

CONTENTS

Introduction	
Methodology	3
Multi-Faceted Risk Measurement	5
Leverage vs. Risk Characteristics	5
Leverage vs. Ex-Post Variance Risk Metrics	6
Leverage vs. Ex-Ante Variance Risk Metrics	7
Leverage Methods	8
Borrowing	8
Derivative Instruments	9
Future Contracts	9
Credit Default Swaps	9
Interest Rate Swaps	10
Total Return Swaps	11
Delayed Delivery Transactions	13
Mortgage Backed TBAs	13
Repurchase Agreement	13
Short Positions	13
Net Leverage Ratio	14
Conclusion	15

Portfolio Leverage Ratio

By David Asermely

Introduction

Portfolio leverage can be created through the use of borrowing, through investing the proceeds from short sales or through the use of derivative instruments.¹ Leverage provides investors risk and opportunity. As a leading provider of performance and risk analytics, many clients are asking BNY Mellon Asset Servicing “how we measure leverage” as there is no current industry standard.

A recent study of 92 U.S. public pension plans, including 25 focused interviews, provided insights into changing investor attitudes in an evolving regulatory environment. Commissioned by Pershing LLC and produced by Finadium LLC, the study offers guidance on how hedge funds can execute successful lending programs for the future. The most common concern highlighted by the pension fund managers was the lack of portfolio leverage monitoring.² Many respondents stated that unchecked leverage could negatively impact a fund’s long-term performance.

To demystify the concept of leverage, this paper provides a straightforward approach to calculating and monitoring portfolio leverage. Leverage is defined as the creation of exposure greater than the capital invested.

Asset managers, including many hedge funds, use leverage to take advantage of perceived opportunity, often resulting in superior performance. The risk associated with this enhanced leverage is often not fully understood or considered while comparing various strategies and managers. In an attempt to reduce the leverage risk, asset managers implement sophisticated hedging and diversification methods to reduce the probability of excessive losses. Depending on the asset manager’s skill, investment strategy and market conditions, this leverage risk may not negatively impact the portfolio’s performance for long periods of time.

During periods of low market volatility, asset managers that successfully deployed leverage often outperformed managers that did not. As a prelude to the 2007-2009 financial crisis, this leverage bias resulted in more firms deploying more leverage.³ Unfortunately, during a market crisis, most hedging and diversification strategies tend to fail. “Traditional diversification did not provide the typical level of risk reduction during the 2008 financial crisis,” said Michael Ho, chief investment officer of Mellon Capital. “One of the most frightening aspects of the 2008 crisis was that all risky assets sank in lockstep, resulting in devastating losses.”

Frequently, only after the markets destabilize is the leverage risk fully understood. This paper defines a leverage ratio methodology that can be used, in combination with other risk metrics, in the performance evaluation process.

Nassim Taleb makes the argument that we cannot predict risk during “Black Swan” or large-impact, hard to predict, rare events beyond the realm of normal expectations.⁴ Extreme events

may be unpredictable, but the leverage ratio detailed in this paper attempts to quantify opportunity for loss in relation to an account’s market value during these periods. Although a higher leverage ratio does not necessarily imply greater risk in strategy execution, it may imply that, during a systematic destabilization, risk is often immeasurable, financial models tend to fail and more of the asset owner’s capital may be lost. A leverage ratio may uncover unintended exposures prior to a shock event which could result in exaggerated investment losses.

Taleb provided the following recommendation in his September 10, 2009, testimony to the U.S. House of Representatives Committee on Science and Technology:

“Regulators should understand that financial markets are a complex system and work on increasing the robustness in it, by preventing ‘too big to fail’ situations, favoring diversity in risk taking, allowing entities to absorb large shocks, and reducing the effect of model error. This implies reliance on hard, non-probabilistic measures rather than more error-prone ones. For instance ‘leverage’ is a robust measure (like the temperature, it does not change with your model), while VaR is not.”⁵

Risk must be considered when reviewing and comparing a portfolio’s performance. The multi-dimensional nature of today’s financial risk requires the consideration of multiple risk metrics. The following example illustrates the benefit of including the leverage ratio as a risk metric to consider within your investment process.

This example consists of a portfolio that was constructed with an industry recognized index optimization tool to replicate the Barclays U.S. Aggregate Index minus the index’s exposure to the “industrial” sector. Portfolio 2 consists of the same positions and weighting as Portfolio 1, plus a credit default swap (CDS) where the manager is receiving payment for selling credit protection on a BP holding. The BP CDS within Portfolio 2 provides an exposure to the industry sector not present in Portfolio 1. The resulting “portfolio risk” was calculated prior to the Black Swan oil spill in the Gulf of Mexico, using a parametric multi-factor model that incorporates leverage, term structure, credit risk, sector risk and other factors. The additional leverage risk present in Portfolio 2 is largely offset by the diversification achieved when the exposure to the industrial sector is introduced. An account’s leverage ratio, while providing limited value when evaluated in isolation, does provide a different perspective than traditional risk metrics, allowing a more comprehensive review of the performance results.

