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TRUSTEE SERIES

PAPER 3: Made to Measure

Understanding the use of leverage in alternative investment funds

Contents

Foreword

Welcome to 'Made to Measure', the third paper in a series by AIMA and the CAIA Association for retirement fund trustees and other fiduciaries.

In the first paper in the series, 'The Way Ahead'[1], we set out hedge funds' core value proposition and discussed some of the issues that institutional investors should consider when selecting a fund manager and conducting due diligence, such as redemption restrictions, reputational risk and fees.

In 'Portfolio Transformers'[2], we considered the risk and return characteristics of different types of funds and showed how they tend to fall into one of two categories – as substitutes for traditional assets or as diversifiers.

In this, our third paper, we have put leverage under the spotlight. As the title of this paper alludes to, alternative investment fund managers are striving to customise risk/return profiles for their investors, and like a tailor uses a pair of scissors, leverage is one of the tools that a fund managers uses.

For investors, understanding leverage and why it is used has become an essential part of their manager selection and due diligence. We recognise that some investors may be reluctant to allocate to managers that use leverage. But such fears can sometimes be misguided.

Leverage and risk are not two sides of the same coin. Increasing the leverage ratio of a fund might add to the risk being taken on. But in certain circumstances – and however counterintuitive this may seem – it reduces the level of risk. As data in this paper shows, investor drawdowns (losses) do not necessarily increase when fund leverage ratios increase. The same goes for performance – returns do not necessarily improve just because leverage levels rise.

We hope you find the paper useful, and as always we welcome your feedback.

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William Kelly, CEO, CAIA Association

[1] www.aima.org/en/document-summary/index.cfm/docid/F4D1F5DA-B20A-4052-80D8CC894090C9A1

[2] www.aima.org/en/document-summary/index.cfm/docid/7F64B351-BF93-4E03-80ACA06A53403BCC

Executive Summary

- Contrary to popular opinion, the use of leverage is not just reserved for high finance but is ubiquitous and integral to simple everyday transactions like buying a house or a car.
- Leverage is simply a tool used – a means to an end, and just like any tool, if used carefully, it can allow for greater power and precision, but placed in the wrong hands, and if not managed properly, it can be dangerous.
- Leverage is an essential part of an investor's toolbox used by asset managers and all types of investors to help enhance the return potential of their investments and improve on asset allocation decisions to benefit portfolio diversification.
- Incorporating leverage into an investor's portfolio can help to minimise or control its risk.
- In much the same way as a buyer of a house, a stock investor or a financial institution would use leverage, hedge funds would also deploy leverage across the various instruments that they trade.
- Depending on market conditions at any particular time and on the type of hedge fund strategy being pursued, the amount of leverage that a hedge fund may use can vary. Most hedge funds use a modest amount of leverage with average levels of hedge funds utilising no more than two times its assets, typically less than the average levels of leverage used when financing a house through a home loan.
- Higher leverage levels do not always imply a higher risk, as it must be understood in the context of other features of an investment strategy, such as whether leverage is used to offset certain risks in a portfolio.
- No consensus has been reached as to what measure, if any, is the most appropriate to calculate leverage. Consequently, depending on what measure is used, the estimate of leverage being calculated can vary significantly.
- Understanding how underlying managers negotiate margin positions, put on repurchase agreements, creditor agreements, borrowing lines, haircuts, and the size of derivative strategies is of paramount importance to hedge fund investors, as it has a dramatic impact on the leverage of a hedge fund and the risks other than market risks in the portfolio.

Introduction

Archimedes recognised the power of leverage. The Greek mathematician described how a simple block-and-tackle pulley system could become a powerful instrument capable of moving great weights without the application of a great force.

"Give me a lever long enough and a fulcrum on which to place it, and I shall move the world"

Subsequently, to lever is a term that is commonly used to describe a mechanism capable of generating an amplification of power and performance.

The term leverage, when used in reference to hedge funds, sometimes denotes a negative reaction, driven by several high profile cases of unintended outcomes from using significant amounts of leverage without appropriate risk management frameworks. Such cases are, however, outliers in an industry that has successfully served its investors over several decades.

This paper will provide an overview of the basic uses of leverage emphasising its importance as a legitimate, if not an essential tool for asset managers and all types of investors to help achieve their return goals, improve asset allocation, as well as to offset, not add to risk. We explain how hedge funds obtain leverage and address any considerations that trustees might have. In addition, we examine the use of leverage across the wide variety of hedge fund strategies that investors can allocate to, and point out that as a measure, the average hedge fund deploys a lower leverage level than what most individuals would use when taking out a home loan.

1 Understanding the basics of leverage

As in mechanical systems, the use of leverage in financial instruments can greatly amplify performance. Nearly every corporation and every homeowner uses leverage in some form whether it is through taking out a bank loan or a home loan. Hedge funds also use leverage.

It is simply a tool used – a means to an end; and just like any tool, if used carefully, it can allow for greater power and precision, but placed in the wrong hands, and if not managed properly, it can be dangerous.

The most basic objective of leverage is to do more with less. In relation to its use across investments, leverage is often incorporated as part of an investment strategy in which borrowed money is used to adjust risk exposures with the intention of multiplying gains and/or limiting losses of an investment. Leverage can be gained by borrowing money or securities directly from counterparties (also known as financial leverage) or indirectly through the use of derivative instruments such as options, futures or swaps (also collectively known as synthetic leverage).

Before going into the greater detail as to how leverage works in an investment portfolio, and how this relates to the use of leverage by hedge funds, it is useful to frame the discussion in a broader context:

Buying a house with a home loan creates leverage

In making the concept of leverage personal, a simple and everyday transaction involving the purchase of a house is helpful to set some foundational concepts that can be applied to hedge funds. When an individual decides to purchase a house, he/she typically does not have the cash needed to purchase it outright and is required to take out a loan (home loan) to finance the purchase.

Example A – Financing the purchase of a house with a home loan

In order to purchase a home valued at $250k, the purchaser makes a $50k down-payment (or the equivalent of a 20% deposit on the purchase price). The remaining $200k needed to make up the purchase price is raised via a home loan. Repayment of this home loan will be paid back to the lender over a long period (typically the term of the loan is 15–30 years) for which the lender will charge a rate of interest for that term (e.g. 5% p.a.) reflecting the credit-worthiness of the purchaser (borrower) among other factors.

As a measure of the purchaser's 20% deposit they are using the $50k to buy an asset valued at $250k, or to put another way, the borrower is leveraging her equity five times i.e. $250k/$50k. It is not unusual for deposit amounts equivalent to 5% of the purchase price being permitted by banks as an initial home deposit[3], meaning that the leverage levels used when purchasing a house can be as high as twenty times in size (i.e. in this example, $250k of assets/ $12.5k in equity). In this transaction, the house serves as collateral on the loan.

Following the purchase of the house, if it increases in value, gains accrue to the purchaser (house owner) after repayment of the loan amount, e.g. if the house is sold for $300k, $200k of the proceeds would be used to pay down the home loan and the seller would be left with $100k (or a 100% gain on her $50k investment) less any frictional costs and unpaid interest. As the investment is levered 5 times, for a 20% increase (from $250k to $300k) in the price of the house, the return to the seller is 100% (i.e. 5 times 20) of their initial investment before any frictional costs.

Let's assume for simplicity, after drawing down the loan, the value of the home immediately falls to $200k and the borrower has to sell. The purchaser of the house would then have to pay back the full loan amount of $200k back to the bank as well as other additional costs incurred realising a 100% loss of her equity, or put another way, she is left with nothing.

As long as the value of the house remains at least $200k, and the bank is able to liquidate the property at this price in the market in the case of a default, it has very little or no risk of losing out. In the event, the borrower defaults on the loan, the bank can repossess the house and sell it to pay off the home loan. The use of collateral in this example (where the borrower draws down a loan) is applicable to an investor borrowing from a prime broker (broker/dealer) which is discussed later in this paper.

[3] Examples of this can still be found across the UK.

Buying on margin creates leverage

Often available to and used by retail investors, buying a security on margin is an example of deploying leverage to maximise your gains as long as prices increase in value. In this instance, the asset manager borrows money and buys securities much the same way as our home buyer in the example above. The purchased securities then serve as collateral towards the loan. In addition to having the securities pledged as collateral in case the investor is unable to repay the loan, the borrowing institution will also often ask for an initial deposit payment to be provided which will serve as a security buffer for the transaction.

Example B: Buying on margin

Let's suppose that you think the stock of company ABC – which is currently trading at $40 per share will increase in value. You would like to buy 100 shares of the ABC stock, but only have $2,000. One way to do this is to borrow the outstanding $2,000 needed to purchase the 100 shares of stock. If as you anticipate ABC stock increases in value to $50 per share, your investment is now worth $5,000 but you have an outstanding margin loan of $2,000. If you sell the investment, the total proceeds will pay off the loan and leave you with $3,000.

