PUT-CALL PARITY AND THE LAW

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Things are seldom what they seem,
Skim milk masquerades as cream.
—William S. Gilbert
H.M.S. Pinafore

The above couplet from one of Gilbert and Sullivan's most enduring operettas, *H.M.S. Pinafore*,[1] illustrates a common literary theme—the conflict between appearance and reality.[2] That conflict also frequently arises in the law, where it is usually cast as one between substance and form.[3] It arises because legal rules are

* Professor of Law and Real Estate, University of Pennsylvania. I thank Bernie Black, Peter Huang, Deborah Paul, Paul Stephan, and George Triantis, audiences at ALEA, Columbia, Georgetown, USC and Virginia, and my corporate finance students over the years for their many helpful suggestions. I also thank Alvin Dong, Kenny Gersh and Liz Moore for their research assistance and the Zumberge Research and Innovation fund for its financial support.

[1] 1 WILLIAM GILBERT & ARTHUR SULLIVAN, *H.M.S. Pinafore*, act 2, *in* THE ANNOTATED GILBERT AND SULLIVAN 11-81 (Ian Bradley ed., 1985).

[2] In the operetta, the captain of H.M.S. *Pinafore* will not allow himself to fall in love with a bumboat woman nor allow his daughter, who is already deeply in love, to marry one of the ship's seamen because of his family's apparent high social rank. It is, however, later discovered that the captain and the seaman were switched at birth, so it is the seaman and not the captain who is of high rank. Social rank no longer a bar, the two couples marry. *See id*.

[3] *See* PATRICK S. ATIYAH & ROBERT S. SUMMERS, FORM AND SUBSTANCE IN ANGLO-AMERICAN LAW: A COMPARATIVE STUDY IN LEGAL REASONING, LEGAL THEORY AND LEGAL INSTITUTIONS 261-66 (1987); LEO KATZ, ILL-GOTTEN GAINS: EVASION, BLACKMAIL, FRAUD AND KINDRED PUZZLES OF THE LAW 1-132 (1996). Courts frequently rely on the doctrine that substance prevails over form to justify a holding. *E.g.*, Comm'r. v. Court Holding Co., 324 U.S. 331, 345 (1945) (holding that what was formally a sale by taxpayers of property conveyed to them by the corporation was a sale of that property by the corporation in a liquidating dividend on the grounds that "[t]o permit the true nature of a transaction to be disguised by mere formalisms, which exist solely to alter tax liabilities, would seriously impair the effective administration of tax policies of Congress"); Gregory v. Helvering, 293 U.S. 465, 470 (1934) (holding that a "reorganization" brought about to transfer stock held by a corporation in a second corporation was a taxable dividend because to treat the transaction as a nontaxable reorganization "would be to exalt artifice above reality"); SEC v. Friendly Power Co., 49

frequently written using concepts from everyday experience. Thus, for example, usury rules restrict interest rates and the income tax taxes the seller of common stock.[4] In recent years, financial innovators have recognized that cash flows can be disaggregated and rebundled in almost limitless combination. Viewed from the perspective of the modern financial engineer, there is nothing fundamental and immutable about the classic financial contracts (e.g., a loan) and transactions (e.g., a sale) that have been around for centuries.[5] Today, cash flow streams can easily be repackaged to create "hybrids," which do not have the cash flow of any single existing contract or recognized transaction, or "synthetics," which have a cash flow identical to that of an existing contract or recognized transaction.[6]

Not surprisingly, financial engineering has created nightmares for regulators and tax authorities.[7] In order to provide the public with guidance, legislatures and regulatory agencies write laws and rules that they intend to be stable and to cover most cases. As a result, the authorities charged with their enforcement must work within the existing framework by fitting new innovations into familiar categories.[8] The tax and regulatory treatment of traditional financial contracts and transactions are well established. They are also often inconsistent.[9]

The pressure that financial innovation has placed on tax and regulatory authorities is not incidental. Inconsistencies in tax and regulatory regimes are one of the major impetuses for financial innovation.[10] Indeed, they might be the primary such impetus.[11]

F. Supp. 2d 1363, 1368 (S.D. Fla. 1999) (holding that putative franchise contracts were investment contracts required to be registered because "[e]conomic substance, not form, governs whether a given investment is a security" for purposes of Securities Act prohibition on sales of unregistered securities).

4 *See* discussion *infra* Parts II.A., II.B.2.

5 *See* CLIFFORD W. SMITH, JR. & CHARLES W. SMITHSON, *Financial Engineering: an Overview*, *in* THE HANDBOOK OF FINANCIAL ENGINEERING 3, 10-12 (Clifford W. Smith & Charles W. Smithson, Jr. eds., 1990).

6 *Id.* at 3.

7 *See* Herwig J. Schlunk, *Little Boxes: Can Optimal Commodity Tax Methodology Save the Debt-Equity Distinction?*, 80 TEX. L. REV. 703, 859 (2002); Mark P. Gergen, *Afterword, Apocalypse Not?*, 50 TAX L. REV. 833, 833 (1995).

8 *See* Gergen, *supra* note 7, at 833 n.1.

9 *See* Jeff Strnad, *Taxing New Financial Products: A Conceptual Framework*, 46 STAN. L. REV. 569, 587-93 (1994) (demonstrating that the tax treatment of debt and equity are inconsistent).

10 Clifford Smith and Charles Smithson provide four rationales for financial innovation: tax and regulatory arbitrage; classic arbitrage; reducing the expected costs of financial distress; and increasing the corporation's debt capacity. *See* SMITH & SMITHSON, *supra* note 5, at 10-12.

11 That at least is what Merton Miller, who shared the 1990 Nobel Prize in Economics, argued. *See* MERTON H. MILLER, FINANCIAL INNOVATIONS AND MARKET VOLATILITY

There is a strong incentive for financial innovators to disaggregate and rebundle cash flows in order to avoid prohibited or disadvantaged transactions.[12] When this occurs the innovator can charge a premium for its product, at least until others catch on, that reflects the saving. Such innovations are commonly referred to as tax or regulatory arbitrage.

The basis for much of this arbitrage is the put-call parity theorem. The theorem states that given any three of the four following financial instruments—a riskless zero-coupon bond, a share of stock, a call option on the stock and a put option on the stock—the fourth instrument can be replicated.[13] Thus, the theorem implies that any financial position containing one of these assets can be constructed in at least two different ways. Its legal significance arises when economically equivalent positions receive different legal treatments simply because they are constructed from different instruments. If this happens, the legal system is inconsistent, some cash flow patterns correspond to more than a single legal treatment, form takes precedence over substance, and regulatory arbitrage is possible.

Regulators and lawmakers are concerned with regulatory arbitrage because such arbitrage creates both inefficiency and unfairness. Arbitrage that exploits legal inconsistencies is inefficient because the authorities could eliminate the additional costs parties incur contracting around inconsistent rules by rewriting those rules. Regulatory arbitrage is unfair because the less wealthy and less sophisticated often are unable to avail themselves of the arbitrage and so only they pay the higher regulatory cost.

This Essay shows how financial innovators have used the put-call parity theorem to evade a wide range of rules by synthesizing a position or transaction that is identical in substance to either a prohibited or disadvantaged one, but which differs from it in form. Some of these techniques still work; others no longer do because the authorities have recognized the equivalence and have taken steps to treat the two alternatives in the same way. However, before the put-call parity theorem is applied to legal issues, it is stated and proved in the next section.

5-9 (1991).

[12] I use the terms evasion and avoidance synonymously. Specifically, I do not make the distinction, well-known in the tax law, between permissible acts (avoidance) and impermissible acts (evasion).

[13] *See* discussion of put-call parity theorem *infra* Part I.

I. THE PUT-CALL PARITY THEOREM

The first step in illustrating the put-call parity theorem is to define the financial instruments that are its elements. There are four such instruments. However, there are eight positions with respect to these instruments because each instrument can be held either long or short.

A. *The Basic Instruments*

In finance, it is common to use position or payoff diagrams to study portfolios containing options. The vertical axis in the position diagram represents the value of the position at maturity, which is the amount in dollars the investor will receive (or pay) from liquidating the position. The horizontal axis gives the price of a given asset (usually common stock) at the same date. Thus, the position diagram represents the value of the position at maturity as a function of the value of a given asset.[14]

1. Underlying Stock

The position diagram for a portfolio consisting of one share of Yahoo! is drawn in Figure 1. The value of the portfolio on any date, say March 1, 2003, is just equal to the price of one share of Yahoo! on that date. Thus, the value of the position is the bold line drawn from the origin at 45 degrees.

[14] *See* RICHARD A. BREALEY & STEWART C. MYERS, PRINCIPLES OF CORPORATE FINANCE 586 (6th ed. 2000). If the diagram takes into account what the investor paid to obtain the position, it is called a profit diagram. *See* ZVI BODIE ET AL., INVESTMENTS 555-58 (1989). For general discussions of profit diagrams, see JOHN COX & MARK RUBINSTEIN, OPTION MARKETS 5-23 (1985); ROBERT A. JARROW & ANDREW RUDD, OPTION PRICING 22-33 (1983).

