THE LONG AND SHORT ON LONG-SHORT

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ong-short is an active portfolio construction discipline that balances long positions in high-expected return securities and short positions in low-expected return securities of approximately equal value and market sensitivity.[1] Because overall market moves are "canceled out" by the movements of the securities held long and sold short, the portfolio is "neutralized" or immunized against changes in the value of the underlying market; it has zero systematic, or beta, risk. The portfolio's performance will reflect the return and risk of security selection. If the selected securities perform as expected, the long-short positions will provide a positive return, whether the market rises or falls.

Long-short construction offers advantages over long-only, advantages that should translate into improved performance for long-short portfolios vis-à-vis long-only constructs. Long-short will be especially advantageous if, as many market observers believe, candidates for short sale are less efficiently priced than candidates for purchase. But the major benefits of long-short do not depend on such greater inefficiency on the short side.

In freeing the portfolio from the underlying market's systematic risk, long-short construction with integrated optimization also frees it from constraints typically imposed on long-only portfolio management. For example, a long-short portfolio can take full advantage of insights on overpriced securities, because its ability to underweight a security is not constrained by the security's weight in the underlying market, as is long-only's. Furthermore, properly optimized long-short portfolios can use offsetting long and short positions to control portfolio residual risk; long-only portfolios must seek to control residual risk by balancing over- and underweightings relative to the underlying market's weights.

Finally, long-short construction enables the investor to separate the return and risk of security selection from the return and risk of the equity market, because the return to a market-neutral portfolio is independent of the equity asset class underlying it. The investor can recapture the equity class return by purchasing stock index futures. The performance of

the long-plus-short-plus-futures, or "equitized," portfolio will reflect the underlying market's return and risk plus the return and risk of the long-short portfolio. Alternatively, the investor can purchase other derivatives, thus transporting the return from stock selection to other desired asset classes.

Compared with long-only portfolios, then, long-short portfolios offer enhanced flexibility not only in the control of risk and pursuit of return, but also in asset allocation. These benefits, of course, must be weighed against the costs of long-short. Long-short is often perceived as much costlier and riskier than long-only, but it is inherently neither. Long-short does experience some incremental costs relative to long-only; these include the trading costs incurred in meeting the demands of long-short balancing, margin requirements, and uptick rules, as well as the financial intermediation costs of borrowing shares to sell short. In general, these costs are not large and should not outweigh the flexibility benefits of long-short construction.

BUILDING A
MARKET-NEUTRAL PORTFOLIO

Exhibit 1 illustrates the deployment of capital in a market-neutral implementation of long-short. It presupposes that the investor has already selected the securities to be held long and sold short. The stock evaluation and selection process may be traditional o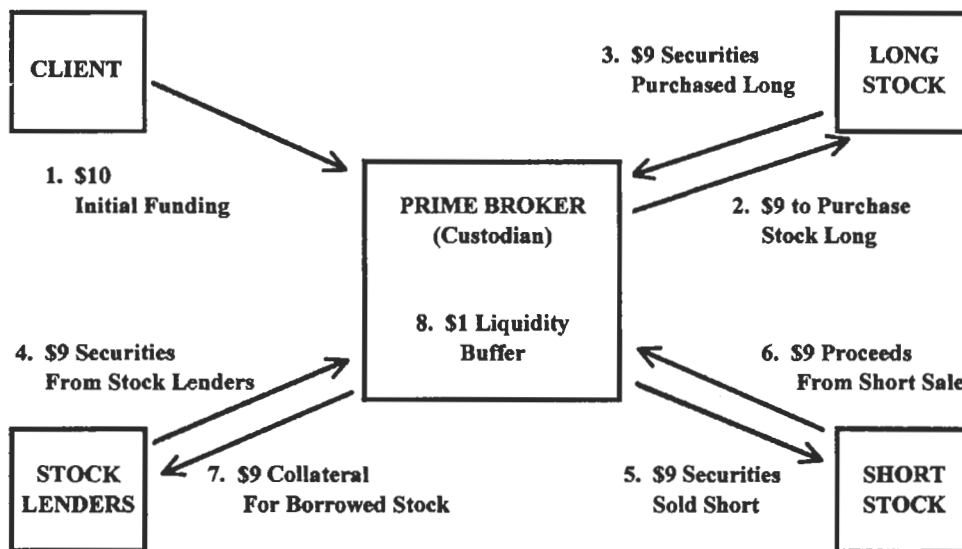r quantitative, but the outcome should be some listing or ranking of "winners," or underpriced stocks expected to perform well, and "losers," or overpriced stocks expected to perform poorly. The winners are to be considered for purchase and the losers for short sale.[2]

Federal Reserve Board regulations require that short positions be housed in a margin account at a brokerage firm; the broker will clear all trades and arrange to borrow the shares to be sold short. Exhibit 1 assumes the investor deposits $10 million with this custodial prime broker. Because Federal Reserve Board Regulation T requires at least 50% initial collateralization of margined positions, the investor could use this $10 million of capital to collateralize up to $20 million of securities positions — $10 million of longs and $10 million of shorts.[3]