As your initial investment was $2,000, you have made a profit of 50%, because your principal amount generated a profit of $1,000 (i.e. half your principal amount). However if you paid the entire $4,000 up front, without having taken out the margin loan, your $4,000 investment would have yielded a profit of 25%. The use of leverage in this case would have doubled the return on your investment.

The downside to borrowing on margin is that if the stock price decreases, substantial losses can mount quickly. So in the same example, if the stock you bought falls to $20 and you had fully paid for the stock, you'll lose 50% of your money. But if you bought on margin, you'll lose 100% of your investment and still need to come up with the interest you owe on the loan.

Short selling creates leverage

Short selling is one of the most common techniques used by hedge funds to increase their return potential and control or minimise its risk.

Imagine an investor has purchased a portfolio of shares (i.e. has taken a long investment position). Fearing that the portfolio may fall in value, (which may or may not be temporary), to protect her investments, the manager has two choices - either reduce the long position by selling the shares she owns or keep the long position but simultaneously enter into a "short" position which will act like an insurance cover, offsetting some or all of the risk of the long position.

Where she chooses the latter option, the manager can "go short" by borrowing a basket of securities from a bank and selling them immediately with the intention of purchasing them at a later date if the price of the securities have decreased. If/when the shares fall in value, she can buy back the securities at a lower price and return them to the bank. The result of this is that the manager will have generated a profit on this trade that will offset the losses on the long side of the portfolio (if any).

Example C: Short Selling

Taking the example above; suppose company ABC is now currently trading at $20 per share. Believing that the value of ABC will fall, you decide to short-sell 1,000 shares of ABC for a total of $20,000. Shortly afterwards, disappointing half-year profits cause the share price of ABC to fall to $19.50.

Following the decline in value of the share price of ABC to $19.50, you can now buy 1,000 shares of the company for $19,500, and return the shares to the lender who accepts the returns of the same number of shares they lent, irrespective of the fact that the market value of the shares has decreased.

In doing so, you retain the $500 difference (not including any borrowing fees/commission incurred in the transaction) between the price that the original investment of ABC was sold at (i.e. $20) and the lower price that you bought them back at (i.e. $19.50). To put another way, you have benefited by $500 as your belief that the share price of ABC was likely to fall below $20 proved correct.

Shorting also has the effect of creating leverage. The leverage or amplification of the stock's returns occur because the stocks sold have been initially borrowed. The borrowing of the stock and subsequent sale will result in the increase in the size of the fund relative to its capital. In a wider context, where an

investor would hold both long and short positions in their portfolio, and where they take a short position, it can act as a hedge for any downside to specific long positions in the portfolio. The increased leverage via a short sale is designed to lead to a reduction in risk and volatility of the stock portfolio.

It is important to note that short selling can amplify your gains and your losses. In order for a short selling strategy to be successful, the security that you shorted must fall in value. If the position works against you, your losses are potentially unlimited.

The ability to short publicly-traded securities is one of the key distinctions that exist between hedge funds and traditional asset managers.

The process of borrowing securities is coordinated through a prime broker who has the ability to close out the fund's short sales at any time, either through the inability to continue to borrow the stock or due to fund losses that reduce the capital available to guarantee the purchase of the short position as the underlying security rises in value. Further explanation on the role of the prime broker and how it facilitates credit to investors can be found in section 3 of this paper.

Using derivatives creates leverage

There are a vast number of derivatives in use today. A derivative is a contract between two parties which derives its value from the value of an underlying asset, rate or a variable. Common derivatives underlying will include securities (shares and bonds), commodities, and various rates and variables such as interest rates, foreign exchange rates or measures of volatility, weather or freight activity.

As such, derivatives are extremely versatile instruments that allow asset managers to gain economic exposure to various risks without necessarily obtaining control or ownership of the underlying assets.

Most derivatives will require small or no upfront payment associated with such exposure and this is why they create leverage – a small investment could result in a large and volatile exposure to an asset, rate or economic variable because the contract's value may fluctuate more than the change in value of the underlying asset or variable.

Some derivatives, such as options and futures are very simple, liquid, are traded on exchanges and have very competitive and transparent prices. Other derivatives such as forwards[4], swaps and bespoke contracts are traded on a bilateral basis with banks (so called over-the-counter or OTC trading) acting as counterparties. Many OTC-traded derivatives such as interest rate and credit default swaps are also standardised, liquid and cleared in clearing houses. Others are bespoke and tailored to the needs of individual counterparties. The majority of derivatives can be decomposed into a series of or a combination of options and forward contracts. For example, a swap, which is a contract for the exchange of a number of payment flows between two counterparties over a period of time can be seen as a series of forward contracts.

As with borrowing, derivatives can be used to obtain a long and short exposure to a particular underlying.

Derivatives, therefore, serve an extremely important role in allowing managers to carefully tailor their investment strategy while controlling for downside risk.

[4] Forward contracts, like futures, are also part of the wider derivative family. Both are governed by a set of contracts which are very similar in nature, but with a few critical differences. Futures contracts are highly standardised whereas the terms of a forward contract tends to be privately negotiated. Forwards tend to be traded over-the-counter, whereas futures are exchange traded.

(i) Use of options

Example D: Using a call option to get leveraged exposure to a stock

Recalling example B, instead of buying the stock in ABC outright or buying on margin, you could buy one call option which gives you the right but not the obligation to purchase a security at a given price (i.e. *the strike price or exercise price for the option*) on or before a certain date in the future.

In this case, to buy the call option on ABC stock, you are required to pay a fraction of the stock price. Let's assume that ABC stock is trading at $40 and instead of buying 100 shares in ABC for $4,000, you instead buy a call option (which provides you with the right but not the obligation to buy 100 shares) by paying a price (i.e. premium for the option) of $2 per share (or $200 in total) that allows you to exercise the right to purchase the security once it gets to $50 (the exercise price).

After a month, the price of ABC stock has increased to $60, in this instance, given the price is in excess of the exercise price of $50 (that you are able to buy at), your net gain (after paying the cost of the option) is equal to $8 per share ($60-$50-$2) or to put another way, you would have made a 400% gain on your initial $2 per share investment.

In this case, when using a call option, you are putting leverage on your investment (which in this example based on a $2 outlay and with the stock trading at $40, and an exercise price at $50, is 20 times levered). *This is just another way of saying an investor would require 20 more times the amount of capital to control the share* which can result in you multiplying your gains or losses. This means that you could also lose your investment very quickly in case the price of the shares does not move above the strike price, in which case your option will expire worthless.

The argument for owning options (and any other form of derivative) also goes beyond simply having them generate a large potential return for a relatively small outlay. An investor that uses options will also do so to better manage the risk on its investment.

Similar to taking out an insurance policy when you insure your house, options can be used to insure your investments against a fall in price. One clear example of this is when an investor purchases put options on a stock to minimise the fall in downside risk. Suppose that an investor has a 100 shares in a company and the company's stock has increased in value from $20 to $40 per share over the past year, and is presently trading at $40. While the investor may still favour the stock, he can protect against the stock falling in value. Similar in some respects to short selling, the investor can buy a put option giving him the right to sell the stock at the exercise price before the expiry date of the option, or to put it another way, guarantee himself a minimum price for which he can sell the stock. Investors can use put options to protect their security and wider portfolio from extreme falls in value.

Example E: Using a Put option to protect against a fall in the price of stock

For example, ABC stock is trading at $40 per share. Fearing that the stock may fall below $40, the investor buys a three month put[5] option for $1 at an exercise price of $38. During the three month period, the stock falls to $30 per share. In this case, rather than losing $8 per share, the investor has the right to sell the stock at $38 per share. So in this case, you buy the share at $30 in the market and as you have a put option, you can then sell it at $38 per share, resulting in a profit of ($38-$30 -$1 =) $7 per share.

If the share price of ABC stock were to either increase or not change in value throughout the option period (i.e. from the time the investor bought the option to its expiry date, normally three months) then the investor will not exercise the option and the investor will have lost his premium payment. Buying a put instead of shorting a stock is advantageous for a similar reason to buying a call option rather than buying the stock outright. Because the most that you can lose when buying a put is the premium of the option, puts can be less risky than the use of physical short selling achieved via the borrowing of securities.