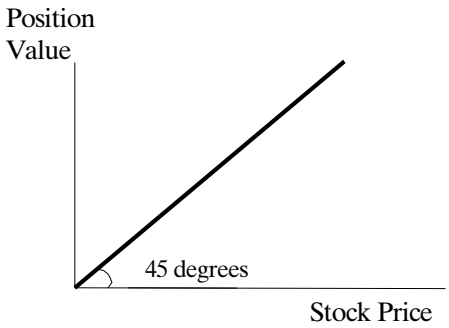

Figure 1 – Position Diagram for Holding One Share of Stock

The position that is the opposite of holding one share of Yahoo! might be thought to be issuing one share, which only Yahoo! can do. Instead, the corresponding position is to sell short, or simply short, one share of Yahoo!. An investor shorts a stock by borrowing a share from another investor or a broker and selling that share in the market. The investor, who now holds cash, is obligated to return one share of Yahoo! to the lender at a later date. The investor closes out the short position by purchasing one share of Yahoo! and tendering it to the lending party.[15]

An investor who shorts a stock is betting that the stock will go down. If the price of the stock falls between the time the short position is opened and closed, the investor's gain (ignoring the time value of money) is the difference between the price when the transaction was opened and when it was closed. If the price rises, the difference is the investor's loss.

Regardless of whether the investment produces a gain or loss, the investor will have to pay the lender when the transaction is closed, unless the stock is worthless. The corresponding position diagram for a short sale of one share of Yahoo! is given by the bold line in Figure 2. The line slopes down at 45 degrees because the investor is $1 out-of-pocket for each $1 of share price.

[15] The investor must also compensate the lender for any dividends that were paid on the stock in the interim. To simplify the discussion, the underlying stock is assumed not to pay dividends.

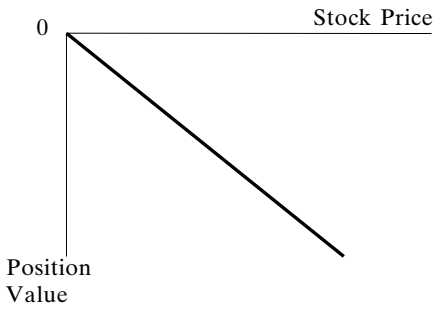

Figure 2 – Position Diagram for Shorting One Share of Stock

A quick comparison of Figures 1 and 2 reveals that Figure 2 is just the mirror image of Figure 1 about the horizontal (stock price) axis. This relationship, that the long position and short position are mirror images about the horizontal axis, holds for all four instruments. This is because the buyer of the long position receives what the seller of the short positions pays.

2. Zero-Coupon Bond

The second instrument is a riskless zero-coupon bond. The periodic interest payment on a bond is called the coupon. Accordingly, a zero-coupon bond is one on which interest is not paid periodically, but only at maturity along with repayment of principal.[16]

Consider a zero-coupon bond that will pay $100 on March 1, 2003. The investor who holds the bond will receive $100 on that date regardless of the price of any stock, including Yahoo!. Figure 3 is the position diagram for an investor who holds such a bond. The bold payoff line is horizontal at $100 because the payment is invariant with respect to the price of Yahoo!.

[16] For many years, bonds were issued in bearer form with coupons attached. When an interest payment was due, the holder would clip the appropriate coupon and send it to the issuer's bank for payment. The periodic interest payment, thus, came to be called the coupon. Bearer bonds were an effective means of tax avoidance because the authorities could not track the payment. Accordingly, in 1982 Congress added section 163(f) to the Internal Revenue Code, which denies issuers an interest deduction for bonds in bearer form. *See* Tax Equity and Fiscal Responsibility Act of 1982, Pub. L. No. 97-248, § 310(b)(2), 96 Stat. 596 (1982). As a result, corporate bonds are issued in registered form with the periodic interest sent to the registered owner along with IRS Form 1099, a copy of which is also sent to the government.

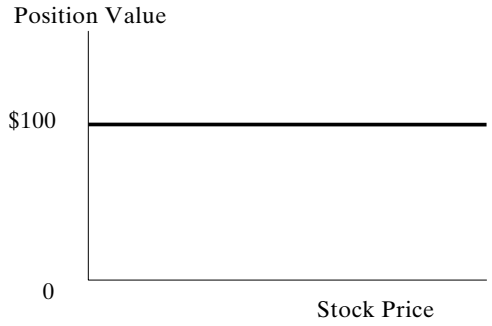

Figure 3 – Position Diagram for a Lending Transaction (Purchase Bond)

The transaction depicted in Figure 3 is a lending transaction. The opposite of lending is borrowing. Figure 4 is the position diagram for a borrowing transaction. The investor is borrowing money and must pay $100 on March 1, 2003. Since the obligation is $100 regardless of the price of Yahoo!, the bold payoff line is horizontal at minus $100.

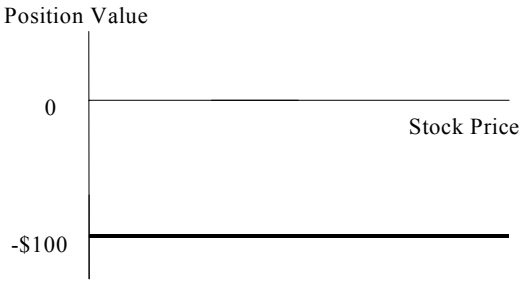

Figure 4 – Position Diagram for a Borrowing Transaction (Sell Bond)

3. Call Option

Puts and calls are derivative instruments. A derivative does not exist independently, but only in relation to an underlying asset,

and its payoff is related to the price of the underlying asset.[17] In this example, the underlying asset is one share of Yahoo!.

One of the simplest derivative instruments is a call option. A call option gives its holder the right to buy a fixed number of units of the underlying asset at a fixed price on or before a given date.[18] The holder of a call option has the right to make the purchase, but is not obligated to do so.

Options have their own terminology. Purchasing the underlying asset through the call option is exercising the call.[19] The fixed price is the exercise price or the strike price, and the given date is the maturity or expiration date.[20] The individual who issues the call is the seller or writer, and the individual who purchases it is the buyer or holder.[21] The market price of the call is the premium or the call price.[22]

Options can be divided into American and European options. An American option can be exercised anytime up to the expiration date; a European option can only be exercised on the expiration date. The basic put-call parity theorem illustrated here is strictly true only for European options. [23] There is a slightly different version for American options.

Options are widespread. In theory, an option can be written on any asset that can be bought or sold. In practice, there are limits, but not many. For example, options are commonly written on real estate and businesses.[24] Options can even be implicit, such as the option to develop a proven oil reserve or to produce a sequel to a hit movie.[25] Although options and assets with option

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[17] *See* JOHN C. HULL, OPTIONS, FUTURES AND OTHER DERIVATIVE SECURITIES 1 (4th ed. 2000); ROBERT L. MCDONALD, DERIVATIVES MARKETS 1 (2002).

[18] *See* Cox & RUBINSTEIN, *supra* note 14, at 1; BREALEY & MYERS, *supra* note 14, at 586; STEPHEN ROSS ET AL., CORPORATE FINANCE 547 (5th ed. 1999).

[19] *See* COX & RUBINSTEIN, *supra* note 14, at 1; ROSS ET AL., *supra* note 18, at 546.

[20] *See* COX & RUBINSTEIN, *supra* note 14, at 1; ROSS ET AL., *supra* note 18, at 546.

[21] *See* COX & RUBINSTEIN, *supra* note 14, at 1; ROSS ET AL., *supra* note 18, at 547 n.2.

[22] *See* COX & RUBINSTEIN, *supra* note 14, at 1.

[23] *See* BREALEY & MYERS, *supra* note 14, at 586; ROSS ET AL., *supra* note 18, at 546. The put-call parity theorem described here does not hold for American options because the holder can exercise an American option before its expiration date.

[24] In 1990, Roche Holdings, Ltd., a Swiss drug company, acquired 60 percent of Genetech with an option to purchase the remaining 40 percent. *Roche Extends Option to Buy Genetech Shares*, AFP-EXTEL NEWS LTD., May 1, 1995, *available at* LEXIS, Nexis Library, Finrep File.

[25] Such options, called real options, have recently become an important field of study. *See, e.g.*, MARTHA AMRAM & NALIN KULATILAKA, REAL OPTIONS: MANAGING STRATEGIC INVESTMENT IN AN UNCERTAIN WORLD (1999); TOM COPELAND & VLADIMIR ANTIKAROV, REAL OPTIONS: A PRACTITIONER'S GUIDE (2001); AVINASH K. DIXIT & ROBERT S. PINDYCK, INVESTMENT UNDER UNCERTAINTY (1994); LENOS TRIGEORGIS, REAL OPTIONS: MANAGERIAL FLEXIBILITY AND STRATEGY IN RESOURCE ALLOCATION (1996).

characteristics are ubiquitous, the most familiar options are written on common stocks. In this section, the discussion will focus on options on common stocks, and principally on those options traded on organized exchanges.

Consider a call on Yahoo! that gives the holder the right to buy one share of Yahoo! from the writer for $100 on March 1, 2003.[26] Since the holder is not obligated to make the purchase, the holder should permit the option to lapse unexercised if the price of Yahoo! on March 1, 2003, is less than $100. If the price of Yahoo! is less than $100, the holder can buy a share of Yahoo! for less on the open market than by exercising the option. In this case, the option is said to expire out-of-the-money.[27] Conversely, if the price of Yahoo! at maturity is above $100, the holder should exercise the option and the option is said to expire in-the-money.[28] For example, if Yahoo! is selling at $120, the holder can make $20 profit, the difference between the stock price and the exercise price, by exercising the option. Thus, the value of a call option at maturity is zero if the stock price is at or below the exercise price ($100) and it increases $1 for every dollar that the stock price increases.[29] This is indicated in Figure 5.

