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Alternative Investment Analyst Review

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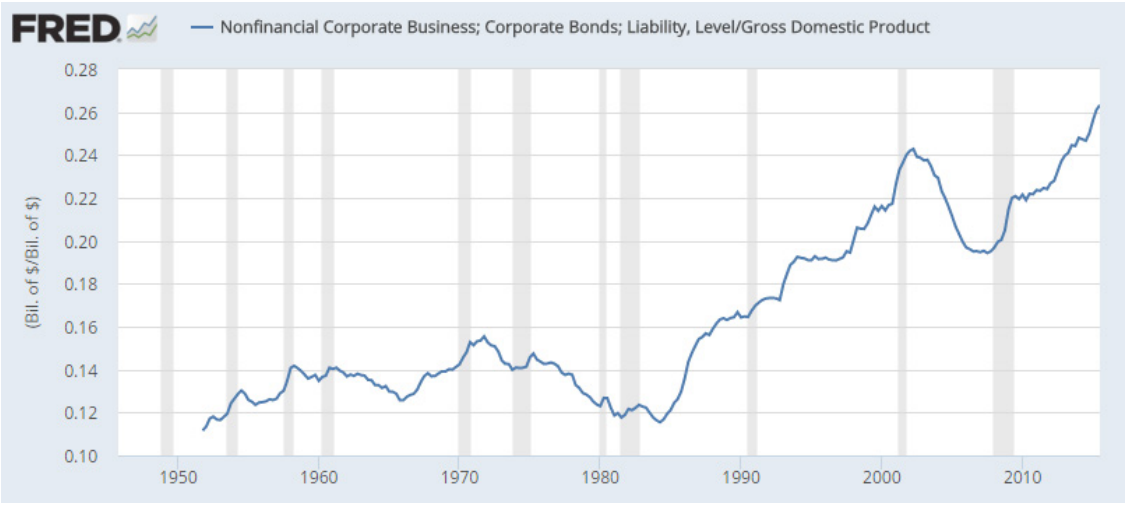
Editor's Letter

What is next for the credit cycle?

Until a few years ago, macroeconomists did not think that the financial sector exerted much influence over the real economy. This was rooted in the concept of monetary neutrality, which claims that changes in monetary policy only affect nominal variables and not real ones. That is, changes in the money supply alter nominal figures through changes in the inflation rate, but do not change the inflation-adjusted variables. Economists generally assumed that the neutrality of money may be violated on temporary basis, but its lasting effects tend to be minimal. For instance, while a rapid rise in the supply of money can lead to an increase in the rate of inflation, and, therefore, a decline in the real rate of interest, the effect will be temporary, as nominal interest rates would adjust and restore the real rate of interest to its previous level.

By the same token, other real variables of the economy such as employment, resource utilization, productivity, and real economic growth were not thought to be permanently affected by changes in the financial sector. The Great Recession, with its roots in the financial sector, changed all that. It is now accepted that modern economies are significantly affected by the financial sector and that shocks originating from this sector could have lasting effects on the real economy. However, the lack of significance attached to the financial sector was not always the norm. It turns out that economic and financial models follow their own cyclical patterns.

Similar to the rest of us, economists do not have perfect memories and the field of economics moves forward over time, while not necessarily incorporating what was learned 25, 50, or 100 years ago. Lessons of the past are learned and forgotten and learned again. The reason behind this is that depending on economic environment, economic ideas come into and go out of fashion. The role of financial markets and financial cycles and their impacts on the real performance of the economy are prime examples of how some ideas can gain prominence and then be put back into the drawer as economic environment changes. Therefore, it should come as no surprise that the interaction between the financial cycle and the business cycle gained prominence after the Great Depression of 1930. Irving Fisher, perhaps the most well known economist at the time of the Great Depression, observed that during the financial boom, credit plays an increasingly important role as financial constraints are weakened, allowing investors to increase their purchases of assets. This, in turn, leads to misallocation of resources, as cheap capital helps make marginal investments become economically viable. Higher levels of leverage eventually become unsustainable as the boom turns to bust and asset prices and cash flows fall, making the servicing of the debt that was accumulated during the boom period a significant burden, forcing corporations to cut their expenditures in order to repair their balance sheets. In addition, overinvestment in certain sectors will hold the economy back, leading to a sluggish recovery.



Irving Fisher's ideas were almost forgotten until some 40 years later when Hyman Minsky proposed a new version of them called the "financial-instability hypothesis." According to Minsky, credit and financial cycles go through five stages: displacement, boom, euphoria, profit- taking, and panic. A displacement occurs when investors get excited about something—an invention, such as the automobile and household appliances in the 1920s and the Internet in 1990s, or a war, or an abrupt change of economic policy. The current cycle began in 2008, with the Fed's decision to reduce interest rates and increase liquidity to overcome the devastating effects of the bursting

of the housing bubble. With the cost of borrowing—junk bonds' yield, in particular—at historic lows, a speculative boom in corporate borrowing and investing may have developed. The Chinese economy's insatiable appetite for natural resources and consumer products that are desired by a growing middle class, led to significant investments in these sectors, with much of it financed through the corporate bond market (The following graph displays the ratio of non-financial US corporations' debt to US GDP).

We can see that the ratio is almost twice as high as it was during the mid-1980s, with a 30% rise since 2010. Minsky argued that this boom leads to over-valuation of assets that were associated with the initial displacement (e.g., radio stocks in the 1920s, Internet stocks in the 1990s, and homes in the 2000s). As a boom leads to euphoria, Minsky said, cheap credit becomes available to ever more dubious borrowers, often creating new financial instruments to do the job (e.g., securitization of mortgages). Then, at the top of the market (in this case, mid-2006), some smart traders will start to cash in their profits. The onset of panic is usually heralded by a dramatic effect. The Internet bubble was highlighted by the bankruptcy of several dotcom firms; the Great Recession of 2007-2009 began in July 2007, when two Bear Stearns hedge funds that had invested heavily in mortgage securities collapsed. Today, we might be witnessing some minor effects that with hindsight may be considered dramatic. First, we have seen a breathtaking drop in the prices of many commodities and oil in particular. Second, we have seen a sharp increase in credit spreads in the junk bond market (see chart below). These credit spreads have reached levels not seen since the height of the European credit crisis and the end of the 2007-2009 financial crisis. Finally, we have seen two high-yield mutual funds impose restrictions on withdrawals by their investors.

Related to the credit and financial cycle described above, Minsky argued that debt is employed for different purposes during the cycle. He referred to the three uses of debt as hedge, speculative, and Ponzi, after financial fraudster Charles Ponzi.

In the first stage, soon after a crisis, lenders and borrowers are cautious. Loan agreements are strict and loans are of high quality, as borrowers can afford to repay both the initial principal and the interest. As confidence rises, lenders begin to make loans where the borrower can only afford to pay the interest. Usually the loan will be taken out against an asset that is rising in value. Finally, when the previous crisis is a distant memory, we reach the final stage - Ponzi finance. At this point, lenders will make loans to firms and households that can afford to pay neither the interest nor the principal, and this extension of credit is founded on the belief that asset prices will continue to rise.

While the previous credit cycle that ended with the Great Recession fits the debt model proposed by Minsky quite well, the current cycle seems to lack all of the characteristics proposed by him. For instance, banks are still reluctant to lend and we have not seen a significant rise in asset-backed borrowing by households over the past few years. Perhaps because of the tighter regulatory framework, lending has shifted from banks to other lenders (e.g., direct lending by bond markets). Still, the current credit cycle seems to be displaying an increasing number of features predicted by Minsky. It remains to be seen whether recent gyrations in the high-yield market signal a maturing credit cycle, or just a hiccup in the expansion process that began six years ago.

Hossein Kazemi,

Editor

[1] For a non-technical discussion of Hyman Minsky and his work see The New Yorker, February 4, 2008 and BBC Magazine, March 24, 2014.

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Pioneering the Alternative Beta Space: A View From Portfolio Management

Yaz Romahi's development of the Alternative beta investment space has moved Alternative beta from a theoretical concept to an investable reality over the last five years. A key thesis in the Alternative beta offering he has developed is that it raises the standard for hedge fund managers and investors. In the same way that traditional managers need to outperform traditional Beta, Yaz has called for Alternative beta to act as a tool for evaluating Alternative investment managers as well as reducing investment fees.

Q: What is your view on alternative beta and how alpha and beta are being redefined?

ROMAHI: Hedge fund investments have entered the mainstream and become a standard part of asset allocation due to their attractive diversification benefits. As a result, academic interest in their sources of return has intensified. The academic literature has increasingly been able to describe the return drivers behind a wide range of hedge fund styles as there typically exists common risk exposures shared by hedge fund managers pursuing similar strategies. Since these return drivers are systematic in nature, they have been termed alternative beta. Alternative beta provides access to the returns to factor risks uncorrelated to market risk that are typically due to behavioral biases, market anomalies, systematic deviations from equilibrium or alternative risk premia. These risk factors can typically capture a meaningful portion of hedge fund returns.

Ultimately, the growing knowledge around the concept of alternative beta will lead to the reclassification of a significant portion of what is today considered "alpha". Furthermore, increased understanding by investors of the factor risk exposures associated with different hedge fund styles will also help in the pursuit of better diversified portfolios with greater transparency. The development of strategies that have made the concept of "alternative beta" investable has provided investors with a compelling portfolio solution.

From an investor's perspective, the optimal alternatives portfolio becomes a core-satellite structure with alternative beta strategies as the core diversifying holdings with satellite exposures to high conviction alpha managers. Indeed, as investors increasingly appreciate this concept, we would expect the alternatives industry to follow in the same trajectory that has taken place in the traditional investment world – with a bifurcation of the industry into low cost, transparent alternative beta solutions on one side and highly concentrated idiosyncratic alpha managers on the other.

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Yazann Romahi, PhD, CFA is the head of Global Multi-Asset Research in the Multi-Asset Solutions team, responsible for the quantitative models that help establish the broad asset allocation reflected across the Multi-Asset Solutions team's portfolios globally. The team is also responsible for the design and portfolio management of the Alternative Beta suite of products. An employee since 2003, Yazann previously worked as a research analyst at the Centre for Financial Research at the University of Cambridge, holds a Ph.D. in applied mathematics from the University of Cambridge, and is a CFA charterholder.

Catastrophe Bonds: An Important New Financial Instrument

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Catastrophe bonds (CAT bonds) are a major category in the class of securities known as insurance-linked securities or ILS. Their purpose is to crowd-source reinsurance coverage, in order to reduce reinsurers', insurers', and self-insurers' reserve requirements and reduce their cost of coverage. At the same time they are attractive to investors, because the risks they cover are virtually uncorrelated with other risks such as equity market risk, interest rate risk, and credit risk.

The investor purchases the bond with a principal payment then receives regular periodic payments, usually quarterly. The bond has a maturity which ranges from one year to five years but is typically three years. If a covered catastrophe exceeding the "trigger" point defined in the bond's contract occurs during the period before maturity, then the bond defaults and a portion or all of the principal paid for the bond by the investor may not be returned, going to cover the issuer's indemnities. The issuer is usually a reinsurer, but may be an insurer, a government entity, a corporation, a pension fund, or even a nonprofit organization. Catastrophes typically covered include damages from extreme earthquakes and high winds but can also include high or low extremes of mortality and other risks.

The investor's principal payment is invested in safe securities, such as a U.S. Treasury money market fund, thus minimizing or eliminating credit risk. The payments to the investor consist of the interest on those investments plus the premiums paid by the cedent – the issuer of the bond. Loss of principal is triggered by the occurrence of the covered catastrophe. The specific trigger and the amount of principal lost depend on the trigger type, which can be an indemnity trigger, industry trigger, parametric trigger, or modeled trigger. An indemnity trigger is tripped by claims on the cedent in the event of a catastrophe exceeding a specified amount. An industry trigger is tripped by claims on the entire insurance industry for the specified event in a region. A parametric trigger

is tripped by a specified quantitative severity of the catastrophe, while a modeled trigger is tripped by modeled claims greater than a specified amount.

The market for CAT bonds has developed rapidly since their introduction about 20 years ago. Outstanding issues stood at $20 billion at year-end 2013. Issuance has increased rapidly, with $5.7 billion in new issues in the first half of 2014 alone. Recent CAT bond spreads have been about 2-3% higher than those of comparably-rated high-yield corporate bonds, and rates of return have averaged in the range of 7-9% annually since 2002 with little volatility.

Overview of CAT Bonds

"Reinsurance" is insurance purchased by insurance companies to cover so-called "tail risks", that is, risks so severe that the insurance companies themselves would not have enough reserves to cover them. For example an insurance company that has sufficient reserves to pay claims of up to $1 billion but no more, in the event of a catastrophe such as a hurricane or an earthquake, may purchase reinsurance from a reinsurance company to cover claims in excess of $1 billion. In turn, a reinsurance company may purchase reinsurance of its own tail risks from yet another or several other reinsurance companies. This purchase of reinsurance by reinsurers is called retrocession. Each reinsurer must have sufficient reserves to cover the claims that it may be called upon to cover with a high level of probability.

Catastrophe bonds, or CAT bonds, were created in the mid-1990s after Hurricane Andrew, the most costly hurricane in U.S. history, caused sufficient damage to bankrupt some insurance companies. This led insurers and reinsurers to seek new ways to ensure that they had adequate capital to cover claims in the event of future disasters.

Recently China Daily (2013) reported that China's National Development and Reform Commission, in a strategy guideline, encouraged the issuance of CAT bonds as a way to leverage financial resources in response to climate change.

The Mechanics of CAT Bonds

At this time CAT bonds are issued and trade mainly in the institutional investor marketplace, in which, in the U.S., securities sales are exempt from most regulatory reporting requirements under Rule 144A of the Securities Act of 1933, if sold in transactions of at least $150 million each to institutional investors. These institutional investors may be dedicated CAT bond funds, which operate like hedge funds, and in which institutional funds such as pension funds and endowment funds as well as accredited (wealthy) individual investors may invest, or they may be those institutional funds directly, or in a few cases, other pooled funds such as mutual funds and hedge funds.

From the standpoint of cash flows, to an investor a CAT bond looks similar to a corporate bond. The investor purchases the bond with a principal payment approximately equal to the face value of the bond then receives regular periodic payments, usually quarterly. The bond has a maturity which ranges from one year to five years but is typically three years. If a covered catastrophe exceeding the "trigger" point defined in the bond's contract occurs during the period before maturity, then the bond defaults and a portion or all of the principal paid for the bond by the investor may not be returned, going to cover the issuer's indemnities. The issuer is usually a reinsurer, but may be an insurer, a government entity, a corporation, a pension fund, or even a nonprofit organization.

The principal paid for the bond is deposited in very safe securities, usually a U.S. Treasury money market fund, to ensure that the funds are kept in reserve to cover claims in the event that the covered catastrophe occurs. This practice of investing the funds in very safe securities supersedes a practice that was prevalent in the mid-2000s. At that time in order to offer investors a floating rate of LIBOR (the London Interbank Offer Rate) plus a fixed premium, issuers would enter into an interest rate swap with an investment bank counterparty. However, four CAT bonds defaulted in 2008 when one of those counterparties, Lehman Brothers, went into bankruptcy and could not honor its side of the interest rate swap. Those four defaulting CAT bonds represent one-third of all CAT bonds that have defaulted so far, the other eight having defaulted due to the occurrence of natural catastrophes.

Typically the issuer of a CAT bond uses it to cover a "slice" of risk, for example indemnities exceeding $1 billion but not to exceed $1.2 billion. In this case the amount of the bond would be $200 million. The $1 billion is called the "attachment point", at which at least a portion of principal must be attached to cover claims. The $1.2 billion mark is called the "exhaustion point", at which principal is exhausted and investors are not liable for any further claims.

The attraction of CAT bonds to investors is two-fold. First and most important, because it is the reason why the CAT bond market is likely to remain very attractive to investors for a long time and to grow steadily and rapidly, is that the risk of CAT bonds is virtually uncorrelated with the other risks that investors assume, namely the risk of equity market fluctuations, credit risk, and interest rate risk. The occurrence of natural catastrophes is in general uncorrelated with events in the broad economy such as stock market and interest rate movements and inflation. And since the abandonment of the interest rate swap contract that failed when Lehman Brothers failed, investors' principal is deposited in the safest securities available.

The second attraction to investors is that CAT bonds have been offering high rates of interest consisting of the base interest on the Treasury money market funds in which they are deposited, which currently offer only a low interest rate, plus the premium paid by the issuer for their insurance coverage feature. This interest rate has so far been high compared to the risk of default.

For the issuer the attractions of CAT bonds are that it reduces the issuer's reserve requirement, increases its insurance protection, and poses no or negligible credit risk. In addition issuers can tranche CAT bonds, for example by issuing one $200 million CAT bond to cover the slice of risk from $1 billion to $1.2 billion and another $200 million CAT bond to cover the slice from $1.2 billion to $1.4 billion. The tranche with the higher attachment point, $1.2 billion, will of course be of higher quality (lower default probability) than the tranche with the lower attachment point, $1.0 billion.

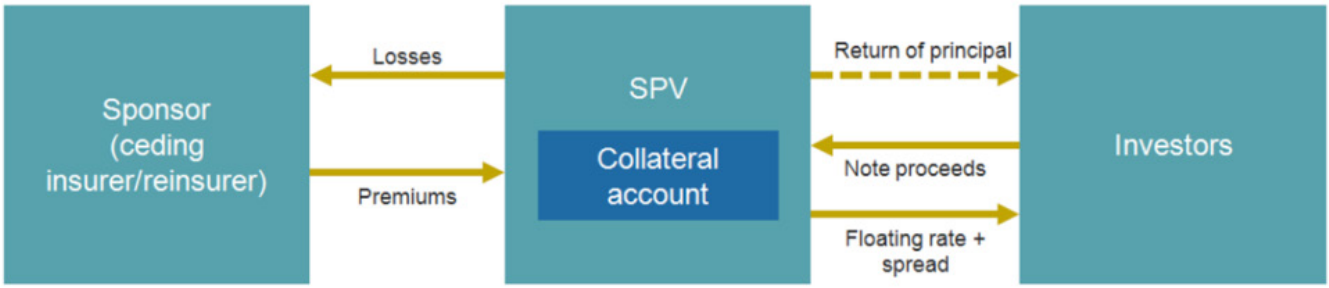

Exhibit 1: CAT bond structure;
Source: Risk Management Solutions, Inc. (2012)

Exhibit 1 shows the structure of a CAT bond transaction. The special purpose vehicle (SPV) is necessary because otherwise investors would be directly offering insurance to the issuer, which they could not do without receiving regulatory authority – a license – to assume risk under a contract of insurance. The SPV is therefore also sometimes called a "transformer" because by being licensed itself to sell insurance, it transforms the investment of funds by the investors into a sale of insurance. When domiciled in an offshore location such as Bermuda or the Cayman Islands, it also provides ease of licensing and simplified and often lowered tax requirements.

Trigger Types

The most complicated aspect of the creation of a CAT bond is defining what triggers loss of principal. Four basic trigger types are possible:

a) Indemnity trigger: covers actual excess claims paid by issuer

b) Industry loss trigger: coverage based on whole-industry losses on the extreme event

c) Parametric trigger: coverage based on exceedance of specified natural parameters

d) Modeled trigger: coverage based on claims estimated by a computer model

Indemnity trigger

The attachment point of an indemnity trigger is defined by the actual claims or losses of the CAT bond's issuer. Hence, if the attachment point is $1 billion that means that loss of principal will trigger when the claims that must be paid to claimants by the issuer total in excess of $1 billion in aggregate. If the exhaustion point is $1.2 billion (and thus, the bond issue is for $200 million) then principal will be exhausted when claims actually paid to claimants equal or exceed $1.2 billion.

The indemnity trigger is the most advantageous for the issuer because it leaves the issuer with no "basis risk", which is the difference between what reinsurance pays the issuer and what the issuer will have to pay to claimants. However, the indemnity trigger is least attractive to the investor because it poses the likelihood that the investor will have to wait a long time after the occurrence of a triggering event, and possibly a long extension period after maturity of the bond, to reclaim a portion of principal – if any – because repayment must wait for all claims to be settled. Furthermore because the issuer retains no basis risk, it poses the danger of moral hazard – the issuer will have little incentive not to underwrite excessive risks, for example homes constructed in high hurricane-risk zones.

Industry loss trigger

An industry loss trigger is based on index estimates of total industry losses on the insured event created, after the event has occurred, by an independent third party service, such as PCS (Property Claims Service) in the U.S. and PERILS in Europe. If a triggering event occurs, such as total industry losses in excess of, for example, $10 billion, then the investors are liable for the percentage of the industry represented by the CAT bond's issuer's share. This subjects the issuer to basis risk because the claims that the issuer must pay may not be exactly equal to its share of the industry loss, and the estimate made by the independent third party service of total industry losses may not be exactly equal to the actual total industry losses. However, this is more advantageous than a pure indemnity trigger for the investor because the claims are settled more quickly, once the independent third party service estimates industry losses (by surveying the participants in the industry for their estimates), and because moral hazard is lessened since the issuer assumes some basis risk.

Parametric trigger

A parametric trigger is based on the occurrence of a specific natural event, such as wind speed exceeding 120 km/hr (in a specified location), or hurricane category 5, or an earthquake exceeding 7.0 on the Richter scale. While this poses basis risk to the issuer, it is advantageous to the investor because little or no waiting time is required before settlement of the bond after a triggering event, resolution of losses is rapid and transparent, and the danger of moral hazard is low.

Modeled trigger

A modeled trigger is like an indemnity trigger, but instead of being based on actual claims it is based on claims estimated or projected by an independent modeling company. Hence, loss resolution after a triggering event can be more rapid than with a pure indemnity trigger, and the issuer retains some basis risk.

Trigger breakdown

Exhibit 2 shows the distribution of trigger types of outstanding CAT bonds as of December 31, 2013. It can be seen that most CAT bonds issued have either an indemnity trigger or an industry loss trigger. (MITT and "Various" are hybrids of the triggers.)

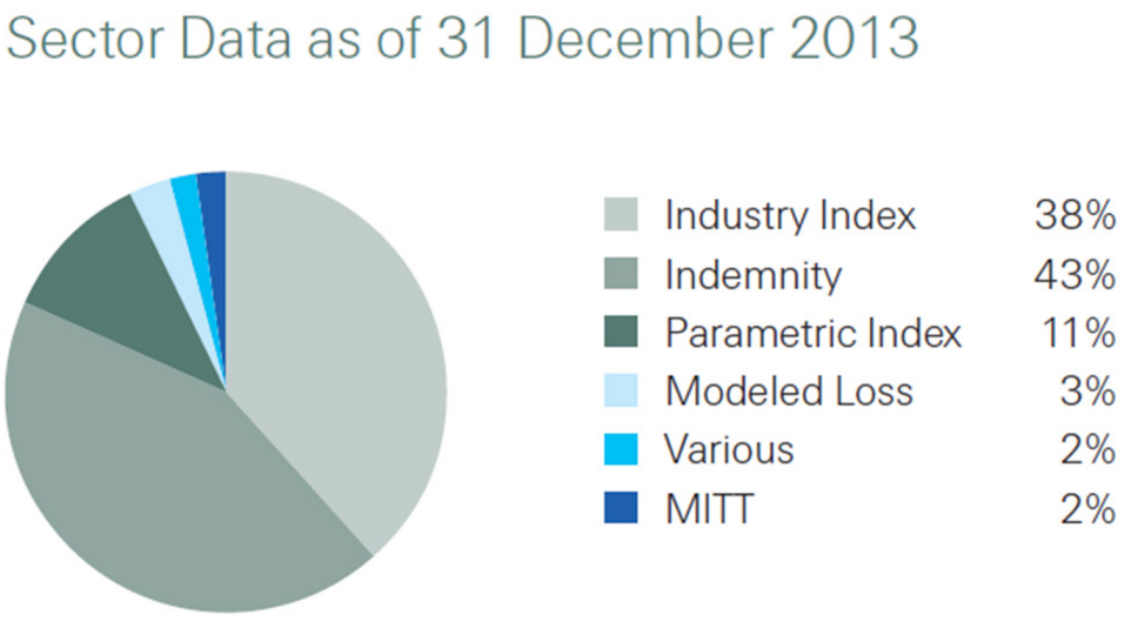

Exhibit 2: Trigger breakdown
Source: Swiss Re Capital Markets (2014)

Market Overview and Participants

The participants in the CAT bond market include issuers, structuring agents, modeling agents, ratings agencies, performance index compilers, investors, industry loss index compilers, and media. The following provides more details about these participants.

Issuers

Issuers are typically reinsurers and insurers such as Munich Re, Swiss Re, USAA, AIG, Aetna, Chubb, and Berkshire Hathaway, but can also be a government entity, corporation (e.g., electric utility), or a pension fund seeking to cover an unanticipated lengthening of longevities.

Structuring agents

Structuring agents assist the issuer in selecting the trigger type and the level of protection, that is, the attachment and exhaustion points. These are determined by what the structuring agent believes can most advantageously be sold to investors. The structuring agent also assists in placing the bond with investors. Structuring agents are usually investment banks or the capital markets arm of a major broker or insurer. Examples include Swiss Re Capital Markets, Deutsche Bank Securities, Goldman Sachs, Aon Benfield Securities, and Towers Watson Capital Markets.

Modeling agents

Modeling agents estimate the risk of the catastrophe bond. For example their models may estimate that the probability of reaching the attachment point $1 billion in a CAT bond is 1.5%, and the probability of reaching the exhaustion point $1.2 billion is 0.5%. They also model the loss in case of a modeled or industry loss trigger. The models are based on simulations of the many possible scenarios in which a catastrophe could unfold – for example paths of a hurricane or locations of the epicenter of an earthquake – and then estimating the monetary value of the damage that would take place for each scenario. There are three main modeling agents, Risk Management Solutions, Inc. (RMS), AIR Worldwide, and Eqecat.

Ratings agencies

Both Standard & Poors (S&P) and A. M. Best rate CAT bonds. S&P typically rates them at below investment grade, either BB or B rating, similar to high-yield ("junk") bonds, due to their high probability of default (historically averaging 1.4%).

Performance index compilers

The appearance of a secondary market in CAT bonds (see below) has facilitated the regular computation of average CAT bond prices and thus the calculation of performance indices, i.e., rates of return on investment over historical time periods. These computations are performed regularly by Swiss Re and Aon Benfield to present their Swiss Re Global CAT Bond Index and Aon Benfield ILS Indices, respectively.

Investors

The ultimate investors in CAT bonds are principally institutional investors such as pension funds, endowment funds and hedge funds. Primary investors are both institutional investors investing directly and dedicated ILS funds such as those managed by U.S.-based Fermat Capital Management, Inc., and Swiss-based Plenum Investments Ltd., which are organized like hedge funds and in which institutional investors and accredited individual investors can invest. Institutional investors that invest directly include such entities as TIAA-CREF, the academic and nonprofit organization retirement fund manager, Ontario Teachers fund, and hedge funds like DE Shaw and AQR.