As we can see from above, the nature of option instruments implies the use of leverage. Buying and selling call and put options can create leverage. Buying these instruments requires a fixed payment (usually a small amount for the

[5] A put option is an option giving the owner the right but not the obligation to sell a specified amount of an underlying security at a specified price within a specified time. For the purposes of this example, we are assuming that the investor has bought an American put option, which gives the investor the right to execute the option at any period from buying the option to the expiry date of the option.

option), which in effect enables the purchaser to control a far greater size of the investment. There is significant leverage in owning options, a small or modest investment can reap significant gains if you're right. Due to the extreme sensitivity of the value of options to the movements of underlying asset prices and their time-limited nature, most options expire worthless and the investor loses the premium paid. However, just like in insurance, the fact that an adverse effect has not materialised, does not mean that the premium paid for an insurance contract is not economically useful.

(ii) Using futures

Similar to an option, a futures contract is an agreement to buy or sell a specified amount of a product or financial instrument at an agreed upon price on or before a given date in the future. It differs from options in that the two parties are obliged to buy/sell the underlying commodity whereas the option merely bestows a right to buy/sell a particular underlying.

Example F: Using a futures contract

Let's assume that the current price of oil is trading at $50 per barrel, and your research tells you that the price of oil will fall to $40 within the next six months. The futures market is pricing oil for delivery in 6 months at $60 per barrel, so you sell a futures contract which promises to deliver 1,000 barrels of oil after 6 months at a future price of $60 per barrel.

To enter this contract, you need to make a small deposit payment (known as the initial margin), and let's say this is equivalent to 5% of the value of the 1,000 barrels of oil, so you pay $3,000 (or the equivalent of $3 per barrel of oil). In this case, an initial margin equivalent to 5% implied a leverage of 20 times the value of the commodity.

If your research proves correct and oil falls to $40, the short position has earned $20,000 (i.e. $60,000-$40,000). Recall, that you deposited $3,000 with the clearing house (the margin payment), and so the profit on this trade is 667%.

When trading a futures contract, you are only required to make a small down payment to have control over a large amount of a security or commodity. The utility of a futures contract can be best described with an example. In this example, similar to example E above, the investor is using a future to hedge against his oil position declining in value beyond a certain price.

Futures positions tend to be highly levered because the initial margins that are set by the future exchanges are relatively small compared to the cash value of the contracts in question, with the initial margins being typically within a range of 5%-25% of the notional value of the contract. Because of this leverage, small changes in price can result in large gains and losses in a short period of time.

Futures are riskier than options, as with the latter, the worst case scenario in the event that you bought a call option is to lose your premium paid while an investor in a futures contract would stand to lose significantly more than their initial margin deposit. Returning to this example, if we assume that the price of oil went to $65 (i.e. the price of oil increased rather than decreased) your short position has now lost $5,000 (on your futures position of $60), and, effectively you have experienced a loss on this trade of 167% (i.e. $5,000/$3,000).

(iii) Using embedded leverage

Another means for an investor to borrow or obtain leverage is through holding an embedded position in a security where the exposure of the desired position is larger than cost of obtaining the instrument which embeds leverage.

Similar to the mechanics of derivatives leverage which we describe above,

an investor can gain substantial market exposure without using outright leverage by deploying structured credit products, (i.e. using CDOs[6], CLOs[7], financial notes/certificates) or levering Exchange Traded Fund[8] products or other securities that embed leverage.

Most structured products have high levels of embedded leverage, resulting in an overall exposure to a loss or gain that is a multiple of a direct investment in the underlying portfolio. Banks create structured notes by packaging debt with derivatives to offer customised trading solutions to investors (both retail and others) while earning fees and raising money.

Over the course of the past ten years, we have seen the growth of levered ETFs, which are individual securities that

[6] Collateralised Debt Obligation: A financial tool that banks use to repackage loans into products sold on the secondary market. These packages consist of home loans, auto-loans and credit card loans.

[7] Collateralised Loan Obligation: A type of debt security encompassing senior secured loans covering a wide range of issues and industries.

[8] Investment fund traded on exchange that tracks an index, a commodity, bonds or a basket of assets like an index fund.

trade on an exchange and can be bought and sold in intra-day trading. They differ from a traditional ETF (security that can track an equity, bond or commodity index) as they deploy financial derivatives and debt to amplify the returns of an index, which will cause their prices to rise or fall exponentially more than the underlying benchmark being traded.

For example, an ETF that is double levered against the S&P500 would rise and fall twice as much in price as the index itself. If the index rises 2% in 1 day, then this fund would rise 4% in value. These funds can be leveraged at different rates, with some moving twice as much as the underlying market or index and others rising or falling three or more times as much as the benchmark. You can also buy a levered ETF that moves inversely to their benchmark, where the fund will fall in price by a given multiple of the benchmark price increases and vice versa.

Unlike when taking out an option or future, a levered ETF offers investors a pre-packaged form of leverage which forgoes the necessary requirements that come with investing in a derivative. Investors who use these instruments will face the same disadvantage as investors who purchase securities on margin or use any other form of borrowing to finance their investments.

The growth in structured products alongside embedded leverage has made the use of traditional balance sheet leverage as a measure of risk for the same less meaningful.

The table below illustrates the most popular list of exchange traded derivatives and over-the-counter traded derivative instruments. Further mention of some of these can be found in section 3 of this paper.

Table 1: Examples of derivatives

Exchange-Traded Derivatives	Standardised OTC	Bespoke OTC
Futures	Swaps (Equity, IRS, CDS)	Total Return Swaps
Exchange-Traded Options	Forward Rate Agreements	Structured Products
Levered ETFs	Swaptions	Certificates/Notes
	Commodity Derivatives	
	Contracts for Difference (CFD)	

Source: AIMA Research

Using a repo generates leverage

A repurchase agreement (or as it is more commonly called in finance parlance – a repo) is just another form of borrowing either cash or securities (in particular fixed income securities) whereby one party agrees to sell securities to another party at a specified price with a commitment to buying back the securities at a specified price at a later date. Through using a repo, investors have an additional method of borrowing to finance their investments.

Example G: Using a repo to borrow additional capital for the short-term

Assume a fund in need of additional capital over the short term borrows $1 million by posting $1.1 million in securities as collateral. This loan is made at a 3% interest rate with a 90% loan-to-value (or a 10% haircut). As the fund pays a 10% haircut only to get access to the full $1 million in additional capital, this is the equivalent of being 10 times levered. The fund then agrees to "sell" back the collateral to the bank for the $1 million in proceeds and agrees to "repurchase" the collateral for $1 million plus interest at the end of the term of the agreement.

Most other repo agreements ask the borrower to put up significantly less margin than in this example, resulting in even higher levels of leverage being the norm.

2 The effects of leverage on a fund

Leverage is frequently used by both public and private companies of all sizes, various governmental entities ranging from sovereign states to municipalities as well as a variety of other investor types. In a corporate context, companies raise debt through a variety of channels to fund their working capital requirements, growth initiatives or expansion plans. Most governmental agencies around the world issue debt[9] to fund operations, build infrastructure, and provide various public services.

In an investment context, portfolio managers borrow money or assets or enter into derivatives transactions to create a unique set of risk exposures with a goal to generate higher expected returns while controlling for risk.

The following two examples demonstrate how a hedge fund manager could be constrained when making an investment unless it can use leverage.

(i) Fund manager that does not deploy leverage

A manager believes a technology stock is overvalued relative to its peer group. At the same time, she believes that a pharmaceutical stock is undervalued in comparison to its peers. The manager is agnostic regarding the direction of the technology and pharmaceutical sectors. Without being able to deploy leverage, the best the manager can do to position herself to maximise her trading conviction is to underweight the technology stock relative to its peers in the sector within the index and overweight the pharmaceutical stock relative to its peers in the sector within the index.

(ii) Fund manager that uses leverage

In comparison, a manager that is able to deploy leverage can fine tune its investment strategy. Believing the technology stock to be overvalued, the manager can short the stock and buy a basket of long positions (comprising its peers) and can go long the cheap pharmaceutical stock and short a basket of its peers. This benefits the manager in two ways:

i. it allows the manager to further hone her investment thesis (isolate stocks that are mispriced relative to their industry peers) and focus the investment on a specific area of interest, which increases its expected return; and

ii. it reduces the portfolio's exposure to the sector specific risk.

Leverage is, therefore, often used by hedge funds to take particular kinds of risk while simultaneously reducing unwanted (i.e. sector) risk by taking offsetting positions within the investment portfolio. By going long certain securities and entering short positions in others, hedge fund managers seek to generate a return from both an increase and a decrease in securities prices, and in doing so can also reduce or neutralise the impact of market fluctuations (or risk) on the overall portfolio.