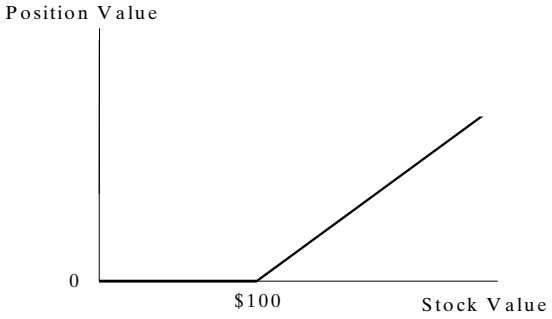

Figure 5 – Position Diagram for a Held Call Option

The writer of the call option pays what the holder receives.[30] Assuming that the holder follows the value-maximizing exercise strategy described above, the writer's position value is zero for stock prices at maturity below the exercise price and it decreases $1 for every dollar that the stock price increases. This is described

[26] Exchange-traded call options give the holder the right to buy 100 shares of the underlying asset. To simplify the discussion, put and call contracts will be assumed to be written on only one share each.

[27] *See* ROSS ET AL., *supra* note 18, at 547.

[28] *See id*.

[29] Mathematically, the payoff on the call option at maturity is max(S-100,0), where S is the stock price at maturity.

[30] This ignores transactions costs, which include brokerage fees.

in Figure 6. The writer of a call option promises to deliver the underlying asset to the option holder if the holder exercises the call. Thus, in contrast to the holder, the writer does not have the option of performing, but is obligated to perform if the holder exercises the call.

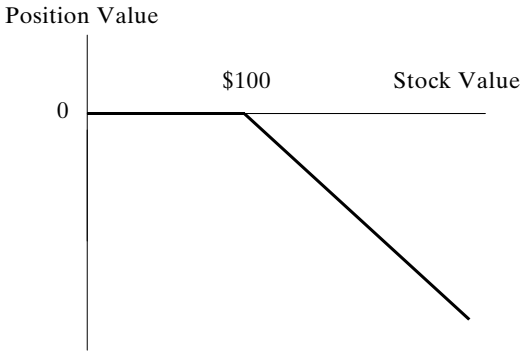

Figure 6 – Position Diagram for a Written Call

In effect, the writer of a call option is betting that the stock price will not rise above the exercise price. Since the writer at best receives nothing at maturity and might have to pay the holder, writing a call is a losing proposition (and holding one is a winning proposition). Consequently, if calls were free, everyone would want to hold them and no one would be willing to write them. Accordingly, in order to induce investors to write calls, holders pay writers a premium when the transaction is undertaken.[31]

4. Put Option

The last instrument in the put-call parity theorem is the put option. A put option gives its holder the right, but not the obligation, to sell the underlying share of stock to the writer in exchange for the exercise price. Thus, a $100 put option on

[31] Options are settled by delivery. That is, a call option is settled by tendering the strike price and receiving the underlying security. To avoid the additional brokerage costs of the transaction in the underlying security, exchange-traded options can also be settled by closing out the position. In the case of a held call, this is done by writing the identical call and then tendering the held and written calls to the exchange and having the exchange cancel the transaction. The payoff from exercising the original call comes from writing the later call. Similarly, the loss from a written call is realized by purchasing the identical call. The same principle applies to puts. *See* WILLIAM A. KLEIN & JOHN C. COFFEE, BUSINESS ORGANIZATION AND FINANCE 286 (7th ed. 2000).

Yahoo! expiring on March 1, 2003, gives the holder the right, but not the obligation, to sell one share of Yahoo! to the writer for $100. Obviously, that right should be exercised only if the share price of Yahoo! is below $100. It therefore follows that the position value from holding the $100 Yahoo! put at maturity is $0 if the price of Yahoo! is at or above $100, and it increases by $1 for every dollar that the price of Yahoo! is below $100.[32] The position diagram for the holder of the put option is given in Figure 7.

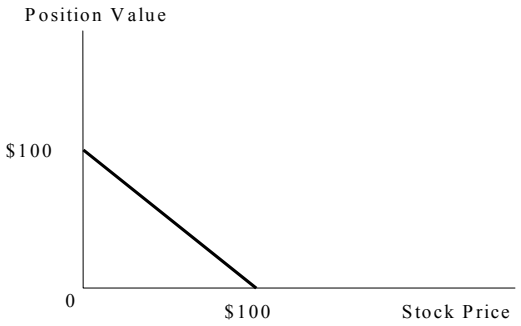

Figure 7 – Position Diagram for a Held Put Option

The writer of the put option is out-of-pocket what the holder receives. Thus, assuming the holder follows the value-maximizing exercise policy, the value of the writer's position is zero if the price of Yahoo! is at or above $100 at maturity and it falls by $1 for each dollar that the price is below $100. The position diagram for the writer of such a put is drawn in Figure 8.

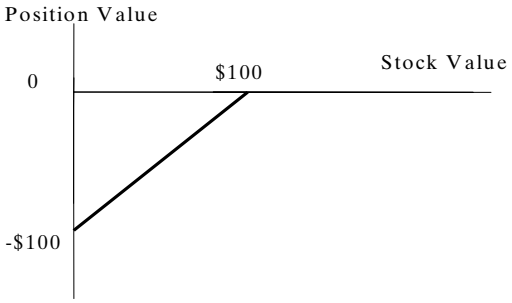

Figure 8 – Position Diagram for a Written Put

[32] Mathematically, the payoff on the put option at maturity can be written as max(100-S,0).

B. *An Intuitive Proof of the Put-Call Parity Theorem*[33]

The put-call parity theorem states that the payoff from a portfolio consisting of one share of the underlying stock and the right to sell that share (at date T for exercise price E) is equivalent to a portfolio consisting of a riskless zero-coupon bond (that pays E at date T) and the right to buy one share of the underlying stock (at date T for exercise price E). Therefore, because the payoffs at maturity from the two portfolios are equal, the value of the two portfolios at any date prior to maturity must be equal.

Use a subscript T to indicate the payoff from holding an instrument at date T. Allow E to denote a riskless zero-coupon bond that pays E at date T, S the underlying stock, P a (European) put on that stock, and C a (European) call, with both the put and the call having expiration date T and exercise price E. The put-call parity theorem implies that the payoffs from the four securities at maturity have the following relationship:

$$E + C_T = S_T + P \qquad \textbf{(1)}$$

Letting PV(E) denote the market price of a bond that will pay E at date T,[34] the claim that the market price of the two portfolios is equal at any date prior to maturity can be written as follows:

$$PV(E) + C = S + P, \qquad \textbf{(2)}$$

where S is the market price of the stock and P and C are the premiums on the put and call.

There are several ways to demonstrate the put-call parity theorem. The most intuitive is to describe the bond in terms of the three remaining instruments. The convention with financial instruments is that a plus sign (+) indicates that the instrument is held and a minus sign (-) indicates that it is sold short in the case of the underlying stock, issued in the case of the bond (borrowed), or written in the case of the put or call. Thus, subtracting C from both sides, Equation 2 can be rewritten as:

$$PV(E) = S + P - C\,. \qquad \textbf{(3)}$$

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[33] More formal proofs of the put-call parity theorem are provided by COX & RUBINSTEIN, *supra* note 14, at 39-44 *and* JARROW & RUDD, *supra* note 14, at 47-56, 69-79. Informal proofs along the lines described below are given by BODIE ET AL., *supra* note 14, at 564-66; ROSS ET AL., *supra* note 18, at 552-54.

[34] PV(E) is the present value of E to be received at time T.

Equation 3 states that a zero-coupon bond that pays E at date T is equivalent to a portfolio consisting of stock plus a put on the stock and a call written on the stock, with the put and call sharing the same exercise price (E) and maturity date (T). The intuition behind the put-call parity theorem is easily demonstrated using a bond that pays $100 on March 1, 2003, one share of Yahoo!, a put that gives the holder the right to sell one share of Yahoo! to the writer for $100 on March 1, 2003, and a call that gives the holder the right to purchase one share of Yahoo! from the writer for $100 on March 1, 2003.

A portfolio consisting of one share of Yahoo!, the held put and the written call will pay $100 on March 1, 2003, regardless of the price of Yahoo! on that date. If Yahoo! is selling for less than $100, the written call will expire worthless. The stock and the put will together be worth $100 because the put can be used to sell the stock for $100.[35] Alternatively, if Yahoo! is selling for more than $100, the put expires worthless and the stock and the written call are together worth $100 because the holder of the call will buy the stock from the writer for $100.[36] Finally, if the stock is worth exactly $100, the put and call both expire worthless, so the portfolio is again worth $100. Therefore, whatever the price of Yahoo! on March 1, 2003, the portfolio will be worth exactly $100.

Of course, the financial instrument that pays $100 on March 1, 2003, regardless of the price of Yahoo! is a $100 zero-coupon bond maturing on that date. It follows, therefore, as is also demonstrated graphically in Figure 9, that the payoff on a portfolio consisting of one share of Yahoo! (dotted line), one held put on Yahoo! (dashed line), and one written call on Yahoo! (dashed and dotted line), with the put and the call both having a $100 exercise price and maturing on March 1, 2003, is equivalent to the payoff on a $100 zero-coupon bond maturing on March 1, 2003 (bold solid line). The intuition is straightforward. The stock and the held put together guarantee that the investor will not receive less than $100 on March 1, 2003, and the stock and written call

[35] In terms of our notation, if $S_T < 100$, then $S_T + P_T = 100$. This is because $P_T = 100 - S_T$, when $S_T > 100$. Thus, if the price of Yahoo! on March 1, 2003 is below $100 a share, say $80, the share of stock can be sold for $80 and the put can be closed out netting the investor $20, so the portfolio is worth $100. For any other price of Yahoo! below $100, the portfolio is still worth $100 because any decline in the price of the stock is exactly offset by an increase in the value of the put.