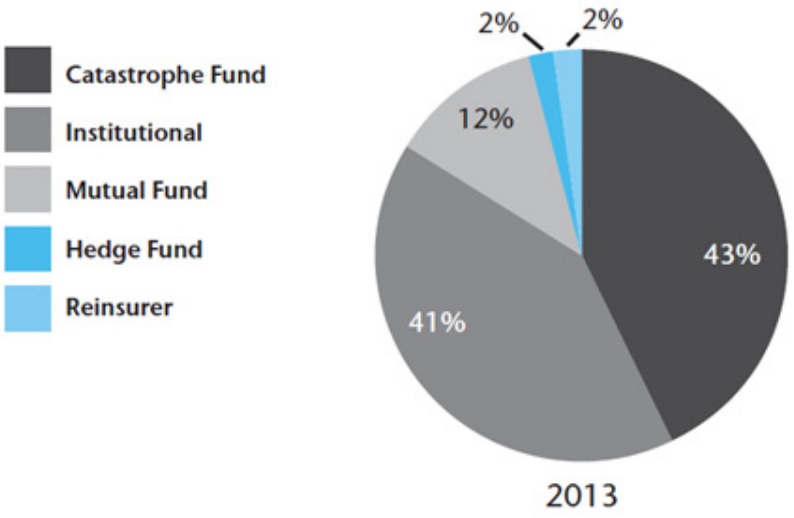

Exhibit 3: CAT bond investors by category
Source: Aon Benfield (2013)

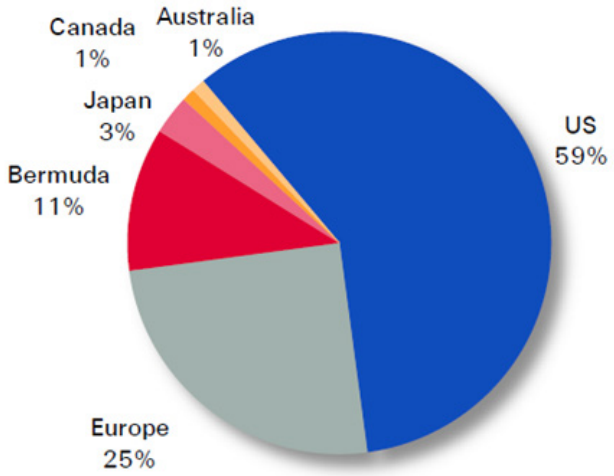

Exhibit 4: CAT bond investors by region
Source: Swiss Re Capital Markets (2014)

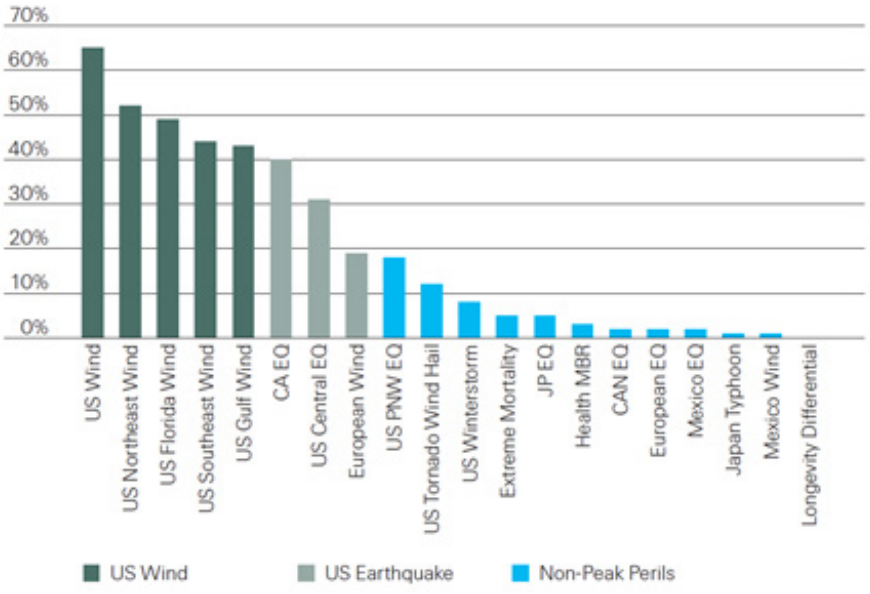

Exhibit 5: CAT bond by peril
Source: Swiss Re Capital Markets (2014)

Exhibit 3 shows the breakdown of CAT bond investors by category, Exhibit 4 shows the breakdown of investors by region, and Exhibit 5 shows the breakdown of CAT bonds by peril (figures add up to more than 100% because some CAT bonds cover more than one peril in a single bond).

Industry loss index compilers

The main compilers of industry loss estimates are Property Claims Services (PCS) in the U.S. and PERILS in Europe. Estimates are made through confidential surveys of "insurers, agents, adjusters, public officials, and others" to gather data on claims volumes and amounts, which are then combined with trend factors to determine a loss estimate (PCS, 2014). PERILS industry index values are generally made available six weeks after a triggering event, with updates after three, six, and twelve months (PERILS, 2014).

Media

The Bermuda-based online web site ARTEMIS (www.artemis.bm) provides extensive news coverage of CAT bonds, insurance-linked securities, and reinsurance capital and investment.

The CAT Bond Market, Returns, Spreads, and Ways to Invest

CAT bond offerings are customarily structured as private placements. The placement agent / (structuring agent) contacts a limited number of prospective investors to place them. No CAT bonds are publicly offered or traded in the U.S. A secondary market exists in which CAT bonds are transferred among qualified institutional buyers, facilitated by a market maker, based in the U.S. on the Rule 144A exemption. Secondary market transactions are about equal in volume to primary market transactions. Demand at year end 2013 exceeded supply (some issues traded in the secondary market immediately after issue at 1-2% premiums); thus, of the 10.8% 2013 Swiss Re Cat Bond Global Index return the price component returned 2.2% while the coupon component returned 8.5%.

Issuance of CAT bonds peaked at over $7 billion in 2007 but declined after the defaults caused by interest rate swaps that were not honored after the Lehman bankruptcy. Since 2009 however, issuance of CAT bonds has increased rapidly, reaching USD7.42 billion in 2013 in 31 transactions. At year-end 2013 there were USD20 billion in CAT bonds outstanding. In the first half of 2014 18 CAT bonds were issued totaling $5.7 billion, with $4.5 billion of that in the second quarter. (Property Claims Services, 2014b; Swiss Re, 2014; artemis.bm, 22 January 2014 and 19 February 2014.) CAT bond default rates have been low, with defaults approximately in line with or below model estimates. Defaults have totaled about 1.4% of principal on average. There have been twelve defaults in total, four of them due to the Lehman bankruptcy and its consequent interest rate swap defaults. Three CAT bonds defaulted in 2011 – two due to tornados in the U.S. Midwest and one due to the 2011 Tōhoku earthquake and tsunami in Japan – and none defaulted in 2012 and 2013. (Plenum, 2011, 2012, 2013.) CAT bond spreads (interest rates in excess of U.S. Treasury rates) are about 2-3% higher than those of comparably-rated high-yield corporate bonds (Swiss Re, 2014). Rates of return have averaged in the range of 7-9% annually since 2002 with little volatility.

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Michael Edesess, a mathematician and economist, is a senior research fellow in the Centre for Systems Informatics Engineering at City University of Hong Kong, a principal and chief strategist of Compendium Finance, and a research associate at EDHEC-Risk Institute. In 2007, he authored a book about the investment services industry titled *The Big Investment Lie*, published by Berrett-Koehler. His new book, *The Three Simple Rules of Investing*, coauthored with Kwok L. Tsui, Carol Fabbri, and George Peacock, was published in June 2014 by Berrett-Koehler. He writes regularly for the online publication *Advisor Perspectives*.

Extending Rules-Based Factor Portfolios to a Long-Short Framework

Jennifer Bender, PhD

Taie Wang

Why Extend Factor Investing to Long-Short?

While long-short strategies are commonplace in the arena of hedge funds, they are relatively new in the world of factor investing. (This includes our own definition of advanced beta and many forms of smart beta, systematic investing, risk premia investing, etc.) Advanced beta involves capturing well-known factors in simple rules-based ways typically in long-only portfolios; see [Ang et al. [2009], Bender et al. [2013]. By construct, we choose not to employ optimization or other well-known techniques since these portfolios are meant to be simple, rules-based, and transparent—in other words, a benchmark that any active strategy should be able to improve upon.

Why extend factor investing to long-short portfolios in the first place? Depending on whom you speak to, shorting is either a boon to investing or the devil in disguise. Jacobs and Levy [1993] pointed out that "investors who are able to overcome short-selling restrictions and have the flexibility to invest both long and short can benefit from winners and losers." Using a neat analogy about a hypothetical Yankees fan with perfect foresight, clearly he or she would benefit from being able to bet on the Mets losing, not just the Yankees winning.

Similarly, factor investing is based on faith or belief in the power of the risk premia captured by that set of attributes. Harnessing the full risk premium requires shorting. If an investor has a view that undervalued stocks will generally outperform, the corollary is that overvalued stocks will generally underperform. In a long-only portfolio, the investor can overweight the low valuation stocks but the most he can do is choose to not hold the high valuation stocks. The long-short framework allows the investor to more fully express the Value factor by actually shorting the high valuation stocks.

Building Long-Short Factor Portfolios: Simple Quintiles

Factor portfolios can be built using a simple methodology. First, a universe of stocks is ranked or sorted based on the security attribute in question. In long-short space, one would then go long the securities that are most attractive along that attribute and short the securities that are unattractive. Specifically, within some pre-defined universe:

- Value: Long lower valuation securities, short higher valuation securities
- Low Volatility: Long lower volatility securities, short higher volatility securities
- Quality: Long higher quality securities, short lower quality securities
- Size: Long smaller cap securities, short larger cap securities
- Momentum: Long higher momentum securities, short lower momentum securities

A pitfall of such a simple approach is that the resulting portfolio may have certain biases, such as at the sector or country level. Also, there may be a bias towards another factor; for instance if Value and Size are correlated at the time of construction, the Value portfolio will partially be a Size portfolio and vice versa. The advantage of such an approach is that it is clear how a portfolio is formed; that is, the resulting holdings in the portfolio are easy to explain.

Exhibit 1 shows the results of sorting the securities and forming quintiles (in which securities are equally weighted), where quintile 1 (Q1) consists of securities that are most attractive along the attribute in question, and quintile 5 (Q5) consists of the securities that are most unattractive. (We acknowledge that the choice of quintiles over quartiles or any other unit of segmentation is somewhat arbitrary here.) Returns shown are gross of assumed transactions costs. We use broadly accepted definitions of the factors.[1]

Given that these are factors that have been shown by a swath of academics to have a premium over the long run, it should come as no surprise that Q1 securities invariably have had higher returns over the last 25 years than Q5 securities. Interestingly, there are differences across the factors; Value and Quality for instance are factors where Q1 securities have much larger returns than Q5 securities, but Q2 through Q4 returns are rather flat (and not differentiated).

We construct long-short portfolios by going long the Quintile 1 portfolios and short the Quintile 5 portfolios in Exhibit 1. The annualized average return and volatilities, gross of transactions costs, are shown for these long-short portfolios in Exhibit 2.[2] The Value portfolio earns the highest returns historically by far, followed by Momentum, Quality, and Volatility. While all four portfolios have earned positive historical returns, Quality and Volatility have not outperformed the US 1-Month T-bill (which along with Libor is generally the benchmark for long-short strategies).

	Value	Quality	Volatility	Momentum
Q1	13.05%	10.16%	10.78%	11.67%
Q2	9.91%	9.04%	9.63%	10.49%
Q3	8.69%	8.83%	8.79%	8.42%
Q4	7.49%	8.02%	7.61%	6.68%
Q5	2.70%	6.08%	4.53%	3.90%

Exhibit 1: Annualized Returns (December 31, 1989 to August 31, 2014, Rebalanced Monthly, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

	Value	Quality	Volatility	Momentum	US 1M T-Bill	MSCI World Index
Annualized Returns	9.30%	2.30%	1.50%	3.27%	2.97%	7.06%
Annualized Volatility	15.82%	9.38%	18.79%	20.23%	0.62%	15.24%
Sharpe Ratio*	0.59	0.24	0.08	0.16	0.00	0.27

Exhibit 2: Performance of Long-Short Portfolios (December 31, 1989 to August 31, 2014, Rebalanced Monthly, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.
Note that because the long-short portfolio returns do not include the cash return, the Sharpe Ratio shown here is calculated as: (portfolio return + cash return – cash return)/(portfolio return volatility).
*Note: To compute annualized returns, we do not subtract the annualized return of Q5 from Q1. Instead we compute monthly spreads (return difference) between the Q1 and Q5 portfolios, and take the annualized geometric mean of this time series. Asset base is adjusted monthly in all figures. All portfolios are notional neutral.

Notional Neutral versus Beta Neutral

So far we have assumed that the weight in the long portfolio is 100% and the weight in the short portfolio is 100%. This is the same as a notional-neutral or dollar-neutral strategy in which the long and short portfolios have equal dollar amounts. Specifically, we assume we have $100 in the long portfolio, $100 is shorted in the short portfolio, and we hold $100 in cash. Leverage is fixed for a notional-neutral portfolio so if the strategy is long one dollar and short one dollar for every dollar of invested capital, as in our framework, the leverage is 2:1. Note that leverage is fixed at the time of rebalancing but can drift in between rebalancing dates.[3] We do not include the cash return in any of the results shown for the remainder of the paper though in practice, an investor would earn some amount of interest on that amount. Unless otherwise stated, all returns are gross of transaction costs.

We showed results for notional neutral portfolios previously. However, as we show in Exhibit 3, they all have historically exhibited significantly non-zero beta.[4] Most factor portfolios have had negative beta on average (the long portfolios have generally had lower beta than the short portfolios have).[5] This significant negative beta reflects a sizable exposure to market risk; the returns to the portfolios are effectively penalized by the fact that the market has generally gone up during the two-decades in question. In addition, constructing the portfolios such that they are beta neutral (or market neutral) may have the merit of potentially being employed as a diversified uncorrelated source of return when layered onto an existing equity portfolio.

We examine the impact of beta-neutralizing the portfolios each month by forcing the beta of the long portfolio to be the same as the short portfolio. Specifically we calculate the weighted average beta of the final long and final short portfolios using historical 60-month betas to the MSCI World.[6] We then assign a weight of 100% to the portfolio (long or short) with the lower relative beta, and assign a weight to the higher beta portfolio proportional to their betas:

$$w_{low\_beta} = 100\% \quad (1)$$

$$w_{high\_beta} = \frac{\beta_{low\_beta}}{\beta_{high\_beta}} \quad (2)$$

Why would beta neutralizing the portfolios be desirable? A portfolio with a beta of zero will be completely uncorrelated with the market and thus attractive if the investor's objective is to offset losses to the existing equity portfolio when there are equity market drawdowns.

Exhibit 4 shows the results of beta neutral factor portfolios. Ex post betas are reasonably close to zero and compared to the dollar-neutral portfolios, exhibit lower annualized volatility and improved risk-adjusted returns. Returns are meaningfully higher in the case of Quality, Volatility, and Momentum.

	Value	Quality	Volatility	Momentum	US 1M T-Bill	MSCI World Index
Annualized Returns	9.30%	2.30%	1.50%	3.27%	2.97%	7.06%
Annualized Volatility	15.82%	9.38%	18.79%	20.23%	0.62%	15.24%
Sharpe Ratio	0.59	0.24	0.08	0.16	0.00	0.27
Beta vs MSCI World	0.001	-0.30	-0.81	-0.44	0.00	1.00

Exhibit 3: Long-Short Portfolios (December 31, 1989 to August 31, 2014, Rebalanced Monthly Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

	Value	Quality	Volatility	Momentum	US 1M T-Bill	MSCI World Index
Annualized Returns	9.54%	5.13%	8.44%	6.49%	2.97%	7.06%
Annualized Volatility	14.99%	6.59%	8.32%	13.67%	0.62%	15.24%
Sharpe Ratio	0.64	0.78	1.02	0.47	0.00	0.27
Beta vs MSCI World	0.13	(0.04)	0.07	0.03	0.00	1.00

Exhibit 4: Long-Short Portfolios, Beta Neutral, Netted (Monthly Rebalancing, December 31, 1989 to August 31, 2014, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

	Value	Low Volatility	Quality	Momentum
Value	1.00			
Low Volatility	0.06	1.00		
Quality	-0.43	0.56	1.00	
Momentum	-0.35	0.56	0.48	1.00

Exhibit 5A: Correlation of Long-Short Portfolios, Notional Neutral (December 31, 1989 to August 31, 2014, Rebalanced Monthly, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

	Value	Low Volatility	Quality	Momentum
Value	1.00			
Low Volatility	0.22	1.00		
Quality	-0.45	0.23	1.00	
Momentum	-0.36	0.31	0.35	1.00

Exhibit 5B: Correlation of Long-Short Portfolios, Beta Neutral (December 31, 1989 to August 31, 2014, Rebalanced Monthly, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

Combining Multiple Factors

The analysis so far has focused on individual factor portfolios. What if we were to combine multiple factors in a single portfolio? Exhibit 5 shows the long-term correlations between the factor portfolios, both notional neutral and beta neutral. Combining multiple factors can provide the benefit of diversification, as an investor could take advantage of the low, sometimes negative correlations, between factor portfolios to achieve more consistency in performance. Correlations can of course vary substantially over time but over the long term, there have been significant diversification opportunities across the factors.

Factors also behave differently depending on the market or macro regime. Gupta et al. [2014] find that Momentum and Size have historically performed best in high growth regimes, while Low Volatility has historically done well in low growth and high inflation periods. Furthermore, Quality has historically done well as economic growth slows. Exhibits 6A and 6B highlights these patterns with the cumulative returns of both the dollar-neutral and beta-neutral factor portfolios over time.

We next combine the individual factor portfolios using equal weights. Unlike typical hedge fund strategies where securities are specifically selected for the long and short portfolios, multiple factor portfolios can have overlapping names in the combined long and short portfolios. For instance, a security can show up in the long portfolio for Value and in the short portfolio for Momentum. We "net" these trades out. The netted portfolio return is different from the combined, non-netted portfolio, due to compounding effects. Netting also can meaningfully impact turnover and transaction costs, which are discussed in the next section.

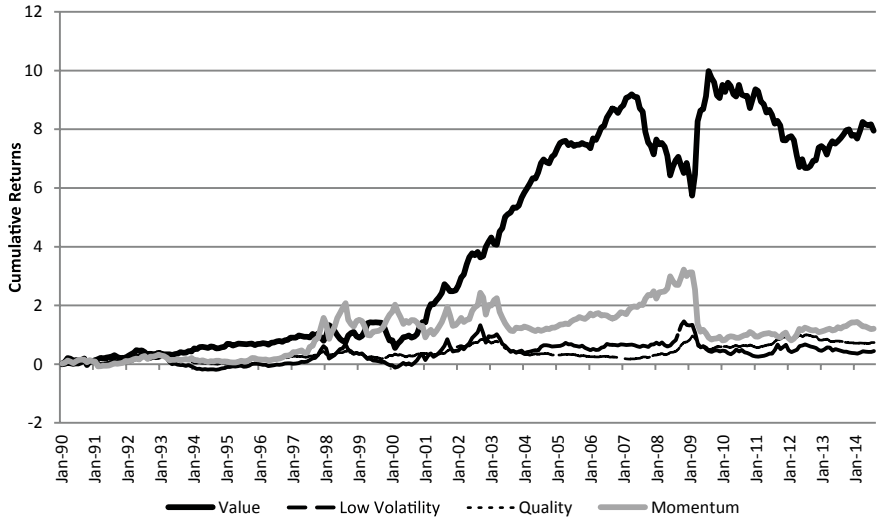

Exhibit 6A: Cumulative Returns of Long-Short Portfolios, Dollar Neutral (December 31, 1989 to August 31, 2014, Rebalanced Monthly, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

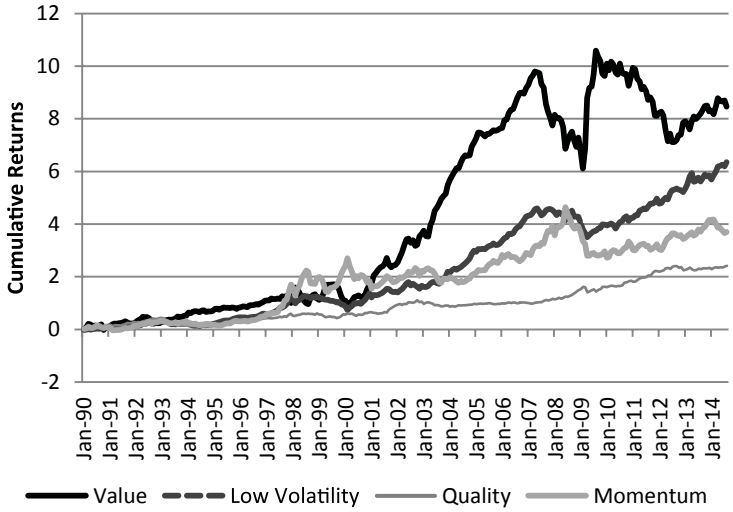

Exhibit 6B: Cumulative Returns of Long-Short Portfolios, Beta Neutral (December 31, 1989 to August 31, 2014, Rebalanced Monthly, Universe = MSCI World Index)
Source: MSCI World Index and Authors' calculations.

The equally weighted combination of the four factor portfolios is shown in Exhibit 7. Only the notional neutral version is shown here for illustration (a beta-neutral version using a modified rebalancing scheme is later shown in Exhibit 12).[7] Combining the four portfolios results in a portfolio with 7.61% annualized returns, which is notably higher than the average return of the individual four factor portfolios of 4.09%. This result is due to netting, and the compounding effects that arise.[8]

There are of course other ways we can build long-short multi-factor portfolios besides combining individual factor portfolios. One reasonable and intuitive way is to take into account all factor attributes simultaneously when selecting the securities for the long and short portfolios. To illustrate, we create normalized scores ranging from -3 to 3 for each security and each factor. We average the four factor scores for each security and bucket them into quintiles. We then go long the top quintile (using the average score) and short the lower quintile. Exhibit 8 compares the results of this method with Exhibit 7. The annualized returns improve from 7.61% to 8.31%; however the annualized volatility increases, the Sharpe Ratio decreases, and the beta also decreases.

Exhibits 7 and 8 illustrate the power of combining factors using dollar-neutral portfolios. The combined portfolio by construction is dollar neutral as well and likewise exhibits a large negative beta. The power of diversification is equally compelling for beta-neutral portfolios. Later in Exhibit 12 we show the results of combining the notional-neutral portfolios and beta neutralizing the combined portfolio.

Rebalancing Mechanisms to Mitigate Turnover

Last but not least, we address the challenge of turnover. Exhibit 9 displays two-way annual turnover for the long-short factor portfolios along with the estimated drag on returns incurred under a range of transaction cost assumptions (20 to 50 bps). (Details on how we calculate turnover appear in Appendix A.) Note that for transaction costs, we not include borrow costs for the short positions, which we address later in Section 6.[9]

The turnover numbers in Exhibit 9 are orders of magnitude higher than the 6-10% turnover for the market cap weighted index and the 30-50% two-way turnovers that long-only factor portfolios generally experience. On the other hand, it is not uncommon to see two-way annual turnover for long-only active strategies between 150-300% and long-short strategies 3 to 4 times higher.

Subtracting the estimated drag from the annualized returns shown in the first row of Exhibit 9 would give us the transaction-cost-adjusted return. Transaction costs would clearly erode a

	Value	Quality	Volatility	Momentum	Combined Four Factor	US 1M T-Bill	MSCI World Index
Annualized Returns	9.30%	2.30%	1.50%	3.27%	7.61%	2.97%	7.06%
Annualized Volatility	15.82%	9.38%	18.79%	20.23%	15.72%	0.62%	15.24%
Sharpe Ratio	0.59	0.24	0.08	0.16	0.48	0.00	0.27
Beta vs MSCI World	0.001	-0.30	-0.81	-0.44	-0.64	0.00	1.00

Exhibit 7: Performance of Long-Short Factor Portfolios, Notional Neutral, Netted (December 31, 1989 to August 31, 2014, Rebalanced Monthly, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.
Note: Individual factor portfolios use simple quintiles (long Q1, short Q5). The combined four factor portfolio combines these in equal weight and nets out positions.

	Value	Quality	Volatility	Momentum	Combined Four Factor	Combined Four Factor (Security-Level)	US 1M T-Bill	MSCI World Index
Annualized Returns	9.30%	2.30%	1.50%	3.27%	7.61%	8.31%	2.97%	7.06%
Annualized Volatility	15.82%	9.38%	18.79%	20.23%	15.72%	18.47%	0.62%	15.24%
Sharpe Ratio	0.59	0.24	0.08	0.16	0.48	0.45	0.00	0.27
Beta vs MSCI World	0.001	-0.30	-0.81	-0.44	-0.64	-0.75	0.00	1.00

Exhibit 8: Performance of Long-Short Portfolios, Notional Neutral, Netted (December 1989 to August 2014, Rebalanced Monthly, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

significant amount of the return across all factors. The question remains whether there are ways to reduce the turnover of the strategies while still preserving the returns.

First we explore whether rebalancing quarterly would solve the problem. As shown in Exhibit 10, the turnover can be reduced significantly; however, the returns for Quality, Volatility, and Momentum are greatly diminished. Unlike long-only tilted portfolios, in which Quality and Volatility can be captured using annual rebalancing and Momentum can be captured using quarterly rebalancing, the use of a more concentrated stock universe (quintiles) and their weightings require more frequent rebalancing.

Second we explore whether we can maintain the monthly rebalancing frequency but mitigate the turnover with buffer rules. Specifically, we allow stocks that have previously been in Q1 but drop to the top half of Q2 to remain in the long portfolio; these securities stay in the long portfolio indefinitely until they fall below the top half of Q2.[10] Similarly, securities that have previously been in Q5 but move to the bottom half of Q4 continue to be shorted, and held indefinitely unless they move above the bottom half of Q4. While this does introduce an element of path dependency to the long-short portfolios, we believe it is the lesser of necessary evils if one wants to capture the factors. Effectively the buffer rules find a half-way point between monthly and quarterly rebalancing.

Exhibit 11 shows the results with the buffer rules in place. We find that turnover can be mitigated by using simple buffer rules while still preserving some of the excess returns. After subtracting the estimated drag, the returns to Value, Quality, Volatility, and Momentum would have been 8.08%, 0.62%, 0.48%, and 0.33% respectively. These annualized returns are all positive, though with the exception of Value, are quite small.

Similar to the dollar neutral portfolios shown in Exhibit 11, the rebalancing buffer is equally helpful in reducing the turnover of beta neutral portfolios (Exhibit 12). Because the annualized returns are historically higher for beta-neutral Quality, Volatility, and Momentum portfolios, the returns (after costs have been accounted for) are far more compelling than the dollar-neutral portfolios. After subtracting the estimated drag, the returns to Value, Quality, Volatility, and Momentum would have been 6.50%,

	Value	Quality	Volatility	Momentum
Annualized Returns	9.30%	2.30%	1.50%	3.27%
Annualized Volatility	15.82%	9.38%	18.79%	20.23%
Sharpe Ratio	0.59	0.24	0.08	0.16
Beta vs MSCI World	0.00	-0.30	-0.81	-0.44
Two-Way Annual Turnover (Monthly Rebalancing)	603%	381%	424%	1339%
Estimated Drag in bps (Assuming 20 bps one way)	121	76	85	268
Estimated Drag in bps (Assuming 30 bps one way)	181	114	127	402
Estimated Drag in bps (Assuming 40 bps one way)	241	152	170	536
Estimated Drag in bps (Assuming 50 bps one way)	303	190	213	670

Exhibit 9: Turnover for Long-Short Portfolios, Dollar Neutral, Netted (Monthly Rebalance, December 31, 1989 to August 31, 2014, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

	Value	Quality	Volatility	Momentum
Monthly Rebalance				
Annualized Returns	9.30%	2.30%	1.50%	3.27%
Two-Way Annual Turnover (Monthly Rebalancing)	603%	381%	424%	1339%
Estimated Drag in bps (Assuming 30 bps one way)	181	114	127	402
Annualized Return Minus Drag	7.49%	1.16%	0.23%	-0.75%
Quarterly Rebalance				
Annualized Returns	8.81%	1.58%	-0.08%	0.32%
Two-Way Annual Turnover (Monthly Rebalancing)	358%	264%	271%	744%
Estimated Drag in bps (Assuming 30 bps one way)	107	79	81	223
Annualized Return Minus Drag	7.74%	.79%	-0.89%	-1.91 %

Exhibit 10: Turnover for Long-Short Portfolios, Dollar Neutral, Netted (Monthly Rebalance vs. Quarterly Rebalance, December 31, 1989 to August 31, 2014, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

3.53%, 7.44%, and 2.25% respectively. When combined together, an equally weighted, beta-neutral combination of the Value, Quality, Volatility and Momentum factor portfolios would have earned 8.42% after subtracting the estimated drag of 161 bps from the 10.03% return.

The Costs and the Risks of Shorting

It is well known that one of the biggest challenges to managing a long-short strategy is the cost of shorting. So far we have looked at transaction costs but have not included additional costs related to shorting such as borrowing costs. Historical shorting costs are difficult to obtain and may not necessarily be indicative of current or future costs.

