THE L Word

Go beyond the boundaries of leverage ratios to understand hedge fund risk.

BY PETER KLEIN

There are few practices that are as subject to preconceived notions as the L word. In modern finance this term refers, of course, to the use of leverage, which is widespread yet often misunderstood. One source of confusion is the different ways in which leverage is defined and measured. Another arises from one of its most basic and fundamental properties: adding leverage to an investment increases risk. Accordingly, investors often equate highly levered investments with high risk and will judge them as unsuitable without further analysis. Unfortunately this conclusion can be inaccurate if it fails to take into account potential differences in the risk of what is being levered.

These sources of confusion are particularly important to keep in mind when analyzing hedge funds. The measurement of leverage in a hedge fund trading strategy is more difficult than for a traditional investment strategy because of the sophisticated nature of the underlying securities and the complicated way in which they are put together in a portfolio. Further, leverage is often used by hedge funds not to add risk but to take offsetting positions in order to decrease the overall risk for investors.

The purpose of this article is to clarify how leverage is defined and used in various hedge fund and traditional investment strategies and to assess what levels of risk are produced. It finds that leverage ratios vary widely across hedge fund strategies and are generally higher than those of traditional investment strategies. The effect of leverage on risk, however, is not clear: several numerical examples demonstrate the risk for certain highly levered hedge fund strategies can be lower than for unlevered traditional investment strategies. Further, the empirical evidence suggests there is no discernible relationship between the use of leverage and the amount of risk in a given strategy, and that the investment risk of highly levered hedge fund strategies has generally been lower than for traditional long-only equity portfolios that do not use leverage. These findings imply that investors should not rely on leverage ratios alone as a proxy for risk when analyzing hedge funds but need to analyze the nature of the trading strategy in more detail.

HEDGE FUND TRADING STRATEGIES

Before attempting to measure the amount of leverage used by hedge funds it is important to have a basic understanding of the types of trading strategies they pursue. Table 1 outlines example trades for four common hedge fund strategies: Equity Long/Short, Equity Market Neutral, Convertible Bond Arbitrage and CTA/Futures. For comparison, similar examples for traditional Equity Long Only as well as Short Extension (130:30) strategies are also provided. These examples are intended to be representative and are based on common industry knowledge but they are admittedly anecdotal in nature.[1] For each example, the dollar values of Longs, Shorts, associated Cash balances and Notional exposures on derivatives employed are provided. For simplicity, it is

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assumed that the Beta of all equity securities equals one. Unless otherwise noted, these examples assume no direct borrowings but that leverage is available through margin requirements of 30% on both long and short positions (net of the proceeds from the short sale). The amount of investors' Capital or Net Asset Value that would be required to support each type of trade is calculated based on these margin requirements.

The positions of a typical Equity Long/Short fund are shown in the first column of Table 1. This fund is assumed to have a goal of 50% net long exposure. A typical trade might consist of long position of $23 of securities and a short position of $17. Margin requirements of 30% on both the long and short positions (net of proceeds of the short sale) would imply that investors' Capital of $12 would be required to support the net position of $6.

The second column provides a similar example for an Equity Market Neutral fund. Since there should be no net market exposure for such a fund, a typical trade might comprise long and short positions of $20 each. Based on 30% margin, $12 of investors' Capital would also be needed to support this trade.

A typical trade for a Convertible Bond Arbitrage fund is provided in column three. This trade is based on the intuition that the risk of a convertible bond can be replicated or hedged by a call option on the underlying stock as well as a straight bond in the same issuer. Thus, in theory, a trade would consist of a long position in a convertible bond and a short position in a call option and a straight bond. In practice, however, the short call option is replicated dynamically through the sale of an appropriate number of common shares based on the Delta of the option. This example assumes the Delta is .25. The short position in the straight bond is also not typically put in place; instead the credit risk is usually hedged through a credit default swap (CDS) and the interest rate risk is hedged through a bond futures contract. This example assumes that the CDS costs $2.50 and that the combined notional exposure of the CDS and the bond futures contract is 100% of the value of the convertible bond. Based on margin requirements of only 15% for a typical convertible bond, the amount of investors' Capital required to support this trade is $25.

Column four provides an example trade of a CTA/Futures fund. This trade consists of being long $100 notional exposure (through futures contracts) to the price of cocoa and short $100 notional exposure (through other futures contracts) to the price of pork bellies. Margin requirements are assumed to be 7.5% for each futures contract. Since daily variation margin requirements can be substantial, however, the common practice of CTA/Futures managers is to keep large amounts of cash on hand—sometimes as much as four times the required margin. In total, $75 of investors' Capital would be needed to support this trade in this example.