[36] Again using our notation, if $S_T > 100$, then $S_T - C_T = 100$, because $-C_T = 100 - S_T$ when $S_T > 100$. Thus, if the price of Yahoo! on March 1, 2003 is above $100, say $120, then the stock is worth $120, but the written call will cost the investor $20 to close out. For any other price of Yahoo! above $100, the portfolio is still worth $100 because any increase in the price of the stock is exactly offset by the loss on the written call.

together ensure that the investor will not receive more than $100.

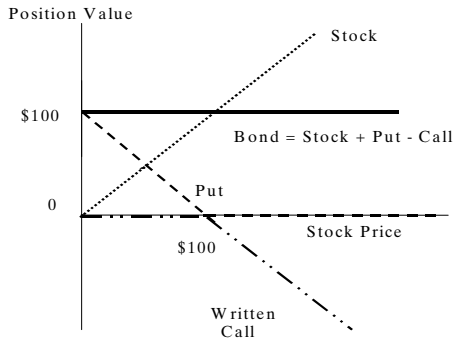

Figure 9 – Demonstration of Put-Call Parity Theorem Using Position Diagrams

The analysis has so far shown that the put-call parity theorem holds at maturity.[37] The theorem must also hold before maturity because the no-arbitrage condition will ensure that the price of the zero-coupon bond on any date before maturity must equal the cost of assembling the portfolio on that same date.[38]

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[37] Variations of the put-call parity theorem apply when the stock pays dividends, interest rates vary, or American options replace European options. They are more complex, less intuitive and often contain inequalities. Moreover, greater generality reduces the tightness of the arbitrage conditions. *See* JARROW & RUDD, *supra* note 14, at 51-56, 69-79. However, under more general specifications, there are still strong arbitrage conditions that, if left unchecked, would permit the tax and regulatory arbitrage described below.

[38] If the no-arbitrage condition were violated, it would be possible for investors to make a risk-free profit with no investment by shorting the more expensive side of the transaction and investing the proceeds in the less expensive side. Such an arbitrager could pocket the difference today and would be confident because of put-call parity that the proceeds from the held portfolio could be used at maturity to satisfy the obligation on the short portfolio. Arbitragers would obviously want to increase their arbitrage and because the arbitrage requires no net investment the amount of arbitrage would be potentially unlimited. As a result, it is widely recognized in finance and economics that a necessary condition for equilibrium is that arbitrage, the simultaneous purchase and sale of the same security (or of an economically equivalent security) at different prices, not be possible. *See* ANDREI SHLEIFER, INEFFICIENT MARKETS: AN INTRODUCTION TO BEHAVIORAL FINANCE 3 (2000). The notion is that if the portfolio is cheaper than the bond, an investor can make unlimited arbitrage profits by borrowing (shorting the bond) to purchase the portfolio, and conversely if the bond is cheaper than the portfolio, an investor can make unlimited arbitrage profits by lending (buying the bond) and shorting the portfolio. For example, assume on March 1, 2002, the market price of Yahoo! is $80, the put premium is $25 and the call premium is $15. The cost to the investor of purchasing the stock and the put is $105 and the investor receives $15 for writing the call. Thus, the cost of assembling

II. LEGAL APPLICATIONS

This Part provides several examples of how the put-call parity theorem has been used to circumvent various legal rules. These applications fall into two groups. The first group involves taking positions that if taken directly would be legally disadvantaged and the second involves engaging in transactions that if done directly would be legally disadvantaged.

A. *Evading Usury: Loans With Title Transfers*

The put-call parity theorem can be used to circumvent usury laws, which limit the legal rate of interest on loans. Assume that Anne has agreed to lend Bob $200, and that Bob has agreed to repay the loan in one year along with $100 interest. If the maximum legal interest rate is below 50 percent, then Anne will be prevented from making the loan to Bob. Anne and Bob, however, can avoid the usury provision if Bob sells Anne securities or other assets for $200, Bob writes Anne a (European) put on the securities with a $300 exercise price, and Anne writes Bob a (European) call on the securities with the same $300 exercise price.[39] Such an arrangement will ensure that Anne receives $300 at the end of the year.[40]

the portfolio is $90. If the price of the bond on March 1, 2002, is above $90, say $92, arbitrage is possible: the investor can short the bond (borrow) receiving $92 and take $90 to assemble the portfolio. The investor will pocket $2. On March 1, 2003, she will get $100 for her portfolio, which will be just enough to pay principal and interest on the money borrowed. The investor, thus, makes $2 on no investment. The investor and many others would like to do as much of this arbitrage as possible. Thus, the price of the bond on March 1, 2002, cannot be above $90. Similarly, if the price of the bond on March 1, 2002, is below $90, say $88, the investor can make an arbitrage profit by shorting the portfolio and purchasing the bond. The investor shorts the portfolio consisting of one share of Yahoo!, the put on Yahoo! and the written call on Yahoo! by shorting the share, writing the put and purchasing the call. If the investor follows this strategy, she will receive $90. Taking $88 to purchase the bond, leaves her with $2. At maturity, the bond yields the investor $100, which she can use to pay the $100 owed on the shorted portfolio. Thus, by an argument similar to the one above, the price of the bond cannot be below $90. It follows that the price of the bond is $90, the cost of assembling the original portfolio.

[39] It does not matter what the securities are actually worth. The parties could use a peppercorn. Of course, the greater the value transferred, the more security Anne has if Bob refuses to pay or is insolvent.

[40] If the securities are worth less than $300, Anne will exercise her put; if they are worth more, Bob will exercise his call. The only instance in which Anne will end up with less than $300 is if the securities are worth less than $300 and Bob is bankrupt. However, she would be in the same place had she made a loan to Bob and took a security interest in the securities.

Expressing the above transaction using put-call parity, Anne's position can be represented as S-C+P, which from the put-call parity theorem is equivalent to PV(E). Although the transaction is in substance a loan from Anne to Bob, in form it is not. In form, Anne holds stock and the option to sell that stock to Bob (a held call), and she has written Bob the option to buy that stock from her (a written put). Since none of those transactions are subject to a restriction on the permissible rate of return, the transaction will escape the prohibition on usury, unless that prohibition also covers positions that are in substance (but not in form) loans.

The two alternative versions of the transaction between Anne and Bob are illustrated below in Figure 10.

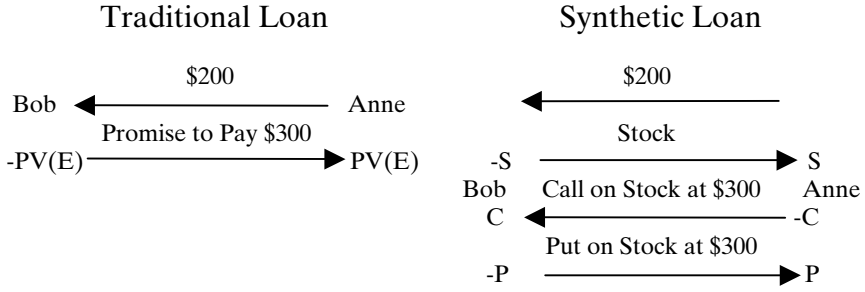

Figure 10 – Avoiding Usury Through Put-Call Parity

The left side of Figure 10 illustrates a traditional loan: Anne advances Bob $200 and Bob promises to pay Anne $300. Viewed from the lender's (Anne's) perspective, this transaction is expressed PV(E), the left side of equation 3. The right side illustrates a synthetic loan: Anne pays Bob $200 and receives stock in return (S); Anne writes a call to Bob at $300 (-C); and she receives a put from Bob at $300 (P). Thus, viewed from Anne's perspective, her position can be written as S-C+P, the right side of equation 3.[41]

The use of put-call parity to avoid usury restrictions is more than theoretical. Today, some Muslims are using put-call parity to avoid Islam's prohibition on paying interest. That prohibition, which has made it difficult for many Muslims living in the West to purchase homes,[42] has spurred some innovative home financing

[41] The transaction can also be viewed from the borrower's (Bob's) perspective. The prohibited transaction on the left side of Figure 10 is represented by –PV(E), which is the left side of equation 3 multiplied by –1. The right side illustrates a synthesized loan. The borrower's position with the synthesized loan can be written as –S+C-P, which is the right side of equation 3 multiplied by –1. Here, –S represents an actual sale rather than a short sale because Bob originally owned the stock.

[42] *See* Neal Gendler, *Finance Methods Could Allow More Muslims to Own Homes*,

techniques. In one of the simplest of these transactions (used in and around London), the bank buys the house and agrees to sell it to its client for a higher price through an installment sale.[43] Thus, instead of owning the house and taking out a mortgage, which would be written as S-PV(E), the client has agreed to buy the house, which can be written as C-P.[44] Viewed from the bank's perspective, it owns the house subject to the agreement to sell it to its client for the promised payments. Thus, the bank's position can be written as S-C+P, which from put-call parity is equivalent to PV(E), a simple loan.