That said, to get a sense of shorting costs, we look next at short scores. In the portfolios we have shown, the long and short portfolios for each factor have roughly 300 names each. This is a relatively diversified portfolio (not concentrated) but because the securities are equally weighted, there is a bias in both the short and long portfolios towards smaller more illiquid names. And in the short portfolio, these names may have very high shorting costs. Utilizing shorting scores from Data Explorer, we analyze whether the cost of shorting for our portfolios is significantly higher than the underlying universe or not. Data Explorer assigns each security in the universe a short score ranging from 0 to 5, where 0 being the least expensive to short and 5 the most expensive. The following table and charts show the score distribution of the MSCI World universe versus our

	US 1M T-Bill	MSCI World Index	Value	Quality	Volatility	Momentum	Combined Four Factor (Equally Weighted)
Monthly Rebalance with Buffer (Notional Neutral)							
Annualized Returns	2.97%	7.06%	8.59%	1.55%	1.42%	2.84%	6.45%
Annualized Volatility	0.62%	15.24%	15.07%	8.94	17.49%	19.84%	15.36%
Sharpe Ratio	0.00	0.27	0.57	0.17	0.08	0.14	0.42
Beta vs MSCI World	0.00	1.00	-0.08	-0.28	-0.74	-0.40	-0.61
Two-Way Annual Turnover (Monthly Rebalancing)			338%	311%	313%	837%	553%
Estimated Drag in bps (Assuming 30 bps one way)			101	93	94	251	166
Annualized Return Minus Drag			7.58%	0.62%	0.48%	0.33%	4.79%

Exhibit 11: Performance and Turnover for Long-Short Portfolios, Dollar Neutral, Netted (Monthly Rebalance with Buffer, December 31, 1989 to August 31, 2014, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

	US 1M T-Bill	MSCI World Index	Value	Quality	Volatility	Momentum	Combined Four Factor (Equally Weighted)
Monthly Rebalance with Buffer (Beta Neutral)							
Annualized Returns	2.97%	7.06%	7.50%	4.42%	8.15%	4.82%	10.03%
Annualized Volatility	0.62%	15.24%	12.90%	6.38%	8.15%	13.03%	8.17%
Sharpe Ratio	0.00	0.27	0.58	0.69	1.00	0.37	1.23
Beta vs MSCI World	0.00	1.00	-0.02	-0.03	-0.09	-0.04	0.01
Two-Way Annual Turnover (Monthly Rebalancing)			333%	295%	237%	855%	537%
Estimated Drag in bps (Assuming 30 bps one way)			100	89	71	257	161
Annualized Return Minus Drag			6.50%	3.53%	7.44%	2.25%	8.42%

Exhibit 12: Performance and Turnover for Long-Short Portfolios, Beta Neutral, Netted (Monthly Rebalance with Buffer, December 31, 1989 to August 31, 2014, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

	MSCI World	Value	Quality	Volatility	Momentum
0 (Lowest)	36.64%	30.00%	33.29%	28.37%	29.02%
1	45.39%	49.11%	44.91%	45.91%	45.37%
2	12.52%	14.34%	14.26%	16.22%	15.74%
3	3.44%	4.00%	4.85%	5.84%	5.97%
4	1.17%	1.42%	1.70%	2.32%	2.39%
5 (Highest)	0.85%	1.13%	0.99%	1.34%	1.50%
Mean	0.90	1.01	1.00	1.12	1.12
Standard Deviation	0.93	0.96	0.99	1.04	1.06

Exhibit 13: Weight of Portfolios in Various Short Score Categories Reflecting Shorting Costs (Portfolio Averages, 2006 to 2014)
Source: SSgA, Factset, Data Explorer

short portfolios. In the bottom two rows of Exhibit 13, the average short score of each of the short portfolios over the period 2006 to 2014 is shown as well as the standard deviation across scores. These average scores are all higher than the universe (suggesting that it is more expensive to short the portfolio compared with the universe) however not meaningfully higher.

Also shown in Exhibit 13 is the percentage of each factor portfolios' short portfolio in each category. The weights of all four factors in the most expensive category (Category 5) are not significantly higher than the MSCI World's percentage of 0.85%. To the extent that the MSCI World Index as a portfolio remains relatively easy and not too expensive to short, we would expect the short sides of the factor portfolios to be similar and within a narrow range.

If we assume that shorting costs for the factor portfolios are generally around the shorting costs for an MSCI World universe (cap-weighted), we can assume the costs of shorting might be in the range of 20 to 50 bps. Returning to Exhibit 12, we could further adjust the returns as shown in Exhibit 14 using the conservative estimate of 50 bps. The potential performance benefits of the beta-neutral factor portfolios do in fact remain viable.

That said, shorting costs do not capture the dangers of shorting. These include the potential for infinite losses, the risks of shares being recalled, inability by the investor to meet margin requirements, and the potential that counterparties may just stop lending out securities to short altogether. If the strategy underperforms significantly, margin calls may force positions to be liquidated. Short squeezes may occur, when prices of appreciating shorted securities further rise as existing short sellers buy shares to cover their short positions. Losses may be limited on the long side but they are infinite on the short side. These risks are difficult to quantify but are critical to manage. This paper does not claim to address these important risks but they are nevertheless paramount to the viability of long/short factor investing.

Conclusion

The idea of extending factor portfolios to a long-short framework has the merit of allowing investors to more fully express their factor beliefs by being able to short names that are less desirable along the relevant attribute. Here we explore the implications of

	US 1M T-Bill	MSCI World Index	Value	Quality	Volatility	Momentum	Combined Four Factor (Equally Weighted)
Annualized Returns	2.97%	7.06%	7.50%	4.42%	8.15%	4.82%	10.03%
Estimated Drag from Transaction Costs in bps (Assuming 30 bps one way)			100	89	71	257	161
Estimated Drag from Shorting Costs in bps (Assuming 50 bps)			50	50	50	50	50
Annualized Returns Minus Drag from Both Transaction and Shorting Costs			6.00%	3.03%	6.94%	1.75%	7.92%

Exhibit 14: Estimated Costs for Long-Short Portfolios, Beta Neutral, Netted (Monthly Rebalance with Buffer, December 31, 1989 to August 31, 2014, Universe = MSCI World Index)
Source: MSCI World Index and authors' calculations.

extending the simple rules based framework to portfolios that can employ leverage. These portfolios could be used as potential benchmarks for long-short strategies, particularly factor-based active strategies which should in theory add value over these simple rules-based portfolios. These portfolios could also serve as investable solutions, either as candidates for alternatives mandates or to complement existing long-only portfolios.

Our results show that long-short factor portfolios have historically provided compelling performance even after costs are accounted for. Not all factors are created equal--some factors are more compelling than others in terms of their historical returns and volatility. Importantly, the choice to construct portfolios as dollar neutral versus beta neutral has a significant impact on the historical returns. Dollar neutral portfolios, particularly for Low Volatility, have historically exhibited large negative betas, exposing them to market risk. Factors such as Low Volatility and Quality are thus less compelling when captured in a dollar neutral framework versus a beta neutral framework. Ways to mitigate turnover can be introduced such that the potential performance benefits of these strategies are still compelling even after costs are accounted for.

Moreover, combining factors yields strong benefits as the factors diversify each other over time. Netting trades that overlap from one factor to another has a large impact in the long/short framework, producing sizable reductions in turnover relative to the collection of individual standalone portfolios.

That said, there are two main challenges. First, it is well-known that factors are cyclical and can experience periods of underperformance. Implementing long-short versions of the factors means these periods of underperformance will generally be magnified. Second, shorting itself entails significant risks. However, for investors willing to bear the risks associated with shorting, our results indicate that long-short factor investing can be viable.

Endnotes

The authors would like to thank Ric Thomas, Geoffrey Kelley, Rob Shapiro, and Ke Cheng for their many contributions to this research. We would also like to thank Volodymyr Zdorovtsov, John Tucker, Michael Feehily, Frederic Jamet, Scott Conlon, Richard Hannam, Karl Schneider, and Emiliano Rabinovich for their helpful comments and insights.

1. Valuation is measured by the equally weighted average of price-to-fundamental ratios where the fundamentals are Earnings, Cash Flow, Sales, Dividend, and Book Value. Volatility is measured by 12-month variance of USD return. Size is measured by free-float adjusted USD market capitalization. Momentum is measured by the trailing 12 month's local return minus the last month's return. Quality is measured by the equally weighted average score across return-on-assets, earnings-per-share variability, and long-term debt-to-equity. These are equally weighted
2. It should be noted that the return of the long/short portfolio is the difference (or spread) between the the Q1 and Q5 portfolios, for which we show the annualized geometric mean in Exhibit 2. This return figure can differ significantly from subtracting the annualized Q5 return from the annualized Q1 return shown in Exhibit 1. For instance, the annualized return for Quality is 2.3% but the difference between the Q1 and Q5 annualized returns in Exhibit 1 was 10.16% minus 6.08% which is 4.08 percentage points. This is primarily due to compounding. For Low Volatility, where the difference is even more stark, the difference between the two is also due to beta.
3. The rebalancing mechanics are simply illustrated as follows: Suppose we hold $100 in the long portfolio,-$100 in the short portfolio and an equivalent amount in cash. Within a given month, the dollar amount of each portfolio will vary with returns such that the portfolio will not be perfectly notional neutral, but at the end of each month, we rebalance back to notional neutral. Specifically, if the long portfolio outperforms the short portfolio (say the long portfolio now is now worth $110, while the short portfolio is worth $90),

we sell a proportional amount of the short holdings ($30) and reinvest $20 into cash, and $10 into the long portfolio. So now both the long, the short and the cash are at $120. Rebalancing the beta neutral portfolios follows the same process as above except that instead of rebalancing back to $100 long, $100 short in the above example, we would rebalance back to the beta neutral amounts, for example $100 long, $70 short.

4. Beta of the notional-neutral portfolios are computed as the beta of the long-short spread against MSCI World Index returns. Beta of the beta-neutral portfolios are computed as the beta of the beta-neutral portfolio returns relative to the MSCI World Index returns.

5. We highlight that Momentum counterintuitively has a negative beta of -0.44 in Exhibit 3. This is because the long portfolio has a beta of 0.93 while the short portfolio has a beta of 1.37. The low momentum losers tend to exhibit significantly greater volatility than the high momentum winners.

6. We tested alternative versions with 36-month historical beta, Axioma predicted beta, and Axioma historical beta. The results, while different depending on the factor, were qualitatively similar. 60-Month Historical beta was chosen for simplicity.

7. For the beta-neutral version, the notional neutral portfolios are first combined and the beta neutralization applied afterwards.

8. Readers may note that combining long-only factor portfolios produces a portfolio with characteristics that generally average the individual portfolios (with diversification between factor portfolios lowering the overall volatility and improving the Sharpe and Information Ratios). Here, there are much greater differences that arise when factors are combined and this is both due to factor diversification and netting but largely the result of the latter. For example, in each single factor long-short portfolio, we only select stocks that reflect the best/worst of that dimension. Then when we combine the portfolios, securities that are desirable in one dimension but undesirable in another dimension will be netted out. Only securities that are desirable simultaneously across all dimensions will be held in the final long portfolio. Similarly, only securities that are undesirable simultaneously across all dimensions will be held in the final short portfolio.

9. For instance, if we assume the transaction cost is 20 basis points, the 20 basis points would apply to a one-way trade, such that trading $100 of any security either on the long or short side would incur 2 cents.

10. Note that securities that have previously been in Q1 and remain in Q1 in subsequent months are held indefinitely in the long portfolio. To preserve the number of securities in the long portfolio to be 1/5 of the universe, securities that are the lowest ranked in Q1 are not held in lieu of those names in Q2 that remain because of the buffer rule. Similarly, securities that have previously been in Q5 and remain in Q5 in subsequent months are held indefinitely in the short portfolio. And again, to preserve the number of securities in the short portfolio to be 1/5 of the universe, securities that are the highest ranked in Q5 are not held in lieu of those names in Q4 that remain because of the buffer rule.

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Appendix A: Turnover Calculation

The turnover for the long-short portfolio from period t to t+1 will be the total changes of security values at the beginning of period t+1 versus the end of period t, as well as the notional amount changes in the long and short portfolio and the resulting security value changes, divided by the average of the long and the short portfolio values at the end of period t. Further details on the turnover calculation may be obtained upon request from the authors.

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Patient Capital, Private Opportunity: The Benefits and Challenges of Illiquid Alternatives

Avi Sharon, CAIA
Principal
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The Illiquid Opportunity

All less liquid financial assets include some "premium" because investors value cash, the most liquid of financial instruments. Recent attempts to quantify an illiquidity premium suggest it may amount to 3% per year or more,[1] and managers with particular skill in private market investing tend to deliver that premium with some consistency over time.[2]

But there's a reason investments in less liquid, private funds are called "patient capital": they often require restrictions on withdrawals for 10 years or longer before fully returning capital and profits to investors. This has tended to limit allocations by individual investors to private market strategies (including Private Equity, Real Estate, Distressed Debt, and other alternative strategies).

The lack of a public market for these assets and their resulting illiquidity is the primary source of both the benefits and challenges they present. We believe a better understanding of the issues surrounding private market investments may result in greater comfort with and more appropriate allocations to these strategies.

Illiquidity Sized and Defined

While they may play a less prominent role in the typical investment portfolio, there is surely no shortage of illiquid assets. In fact, they easily rival the public markets in size. Public companies comprise just 0.1% of the more than 5.7 million total U.S. firms (for another measure, among firms with 500+ employees, less than 14% are public).[3]

When we turn to the public market for these assets, we find that none of them is perfectly liquid. In fact some sub-asset classes within equities and fixed income can be highly illiquid, in the sense that they trade infrequently and turnover is low. Equities in pink sheet OTC markets may go for a week without trading, some categories of fixed income trade just a few times each year and holding periods for institutional infrastructure can be 50 years or

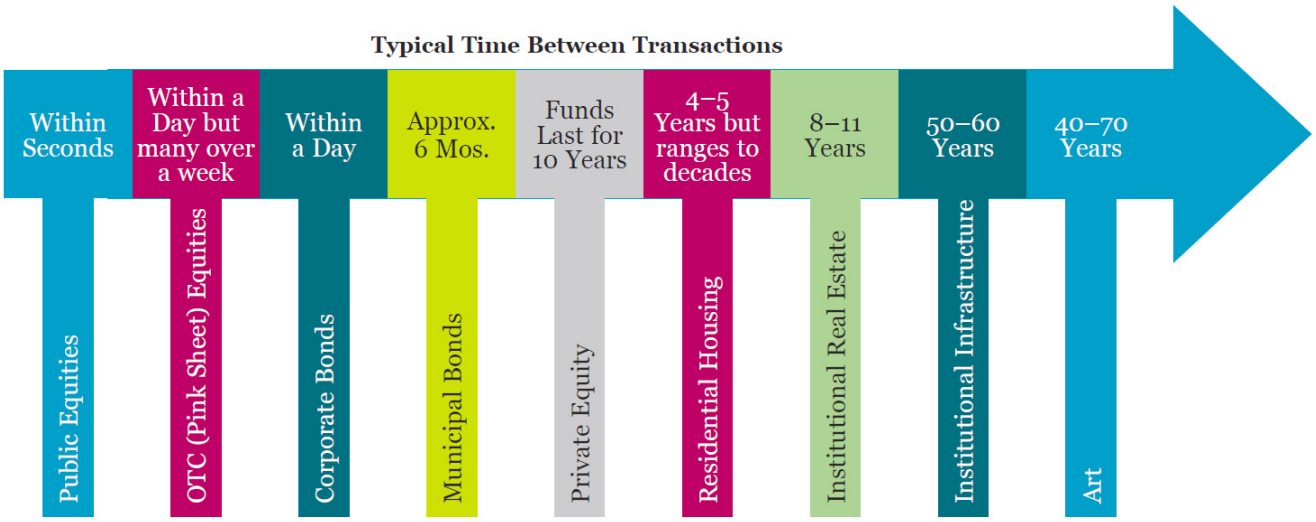


Exhibit 1: Everything Is (Relatively) Illiquid
Source: Antti Ilmanen, Expected Returns, 2011.
For illustrative purposes only.

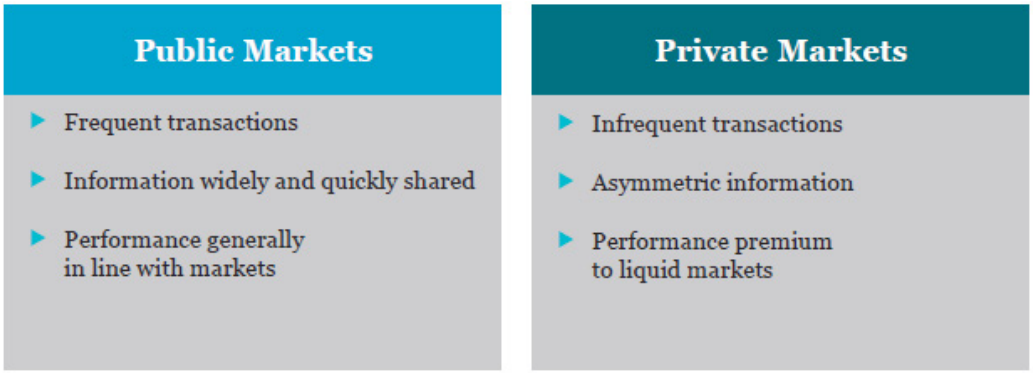


Exhibit 2: Everything Is (Relatively) Illiquid
Source: A Natural Complement: Private and Public Market Investments.
Note: For illustrative purposes only. There can be no assurance that an allocation to alternatives would provide higher real returns. Please consult your own third-party advisor before making any investment decisions based on this information.

longer (Exhibit 1). As we will see, the "tradability" of an asset can directly influence its value.

The Illiquid Advantage

So what is the merit of illiquidity and why should investors bother with less traded assets? In a seminal paper, Michael Jensen argued that the tradable nature of any public corporation generates an inherent discount: it creates a fundamental conflict between those who bear the risk (shareholders) and those who manage the risk (executives) over the payout of free cash flow.[4]

Jensen noted that public corporations tend to hold twice the amount of cash as private companies, which by contrast exhibit higher equity ownership by managers and more leveraged corporate structures that help limit the waste of free cash flow. This model better aligns the interests of owners and managers, enabling privately held companies to achieve "remarkable gains in operating efficiency, employee productivity, and shareholder value."[5]

But beyond the tradability of an asset, other factors can render an asset less liquid and therefore potentially "inefficient." The time and labor to gain special expertise in and enter certain markets ("participation costs") can slow an investor's engagement with private assets. So can the effort and cost involved in sourcing and evaluating a complicated investment opportunity ("search frictions").

But arguably the most important factor in private market investing is the role of asymmetric information, where some investors have superior knowledge relative to others. For example, unlike passive investors in a marketable security, where information is public and governed by regulatory provisions restricting selective disclosures, private purchasers may sign agreements that "open the books" to them alone, giving them transparency through the due diligence process and afterward. These advantages often allow private market investors to achieve returns that may differ substantially from public market indices. (Exhibit 2)

All of these characteristics render illiquid assets inefficient to buy and sell–and thus particularly attractive to investors who can tolerate the long investment periods associated with private market allocations.

Long Horizons and Institutional Appeal

These attractions have led many institutions with long investment horizons and known funding requirements, like pensions (with their extensive liabilities for retirees) and endowments (with their ongoing operating budgets), to increase their allocations to illiquid alternatives. Their appeal over the last two decades can be measured in the growing share of illiquid assets across institutional portfolios.

In 2010, the average endowment held a portfolio weight of 26% in alternative assets, versus roughly 5% in the early 1990s. A similar trend is evident among pension funds. In 1995 they held less than 5% of their portfolios in less liquid alternatives, but today the figure is close to 20%. (Exhibit 3)

Such institutional allocations to private market alternatives would dwarf most individual investor allocations, which rarely exceed 5% of their portfolio.[6] Having a long horizon may give more patient investors a natural edge in harvesting this premium: They are rewarded for sacrificing liquidity that they simply do not need.

What's Illiquidity Worth? Unpacking the Premium

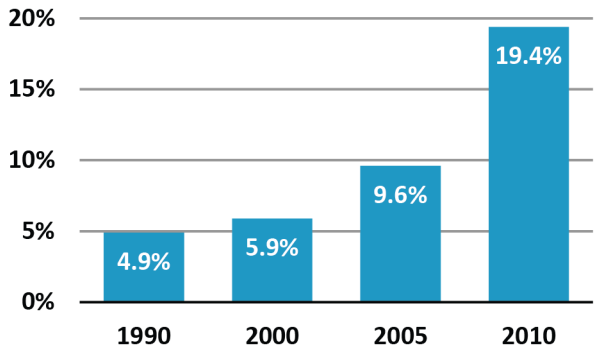
Gauging the value of liquidity (the premium) with any precision is difficult, as it's hard to untangle it from other market forces. But, recent academic research in equities has tried to uncouple a specific liquidity "factor" from other, more well-known return drivers within the capital asset pricing model.

One study showed that, over the last 40 years, less liquid stocks outperformed those with higher liquidity by almost 3% per annum in large capitalization stocks, and by a greater margin in smaller cap stocks. The study also identified illiquidity as a market factor akin to more historically verifiable ones such as size (small-cap outperformance) and investment style (the value premium).[7]

Estimates of the illiquidity premium for non-traditional assets can range well beyond 3%, and the premium tends to increase with the amount of illiquidity in the asset.

For example, one study focusing on hedge funds shows that funds with longer "lock-ups" (which enable managers to invest in less liquid holdings) tend to earn higher returns than those without. The data indicate that fund returns actually rise as their lock-up period increases, from a median of 4.5% for funds with lock-ups less than a quarter up to a median return of almost 13% for funds with a two to three year lock-up.[8] (Exhibit 4)

Allocation to Alternatives
Pensions: U.S. Public Pension Funds, 1990–2010



Allocations to Alternatives
Endowments: Average Endowment, 1995–2010

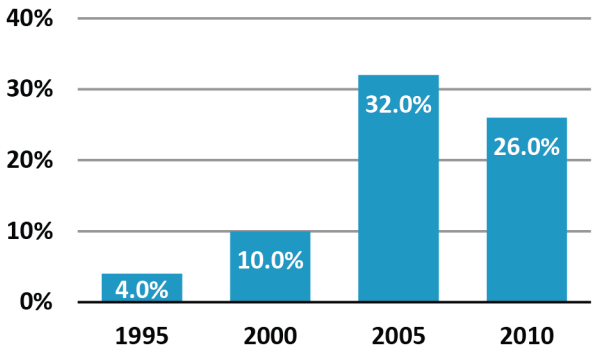


Exhibit 3: Long-Horizon Investors Turn to Private Market Alternatives
Source: Global Pension Asset Study, Towers Watson, 2011, The National Association of College and University Business Officers (NACUBO) 2014 Asset Allocation Study. Equal-weight (1995, 2000), Dollarweight (2005, 2010)

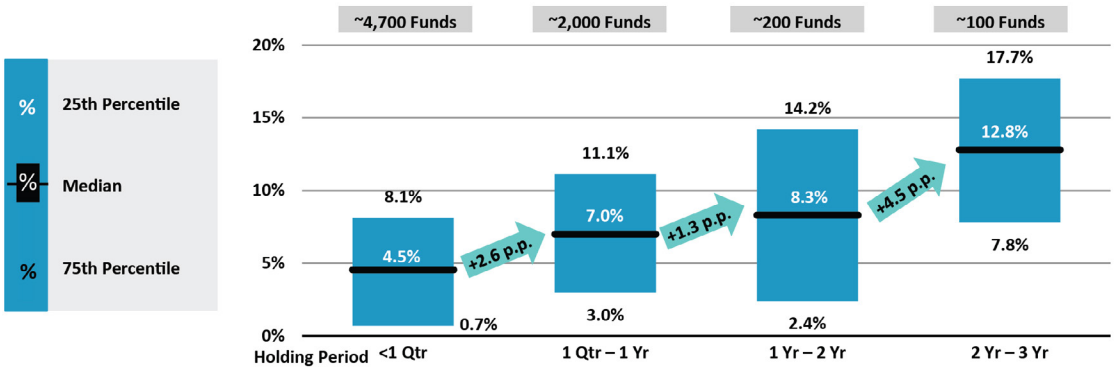


Exhibit 4: Less Liquid Hedge Funds Offer a Return Advantage
Source: Barclays Strategic Consulting analysis based on data from HFR, BarclayHedge and HedgeFund.net. Methodology: Analysis of ~7,000 hedge funds representing ~$1 trillion in AUM or ~50% of total HF AUM. Lock-up period measurement is an aggregate of hard lock, redemption notice, and redemption frequency.

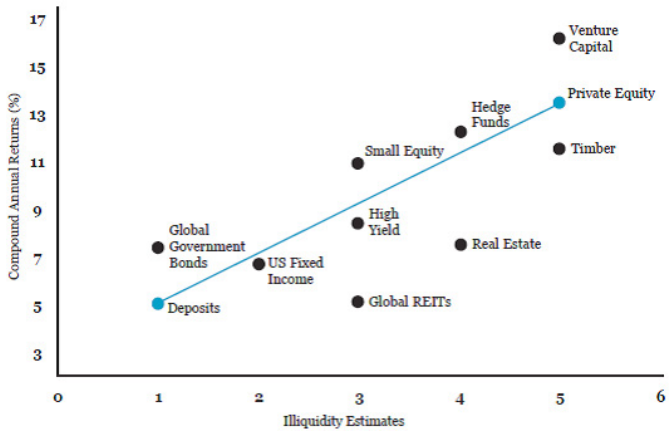


Exhibit 5: Investment Returns Generally Increase with Degree of Illiquidity
Source: "Expected Returns," by Antti Ilmanen, 2011. Scatterplotting average asset returns 1990-2009 on (subjective) illiquidity estimates. Sources: Bloomberg, MSCI Barra, Ken French's website, Citigroup, Barclays Capital, JP Morgan, Bank of America Merrill Lynch, S&P GSCI, MIT-CRE, FTSE, Global Property Research, UBS, NCREIF, Hedge Fund Research, Cambridge Associates.

Extending this to even less frequently traded "private market" assets, we find that at least part of the long-run return premium of Private Equity and Venture Capital funds may be compensation for their illiquid characteristics. That is, as the illiquidity of certain private market alternatives increases (along with the various "frictions" inherent to investing in them), so do their expected returns. (Exhibit 5)

Beyond the Premium: What's Luck Got to Do With It?

While greater illiquidity may increase the inefficiency of a particular market, it does not by itself guarantee higher returns. What it does is shift the primary source of the return from the "beta" or movements of the market itself to the individual manager's superior knowledge or skill at navigating the investment to a more successful outcome. Superior manager skill influences the returns of illiquid alternative funds primarily through operational improvements they bring to their portfolio companies.

A particularly skilled private equity team, for example, may be better able to identify which companies can be turned around. They may have experience reducing operating expenses, optimizing asset utilization or exploiting leverage. Some managers may also have superior deal flow or a better network of senior management to install in leadership positions at their portfolio companies. For these reasons, the potential for upside in illiquid alternatives is not driven simply by exposure to some illiquid category, but by investing with the right managers.

This is evident in Exhibit 5 which shows the range of returns across the top and bottom quartile managers of various assets. The best and worst managers of publicly traded stocks and bonds tend to trail or outperform the median by modest amounts: at most several percentage points separate top and bottom quartile managers.

But the difference between top and bottom quartile managers in Hedge Funds can be over 20 percentage points, and over 30 percentage points in private equity. In short, the more illiquid the asset, the greater the dispersion we find across the best and worse performing managers. (Exhibit 6)

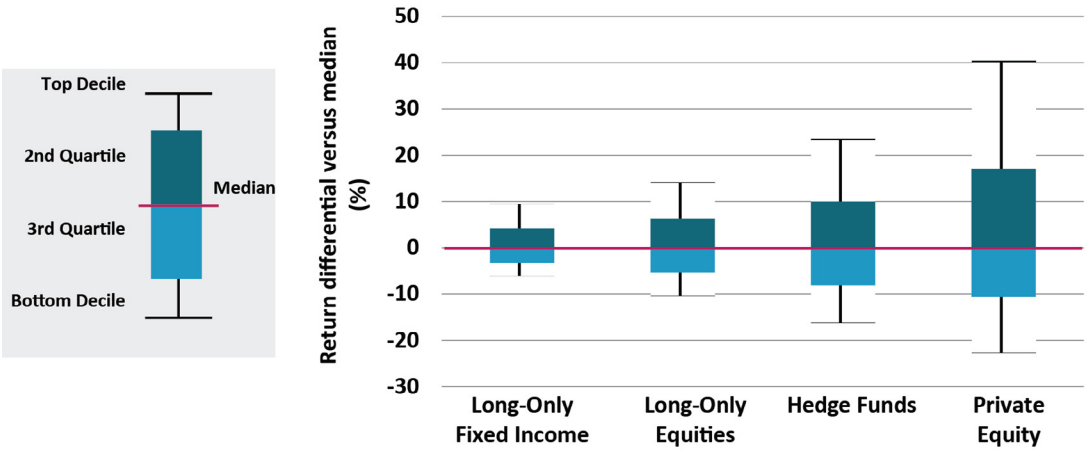


Exhibit 6: Manager Dispersion Increases as Illiquidity Grows
Source: Morningstar, Lipper Tass, Preqin.
Note: Dispersion of fund performance, average calendar year 2002-2011. Past performance is not indicative of future results. Should the study have been conducted over a different time period, the results may have been different. There can be no assurance that an allocation to illiquid investments would yield higher real returns.