Figure 1

		Daily VaR (95%)	Portfolio Risk	Leverage
Portfolio 1	Barclays Agg. minus “industrials” exposure	0.36%	3.43	1.00
Portfolio 2	Barclays Agg. plus BP CDS	0.37%	3.50	1.31

¹ “The Impact of Leverage on Hedge Fund Risk and Return,” by Thomas Schneeweis, George Martin, Hossein Kazemi and Vassilis Karavas, Center for International Securities & Derivatives Markets, 2004, Pages 5-6.

² “Lending and Leverage: The New Securities Finance Model for Hedge Funds,” commissioned by Pershing LLC and produced by Finadium LLC, June 2010.

³ Greenlaw, David, Jan Hatzius, Anil K. Kashyap, and Hyun Song Shin. 2008. “Leveraged Losses: Lessons from the Mortgage Market Meltdown.” U.S. Monetary Policy Forum: 8-59.

⁴ Taleb, Nassim Nicholas (2007). “The Black Swan: The Impact of the Highly Improbable.” New York: Random House. ISBN 978-1-4000-6351-2.

⁵ Testimony of Nassim N. Taleb, PhD. Submitted to the U. S. House of Representatives, Committee on Science and Technology Subcommittee on Investigations and Oversight For the Hearing: “Report on The Risks of Financial Modeling: VaR and the Economic Meltdown.” September 10, 2009.

Methodology

Mathematically, leverage can be calculated using this formula:

$$\text{Leverage Ratio} = \frac{\text{Total Exposure}}{\text{Capital}}$$

The total exposure variable within the leverage ratio is defined as the capital that is exposed to any of the many investment risks including: interest rate, credit, liquidity (spread) and other market risks. The following principles can be applied to define the capital exposed:

1. The market values for traditional assets such as stocks and bonds are treated as exposure.
2. Since the loss potential of derivative instruments, such as credit default swaps, interest rate swaps, total return swaps, and future contracts are proportional to their notional market value, the notional value is counted as the total exposure for these instruments within the leverage ratio.
3. For purposes of our leverage ratio, total exposure does not include assets with low nominal volatility.⁶ Assets with low nominal volatility, such as cash (including accruals) and high quality short-term instruments are excluded from the total exposure value because they are often held as collateral against derivative exposures. By excluding low volatile assets from the leverage ratio numerator, you can distinguish between strategies that have low volatile assets to mitigate leverage achieved through other instruments and strategies that do not.

Figure 2 attempts to illustrate the logic for not treating low volatile assets as exposure within the Capital Leverage Ratio methodology.

Figure 2

	Strategy 1	Strategy 2
Capital	\$1,000,000	\$1,000,000
Derivative Notional Market Value Exposure	\$1,000,000 in a Barclays Aggregate Bond Index Future Contract	\$1,000,000 in a Barclays Aggregate Bond Index Future Contract
Low Volatile Asset Exposure	0	\$1,000,000 in commercial paper
Long Term Asset Exposure	\$1,000,000 in corporate bonds	0
Total Exposure	\$2,000,000	\$1,000,000
Leverage Ratio	2X	1X

In this example, both strategies have purchased a Barclays Aggregate Bond Index future contract and thus are 100% exposed to price movements in that index. Stated another way, if the Barclays Aggregate Bond Index loses 10% of its value, the owner of this future contract will lose 10% of the notional market value invested in that instrument. Until payment is due on the future contract, the asset manager may have the option of investing the cost of the future contract in volatile or low volatile assets. In the first strategy, the asset manager has elected to purchase an additional \$1,000,000 in corporate bonds—considered a volatile asset.

⁶ Laker, Damien, "Performance Measurement and Attribution with Leverage and Derivatives," *The Journal of Performance Measurement*, Spring 2009, pp. 50-64.

$$\text{Strategy 1 Leverage Ratio} = \frac{\text{Total Exposure } (\$2,000,000)}{\text{Capital } (\$1,000,000)} = 2$$

Strategy 2 has elected to invest the capital required to fulfill the future contract in commercial paper, a low volatile asset, and thus has a non-leveraged account.

$$\text{Strategy 2 Leverage Ratio} = \frac{\text{Total Exposure } (\$1,000,000)}{\text{Capital } (\$1,000,000)} = 1$$

Figure 3 illustrates the leverage impact of several common asset classes in addition to some derivative instruments.