In another variation (used in parts of the United States), the bank buys the house and enters into a contract to sell it to the client for the same price in a series of installments over a number of years. The bank also agrees to rent to the client that portion of the house the bank owns.[45] If the client fails to make the payments, the bank will take over the house and sell it. Thus, the client has the option to buy the entire house by making all of the payments, which can be written as C.[46] From the put-call parity theorem, this is equivalent to the client owning the house, S, and financing it with a nonrecourse mortgage, -PV(E)+P.[47] Viewed from the bank's perspective, it owns the house, but has written a call on it (S-C), which is economically equivalent to making a nonrecourse loan with the house as security (PV(E)-P).

Of course, the bank's profit from this rent-to-purchase transaction comes from the rent it receives on its portion of the house. Interestingly, the U.S. Treasury Department considers the rent—which replaces the interest a bank would receive from an

STAR TRIB. (Minneapolis), May 19, 2000, at 5B; Yuki Noguchi, *Matching Faith and Finances; Alternatives to Loans Cater to Area Muslims*, WASH. POST, Oct. 28, 1999, at E1; Alison Steed, *Midweek Money: Borrow in Good Faith*, THE INDEPENDENT (London), Feb. 3, 1999, at 11.

[43] *See* Adam Jones, *No-Interest Loan has Poor Take-up*, TIMES (London), Jan. 17, 1998, at 64.

[44] Technically, the contract is not a simple forward, but a series of forward contracts. In a forward contract, the holder is obliged to purchase the underlying asset from the writer. Thus, a held forward combines a held call and a written put, so it can be written as C-P.

[45] *See* Noguchi, *supra* note 42. If the rental rate (for each percent of the house the bank still owns) is fixed, the transaction is similar to a fixed-rate mortgage; if the rental varies over time, it is similar to a variable rate mortgage. *See* Steed, *supra* note 42, at 11; Marla Dickerson, *The Price of Piety in Islam*, L.A. TIMES, Mar. 17, 1999, at A1.

[46] Technically, this is not a single option, but a series of embedded options. Each month, the client has to decide whether to make the next payment, in which case it has the right to continue to make payments, or to stop making payments. If it chooses the latter, the bank takes the property and sells it.

[47] The borrowers right to walk away from the transaction by transferring the property to the lender is the right to sell the property to the lender for the outstanding balance of the loan. Thus, this right is a put option.

ordinary loan transaction—to be interest and requires the bank to include these payments in income and allows the client to deduct these payments as qualified home mortgage interest.[48] Thus, in effect, Treasury is using put-call parity to treat the transaction as a nonrecourse loan for tax purposes.

Although the tax authorities consider these transactions to be loans, Muslims who finance their homes through them seek assurances that they are not paying interest. Accordingly, these transactions are usually supported by opinions from clerics and scholars that they are consistent with Islamic principles.[49] Nonetheless, some experts believe these transactions are impermissible disguised loans.[50] In effect, those critics are also using put-call parity to look through these transactions.

B. *Transferring Tax Losses with Leases: Ownership Without Title*

The previous section illustrated how put-call parity has been used to synthesize loans. Put-call parity has also been used to synthesize ownership interests.

The following simple example illustrates how put-call parity can be used to construct a position that is equivalent to an ownership interest without transferring title. Assume that Diane owns a commercial building; that Diane and Eric have agreed in principle that Eric will purchase the building for $1 million; but that regulations prevent Eric from currently owning the building. The parties would appear to be stymied. However, Diane can in effect sell the building to Eric by borrowing $1 million from Eric, giving Eric the option to buy the building for $1 million, and receiving from Eric the option to sell the building to him for $1 million.[51] In terms of our notation, Eric's position can be written as PV(E)+C-P, which is equivalent to S. After the transaction, Diane has no financial interest in the building, although she still

[48] *See* Noguchi, *supra* note 42.

[49] *See* Paul Slade, *Family Finance: Ethical Mortgages for Muslims*, SUNDAY TELEGRAPH (London), Feb. 14, 1999, at 11.

[50] *See* Dickerson, *supra* note 45 ("Islamic banking isn't without its critics, most of whom are Muslims wary of financial institutions using religion as a marketing tool. Some view the 'fees,' 'markups,' and 'profit-sharing,' of Islamic transactions as a thinly veiled subterfuge for interest.").

[51] Diane would also lease the building to Eric, and the loan from Diane to Eric would call for interest equal to the rent Eric pays Diane on the building. This arrangement ensures that Eric receives the benefit from using or renting the building, as well as any rise or fall in the building's value. In addition, if Eric does not have $1 million cash and intends to finance the purchase through a third-party, the parties can achieve the same result by having Diane finance that portion of the loan with an outside lender.

holds title.[52] Thus, if the regulatory prohibition only prevents Eric from holding title, put-call parity can be used to transfer the financial equivalent of ownership to Eric.

The above example is similar to the facts in *Frank Lyon Co. v. United States.*[53] In *Frank Lyon*, then-applicable Federal Reserve regulations prevented the Worthen Bank from constructing the new bank building it wanted to own.[54] Accordingly, Worthen entered into the following arrangement with Frank Lyon (a home appliance distributor run by a member of Worthen's board of directors). Worthen constructed a new building and sold it to Frank Lyon for $7.6 million, $500,000 of which was funded by Frank Lyon and the rest was borrowed from a third-party lender, using a 25-year self-amortizing loan.[55] Frank Lyon then leased the building for 25 years to Worthen (using a net lease, so Worthen paid all maintenance costs) for exactly Frank Lyon's mortgage payment. Worthen also had the option after the loan was repaid of repurchasing the building from Frank Lyon for a price equal to Frank Lyon's $500,000 investment plus a 6 percent return on that investment (roughly $2 million).

Using our notation, Frank Lyon owns the building and has written to Worthen a call on the building with a strike price of $2 million (S-C). Through put-call parity, Frank Lyon's position is equivalent to Worthen owing it $2 million in 25 years and Worthen having the right to satisfy that obligation by transferring the building to Frank Lyon. Frank Lyon therefore held the economic equivalent of a nonrecourse loan to Worthen secured only by the building (PV(E)-P).[56] Similarly, Worthen's call option on the building (C) is through put-call parity equivalent to owning the building, owing Frank Lyon $2 million in 25 years and having the right to satisfy that obligation by transferring the building and land to Frank Lyon (S-PV(E)+P). In other words, Worthen's interest in the building was equivalent to owning the building subject to a $2 million nonrecourse loan from Frank Lyon, which was the very

[52] By extending the options when they mature, the arrangement can be extended indefinitely if Eric is still precluded from owning the building.

[53] 435 U.S. 561 (1978).

[54] *See* Bernard Wolfman, *The Supreme Court in the Lyon's Den: A Failure of Judicial Process*, 66 CORNELL L. REV. 1075 (1981) (Worthen could not own the building because the rules prevented banks from investing more than their capital stock in their premises).

[55] The building, which cost more than $10 million to construct (excluding the land), was sold to Frank Lyon as it was being constructed. Thus, at all times, Worthen's investment in the building was less than its capital stock.

[56] Moreover, it was unlikely that Worthen would exercise the put because the expected value of the building in 25 years was more than $25 million. In other words, the strike price of the put was set so that it would very likely be out-of-the-money.

position the regulations prohibited Worthen from taking directly.[57] *Frank Lyon* is a tax case and the issue was whether Frank Lyon or Worthen would receive the depreciation deductions.[58] As for avoiding the regulatory prohibition, the transaction appears to have been completely effective.

Today, put-call parity is widely used to transfer depreciation deductions. Although the owner of property can depreciate it, frequently the party that can best use a specific piece of property does not place the highest value on the tax deductions. Thus, to realize the greatest value from these deductions, the user transfers title to a third party. The classic example involves commercial airliners.[59]

The airline industry is cyclical and highly volatile and, as a result, airlines frequently operate in the red. Consequently, because of incomplete loss offsets, depreciation deductions are not worth as much to airlines as they are to more stable and profitable firms.[60] Accordingly, most airlines no longer own their own planes, choosing instead to lease them. The principal advantage of leasing is that it allows the airline to realize more value from the depreciation deductions by transferring those deductions to other parties. The airlines benefit from the transfer because they are, in effect, paid for the deductions through reduced aircraft payments.

Consider, for example, a $35 million Boeing 737 aircraft that United Airlines plans to purchase and use for 10 years, at which time the aircraft is estimated to have a resale value of $25 million. Assume that Boeing offers United a $30 million, 10-year loan that calls for an annual payment of $2.5 million and a balloon payment of $20 million.[61] If the airline purchased the jet, it would have to pay $5 million when it took delivery. It would also suffer any gain or loss on the aircraft from changes in its resale value. In our

[57] Because the $7.1 million self-amortizing third-party loan would be repaid in 25 years it can be excluded from the notation. However, whether Worthen owned a call on the building or owned the building subject to a nonrecourse loan, the third-party mortgage had to be repaid before Worthen could own the building free and clear. *See infra* notes 59-70 and accompanying text.

[58] *See infra* notes 59-70 and accompanying text.

[59] Other well-known examples of actual and proposed tax-motivated leases include municipal buses, trains and subway cars, university and municipal buildings, and Navy support vessels.