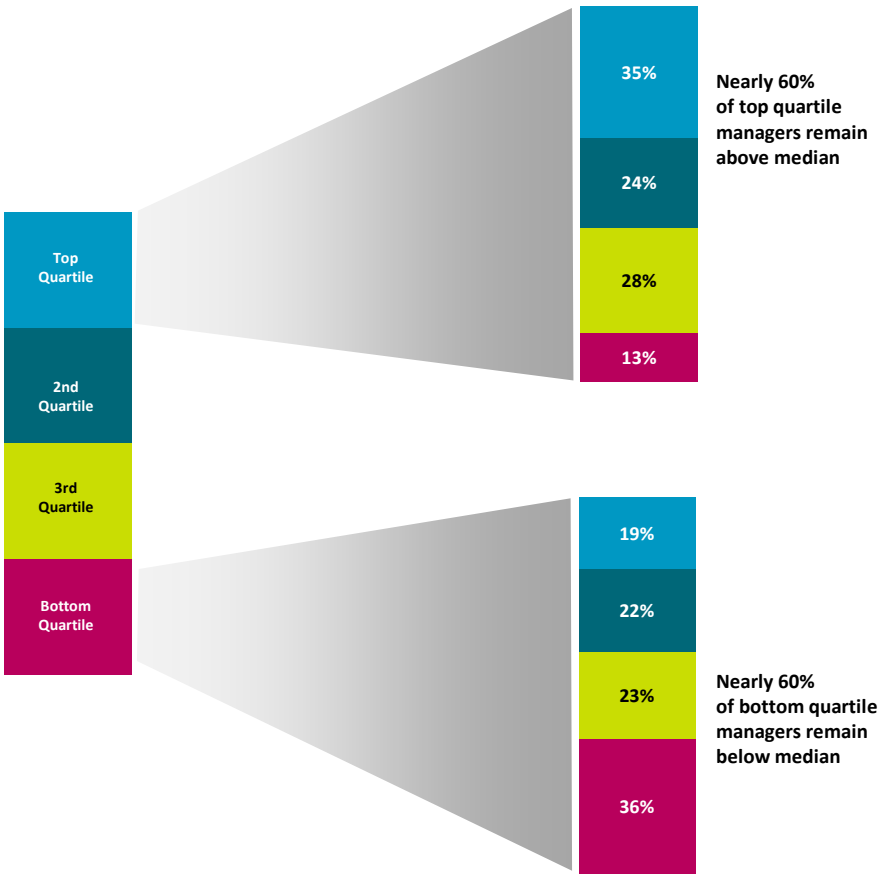


Exhibit 7: Private Market Persistence? Performance Often Continues Across Vintages
Source: Steven N. Kaplan, Robert S. Harris, Tim Jenkinson, Rudiger Stucker, "Has Persistence Persisted in Private Equity? Evidence from Buyout and Venture Capital Funds" (February 2014). Darden Business School Paper: 2304808. Vintages are only through 2008 since more recent vintages may still be investing and have few realizations.

This sort of dispersion can be perilous for investors seeking to choose the "right" manager. But if they choose well, there is some consolation: manager performance tends to be more persistent for illiquid alternatives than for more liquid hedge funds and traditional long-only portfolios.

A recently updated study of performance persistence among alternative investments divided Private Equity funds into quartiles, based on how a manager's most recent fund performed, and examined the results for the next fund launched by each manager.

The study found that 35% of the top-quartile managers delivered top-quartile performance on their next fund, and only 13% delivered bottom-quartile results. By contrast, only 19% of the managers of bottom-quartile funds delivered top-quartile performance in their next funds, and 36% repeated their bottom-quartile performance again. Extending the analysis, about 60% of the top-quartile funds remain above median in their next fund, while a similar percentage of bottom-quartile funds remain below median. (Exhibit 7)

The higher persistence of manager performance among illiquid alternatives suggests there are real differences in skill levels among managers. It also explains the loyalty some investors tend to feel for certain managers, where many "re-up" for subsequent funds. Either way you look at it, manager selection is crucial for investors considering illiquid strategies.

But before even considering manager selection, investors need to understand the very different mechanics at the heart of private market investing.

Assessing Performance in Private Market Funds

Analyzing private market fund performance is quite different from assessing public equity and debt. Like Hedge Funds, private investment firms "self-report" their results. This renders their long-term return numbers subject to various biases.[9]

More to the point, private fund returns are not calculated in the same manner as traditional investments. They are most often quoted as "dollar-weighted," measured by an internal rate of return (IRR) rather than the more conventional time-weighted return (TWR), the standard applied to stocks and bonds.

Cash flow is the key distinction. When considering stock and bond funds an investor is free to enter and exit at will. By contrast, investors in private funds face constraints in the form of multiyear "lock-up" provisions. That is, the investment managers control investor cash flows, determining the optimal moment for entering and exiting investments.

Given the differences between these performance measures, comparing a private equity IRR with a public return index is apples to oranges. To make a like-for-like comparison some use a PME (Public Market Equivalent) measurement to translate dollar-weighted to time-weighted returns. This process involves the creation of a hypothetical investment vehicle that mimics private equity cash flows.

A PME performance measurement represents the level of returns investors could have achieved if they had sold or bought the equivalent amount of public index whenever a private equity fund made a capital call (investment) or a distribution (divestment). A PME of 1.0 means the fund's performance is in line with the public market; a PME of 1.20, for example, implies that at the end of the fund's life, investors ended up with 20% more than they would have if they had invested in the public markets.

According to recent studies done on a cleaner and more representative set of performance data, the amount by which buyout funds outperformed the S&P 500 in each of the last three decades works out to a PME ratio of about 1.3, meaning median outperformance of more than 3% per year versus its public market benchmark over the life of a fund. (See Exhibit 8).

Patient Capital: Reviewing the Mechanics

There's a reason investments in less liquid, private market assets are sometimes referred to as "patient capital"—it can be a long wait to get invested, and even longer to realize returns. In a private market fund, investors, called Limited Partners (LPs), make an upfront commitment to invest a specific dollar amount into a limited partnership. That commitment is then "called down" incrementally by the General Partner (GP) or fund manager over a term of three to six years (the "investment period"), to fund investments in portfolio companies and to pay fees and expenses.

Harvesting investments takes an additional three to six years, resulting in a total commitment of 10 years or more. Invested capital is returned to LPs in the form of distributions generated from company sales or IPOs. As a result, investors' cumulative net cash flows form a "J-Curve," first sloping down into negative (outflow) territory, then rising back to neutral and, if successful, becoming strongly positive. (See Exhibit 9).

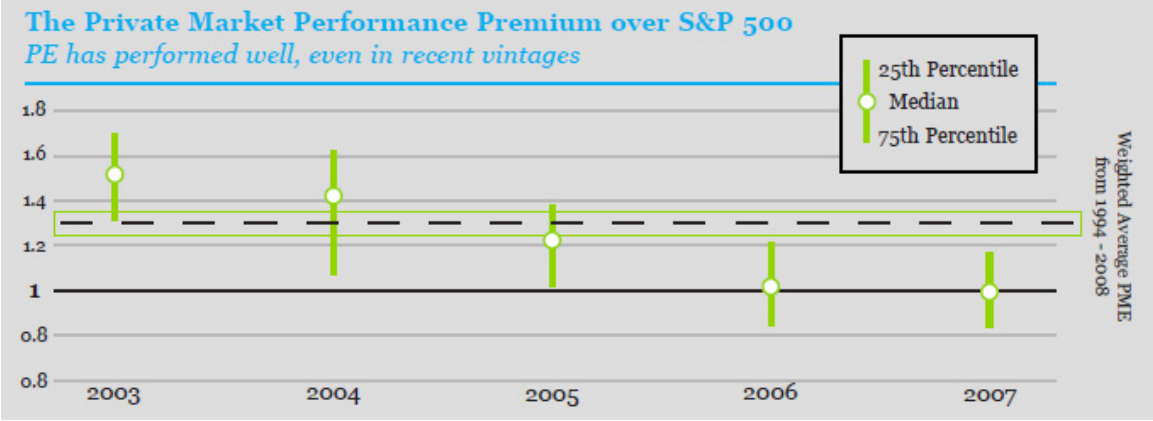


Exhibit 8: The Private Market Performance Premium over S&P 500
Source: Burgiss Private iQ data for buyouts, based on cash flow from investors at end 2010. Sourced from "Private Equity Performance: What Do We Know?" Robert S. Harris, Tim Jenkinson and Steven N. Kaplan, SSRN, April 2013.

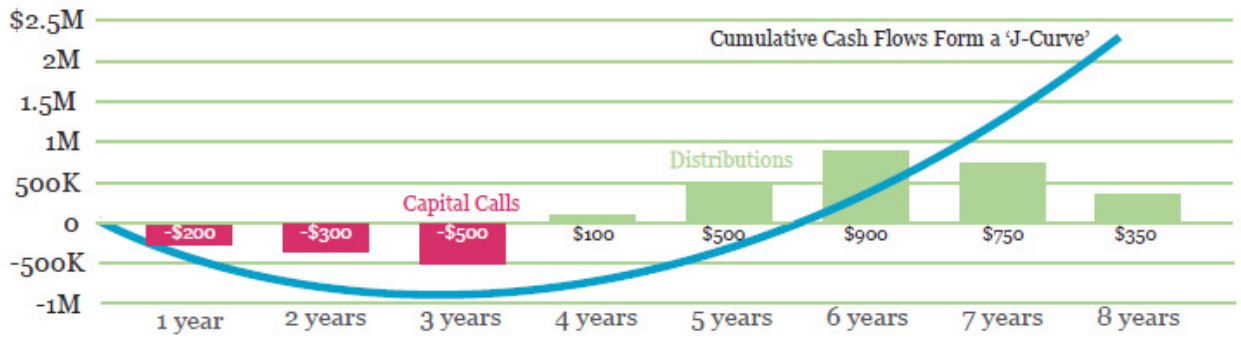


Exhibit 9: The J-Curve in Action: The Structure of Private Market Investing
Note: For illustrative purposes only. Each investor's cash flows and returns will differ. These statistics are not meant to be predictive of the performance of any particular fund. This scenario and resulting performance are hypothetical and no such Blackstone portfolio or fund exists. Hypothetical performance results have many inherent limitations and no representation is made that any Blackstone investor will, or is likely to achieve, results similar to those shown. There is no assurance that an allocation to alternatives would yield higher real returns.

The fundamental reality of private market investments is that it takes time to achieve the kind of outperformance investors expect: time to identify and source the right deals; time to improve the underlying investment (through management changes, operational enhancements, and other forms of "intervention"); and time to successfully "liquidate" the investment—either through an IPO back to the public markets or a sale to a strategic buyer.

These constraints on the speed of private transactions (or rather, the lack of control or predictability of cash flows into or out of any underlying investment) are key to the value-creation inherent in these deals. But the structural realities of illiquid investments also create a number of challenges that may constrain the appetite of individual investors for private market assets. The challenges include:

Gaining Exposure: Unlike the public markets, where investors can quickly and efficiently increase their allocation by purchasing shares in the open market, private market investors cannot gain instantaneous exposure, as managers need time to identify and negotiate attractive deals.

Achieving a Diversified Allocation: Fund offerings are calendar-dependent, may not be accessible for smaller investors, and often require steep investment minimums. That means individual investors seeking broad diversification in the space—across assets, strategies, managers, and "vintage years"—may have difficulty achieving that kind of exposure.

Maintaining the Allocation: Making a $1 million commitment to Private Equity for ten years is not the same as achieving a constant $1 million allocation for that period. Over the years, the average exposure would probably reach about 50% of the total $1 million commitment—so only half of the capital is "at work" most of the time.

That said, some of these structural issues can be addressed and largely resolved, potentially leading to more suitable allocations by individual investors.

Implementing a Private Market Allocation: Matching Commitments with Cash Flows

Let's take one central problem: the difficulty of achieving and maintaining an allocation—with the aim of keeping more of the illiquid investment in the ground and at work.

The challenge here is managing the pace of cash flows: marrying the timing of commitments with the uncertainty of distributions. To solve this dilemma, investors can employ two strategies: 1) Front-loading or "over-committing" to the allocation and 2) smoothing cash flows (calls and distributions) across successive funds.

Let's say an investor has $5 million dollars in liquid net worth. Based on his capacity for illiquidity and overall risk and return goals, he decides on a long-term strategic allocation of 10% or $500,000 to private market strategies. So how can he efficiently reach and sustain that allocation, keeping it at work and diversifying it across an appropriate array of private investments?

If the investor simply commits $500,000 to one single fund, he will fall well short of the goal of a continuous 10% allocation to private investments. At no single point in the life of the fund is it likely that the full $500,000 would be allocated to actual investments. If he instead commits to invest a total of $750,000 to Fund A, a portion of that commitment would be called gradually over the next several years. By the end of year one, it may be that only $75,000 of the total commitment is called. By year 3, perhaps something closer to half, or $375,000, would likely have been called. By that point, some of that called capital would begin generating positive investment returns in the form of distributions. (Exhibit 10).

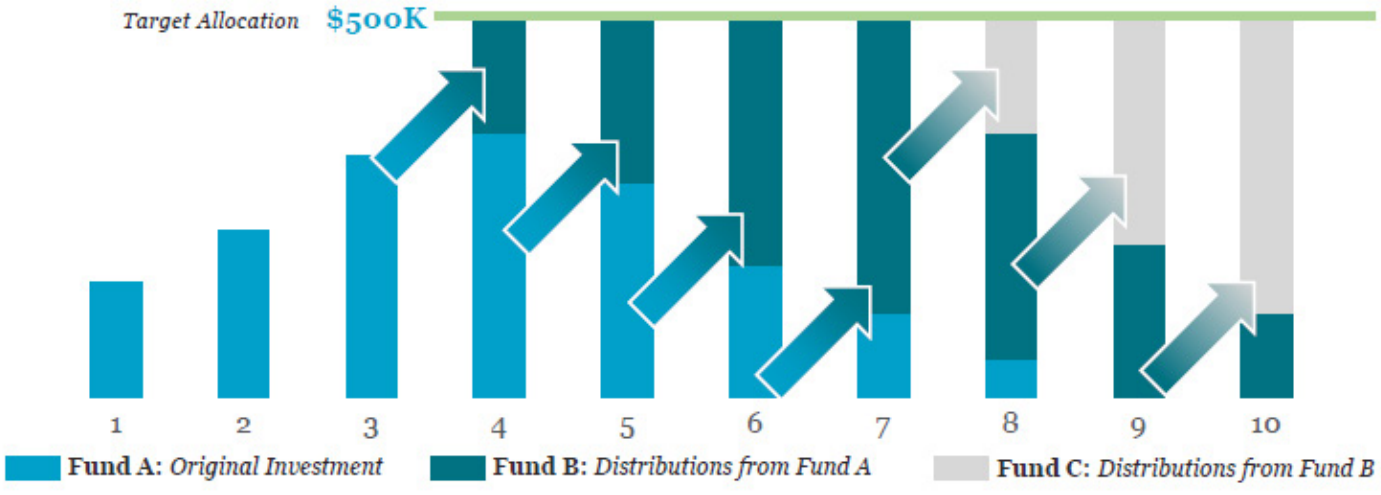


Exhibit 10: Achieving and Sustaining an Allocation
Note: Represents capital invested over time assuming $750,000 is committed to Fund A in year one, $750,000 is committed to Fund B in year four and $750,000 is committed to Fund C in year eight. Each fund gradually calls on the capital and gradually returns it as it harvests its investments. For illustrative purposes only. Each investor's cash flows and returns will differ.

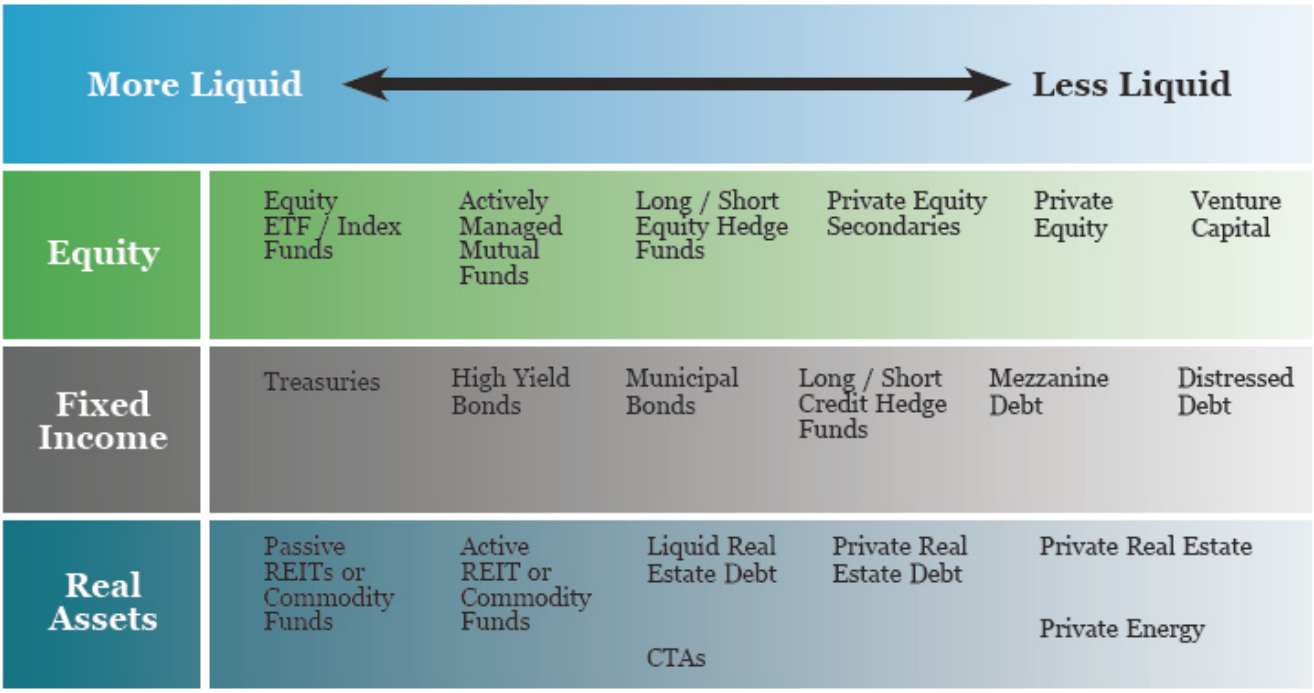


Exhibit 11: Simplifying Private Market Investing: Allocating across the Liquidity Spectrum
For Illustrative Purposes Only

At about this time (3 years into Fund A) the investor targets another private fund (B). He may commit an additional $750,000 to Fund B, with the expectation that ongoing distributions from Fund A would be available for cash calls required by the new fund. Likewise, as Fund B matures and more capital is called, some profits from maturing investments would then be returned as distributions to the investor. Continuing the example, in year 8, he would commit another $750,000 to Fund C, all in order to maintain a consistent $500,000 allocation of invested capital in private alternatives, with the distributions from prior funds theoretically available to meet calls for the new one.

Perfectly aligning distributions with capital calls is impossible. But making steady commitments in this way could help create a self-funding portfolio, targeting a consistent allocation diversified across vintage years.

Getting Comfortable with Illiquidity

At the end of the day, if investors want to benefit from the performance upside that illiquidity can offer, they need to get comfortable with the idea and the process of allocating to these strategies.

One way to do so is to understand these investments—Private Equity, Real Estate, Distressed Debt—not as new asset classes but as less liquid versions of strategies they're already comfortable investing in. That is, investors should consider their allocation to private market funds alongside their traditional allocation, in a "liquidity continuum." (Exhibit 11).

For example, think of an investor's equity exposure: within the "liquidity continuum" we are suggesting, an advisor might position private equity alongside other more liquid equity-like exposures, such as long/short equity, active long-only, and passive equity structures. At bottom, they are all equity-oriented assets, the longer-term nature of private market vehicles being just one distinguishing characteristic (and since gains tend to be primarily long term, this brings correspondingly beneficial tax treatment).

We can say the same for allocations to fixed income, which would extend from the most liquid Treasury or Bond ETF portfolio into less liquid high yield or senior loans, and then long/short credit, mezzanine and distressed debt at the more illiquid extreme. And likewise with real assets: moving from passive REIT or Commodity Funds to more active real estate strategies, commodity trading advisors, private real estate and private energy funds.

In this way, the private market allocation may be understood as a natural extension of the public or liquid portfolio—with related risk and return characteristics all derived from the overarching asset class that each belongs to.

Conclusion

Generally speaking, most investors are familiar with one market: a liquid and public one where prices quickly reflect new data, almost everyone sees the same information and news gets spread around quickly. But there is another, more private market, where only a select few have good data, information is difficult to analyze and even harder to procure, and news takes a long time to get around.

Skilled managers and long-term investors generally prefer the latter, where informational and other inefficiencies that characterize illiquid investments allow them to outperform their equivalent liquid asset benchmarks, often by substantial amounts.

The approaches we've outlined here may help render investing in private markets more intuitive, making it easier for individual investors to deploy their own patient capital and to participate in the upside that illiquidity offers.

Glossary

Alpha: Alpha is a measure of the return due to active management, rather than market exposure, or beta. It is often used to refer to the value added by a manager's skill.

Alternative Investments: Investment categories other than traditional securities or long-only stock and bond portfolios; they include hedge funds, venture capital, private equity, and real estate. Alternative investments often employ strategies typically unavailable to long-only managers, such as the use of derivatives, the ability to short, and the ability to hold illiquid assets.

Beta: Beta is a measure of the sensitivity of a security or portfolio to broad market movements. The beta of the market index is 1.0. A security with a beta of greater than 1.0 tends to rise or fall more than the market; a security with a beta of less than 1.0 tends to rise or fall less than the market. The term "beta" can also indicate the portion of portfolio returns that result from market exposure, rather than from manager strategies or skill (alpha).

Capital Call / Drawdown: Occurs when a private equity fund manager (typically acting through the General Partner (GP) of the partnership) asks an investor (typically, a Limited Partner (LP) of the partnership) to fund a portion of his or her capital commitment in order to make a current investment, or to fund management fees or expenses. Usually, an LP will agree in advance to a capital commitment, and over time the GP will make a series of capital calls to the LP as opportunities arise or the capital is otherwise needed.

Distribution: When an investment by a private equity fund is fully or partially realized (resulting from the sale, liquidation, disposition, recapitalization, IPO, or other means of realization of one or more portfolio companies in which a GP has chosen to invest) the proceeds of the realization(s) are distributed to the investors. These proceeds may consist of cash or, to a lesser extent, securities.

Hedge Fund: A private investment portfolio that uses nontraditional techniques (such as short sales and leverage) to preserve and/or gain capital. Hedge funds are generally considered part of the alternative investments asset class. In many jurisdictions, they are more loosely regulated than long-only portfolios and are restricted to larger or more sophisticated investors.

Illiquid: The term used to describe an asset that cannot be quickly sold in the market without incurring a substantial loss.

Illiquid Alternatives: Alternative investments that invest in illiquid assets and offer limited liquidity to investors. Many illiquid alternatives require investors to make capital commitments over several years that cannot be redeemed in the short term. Illiquid alternatives can include venture capital, private equity, and direct real estate.

Illiquidity Premium: The extra expected return an investor demands as compensation for investing in an illiquid asset.

Internal Rate of Return (IRR): The rate that discounts the future value of an investment back to its current value. The IRR can also be seen as the hurdle rate that an investment seeks to outperform.

Limited Partnership: A legal entity composed of a General Partner and various Limited Partners. The GP manages the investments and is liable for the actions of the partnership while the LPs are generally protected from legal actions and any losses beyond their original investment. The GP receives a percentage of profits, while the LPs receive income, capital gains and tax benefits.

Lock-up: A period of time during which investors cannot redeem invested capital. For example, illiquid alternative investments such as venture capital, private equity and real estate funds typically have lock-up periods before the full return of capital and profits to investors.

Mezzanine Financing: Financing provided by a bank or specialized investment fund to invest in a debt instrument of lower credit quality relative to the senior debt in a company but ranking senior to any equity claims. The instrument may include equity features, such as warrants.

Private Equity: A type of investment that seeks return by acquiring companies and restructuring them, with the goal of improving or restoring profitability. The companies are sold at the conclusion of their restructuring. Private equity investments are illiquid and, by definition, are not publicly traded.

Secondary Market: A market for the sale of existing private equity investments prior to their stated maturity. Traditionally, the secondary market has been focused on partnership interests in private equity funds. Certain investment companies specialize in providing liquidity to these investors, acquiring partnership interests or portfolios of directs as "secondaries."

Venture Capital: A type of investment that seeks return by providing seed or early-stage financing to privately held, fledgling businesses thought to have strong growth prospects due to a new technology, product, or business model.

Vintage: The year in which a private equity fund has its final closing.

Endnotes:

1. Private Equity Performance: What Do We Know?" Robert S. Harris, Tim Jenkinson and Steven N. Kaplan, SSRN, April 2013.
2. The academic literature on the topic of illiquidity is vast, but several articles stand out. A recent text with a focus on the topic is Expected Returns, by Antti Ilmanen, 2011. Other more discrete studies include: Amihud, Yakov, Haim Mendelson, and Lasse Heje Pedersen. 2005 "Liquidity and Asset Prices." Foundations and Trends in Finance, vol. 1, no. 4 (April):269–364; "Liquidity as an Investment Style," Ibbotson, Roger, Chen, Zhiwu, Kim, Daniel and Wendy Hu, FAJ, Volume 69, Number 3, 2013; Andrew Ang, "Portfolio Choice with illiquid Assets," SSRN, August, 2013; a classic study of private equity is Kaplan, S. N. and A. Schoar (2005). "Private equity performance: Returns, Persistence, and Capital Flows," Journal of Finance 60 (4); generalist approach to illiquid alternative investing is David Swensen's 2000 book, Pioneering Portfolio Management: An Unconventional Approach to Institutional Investment. Free Press.
3. "Comparing the Cash Policies of Public and Private Firms" Joan Farre-Mensa, SSRN, April 2014. NYSE and NASDAQ market capitalizations were approximately $12 trillion and $5 trillion as of July 2012.
4. "Michael C. Jensen, "Eclipse of the Public Corporation," Harvard Business Review (September-October 1989).
5. "More than any other factor, these organizations' resolution of the owner-manager conflict explains how they can motivate the same people, managing the same resources, to perform so much more effectively under private ownership than in the publicly held corporate form." Jensen Ibid.
6. "Retail Liquid Alternatives: The Next Frontier," Goldman Sachs Equity Research. December 2013.
7. Ibbotson, Chen, and Hu, "Liquidity as an Investment Style," April 2011.
8. "Waiting to Exhale" 2014 Global Hedge Fund Investor Trends and Allocation Outlook. January 2014, Page 15.
9. These include backfill and survivorship bias, the most common type of sample selection bias. It occurs when studies are conducted on databases that have eliminated all companies that have ceased to exist (often due to inferior performance). The findings from such studies most likely will be upwardly biased, since the surviving funds will look better than those that no longer exist. See "Deciphering the Biases in Hedge Fund Indices," CFA Institute, March 2013.

Notes and Disclaimers

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Tactical Timing of Low Volatility Equity Strategies

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Many investors we speak to are interested in making a strategic allocation to low volatility equities to help them better meet their investment objectives. The appeal of this strategy is clear. Low volatility stocks have historically delivered higher returns with lower risk than the capitalization-weighted market. Moreover, the behavioral and market-structural forces that have been suggested as possible explanations are inherently hard to change, which means the anomaly might not readily disappear.[1] However, we often hear two tactical concerns about the timing of an allocation. The first is that relative valuation of low volatility stocks may be expensive compared to the rest of the market so they should wait for more attractive levels. The second is that low volatility stocks, which tend to pay higher dividends, may underperform against the back-drop of potential rate increases. In this research note we examine the validity of these concerns by researching drivers of global low volatility equities' performance relative to the capitalization-weighted index since 1980. We consider valuation as well as the macro-economic backdrop. We find that relative valuation levels have not been a good predictor of low volatility equities' relative return. In addition, while low volatility equities' performance was indeed more sensitive to interest rate changes than the capitalization-weighted index, both delivered similar risk-adjusted returns (Sharpe ratios) in rising-rates environments.

Background: Performance Track Record of Low Volatility Investing

Low Volatility Investing is a broad term that captures a wide range of defensive portfolio construction methodologies, generally resulting in similar performance benefits.[2] The hypothetical Global Low Volatility Portfolio we considered in this analysis invested in a diversified combination of low volatility capitalization-weighted country-sector baskets of stocks included in the MSCI World

Developed Markets Index, e.g. US Financials, UK Telecoms.[3] In earlier research, we have shown this approach to capture the global low volatility effect with less concentration risk and a higher level of liquidity than when using stock specific data, delivering comparable returns.[4] In our analysis, we consider this strategy's performance from 1980 through 1Q 2014.

Low volatility investing has exhibited a strong track record versus the capitalization-weighted market index (Cap-Weighted Index), as shown in Exhibit 1. Since 1980, the Global Low Volatility Portfolio delivered higher returns at lower risk; over the most recent 3 and 5 years, it delivered higher risk-adjusted returns as measured by the Sharpe Ratio. Only in the final year of our analysis period, when the Cap-Weighted Index delivered a strong return with unusually low volatility, did the Global Low Volatility Portfolio underperform while not delivering a risk reduction benefit. Exhibit 2 shows that this result is consistent with past market rallies when low volatility strategies have the highest likelihood of lagging. The silver lining is that low volatility strategies did have positive performance during these time periods.

This performance pattern is not surprising for a more defensive portfolio with a beta of 0.69. It is, in fact, consistent with a particularly attractive feature of low volatility investing: the asymmetry of relative performance. Low volatility equity strategies have avoided more of the downside in falling markets than they have lagged on the upside in rising markets. As illustrated in Exhibit 2, in the worst third of cap-weighted market performance, the Global Low Volatility Portfolio captured only 57% of the downside while in the best third it captured 74% of the upside. This asymmetry helps to explain not only the appeal, but also the long-term cumulative outperformance of low volatility strategies.