The account in this table has an overall leverage equal to 1; all of this account's capital has been deployed and is exposed to the market. Although the account has three derivative leverage instruments, it also has low nominal volatility assets, including cash and commercial paper that could be used to:

1. Fulfill the CDS insurance policy obligation in event of default
2. Fulfill the terms and conditions on the future contract
3. Absorb losses if the interest rate moves against the IRS position

The derivative leverage implications are further addressed in the sections below.

Figure 3: Sample Asset Class Leverage Impact

	MV	Exposure	Capital	Leverage
Equity Holding	100	100	100	1
Long Term Bond	100	100	100	1
Convertible	100	100	100	1
Option	100	100	100	1
Maturing Bond	100	0	100	0
Commercial Paper	100	0	100	0
Cash	100	0	100	0
CDS (buying protection)	0	0**	0	0
CDS (selling protection)	0	100	0	Infinite
Future	0	100	0	Infinite
IRS (float for fixed)	0	100	0	Infinite
IRS (fixed for float)	0	0**	0	0
				Leverage Ratio
	Sum	700	700	1

** Note: the CDS/IRS protection's current market value, not its notional market value, is considered exposure within the leverage ratio. In this simple example, a zero current market value is assumed.

Multi-Faceted Risk Measurement

Many of the existing risk measures tend to predict the lowest risk when financial conditions are favorable, prices are not volatile and asset correlations are consistent. Alternatively, financial institutions tend to apply greater leverage to their balance sheets during these favorable conditions.⁷ The opposite is true during financial downturns. Many have speculated that this heightened leverage application is directly related to the counter-cyclical nature of many of the common risk metrics.⁸ Regulatory requirements based on predictive risk metrics, such as VaR, have often underestimated risk and have encouraged and sanctioned this heightened use of leverage.⁹ As Taleb added in his testimony to the Committee on Science and Technology,

“VaR has side effects of increasing risk taking, even by those who know that it is not reliable. We have ample evidence of so-called ‘anchoring’ in the calibration of decisions. Information, even when it is known to be sterile, increases overconfidence. VaR-style quantitative risk measurement is the engine behind leverage, the main cause of the current crisis. Leverage is a direct result of underestimation of the risks of extreme events and the illusion that these risks are measurable.”¹⁰

It may be most appropriate to consider a leverage ratio during stable financial periods when other measures are predicting low risk.

Asset managers are often measured and selected not only by their returns but also by their risk/return profiles. This section of the paper stresses the importance of using multiple risk metrics to better view performance results. The following section will attempt to differentiate leverage vs. variance and correlation-based risk measures.

Leverage vs. Risk Characteristics

The main leverage ratio criticism in a 2008 industry study was the inability to distinguish between assets with widely differing risk.¹¹ The argument is that the “total exposure” is not additive across asset types: \$100 notional of one-year duration U.S. Treasuries is not comparable to \$100 of equity exposure. A leverage ratio of 3 or 4 may be associated with high risk (a market directional equity fund with a beta of 3), whereas a fixed-income fund that uses Euro-dollar strips to hedge a 30-year coupon bond may be virtually riskless, but could have a leverage ratio around 60. Selective exclusion of a cash-like instrument does attempt to mitigate this effect but does not solve the problem. By considering all exposures equally the leverage ratio fails to capture the gradual risk profile of investment instruments, and thus will provide limited value when evaluated in isolation.

Risk characteristics such as duration, option adjusted spread, quality ratings and beta, allow a more gradual analysis of assets, assigning them with various degrees of risk. It is suggested that these portfolio characteristic measures are used in combination with a leverage ratio to better analyze the portfolio.

⁷ Adrian, Tobias, and Hyun Song Shin (2008), “Liquidity, Financial Cycles and Monetary Policy,” *Current Issues in Economics and Finance*, Federal Reserve Bank of New York, 14(1).

⁸ Greenlaw, David, Jan Hatzius, Anil K. Kashyap, and Hyun Song Shin. 2008. “Leveraged Losses: Lessons from the Mortgage Market Meltdown.” *U.S. Monetary Policy Forum*: 8–59.

⁹ Triana, Pablo (2009) “Lecturing Birds on Flying – Can Mathematical Theories Destroy the Financial Markets?” Wiley, John & Son, Incorporated. ISBN-13: 9780470406755.

¹⁰ Testimony of Nassim N. Taleb, PhD. Submitted to the U. S. House of Representatives, Committee on Science and Technology Subcommittee on Investigations and Oversight For the Hearing: “Report on The Risks of Financial Modeling: VaR and the Economic Meltdown.” September 10, 2009.

¹¹ “Containing Systemic Risk: The Road to Reform.” *The Report of the CRMPG III*. August 6, 2008.