In practice, however, the investor will retain some of the initial capital as a "liquidity buffer" to meet marks to market on the short positions. Exhibit 1 assumes the investor uses only $9 million of the initial $10 million to purchase the desired long positions, which are held at the prime broker. The broker arranges to borrow the $9 million in securities to be sold short. Upon their sale, the broker provides the $9 million in proceeds to the securities' lenders as collateral for the shares borrowed.[4]
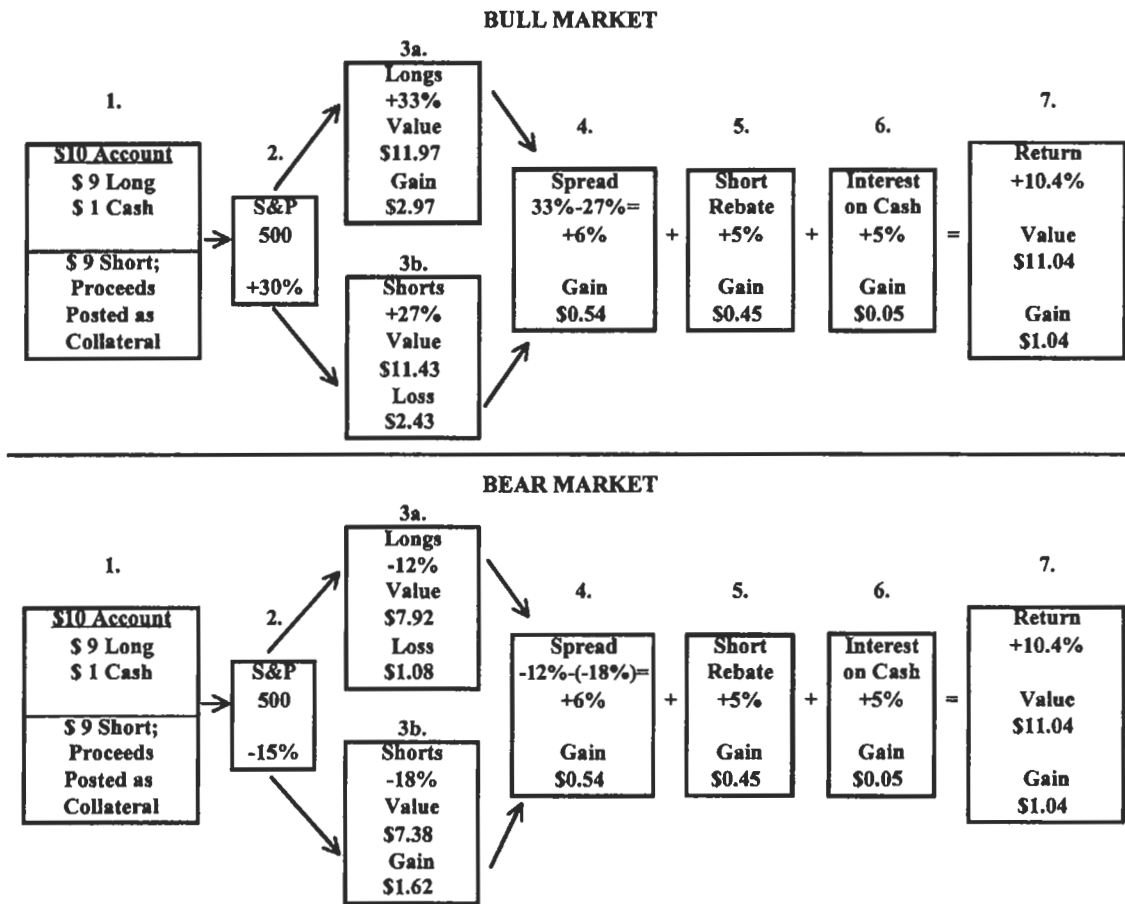
The securities' lenders require full collateralization of the shares they lent. If those shares increase in value, the borrower (our long-short investor) will have to arrange payment to the lenders so collateral continues to match the value of the shares. If the

EXHIBIT 1
MARKET-NEUTRAL LONG-SHORT DEPLOYMENT OF CAPITAL

EXHIBIT 2
MARKET-NEUTRAL LONG–SHORT HYPOTHETICAL PERFORMANCE: BULL AND BEAR MARKETS

BULL MARKET

1.	2.	3a.		3b.	4.	5.	6.	7.
$10 Account $ 9 Long $ 1 Cash $ 9 Short; Proceeds Posted as Collateral	**S&P 500** +30%	**Longs** +33% Value $11.97 Gain $2.97		**Shorts** +27% Value $11.43 Loss $2.43	**Spread** 33%-27%= +6% Gain $0.54	**Short Rebate** +5% Gain $0.45	**Interest on Cash** +5% Gain $0.05	**Return** +10.4% Value $11.04 Gain $1.04

(net: Spread + Short Rebate + Interest on Cash = Return)

BEAR MARKET

1.	2.	3a.		3b.	4.	5.	6.	7.
$10 Account $ 9 Long $ 1 Cash $ 9 Short; Proceeds Posted as Collateral	**S&P 500** -15%	**Longs** -12% Value $7.92 Loss $1.08		**Shorts** -18% Value $7.38 Gain $1.62	**Spread** -12%-(-18%)= +6% Gain $0.54	**Short Rebate** +5% Gain $0.45	**Interest on Cash** +5% Gain $0.05	**Return** +10.4% Value $11.04 Gain $1.04

borrowed shares fall in value, the money will flow in the opposite direction, with the lenders releasing funds to the investor's prime broker account. A liquidity buffer equal to 10% of the account's capital ($1 million at the outset of our example) is generally sufficient to meet these daily marks to market.[5]

In Exhibit 1, then, the long-short portfolio consists of $9 million in shares held long and $9 million in shares sold short. The portfolio's return will reflect the performances of these long and short positions.

It will also benefit from a cash return stemming from two sources. First, the account will earn interest on the cash held as a liquidity buffer, at approximately the prevailing short-term rate. Second, the $9 million in proceeds from the short sales, posted as collateral with the securities' lenders, will earn interest. The lenders will retain a small portion of this interest as a securities lending fee, and the prime broker will retain a portion to cover expenses and provide some profit; the investor's account will receive the rest.[6] Although the exact

distribution is a matter for negotiation, we will assume the amount rebated to the investor (the "short rebate") approximates the short-term rate.[7]

Exhibit 2 illustrates the hypothetical one-period performance of the long-short portfolio, assuming bull market and bear market scenarios. The bull market scenario assumes the market (as proxied by the S&P 500) rises 30% over the period, while the long positions rise by 33% and the shorts by only 27%. The long positions are worth $11.97 million at the end of the period, for a gain of $2.97 million, and the shorts are worth $11.43 million, for a loss of $2.43 million.

The long-short portion of the portfolio has a net gain of $0.54 million. This amounts to 6% of the $9 million invested (equal to the spread between the long and short returns), or 5.4% of the initial $10 million.[8] In addition, the portfolio receives a short rebate of 5% of the short sale proceeds ($0.45 million) and 5% interest on the liquidity buffer (equal to $0.05 million), for a "cash" return of $0.5 million, or 5% of the initial $10 million. Overall, the portfolio

increases in value from $10 to $11.04 million, for a net gain of $1.04 million and a 10.4% return.

The bear market scenario assumes the market falls by 15%, with the long positions falling by 12% and the short positions by 18%. This provides the same return spread as in the bull market scenario. The decline in value of the longs translates into a loss of $1.08 million, while the decline in value of the shorts translates into a gain of $1.62 million. The net gain for the long-short portfolio is, again, $0.54 million, exactly the same result as when the market rose by 30%. Cash returns are the same in both market environments, so overall portfolio results are the same.

The return to the basic market-neutral portfolio, then, consists of three components — the interest on the liquidity buffer, the rebate from the short sale proceeds, and the return spread between the aggregate long and aggregate short positions in the long-short portfolio. Because the aggregate long positions and the aggregate short positions are of approximately equal value and have equal sensitivity to the underlying market, those portions of their returns that reflect overall market movements (their returns to beta) cancel out. All that is left is the return spread. The return to the long-short portfolio is thus a true reflection of the success of the manager's stock selection skills.