Relative Valuation Does Not Predict Low Volatility Equities Performance

Exhibit 3 illustrates the relationship of the subsequent relative performance of the Global Low Volatility Portfolio to its relative valuation from January 1, 1980 through March 31, 2014, as well as the last 10 years of this analysis period. We note that none of our three valuation metrics, dividend spread (DIV), book-to-price (BP) spread and earnings-to-price (EP) spread, had much efficacy as predictors. Thus, the concern that a current high relative valuation of low volatility stocks presents a sub-optimal environment for allocating to low volatility strategies appears to be unfounded. This result is counter to the common wisdom that valuation levels are significant predictors of future performance; we explore this in more detail in the next section.

Drivers of Relative Valuation of the Global Low Volatility Portfolio

Since valuation has historically been a good predictor of stocks' relative performance, it is surprising that it is not a better predictor of the Global Low Volatility Portfolio's relative performance. In trying to understand this, we found that the relative valuation of the Global Low Volatility Portfolio is primarily driven by its dynamic country and sector positioning rather than the valuation changes of static holdings.[5] One clear historical example that illustrates this point is Japan over the period 1980 through 1Q 2014, though other macro effects such as the portfolio's energy sector exposures were important contributors too.

As of March 31, 2014		Since January 1, 1980	10YR	5YR	3YR	1YR
Capitalization-Weighted Equities Index	Return	10.67%	7.44%	18.98%	10.89%	19.69%
	Volatility	15.19%	16.10%	15.77%	14.05%	10.84%
	Sharpe Ratio	0.39	.037	1.20	.77	1.81
Global Low Volatility Portfolio (gross of fees)	Return	12.82%	10.04%	15.49%	10.66%	11.22%
	Volatility	12.12%	11.30%	10.44%	9.96%	10.87%
	Sharpe Ratio	.66	.075	1.47	1.06	1.03

Exhibit 1: Historical Performance — Global Low Volatility Portfolio and the Cap-Weighted Index
Annualized performance statistics; Sharpe Ratio uses 3-month treasury bills as risk-free rate. Performance shown is of a hypothetical investment strategy, gross of fees, taxes and transaction costs.

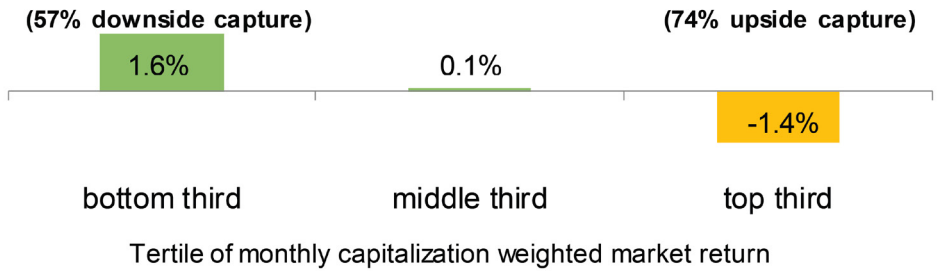


Exhibit 2: Average Monthly Excess Return — Global Low Volatility Portfolio Versus Cap—Weighted Index
Performance in Different Market Regimes: Top, Middle and Bottom Third of Cap — Weighted Index Returns January 1, 1980 — March 31,2014 Excess returns are versus the Cap-Weighted Index. Performance shown is of a hypothetical investment strategy, gross of fees, taxes and transaction costs.

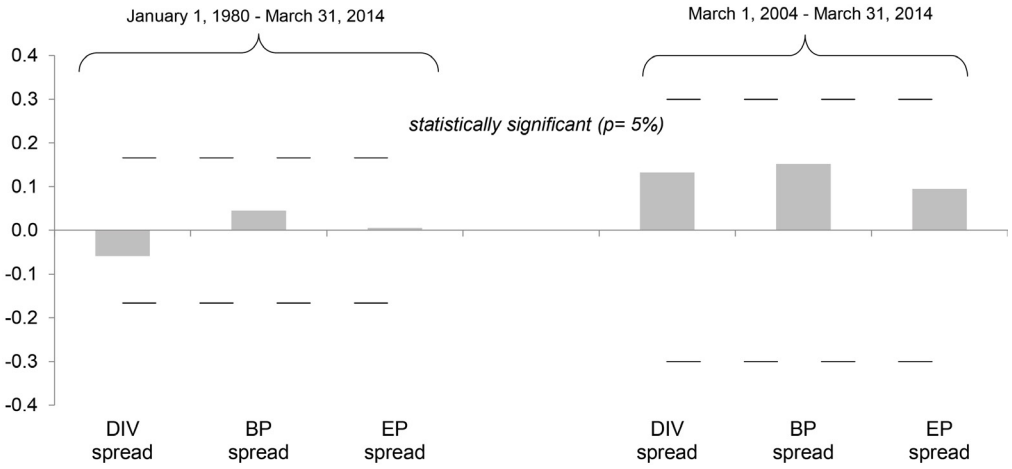


Exhibit 3: Predictive Analyses — Quarterly Correlation of excess returns of the Global Low Volatility Portfolio with Relative Valuation Metrics
Excess returns are versus the Cap-Weighted Index. Performance shown is of a hypothetical investment strategy, gross of fees, taxes and transaction costs

Exhibit 4 shows that Japanese equities have been structurally expensive since the 1980s. Since the advent of the Global Financial Crisis in 2007, Japan has acted as a safe haven with low return volatility. Therefore, the weight of Japan in the Global Low Volatility Portfolio increased, and the portfolio consequently became more expensive (shaded area). Since this shift was primarily caused by macro effects rather than existing holdings having been bid up, we believe this to be less of a concern. We see this as part of a true expression of identifying lower volatility, "safer" assets.

The Concurrent Macro Environment

Many investors have predictions about the upcoming macro environment. This raises the question about how low volatility performance relates to its concurrent macro environment, with a rising interest rate environment being of particular interest as many investors expect normalization to higher rates sometime in the future. To answer this, Exhibit 5 shows the correlation of the Global Low Volatility Portfolio's quarterly performance with the change in medium-term interest rates, CPI indicator and global GDP growth during that same period. We see that the portfolio underperformed during economic booms when strong real GDP growth and elevated inflation were accompanied by interest rate increases.

The interest rate environment had the strongest relation to the performance of the Global Low Volatility Portfolio among the economic indicators considered. Exhibit 6 breaks down the Global Low Volatility Portfolio's relative performance by quarters of increasing and decreasing interest rates. The Global Low Volatility Portfolio's clearly underperformed the Cap-Weighted Index during periods of rising rates. However, the return difference is not large, 2% on an annualized basis, and the average total return of the Global Low Volatility Portfolio was still above 9%. Moreover, in terms of risk-adjusted returns as measured by the Sharpe Ratio the two were even closer, particularly over the

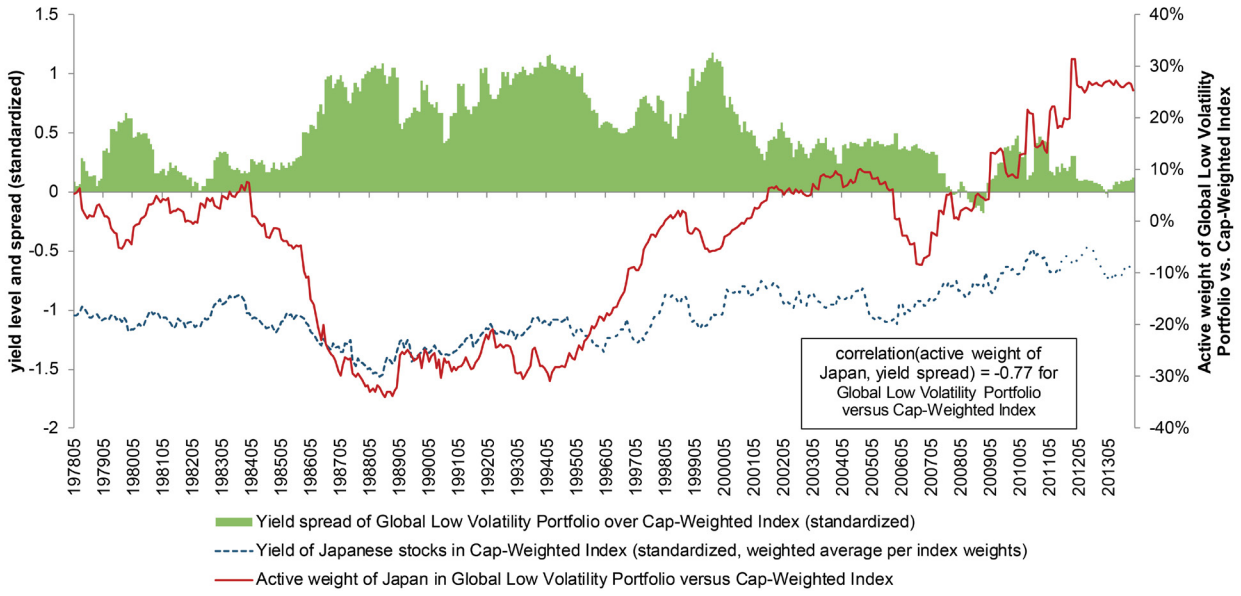
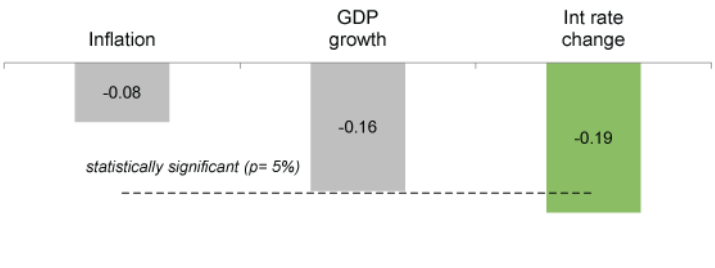


Exhibit 4: Yield Spread — Global Low Volatility Portfolio versus Cap—Weighted Index and Japan
Source: Authors' calculations.

January 1, 1980 — March 31, 2014



March 2004 — March 2014

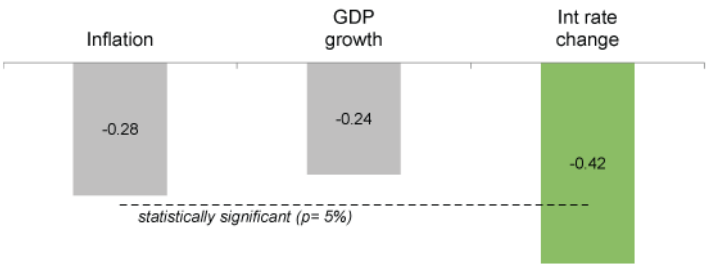


Exhibit 5: Sensitivity Analyses — Quarterly Correlation of the Global Low Volatility Portfolio's Excess Return with Macro Environment
Excess returns are versus the Cap-Weighted Index. Performance shown is of a hypothetical investment strategy, gross of fees, taxes and transaction costs.

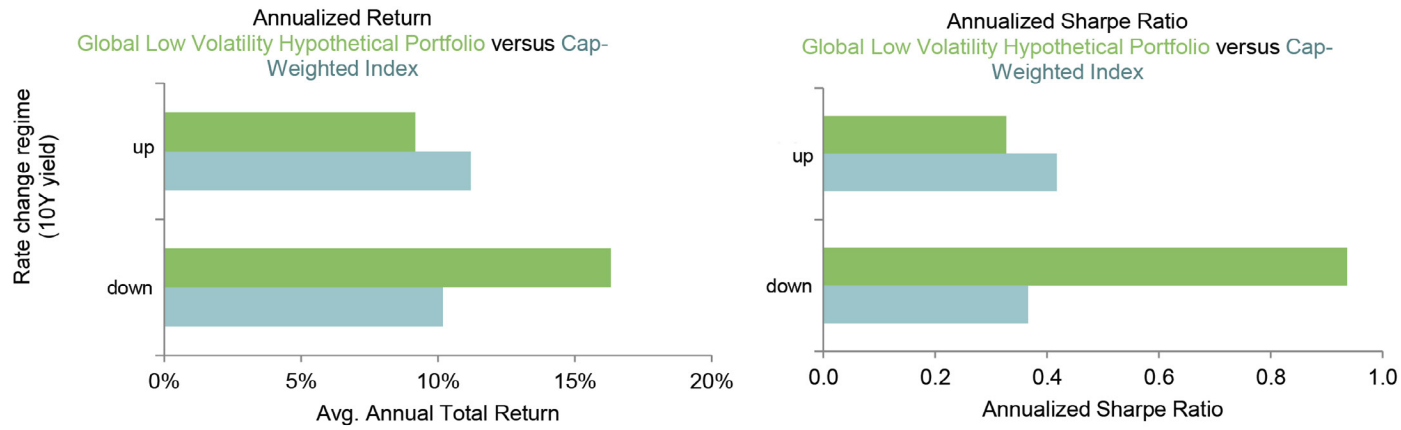
past ten years. Though the expectation of interest rates increasing further might be widespread, generally central banks have indicated that this will only happen if the economy supports it. It's not far-fetched to believe that even if low volatility strategies might trail the broad market index in such an environment, they will still deliver sufficient total return for investors to meet their goals with similar or lower volatility. Conversely, interest rate expectations not coming true might lead to or result from an environment in which low volatility strategies have historically performed well.

Performance shown is of a hypothetical investment strategy, gross of fees, taxes and transaction costs.

The Recent Backdrop

Developed Markets equities continued their multi-year upward trend during 2014, albeit in fits and starts. The MSCI World index gained a modest 5.50% in USD terms, including gross dividends. The Global Low Volatility Portfolio outperformed, returning 8.41% for the year with lower monthly volatility to boost (6.47%, compared to 8.56% for the Cap-Weighted Index).[6]

January 1, 1980 – March 31, 2014



March 1, 2004 – March 31, 2014

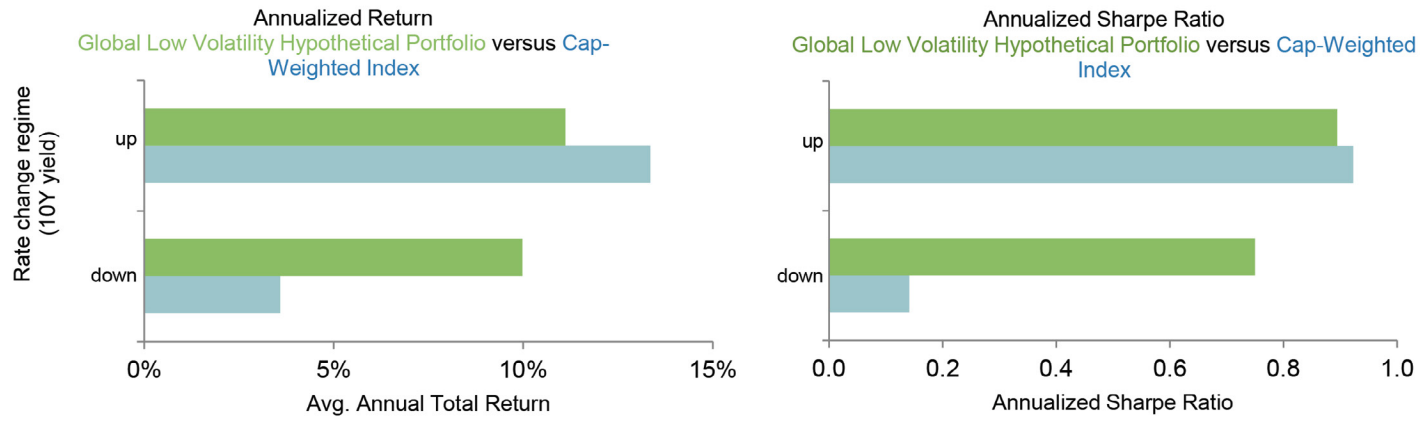


Exhibit 6: Concurrent Rate Change Regime
Performance shown is of a hypothetical investment strategy, gross of fees, taxes and transaction costs.

Predictive Indicator	Value	Percentile (vs. History, 100=highest)
DIV spread (standardized)	.07	7
BP spread (standardized)	-0.09	17
EP spread (standardized)	0.05	21

Exhibit 7: Recent Backdrop (as of December 31, 2014)
History relates to the period January 1, 1980, to December 31, 2014.

Exhibit 7 considers the relative valuation of the Global Low Volatility Portfolio, which was priced about at par with the broad market at the time of writing. Compared to the discount at which this portfolio has historically traded, this is indeed expensive. However, we have seen that this primarily reflects the strategy's macro positioning and has not been a good predictor of its impending performance.

The market rally could certainly have legs if economic fundamentals continue to improve. However, this might prompt the Fed to normalize its interest rate policy, potentially tempering the upside. Conversely, if economic growth disappoints, a correction might ensue as investors may conclude markets have gotten ahead of fundamentals. The risk might be asymmetric, and we note the Global Low Volatility Portfolio has historically performed relatively well compared to the Cap-Weighted Index during moderate up markets and during down markets.

Conclusions

Investors understand the appeal of low volatility equity investing but have expressed concerns about the tactical timing of making an allocation, primarily related to valuation levels and the interest rate environment. We have illustrated that valuation levels of the Global Low Volatility Portfolio primarily reflect its dynamic country and sector positioning more than the valuation of its existing holdings. This can explain its relative valuation being a poor predictor of its future relative performance. Our research showed that the Global Low Volatility Portfolio has tended to underperform during periods of rising interest rates. However, rate increases don't happen in isolation and in such a rising rate environment the strategy may still deliver the total return needed for investors to achieve their goals, while reducing volatility. We believe these are relevant considerations for investors looking to make an allocation to low volatility equities at this time.

Endnotes

This paper has benefited greatly from useful comments and discussions with Janet Campagna, Rosemary Macedo, Adam Petryk, Colm O'Cinneide and Heena Doshani. The authors thank Sarah Reifsteck and Nicole Phan for careful editing and Harish Suyal for data support.

1. For an overview thereof, see Baker, M., B. Bradley, and J. Wurgler. "Benchmarks as Limits to Arbitrage: Understanding the Low-Volatility Anomaly." Financial Analysts Journal, vol. 67, no. 1, 2011.
2. For a comparison thereof, see for example C. Walkshäusl, "International Low-Risk Investing," Journal of Portfolio Management, Fall 2014.
3. See the Appendix for a detailed description of the construction process of the hypothetical Global Low Volatility Portfolio and the Cap-Weighted Index considered in this analysis.
4. De Boer, S., Campagna, J. and J. Norman, "Country and Sector Drive Low-Volatility Investing in Global Equity Markets," Journal of Index Investing, Spring 2014.
5. We emphasize that this insight might be specific to the top-down implementation of the Global Low Volatility Portfolio, which may be less sensitive to "crowding" in individual low volatility stocks.
6. The reported return is for the top-down implementation of low volatility equity investing analyzed in this paper. The MSCI World Minimum Volatility Index return was even higher at 12.06%, likely due to a higher weight to US equities resulting from its 5% maximum active weight constraint versus the parent index, while the USD rallied.
7. De Boer, S., Campagna, J. and Norman J., "Country and Sector Drive Low-Volatility Investing in Global Equity Markets," Journal of Index Investing, Spring 2014.

Appendix: Description of the Global Low Volatility Portfolio Construction and the Capitalization-Weighted Index

To conduct this research, we created a hypothetical Global Low Volatility Portfolio by allocating capital among country-sector sub-indices which are cap-weighted baskets of the stocks in market segments of the MSCI World Developed Markets Index, e.g. US HealthCare, UK Telecommunications or Japanese Consumer Staples. A recent study we performed shows that such a top-down approach to low volatility investing historically delivered the same performance benefits as low volatility stock selection, with some implementation benefits.[7]

The construction process of the Global Low Volatility Portfolio is iterative to temper reliance on historical returns and to seek a diversified portfolio across countries, sectors and individual stocks. First, we created a portfolio of country-sector baskets with the lowest predicted risk, based on the trailing 5-year covariance matrix of weekly returns. Each country-sector basket had to meet certain minimum-liquidity constraints (measured by its aggregate market capitalization) in order to be eligible for inclusion. The resulting portfolio had to be sufficiently diversified based on the Herfindahl index – a measure of concentration. If not, we created a second portfolio with the lowest predicted risk among those country-sector baskets not yet selected, and equal-weighted between the two hypothetical low volatility portfolios. If that portfolio was sufficiently diversified it was used, if not a third low volatility portfolio was included in the mix based on the as-of-yet unselected country-sector baskets and equal-weighted with the other two hypothetical low-volatility portfolios. No more than a blend of three hypothetical non-overlapping low-volatility portfolios was ever required during the creation period (back-test and latest reading: January 1, 1980 to December 31, 2014) to meet our requirements for sufficient diversification. The Global

Low Volatility Portfolio was rebalanced on a quarterly basis. The Capitalization-Weighted Index represents the constituents of the MSCI World Developed Markets Index weighted by their free-float market capitalization, recalculated on a monthly basis.

Appendix: Indicator Definitions

The definitions of the indicator variables used in this research are as follows:

For all country-sector indices in our investable universe, we calculated the dividend yield, earnings yield and book-to-price ratio. Each month, we cross-sectionally z-scored these valuations. We used these standardized valuation scores to create the weighted average valuation score of the Global Minimum Volatility Portfolio and the Cap-Weighted Index, and used the month-end differences as the valuation spreads.

Trailing inflation was measured as the Year over Year (henceforth YoY) percentage change in OECD's price index, lagged by 1 month.

Real GDP growth was measured as the YoY change in the OECD's Gross Domestic Product by Expenditure in Constant Prices, lagged by a quarter. An adjustment was made for growth in non-OECD member states using World Bank data.

The trailing interest rate change was measured as the YoY difference in medium-term sovereign rates. Starting in 1991, we used the Barclays Global Aggregate Bond index yield. Before that, we used the 10Y US treasury rate.

Data was sourced from MSCI (country-sector index returns as well as valuation data), Datastream (return data for low volatility portfolio construction, interest rate data), the OECD and the World Bank (inflation, global economic growth).

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Risk-Parity Strategies at a Crossroads, or, Who's Afraid of Rising Yields?

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Risk-parity strategies have gained considerable popularity in recent years. Their stable, attractive risk/return profile particularly during the turbulent stages of the financial and debt crisis in 2008 and 2010/2011 unequivocally helped corresponding multi asset- class strategies to become a firmly established fixture by now in a wide array of institutional portfolios. What's less clear is how to proceed with such investments in the future.

For commonly accepted rumours have it that the historically attractive performance of risk-parity strategies has been due in large part to the trend toward record-low market interest rates. However, the yield situation looks set to return to normal in the medium term against the backdrop of reviving economic growth data, a gradually noticeable job-market recovery and a foreseeable exit from unconventional monetary policy actions, particularly in the USA. This therefore raises the question of whether risk-parity strategies can continue to deliver a stable performance in the future in the face of potentially rising market interest rates.

This article employs an empirical analysis in an attempt to provide conclusive answers to that question. It starts off by analysing how the high-yield phase of the 1970s would have affected a risk-parity strategy, taking the USA as an example. It then analyses the impact that some fundamental factors behind interest-rate hikes – i.e. inflation and economic growth – exert on the risk-parity strategy's return behaviour. A summating conclusion rounds out the analysis.

A trip back in time – the past since 1970…

In stark contrast to the more recent past, the 1970s in particular were shaped by soaring market interest rates. Figure 1 shows that the two oil price shocks in 1973/74 and 1979/80 and the abrupt disinflation initiated by Paul Volcker at the start of the 1980s caused the yield on 10-year US Treasury notes to practically double to a temporary peak of around 16% in autumn 1981.

Since then, other – albeit smaller – yield spikes have intermittently interrupted the trend toward record-low market interest rates, but have been unable to reverse it.

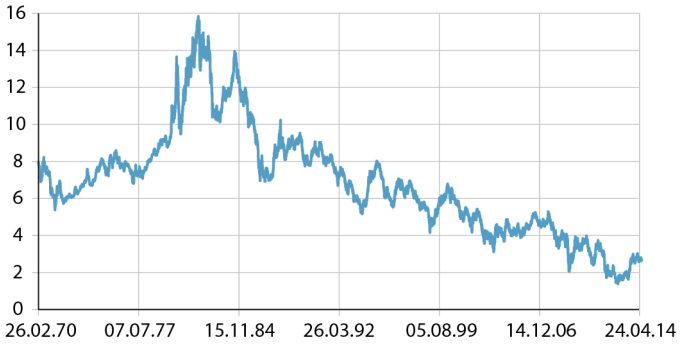

Exhibit 1: Rising vs Falling Interest Rates
Source: Vescore LTD

This turbulent past provides an ideal basis for analysing the risk/return behaviour of risk-parity strategies in various market phases. Using an investment universe consisting of three asset classes – bonds, stocks and commodities – we undertake an analysis to determine how a simple risk-parity strategy would have performed compared against two classical static portfolios weighted by market capitalisation. To do this, we simulate a risk parity (RP) strategy that uses historical 40-day volatility data as a relevant risk measure. We allow leveraged positions in order to also factor in the strategy's potential to dynamically adapt overall exposure to a specific target risk. The portfolio is balanced daily and the corresponding transaction costs are taken into account.

For the benchmark, we calculate a classical capitalisation weighted portfolio that at all times is fully invested 60% in bonds, 30% in stocks and 10% in commodities. We hereinafter call this portfolio the conservative benchmark (CB). For the sake of consistency, the weightings are likewise rebalanced daily with transaction costs taken into account. To give the benchmark comparison a broader underpinning, we additionally simulate a more aggressive portfolio with an asset allocation weighting of 40% bonds, 40% stocks and 20% commodities. We hereinafter call this portfolio the aggressive benchmark (AB).

… and its influence on asset allocation strategies

A yield increase can be embedded into different market scenarios. So a meaningful analysis also needs to take into account the historical context and thus the drivers behind the change in interest rates. Did exogenous causes bring about an abrupt change in interest rates that caught market participants on the wrong foot? Or was a period of positive economic growth coupled with creeping inflation – i.e. an orderly economic cycle – the underlying cause of the rise in market interest rates?

To factor in these market scenarios, we compare the change in their fundamental factors – the 10-year US Treasury yield, US inflation and US real GDP growth – with the cumulative return delivered by the different strategies over a fixed six-month time window. We thus ask, for instance, how a six-month increase in yields affected the six-month return of a risk-parity strategy on average. In order to attain stably underpinned market scenarios in the analysis, we divide the evolution of the fundamental factors into quintiles. The bottom quintile, for example, serves to analyse the biggest 20% of interest-rate reductions, and the top quintile serves to analyse the biggest 20% of yield increases.The focal point of the analysis – rising vs. falling interest rates.

What basic findings does this empirical analysis bring to light? The top section of Table 1 compares the interest-rate change over six months with the changes in the fundamental factors inflation and GDP growth over the same period. The macroeconomic picture speaks for itself. An interest-rate hike is usually tied to an increase in inflation and economic growth. This means that exogenous shocks such as the 1994 bond market crash or the 2013 "tapering" announcement that are ascribable neither to inflation nor to GDP growth cannot significantly affect the aggregate picture.

The table additionally shows the average six-month return for the individual asset classes under the different interest-rate scenarios. Not surprisingly, the return on bonds exhibits a significant inverse correlation with changes in interest rates. Somewhat more surprising is the performance of stocks, which is positive across all interest-rate scenarios despite phases such as the one in 2008, when equity markets corrected sharply as a result of the financial crisis and market interest rates tumbled in their wake. Commodities, on the other hand, indirectly live up to their reputation as a hedge against inflation and generate the highest gains precisely during periods of rising yields and associated inflation, such as during the two oil shocks in the 1970s.

How well did the different asset allocation strategies exploit the diverse characteristics of the different asset classes to generate a stable performance? To glean an answer, the middle section of Exhibit 1 and Exhibit 2 show the average volatility-adjusted six-month returns of the strategies under the different interest rate scenarios. What's striking is that the risk-parity strategy outperforms the conservative benchmark across all interest-rate scenarios. The more yields drop, the higher the risk-parity strategy's alpha tends to be. Both strategies delivered negative returns only in the instance of the biggest 20% of yield increases, but here too there was a slight edge in favour of the dynamic risk-parity strategy.