Many hedge funds adhere to a bottom-up fundamental approach to investing in securities (i.e. researching individual securities or trade structures) that focus on exploiting pricing discrepancies of specific securities (referred to as idiosyncratic risk) which attempts to mitigate market risk (i.e. the risk of losses in positions arising from movements in market prices). With less market risk, a fund is expected to enhance its return per unit of risk. By prudently adding leverage (increasing the financial exposure) to this portfolio it can generate a higher return without increasing its market risk.

Tailor your investment to better fit your needs

One analogy that we like to use when explaining how leverage can be used to amplify the long exposure of a security or to increase the exposure taken when a shorting position is employed is to compare its deployment as to how a tailor would work with clothing.

A tailor, by definition, customises or alters clothing to adapt it for a particular person's requirements, and in making these alterations, the fit of clothing is more precise for the individual's comfort and needs. Similarly, a hedge fund manager or an investor that allocates to hedge funds can 'stretch' their investment (long exposure taken in a particular risk bucket) where they have a belief that the security is likely to increase in value or where they are comfortable with the level of risk and returns on offer from holding that position and 'cut back' on the risk where they believe it to be less desirable to hold. By stretching and cutting back on a particular investment position, they will have reached the optimum fit for the risk that they are prepared to take.

Risk Parity

Extending this analogy further, using Risk Parity allows the portfolio manager to use leverage to tailor (by stretching and cutting) its investment portfolio to a size that best meets its expectation in relation to the preferred returns and risk. Appendix 1 of this paper examines in greater detail how using risk parity may maximise the risk adjusted return potential of an investment portfolio.

[9] A way of financing – obligation that allows the issuer to raise funds by promising to repay the lender at a certain date in the future.

3 How do hedge funds acquire leverage?

Each of the investment options cited below are popular vehicles to obtain leverage:

3.1 Prime Brokerage borrowing facilities (including shorting and repo)

3.2 Derivatives-based leverage (in options, futures, and other securities)

3.3 Embedded leverage (using bespoke derivatives products)

3.1 Prime Brokerage borrowing facilities (including shorting and repo)

Prime brokerage is the generic name for a bundled package of services offered by investment banks and financial service firms to large investors and hedge funds. These services include acting as a financial counterparty to facilitate the borrowing of cash and securities, providing a centralised cash and securities facility to enable all custody, settlement and clearing for the hedge fund or investor as well as offering other specialist services[10].

A prime broker will extend credit to a hedge fund or investor to purchase or sell (short) securities in exchange for the hedge fund or investor putting up cash and securities as collateral (known as the margin). The borrowing terms offered by the prime broker tend to vary per hedge fund manager but are usually based on the type of securities in the hedge fund's portfolio which will alter according to their level of diversification, liquidity, and interest rate sensitivity. When considering the value of the total investment portfolio, a prime broker considers all of a fund's positions in aggregate to assess the amount that it is willing to lend to the fund (which in industry terms is more familiarly known as portfolio margining).

When a hedge fund's collateral is determined on a security-by-security basis, the prime broker applies a discount or "haircut" to the value of each security; essentially lending less than the full value based on the riskiness of the security itself. Prior to 2008, the cost of financing to hedge funds was relatively low.

However the heightened regulatory environment that banks face as a result of various rule changes (i.e. Basel III, Dodd-Frank) has made this practice considerably more expensive and has fundamentally changed the hedge fund manager/prime broker relationship[11].

As a result, the cost of leverage for a hedge fund has increased with the net return to levered investments falling in value.

The ability of a prime broker to facilitate the lending of securities to cover short sales is critical. For example, when a security is borrowed from a prime broker and sold short, a hedge fund receives cash from the sale on which it earns interest from the prime broker at prevailing rates. There is also a cost associated with borrowing the security that is a function of how difficult the security is to obtain (i.e. cost of borrowing) with the difference between the two known as the short sale rebate. Certain prime brokerage arrangements allow for the borrower to reinvest these proceeds to purchase long positions in additional securities. With all these arrangements, prime brokers are limited in the leverage that they can provide to their clients.

Risks of obtaining leverage through a Prime Broker

i. Counterparty credit risk: If the prime broker becomes insolvent, it may take considerable time to locate and claim back securities that it borrowed, especially if they are moved to an overseas subsidiary or re-used by the prime broker.

ii. Financing risks: A sudden change in liquidity conditions within markets could result in the prime broker having to call back the securities it loaned to the hedge fund, in essence losing its ability to continue to finance margin lending.

iii. Liquidity mismatch[12]: obtaining financing from a prime broker can result in a potential liquidity mismatch within a fund, which could then result in an unwinding of the fund's trades.

iv. Timing mismatch: The security might be called back from the hedge fund prior to the catalyst being realized, resulting in an increase in borrowing costs prior to generating the expected return or forcing the unwinding of a hedge, to reduce risk.

When each of these risks occur, the hedge fund is forced to close out (i.e. sell) its positions, often at a substantial loss. It should be noted that hedge funds with prime brokerage borrowings do not always control the timing with which positions are closed.

[10] For more on this, please see AIMA's guide to selecting a prime broker; www.aima.org

[11] Accessing the Financial Power Grid: Hedge Fund Challenges under Basel III and beyond, www.aima.org/en/document-summary/index.cfm/docid/C2FB3D45-5BD8-4133-BB11BB6E401CF7C6

[12] Where the maturity of the underlying assets being invested in a portfolio does not match its expected liquidity period.

Repurchase Agreements

Through using a repo, investors (such as hedge funds) have an additional method of borrowing to finance their investments. A repo is similar in nature to taking out a secured loan (i.e. a home equity or homeowner loan) with the cash lender requiring security to be put up as collateral against the loan being taken out to protect the lender against default by the borrower. A repo transaction involves two parties, the buyer and the seller. There are two exchanges that occur – the first of these at the start of the transaction, the second at its maturity.

Typically, a repo transaction would see the investor (seller) swap fixed income securities from their portfolio (although it does not have to be fixed income securities) in exchange for (the buyer paying) cash with the promise to repurchase the securities later at an agreed upon (higher) price from the investor (or the counterparty). Further, the cash lender receives the legal transfer of the securities collateral from the borrower, while agreeing up front that the repayment of the cash loan would be simultaneously accompanied by the return of the collateral to the cash borrower.

Repo transactions are ubiquitous in finance being used extensively by corporations, money market funds, institutional investors and asset managers including hedge funds. The use of a repo to finance long positions or cover any short positions for an investor or hedge fund is integral to both the hedging and pricing of derivatives instruments. Arguably, of more importance, repos have become a vital source of day-to-day funding for banks and independent broker dealers and integral to the smooth and efficient functioning of the financial system.

Risks in obtaining leverage using a Repo

Counterparty risk:

i. The primary exposure in a repo is the risk of the counterparty supporting the transaction. Since leverage introduces counterparty risk, investors and managers are advised to work with a group of counterparties to limit their exposure to any single negative event which a counterparty might experience.

ii. If the hedge fund's counterparty fails to return a security that the fund may have rehypothecated[13], the investor may have to default on the agreement, and all other agreements with other counterparties that include the hedge fund.

Collateral risk:

i. The choice of collateral to be used in a repo transaction is very important. To that end, the credit risk on the collateral used in a repo should have a minimal correlation with the credit on the repo counterparty in order to diversify the investor's credit exposure as much as possible. Secondly, the collateral used should have minimal credit and liquidity risks in order to maximise certainty about its value and ease of liquidation in the event that there is a default.

ii. It is advised that a written contract is agreed between the various parties involved in a repo transaction. Such written agreements for financial transactions, such as a repo, frequently take the form of a master agreement such as the Global Master Repurchase Agreement, which contains standard contractual provisions to be applied to all repo trades that are entered into.

3.2 Derivatives-based leverage (in options, futures and other securities)

Hedge fund managers, commodity traders and other financial institutions (e.g. insurance companies) may use derivatives (such as futures and options contracts) to gain exposure (either by going long or short) to an underlying security without borrowing or using explicit leverage.

Buying derivatives based securities (with an implicit leverage) increases market exposure without violating possible leverage constraints (risking a loss of more than 100% and without a need for dynamic rebalancing). Due to the high degree of liquidity across most global derivatives markets, investors that deploy futures and options as part of their investment strategies only have to put up a small amount of capital to allow them to control a much larger asset size (notional exposure). The highest leverage levels available are for US Treasuries, the more liquid FX markets, and interest rate swaps, which are a popular instrument traded in macro hedge funds and other relative value strategies.

[13] Rehypothecation is the practice by banks and brokers of using, for their own purposes, assets that have been posted as collateral by their clients. It is regarded by Prime Brokers as essential to the economics of their business. In return for being granted the right to rehypothecate, it can offer clients cheaper funding.

These instruments are often off-balance sheet (and so often referred to as “off-balance sheet financing”).