A QUESTION OF EFFICIENCY

Exhibit 2 assumes symmetric market-relative returns for the long and short positions; that is, in both bull and bear market environments, the longs were assumed to outperform the market by 3% while the shorts were assumed to underperform by 3%. But there are reasons to believe that short-sale candidates — the most overpriced stocks, which offer the lowest expected returns — may be more common or more mispriced than the underpriced stocks that constitute the candidates for purchase. In that case, one might expect higher excess returns from short positions than from long positions.

Stocks may be overpriced, and overpricing may continue over some non-trivial period, because investors tend toward overoptimism. Several theories and some evidence suggest that this may be the case. Bubbles and fads, for example, may cause investors to bid prices up beyond reasonable valuations (see, e.g., Camerer [1989]). Company practices may also encourage overpricing. Many companies, for example, are eager to publicize good news in a timely manner, but may delay releasing bad news or attempt to disguise it via window-dressing (or, more rarely, commit actual fraud). Stock prices may thus reflect good news more quickly and unambiguously than bad news.

Overpricing may also exist because brokers and analysts favor buy over sell recommendations, and focus research efforts on purchase rather than sale candidates. Such bias may reflect an economic rationale: Buy recommendations may elicit more commissions, as all customers are potential purchasers, while commissions from sales will come primarily from customers who already own the stock. Bias may reflect political issues: Publishing negative opinions about a company may jeopardize investment banking relationships and even threaten analyst job security (Regan [1993]). And it may reflect underlying analyses: Evidence suggests, for example, that brokers may produce overly optimistic earnings estimates, especially for firms with the least stable earnings histories (Huberts and Fuller [1995]).

Whatever its source, the greater the uncertainty about "true" value, the more overpricing is likely. This is because increasing uncertainty leads to increasing divergence of investor opinions. And those investors with the most optimistic opinions will become the buyers, setting security prices (see Miller [1990]). Theoretically, of course, short-sellers should act to keep shares from becoming overpriced; if overly optimistic investors bid up share prices beyond what other investors consider reasonable, those investors should sell short, reducing upward pressure on prices. But short-selling is certainly not as unrestricted as buying long.

Share borrowability and uptick rules make short-selling more difficult than going long. Short-selling is also costlier, because investors do not receive full interest on the proceeds from short sales (and retail investors rarely receive any of the interest). Short-selling may also be legally or contractually restricted for some investors (such as mutual funds, which can take only limited short positions). Other investors may eschew it because they consider it too speculative or morally objectionable.

In fact, short sales have historically accounted for a very small percentage of shares outstanding; short interest on the NYSE has risen only slightly in recent years, from 0.25% at year-end 1980 to 1.32% at year-end 1995. And only a portion of this interest is motivated by security selection; most short sales are undertaken by dealers supplying liquidity or investors shorting for risk-hedging, tax-deferral, or arbitrage purposes.

In a market in which prices tend to reflect overoptimism on the part of investors and in which

short-selling is restricted de facto and de jure, inefficiencies may be concentrated in overpriced stocks. Short sales of the most overpriced stocks may therefore offer higher positive returns than long purchases of underpriced stocks.

Nevertheless, the benefits of long-short are not dependent upon the existence of greater inefficiencies in overpriced than in underpriced stocks. Rather, they flow from the increased flexibility allowed by short-selling within the context of the long-short portfolio construction process.

BENEFITS OF LONG-SHORT

Long-short portfolio construction can offer real advantages over long-only construction in terms of both pursuit of return and control of risk. These benefits stem primarily from the enhanced implementation of investment insights afforded by the removal of index constraints in an integrated optimization of long-short portfolios.

Integrated optimization releases the long-short portfolio from the constraints imposed by an underlying index on the construction of long-only portfolios. Consider, for example, a long-only portfolio whose selection universe is a given market index, and whose performance is measured against that index. By holding every name in the index in proportion to its weight in the index, the portfolio will achieve a return, and a risk level, equivalent to the benchmark's. If it expects to achieve a return over and above that of the underlying market index (an excess return), it must be able to overweight, relative to their market index weights, securities that are expected to earn above-average returns, and underweight those expected to earn below-average returns.

Underweightings or overweightings relative to the underlying benchmark, necessary to produce excess return, also introduce benchmark-relative, or residual, risk. The more the portfolio departs from underlying benchmark weights, the greater the probability that its return will not match the return on the benchmark. Control of portfolio excess return and residual risk requires control of underweightings and overweightings relative to the benchmark. Benchmark weights thus have substantial influence on the portfolio's allocation of capital and can constrain the implementation of investment insights.

Consider a stock that constitutes 5% of the benchmark's weight. What if the investor expects the stock to offer an above-benchmark return? The investor will want to overweight the stock in the port-folio. Establishing an overweight, however, will require investing more than 5% of the portfolio's capital; a 1 percentage point overweight, for instance, requires a 6% portfolio position. Furthermore, as the overweighting represents a departure from the benchmark weight, it introduces residual risk. The portfolio's ability to take an active position in the stock will be constrained both by allocation requirements and by risk considerations.

Somewhat counter-intuitively, the portfolio may also have to allocate capital to limit stock underweights. Say the investor wants to underweight a stock that is expected to provide a below-benchmark return. If the stock constitutes 5% of the underlying index, as in the example above, establishing a 1 percentage point portfolio underweight requires holding a 4% portfolio position in the security.

Of course, if the security represents a smaller-capitalization company, less capital is required to establish either an overweight or an underweight, but the portfolio's ability to underweight a small-capitalization company may be severely restricted. Consider, for example, a stock that makes up 0.1% of the index. The investor can establish a 1 percentage point overweight of this stock by holding a 1.1% portfolio position. Little capital is needed to establish an underweight; the maximum underweight the portfolio can attain is only 0.1% — achieved by not holding the stock at all. The latter constraint, however, may become binding if the investor thinks the stock will perform poorly and wants to underweight it significantly. The maximum attainable underweight for this stock is equivalent to saying that the portfolio cannot hold more than a 0.1% overweight in a stock that is expected to perform well.

More than a few discussions of long-short portfolios have assumed an identity between an index-constrained long-only portfolio and the long and short portions of a long-short portfolio. In this view, the aggregate longs and the aggregate shorts of long-short constitute two separate, index-constrained portfolios. By definition, neither can offer advantages over a long-only portfolio. Together, they may offer diversification benefits over long-only if the return on the long portfolio in excess of the market return and the excess return on the short portfolio are less than perfectly correlated.[9]

With integrated optimization, however, a long-short portfolio is not constrained by index weights. Once an underlying index has been used to determine the systematic risks of the candidate securities, its role in long-short construction is effectively over. The offsetting market sensitivities of the aggregate long and aggregate short positions eliminate market sensitivity and the need to consider index weightings in establish-

ing security positions. The portfolio is not constrained to moving away from or toward market weights in order to pursue return or control risk. Rather, it can allocate its capital without regard to the securities' weights in the underlying market.