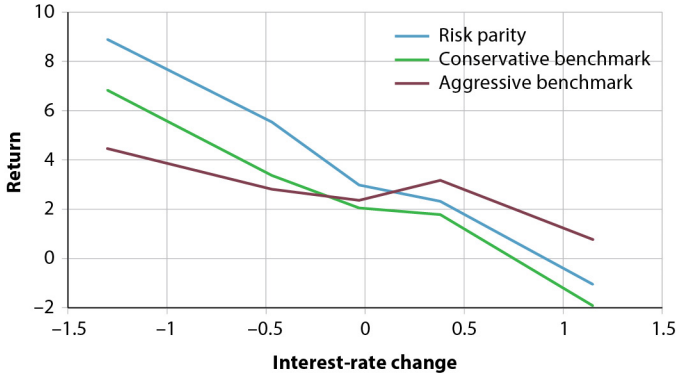

Exhibit 2: Yield Scenarios vs Return Behavior
Source: Vescore LTD

The more aggressive benchmark, on the other hand, was able to achieve a more consistent performance across all interest rate scenarios that also delivered positive returns on average. However, this consistency comes at the price of a poorer performance in the event of falling interest rates and a generally higher loss risk. A comparison of maximum drawdowns over the 1970 to 2014 time frame shows that the risk-parity strategy can limit

		Falling interest rates			Rising interest rates	
		1. Quintile	2. Quintile	3. Quintile	4. Quintile	5. Quintile
Market environment and prices	Change in interest rate	–1.3%	–0.5%	0.0%	0.4%	1.2%
	Change in inflation	–0.6%	–0.3%	0.1%	0.3%	0.3%
	Change in GDP growth	–0.9%	–0.5%	0.1%	0.7%	0.8%
	Return on bonds (10-year)	10.2%	4.0%	0.8%	–2.0%	–7.3%
	Return on stocks (SPX)	4.6%	3.6%	3.7%	5.2%	3.4%
	Return on commodities	–0.1%	3.1%	5.1%	10.6%	10.2%
Total return and return attribution	Risk parity (RP)	8.9%	5.5%	3.0%	2.3%	–1.0%
	Conservative benchmark (CB)	6.8%	3.4%	2.1%	1.8%	–1.9%
	Aggressive benchmark (AB)	4.5%	2.8%	2.4%	3.2%	0.8%
	RP bonds	6.6%	3.3%	0.4%	–2.2%	–4.8%
	CB bonds	5.4%	1.9%	0.4%	–1.1%	–4.2%
	AB bonds	3.0%	1.1%	0.2%	–0.6%	–2.3%
	RP stocks	1.5%	1.3%	1.2%	1.6%	1.0%
	CB stocks	1.3%	1.1%	1.2%	1.9%	1.4%
	AB stocks	1.5%	1.2%	1.3%	2.1%	1.5%
	RP commodities	0.7%	0.9%	1.4%	3.0%	3.0%
	CB commodities	–0.1%	0.3%	0.5%	1.0%	1.0%
	AB commodities	–0.1%	0.5%	0.8%	1.7%	1.6%
Exposure data	Overall exposure RP	2.0	2.6	2.7	2.6	1.7
	Bond exposure RP	1.3	2.0	2.1	2.0	1.1
	Equity exposure RP	0.3	0.3	0.4	0.3	0.3
	Commodity exposure RP	0.3	0.3	0.3	0.3	0.3
	Delta overall exposure RP	7.1%	25.1%	18.5%	7.7%	–8.0%
	Delta bond exposure RP	13.8%	42.3%	32.7%	17.7%	–8.6%
	Delta equity exposure RP	3.6%	22.7%	18.0%	12.3%	2.5%
	Delta commodity exposure RP	0.9%	8.8%	11.4%	10.0%	7.8%

Exhibit 3: Rising vs Falling Interest Rates
Source: Vescore LTD

the maximum loss to minus 21%. Both benchmark portfolios, in contrast, exhibit much bigger losses in value: minus 25% for the conservative benchmark and minus 30% for the aggressive benchmark. This means that the risk-parity portfolio is able to combine the conservative benchmark's excess return amid falling market interest rates with the aggressive benchmark's good return profile amid rising yields. At the same time, the risk-parity strategy also provides the best capital preservation for investors since it exhibits the smallest maximum drawdown.

This raises the question of what lies behind these risk/return characteristics. Why does the aggressive benchmark appear to be less sensitive to yield movements but seems at the same time to be the riskiest of the asset allocation strategies? What is the reason behind the risk-parity strategy's consistent alpha relative to the conservative benchmark? The middle section of Exhibit 1 and Exhibit 4 provide initial answers; for each strategy they compare the return attribution of the individual asset classes under the different interest-rate scenarios.

With regard to the return attribution for bonds, the findings indicate that the risk-parity strategy profits the most in an environment of falling market interest rates, but at the same time suffers the most in a climate of rising yields. The aggressive benchmark exhibits the lowest sensitivity to yield movements because it has the smallest average exposure to bonds. However, the return attribution of stocks to the overall performance of the various strategies stays similar under the different interest-rate scenarios. Here, too, a comparison of the three strategies verifies the risk-parity strategy's tendency to profit from stocks particularly amid falling market interest rates. But the most significant differentiation owes to the return attribution to commodities. The risk-parity strategy is the one that profits the most from the commodity markets regardless of the interest-rate scenario. The higher the yield increase, the greater its excess return. As a result of its dynamism, the risk-parity strategy seems to be the one best able to exploit the inverse correlation between bonds and commodities to offset the adverse effects of higher bond yields.

To confirm this supposition, the bottom section of Exhibit 3 and Exhibit 4 show the average exposure of the risk-parity strategy and the asset classes and their percentage change under the different interest-rate scenarios. The percentage change in overall leverage basically correlates inversely with the interest-rate scenarios. Overall leverage decreases as yields rise, primarily due to a reduction in exposure to bonds that tend to receive the heaviest weighting. Conversely, the strategy ratchets up bond exposure and overall leverage the more that yields fall. Note,

however, that bond exposure and overall leverage get increased only mildly in the quintile with the deepest yield reductions. This is due to the elevated market volatility that often accompanies significantly falling yields during a flight to less-risky asset classes. The fact that the risk-parity strategy employs a target risk also reduces overall leverage amid rising volatility. Equity exposure likewise tends to get reduced when market interest rates are rising. As a confirmation of the supposition postulated above that risk parity strategies exploit the diversification potential of commodities the best, Exhibit 5 on the other hand shows a positive correlation between the change in market interest rates and the percentage change in exposure to commodities. This means that when yields are rising, the risk-parity strategy shifts out of bonds and stocks into commodities and on average offsets losses on bonds by reaping gains on commodity positions. This very dynamic shifting between asset classes and the target risk aimed for substantiate the risk-parity strategy's ability to adapt pro-cyclically to the market climate and thus better seize performance opportunities.

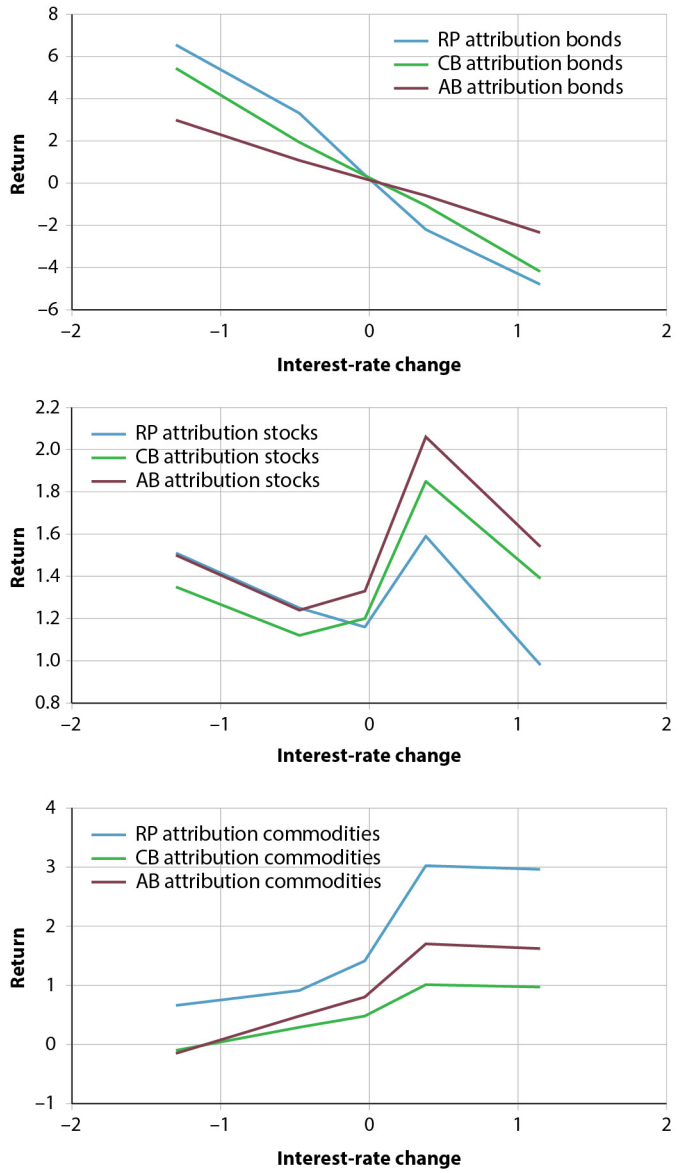

Exhibit 4: Yield Scenarios vs Return Attribution
Source: Vescore LTD

In summation, empirical evidence corroborates a negative correlation between the change in the market interest rate and the return on the asset allocation strategies. However, the risk parity strategy consistently earns an excess return relative to the conservative benchmark and on average only suffers a negative six-month return in the quintile of the biggest 20% of yield increases. The aggressive benchmark, due to its lower exposure to bonds by design, exhibits reduced sensitivity to yield movements and thus the best return in the event of sharply rising market interest rates, but in exchange faces significantly elevated loss potential on the riskier stock and commodity asset classes that it is unable to counterbalance, as evidenced by the maximum drawdown.

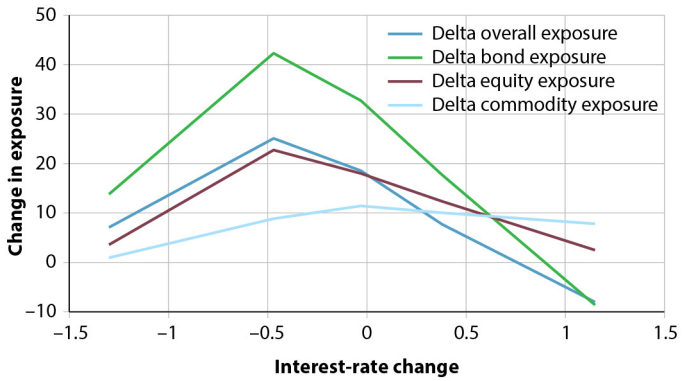

Exhibit 5: Interest-Rate-Change vs Change in Exposure
Source: Vescore LTD

However, the question of how each asset allocation strategy has historically performed under different yield scenarios is only limitedly meaningful against the backdrop of the current rhetoric from the leading central banks saying that the general interest-rate level might stay low even in the event of rising inflation and accelerating growth data. The more pressing question, then, is how the strategies have performed in explicit relation to inflation and the general economic environment. The next two chapters are devoted to answering that question. To stay within the scope of this article, though, we will confine ourselves to an abbreviated discussion of the facts.

Inflation vs. deflation – all the same, or indeed different?

Duo cum faciunt idem, non est idem – when two do the same thing, it is never quite the same thing. Analogously to this wise maxim, Exhibit 6, which reflects the situation amid a change in inflation over the preceding six months, shows that the change in inflation basically behaves inversely to economic growth due to the phase shift between the inflation cycle and the economic cycle. In contrast, rising inflation rates have historically been accompanied by rising market interest rates, as one would expect. Hence, it comes as no surprise that inflation-sensitive commodities correlate positively, and deflation-sensitive bonds negatively, with the inflation cycle. A negative correlation holds for stocks as well, which tend to benefit more from falling than rising inflation.

This pronounced difference in the behaviour of the individual asset classes during the different stages of the evolution of inflation changes provides the dynamic risk-parity strategy with an ideal foundation for exploiting its full potential. Exhibit 6 and Exhibit 7 verify that the risk-parity strategy delivered a

		Deflation or falling inflation			Rising inflation	
		1. Quintile	2. Quintile	3. Quintile	4. Quintile	5. Quintile
Market environment and prices	Change in interest rate	–0.3%	–0.2%	–0.2%	0.1%	0.3%
	Change in inflation	–2.0%	–0.6%	–0.1%	0.5%	1.9%
	Change in GDP growth	1.2%	0.2%	–0.3%	0.0%	–0.9%
	Return on bonds (10-year)	3.0%	2.3%	1.8%	–0.1%	–1.3%
	Return on stocks (SPX)	7.6%	6.5%	3.7%	3.3%	–0.7%
	Return on commodities	–3.8%	3.2%	2.8%	10.4%	16.3%
Total return and return attribution	Risk parity (RP)	3.4%	4.8%	4.0%	3.7%	2.9%
	Conservative benchmark (CB)	3.5%	3.3%	2.3%	2.5%	0.5%
	Aggressive benchmark (AB)	2.7%	3.2%	2.2%	3.4%	2.0%
	RP bonds	1.7%	1.6%	1.5%	–0.3%	–1.3%
	CB bonds	1.6%	1.2%	0.9%	–0.1%	–1.1%
	AB bonds	0.9%	0.7%	0.5%	–0.1%	–0.6%
	RP stocks	1.8%	1.9%	1.4%	1.4%	0.0%
	CB stocks	2.4%	1.8%	1.2%	1.6%	0.0%
	AB stocks	2.6%	2.0%	1.3%	1.7%	0.0%
	RP commodities	–0.1%	1.1%	1.1%	2.5%	4.3%
	CB commodities	–0.5%	0.3%	0.3%	1.0%	1.5%
	AB commodities	–0.8%	0.5%	0.4%	1.7%	2.6%
Exposure data	Overall exposure RP	2.2	2.6	2.4	2.4	2.1
	Bond exposure RP	1.6	1.9	1.7	1.8	1.5
	Equity exposure RP	0.3	0.4	0.3	0.3	0.3
	Commodity exposure RP	0.3	0.3	0.3	0.3	0.2
	Delta overall exposure RP	17.0%	19.1%	9.1%	8.3%	–3.2%
	Delta bond exposure RP	24.2%	25.9%	25.2%	24.4%	–1.8%
	Delta equity exposure RP	21.7%	32.2%	1.1%	1.2%	2.9%
	Delta commodity exposure RP	19.5%	14.2%	4.8%	4.3%	–3.7%

Exhibit 6: Inflation vs Deflation
Source: Vescore LTD

positive return across all inflation phases and consistently earned an excess return relative to both benchmark portfolios. On the whole, phases of sharply spiking and plummeting inflation pose a relatively challenging environment also for the risk-parity portfolio. However, a comparison of the percentage change in exposure shows that by dynamically adjusting the inflation-sensitive commodity and deflation-sensitive bond asset classes, the risk-parity strategy was able to avoid major risks and at the same time was capable of seizing return opportunities. So although the risk parity strategy was the one that lost the most on equity exposure during periods of spiking inflation, it was the one that best offset those losses via gains on commodity exposure.

Expansion vs. contraction – what impact does the economic cycle exert?

In Exhibit 9, a comparison of the change in economic growth data with the change in the interest-rate level and the inflation environment verifies that the dynamics are only partially congruent. For instance, a pickup in the economic cycle has historically been accompanied by elevated market interest rates, but no systematic correlation is evident with regard to changes on the inflation front. The commodities asset class as well does

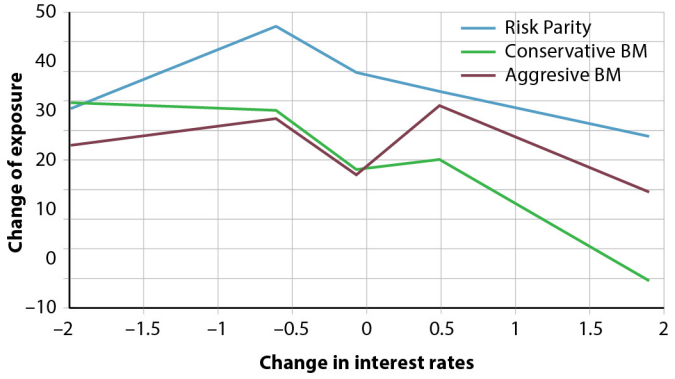

Exhibit 7: Change in Inflation vs Return Behavior
Source: Vescore LTD

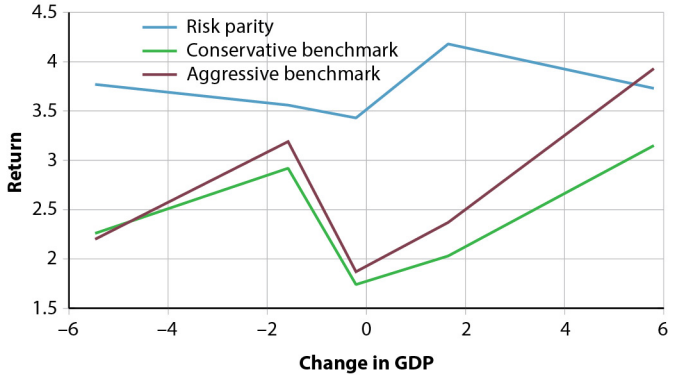

Exhibit 8: Change in Economic Growth vs Return Behavior
Source: Vescore LTD

not exhibit considerably varying return characteristics across the different stages of the economic cycle. Stocks, in contrast, tend to benefit from accelerating economic growth. The risky asset classes' positive return across the different stages of the economic cycle has historically given the individual asset allocation strategies a stable return profile. Only bonds have come under pressure amid accelerating economic growth momentum, due to rising market interest rates. Exhibit 8 verifies that the risk-parity strategy was the one that mastered the different growth scenarios the best. Given its robust performance across all change-in-growth quintiles, the risk-parity strategy exhibits stable return behaviour and consistently outperformed the benchmark strategies in most instances. It was only during periods of particularly strong economic expansion that a relatively less positive equity return attribution enabled the aggressive benchmark to catch up with the risk-parity strategy. The risk-parity strategy's consistent performance across the economic cycle is also the reason why it is laconically called an all-weather portfolio. The benchmark portfolios exhibit greater sensitivity to economic growth and thus react more strongly to fluctuations in economic activity.

Conclusion

By means of an empirical analysis that takes the USA as an example, this article has demonstrated that a simple risk-parity strategy can pay off in an environment of rising market interest rates and stands up well against classical capitalisation-weighted portfolios, even when the high-yield phase of the 1970s is factored in. When the increase in market interest rates proceeds in an orderly manner, i.e. when it is coupled with moderately rising inflation and gradual economic growth, the risk-parity strategy achieves the best risk/return profile. This added value is attributable to two reasons. First, the high dynamism of the risk-parity strategy better exploits the diversifying characteristics of the different asset classes. Second, thanks to the target risk, the overall portfolio exposure continually adapts to the current risk climate and thus reacts pro-cyclically to opportunities. On average, the risk-parity strategy outperforms the conservative benchmark, even amid abrupt spikes in market interest rates. However, an aggressive benchmark with a lower investment allocation to bonds is also able to generate an excess return in such a yield environment. But that strategy's higher tolerance for risk results in a lower return in the event of falling market interest rates and in significantly greater loss potential as measured by the maximum drawdown.

Despite this favourable finding, it should be noted that although the risk-parity strategy is the one that profits the most from bonds when yields fall, it is also the one that suffers the most from losses on bonds when yields rise. The risk-parity strategy's attractive risk/return profile is primarily attributable to the fact that stocks and especially commodities were able to offset the bond-loss phases. This serves as a clear reminder that risk-parity strategies exhibit more-than-negligible sensitivity to bonds. This can become problematic particularly in the event of interest-rate shocks like the ones in 1994 or 2013, when the correlations between asset classes suddenly spike and curtail the diversification potential within the portfolio. To mitigate the impact of such events, it appears advisable to additionally steer a risk-parity strategy's bond exposure using factors that are not directly taken into account in the balancing of risks. We are leaving this point open to be addressed in future Research Note articles.

		Contraction			Expansion	
		1. Quintile	2. Quintile	3. Quintile	4. Quintile	5. Quintile
Market environment and prices	Change in interest rate	–0.2%	–0.1%	–0.1%	–0.1%	0.1%
	Change in inflation	–0.2%	0.0%	0.3%	–0.1%	–0.3%
	Change in GDP growth	–5.5%	–1.6%	–0.2%	1.6%	5.8%
	Return on bonds (10-year)	2.2%	1.4%	1.3%	1.0%	–0.2%
	Return on stocks (SPX)	1.5%	5.2%	2.8%	3.5%	7.4%
	Return on commodities	6.8%	6.6%	4.5%	4.8%	6.1%
Total return and return attribution	Risk parity (RP)	3.8%	3.6%	3.4%	4.2%	3.7%
	Conservative benchmark (CB)	2.3%	2.9%	1.7%	2.0%	3.2%
	Aggressive benchmark (AB)	2.2%	3.2%	1.9%	2.4%	3.9%
	RP bonds	0.6%	0.4%	1.2%	1.2%	–0.2%
	CB bonds	1.1%	0.7%	0.5%	0.2%	–0.1%
	AB bonds	0.6%	0.4%	0.3%	0.1%	–0.1%
	RP stocks	0.8%	1.3%	1.0%	1.4%	2.0%
	CB stocks	0.5%	1.6%	0.8%	1.4%	2.7%
	AB stocks	0.6%	1.7%	0.9%	1.5%	3.0%
	RP commodities	2.4%	1.9%	1.3%	1.5%	1.9%
	CB commodities	0.6%	0.6%	0.4%	0.4%	0.6%
	AB commodities	1.0%	1.1%	0.7%	0.7%	1.0%
Exposure data	Overall exposure RP	2.1	2.3	2.5	2.6	2.0
	Bond exposure RP	1.5	1.8	1.8	2.0	1.4
	Equity exposure RP	0.3	0.3	0.3	0.3	0.3
	Commodity exposure RP	0.3	0.3	0.3	0.3	0.3
	Delta overall exposure RP	12.0%	6.1%	7.6%	10.5%	14.2%
	Delta bond exposure RP	28.7%	12.7%	12.0%	25.1%	19.3%
	Delta equity exposure RP	8.4%	16.4%	5.5%	7.4%	21.4%
	Delta commodity exposure RP	–2.6%	11.9%	7.7%	2.0%	20.0%

Exhibit 9: Expansion Vs. Contraction
Source: Vescore LTD

Authors' Bios

Fabian Dori, M.A. HSG, CFA, FRM
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Fabian Dori was appointed Head of Notenstein Private Bank's Investment House unit in March 2015. From February 2013 to February 2015 he was a Member of the Executive Board of 1741 Asset Management AG, responsible for portfolio management. Previously he was a Member of Senior Management in the Asset Management division of Wegelin & Co. Private Bankers, where he was responsible for the management of quantitative multi-asset-class strategies. Fabian Dori holds a master's degree in quantitative economics & finance from the University of St. Gallen and is a certified Financial Risk Manager and CFA.

Manuel Krieger, M.A. HSG
Entrepreneur
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Manuel Krieger is an independent entrepreneur and financial consultant. Until Mid-2014 he was overseeing the multi-asset class portfolio management at 1741 Asset Management Ltd. He was a member of the Global Risk Diversification portfolio management team, as well as the fund manager of the 1741 Diversified Trends fund. Before joining 1741 in 2012, he was portfolio manager at Wegelin & Co. Private Bankers. Manuel Krieger has a Master's degree in Information Management from the University of Fribourg and was awarded top honors for his master thesis in the area of artificial intelligence. Manuel Krieger also holds a master's degree in Finance from the University of St. Gallen.

Urs Schubiger, M.Sc. ETH, lic.iur.
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Urs Schubiger work at Achievement LLC. Until Septmeber 2015, he was Head Managed Futures & Indexing at Vescore Ltd and Chief Investment Officer at 1741 Asset Management Ltd. Between 2009 and 2012, he was head of Research, Modelling & Technology with Asset Management at Wegelin& Co. Private Bankers. Before moving to Wegelin & Co., he worked as a quantitative analyst in research and portfolio management for the US Equity Statistical Arbitrage Group of UBS O'Connor in Chicago. Urs holds a master's degree in mathematics from the Swiss Federal Institute of Technology (ETH) in Zurich and a master's degree in law from the University of Basel.

Daniel Torgler, M.A. HSG, CAIA
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Vescore Ltd.

Daniel Torgler is Head Managed Futures and member of the senior management at Vescore Ltd. Before taking on this responsibility, he was Head Managed Futures at 1741 Asset Management Ltd and lead portfolio manager of the 1741 Diversified Trends and 1741 Global Risk Diversification fund. Before joining 1741 Asset Management Ltd. in 2012, he was a research analyst at Man Investments in Switzerland and the UK, a credit analyst in leveraged finance at Pemba Credit Advisers, and a portfolio manager at Wegelin & Co. Private Bankers.

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Description of MLPs

A Master Limited Partnership, or MLP, is a partnership that has its shares (called "units") traded on a public exchange, such as NYSE or NASDAQ. As partnerships, MLPs are passthrough entities for tax purposes, meaning they do not pay taxes at the corporate level. As currently defined by the U.S. Tax Code, MLPs are required to generate at least 90% of their income from activities with "qualified sources"[1] such as depletable natural resources. Such activities include oil & gas exploration & production, mining, gathering & processing, refining, compression, transportation, storage, marketing and distribution. MLPs operate in a number of natural resources-related businesses and have been popular vehicles for investment due to their tax-advantaged high distribution payout structure and, in certain cases, cash flows backed by long term contracts. While REITS have statutorily required distribution minimums, MLPs do not. MLPs have the ability to grow, and thus increase distributions, through additions to their asset bases by acquisition or development.

MLP Structure

Typically, an MLP's ownership consists of a general partner (GP) and limited partners (LP). The LPs provide capital but have no role in managing or operating the MLP and have limited voting rights. They are, however, entitled to receive cash distributions and their units are publicly traded, allowing for liquidity. In contrast, the GP tends to hold a small stake (e.g., 2%) but have full management responsibility and control of the business (See Exhibit 1).

Many MLPs operate what may be described as a "toll-road" business model, meaning they receive a fee for handling the customers' product without taking ownership of the commodity. MLPs can have long term contracts with their customers, often with attractive features such as "take-or-pay" and inflation escalators that help provide cash flow stability and limited commodity price exposure. MLPs typically

operate in asset intensive businesses with high barriers to entry which can also help ensure their cash flow stability.

MLP Distributions

MLPs typically pay almost all of their distributable cash flow ("DCF") in the form of quarterly distributions. Due to their high payout ratios, MLPs are often reliant on debt and equity capital markets to finance growth. In order to grow, an MLP needs to develop its existing assets and/or acquire new assets, as well as raise the necessary capital to execute its growth plans. To retain access to the capital markets, MLPs are motivated to retain a strong balance sheet and not rely too heavily on debt to finance growth. However, existing investors will experience dilution as more MLP units are issued.

The GP usually owns Incentive Distribution Rights ("IDRs") that entitle the GP to a greater percentage of incremental cash flows that are distributed by the MLP. The IDRs are akin to a performance fee and help motivate the GP to increase the per unit distributions. Initially, the GP is entitled to its pro rata share (e.g., 2%) of the cash distributions. As distributions increase and reach certain levels (i.e., "splits" or "tiers"), the GP is entitled to a larger percentage of the incremental cash distribution – in some cases up to 50%. Hence, in a typical structure, the GP has an incentive to grow distributions. The particular MLP's partnership agreement spells out the terms of its IDRs.

Exhibit 2 illustrates the mechanics of how cash flows are allocated between the LPs and the GP, based on the Incentive Distribution Rights schedule. The "Declared Distribution" refers to the amount of cash distributable to the GP (prior to the IDR) and the LP at each tier level. (See Exhibit 3). As cash distributions grow, the GP (based on its GP interest *plus* the IDR) is allocated a greater percentage of the total distributions.

As the distribution flows through each tier, more incremental cash is allocated to the GP. Note that it would take $5.42 of total distributions to fill each tier, resulting in $3.92 (72%) to the limited partner and $1.50 (28%) to the general partner.