Leverage vs. Ex-Post Variance Risk Metrics

The Capital Market (CAPM) theory stresses the tradeoff between the risk taken and the returns achieved. Many of today's standard ex-post risk metrics (e.g., VaR, Sharpe Ratio, Information Ratio, Jensen's Alpha, Treynor, etc.) use variance of returns as the underlying measure of risk. Asset managers that provide consistent returns over a period of time are perceived to be taking on less risk, while asset managers whose accounts exhibit greater variance in returns are perceived to be riskier. Is a metric that is based solely on return variance sufficient to gauge an account's risk profile? What if the time period used to calculate a variance risk measure were relatively stable? How useful would a variance metric calculated using return data from a stable period be when estimating risk during extremely unstable time periods? Would the variance measures capture the inherent risk, or would the variance stay relatively stable until an event destabilizes the market? To stress the importance of these questions, consider Adrian and Shin's work that provides evidence to suggest that leverage increases during periods of low volatility, when metrics such as VaR predict low risk.¹²

Would the market tend to favor inherently risky strategies that experienced relatively low variance under certain market conditions, yet provided enhanced returns? Consider two accounts, one that invested in core fixed-income bonds; the second that sold credit protection through credit default swaps. Both receive a premium for taking on additional credit risk in excess of the risk-free Treasury bond. Since the capital outlay required to enter into a credit default swap is minimal, the second strategy allows the asset manager to take on greater exposure than the account's market value. If you buy a \$100 bond, you receive a coupon in exchange for taking on the risk that, if the issue defaults, you fail to recover your principal. If you sell \$100 of protection through a credit default swap, you receive a coupon in exchange for insuring the \$100 in the event of a credit event. Unlike the vanilla fixed-income bond, the capital outlay of entering into the credit default swap is nominal in comparison to the capital at risk.

In Figure 4, we have postulated two strategies, each investing \$1,000,000. By the nature of the credit default swaps, strategy 2 will be receiving a higher annual coupon for taking on 10 times the credit risk of strategy 1. Under stable market conditions, with very few defaults, the second strategy will achieve superior returns per unit of variance. When comparing the two asset managers using a risk-adjusted metric (e.g., Sharpe ratio, Information Ratio, Treynor Ratio, M-Squared, etc.), strategy 2 will appear to provide a superior return per unit of risk taken. Strategy 2's superior risk-adjusted performance will continue until the market destabilizes, at which point we will need to incorporate an additional measure to fully understand the relative risk of the two approaches.

Figure 4

	Strategy 1 – Core Fixed Income	Strategy 2 – Selling Credit Insurance through Credit Default Swaps
Initial Market Value	\$1,000,000	\$1,000,000
Investments	10 fixed income bonds each costing \$100,000	10 CDS each guaranteeing \$1,000,000 in insurance.
Exposure	\$1,000,000	\$10,000,000

***Note: the premium paid by the CDS purchaser to the CDS seller is not captured in this example. The true exposure adjusts the notional by the paid premiums.*

¹² Adrian, Tobias, and Hyun Song Shin. 2008. "Liquidity and Financial Contagion." *Financial Stability Review*, no. 11 (February):1-7.

Winton Capital Management's David Harding argues that ex-post variance risk metrics, such as the Sharpe Ratio, are only meaningful when an asset manager has consistently constructed a portfolio. A common ex-post statistical violation occurs "when a manager's style or leverage changes over the course of their history."¹³ Asset managers are often selected and measured by their risk/return profiles. It's suggested to consider a portfolio's capital leverage ratio throughout the time period used to calculate an ex-post risk statistic.

Leverage vs. Ex-Ante Variance Risk Metrics

Leverage and ex-ante risk metrics show little evidence of a systematic relationship.¹⁴ In fact, they are constructed completely differently and, arguably, give a different risk perspective. Ex-ante metrics predict future risk based upon an account's fundamental makeup, including asset correlations, diversification and hedging effects. Alternatively, the capital leverage ratio does not factor in these construction factors.

Richard Bookstaber provided the following recommendation in his September 10, 2009, testimony to the U.S. House of Representatives Committee on Science and Technology:

*"The first approach is to employ coarser measures of risk; measures that have fewer assumptions and that are less dependent on the future looking like the past. The use of the leverage ratio mandated by U.S. regulators and championed by the FDIC is an example of such a measure. The leverage ratio does not overlay assumptions about the correlation or the volatility of the assets, and does not assume any mitigating effect from diversification, although it has its own limitations as a basis for capital adequacy."*¹⁵

The different perspective given by the leverage ratio may be most useful during tail events when financial models tend to fail and hedging and diversification safeguards do not work as intended or expected by the ex-ante models. Another distinction in the leverage ratio is Knightian¹⁶ as it does not attempt to predict the loss probability, but rather the potential loss magnitude during an extreme event that is unexpected and, therefore, not measurable. For example, a leverage ratio may inform you that your current exposure is 6.5 times your present market value. Alternatively, ex-ante risk metrics attempt to describe an account's expected loss within a given probability range—there is a 95% probability of losing less than 10% within a given year.