The last two columns provide examples for a traditional Equity Long Only equity fund and a Short Extension (130:30) fund. Since the mandate of an Equity Long Only fund does not permit shorting any securities, the example is very simple: $12 of investors' Capital would be used to purchase $12 of equity securities. In contrast, $12 of Capital invested in the Short Extension (130:30) fund would be employed to take long and short equity security positions of $15.60 and $3.60, respectively, leaving a net long position of $12.

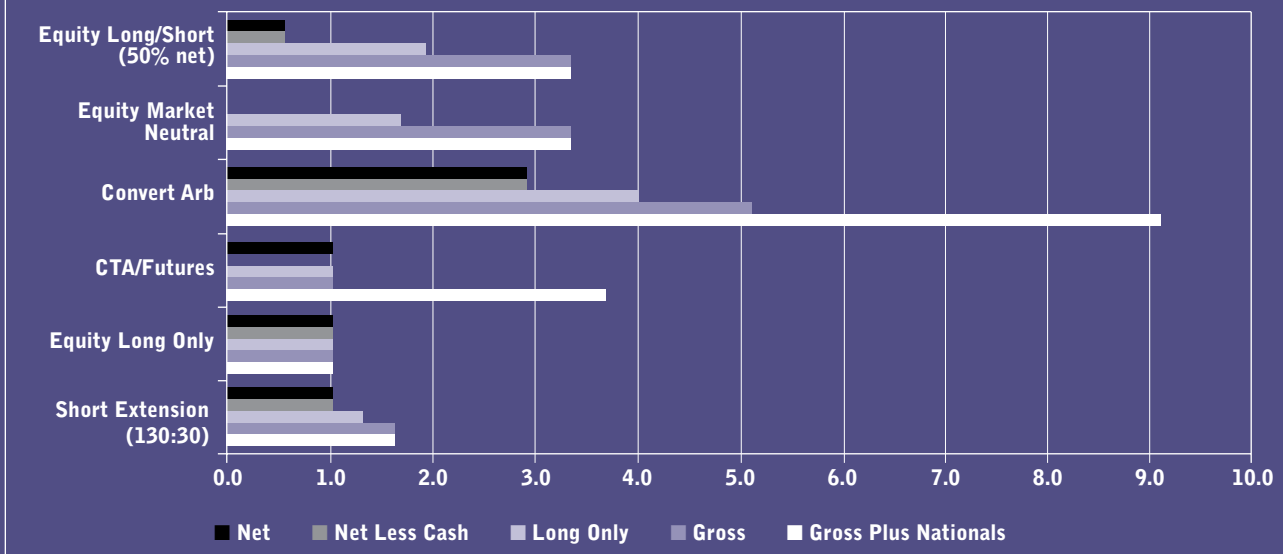
MEASURING LEVERAGE

Leverage is typically defined as a ratio. When assessing the leverage in an investment or investment fund, the denominator of that ratio is usually investors' Capital or

Table 1: Example hedge fund and traditional investment strategies

	Equity Long/Short	Equity Market Neutral	Convertible Bond Arbitrage	CTA/Futures	Equity Long Only	Short Extension (130:30)
Longs	$23.00	$20.00	$100.00	-	$12.00	$15.60
Shorts	$17.00	$20.00	$25.00	-	-	$3.60
Cash balances	-	-	-	$60.00	-	-
Notional exposures	-	-	$100.00	$200.00	-	-
Cost of derivatives	-	-	$2.50	-	-	-
Borrowings	-	-	-	-	-	-
Capital required	$12.00	$12.00	$25.00	$75.00	$12.00	$12.00

Figure 1: Summary of Leverage Ratios



Net Asset Value. Unfortunately there is no agreement on what should be in the numerator. Some fund managers will define their leverage based solely on the amount of bank borrowings, which are often very small. Other managers will consider the value of their long positions only, whereas some will consider the net value of the longs and shorts. Cash balances are sometimes subtracted from net values if they are immediately available to pay down leverage. A more expanded measure includes the gross value of positions (i.e., longs plus shorts). Also considering the notional value of assets underlying derivative positions may increase the leverage ratio even further.

Figure 1 provides leverage ratios defined in various ways for the four examples of hedge fund trading strategies as well as for the Equity Long Only and Short Extension strategies. The length of the various bars indicates the amount of leverage based on the following measures: Net, Net Less Cash, Longs Only, Gross and Gross Plus Notionals. Note these examples all assume no direct borrowings.

When considering Net positions only, the lowest leverage ratios are for the Equity Market Neutral and Equity Long/Short hedge fund strategies. When the more expanded measures of Long Only or Gross positions are used in the numerator of the leverage ratio, however, the leverage ratios for these two hedge fund strategies are among the highest and now exceed the comparable ratios for the Equity Long Only and Short Extension strategies. This comparison is consistent with the commonly held view that equity-based hedge fund strategies are inherently riskier than traditional equity investments—although potential differences in the risk of the portfolio being levered have yet to be considered. It is also important to note that the Short Extension strategy is not unlevered when a more expansive definition of leverage is considered.