To establish a 1% "overweight" or "underweight," it merely has to allocate 1% of its capital long or allocate 1% of its capital short. And because it can short securities, the long-short portfolio can "underweight" a security by as much as investment insights (and risk considerations) dictate. Negative opinions can thus be more freely and fully reflected in long-short than in long-only.

Furthermore, in an integrated optimization, selection of the securities to be held long is determined simultaneously with selection of the securities to be sold short. The result is a single long-short portfolio, not one long portfolio and one short portfolio. Just as one cannot attribute the qualities of water, its wetness, say, to its hydrogen or oxygen components separately, one cannot reasonably dissect the performance of an integrated long-short strategy into one element attributable to long positions alone and another attributable to short positions alone. Only jointly do the long and short positions of long-short define the strategy. Long and short excess returns, or "alphas," are thus meaningless concepts.

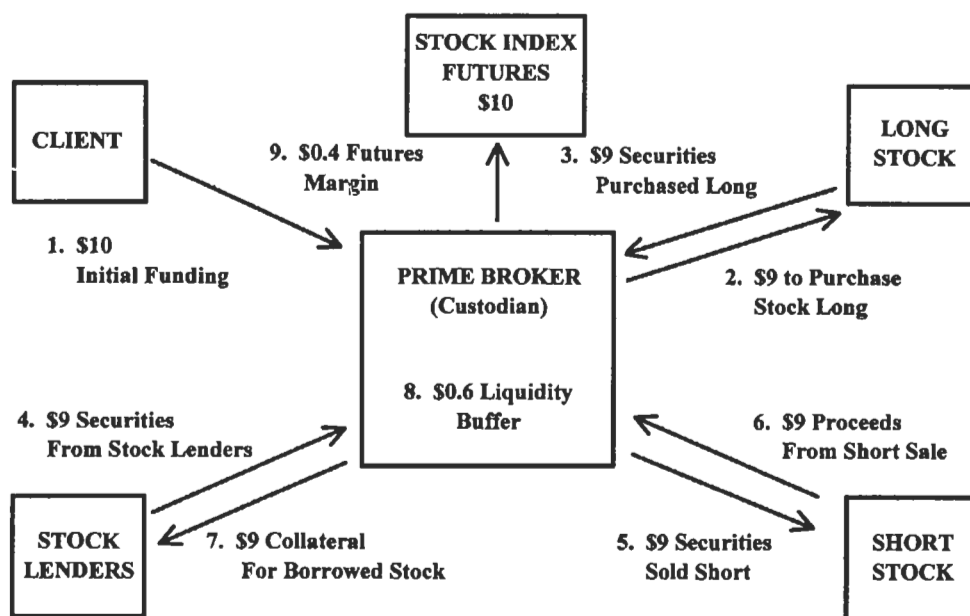Rather than being measurable as long and short performance in excess of an underlying benchmark, the performance of the equity portion of the long-short portfolio is measurable as the overall return on the long and short positions — or the spread between the longs and shorts — relative to their risk. Compared with the excess return/residual risk of long-only management, this performance should be enhanced by the elimination of index constraints, which allows the long-short portfolio increased flexibility to implement investment insights, both long and short.

EQUITIZING LONG-SHORT

The return enhancement afforded by long-short construction reflects the removal of the constraints an underlying index imposes on long-only portfolio construction. Of course, the basic, market-neutral long-short construction also eliminates exposure to the underlying index's risk — and its return. Market return, and risk, can be added back by purchasing stock index futures contracts in an amount equal to the invested capital.[10] The return to the resulting long-short-plus-futures, or equitized, portfolio will then reflect the market return (the change in the price of the futures contracts plus interest) plus the spread on the long-short portfolio. The equitized portfolio will retain the flexibility benefits of long-short construction, reflected in the long-short spread, while also participating in overall market movements.
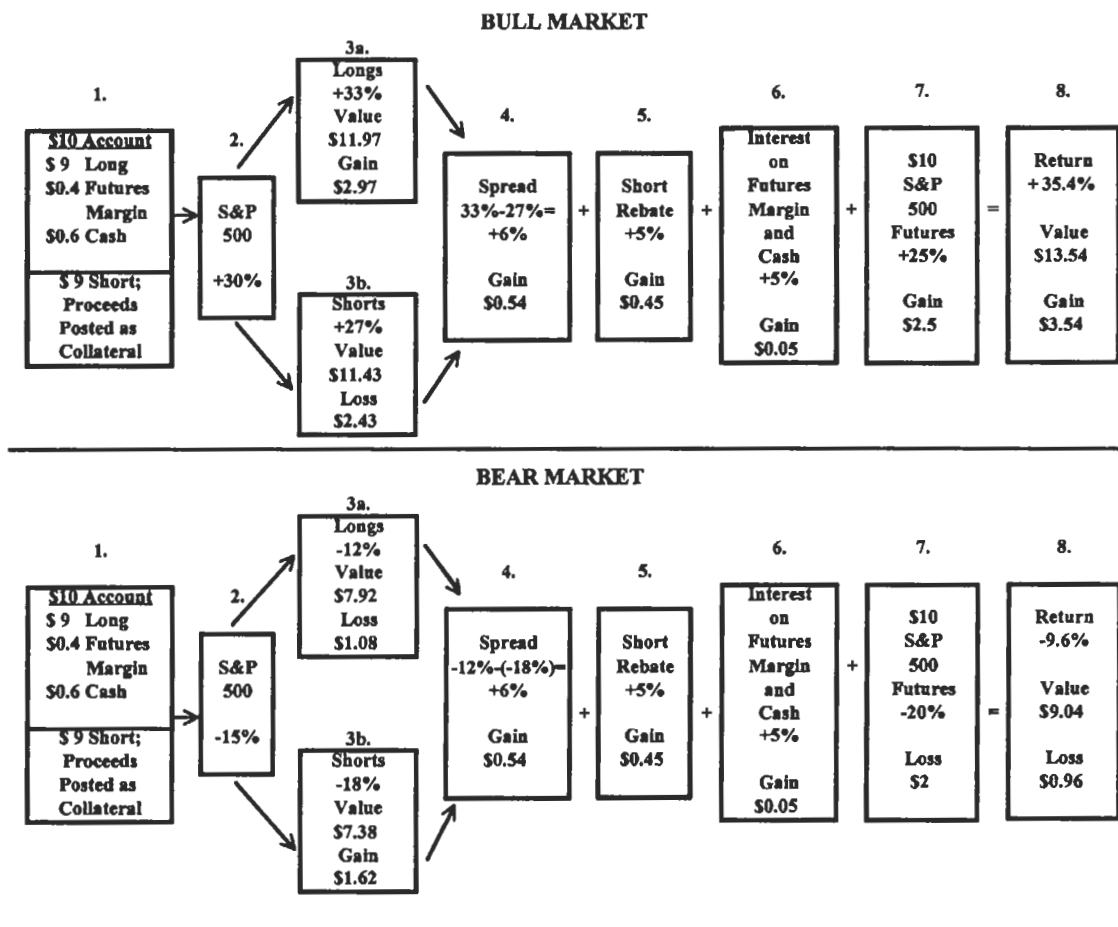
Exhibit 3 illustrates the deployment of capital