¹³ "A Critique of the Sharpe Ratio," by David Harding, Winton Capital Management.

¹⁴ "The Impact of Leverage on Hedge Fund Risk and Return," by Thomas Schneeweis, George Martin, Hossein Kazemi and Vassilis Karavas, Center for International Securities & Derivatives Markets, 2004, Page 18.

¹⁵ Testimony of Richard Bookstaber Submitted to the U. S. House of Representatives, Committee on Science and Technology Subcommittee on Investigations and Oversight For the Hearing: "The Risks of Financial Modeling: VaR and the Economic Meltdown," September 10, 2009.

¹⁶ Frank H. Knight, *Risk, Uncertainty, and Profit* (Boston: Houghton and Mifflin, 1921).

Leverage Methods

Leverage is defined within this paper as the creation of exposure to losses greater in magnitude than the capital invested. Portfolio leverage can be created through the use of borrowing, through investing the proceeds from short sales, or through the use of derivative instruments.¹⁷ Leverage can also be gained by investing in securities with embedded leverage, such as CDOs, and in delayed delivery transactions, such as mortgage backed TBA securities.

Borrowing

Borrowing maybe the easiest leverage method to understand. By putting \$30,000 down on a \$300,000 home, a buyer is leveraged 10:1. If the home price increases 20%, the total value of the home increases to \$360,000. Leverage applied to the 20% gain has netted the investor a 200% profit. Similarly, a downward move would have the opposite effect. A 20% decrease in home value would erase the initial \$30,000 investment and the investor would owe the lender an additional \$30,000. Thus the homeowner would have turned a \$30,000 asset into a \$30,000 liability.

The leverage ratio described in this paper is a simple exposure by capital ratio.

$$\text{Leverage Ratio} = \frac{\text{Total Exposure}}{\text{Capital}}$$

The capital variable does not include borrowed funds. Consider a portfolio where \$100 of capital is invested in a portfolio that has achieved \$200 of exposure. This portfolio has a leverage ratio of 2.

Capital - \$100

Total Exposure - \$200

Leverage Ratio = \$200/\$100 = 2

Now consider that same portfolio that was constructed by borrowing 80% of the invested capital.

Non Borrowed Capital - \$20

Borrowed Capital - \$80

Total Exposure - \$200

By considering the borrowed funds, the ratio jumps to \$200/\$20 or 10.

¹⁷ "The Impact of Leverage on Hedge Fund Risk and Return," by Thomas Schneeweis, George Martin, Hossein Kazemi and Vassilis Karavas, Center for International Securities & Derivatives Markets, 2004, Pages 5-6.

Derivative Instruments

Capturing leverage achieved through derivative instruments is by far the most challenging aspect of analyzing leverage due to the variety and customization of instruments available. Although many derivative instruments are used to lever an account, this paper will focus on fixed-income futures, credit default swaps, interest rate swaps and total return swaps.

Future Contracts: A futures contract is a financial obligation to buy or sell an agreed-upon asset at a predetermined price and date. Once the asset owner has entered into a futures contract, he or she is exposed to price movements of the underlying asset for the entire size of the contract. Futures contracts should be considered a leveraged position unless the asset owner has set aside low volatile assets to complete the purchase.

Credit Default Swaps (CDS): Credit Default Swaps (CDS) are the most widely traded credit derivative product. They can either increase credit exposure through leverage, or decrease credit exposure by transferring the risk of default to another party. An asset owner can enter into a CDS as a purchaser or seller of credit protection. In its simplest form, a buyer of credit protection pays a coupon either to negate the credit risk of another position defaulting or to express a negative view of a position in hopes of benefiting from its default. A buyer of a CDS is essentially hedging their exposure to the credit risk of a particular bond by paying a premium to another party who will pay the buyer in the event that the issuer defaults on that bond. The buying of CDS protection will hedge an asset owner's credit exposure to a specified asset, but this protection is relevant only in the event of default. Because the buying of credit protection does not insulate the asset owner to other risks, including interest rate risk, the CDS's notional market value is ignored, so it does not decrease an account's total exposure within the capital leverage ratio. Figure 5 illustrates an example where credit default swap protection has reduced the portfolio's credit exposure, but has no impact on the capital leverage ratio.