Risks of deploying derivatives-based leverage

i. Counterparty credit risk (as per 3.1 above).

ii. Inadequate levels of unencumbered cash to provide the variation margin.

iii. When using derivatives-based leverage, a hedge fund must consider its margin and collateral requirements at the transaction level, and any credit limits imposed by its trading counterparties such as the fund’s prime brokers.

iv. Hedge fund investors should understand for what purpose managers are using derivatives and whether they are additive to the risk profile of the fund or used as a hedge to offset risk. Investors should therefore carefully monitor the risk of derivatives position.

3.3 Embedded leverage (using bespoke derivatives products)

Embedded leverage is extremely difficult to measure, whether in an individual institution or in the financial system. The only way that you can identify embedded leverage is through looking at the underlying instruments used in a fund (embedded leverage is incorporated in the instrument), and their volatility. A good analogy when making a reference to the use of embedded leverage is using duration to measure the riskiness of a bond investment. Like conventional leverage, it may increase investor vulnerability to market shocks.

Risks of obtaining leverage through the deployment of a bespoke derivatives product

i. Counterparty default: If the hedge fund counterparty defaults, they would then become a bankruptcy creditor with respect to any amount owed under any bespoke financial arrangement.

ii. Hedge fund investors should understand for what purpose managers are using derivatives and whether they are additive to the risk profile of the fund or used as a hedge to offset risk. Investors should therefore carefully monitor the risk of the embedded derivatives position.

4 Examining leverage in hedge funds

In much the same way as a buyer of a house, a stock investor or a financial institution would use leverage, hedge funds also deploy leverage across the various instruments that they trade. Depending on market conditions at any particular time and on the type of hedge fund strategy being pursued, the amount of leverage that a hedge fund may use can vary.

As of yet, there is no consensus on how to best measure leverage and consequently depending on what measure is used, the estimate of leverage can vary significantly[14].

For the purpose of the analysis to follow, we reference the measure of leverage in its two most recognised forms. The first is the standard leverage measure in which leverage is measured by the gross value of assets controlled by the fund (longs plus short positions) divided by the fund's total capital. The second measure is the margin-to-equity method, a more commonly used measure for funds that trade primarily in commodities and futures markets.

Understanding this, below we examine how leverage is best deployed across some of the more popular hedge fund strategies.

a) Long/Short hedge funds

Equity long/short hedge funds tend to buy and short sell securities within the same industry to maximize their return but also to control the risk of their investment. This behaviour is very different from most traditional money managers, who are tied to investing in a long-only securities benchmark.

Simple example:

Hedge fund A has $1 million of capital, borrows $250,000 and invests the full $1,250,000 in a portfolio of stocks (i.e. the fund is long $1.25 million), expecting them to trade higher. At the same time, hedge fund A sells short $750,000 of stocks, believing them to be overvalued.

Leverage of the fund = (Gross long + Gross short positions)/Net asset value of the fund[15] (or NAV).

= ($1.25million +$0.75 million)/$1million

= $2million/$1million = 200%

= 2 times capital (i.e. 2X capital or equity)

By using leverage to hold offsetting positions in both stocks, the manager should expect the portfolio comprised of long and short stocks to have less volatility than the overall market. Using leverage increases the amount of idiosyncratic risk in the fund's portfolio but reduces risk to the broader market.

Most popular type of leverage used:

Prime brokerage borrowing of cash and securities (short selling), repo.

Analysis of fund leverage levels deployed

Managers that invest using an equity long/short strategy (i.e. equity long/short, long-biased, short biased, or equity market neutral) tend to use modest levels of leverage (ranging between 1-2 times its assets[16]). Leverage used in equity long/short strategies is typically secured financing (such as repo finance) where the manager uses the securities in their portfolio as collateral.

b) Market neutral hedge funds

Equity market neutral strategies seek to generate returns by establishing offsetting buy and sell positions to take advantage of a mispricing of correlated or semi-correlated[17] securities. Most market neutral managers hold between 400 and 1000 securities in their portfolio. Others hold more. This is unique compared to the other hedge fund strategies. Like equity long/short managers, market neutral managers establish long positions in underpriced securities while establishing offsetting short positions in overvalued securities. Oftentimes, the potential total return from the spread between the overpriced and underpriced securities is just a few percentage points. Although more leverage is used than a

[14] Gross leverage levels sourced from a number of different prime brokers as of the end of June 2016. Estimates of leverage are also regularly collated by the UK FCA. As per their 2015 hedge fund survey, median gross leverage based on a sample of 132 funds was 3.9x as of September 2014.

[15] The net asset value of the fund is the value of an entity's assets minus the value of its liabilities, often in relation to open-end or mutual funds.

[16] As per data from Hedge Fund Research.

[17] Correlation measures the extent of which two securities move in relation to each other.

long/short hedge fund strategy, the offsetting of numerous positions is designed to reduce the market beta[18] exposure to a negligible amount to protect the portfolio against broader market changes.

Most popular type of leverage used:

Repo, prime brokerage borrowing.

Analysis of fund leverage levels deployed

The market neutral strategy characterises performance stability, low volatility, and low correlation to a traditional institutional balanced portfolio. Given the strategy's low volatility characteristics, the market neutral strategy can and does employ leverage with most market neutral portfolios having a gross exposure greater than 300% (*or 3x assets*) to enhance the returns of the strategy. Most equity market-neutral hedge fund managers use sophisticated computer-run quantitative models to select stocks. These models are used to create both a statistical advantage in picking stocks (also known as statistical arbitrage) as well as provide a strategic advantage to their investors in controlling exposure to systemic risk. Statistical arbitrage strategies tend to use more leverage compared to fundamental market neutral funds, and typically can be as high as 5 times its assets.

c) Merger Arbitrage (also known as Risk Arbitrage)

Classic merger arbitrage involves buying shares of a company that is being acquired (i.e. the target company) and shorting the shares of the acquirer company as a hedge (assuming this is a stock-for-stock deal). The objective of the trade is to capture the *arbitrage spread* – the difference between the acquisition prices and the price at which the target's stock trades before the merger is realised.

For example, the price of the target company following a merger announcement will usually not meet the anticipated closing share price, as there is often a level of uncertainty as to whether the acquisition will close. The greater the uncertainty that surrounds the deal closing, the wider the spread will be, while if the market believes that the deal will go through, the more narrow the spread will be.

By deploying prudent amounts of leverage the hedge fund manager can increase its capital to generate more attractive returns from the arbitrage opportunity. For deals with tight spreads, hedge funds will often apply moderate amounts of leverage so the return is more attractive (see example below). The risk of such a trade is that the spread widens due to the deal collapsing or due to uncertainty in the deal closing which will result in a loss. In this circumstance, any leverage that is deployed would magnify any loss when there are unfavourable outcomes.

Most popular type of leverage used:

Prime brokerage borrowing.

Example[19]:

Option 1:

One-for-one share exchange. Assume $100 of capital and that the deal is expected to close in 4 months. Assume from short sale, no additional leverage is employed. Purchase one share of the target company, short one share of the acquirer.

Acquirer stock price after deal announcement:	$100
Target company stock price after deal announcement:	$98
Spread:	2%
Approximate annual return from spread:	**6%**

Option 2:

One-for-one share exchange where the deal is expected to close in 4 months. The difference from option 1 (above) is that we have levered the trade 3x, purchasing three shares of the target company and shorting three shares of the acquirer. Assume annual financing cost of capital borrowed is 5%

Acquirer stock price after deal announcement:	$100
Target company stock price after deal announcement:	$98
Spread	2%
Annual return from unlevered spread:	6%
Approximate annual return from leveraged spread:	18%
Less cost of financing ((5%*120/360)*$200)/$100	-3.33%
Net annual return from spread	**14.67%**

Analysis of fund leverage levels deployed

Given the relatively tight spread that exists in many merger arbitrage scenarios, the strategy tends to use modest levels of leverage (typically 2–4x leverage) to amplify its returns.

[18] Market beta is the measure of the asset or security's risk in relation to the risk of movement in the market.

[19] Source: Hedge Funds and Leverage, JP Morgan, (2008)

d) Relative Value Arbitrage Strategies

A relative value arbitrage strategy seeks to take advantage of pricing discrepancies (usually a small anomaly that exists in a trade) between multiple securities and scale it profitably. In its simplest form, a relative value arbitrage strategy involves purchasing a security that is expected to appreciate in value, while at the same time selling short a related security that is expected to decline in value. This strategy can be used across a wide range of security types whether investing in equities, fixed income or derivatives.

Most popular type of leverage used:

Derivatives, prime brokerage borrowing, repo.