EXHIBIT 3
EQUITIZED LONG-SHORT DEPLOYMENT OF CAPITAL

EXHIBIT 4
EQUITIZED LONG-SHORT HYPOTHETICAL PERFORMANCE: BULL AND BEAR MARKETS

BULL MARKET

1.
$10 Account
$9 Long
$0.4 Futures Margin
$0.6 Cash

$9 Short;
Proceeds Posted as Collateral

2.
S&P 500
+30%

3a.
Longs +33%
Value $11.97
Gain $2.97

3b.
Shorts +27%
Value $11.43
Loss $2.43

4.
Spread 33%-27%= +6%
Gain $0.54

+

5.
Short Rebate +5%
Gain $0.45

+

6.
Interest on Futures Margin and Cash +5%
Gain $0.05

+

7.
$10 S&P 500 Futures +25%
Gain $2.5

=

8.
Return +35.4%
Value $13.54
Gain $3.54

BEAR MARKET

1.
$10 Account
$9 Long
$0.4 Futures Margin
$0.6 Cash

$9 Short;
Proceeds Posted as Collateral

2.
S&P 500
-15%

3a.
Longs -12%
Value $7.92
Loss $1.08

3b.
Shorts -18%
Value $7.38
Gain $1.62

4.
Spread -12%-(-18%)= +6%
Gain $0.54

+

5.
Short Rebate +5%
Gain $0.45

+

6.
Interest on Futures Margin and Cash +5%
Gain $0.05

+

7.
$10 S&P 500 Futures -20%
Loss $2

=

8.
Return -9.6%
Value $9.04
Loss $0.96

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for equitized long-short portfolio construction. Note that the major difference between Exhibit 3 and Exhibit 1, other than the addition of the $10 million of stock index futures, is the size of the liquidity buffer. As noted, the liquidity buffer serves to meet marks to market on the short positions; when short positions rise in price, the lenders of the securities sold short need more collateral from the investor's account. With an equitized long-short strategy, however, an increase in the price of the short positions induced by a rise in the overall market should be accompanied by an increase in the price of the futures contracts held long. The marks to market on the futures can offset the marks to market on the shorts.

A smaller liquidity buffer therefore suffices to ensure that short positions will be fully collateralized at all times. Most of the freed-up capital, however, is used to margin the futures position.[11] Thus, in Exhibit 3, as in Exhibit 1, $9 million of the initial $10 million investment is assumed available for purchase of securities.

Exhibit 4 illustrates the performance of the equitized long-short portfolio in bull and bear market scenarios, using the same assumptions as Exhibit 2. Returns to the long-short portfolio are the same as in Exhibit 2. Cash returns are also the same, as the reduced interest from the smaller liquidity buffer is combined with the interest earned on the futures margin.

Total returns on the portfolios in Exhibits 2 and 4 differ markedly, however, and the entire difference is attributable to the performance of the overall market, which is reflected in the equitized but not the market-neutral portfolio. Because of its market exposure, the equitized portfolio does not behave the same in both bull and bear market scenarios; it is not market-neutral. Unlike the market-neutral portfolio, the equitized portfolio's overall return will be sensitive to market movements; it will also benefit fully, however, from the return spread on the long-short portfolio.

This result underlines one of the major benefits of long-short — the "transportability" of the return on the basic, market-neutral long-short portfolio. In essence, the return on the long-short portfolio represents a return to security selection alone, independent of the overall return to the equity market from which the securities are selected. This return, and all the benefits of long-short construction that it reflects, can be transported to other asset classes through the use of derivatives. The equitized long-short portfolio transports the return to the equity asset class, adding the security selection return (and its associated risk) to the equity market return (and its risk). Other derivatives (for bonds or foreign equity, for example) can be used to establish other asset class returns.

The transportability of the long-short spread has at least two implications for investment management. First, it offers the investor the benefits of being able to separate stock selection skills from asset allocation decisions. The talents of an equity manager particularly skilled in stock selection need no longer be confined to an equity market allocation. They can be transported to virtually any asset class with established derivative markets.

Second, it implies that the identity of a long-short portfolio is flexible. The basic market-neutral construction offers a return (and risk) from security selection on top of a cash return (represented by the short rebate); portfolio performance in this case is appropriately measured as the manager's ability to enhance a cash return (at the cost of added risk). When the long-short portfolio is equitized, however, the security selection return and risk from the long-short portfolio comes on top of an equity market return, and portfolio performance is properly measured relative to the equity index underlying the futures.

Furthermore, long-short is not in and of itself an asset class. Asset class analyses and optimizations should not treat long-short as a separate asset class but as a member of a conventional asset class — cash, equity, bonds — depending upon the long-short portfolio's particular implementation.

TRADING LONG-SHORT

The trading of long-short portfolios is more complicated than that of long-only. First, the values and market sensitivities of the aggregate long and aggregate short positions must be kept in balance on a real-time basis in order to ensure market neutrality. Second, the account must meet Federal Reserve,

stock exchange, and individual broker initial and maintenance margin requirements. Third, marks to market on short (and, if present, futures) positions must be satisfied.

In order to ensure overall portfolio neutrality throughout a trading program, long and short trades may be speeded up or slowed down relative to their occurrence in a typical long-only portfolio. Because short sales are more problematic and more likely to experience delays that would lead to long-short imbalances, for example, some long-short managers start off with their short trades before beginning their long trading programs. Should imbalances occur, securities may have to be bought or sold long or sold short or covered until balance is restored. Derivatives may also be used to correct temporary imbalances.

At all times, at its establishment and throughout its life, a long-short portfolio is subject to margin requirements, as its short positions represent borrowed shares. As noted earlier, under Federal Reserve Board Regulation T, establishment of a short position requires at least 50% margin. Once established, short positions are subject to less stringent maintenance margins, set by the exchanges or individual brokers. New York Stock Exchange Rule 431, for example, requires collateral equal to 25% of the value of long positions held in a margin account, and 30% or more of the value of the short positions.[12] In the interests of self-protection, brokers usually require at least 30% collateralization of all positions in margin accounts.