[60] If a corporation loses money, it does not generally receive a refund from the government above what it has already paid in taxes. There is no negative corporate income tax. Instead, corporations can carry losses forward for up to twenty years (after which time they expire) and use them to offset income in future years. I.R.C. § 172. Because of the time value of money, these losses decline in value with delay even when they do not expire. *See* MYRON S. SCHOLES ET AL., TAXES AND BUSINESS STRATEGY: A PLANNING APPROACH 157-58 (2d ed. 2002).

[61] The loan has an effective annual interest rate of 5.78 percent.

notation, United's position is S-PV(E), where E is the $20 million balloon payment. In addition, United would be allowed to take the depreciation deductions, which might have little or no value to it.

In that case, what United might do is find a party that values the depreciation deductions more highly,[62] say GE Capital, and have it purchase the aircraft using Boeing's financing and lease it to United. For example, GE might lease the aircraft to United for $2.5 million a year plus an initial payment of $2 million. GE could also write a call to United on the aircraft at $20 million and it could take a put from United at $20 million. With this transaction, GE Capital would not be exposed to the risk of price fluctuations.[63] In effect, GE would have paid $3 million for the depreciation deductions[64] because the other payments are a wash.[65]

This leasing transaction can be expressed using put-call parity. However, unlike the previous examples, there are now three parties. Fortunately, that complication presents no difficulty because although GE holds title to the aircraft, it has no other interest in the transaction. In form, GE owns the plane (S) and has agreed to sell it to United for $20 million in ten years (-C+P), at which time GE must also make a $20 million balloon payment to Boeing (-PV(E)). Thus, GE's position (S-C+P-PV(E)) is through put-call parity the economic equivalent of having no financial interest in the transaction.[66]

In contrast, United will be fully exposed to the risk of price fluctuations. In form, United has agreed to pay $20 million for the aircraft in 10 years (C-P). That is economically equivalent to buying the aircraft and financing the purchase using a loan that calls for a $20 million balloon payment in 10 years (S-PV(E)).[67] Of course, Boeing's position is just the right to receive the $20 million balloon payment (PV(E)).[68]

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[62] The value of the depreciation tax shield is the present value of the deductions in excess of the aircraft's actual decline in value.

[63] GE Capital is exposed only if both United is bankrupt and the jet is worth less than $20 million in ten years.

[64] This is the $3 million of the $5 million down payment paid by GE.

[65] The $2.5 million lease and loan payments offset one another.

[66] Substituting in the payments at maturity for the variables in GE's position, S-C+P-PV(E), yields: S-max(S-20,0)+max(20-S,0)-20 = S+(20-S)-20 = 0, which is to say GE has no financial interest in the aircraft.

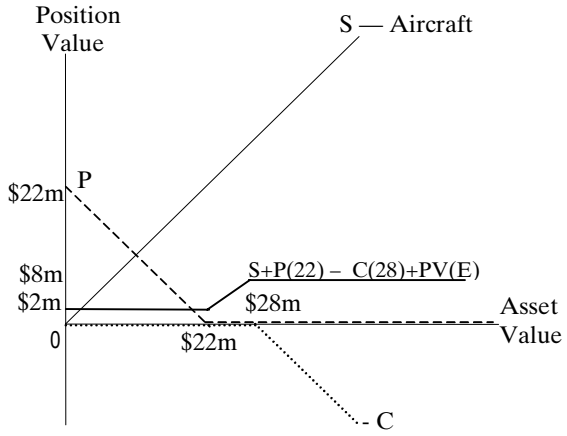
[67] Substituting in the payments at maturity for the variables in United's position, C-P, yields: max(S-20,0)-max(20-S,0) = S-20, which through put-call parity is equivalent to owning the plane and having to pay $20 million in ten years (S-PV(E)).

[68] There is also a $2.5 million annual lease payment from United to GE and a $2.5 million annual loan payment from GE to Boeing. These payments are in essence a $2.5 million annual loan payment from United to Boeing because GE is only a conduit for the payments. These interim payments do not appear in the equations that describe the

The benefit to United from entering into the lease transaction is that GE, in effect, pays United $3 million for the aircraft's depreciation deductions.[69] If the depreciation deductions

parties' positions because they are not payments at maturity.

[69] The tax authorities generally do not permit the putative owner/lessor to transfer the full economic consequences of ownership to the putative lessee. If this is done, the authorities will consider the lessee to be the owner for purposes of the tax law and will not permit the putative owner to take the depreciation deductions. To ensure that the putative owner can take the deductions, the owner must be exposed to some of the risk of price movements. *See* Rev. Procs. 75-21, 1975-1 C.B. 715, and 75-28, 1975-1 C.B. 752 (IRS guidelines for advance rulings that certain equipment leases will be respected for tax purposes). A simple way to do this is to use different exercise prices for the put and call. In ten years, when the aircraft lease expires, the craft, which is expected to be worth $25 million, might be worth substantially more or less. If the lessor's right to put the plane to the lessee and the lessee's right to call the plane from the lessor both have the same strike price, as in the example in the text, then any difference in the price of the craft from $25 million will benefit or harm the lessee. If, however, the put has a $22 million strike price and the call has a $28 million strike price, the putative owner's interest can be written as S+P(22)–C(28)+PV(25), where P(22) is a put on the aircraft with a $22 million strike price, C(28) is a call with a $28 million strike price, and PV(E) is the present value of $20 million. As the formula for the putative owner's interest illustrates, the first $3 million deviation from the aircraft's expected value in either direction will be borne by the lessor. Such an exposure might be sufficient to ensure that the lessor is treated as the owner for tax purposes. The payoff in ten years to the putative owner/lessor with this arrangement is illustrated in the following figure.



The Airline Lease (Lessor's Perspective)

Although the Internal Revenue Service will not give an opinion approving a major lease transaction unless the lessor is exposed to substantial risk, the Service is not always effective in challenging leases where the lessor has eliminated practically all risk. For example, in *Frank Lyon*, the taxpayer had shifted all of the risks from the building to Worthen except for the very small risk that the building would be worth less than the mortgage and that the bank would be insolvent. *See* Frank Lyon Co. v. United States, 435 U.S. 561 (1978). Accordingly, the Commissioner recharacterized the transaction as Worthen borrowing $500,000 from Frank Lyon and paying 6 percent interest. *See id*. at 561. This recharacterization also shifted the depreciation deductions from Frank Lyon,

were worthless to United, it has gained $3 million by leasing instead of buying the jet. The role of put-call parity in the leasing transaction is that it allows United to transfer the depreciation deductions to GE without also transferring use of the aircraft or exposure to fluctuations in the aircraft's resale price.[70] Put-call parity accomplishes this by separating legal ownership (title) and economic ownership, thereby allowing United to transfer only title to the aircraft to GE.

C. *Sales That Are Not Sales*

This section provides two examples in which the put-call parity theorem has been used to achieve the economic equivalent of a sale without incurring the disadvantages that would result from a formal sale. Of the two techniques described below, one remains viable and the other was only recently eliminated.

1. Insider Short-Swing Profits

Section 16(b) of the Securities Exchange Act permits a corporation to recover from any of its officers, directors or 10 percent shareholders the profit realized on a purchase and sale or a sale and purchase of any equity security of the corporation within six months.[71] Until closed by rules released by the Securities and Exchange Commission in 1991,[72] the put-call parity theorem provided a means to escape from section 16(b). This is illustrated by the following example.

On January 15, Helen, an officer of Cycle Corporation purchases 1000 shares of Cycle at $20 a share. By April 30, Cycle's price has risen to $38 a share and Helen would like to sell all of her

which valued them highly, to Worthen, which did not. A majority of the Supreme Court, however, refused to recharacterize the sale-leaseback as a loan and permitted Frank Lyon to deduct the depreciation. *See id*. at 584. The decision is forcefully criticized in Wolfman, *supra* note 54, at 1075.

[70] The rationale for leaving with United exposure to fluctuations in the aircraft's resale value is to give United the correct incentives to care for the aircraft. Shifting that exposure to GE would shift the incentive to maintain the aircraft from United to GE. That would require that GE monitor United, which would directly provide the maintenance. That is less efficient because monitoring is costly and imperfect.

[71] 15 U.S.C. § 78p(b) (2001). Section 16(a) requires that directors, officers and 10 percent shareholders of a class of equity securities file a report with the Securities and Exchange Commission ("SEC") at the end of each month in which the investor acquires or disposes of equity securities of the corporation. 15 U.S.C. § 78p(a).

[72] Ownership Reports and Trading By Officers, Directors and Principal Security Holders, Exchange Act Release No. 34-28869 (CCH).

shares because she believes that their price will soon fall. If Helen were to sell her shares immediately, her $18,000 profit would be subject to the disgorgement provision. What Helen does instead is purchase put contracts and write call contracts on 1000 shares of Cycle at $40 that expire on September 30, which is after the expiration of the 6-month holding period.[73] By purchasing puts and writing calls, Helen has converted her portfolio of Cycle stock, which can be written as S, into a new portfolio that can be written as S+P-C. Through put-call parity, Helen's new portfolio is equivalent to a portfolio of zero-coupon bonds, PV(E).

After the six-month holding period expires on July 15, Helen can sell her shares of Cycle, close out her option positions, and take her profit.[74] This chronology is illustrated in Figure 11.