Analysis of fund leverage levels deployed:

Given that the price discrepancies in relative value arbitrage strategies are very small, it tends to use the greatest amount of leverage (typical levels can exceed 10x) to enable it to scale the returns to where they are attractive to investors.

Fixed income arbitrage strategies, in particular, seek to profit from the spread that exists between cash market securities and derivatives (to garner some kind of risk premium, anomaly or liquidity premium). The key leverage risk associated with these strategies is counterparty risk-that is having the counterparty withdraw its financing which will trigger an unwinding of their position or require it to take delivery of the cash security outright.

Fixed income arbitrage funds may deploy high levels of leverage. The higher leverage levels are typically due to the larger notional exposures in the derivative contracts that are usually employed to hedge out any credit and interest rate risk and traders that take these positions only require a low margin payment. Further, these strategies usually hold a sizable amount of cash as protection to offset the counterparty risk when taking on such a position. Convertible Arbitrage strategies tend to use between 2x-6x[20] leverage when arbitraging prices between a convertible bond and the stock of the same company.

e) Global macro

Managers that deploy a global macro strategy research the global economic landscape and seek to profit from any macro-economic imbalances and or geopolitical events by investing in various markets through stocks, bonds, commodities and currencies as well as financial derivatives such as options, futures and forwards.

Most popular type of leverage used:

Derivatives (options, futures), embedded leverage, repo.

Analysis of fund leverage levels deployed:

Most macro managers rarely hold cash securities and will transact largely in derivatives across all asset classes: options, futures, forwards and Over-the-Counter (OTC) derivatives. These financial instruments have embedded leverage within the financial instruments being traded in addition to any modest leverage available from external financing. The highest embedded leverage is available in treasury, foreign exchange and OTC derivative securities markets such as interest rate swaps and foreign exchange swaps. These transactions permit higher levels of leverage and the securities enable investors to have large notional exposures with little or no initial investment or collateral. Similarly, implied leverage levels are high in futures markets because the margin requirements are much lower than in equity markets.

f) Managed Futures or Commodity Trading Advisors (CTA) funds and trend followers

Funds in this category refer to the active trading of futures and forward contracts on physical commodities, financial assets and exchange rates to earn the risk and return from active management within the futures market. CTA's almost exclusively trade exchange-traded futures across equities, fixed income, currencies and commodities The key metric to understanding the amount of leverage being used in a CTA or macro fund is the amount of cash needed to settle any futures contracts. The relative level of this margin will determine the leverage ratio for CTA's.

Most popular type of leverage used:

Derivatives (options, futures), embedded leverage.

Analysis of fund leverage levels deployed:

Similar to macro, CTA funds rarely use explicit leverage, rather the instruments used by CTA managers are levered. As discussed earlier in section 3 when trading futures, the fund only has to put up on average 10% of the initial margin to get 100% exposure to the position, due to its greater ability to cover positions should the counterparty to the trade fail.

[20] As per various prime broker estimates

Note – Further analysis on the universe of hedge fund strategies is covered in paper 2 of this series (Portfolio Transformers – Examining the role of hedge funds as substitutes and diversifiers in an investor portfolio [21].)

An appraisal of hedge fund industry leverage levels

No debate on the use of leverage by hedge funds can go unpassed, it seems, without acknowledging the events that beset Long Term Capital Management (LTCM). LTCM was a hedge fund engaged in various relative value strategies (predominantly a fixed income convergence trade) which involved deploying significant amounts of leverage to take advantage of the price differential between securities. From the various reports and public record, the majority of LTCM's fund balance sheet positions were invested in G7 government bond securities; while the remainder of the fund was active in many other markets including securities markets, exchange-traded futures and OTC derivatives with its geographic base encompassing markets in North America, Europe and Asia. The distinguishing feature of the LTCM fund was the scale of its trading activities, the large size of its positions in certain markets and the extent of its leverage, both in terms of balance sheet measures and on the basis of more meaningful measures of risk exposure in relation to capital. Prior to the fund encountering problems, the fund's balance sheet on August 31st 1998 included over $125 billion in assets. Even using the January 1st 1998 equity capital figure of $4.8 billion, the level of assets implies a balance sheet leverage ratio of more than 25 times its total assets[22].

Critics of hedge funds often point to LTCM to make their case that hedge funds are too risky. We acknowledge that LTCM's size (and leverage) made it vulnerable to the extraordinary macro-economic conditions that ultimately led to it having to be liquidated in September of that year.

Lessons have been learned with risk management across the industry being improved as a result[23].

In contrast to the practice required of funds today, LTCM was able to put on the positions it did because they were able to post no initial margin, and consequently layer upon layer of swap and repo positions dramatically increased the fund's overall exposure.

Best practice for funds today is to keep unencumbered cash[24] at least equivalent to a multiple of the initial margin being posted. Unencumbered cash refers to the funds' holding of outright cash or cash-like securities such as G-10 government bonds, which can be easily transacted (highly liquid) and are not encumbered to serve as collateral or margin payments to the fund's counterparties. Analysis from the 2015 hedge fund survey (conducted by the UK FCA) show that hedge fund's unencumbered cash levels being as much as 70% for CTA/managed futures funds, while the median fund's unencumbered cash as a proportion of its NAV fluctuates within a range of 27% and 38%[25]. No responsibly managed fund would be comfortable running with positions (similar to what LTCM had) which had already eroded its capital base in the form of initial margin requirements, as the first time the fund would have a "down" day, it would have to start unwinding positions due to it not having any capital to meet its variation margin calls.

In contrast to the trading environment during the LTCM episode, the majority of securities today are centrally cleared. In their 10th semi-annual progress report, the Financial Stability Board reports that approximately 80% of all interest rate and credit derivatives in the US are now centrally cleared. This is consistent with a recent industry report[26] that from 2007 to 2014, the percentage of interest rate derivatives that were being centrally cleared rose from 16% to 69%. To put this into context, interest rate derivatives accounted for roughly three quarters of all outstanding OTC contracts over the past decade. The evolution to a more centrally cleared universe helps to reduce the potential for systemic risk in a number of ways. Firstly, through trade compression[27], a fund's gross notional exposure is significantly reduced. Secondly, as a result of a fund being able to net their positions, the need for collateral is reduced.

Regulatory authorities have encouraged banks to monitor hedge fund clients through imposing constraints on their use of leverage.

[21] https://www.aima.org/en/document-summary/index.cfm/docid/7F64B351-BF93-4E03-80ACA06A53403BCC

[22] Hedge funds, Leverage and the lessons of Long Term Capital Management, Report of the President's working group on financial markets, April 1999. https://www.treasury.gov/resource-center/fin-mkts/Documents/hedgfund.pdf

[23] http://www.cftc.gov/idc/groups/public/@swaps/documents/file/bestpractices.pdf

[24] Unencumbered cash refers to the funds' holding of outright cash or cash-like securities such as G-10 government bonds which can be easily transacted.

[25] See for reference figure 28, Page 27 2015 Hedge fund survey, FCA

[26] January 2016 ISDA report, Derivative Market Analysis, Interest Rate Derivatives

[27] A risk mitigation technique to minimise gross exposures while maintaining a net economic position

A hedge fund's use of leverage must adhere to more strict levels of margin and collateral requirements at the transaction level as well as any credit limits imposed by trading counterparties such as prime brokers.

Prime brokers have the ability to withdraw financing when performance or NAV triggers are breached. Global regulations, such as UCITS[28] in Europe and the Investment Company Act of 1940 in the US, place limits on each publicly-traded fund's leverage. Funds that operate under both structures must adhere to a 300% asset coverage rule that requires a fund to have assets totalling at least three times the total borrowings of the fund, thus limiting the borrowing to 33% of assets. For instance a fund with $100 million in assets may borrow up to $50 million from a bank. Following the borrowing, the fund would have $150 million of assets and $50 million of borrowing and would therefore satisfy the 300% asset coverage rule. While funds that comply as Alternative Investment Funds (under the Alternative Investment Fund Managers Directive regime) are not subject to leverage restrictions, nevertheless additional reporting is required from them if they employ leverage more than 3x their assets.

Further, a hedge fund's use of leverage is subject to close scrutiny by its creditors and investors. Potential creditors perform extensive analysis on a fund's portfolio before extending credit to a hedge fund, and sophisticated investors may require a fund to abide by certain leverage limits and, at a minimum, typically will require transparency regarding the leverage utilized by hedge funds.

A 2011 paper published by the National Bureau of Economic Research[29], the first formal analysis of hedge fund leverage using actual leverage ratios, demonstrated that at the onset of the global financial crisis, the hedge fund industry was reducing leverage in contrast to investment banks and the broader financial sector that still was highly levered. The highest level of gross hedge fund leverage was 2.6 in June 2007, prior to the global financial crisis that started the following year. In contrast, the leverage of investment banks was 10.4 in June 2007 and severely spiked upward to reach a peak of 40.7 in February 2009.