An account that falls below maintenance margin requirements will have to decrease its securities exposure by covering shorts or selling longs or increase its capital by adding cash. An account that meets maintenance margin requirements but not the initial margin requirement is restricted in the sense that it can make no transactions that would cause further reduction in margin, such as shorting additional shares or withdrawing cash.

Exhibits 5 through 7 illustrate how maintenance of long-short balance, margin requirements, and marks to market can require portfolio trading. Exhibit 5 shows the effects on a $10 million market-neutral (unequitized) portfolio when both long and short positions either fall in value by 50% or rise in value by 100%. At the outset, the long-short portfolio easily meets initial margin requirements, as long and short positions totaling $18 million ($9 million long plus $9 million short) are collateralized by $10 million in equity (the longs plus the cash in the liquidity buffer), for a margin of 55.6%.

EXHIBIT 5
MARKET-NEUTRAL LONG–SHORT: TRADING REQUIRED WHEN LONG AND SHORT POSITIONS FALL 50% OR RISE 100%

	INITIAL VALUES FALL OR RISE	RETURN FALL	RETURN RISE	GAIN/LOSS FALL	GAIN/LOSS RISE	OWE/OWED FALL	OWE/OWED RISE	NEW VALUES FALL	NEW VALUES RISE	ACTION FALL	ACTION RISE	AFTER-ACTION VALUES FALL OR RISE
Long	$9	−50%	+100%	−$4.5	+$9			$4.5	$18	Buy $4.5	Sell $9	$9
Short	$9	−50%	+100%	+$4.5	−$9	Owed $4.5 by Lenders	Owe Lenders $9	$4.5	$18	Sell Short $4.5	Cover $9	$9
Cash	$1							$5.5	−$8			$1
Equity	$10							$10	$10			$10
Margin	55.6%							111.1%	27.8%			55.6%

EXHIBIT 6
EQUITIZED LONG–SHORT: TRADING REQUIRED WHEN SECURITIES, LONG AND SHORT, AND FUTURES RISE 100%

	INITIAL VALUES	RETURN	GAIN/LOSS	OWE/OWED	NEW VALUES	ACTION	AFTER-ACTION VALUES
Long	$9	+100%	+$9		$18		$18
Short	$9	+100%	−$9	Owe Lenders $9	$18		$18
Cash	$0.6				$1.6		$1.2
Equity	$9.6				$19.6		$19.2
Margin	53.3%				54.4%		53.3%
Futures	$10 + $0.4 in T-bills	+100%	$10	Owed $10 on Mark to Market	$20 + $0.4 in T-bills	Buy $0.4 in T-bills	$20 + $0.8 in T-bills

EXHIBIT 7
2% LONG–SHORT SPREAD

	INITIAL VALUES	RETURN	GAIN/LOSS	OWE/OWED	NEW VALUES	ACTION	AFTER-ACTION VALUES
Long	$9	+4%	+$0.36		$9.36	Sell $0.198	$9.162
Short	$9	+2%	−$0.18	Owe Lenders $0.18	$9.18	Cover $0.018	$9.162
Cash	$1				$0.82		$1.018
Equity	$10				$10.18		$10.18
Margin	55.6%				54.9%		55.6%

A 50% decline in the values of the longs and shorts results in the securities' lenders being overcollateralized; they will have to transfer $4.5 million to the long-short account. The liquidity buffer will then be larger than needed. The investor can buy an additional $4.5 million in securities and sell short an additional $4.5 million, restoring the account to its initial values.

A 100% increase in the values of the longs and shorts results, by contrast, in the securities' lenders being undercollateralized; they hold only $9 million in cash proceeds from the initial short sales, but the securities they lent are now worth $18 million. The long-short account must transfer an additional $9 million to the securities' lenders. Taking this sum from the liquidity buffer, however, would result in a deficit of $8 million and leave the overall portfolio undermargined, by brokers' standards, at 27.8%. In order to meet the marks to market on the short positions and reestablish maintenance margin, the investor can sell $9 million worth of securities held long and cover $9 million worth of securities sold short. This will restore the portfolio to its initial starting values.[13]

Exhibit 6 illustrates the advantages, in terms of trading activity, of equitizing a long-short strategy by purchasing a $10 million position in stock index futures, using $0.4 million of Treasury bills as margin; the initial liquidity buffer is $0.6 million. If, as assumed, the long and short positions as well as the futures position now double in value, the long-short account will owe the securities' lenders $9 million on the marks to market on the shorts, but it will also receive a $10 million positive mark to market on the futures. The securities' lenders can be paid out of this $10 million, with $1 million left over. However, the futures positions, worth double their initial value, are now undermargined by $0.4 million (assuming futures margin dollar requirements double or percentage margins stay the same). Purchasing an additional $0.4 million in T-bills will meet the futures margin and restore the initial long-short portfolio margin. No securities trades are required.

The behavior of the long, short, and futures values in Exhibits 5 and 6 is consistent with the effects of underlying market movements; that is, the equivalent systematic risks of the long and short positions would lead to equivalent value changes in the absence of residual, or non-systematic risk, and the futures positions would be expected to perform in line with the market underlying the behavior of the long and short positions. We can thus infer that,

even though the return on a basic long-short portfolio is neutral to overall market movements, market movements can have implications for the implementation of long-short strategies; in particular, they may necessitate trading activity.

In practice, of course, one is unlikely to experience market movements of the magnitudes illustrated. More likely market movements would lead to fewer violations of margin requirements and less trading. With a 5% market rise, for example, the initial long and short positions in Exhibit 5 could be expected to increase to $9.45 million, calling for a payment of $0.45 million to the securities' lenders and a reduction in the liquidity buffer to $0.55 million. There would be no violation of margin (margin would be 52.9%), but restoring the liquidity buffer would require selling $0.45 million worth of long positions and covering $0.45 million worth of shorts. Market declines would be even less problematic. A market decline of 20%, in line with what occurred on Black Monday 1987, would lead to a decline in the value of the long and short positions from $9 to $7.2 million and the liquidity buffer's receipt of $1.8 million from the securities' lenders.

Exhibits 5 and 6 assume that returns to the long and short positions are equal. If it performs as expected, however, the long-short portfolio will experience a positive spread between the returns on the securities held long and the returns on the securities sold short, whether the market rises or falls. Exhibit 7 assumes a 2 percentage point return spread between the longs and the shorts: The long positions rise 4% and the shorts 2%. Although these movements lead to no margin violation, payment of the $0.18 million in additional collateral owed the securities' lenders reduces the liquidity buffer below 10% of equity; furthermore, long and short positions are no longer balanced. By selling $0.198 million in long positions and covering $0.018 million worth of shorts, the investor can restore the liquidity buffer to 10% and rebalance the portfolio. Differential returns on long and short positions, then, even if favorable to overall portfolio performance, can induce some trading activity.