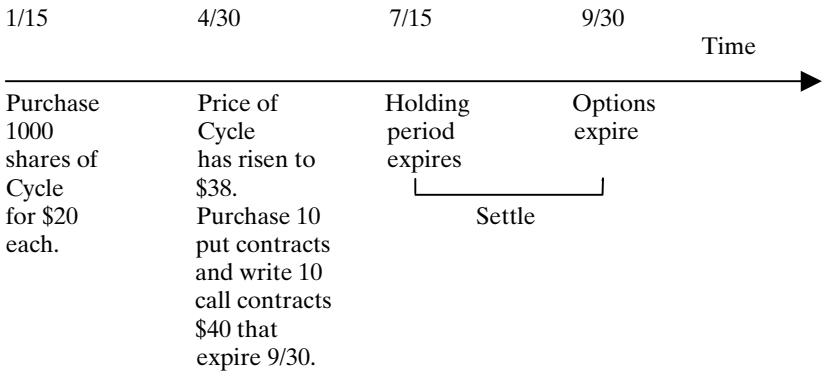


Figure 11 – Evading the Section 16(b) Disgorgement Provision

In promulgating its new rules, the SEC recognized that the profit is not guaranteed by the exercise or settlement of the options, but by their purchase. By purchasing the puts, Helen obtained the right to dispose of her stock at a predetermined price, thereby insuring her profit. Thus, the new SEC rules would treat Helen as if she sold the covered stock at $38 a share when she bought the puts.[75]

[73] Exchange-traded option contracts give the right to buy or sell 100 shares of the underlying stock. Thus, Helen would purchase 10 put contracts and write 10 call contracts.

[74] Alternatively, if her put options were in-the-money, Helen could exercise them by transferring her shares in exchange for the exercise price.

[75] The new SEC rules are broad enough to cover variations of this technique.

2. The Realization Trigger for Capital Gains

Another use of put-call parity is to eliminate the risk from holding an asset and even to "monetize" the asset without selling it. These techniques defer capital gains by avoiding the realization trigger contained in section 1001 of the Internal Revenue Code.[76]

Consider Carol who went to work for High Flying Corporation 35 years ago. Carol, who started as the assistant accountant of a small business and is now chief financial officer of a much larger one, has been acquiring stock all these years. Her portfolio, which is valued at $5 million and has negligible basis, is entirely in the stock of High Flying. Carol intends to retire this year and wants to convert her portfolio into safe bonds. If Carol sells her stock, she will be hit with a large capital gains tax, approximately $1 million.[77] Thus, Carol is apparently faced with a dilemma: she must either pay $1 million tax, leaving her with only $4 million in bonds, or keep an undiversified portfolio with a market value of $5 million. Fortunately for Carol, put-call parity provides a way out of her dilemma.

Assume the current price of High Flying is $50, so Carol has 100,000 shares, and that risk-free bonds pay interest of 5 percent annually. If Carol writes calls on High Flying at $52.50 that mature in one year and purchases puts at $52.50 that expire in one year, she will have a guaranteed return of 5 percent on each covered share. If she writes calls and purchases puts covering all 100,000 shares, she will have effectively converted her $5 million portfolio of risky High Flying stock into a $5 million portfolio of safe bonds (since the return on a risk-free bond is 5 percent, the cost to Carol of purchasing the puts should equal her revenue from writing the calls).[78] Thus, over the year, Carol is guaranteed a $250,000 return on her portfolio.

Expressed in terms of our notation, Carol's portfolio when she is holding only the stock of High Flying can be written as S. By writing calls, -C, and purchasing puts, P, Carol converts her original portfolio into a new portfolio that can be written as S-C+P. Put-call parity implies that Carol's new portfolio is

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[76] This provision provides that "[t]he gain from the sale or other disposition of property shall be the excess of the amount realized therefrom over the adjusted basis . . . ." I.R.C. § 1001 (West 2002).

[77] The capital gain tax rate is currently capped at 20 percent. I.R.C. § 1(h).

[78] The put-call parity theorem implies that the premiums on the call and put are equal when the locked-in return is the risk-free rate on the market value of the underlying asset. *See* MCDONALD, *supra* note 17, at 272. Thus, the only cost to Carol of the proposed transaction is any fee imposed by her broker to cover transaction costs.

equivalent to a portfolio of zero-coupon bonds, PV(E). Thus, Carol has eliminated her exposure to changes in the price of High Flying without selling her shares and without having to pay capital gains tax currently.

At the end of the year, Carol will settle in cash either the calls or the puts, depending upon which is in-the-money.[79] Thus, for example, if the price of High Flying falls to $47.50, Carol will receive $5 from each put for a total of $500,000. (Of this $500,000, $250,000 is offset by the fall in the value of Carol's shares of High Flying.) Carol will have to pay tax on her $500,000 gain from the options. Assuming she is taxed at 20 percent, Carol pays $100,000 tax leaving her $400,000 with which to purchase bonds.[80] If the risk-free interest rate remains at 5 percent, next year Carol will purchase 100,000 puts at $49.88 and write 100,000 calls with this same exercise price.[81] Her $400,000 in bonds will generate $20,000 interest.

The other possibility is that the price of High Flying rises over the year. Thus, for example, if High Flying's price rises to $55, Carol will lose $2.50 on each call or $250,000. She covers her loss by selling 4,545 shares of High Flying.[82] Assuming Carol's High Flying stock has a basis of zero, her capital gain on the High Flying shares she sells offsets her loss from the options.[83] This leaves Carol with 95,455 shares of High Flying with an aggregate market value of $5,250,000. Assuming the risk-free interest rate remains 5 percent, next year Carol will purchase 95,455 puts at $57.75 and write 95,455 calls with this same exercise price.

The effect of this technique is to defer Carol's taxes. Although Carol pays some tax if High Flying falls,[84] she still defers

[79] Carol settles by closing out her position not by delivery. She does not want to purchase more shares of High-Flying, and because she wants to postpone gain she should not sell more shares of High-Flying than necessary.

[80] Technically, Carol will have to hold her put contracts for more than one year for the net gain on her option contracts (the excess of her gain on the held puts over her loss on the written calls) to be long-term gain taxed at the preferential 20 percent tax rate. *See* Rev. Rul. 78-182, 1978-1 C.B. 265 (describing the tax treatment of holder's and issuer's of options). If she settles her held put contracts within one year of acquiring them, her net gain is short term and taxed at her ordinary income tax rate.

[81] Puts and calls with strike prices of $49.88 are unlikely to be traded because options usually trade with strike prices that are multiples of $2.50 in a range around current and recent stock prices. However, puts and calls with strike prices of $50 would do nearly as well.

[82] This is calculated as follows: 4,545 shares = $250,000 ÷ $55 per share.

[83] Carol's net loss from the options will exceed her long-term capital gain from selling 4,545 shares of High Flying by her basis in those shares. Carol can either use this excess loss to shelter the gain from selling additional shares or she could carry forward the loss to a future year where it can be used to offset her net gains on future option transactions.

[84] The tax that Carol pays is directly related to the fall in the price of High Flying. Carol pays tax in this case because she cannot offset her gains from the puts against losses

taxes relative to selling her portfolio immediately and investing in bonds. However, if Carol intends to give some of her portfolio to her children as a bequest, she will forever escape income taxes, but not estate taxes, on that portion of her portfolio that is in appreciated High Flying stock when it passes to her children upon her death. That is because of a long-standing tax rule that the basis of inherited property is its fair market value at death.[85]

In effect, Carol used the put-call parity theorem to avoid realization. Because of the practical problems involved in assessing the market value of infrequently traded property, the federal income tax does not capture gains each year as they accrue. Instead, with a few exceptions, increases and decreases in value are taxed only when the property is sold. The put-call parity theorem allows Carol to *sell* her High Flying stock, without physically selling the shares. Thus, it allows her to make an end-run around the realization requirement.[86]

Moreover, a simple extension would allow Carol to cash out her position in all or part without triggering any immediate tax. This might be important if she wanted to live off her portfolio or use it to make an investment other than in tradeable securities.[87] To "monetize" her position all Carol has to do is to borrow. Using her portfolio as collateral, she should be able to borrow a large portion of its value at a low interest rate because the portfolio is riskless.[88] Thus, in form her portfolio would become S+P-C-PV(E), which through put-call parity is identically zero. Carol then has synthesized the economic equivalent of a sale of her stock, but because she still holds title to her original shares of High Flying she has not triggered capital gains taxes.

For years, the technique described above and other similar techniques were used to defer, and sometimes permanently avoid, the capital gains tax on appreciated securities.[89] Several high-

on the stock.

[85] *See* I.R.C. § 1014 (West 2002).

[86] The put-call parity theorem makes such an end-run optional. If Carol wanted the realization to occur now, perhaps because she thought capital gains rates would increase or because she had a large loss, she would sell the stock. The put-call parity theorem, thus, expands her options by allowing her to realize or defer realization.

[87] Carol can convert her position in High Flying to any portfolio of tradeable securities using options. For example, if she wanted to invest the whole $5 million in the S&P 500 she would buy S&P calls and write S&P puts covering a $5 million investment.

[88] For example, one specialized firm offers to provide hedged investors with a loan of 90 percent of the value of their hedged stock position on securities worth as little as $100,000. ROBERT N. GORDON, WALL STREET SECRETS FOR TAX-EFFICIENT INVESTING 164 (2001).