Hedge fund industry leverage since 2008 has only marginally increased in size and today accounts for approximately 2.7 times investment capital[30]. In comparison, leverage deployed by banks are still very much in double digits while as we recall from the start of this paper, the average house home loan is levered within a range of two to ten times assets.

[28] Undertakings for the Collective Investment of Transferable Securities.

[29] Andrew Ang et al, Hedge Fund Leverage 25, (NBER, Working Paper Series No. 16801, 2011) See http://www.nber.org/papers/w16801.pdf

[30] Gross leverage levels sourced from a number of different prime brokers as of the end of June 2016. Estimates of leverage are also regularly collated by the UK FCA. As per their 2015 hedge fund survey, median gross leverage based on a sample of 132 funds was 3.9x as of September 2014.

5 Conclusion: Leverage, risk and returns

It is essential to distinguish between the concept of leverage and risk. Leverage is the link between the underlying or inherent risk of an asset and the actual risk of the investors' exposure to that asset.

A common misunderstanding is that a levered asset is always riskier than an unlevered asset, even if the levered asset has low risk and the unlevered asset is highly risky.

The picture becomes even more complex when we start to look at portfolio of assets where leverage can be used in parts of the portfolio to offset some of the exposures magnified by the use of leverage in other parts, resulting in an overall risk reduction or transformation.

A hedge fund strategy which has low market risk (beta) and utilises leverage (for example, relative value arbitrage strategies) can be less volatile than a hedge fund with a more directional bias (e.g. long/short equity) and both of these strategies can be substantially less volatile than a simple exposure to an equity benchmark. Generally, funds with more market beta need to be more prudent with regard to their use of leverage. Further, the level of risk associated with a leveraged position depends on the risk parameters (e.g. volatility, liquidity of the investment etc.) associated with the positions that are being levered and the manner in which the leverage has been obtained.

As we have shown in the previous section, most hedge funds use a modest amount of leverage. Further, as explained in papers 1 and 2 of this *trustee education series*, hedge fund managers typically build their portfolios to exhibit less volatility than their respective investments in public market indices (i.e. equities or fixed income/credit).

The table overleaf provides a comparison between publicly traded equities, bonds and hedge funds examining their estimated leverage range, returns, risk (as measured by standard deviation), the risk adjusted returns (as measured by the Sharpe ratio) and the maximum drawdown[31]. As shown, over the long term, on a risk-adjusted basis, hedge funds (as measured by the hedge fund weighted composite index) outperform equities and bonds over the past 20 years.

There is a complex relationship between leverage and risk. A fund that is levered four times its size, for example, is not necessarily twice as risky as one that is levered twice its size. This is because leverage can amplify risk but it can also be used to offset risk elsewhere in the portfolio. Leverage is just one of a number of tools that a fund manager or allocator can use to tailor the risk and return of a security or a portfolio of investments to best match the requirements of their investors.

What measure is chosen to best fit the investor's requirements is dependent on the form of leverage being used and the investment circumstances that the amount of leverage needed is being applied to. Many investors consider leverage not as something that can be bought off the rack, but as a tool to meet with precision accuracy, a custom fit unique to their investment needs. Given such a level of precision, it is not only critical to understand how leverage is sourced and used but also how it is measured and monitored. Through their sophisticated risk management framework and expertise, hedge funds can be a useful complement for any allocator or manager that chooses to use leverage.

'Made to Measure' is the third in the 'Trustee Education' series by AIMA and the CAIA Association. The next paper will examine the most frequently-asked questions that trustees and others raise with fund managers regarding liquidity.

[31] Maximum drawdown measures the largest single drop from the peak to the bottom in the value of a portfolio before a new peak is attained.

Table 2: Hedge fund performance (May 1996 – May 2016)

Index	Leverage Range*	Annualised Return	Annualised Standard Deviation	Sharpe Ratio	Maximum Drawdown
HFRI Fund Weighted Composite Index	2 – 3	7.04%	6.93%	0.34	-21.42%
HFRI Equity Hedge (Total) Index	1 – 2	7.93%	9.16%	0.35	-30.59%
HFRI Event-Driven (Total) Index	2 – 4	8.07%	6.72%	0.50	-24.79%
HFRI Macro (Total) Index	3 – 5	6.45%	5.85%	0.30	-8.02%
HFRI Relative Value (Total) Index	4 – 10**	7.29%	4.28%	0.61	-18.04%
HFRI: Equity Market Neutral Index	> 3	4.78%	3.06%	0.03	-9.15%
HFRI: Quantitative Directional Index (i.e. *Statistical Arbitrage*)	5	7.11%	12.11%	0.20	-31.12%
HFRI: Systematic Diversified Index (i.e. *Managed Futures*)	3 – 5	8.25%	7.85%	0.45	-11.77%
S&P 500		7.88%	15.42%	0.21	-50.95%
MSCI World Dollar		6.28%	15.55%	0.10	-53.65%
Barclays Global Aggregate		4.94%	5.52%	0.04	-10.08%

* Leverage range based on various prime broker estimates over the past 2 years.

** Whilst the majority of relative value funds use between 4 and 10 times leverage, some on occasion use in excess of 10 times leverage.

Appendix 1: Spotlight on Risk Parity

In our earlier trustee education research[32], we have documented the challenges that investors are having to tackle to create an investment portfolio that can endure the vicissitudes of investment performance amidst a background of volatile market conditions and challenging yield opportunities.

Table 1 below shows the performance of equities (as represented by the MSCI World Dollar index), bonds (as represented by the Barclays Global Aggregate index) and a 60/40 portfolio (comprised of an allocation where 60% of the portfolio is invested in equities and 40% of the portfolio is invested in fixed income/bonds) over the 20 year period ended May 2016. The risk and return of each of the portfolio components are described by standard deviation and expected returns. In calculating this we use the historical averages of risk and return). Upon closer examination of this table, we can see that the risk from investing in equities is approximately three times greater than bonds. A combined allocation of both equities and bonds (as represented by the 60/40 portfolio) results in an approximate 40% reduction of total risk to 9.63% versus 15.55% if we were to remain solely invested in equities. Further, the combined 60/40 allocation results in a better risk-adjusted returns metric (as measured by the Sharpe ratio) than being solely invested in equities.

Evaluating the total risk of the 60/40 portfolio, we can see from table 2 below on the next page that nearly 95% is attributable to the portfolio's exposure to equities, or to put another way, a portfolio that has such a high reliance on equities will be dependent on how the equity market performs and just as the portfolio is likely to perform strongly as the equity market increases in value, the opposite applies when equity markets fall in value, and the portfolio is susceptible to underperformance.

Table 1

Portfolio Holdings	Weighting	Expected Annualised Return	Standard Deviation	Sharpe Ratio
MSCI World Dollar		6.28%	15.55%	0.105
Barclays Global Aggregate		4.94%	5.52%	0.054
US 12 month treasury bill		2.53%	7.62%	-0.277
60/40 Portfolio				
MSCI World Dollar	60%	5.74%	9.63%	0.114
Barclays Global Aggregate	40%			

Source: AIMA research

[32] Beyond 60/40, the evolving role of hedge funds in institutional investor portfolios (AIMA, 2013)

Table 2

Portfolio Holdings	Weighting	Expected Annualised Return	Standard Deviation	Sharpe Ratio	Contribution to Portfolio Risk	Proportion of Portfolio Risk
60/40 Portfolio						
MSCI World Dollar	60%	5.74%	9.63%	0.114	9.08%	94.29%
Barclays Global Aggregate	40%				0.55%	5.71%
120% Leverage						
MSCI World Dollar	50%	6.09%	8.89%	0.163	6.87%	77.37%
Barclays Global Aggregate	70%				1.75%	19.69%
US 12 month treasury bill	-20%				0.26%	2.94%
150% Leverage						
MSCI World Dollar	30%	6.55%	9.02%	0.211	2.48%	27.51%
Barclays Global Aggregate	120%				4.93%	54.66%
US 12 month treasury bill	-50%				1.61%	17.82%

Source: AIMA research

As the popular saying goes, "don't put all your eggs in one basket" and by extension, the basic principles of asset allocation is that the more diversified that you make your investment portfolio, the better the possibility that you have of generating the highest possible return for your portfolio for a given level of risk that you take.