EVALUATING LONG-SHORT

Long-short construction maximizes the implementation of potentially valuable investment insights via the elimination of index constraints. Long-short thus offers advantages over long-only. But it also involves complications not encountered

by long-only management, many of which are related to the use of short-selling.

In choosing a prime broker to act as account custodian, the investor must employ due diligence to ensure the broker's capability and creditworthiness. The prime broker will clear all trades for the long-short portfolio; although the long-short investor can execute trades with other brokers, the prime broker usually assesses a "ticket charge" on such "away" trades to cover the costs of bookkeeping. The prime broker will also arrange to borrow stock for shorting. In this capacity, the prime broker must be advised of possible short sales in order to ensure that the shares are available.

The vast majority of shares are available for borrowing, but borrowability may be a problem for some shares, particularly those of small-capitalization companies. Harder-to-borrow shares may also pose problems even after they have been obtained for short sale. This is because shares sold short are subject to recall by the lender at any time. In most cases, the prime broker will be able to find alternative lenders for the securities subject to recall, but if these are not available, the long-short investor will be subject to "buy-ins" and have to cover the short positions.[14]

Long-short also incurs costs not encountered by long-only, again primarily because of shorting. The financial intermediation cost of borrowing shorts, which includes the costs associated with securing and providing lendable stocks, averages 25 to 30 basis points (although harder-to-borrow names will cost more). It is incurred as a "haircut" on the short rebate received from the interest earned on the short sale proceeds.

With equitized long-short, there may be mismatches between the short rebate, which is based on overnight rates, and the futures contracts, which are priced off an equivalent-maturity LIBOR. Such mismatches can usually be mitigated, however, by negotiating term deals with the prime broker.

Finally, short sales are subject to various uptick rules. Securities and Exchange Commission Rule 10a-1, for example, states that exchange-traded shares can be shorted only at a price that is higher than the last trade price ("uptick") or the same as the last trade price if that price is higher than the previous price ("zero-plus-tick"). Uptick rules vary across the different exchanges and proprietary trading systems.

Uptick rules can delay, or in some cases prevent, execution of short sales, resulting in opportunity costs. Tick tests can be circumvented, but doing so is expensive. For example, the long-short manager can submit a package of trades to a broker that guarantees their execution at the market's closing prices. Such "principal packages," which are crossed overseas outside U.S. market hours, avoid uptick rules as well as public disclosure of the trades. But brokers charge higher fees for principal packages.

As an alternative to short-selling, the long-short manager can sell deep-in-the-money call options, avoiding both uptick and borrowability problems. Options, however, are generally short-lived, often illiquid, and not available for all securities. In addition, an option seller's profit potential is limited to earning the option premium, no matter how far the underlying stock falls.

The cost of avoiding uptick rules may be greater than any opportunity costs incurred as a result of the rules. Such costs will in any event be greatest for strategies that depend on immediacy of execution. For patient traders, who supply rather than demand liquidity, uptick rules should generally not pose a serious problem.

Some other costs of long-short may seem as though they should be high relative to long-only and are often portrayed as such. For example, trading activity for a fully leveraged long-short strategy will be roughly double that for a comparable long-only strategy. This differential, however, is a function of long-short's leverage, and leverage is not a necessary component of long-short. Given an initial $10 million, the client can choose to invest $5 million long and sell $5 million short; trading activity for the resulting long-short portfolio will be roughly equivalent to that for a $10 million long-only portfolio. Although the exigencies of maintaining long-short balance and meeting collateralization requirements may force trading that would not be incurred by long-only, the magnitude of such incremental trading should not be large, given typical security price changes.

Furthermore, a long-only portfolio can engage in leverage to the same extent as long-short. Long-short has the advantage here, however, because purchasing stock on margin can give rise to a tax liability for tax-exempt investors. According to a January 1995 Internal Revenue Service ruling (IRS Ruling 95-8), borrowing stocks to initiate short sales does not constitute debt financing, so any profits realized when short sales are closed out do not give rise to unrelated business taxable income.

Management fees for a long-short portfolio will tend to be higher than those for a comparable long-only portfolio, but again only to the extent that

leverage is employed in the former and not in the latter. If one considers management fees per dollar of securities positions, rather than per dollar of capital, there should not be much difference between long-short and long-only.

Furthermore, there can be a substantial "hidden passive" element in long-only portfolios. Only those portions of a long-only portfolio that represent over-weights or underweights relative to the underlying market or other benchmark index are truly active; the remaining portion of the portfolio constitutes index weightings, which are essentially passive. To the extent the long-only manager's fee is based on total investments, rather than just the active investments, the fee per active dollar managed may be much higher for long-only than for long-short.

Finally, long-short is often portrayed as inherently riskier than long-only. This view in part reflects a concern for potentially unlimited losses on short positions. While it is true that the risk of a short position is theoretically unlimited because there is no bound on a rise in the price of the short-ed security, this source of risk is considerably mitigated in practice. It is unlikely, for example, that the prices of all the securities sold short in a long-short portfolio will rise dramatically at the same time, with no offsetting increases in the prices of the securities held long. Also, the trading imperatives of long-short, which call for keeping dollar amounts of longs and shorts roughly equalized on an ongoing basis, will tend to limit short-side losses, because shorts are covered as their prices rise. And if a gap-up in the price of an individual security does not afford the opportunity to cover, the overall portfolio will still be protected, provided it is well diversified.

A long-short portfolio will incur more resid-ual risk than a comparable long-only portfolio to the extent it engages in leverage and/or takes more active positions. A long-short portfolio that takes full advantage of the leverage available to it will have at risk roughly double the amount of assets invested compared with a long-only portfolio. And because it is not constrained by index weights, a long-short portfolio may take larger positions in securities with higher (and lower) expected returns compared with a long-only portfolio. But both the degree of lever-age and the "activeness" of the long-short portfolio are within the control of the investor.

It is ultimately the investor who decides the long-short portfolio's level of residual risk. As noted above, given an initial $10 million, the investor may choose to invest only $5 million long and sell $5

million short, in which case the amount at risk in securities will be identical to that of a $10 million long-only investment. And the investor will determine the activeness of the positions taken by selecting the desired level of portfolio residual risk. With integrated optimization, long-short selections will be made with a view to maximizing expected return at the desired level of risk; risk will not be incurred without the expectation of a commensurate return. Given the added flexibility it affords in the implementation of investment insights, long-short portfolio construction should be able to improve upon the excess returns available from long-only construction based on the same set of insights, whatever the risk level chosen.