[89] *See* Alvin C. Warren, Jr., *Financial Contract Innovation and Income Tax Policy*, 107 HARV. L. REV. 460 (1993) (describing various techniques for avoiding a taxable sale); David M. Schizer, *Frictions as a Constraint on Tax Planning*, 101 COLUM. L. REV. 1312,

profile transactions in the 1990's,[90] however, led Congress to add section 1259 to the Internal Revenue Code as part of the Tax Reform Act of 1997. Section 1259 provides that if a taxpayer makes "a constructive sale of an appreciated financial position," gain is recognized as if the taxpayer had sold the financial position to a third party for its fair market value.[91] The term "appreciated financial position" generally means any investment position with respect to stock, debt or partnership interests if there would be a gain were such position sold.[92] The term "constructive sale" is defined as any of several enumerated transactions in which the taxpayer terminates his economic interest in the appreciated asset.[93] These transactions are the economic equivalent of the transaction described above,[94] but they are not formally the same.[95] The provision also gives Treasury the authority to issue regulations that would treat other transactions that have substantially the

1400-05 (2001) (same).

[90] *See* Diana B. Henriques with Floyd Norris, *Wealthy, Helped by Wall St., Find New Ways to Escape Tax on Profits*, N.Y. TIMES, Dec. 1, 1996, § 1, at 1 (Eli Broad effectively sold $194 million in highly appreciated Sun America stock without triggering any capital gain tax by issuing securities that were tied to the return on his Sun America's shares, and Estee Lauder and her son Ronald Lauder avoided $95 million in taxes by borrowing shares of Estee Lauder Co. from friends and relatives and selling those borrowed shares instead of selling their own shares).

[91] I.R.C. § 1259(a) (West 2002) (as amended by Pub. L. No. 105-34, § 1001(a), 111 Stat. 788, 903 (1997)).

[92] I.R.C. § 1259(b)(1).

[93] I.R.C. § 1259(c)(1). The transactions listed in this section include:

(A) a short-sale-against-the-box (where the taxpayer would borrow the same stock as she owns and sell the borrowed stock in the market), which would eliminate the risk from holding the original stock because any gain or loss on the held stock is exactly offset by the loss or gain on the short sale);

(B) a notional principal (swap) contract (which is equivalent to a series of forward contracts); and

(C) writing a forward contract to deliver the same or substantially identical property (forwards are contracts to sell property at a preset price at a predetermined date; a forward contract differs from a call option because the holder is obligated to purchase the underlying asset and the issuer is obligated to sell it), which has the same payoff as writing a call and buying a put at the forward price). *See id.* § 1259(c)(1)(A)-(C).

[94] A short-against-the-box is represented by -S. According to the put-call parity theorem, this is equivalent to borrowing, writing a call and holding a put (-PV(E)-C+P). Buying a forward contract (long) is equivalent to holding a call and writing a put (C-P). Therefore selling a forward contract (short) is equivalent to writing a call and holding a put (-C+P). Thus, the difference between a short-against-the-box and selling a covered forward contract is that with the former the seller receives the proceeds today and with the later the seller in effect invests the proceeds in a zero-coupon bond. The two transactions are identical if the seller either invests the proceeds from the short-against-the-box in zero coupon bonds (-S+PV(E) = -C+P) or borrows against the locked-in payment on the forward (-C+P-PV(E) = -S).

[95] Section 1259 does not include transactions in puts and calls ostensibly because businesses use puts and calls to hedge exposure to price changes in inventory. However, the law leaves a large hole by exempting transactions in puts and calls from section 1259.

same effect as constructive sales.[96] It remains to be seen whether Treasury will use that authority to treat taxpayers as if they sold shares when they buy puts and write calls covering those shares.[97] However, as of today, taxpayers can still use put-call parity to sell appreciated securities without triggering capital gains tax.[98]

III. IMPLICATIONS

The use of put-call parity to avoid a wide range of legal rules has several implications for academics, policymakers and practicing attorneys who are interested in business and financial matters.

The first implication is that because there are often multiple ways of achieving the same result, rules—to be effective—must generally be consistent. That is to say, they must treat economically equivalent transactions in the same way. That means that legal treatment should not turn on such malleable concepts as whether a transaction is called a loan, or who holds title, or whether title has changed hands. Thus, for example, section 16(b) of the Securities Exchange Act was only effective in preventing insiders from earning short-swing profits after it was extended to cover options. Similarly, usury restriction to be effective must not only cover traditional loans, but also synthetic loans.

The second implication takes off from the qualifier generally in the first implication. An inconsistent rule might not be avoidable through put-call parity because there are important differences between the legally disadvantaged position or transaction and the synthesized version. In the tax literature, these differences are called frictions and include the potentially higher cost of assembling the synthetic and the different rights and risks the party has with the synthetic as opposed to the original position or transaction.[99] For example, Helen and Carol both bear some risk that the put contracts they hold will close in-the-money, but that the counterparty or exchange from which they purchased them will default and not pay. Such credit risk if large enough might discourage Helen and Carol from their proposed

[96] *See* I.R.C. § 1259(c)(1)(E).

[97] Even if it did, that would still leave the question of how much risk taxpayers can rid themselves of without triggering a constructive sale.

[98] Some lawyers, however, will refuse to give an opinion that a hedge using puts and calls is not a constructive sale unless the taxpayer retains substantial risks. *See* Schizer, *supra* note 89, at 1345-46 n.110.

[99] *See* SCHOLES ET AL., *supra* note 60, at 9.

transactions. Frictions, then, are not only a potential hindrance to tax arbitrage; they have the potential to derail any kind of regulatory arbitrage.

The third implication is that it is important for practicing lawyers to understand basic financial principles, how those principles relate to the transactions on which they are working, and the relevant frictions. The transactional lawyer creates value for her clients by helping them to structure their transactions to minimize the cost of complying with the relevant rules.[100] When the law treats similar transactions differently, lawyers can assist their clients by selecting (and sometimes developing) transactional forms that minimize their clients' compliance costs. That work requires not only that the lawyer understand the transaction and the relevant law, but also how the transaction can be synthesized and the frictions that would be incurred. Thus, for example, financially sophisticated lawyers play a large and important role in designing, negotiating and drafting capital leases for airplanes and other property.

The fourth implication is that inconsistent legal rules encourage waste and create a perception of unfairness. Although inconsistent legal rules create lucrative opportunities for lawyers, from society's viewpoint these rules cause waste. Much high-priced talent goes into designing, marketing and implementing strategies that exploit legal inconsistencies. Nowhere is this clearer than with tax planning. The resources devoted to such planning are wasted in as much as the rules could be rewritten to produce roughly the same tax result without requiring all the effort.[101] Also, inconsistent rules create traps for the unwary and for those who cannot afford to pay the experts' fees and the costs of other frictions. For example, the fixed costs of writing calls and buying puts makes it infeasible for investors with small gains to effectively sell their property without triggering realization.[102] That has created a tax system where those with the largest gains pay no capital gains tax, but everyone else does.[103] Not surprisingly,

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[100] *See* Ronald J. Gilson, *Value Creation by Business Lawyers: Legal Skills and Asset Pricing*, 94 YALE L.J. 239 (1984).

[101] *See* Daniel N. Shaviro, *Economic Substance, Corporate Tax Shelters and the Compaq Case*, 88 TAX NOTES 221 (July 10, 2000) (describing the real resource cost of tax shelters).

[102] *See* Schizer, *supra* note 89, at 1348-49 (arguing that such transactions are prohibitive for investors with positions worth less than $1 million); GORDON, *supra* note 88 (stating that the threshold is $100,000).

[103] A few years ago, *The New York Times* observed:

> "The simple fact is that anyone sitting on a big pot of money today probably isn't paying capital gains taxes," said David Bradford, an economist at Princeton University and a critic of the current income tax system. "And the Government

inconsistent tax laws erode support for the tax system.[104]

The fifth implication is related to the first four. When writing laws, policymakers should be aware of alternative ways of achieving the same result. If a regulation is going to be effective, and not just a trap for the unwary and the less wealthy, it must cover all feasible alternatives. If it does not, it will simply drive much of the activity into uncovered paths. For example, section 1259 which taxes constructive sales of appreciated financial positions, but exempts transactions using options, is unlikely to either deter many transactions or raise much revenue. That is because well-advised taxpayers will avoid transactions section 1259 taxes and use put-call parity to defer paying tax.

CONCLUSION

This Essay has examined the legal significance of the put-call parity theorem. The put-call parity theorem states that given any three of the following four financial instruments—a zero-coupon bond, a share of stock, a call option on the stock and a put option—the fourth instrument can be synthesized from the other three. Thus, the theorem implies that any position containing one of these instruments can be constructed in at least two different ways. When the law treats alternative ways of constructing the same position differently (as it often does), form takes precedence over substance, sophisticated parties will spend resources to achieve the preferred result, and only the unsophisticated will be subject to the greater burden. The put-call parity theorem is not the only relationship that has been used to engage in tax and regulatory arbitrage. Work is only beginning on the legal significance of financial arbitrage relationships.

> can adopt rule after rule after rule—but the people who will get stuck paying capital gains taxes will be the ordinary investors who own mutual funds."

Henriques, *supra* note 90.

[104] As *The New York Times* observed:

> The consequences of Wall Street's ingenuity even worry some who profit from it. "I am torn on that issue," said Robert Willens, a managing director and tax analyst at Lehman Brothers. "As someone who makes my living catering to these clients, I find these products useful and successful. But as a citizen, which I am after about 6:30 every evening, I worry that there is a growing perception that these tax techniques are available only to the wealthy few, that the average citizen and investor doesn't have access to them. Nothing does more to undermine our tax system than that."

Id. at 90.