Figure 5: Credit Protection Buyer

	Market Value (Capital)	Credit Exposure	Interest Rate Exposure	Total Exposure
Bond	1,000,000	1,000,000	1,000,000	1,000,000
Credit Default Swap (buying protection)	50,000	-1,000,000	0	50,000
Total	1,050,000	0	1,000,000	1,050,000
			Capital Leverage Ratio	1

The seller of the CDS is assuming the credit risk of the bond in exchange for the premium received. If the issuer of the bond defaults or if there is an occurrence of a specified credit event (e.g., bankruptcy or restructuring), the seller of the CDS will be responsible for paying the insured amount. Since there is little capital outlay required from the seller at the initiation of the swap, CDS can lever an account. To capture this leverage effect within the leverage ratio, the selling of credit protection increases an asset owner's total exposure by its notional and current market value. Figure 6 illustrates an example where an asset owner has levered an account by selling credit default protection.

Figure 6: Credit Protection Seller

	Market Value (Capital)	Credit Exposure	Interest Rate Exposure	Total Exposure
Bond	1,000,000	1,000,000	1,000,000	1,000,000
Credit Default Swap (selling protection)	50,000	1,000,000	0	1,050,000
Total	1,050,000	2,000,000	1,000,000	2,050,000
			Capital Leverage Ratio	1.95

Interest Rate Swaps (IRS): An interest rate swap (IRS) is a derivative instrument in which one party exchanges a defined stream of interest payments for an alternative interest stream. Interest rate swaps can be used to hedge an investment against interest rate movements. Typically, to hedge against interest rate movements, an asset owner will swap a fixed for a floating rate that is tied to a standard benchmark such as LIBOR. Interest rate swaps can also be used as a vehicle to exploit perceived opportunities in future interest rate movements. Interest rate swap contracts have predefined terms and conditions that outline each party's interest rate obligations on a notional market value. For example, an asset owner may enter into an IRS, paying a fixed rate of 5%, and receiving a floating rate of LIBOR plus 1.5% on a notional market value amount of 1 million euros. The leverage ratio will consider the full notional and market value as the instrument's total exposure when the investor increases his or her interest rate risk by swapping a floating rate for a fixed rate. Figure 7 illustrates an interest rate speculator leveraging an account by entering into a float for fixed IRS.

Figure 7: Interest Rate Speculator

	Market Value (Capital)	Credit Exposure	Interest Rate Exposure	Total Exposure
Bond	1,000,000	1,000,000	1,000,000	1,000,000
Interest Rate Swap (float for fixed)	50,000	0	1,000,000	1,050,000
Total	1,050,000	1,000,000	2,000,000	2,050,000
			Capital Leverage Ratio	1.95

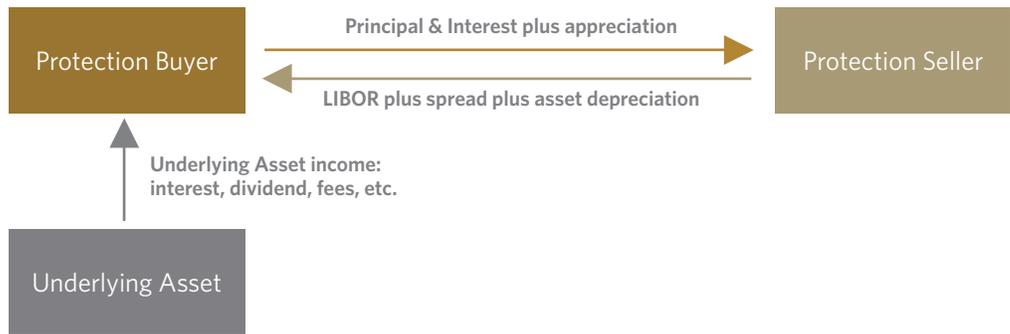
Alternatively, as illustrated in Figure 8, only the current market value will be considered when the asset manager decreases his or her interest rate risk by swapping a fixed for float rate.

Figure 8: Interest Rate Hedge

	Market Value (Capital)	Credit Exposure	Interest Rate Exposure	Total Exposure
Bond	1,000,000	1,000,000	1,000,000	1,000,000
Interest Rate Swap (fixed for float)	50,000	0	-1,000,000	50,000
Total	1,050,000	1,000,000	0	1,050,000
			Capital Leverage Ratio	1

Total Return Swaps (TRS): A total return swap (TRS) is a financial contract that transfers the total economic risk of owning an underlying asset from the asset owner (protection buyer) to a protection seller. A TRS is often used to insulate an investor from a single asset, basket of assets, or market index that cannot be sold for practical or business reasons. Figure 9 illustrates an example where a protection buyer pays all asset income, including interest, dividends, fees, etc., plus any asset appreciation to the protection seller. In exchange, the protection seller pays LIBOR, plus a spread, as well any asset depreciation to the protection buyer. If the underlying asset defaults, the protection seller is required to pay the contract’s full notional market value to the protection buyer.