An issue with IDRs is that they effectively raise the cost of capital for the MLP (which only issue LP units when they raise capital). As cash distributions increase (thereby lifting the tier levels) the LP unit gets a smaller share of incremental dollars. MLPs with high splits (e.g., 50%) can find that acquisitions are uneconomic for the LPs as the LPs only receive 50% of incremental distributions, but provide virtually 100% of the capital. In the last several years, some GPs reduced their splits or exchanged their IDRs for LP units to alleviate this issue.[2]

History of MLPs

MLPs were first formed in the early 1980s in the oil & gas sector. Soon after, other types of businesses formed MLPs as well, including real estate, restaurants, cable TV, amusement parks, and even the Boston Celtics. MLPs provided a way to raise capital from smaller investors by offering them a tax-efficient investment that was also publically tradable. By the mid-1980's, Congress became concerned that MLPs would provide a way for large numbers of corporations to avoid corporate income tax. In 1987 Congress passed legislation that limited partnership tax treatment to those entities earning at least 90% of their income as "qualifying income," which they defined as follows:

> "income and gains derived from the exploration, development, mining or production, processing, refining, transportation (including pipelines transporting gas, oil, or products thereof), or the marketing of any mineral or natural resource"[3]

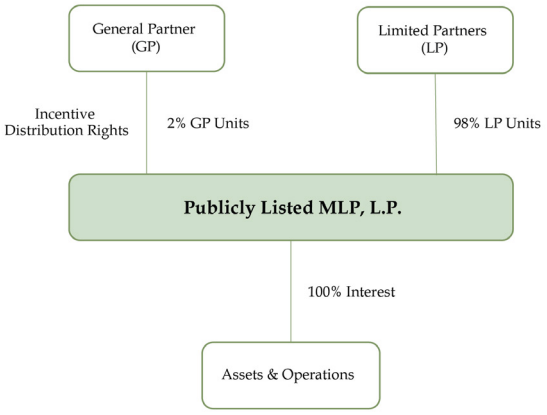


Exhibit 1: Graph of MLP Structure
Source: Meketa Investment Group

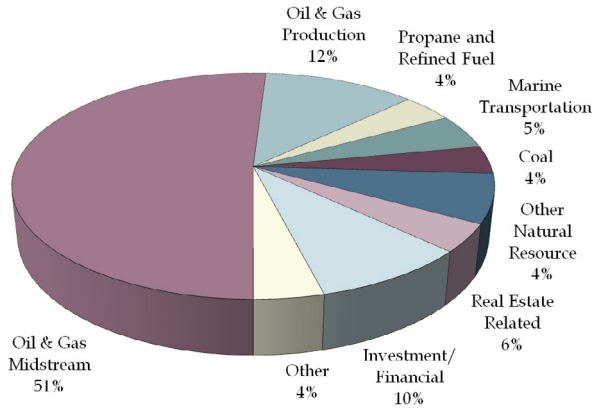
Tier	LP (%)	GP (%)	Declared Distribution
1	98	2	Up to $1.00
2	85	15	$1.00 to $2.00
3	75	25	$2.00 to $3.00
4	50	50	Over $3.00

Exhibit 2: Incentive Distribution Rights Structure for Example MLP
Source: Meketa Investment Group

Tier	LP ($)	GP (2%)	GP (IDR)	GP Total ($)	Total GP Share of Tier Cash Flow (%)
1	0.98	0.02	0.00	0.02	2
2	0.98	0.02	0.15	0.17	17
3	0.98	0.02	0.30	0.33	33
4	0.98	0.02	0.96	0.98	50
Total	3.92	0.08	1.42	1.50	28

Exhibit 3: Declared Distribution Allocation for Example MLP
Source: Meketa Investment Group

By Number



By Capitalization

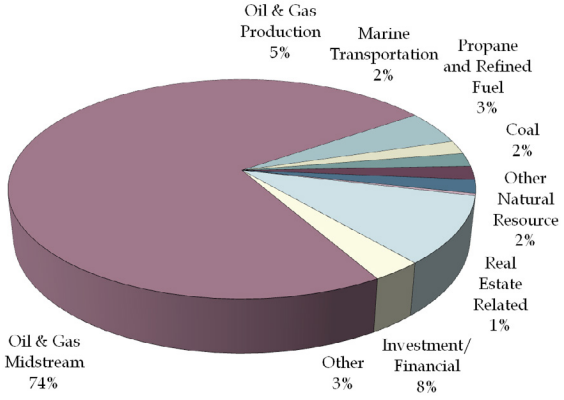


Exhibit 4: MLPs by Industry Group
Source: "Master Limited Partnerships 101: Understanding MLPs", National Association of Publicly Traded Partnerships, 10/4/13

In the late 1980's and the 1990's some integrated energy companies sold or spun off their "midstream" or pipeline-related assets to MLPs. These became the foundation of the current MLP universe. Over time, MLPs engaged in marine transportation of petroleum products, propane distribution, and the coal industry were formed. In the late 2000's, MLPs focused on oil & gas exploration and development, often with hedging to protect cash flow and distributions, were formed. Through the passage of the Renewable Energy and Job Creation Act in September 2008, the definition of "qualifying income" was expanded to include the transportation and storage of renewable fuels, further increasing the MLP universe. (See Exhibit 4).

Overview of the MLP Market

Currently, there are over 110 MLPs trading on major exchanges, with oil & gas midstream activities – gathering, processing, natural gas compression, pipelines, storage, refining, distribution, and marketing – representing the dominant activity. However, the rising popularity of the MLP asset class has drawn entrants beyond the midstream area. Nontraditional assets such as oil sands, chemicals, refiners, and drilling rigs have accessed the MLP marketplace. In some cases, the businesses are supported by stable cash flows and long-term contracts which can lead to stable payout models. In other cases, the businesses could experience volatile cash flows (e.g., exploration or commodity-related MLPs) or are composed of a single asset which could lead to variable payouts to investors.

The market value of the MLP universe has grown substantially since 2000. This has been the result of IPOs, secondary equity issuance and appreciation. (See Exhibit 5).

As the MLP market has grown, so has its liquidity. Average daily liquidity increased from approximately $40 million per day in 2001 to nearly $900 million per day in 2013 (See Exhibit 6). While historically a retail-oriented investment, institutions have steadily increased their share of the MLP market place. Approximately 65% of MLP interests are held by retail investors, with the balance held by institutional investors such as closedend funds, mutual funds, hedge funds. Increasing awareness of MLPs among institutional investors, including pension funds, is expected to contribute to the ongoing growth and liquidity of the assets class.

While the MLP market has grown substantially, it remains small compared to other asset classes such as high yield bonds and much smaller than the broad equity market. The entire MLP market is similar in size to the market capitalization of Exxon Mobil. (See Exhibit 7).

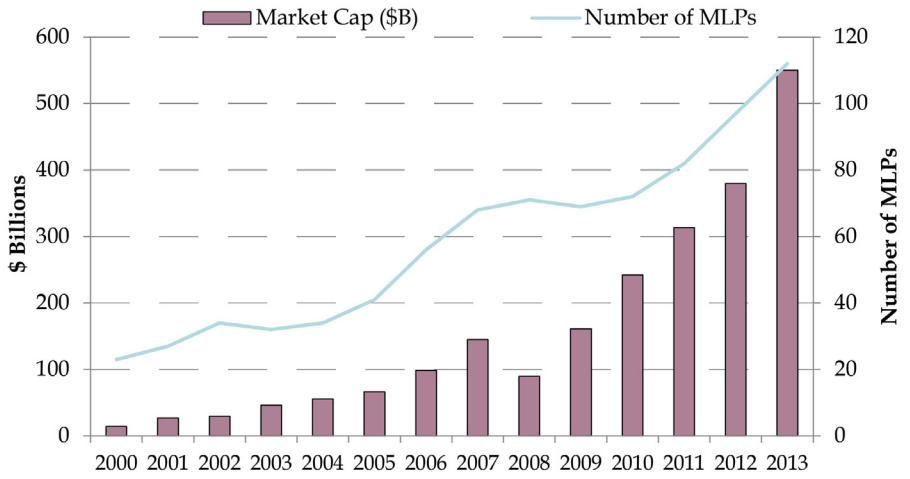


Exhibit 5: Total Market Capitalization of MLP Universe ($ bn)
Source: Goldman Sachs
Total MLP market

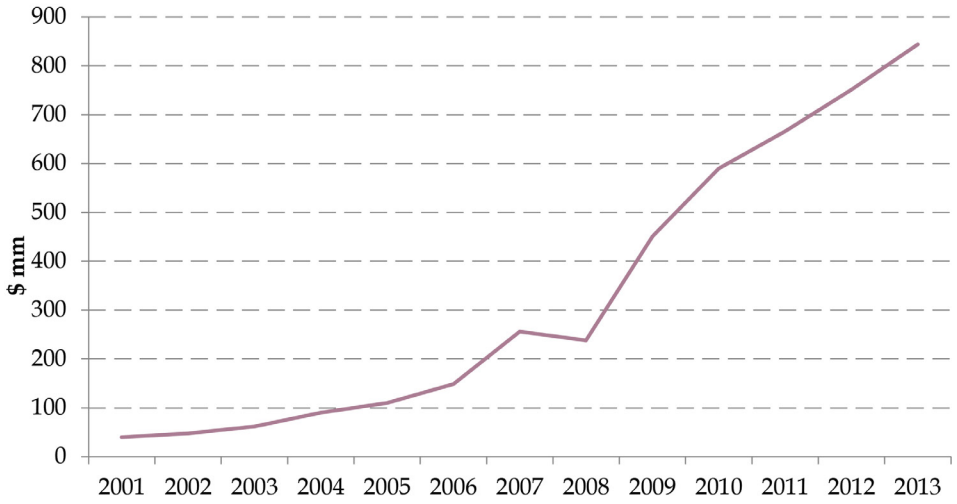


Exhibit 6: Average Daily Trading Liquidity
Source: Goldman Sachs, Morgan Stanley
Total MLP market

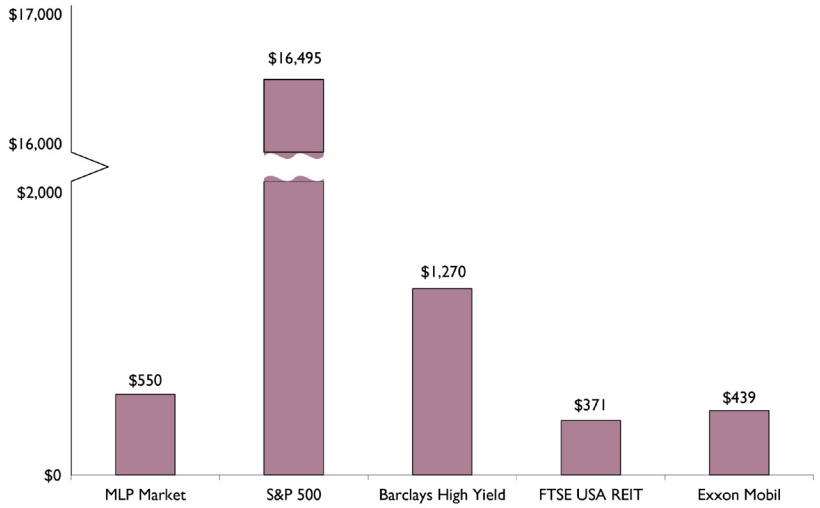


Exhibit 7: Comparison of Market Capitalization
Source: Goldman Sachs, Datastream as of December 31, 2013.

As shown in Exhibit 8, MLPs have historically increased their distributions over time in aggregate. In general, MLPs have businesses that have high barriers to entry which allows them to distribute a high level of their available cash flow. Contracts in the form of "take or pay," natural monopolies, and in some cases federal regulation can all provide a high level of business stability. Additionally, many of the projects in which they invest have relatively visible time lines. This allows investors to estimate when new projects will come on line and hence add to the MLP's distributions. The rising level of distributions, even in the midst of the Global Financial Crisis, has been a key factor in driving investor interest. However, investors should recognize that individual MLPs can also cut dividend payouts due to business, competitive, or other reasons.[4]

MLP's operate in a number of businesses with a variety of contract structures and sensitivities to commodity prices (Exhibit 9). For example, natural gas and crude oil pipelines are often viewed as lower risk businesses given their longer contract lengths and revenue that is either volume based or has takeorpay structure. In general, pipelines do not take title to the commodities and their revenue is not directly related to commodity prices; however, pipelines do have indirect exposure to commodity prices as their growth is related to continued development of domestic oil and gas. Gathering systems, fractionation, and terminals tend to have shorter contracts and have revenues with more exposure to the volume of product transported or treated. Exploration and production businesses typically operate under market rates with short term-hedging contracts and thus may have more exposure to commodity price changes.

Return Characteristics

A key driver of investor appetite for MLPs has been their strong yield characteristics and steady dividend growth. Historically, MLPs have provided attractive yields compared to other alternatives such as REITs, bonds and stocks. As of spring 2014, MLP yields are slightly below those for high yield bonds. (See Exhibit 10).

In addition to yield, MLP investor returns are affected by distribution growth and changes in valuation (e.g., yield compression/expansion). For example, in 2013, the components of the Alerian MLP index had a yield of 7.1% and had distribution growth of approximately 7.1%. In addition, MLP yield spreads compressed (the "risk premium" compared to U.S. Treasuries

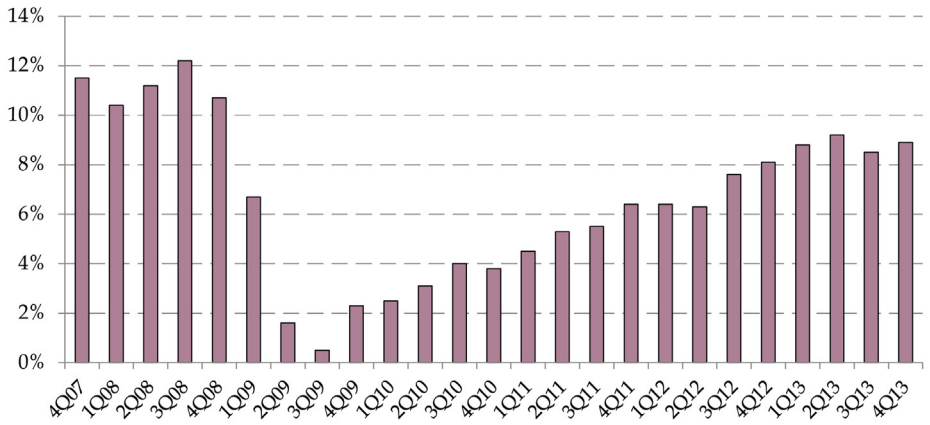


Exhibit 8: MLP Year over Year Distribution Growth
Source: Goldman Sachs.
Figures are capital market weighted and based on the 97 MLPs in the Goldman Sachs research coverage.

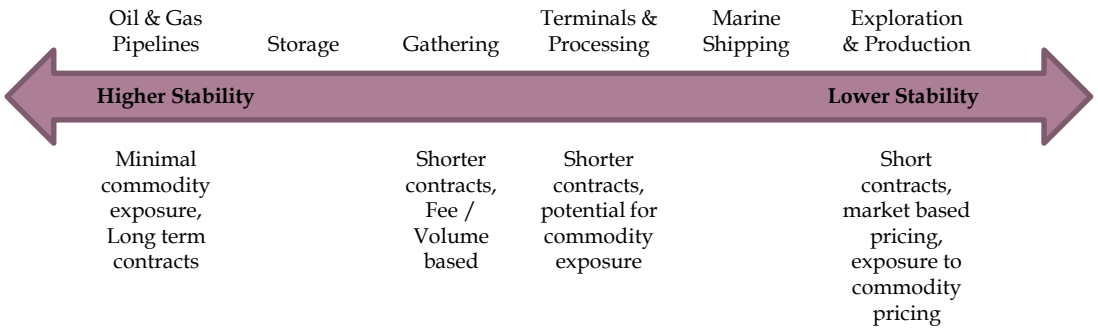


Exhibit 9: MLP Sector Cash Flow Stability
Source: Meketa Invesment Group

Alerian MLP Index (%)	S&P 500 Index (%)	FTSE NAREIT Index (%)	Barclays Aggregate (%)	Barclays High Yield (%)
5.8	2.2	3.9	2.4	6.7

Exhibit 10: Annualized Yields (as of April 30, 2014)
Source: Thompson Reuters, Bloomberg, and Ibbotson.

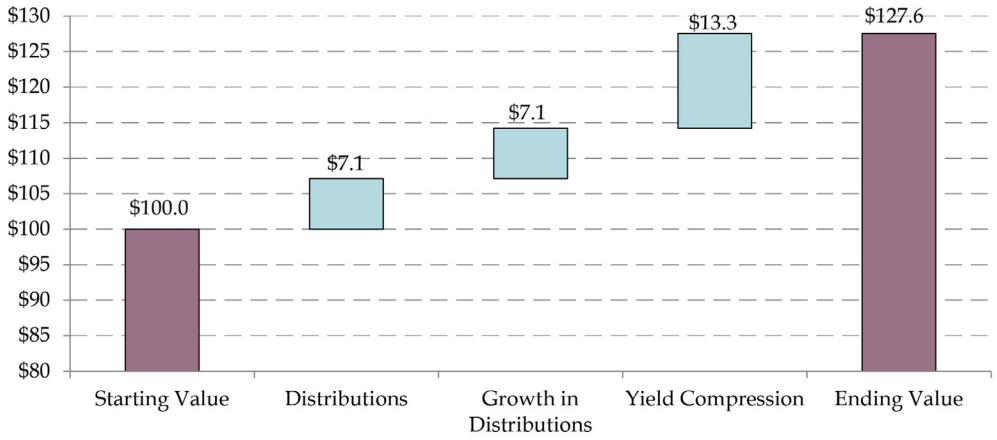


Exhibit 11: Decomposition of 2013 Total Returns (Alerian MLP Total Index)
Source: Goldman Sachs.

	Alerian MLP Index	S&P 500	S&P North American Natural Resources	S&P 1500 Energy	Barclays Aggregate	Barclays High Yield	S&P GSCI Commodity	NAREIT Equity
2013	27.6	32.4	7.5	6.0	-2.0	7.5	-1.2	9.1
2012	4.8	16.0	2.2	4.3	4.2	15.8	0.1	20.1
2011	13.9	2.1	-7.3	3.9	7.9	5.0	-1.2	7.3
2010	35.9	15.1	23.9	21.4	6.6	15.1	9.0	27.6
2009	76.4	26.5	37.5	16.4	5.9	58.2	13.5	27.4
2008	-36.9	-37.0	-42.6	-35.8	5.2	-26.2	-46.5	-37.3
2007	12.7	5.5	34.4	34.5	7.0	1.9	32.7	-17.8
2006	26.1	15.8	16.8	22.1	4.3	11.9	-15.1	34.4
2005	6.3	4.9	36.6	33.7	2.4	2.7	25.6	8.3
2004	16.7	10.9	24.6	32.4	4.3	11.1	17.3	30.4
2003	44.5	28.7	34.4	25.0	4.1	29.0	20.7	38.5
2002	-3.4	-22.1	-13.0	-9.6	10.3	-1.4	32.1	5.2
2001	43.7	-11.9	-15.6	-11.2	8.4	5.3	-31.9	15.5
2000	45.7	-9.1	15.8	19.6	11.6	-5.9	49.7	25.9

Exhibit 12: Total Return by Calendar Year
Source: Thompson Reuters, Bloomberg, and Ibbotson

	Alerian MLP Index	S&P 500	S&P North American Natural Resources	S&P 1500 Energy	Barclays Aggregate	Barclays High Yield	S&P GSCI Commodity	NAREIT Equity
Annualized Return	19.3%	3.7%	9.2%	10.3%	5.7%	7.9%	4.2%	11.9%
Standard Deviation	16.1%	15.5%	22.6%	20.6%	3.5%	10.2%	23.3%	21.5%
Sharpe Ratio	1.19	0.10	0.42	0.47	1.15	0.62	0.23	0.60
Max Drawdown	-43.1%	-55.5%	-56.5%	-50.9%	-4.9%	-35.7%	-67.8%	-68.3%

Exhibit 13: Risk and Return (January 2000 to April 2014)
Source: Thomson Reuters and Meketa Investment Group

became smaller) thereby increasing return by 13.3%. Overall, the Alerian MLP index had a return of 27.6% in 2013 (See Exhibit 11).

Since 2000, the Alerian MLP index has lost money in only two calendar years, while outperforming the US equity market in eleven of those years (See Exhibit 12). Note, however, that in 2008 the Alerian MLP index had a valuation decline that was similar to the broad stock market while also experiencing net outflows.

MLPs have demonstrated volatility and drawdowns similar to equities and higher than fixed income assets (See Exhibit 13). However, MLPs have delivered attractive overall returns. MLPs have also generated high risk-adjusted returns, as demonstrated by their high Sharpe ratio.

As Exhibit 14 illustrates, the Alerian MLP index has demonstrated a modestly positive correlation to U.S. equity indexes (0.40 to the S&P 500). This is a lower correlation than that between US equities and REITs (0.63), an asset class with similar taxadvantaged income characteristics. MLP's correlation to commodities was even lower than to equities (0.30 to the S&P GSCI index) reflecting the

	Alerian MLP Index	S&P 500	S&P North American Natural Resources	S&P 1500 Energy	Barclays Aggregate	Barclays High Yield	S&P GSCI Commodity	NAREIT Equity
Alerian Energy MLP	1.00							
S&P 500	0.40	1.00						
S&P NA Nat. Res.	0.46	0.70	1.00					
S&P 1500 Energy	0.48	0.70	0.96	1.00				
Barclays Aggregate	-0.01	-0.09	-0.03	-0.08	1.00			
Barclays High Yield	0.57	0.64	0.52	0.53	0.16	1.00		
S&P GSCI Commodity	0.30	0.30	0.65	0.73	-0.02	0.28	1.00	
NAREIT Equity	0.35	0.63	0.44	0.41	0.14	0.64	0.21	1.00

Exhibit 14: Correlations (January 2000 to April 2014)
Source: Thomson Reuters and Meketa Investment Group

Inflation Regime	Alerian MLP Index (%)	S&P 500 (%)	S&P North American Natural Resources (%)	S&P 1500 Energy (%)	DJ UBS Energy Spot Price (%)	S&P GSCI Commodity (%)	FTSE NAREIT (%)	CPI (%)
Top 10%	2.8	-0.5	27.3	25.4	41.7	31.9	-0.6	4.4
Top 25%	13.0	3.7	25.9	26.7	32.9	24.3	10.9	3.9
Bottom 25%	12.8	-1.4	-6.0	-2.7	-10.5	-18.1	2.3	0.8
Bottom 10%	-5.1	-17.9	-22.0	-20.9	-28.6	-37.1	-24.7	-0.1

Exhibit 15: Average Annual Performance during Inflationary Periods (January 2000 to April 2014)
Source: Thomson Reuters and Meketa Investment Group

Exhibit 16: MLP Yields
Source: Thomson Reuters and Meketa Investment Group

relatively low impact that commodity price changes have on MLP cash flows (particularly midstream MLPs).

Because MLPs invest in the natural resource sector, investors may consider them to be a good inflation hedge. Exhibit 15 displays the rolling 12-month performance during periods of high and low inflation. Unsurprisingly, commodity indices and energy spot prices display a very high link to the rate of inflation. Energy stocks and natural resource stock more broadly also display a very tight connection to inflation. MLPs, however, do not display the same relationship. The chart below shows average annualized performance of various assets during periods defined by rolling 12-month inflation as measured by CPI. In the case of MLPs, they provided only modest returns during periods of relatively high inflation and performed relatively well during relatively low inflationary periods. Note that this does not include data prior to 2000, so it is difficult to assess how MLPs might perform in a very high inflation environment like the late 1970s. Still, perhaps due to the "tolling" nature of their revenues, they do not appear to be as good an inflation hedge as commodities and natural resource stocks.

MLP Valuations

A primary consideration when investing in any asset class is its current valuations level. Perhaps the best measure for assessing valuations for the MLP market is the yield of the Alerian MLP index. Using yields may also allow for a relative comparison to other asset classes that likewise offer a yield component.

As Exhibit 16 shows, as of April 2014, MLP yields were at one of their lowest levels ever recorded over the history of the MLP marketplace. This implies that future returns for MLPs may well be lower than past returns. This should not be surprising, given how high past returns have been.

Exhibit 17: MLP Spreads
Source: Thomson Reuters and Meketa Investment Group.

Investors should also consider whether MLPs look attractive relative to the other opportunities that are available to them. Exhibit 17 shows the difference between MLP yields and the yield on the 10-year US Treasury (i.e., the yield spread). As of April 2014, the spread was slightly below its historical average.

MLP Spreads

As described previously, MLP returns are affected by their distributions, the growth of their distributions, and compression or expansion of MLP yields compared to other assets. MLPs generally have stable business models which provide a foundation for their distributions. Additionally, they have the ability to grow by building or acquiring assets. These factors, together with continued growth in the United States energy infrastructure network, support an outlook for continued distribution growth.

Benchmarking

The MLP sector has a number of indices that an investor could choose for measuring the performance of the sector or benchmarking their portfolio. The characteristics of the most prominent MLP indices are outlined in Exhibit 18.

The Alerian MLP index is the most widely followed benchmark. It is a float-adjusted, capitalization-weighted total return index of 50 of the largest energy MLPs. Of note is that all the indexes listed above, like other capitalization weighted indexes, are affected by the price movements of the index's largest holdings; however, they are more concentrated than many traditional equity indices (e.g., in the case of the Alerian MLP index, the top 10 holdings account for approximately 60% of the index value).

Criteria	Alerian MLP Index	S&P MLP Index	Tortoise MLP Index	Wells Fargo MLP Index
# of Constituents	50	56	94	92
Weighting Method	Market-cap weighted	Market-cap weighted	Market-cap weighted	Market-cap weighted
Rebalance Frequency	Quarterly	Annually	Quarterly	Quarterly
Market Capitalization Threshold	> $500 million	> $300 million	> $200 million	> $200 million
Liquidity Threshold	6 month median daily trading volume > 25,000 units	3 month average value traded > $2 million	None	None
Public Float Requirement	Investable Weight Factor >20%	None	None	None
Float Adjusted	Yes	Yes	Yes	Yes
Individual Security Weighting Cap	No	15%	10%	No
Minimum Share Price	> $10 (preferred)	None	None	None
Exploration & Production Companies Included	Yes	Yes	Yes	Yes

Exhibit 18: MLP Benchmarking
Source: Meketa Investment Group

MLP Market Outlook

A key growth driver for the MLP market is the substantial infrastructure requirements to gather, transport and process oil and gas liquids resulting from the growth in shale resource development in North America. Technologies such as horizontal drilling and hydraulic fracturing are making vast deposits economically feasible to extract. The resulting increase in supply of natural gas reserves has caused a dramatic decline in natural gas prices (from a peak of over $10 in 2008 to a price closer to $3 in late 2012, and since recovering to $4.50 in 2014)[5] Low natural gas prices led many power companies to switch from coal to gas. For example, there have been announcements of significant numbers of coal-fired power capacity retirements in the Southeast and Midwest, with additional retirements expected in the Southwest.

In addition to increased domestic usage of natural gas, the Department of Energy has so far approved six applications for the export of natural gas with a total expected capacity of 9.3 billion cubic feet ("bcf") per day. Furthermore, North American oil production has been increasing. Production from Canada (largely Alberta bitumen and oil sand) and U.S. shale (from basins such as the Marcellus, Bakken, Eagle Ford and Niobrara) have led to estimates that the U.S. could replace a large portion of the oil currently being imported and that it will become a net oil exporter by 2030.

In many cases, this new exploration and production of oil and gas is in geographic areas that have not traditionally been significantly involved in energy production. This means that the necessary infrastructure for gathering and transporting these commodities does not exist. As a result, industry participants estimate that over $640 billion is needed to meet the midstream equipment and infrastructure requirements through 2035.[6] As shown in Exhibit 19 the dramatic increase in North American natural gas production is expected to lead to substantial changes in how it is moved within North America.

One implication of the rapid development of energy infrastructure is the risk that certain assets could become obsolete. For instance, infrastructure serving "liquids-rich" basins is favored over operations in "dryer" basins. Industry, macroeconomic, production cost, and political changes could impact the economic viability of extracting resources from certain basins. As such, the related pipeline infrastructure could be detrimentally affected by such changes.

Ways to Invest in MLPs

Institutional investors have used a variety of methods to invest in MLPs. Beyond building a portfolio of MLPs directly, there are asset managers who can build customized portfolios through managed accounts, and a number of publicly traded closed-end funds, ETFs and ETNs. While publicly-listed, pooled investment vehicles provide diversification, liquidity, and simplified tax reporting for the investor, they lose the tax efficiency associated with the direct ownership of MLPs. Also, while most open-end funds (e.g., mutual funds) are structured as tax passthrough vehicles, they are limited to no more than 25% of their assets in MLPs (or other tax-pass through investments) otherwise they would lose their tax passthrough characteristics.