In contrast, the CTA/Futures example has Net, Longs Only and Gross leverage ratios identical to those of the Equity Long Only manager, which is often interpreted as evidence of relatively low risk. This interpretation is reinforced if the Net Less Cash leverage ratio is considered; since the long positions that appear on the balance sheet of the CTA/Futures fund consist entirely of cash balances or cash posted as margin, the Net Less Cash leverage ratio declines to the lowest of all example trading strategies considered. Once the notional value of derivatives contracts is added to the gross longs plus shorts, however, the Gross Plus Notionals leverage ratio increases to 3.7, which is the highest leverage ratio for all but one of the example strategies.

By far, the most highly levered strategy appears to be Convertible Bond Arbitrage, for which the ratios range from 3.0 to 9.0 depending on the way leverage is measured. These high leverage ratios are due to the lower margin that is typically required for a long position in a convertible bond, but also arise from the relatively large notional exposures in the derivative contracts that are usually

employed to hedge the credit and interest rate risk.

In summary, the Equity Long Only, Short Extension and CTA/Futures examples appear to be the least levered based on the first four measures. Equity Long/Short and Equity Market Neutral appear to be more highly levered in general, whereas Convert is the most highly levered based on all measures. It is important to recognize, however, that the ranking based on leverage ratios varies depending on the definition of leverage that is being considered.

ESTIMATING RISK

The second reason why using leverage ratios as a proxy for risk can be misleading is that the risk of the portfolio being levered must also be taken into account. This section provides some numerical examples to demonstrate this point. In order to focus on the effect of differences in trading strategies instead of differences in the risk of the securities being traded, only the Equity Long/Short, Equity Market Neutral and the traditional Equity Long Only and Short Extension strategies will be considered.

Table 2 provides examples of overall risk for these four equity-oriented strategies based on standard two-asset portfolio theory. The standard deviation of returns is assumed to be 20% for both assets and correlations are allowed to range from 0 to .9. Calculations for the Equity Long/Short, Equity Market Neutral and Short Extension strategies assume one asset is a portfolio of equity securities that are held long, and the second asset is a portfolio of equity securities that are sold short. For the Equity Long Only strategy a 50% weight in each of the two equity portfolios is assumed. Leverage ratios for each of the strategies are as reported in Table 1.

The Equity Long Only and Short Extension strategies clearly have the lowest risk when the correlation is relatively low. When the correlation is zero the standard deviation for the Equity Long Only strategy is less than one-third those of the Equity Long/Short and Market Neutral strategies. The Short Extension strategy appears riskier than the Equity Long Only strategy—but the standard deviation is still only roughly half that of the two hedge fund strategies.

As the correlation increases, the risk produced by the four strategies becomes more similar. When the correlation is .5, the two hedge fund strategies still have higher standard deviation than the Equity Long Only and Short Extension strategies but the difference is less severe.

Even higher correlation between securities held long and short is not uncommon for hedge funds which follow a true Equity Market Neutral strategy. This is because such funds seek to identify securities that generally move together and to go long one and short the other, based on small and hopefully short-term violations of their pattern of co-movement. Many Equity Long/Short funds also try to offset their long positions with short positions in securities that tend to move in the same direction, although their net exposure is not constrained to be neutral to overall market moves.

The third line in Table 2 provides calculations when the two portfolios held long and short are very highly correlated. When the correlation is assumed to be .9, the offsetting nature of the long and short portfolios lowers the overall standard deviation of the Equity Long/Short and Equity Market Neutral strategies to 18% and 15% respectively as compared to 19% for the traditional Equity Long Only strategy. Somewhat surprisingly, the greatest standard deviation is for the Short Extension strategy—despite the offset of risk this strategy is typically designed to produce.

EMPIRICAL EVIDENCE

Another way to measure the overall risk of these trading strategies—including the risk through the use of leverage—is to analyze the actual history of returns they have produced. Figure 2 provides summary statistics for the returns on the four hedge fund strategies considered in this paper as well as for a benchmark long-only equity index. The data for the hedge fund strategies is from the