Figure 9



Since there is little capital outlay required from the protection seller at the initiation of the total return swap, TRS can lever an account. Many hedge funds and other strategies that deploy leverage use TRS because they require little, if any, initial capital outlay and give the investor instant exposure. The primary reason asset managers sell TRS protection is to take advantage of this highly customized leverage.¹⁸

¹⁸ "Introduction to Credit Derivatives Total Return Swaps -TRS," by Janet Tavakoli, Tavakoli Structured Finance, Inc.

As illustrated in the figure 10 example, the asset manager achieves customized leverage by selling TRS protection. This levered position is captured within the capital leverage ratio by considering the TRS's full notional and current market value as the instrument's total exposure.

Figure 10: Protection Seller

	Market Value (Capital)	Credit Exposure	Interest Rate Exposure	Total Exposure
Bond	1,000,000	1,000,000	1,000,000	1,000,000
TRS (selling protection)	50,000	1,000,000	1,000,000	1,050,000
Total	1,050,000	2,000,000	2,000,000	2,050,000
			Capital Leverage Ratio	1.95

Unlike IRS, that only decrease an asset owner's interest rate exposure, and CDS, that only decrease an asset owner's credit risk exposure, the buying of TRS protections reduces the asset owners total exposure. To capture this total exposure reduction, as illustrated in Figure 11, the notional market value is subtracted from the current market value to calculate the instrument's total exposure within the leverage ratio.

Figure 11: Protection Buyer

	Market Value (Capital)	Credit Exposure	Interest Rate Exposure	Total Exposure
Bond	1,000,000	1,000,000	1,000,000	1,000,000
TRS (buying protection)	50,000	-1,000,000	-1,000,000	-950,000
Total	1,050,000	0	0	50,000
			Capital Leverage Ratio	0.05

Delayed Delivery Transactions

Mortgage Backed TBAs: Delayed delivery transactions, including mortgage backed TBA instruments, are forward contracts to deliver an asset, or basket of assets, at a specified price with delivery and payment due at a future date. During the period between the purchase and settlement date, the investor is fully exposed to the price movements of the underlying assets but has yet to make payments to fulfill that contract. Within the leverage ratio, the mortgage backed TBA's market value is to be included in the total exposure variable upon agreement to enter into the contract. TBA securities will lever a portfolio if the low volatile assets are not available to fulfill these delayed delivery transactions.

Repurchase Agreement (REPO): Repurchase agreements are the simultaneous sale and commitment to repurchase financial securities at specified prices and future dates. The borrower will receive the security, often to meet contractual obligations, for a set period of time in exchange for a cash loan. Although the repo lender doesn't legally own the underlying security, he or she does have a commitment to repurchase at a set price and time, and is exposed to value changes in the instrument. The repo lender may have the opportunity to use the cash payment to fund additional long positions that may, in turn, be used to raise additional cash via another repo transaction. The supplementary cash may be used to purchase additional long positions. Each iteration amplifies the portfolio's exposure and leverage.¹⁹ Within the leverage ratio, the lender is exposed to the repo security and any additional assets purchased with the cash loan. Many repo market participants regard repo markets as a lowest-cost source of leverage.²⁰ The repo borrower is not exposed to price movements of the security and thus should not be included as exposure within the leverage ratio.

Short Positions

Shorting should be considered leverage as it requires the investor to borrow the asset. The leverage ratio's total exposure methodology combines the absolute value of the positive and negative exposures into a single ratio. For example, if an asset manager takes a \$1 million short position on a Ford Motors bond and a \$1 million long position on a GM bond, the total exposure measure will total the absolute exposure in each position resulting in an exposure of \$2 million. The account's performance will be driven by the perceived value on each of these investments. Although the leverage ratio captures the possibility that the asset manager may have been wrong on both positions, it also tends to overestimate risk when an asset manager has effectively hedged a position. For example, if an asset manager finds an arbitrage opportunity and takes a long position and an equal but opposite short position, the leverage ratio will be the total of both exposures.

¹⁹ Bottazzi, J.M., Luque, J. and M. Páscua, "Will you lend me to short? The role of the box in leverage and repo fails."

²⁰ "Implications of repo markets for central banks. Bank for International Settlements." Report of a Working Group established by the Committee on the Global Financial System of the central banks of the Group of Ten countries. Basle, March 9, 1999.