In summary, although long-short is often perceived and portrayed as much costlier and much riskier than long-only, it is inherently neither. Much of the incremental cost and risk is either largely dependent on the amount of leverage employed (transaction costs, management fees, and risk) or controllable via optimization (security selection risk). Those costs and risks that are not — including the financial intermediation costs of borrowing shares to short; the trading costs incurred to meet long-short balancing, margin requirements, and uptick rules; and the risks of unlimited losses on short positions — do not invalidate the viability of long-short strategies.

Neither should some long-standing preju-dices against short-selling. Selling short is not "bad for the economy" or "un-American," as some investors have maintained. In fact, no less a scholar than William Sharpe [1991] has noted, in his Nobel laureate address, that shorting can increase market efficiency and overall economic welfare by allowing for the full expression of negative as well as positive investment opinions.

Nor are long-short portfolios inherently "imprudent" in an ERISA sense. Appropriately constructed long-short portfolios, with long and short positions used to offset market risk and opti-mization used to control residual risk, are fully consistent with the prudence and diversification requirements of ERISA.

A meaningful evaluation of long-short calls for an objective balancing of the real costs against the real benefits. Those benefits may reflect greater inef-ficiencies on the short side of the market but are not dependent on them. The benefits arise from the added flexibility that long-short affords in control of risk and pursuit of return, via the elimination of index constraints, and in asset allocation, via the liberation of security selection return from the

underlying equity class return.

Do the benefits outweigh the costs? The rewards to a long-short portfolio, like those to any active strategy, will depend ultimately upon the insights that underlie its security selections. Good insights will yield good results, whether to a long-short or long-only strategy. Long-short can enhance those results, however, by enhancing implementation of the insights.

ENDNOTES

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[1] Balancing equal dollar amounts long and short is often desired as a means to achieve market neutrality, and it is also the optimal investment posture under certain conditions. For simplicity, assuming the same constant correlation between all securities, long-short balance is optimal when the equation holds:

$$c\sum_{i=1}^{N}\frac{\mu_i}{\sigma_i^2} + d\sum_{i=1}^{N}\frac{\mu_i}{\sigma_i} = 0$$

where c and d are functions of the correlation, the number of securities, and the summation of the inverse of the σ_is,

μ_i = expected excess return of security i,
σ_i^2 = variance of security i's excess return, and
N = number of securities.

We thank Harry M. Markowitz for this insight.

Under the further, although somewhat restrictive, simplifying assumption that all securities have the same constant variance, the equation reduces to:

$$\sum_{i=1}^{N}\mu_i = 0$$

Non-symmetrical distributions of security excess returns can lead to the optimality of long equal to short dollar balances if the summation of the excess returns is zero. The simplest condition for equal dollar amounts is a symmetrical distribution of expected excess returns.

[2] We do not mean to trivialize the importance of the selection process. The ability to discriminate between stocks that will perform well and stocks that will perform poorly is the ultimate arbiter of the success or failure of any active portfolio. But it is also beyond the scope of this article.

[3] Regulation T would alternatively permit up to $20 million in total long positions (given the initial $10 million capital). The purchase of the additional $10 million long would require a margin loan, which has tax implications for tax-exempt investors (as discussed later).

[4] Actually, the lenders of the securities sold short will require somewhat more than the proceeds from the short sale to collateralize their loan, in order to protect themselves in the eventuality that the short-seller cannot meet daily marks to market. In practice, the securities' lenders demand 102% of the value of the shares borrowed. The prime broker will arrange for this incremental collateral.

[5] The liquidity buffer must also be available to reimburse securities' lenders for dividends on borrowed shares. If the liquidity buffer is inadequate to meet mark-to-market and dividend demands, the long-short manager may have to sell long positions for short settlement (receiving cash proceeds faster than the usual three-day settlement period), an expensive proposition, or borrow funds from the broker, also an expensive option and one that may have tax consequences for tax-exempt investors.

[6] Retail investors generally do not receive interest on the cash proceeds from short sales. Institutional investors generally do receive a substantial portion of the interest on the cash proceeds, but they do not technically have use of those proceeds. That is, they cannot decide where to invest the proceeds, nor do the proceeds serve as equity for determining the margin level of the investor's account at the prime broker.

[7] While the liquidity buffer must be invested at short-term rates to ensure availability of funds, there is some room for negotiation in the investment of the short-sale proceeds. Typically overnight rates are pegged to Fed funds, LIBOR, or broker call, but the funds may be committed for longer terms at higher rates. Investment for longer terms will subject the proceeds to interest rate risk if the performance benchmark is linked to a floating rate, but it may reduce risk for an equitized long-short portfolio (for instance, if the maturity of the investment matches that of the stock index futures contracts used as an overlay on the portfolio).

[8] The return spread of 6% is achieved in this example with a long return exceeding the market return by 3 percentage points and a short return falling shy of the market return by 3 percentage points. The market return is provided solely for illustration and is irrelevant to the return spread (as will become evident later, in the discussion of "integrated optimization"). Any pair of long and short returns where the longs outperform the shorts by 6% provides the same return spread, regardless of the market's return.

[9] Such an argument is made by Michaud [1993], who assumes that (using his notation):

$$\alpha_L = \alpha_S \text{ and }$$
$$\omega_L = \omega_S$$

or the excess return and residual risk of the long positions in long-short equal the excess return and residual risk of the short positions. He also implicitly assumes that the excess returns and residual risks of the long and short positions equal the excess return and residual risk of an index-constrained long-only portfolio. That is:

$$\alpha_L = \alpha_S = \alpha_{longonly} \text{ and }$$
$$\omega_L = \omega_S = \omega_{longonly}$$

From these assumptions he concludes that:

$$\Gamma_{LS}/\Gamma_L = \sqrt{2/(1+\rho)}$$

where Γ equals the ratio of portfolio excess return to portfolio residual risk. Thus the long-short portfolio can offer no benefits over a long-only portfolio except to the extent that the correlation between the excess returns on its long and short positions (ρ) is less than one. But such diversification benefits can be obtained by combining any assets that are less than fully correlated.

[10] A consideration in equitizing a portfolio is the use of a tail hedge. See Kawaller and Koch [1988].

[11] We assume a futures margin of 4%. The futures margin is currently set at $12,500 per contract, so the percentage margin will rise and fall with changes in the contract's value.

[12] For shorted shares selling at $5.00 or more, collateral must equal the greater of $5.00 or 30% of share value, while for shorted shares selling at less than $5.00, collateral must equal the greater of $2.50 or share price.

[13] Alternatively, the investor could deposit additional funds to meet the margin call.

[14] One also occasionally hears about a "short squeeze," in which speculators buy up lendable stock to force a buy-in at elevated prices. This will be more of a problem for dedicated short-sellers who take concentrated positions in illiquid stocks than for a long-short investor holding small positions diversified across many stocks.

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