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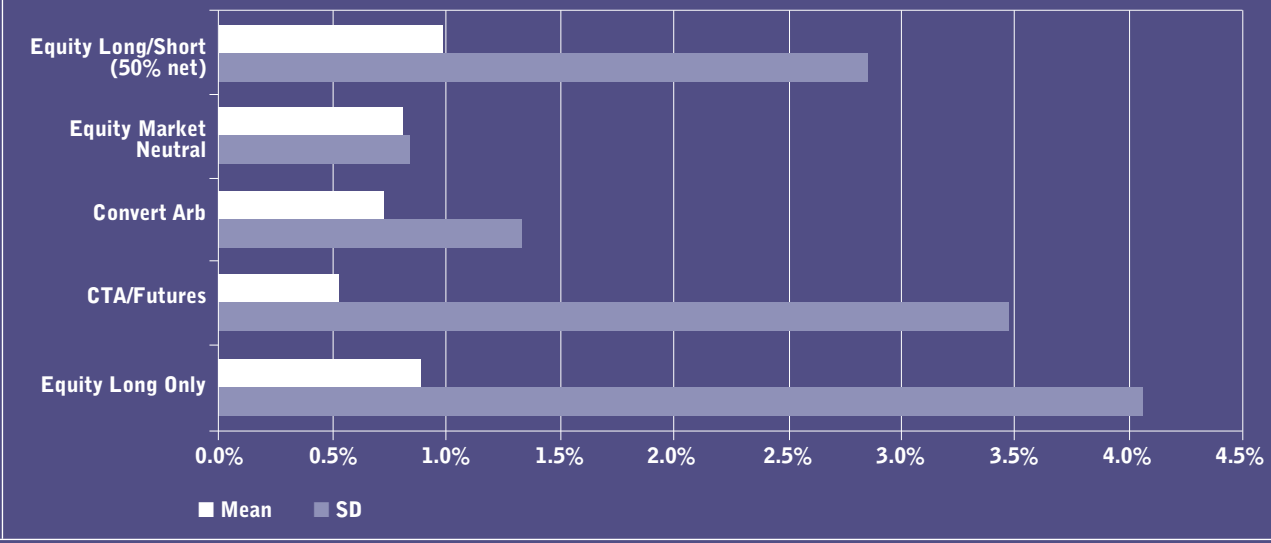
Table 2: Risk of hedge fund and traditional investment strategies

	Equity Long/Short	Equity Market Neutral	Equity Long Only	Short Extension (130:30)
$\rho = 0$	0.48	0.47	0.14	0.27
$\rho = .5$	0.34	0.33	0.17	0.24
$\rho = .9$	0.18	0.15	0.19	0.21

Figure 2: Comparison of Risk



CS/Tremont database and comprises monthly returns from January 1994 to September 2007 for the sub-indices corresponding most closely to these four strategies. Since the data is in U.S. dollars, the S&P 500 Total Return Index is taken as a reasonable proxy for the returns on a comparable Equity Long Only portfolio. Returns for Short Extension funds were unavailable. Average monthly returns are after fees for the four hedge fund strategies, but no fees have been deducted for the Equity Long Only strategy. Standard deviations—one of the most widely used measures of risk—are reported for each.[2]

The historical evidence in Figure 2 suggests no discernible relationship between any of the leverage ratios and the amount of risk a given hedge fund strategy produces for its investors. Although the low leverage ratios for the Equity Market Neutral strategy are consistent with the low standard deviation of the returns produced, the second lowest standard deviation is for the Convert Arbitrage strategy, which typically entails the highest use of leverage. The Equity Long/Short and CTA/Futures strategies both employ leverage more conservatively than the Convert Arbitrage strategy, yet the standard deviations of their returns are both higher.

Of particular interest is the standard deviation of returns on the traditional Equity Long Only strategy. Despite the lowest leverage ratios the standard deviation of returns has been higher than any of the four hedge fund strategies considered.

It appears there is also no discernible relationship between the risk of a given strategy and the returns it has produced. For example, the average return on the Managed Futures sub-index is the lowest, yet its standard deviation is the highest among the four hedge fund strategies considered. Further, the average return for the Equity Market Neutral strategy is similar to that for the Equity Long Only strategy, yet its standard deviation is remarkably lower.

IMPLICATIONS FOR INVESTORS

Preconceived notions that high leverage indicates high risk appear to have no basis in reality. The definition and use of leverage vary widely across hedge fund and traditional investment strategies and there appears to be no discernible relationship between the use of leverage and the amount of risk in a given strategy. Further, the empirical evidence suggests the investment risk of highly levered hedge fund strategies has generally been lower than for traditional long-only equity portfolios that do not use leverage. These findings imply investors should not rely on leverage ratios alone as a proxy for risk when analyzing hedge funds but need to consider the nature of the trading strategy in more detail. ▮

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ENDNOTES

1. See, for example, the articles on the AIMA Canada website for a discussion of trading strategies.
2. Note other measures, such as skew, kurtosis, semi-deviations and higher statistical moments are also often used when assessing risk in hedge funds. Also note data may be biased and is not necessarily indicative of future returns.