Net Leverage Ratio

Providing another perspective is a net leverage ratio. This measure nets positive and negative exposures and may be an appropriate alternative when accessing an asset manager that takes advantage of arbitrage situations by taking opposite positions that the asset owner feels are cancelling each other out from a risk perspective.²¹ The netting will simply subtract the positive exposures from the negative exposures. For example, if an asset manager shorts an equity security for \$1,000 and purchases a \$1,000 corporate bond, the positions would result in zero exposure. Figure 12 illustrates the treatment of derivatives within the net capital leverage ratio and contrasts that treatment with the standard leverage ratio.

$$\text{Net Leverage Ratio} = \frac{\text{Difference of Absolute Exposure}}{\text{Total Capital}}$$

Figure 12: Net and Gross Leverage

Strategy	Net Leverage Ratio	Leverage Ratio
\$1 million fixed for float IRS \$1 million bond \$1 million capital	0.00	1.00
\$1 million float for fixed IRS \$1 million bond \$1 million capital	2.00	2.00
\$1 million fixed for float IRS \$1 million float for fixed IRS \$1 million capital	0.00	1.00
\$1 million CDS buying protection \$1 million bond \$1 million capital	0.00	1.00
\$1 million CDS selling protection \$1 million bond \$1 million capital	2.00	2.00
\$1 million TRS buying protection \$1 million bond \$1 million capital	0.00	0.00
\$1 million TRS selling protection \$1 million bond \$1 million capital	2.00	2.00
\$1 million dollars U.S. Federal Bonds \$1 million short future position in U.S. Federal Bonds \$1 million capital	0.00	2.00

²¹ "The Impact of Leverage on Hedge Fund Risk and Return," by Thomas Schneeweis, George Martin, Hossein Kazemi and Vassilis Karavas, Center for International Securities & Derivatives Markets, 2004, Page 6.

Conclusion

As the number of financial instruments and strategies continue to expand, and as the complex models used to construct and review accounts are based upon many of the same philosophies, investors should consider a simple methodology for constructing a leverage ratio that can be used to complement some of the traditional risk measures in evaluating the investment process. The leverage ratio simply compares an account's market exposure to its invested capital. Unless this ratio is measured and understood, you cannot effectively manage risk. Unlike other risk metrics, it's not designed to predict future risk based upon an account's fundamental makeup including asset correlations, diversification and hedging effects.

The different perspective given by the leverage ratio may be most useful during tail events when complex financial models tend to fail and hedging and diversification safeguards do not work as intended or expected. The leverage ratio may pro-actively inform investors of their maximum risk during systematic failures, and could help facilitate necessary limits and controls based on the investment objective. The methodology presented here will require constant refining to properly capture the ever changing approaches to increasing an account's exposure, investing power and, ultimately, risk.

About BNY Mellon Asset Servicing

BNY Mellon Asset Servicing offers clients worldwide a broad spectrum of specialized asset servicing capabilities, including custody and fund services, securities lending, performance and analytics, and execution services. BNY Mellon Asset Servicing provides services through BNY Mellon and other related companies.

About BNY Mellon

BNY Mellon is a global financial services company focused on helping clients manage and service their financial assets, operating in 36 countries and serving more than 100 markets. BNY Mellon is a leading provider of financial services for institutions, corporations and high-net-worth individuals, providing superior asset management and wealth management, asset servicing, issuer services, clearing services and treasury services through a worldwide client-focused team. It has \$24.4 trillion in assets under custody and administration and \$1.14 trillion in assets under management, services \$12.0 trillion in outstanding debt and processes global payments averaging \$1.6 trillion per day. BNY Mellon is the corporate brand of The Bank of New York Mellon Corporation. Additional information is available at www.bnymellon.com.

About Pershing Prime Services

Pershing Prime Services delivers an unconflicted, comprehensive suite of global prime brokerage solutions, including extensive access to securities lending, dedicated client service, robust technology and reporting tools, worldwide execution and order management capabilities, a broad array of cash management products and the integrated platform of BNY Mellon. Pershing Prime Services is a service of Pershing LLC . Pershing Prime Services (866) 538-5046



BNY MELLON
ASSET SERVICING

Pershing®
Prime Services
A BNY MELLON SERVICE

© 2010 The Bank of New York Mellon Corporation.

All rights reserved.

The Bank of New York Mellon - Incorporated with limited liability in the State of New York, USA. Head Office: One Wall Street New York, NY 10286, USA. London Branch registered in England & Wales with FC No 005522 and BR No 000818: Registered Office at One Canada Square, London E14 5AL, authorised and regulated in the UK by the Financial Services Authority.

This report, which may be considered advertising, is provided with the understanding that it is for informational purposes only and does not constitute the rendering of legal, tax, accounting or other professional advice by Finadium LLC, The Bank of New York Mellon or any of their affiliates. Finadium LLC and The Bank of New York Mellon do not guarantee the accuracy of any information contained herein and cannot be held liable for any errors in or reliance upon this information.

Pershing Prime Services is a service of Pershing LLC, member FINRA, NYSE, SIPC. Pershing is a subsidiary of The Bank of New York Mellon Corporation. Trademark(s) belong to their respective owners. For professional use only. Not for distribution to the public.