Further developing this approach, risk parity tries to alleviate the heavy concentration of risk (and in the case above, the predominance of equity risk that exists) that an investment portfolio might have (whether it is a traditional 60/40 portfolio or another type of diversified portfolio) and restructure it with the objective to limit the impact of large losses (or reduce the risk) from any one predominant portfolio component (like equities). This can be done by making sure that any expected risk contribution of the portfolio is spread more evenly across the various individual components that make up a typical diversified portfolio, namely equities, bonds, credit, private equity, real estate, commodities, and in turn reduces the portfolio's reliance to any predominant risk while increasing its exposure to lower risk asset classes in the portfolio.

The approach that is taken focuses on the allocation of risk in each component of a diversified portfolio with the overall objective to earn the same level of return with less risk than a 60/40 portfolio or to earn better returns with the same level of risk than a 60/40 portfolio. In spreading the risks, investors that deploy this approach will make relatively large allocations to low risk asset classes (predominantly fixed income). To satisfy investor needs for a higher return while maintaining a similar degree of risk, you need to use some leverage.

Table 2 illustrates the results of adding leverage to a 60/40 portfolio. In the first instance the portfolio is levered 120% or 1.2 times by directly borrowing US treasury bills. The end result is that the total risk of the portfolio falls from 9.63% to 8.89%, (i.e. an absolute reduction of 8%) while the absolute total return of the portfolio increases by 6% from 5.74% to 6.09%. As a measure of the proportion of total risk within the portfolio, the use of leverage allows the investor to reduce the equity piece by 17%, which they can then spread to the fixed income part of the portfolio.

Levering the portfolio by 150% can result in even better returns with the portfolio increasing its overall returns from 5.74% to 6.55% (an absolute increase of 14%) albeit with a slightly higher risk than the portfolio that is levered 120%.

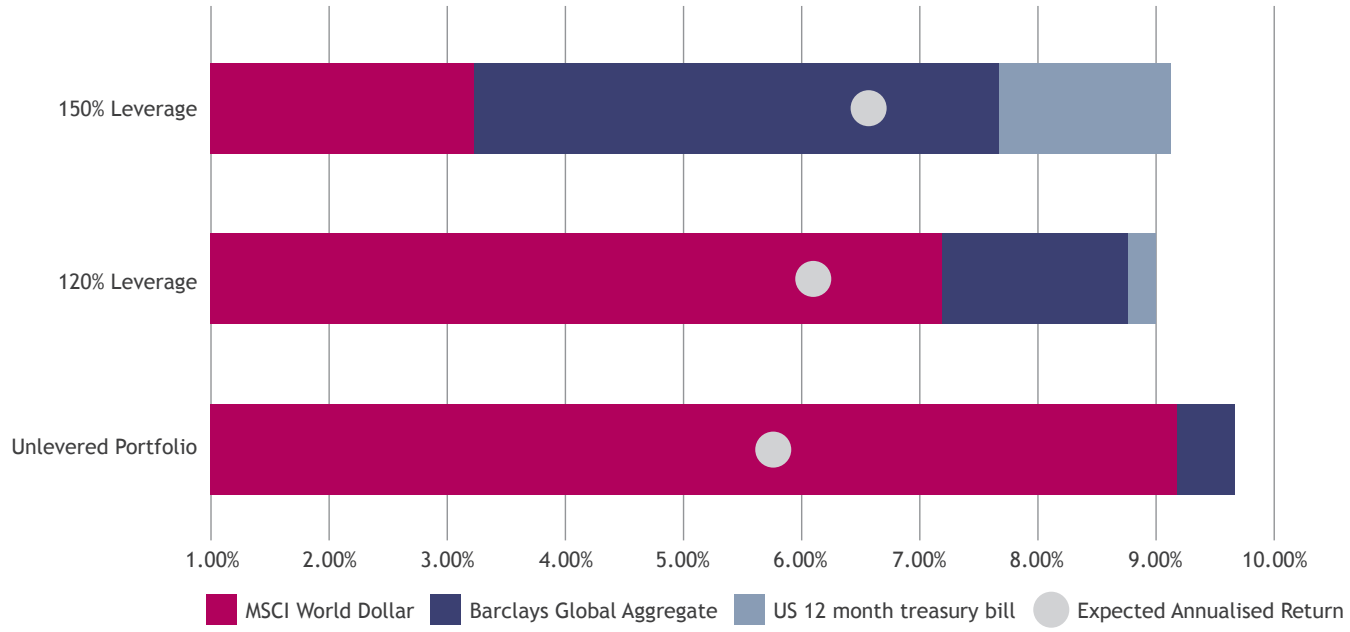
We illustrate this use of leverage in the chart below where the red bar represents the decreasing contribution that the risk of equities makes to the total risk of the portfolio, the dark blue bar shows the increased importance of the risk of bonds and the grey dot highlights the increasing expected returns of the portfolio resulting from the risk parity approach.

As highlighted in the earlier papers of this series (paper 1 and paper 2), alternative investments like hedge funds, tend to have both low volatility and a low correlation to other traditional asset classes, allocations to alternative investments tend to be relatively high in a risk parity portfolio. The key to using a risk parity approach is the willingness on the part of the investor to use leverage and their ability to manage the risks posed by the use of leverage.

Balancing a portfolio's risk exposures offers a greater chance for investment success. By doing this, the result is that in the event one component of the portfolio underperforms, it can be offset by the performance of another part of the portfolio.

By introducing leverage to specific parts of the portfolio this will result in its risk composition being altered which will maximise the return objectives of the portfolio to match the preferred level of risk. Incorporating risk parity in an investor's portfolio can benefit portfolio diversification because it provides the portfolio with a different set of returns. However, where markets end up being too closely correlated, risk parity funds may suffer.

Illustrating the impact of leverage in an investment portfolio



Source: AIMA research

Appendix 2:

A summary of the different forms of leverage which investors could consider

	Portfolio Leverage	Derivative Leverage	Financial Leverage (corporate level)
What is it?	Hedge funds deploy more than $1 of investment for each $1 asset under management (AUM). May include long and short investments.	Use of derivatives (e.g. options) in portfolio which have implicit leverage. Typically, buying such contracts requires a fixed payment and creates the potential for large gains. Selling results in the inverse happening.	Company finances itself with debt.
Term	Leverage usually supplied on margin by prime broker. Some strategies secure "term financing" for fixed periods.	Derivative contracts range from days to a few years.	Various forms of debt company can use including bonds, loans etc. Term of debt is usually years.
Upside	Allows investment strategy to achieve more potential return per dollar of AUM.	If underlying assets move as predicted, multiples of capital can be made.	When profits increase, equity value increases more rapidly than it would without leverage.
Downside	Negative performance will also be accentuated. If performance is too negative, manager may be forced to sell assets to cover margin calls.	If underlying assets do not move as predicted. 100% of upfront payment can be lost. Risk of counterparty failure also introduced.	When profits fall, equity value falls more rapidly than it would without leverage. If profits cannot cover interest expense, company is insolvent.
Potential Risks	Introduces counterparty risk: broker can restrict fund's ability to lever/force unwind at inopportune time.	Introduces counterparty risk – derivatives are contracts and there is a risk that investment choice is successful, but counterparty is unable to fulfil their side of the deal.	If company is unable to earn enough to pay interest, insolvency follows. If capital markets are closed when debt comes due, insolvency follows.

Source: AIMA research

About AIMA

The Alternative Investment Management Association (AIMA) has over 1,700 corporate members (and over 10,000 individual contacts) in over 50 countries. Members include hedge fund managers, fund of hedge funds managers, prime brokers, legal and accounting firms, investors, fund administrators and independent fund directors. AIMA's manager members collectively manage more than $1.5 trillion in assets. All AIMA members benefit from AIMA's active influence in policy development, its leadership in industry initiatives, including education and sound practice manuals, and its excellent reputation with regulators worldwide. AIMA is a dynamic organisation that reflects its members' interests and provides them with a vibrant global network. AIMA is committed to developing industry skills and education standards and is a co-founder of the Chartered Alternative Investment Analyst designation (CAIA) – the industry's first and only specialised educational standard for alternative investment specialists. For further information, please visit AIMA's website, www.aima.org.

About the CAIA Association

The CAIA Association, a non-profit organisation founded in 2002, is the world leader and authority in alternative investment education. The CAIA Association is best known for the CAIA Charter®, an internationally recognised credential granted upon successful completion of a rigorous two-level exam series, combined with relevant work experience. Earning the CAIA Charter is the gateway to becoming a member of the CAIA Association, a global network of over 8,400 alternative investment leaders located in 80+ countries, who have demonstrated a deep and thorough understanding of alternative investing. Having grown rapidly, the CAIA Association now supports vibrant chapters located in financial centres around the world and sponsors more than 120 educational and networking events each year. The CAIA Association also offers a continuing education program, where trustees can learn the Fundamentals of Alternative Investments in a 20 hour, video-based program. For more information, please visit www.CAIA.org.

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