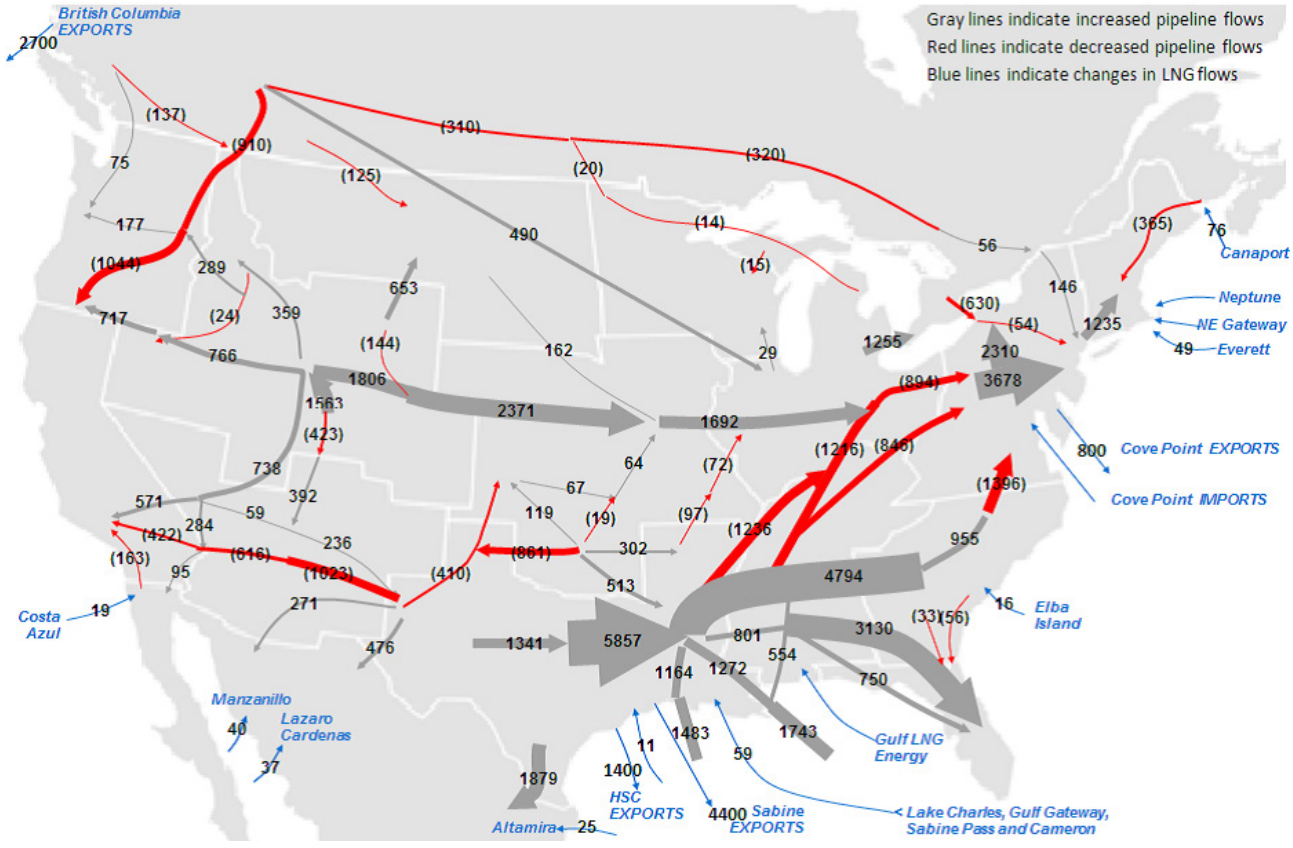


Exhibit 19: Natural Gas Flow Change from 2014 to 2035 (MMcfd)
Source: 2014 INGAA Foundation report: North American Midstream Infrastructure through 2035.

	Description	Benefits	Issues
Direct Investing	Investor builds and manages MLP portfolio internally (i.e., actively managed).	Full control of asset selection and portfolio management. All distributions and income pass through to investor.	Administrative burden related to taxes and record keeping. Lower liquidity (have to sell investments separately). Fees: None (internally managed).
Separate Managed Account (SMA)	Investment manager builds and manages MLP portfolio (i.e., actively managed).	Professional oversight of portfolio. Manager may be able to assist with administrative issues. All distributions and income pass through to investor.	Administrative burden related to taxes and record keeping. Lower liquidity (have to sell investments separately). Fees: Negotiated. May include performance fee.
Closed End Fund	Publicly listed vehicle with a fixed number of shares. Investment focus is MLPs and is often actively managed.	Improved liquidity (can sell entire vehicle). No K-1s, only a single Form 1099. No UBTI.	Can trade at a premium or discount to NAV. Vehicle treated as a corporation for tax purposes and pays taxes on gains and income before passing on to investor, thereby reducing distributions. Can have significant index tracking error due to reserves for future taxes based on portfolio gains. Structure can include leverage. Fees: 0.75% to 1.25%
Exchange Traded Fund (ETF)	Publicly listed vehicle that holds a portfolio of MLPs. Portfolio typically tied to an index (i.e., passively managed).	Improved liquidity (can sell entire vehicle). No K-1s, only a single Form 1099. No UBTI.	Vehicle treated as a corporation for tax purposes and pays taxes on gains and income before passing on to investor, thereby reducing distributions. Can have significant index tracking error due to reserves for future taxes based on portfolio gains. Fees: 0.75% to 1.25%
Exchange Traded Note (ETN)	Debt instrument with return linked to an MLP index (i.e., passively managed).	Improved liquidity (can sell entire vehicle). No K-1s, only a single Form 1099. No UBTI.	Counterparty credit risk. Fees: 0.80% to 1%

Exhibit 20: Access to MLPs
Source: Meketa Investment Group

As noted in Exhibit 20, closed end funds and ETFs can suffer from potentially significant tracking error issues due to their requirements to reserve for capital gains taxes. As such, these are not likely to be a good alternative for tax-exempt investors. Additionally, those investors seeking to build a portfolio of individual MLPs should recognize that certain securities may have limited float or daily liquidity. Potential investors should research the particular characteristics of individual MLPs (e.g., what basins it has exposure to, the average length of contracts) to understand the underlying risk differences among MLPs. Investors making larger investments may need to carefully plan their trades to avoid disrupting the market price for a particular MLP.

Tax Implications of MLP Investments

The MLP structure is considered tax efficient in that the MLP itself does not pay taxes and therefore its distributions are not subject to "double taxation" (i.e., unlike companies, which pay corporate tax, then investors pay taxes on dividends). Unlike a corporation, an MLP is considered to be the aggregate of its partners rather than a separate entity. MLPs pay no corporate-level taxes. Instead, the MLP passes income and losses to the unit holders themselves who are ultimately responsible for paying taxes.

Because MLPs are partnerships, unit holders receive IRS K-1 statements issued by the individual MLPs. Each K-1 will indicate the unitholder's share of net income, gain, loss, and deductions. Additionally, the unit holder will receive information on the MLP's activity in each state in which it conducts business and the unitholder may be required to file taxes in each of those states. To the extent an investor has direct ownership of multiple MLPs, the administrative burden would increase.

Tax-exempt investors have additional tax issues when considering an investment in MLPs. Under current tax law, tax-exempt organizations are exempt from U.S. federal income tax on passive

investment income. However, given the MLP's tax pass-through structure, an MLP is likely to generate UBTI (Unrelated Business Taxable Income).

While certain state and municipal-related investors maintain they are not subject to UBTI, a tax-exempt organization is required to file with the IRS. Investors should evaluate the tax implications and related administrative complexity of MLP investments when considering this asset class.

Investors should note that there have been discussions in Congress to change tax rules for pass-through investments such as MLPs and REITs, as part of a broader revenueraising effort. Such a change would likely have a significant impact on the attractiveness of MLPs to taxable investors and the MLP market as a whole. For example, the 2011 changes to the tax treatment of Canadian royalty trusts (which had a similar tax favored structure) led to a significant deterioration in their value. While the likelihood of a change to MLP tax treatment seems small, investors should monitor developments.

Risks and Considerations

As with any investment, there are unique risks related to investing in MLPs. Some of these risks are due to the legal structure of MLPs and some are borne of the market in which they operate.

Return volatility

MLPs, particularly in times of market stress, can demonstrate equity-like volatility and drawdowns. The majority of MLPs continue to be held by retail investors who may react to negative news by selling their positions.

Changes to distributions

Collectively, MLPs have historically increased their distributions in aggregate. However, individual MLPs can change and, in some cases, decrease their distributions for strategic, competitive, or other business reasons.

Market illiquidity

The MLP marketplace remains small compared to domestic equities and bonds. Investors with larger portfolios may experience difficulty in efficiently building or reducing their positions, due to limited trading volumes.

Limited diversification

Much of the market's investable value is represented by a limited number of MLPs. Specifically, approximately 60% of the Alerian MLP Index value is represented by the index's ten largest MLPs.[8]

Changes in interest rates

A key attraction of MLPs has been their comparatively high yields. An overall rise in interest rates could diminish MLPs' appeal if they are not able to generate a commensurate growth in distributions.

Energy market

Growth in MLPs is expected to be driven in large measure by continued growth in domestic oil- and gas-related activity. A decrease in exploration and production activity, whether due to an economic slowdown, regulatory changes, safety issues, substitution, or other factors, could reduce the cash flows available to MLPs.

Access to capital

MLPs typically distribute a very high percentage of their free cash flow and as such need to regularly access the capital markets for debt and equity to finance their growth. Equity capital raises could be dilutive to existing unit holders.

GP/LP structure

Through their IDRs, GPs obtain an increasing share of incremental distributable cash flow. This may serve as an incentive for GPs to rapidly grow distributable cash flow in what could be an unsustainable manner.

Tax and administrative complexity

As tax pass-through vehicles, MLP unit holders are responsible for calculating and paying taxes due. In addition to Federal taxes, the vast majority of MLPs operate in multiple states potentially requiring the unit holder to review state-level tax obligations as well. Tax exempt investors may be subject to Unrelated Business Income Tax related to their holdings of MLP units.

Regulatory and tax changes

In 2012, Congress and the IRS considered changes to the tax regulations for passthrough investments, such as MLPs, as a potential way to raise tax revenue as part of the overall budget balancing discussions. While this avenue was not pursued, Congress may reexamine the tax pass-through features of MLPs at a future date.

Summary

U.S. energy infrastructure building is likely to continue for several years. MLPs provide a way to access this growth and therefore the MLP market is likely to continue its development. Many MLPs generate attractive cash distributions from steady, long-term contracts with potential for price appreciation due to growth. However, individual MLPs may experience business changes or competitive threats that could cause them to reduce dividend payments. Also, as publicly traded instruments, MLPs are subject to equity market risks, including participating in broad market downturns, such as in 2008, despite maintaining dividend payouts. Additionally, MLPs historically have not provided a significant hedge against inflation. Finally, the tax pass-through structure of MLP's could lead to tax filing complexity that should be considered before making an investment.

Overall, MLPs represent one of several ways to gain exposure to the secular growth in the U.S. energy market. Investors may also want to consider equity or debt of companies with exposure to this growth trend. Additionally, certain private equity and infrastructure managers participate in U.S. energy infrastructure development and could be considered by those investors with allocations to private market investments. We believe it is appropriate for certain investors to consider an allocation to MLPs within a broader energy investment portfolio.

Appendix 1

Glossary of MLP Terms

Qualifying Income – As defined by section 7704 of the Internal Revenue Code: "A partnership meets the gross income requirements… for any taxable year if 90 percent or more of the gross income of such partnership for such taxable year consists of qualifying income."

> "The term 'qualifying income' means - (A) interest, (B) dividends, (C) real property rents, (D) gain from the sale or other disposition of real property…, (E) income and gains derived from the exploration, development, mining or production, processing, refining, transportation (including pipelines transporting gas, oil, or products thereof), or the marketing of any mineral or natural resource (including fertilizer, geothermal energy, and timber), (F) any gain from the sale or disposition of a capital asset… held for the production of income… and (G)… income and gains from commodities… or futures, forwards, and options with respect to commodities."
>
> "The term 'mineral or natural resource' means any product of a character with respect to which a deduction for depletion is allowable."

Distributable Cash Flow – DCF is an indicator of an MLP's ability to generate cash flow that can be used to sustain quarterly distributions to the unit holders. While not a GAAP measure, DCF can be calculated as Net Income adjusted for depreciation, amortization, and other non-cash items and after maintenance capital expenditures. An MLP's specific measure of DCF will be defined in their partnership agreement.

Incentive Distribution Rights – IDRs are typically set out in the MLP agreement and provide the General Partner with a larger percentage of the MLP's incremental cash flow distributions. These rights are designed to motivate the General Partner to grow distributions to Limited Partners.

Unit Holder – The holder of an ownership unit in a publicly traded limited partnership. The unit provides the holder with a stake in the MLP's income and distributable cash flow.

K-1 Statements - A K-1 statement is an IRS form that is used to report the beneficiary's share of partnership's income, deductions, and credits.

Appendix 2

Glossary of Natural Resource Terms

Exploration and production (E&P) - Involves extracting the commodity (e.g., crude oil or natural gas) from the ground.

Fractionation - Fractionation is the process of separating a mixed NGL stream into its components.

Gathering - Encompasses smaller capillary-like pipes 4-to-6 inches in diameter and provides short-haul takeaway capacity from the wellhead, drawing oil or gas into the larger long-haul pipelines or for processing.

Hydrocarbons –Refers to a set of compounds extracted in either liquid (petroleum) or gaseous form (natural gas) and used in the energy, transportation, and petrochemical industries.

Midstream – Oil and gas pipelines and related infrastructure that handle, process, and transport oil, gas, and refined products from the point of production to a point of distribution.

Natural Gas Liquids (NGLs) – Many natural gas resources will include a set of gas liquids such as ethane, propane, butane, and natural gasoline known as NGLs. A "liquids rich" natural gas resource tends to have a higher percentage of NGLs. The primary uses for NGLs include: production of plastics, insulation, lubricants, detergents, heating and refrigeration, petrochemical feedstock, gasoline blending and propellant.

Oil Sands – Oil Sands contain a mixture of sand, clay, water and a viscous form of petroleum referred to as bitumen. Bitumen is a thick, sticky form of hydrocarbon that will not flow unless it is heated or diluted with lighter hydrocarbons.

Pipelines – Pipelines are used to transport of various types of products across the country including natural gas, refined products, crude oil, and NGLs. These assets tend to have stable cash flows through fixed-fee contracts.

Processing – Involves purging impurities in order to meet specific pipeline specifications for transportation. Processing includes dehydration, treating and the extraction of the gas, natural gas liquids ("NGLs") or oil from the resources stream.

Shale – A fine-grained, sedimentary rock composed of mud flakes from clay minerals and small fragments of other materials. The shale acts as both the source and the reservoir for the hydrocarbon.

Storage - Resources may be put in storage to ensure reliable supply when necessary as well as to take advantage of more favorable pricing. Companies store refined products and crude oil in above-ground facilities while underground facilities typically house natural gas within depleted reservoirs, aquifers, or salt cavern formations.

Terminals – Terminals serve to receive and distribute oil and gas products via vessels or pipelines. Terminals generate revenue from storage and handling activities, as well as from services such as blending and additive injection.

Appendix 3

Contract Structures

Ship-or-pay contracts – Pipeline companies lock in revenue for the long term, virtually eliminating price and volumetric risks.

Throughput based contracts – Involves locking in a fixed fee per unit of product. This exposes the business to changes in volume which is indirectly linked to the price of the commodity.

Storage contracts – Shippers typically pay a rental fee for usage of the storage so that they can manage varying levels of demand in different seasons. Owners of storage typically charge rates based on the difference between peak and off-peak commodity prices and therefore benefit when the futures price curve is positive.

Commodity linked contracts – These contracts require the owner of the asset to take some level of commodity price risk through either a share of proceeds, share of the product, or a margin off the commodity price. These contracts are more typical in processing, fractionation, and production businesses.

Endnotes

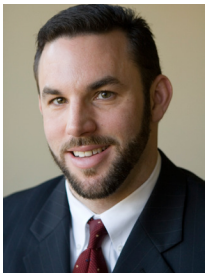
1. Source: Internal Revenue Code Section 7704.
2. Examples include Niska Gas Storage L.P., Genesis Energy L.P., and PVR Partners, L.P.
3. Source: Section 7704 of the Internal Revenue Code.
4. Recent dividend cuts include Boardwalk Pipeline Partners (-80%), Eagle Rock Energy Partners (-30%), and Natural Resource Partners (-36%).
5. Source: Goldman Sachs. Figures are capital market weighted and based on the 97 MLPs in the Goldman Sachs research coverage.
6. Source: U.S. Department of Energy, U.S. Energy Information Administration.

7. Source: 2014 INGAA Foundation report: North American Midstream Infrastructure through 2035.
8. Source: Alerian as of March 31, 2014.
9. Pertaining to Closed-End Fund Entry in Appendix 4 - this excludes those vehicles that own less than 100% MLPs.
10. Pertaining to AUM in Appendix 4: As of March 28, 2013.

	Direct Investment	Managed SMA	Closed-End Fund	Exchange Traded Fund	Exchange Traded Note
Tax Classification	Partnership	Partnership	Taxable "C" Corp	Taxable "C" Corp	Structured Note
Investment Management	Active	Active	Active or Passive	Passive	Passive
Tax Form	Form K-1	Form K-1	Form 1099	Form 1099	Form 1099
UBTI	Yes	Yes	No	No	No
Leverage	No	No	Varies	No	Varies
Number of Funds	N/A	N/A	18	5	11
AUM ($Bn)	N/A	N/A	$15.2Bn	$6.0Bn	$7.3Bn

Appendix 4: Comparison of Investment Structures
Source: Alerian, Meketa Investment Group

Authors' Bios



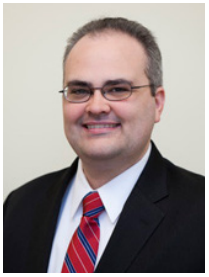
Frank Benham, CFA, CAIA
Managing Principal
Director of Research
Meketa Investment Group

Mr. Benham joined Meketa Investment Group in 1999. As Director of Research, Mr. Benham oversees all research projects, including white papers and the firm's annual asset study. Mr. Benham leads the design of the firm's portfolio construction initiatives and he is key in constructing customized investment programs. Mr. Benham is a member of the firm's Investment Policy Committee, Private Markets Investment Committee, Infrastructure Investment Committee, and Natural Resources Investment Committee.

Mr. Benham received an undergraduate degree in Finance from Bentley College. He holds the Chartered Financial Analyst designation, and he is a member of the CFA Institute and the Boston Security Analysts Society. Mr. Benham also holds the Chartered Alternative Investment Analyst (CAIA) designation and is a member of the CAIA Association®. Prior to joining Meketa Investment Group, Mr. Benham was employed at State Street Bank, performing operations analysis and developing process improvements.

Mr. Benham has served as a frequent speaker at industry events, including: the International Foundation of Employee Benefit

Plans Annual Conference, the NCPERS Annual Conference, the Investment Forum for Endowments, Foundations and Pension Funds, the Endowment and Foundation Forum, the Made in America Conference, the Institutional Investor Public Funds Roundtable, the Boston Security Analysts Society Asset Allocation Seminar, the Institutional Investor Global Real Assets Forum, the Institutional Investor Infrastructure Investment Forum, the SuperReturn Latin America conference, the Institutional Real Estate VIP conference, and the Investing in Infrastructure Assets Europe and Americas conferences.



Christopher P. Tehranian
Principal
Head of Infrastructure Research
Meketa Investment Group

Mr. Tehranian joined Meketa Investment Group in 2007. A Principal of the firm, Mr. Tehranian works in the Private Markets Group specializing in infrastructure investments. He focuses on performing due diligence of infrastructure opportunities, maintaining and establishing new relationships, and reporting. In addition, he assists clients with the development of investment policies, strategic planning, and program implementation. Mr. Tehranian sits on a variety of fund advisory boards, and speaks at numerous industry events.

Prior to joining the firm, he worked in capital budgeting, allocation, and financial management for the Gulf Power Company, a subsidiary of the Southern Company. Mr. Tehranian was previously employed as a portfolio analyst at Franklin Templeton Investments, and as an investment analyst at Segal Advisors.

He received a Master of Science in Finance from Boston College and a BS in Finance and International Economics from the University of Florida.

Edmund A. Walsh
Vice President
Meketa Investment Group

Mr. Walsh joined Meketa Investment Group in 2011 and has been in the investment industry for two years. A Research Analyst for the firm, Mr. Walsh's work includes asset allocation, risk management, and macro-economic research.

Mr. Walsh earned an MA in International Economics and Finance from Brandeis University's International Business School and a bachelor's degree in Political Science from The Ohio State University. He is pursuing a CFA designation and is an active

member in several professional societies, including the Quantitative Work Alliance for Applied Finance, Education, and Wisdom and the Boston Security Analyst Society.

Prior to joining Meketa Investment Group, Mr. Walsh was a research intern with State Street Associates in the Asset Allocation and Risk Management Group. Prior to that, he focused on similar research within an investment firm that he helped co-found. Before returning to graduate school, Mr. Walsh worked with the United Way of Central Ohio in a public policy research role.

Steven Hartt, CAIA
Principal
Meketa Investment Group

Mr. Hartt joined Meketa Investment Group in 2010 and has been in the financial services industry for twenty-six years. A Principal of the firm, Mr. Hartt works in the Private Markets Group where he focuses on client service and marketing, as well as performing due diligence on private markets managers. Additionally, Mr. Hartt leads our private equity co-investment and secondary transaction research.

Prior to joining the firm, Mr. Hartt was a Senior Vice President at Amalgamated Bank where he was in charge of alternative investments. While at Amalgamated Bank, Mr. Hartt managed the discretionary portfolios of private equity, debt, and infrastructure funds, in addition to the development, marketing and management of a private equity fund of funds. Prior to this, he spent eleven years at Citigroup in financial advisory, marketing and investment positions. He was also a senior member of Citigroup Alternative Investments where he was responsible for originating, evaluating, and managing private equity fund and direct investments. Mr. Hartt was also a summer associate at Dean Witter Reynolds and an assistant trader at Morgan Guaranty Bank.

Mr. Hartt received a Masters of Business Administration from Columbia Business School, and a Bachelor of Science degree, cum laude, from the University of Colorado, Boulder. Mr. Hartt holds the Chartered Alternative Investment Analyst (CAIA) designation and is a member of the CAIA Association®.

VC-PE Index

A Look at North American Private Equity as of Q1 2015

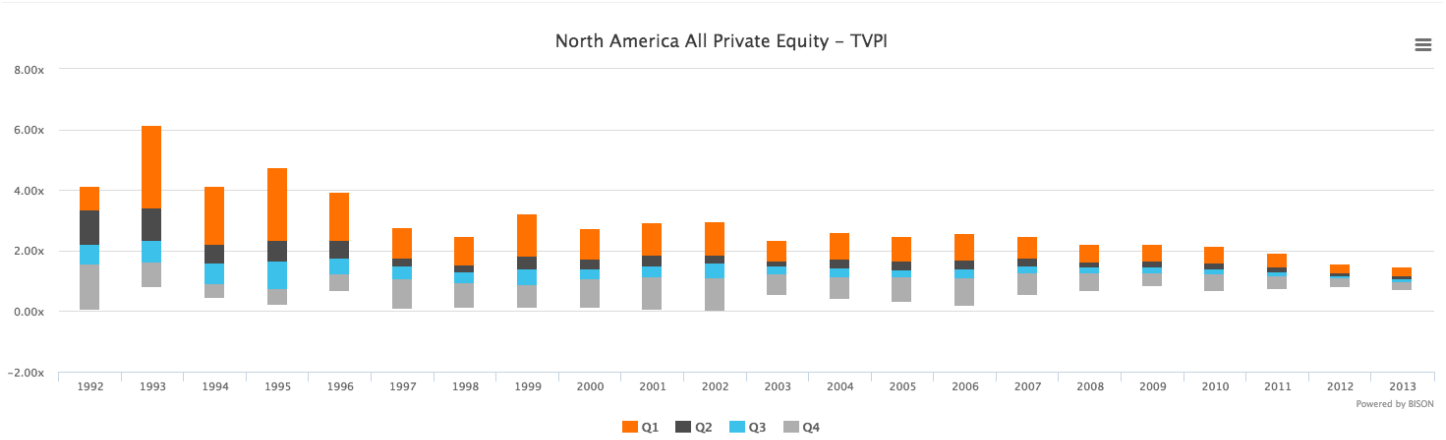
Mike Nugent
CEO/Co-Founder
Bison

Mike Roth
Research Manager
Bison

North American private equity funds returned more money to investors than they invested during the first three months of 2015. Based on the cash flow dataset we maintain, distributions outpaced capital calls by 1.9x.

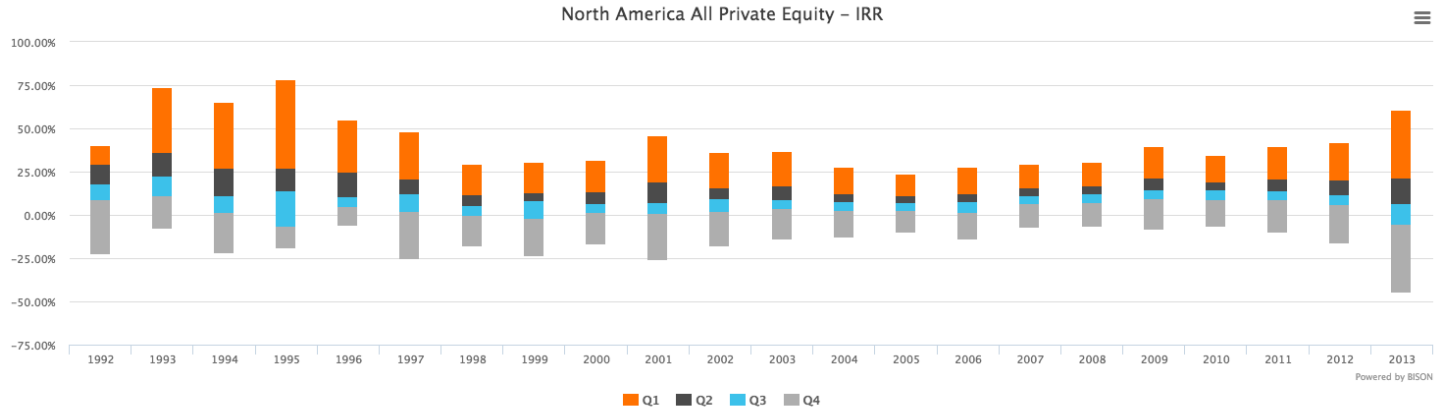
Digging in to the data, buyout funds had a noticeably higher ratio than venture capital and growth equity funds. The ratio of distributions to calls for buyout funds was 2.0x while the ratio for venture capital and growth equity funds was 1.5x. The "bubble vintages" were the most active with more than 60% of the distribution activity coming from the 2006 – 2008 vintages. Taking a "big picture" view of things, buyout funds appear to be doing a better job monetizing value in their portfolios at a time when valuations are perceived by many to be elevated.

For a more in depth look at the buyout and venture capital benchmarks, please visit www.bison.co.



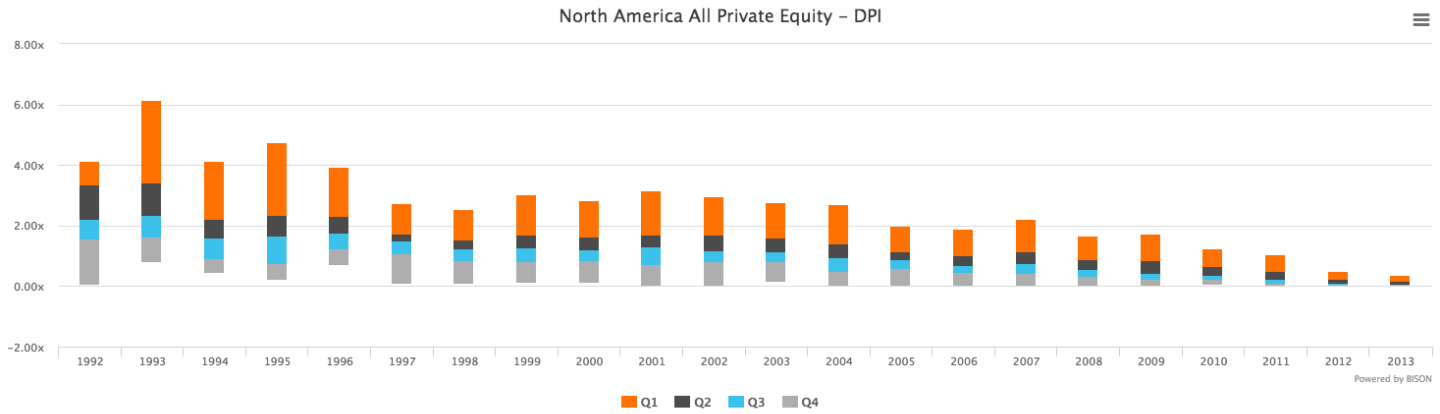
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Upper Fence	4.10x	6.10x	4.09x	4.70x	3.91x	2.73x	2.42x	3.17x	2.69x	2.90x	2.91x	2.31x	2.56x	2.42x	2.54x	2.42x	2.17x	2.18x	2.09x	1.87x	1.52x	1.43x
Q1	3.30x	3.39x	2.16x	2.30x	2.29x	1.72x	1.50x	1.77x	1.70x	1.82x	1.80x	1.63x	1.69x	1.63x	1.65x	1.71x	1.60x	1.61x	1.56x	1.43x	1.24x	1.14x
Q2	2.19x	2.32x	1.56x	1.63x	1.74x	1.49x	1.29x	1.38x	1.37x	1.47x	1.57x	1.47x	1.40x	1.36x	1.39x	1.47x	1.43x	1.43x	1.38x	1.29x	1.14x	1.05x
Q3	1.52x	1.58x	0.87x	0.71x	1.21x	1.05x	0.89x	0.84x	1.03x	1.10x	1.06x	1.18x	1.12x	1.09x	1.05x	1.23x	1.22x	1.23x	1.20x	1.14x	1.05x	0.95x
Lower Fence	0.04x	0.77x	0.42x	0.20x	0.64x	0.06x	0.08x	0.11x	0.09x	0.03x	0.01x	0.51x	0.37x	0.29x	0.16x	0.52x	0.64x	0.81x	0.66x	0.70x	0.78x	0.67x
Funds	17	30	23	21	41	33	61	73	114	57	62	51	91	123	142	152	159	62	102	101	98	124
Commitments	30	47	34	31	56	47	109	146	233	99	128	98	184	266	347	386	353	168	234	222	235	329

Exhibit 1: North America All Private Equity TVPI Benchmark



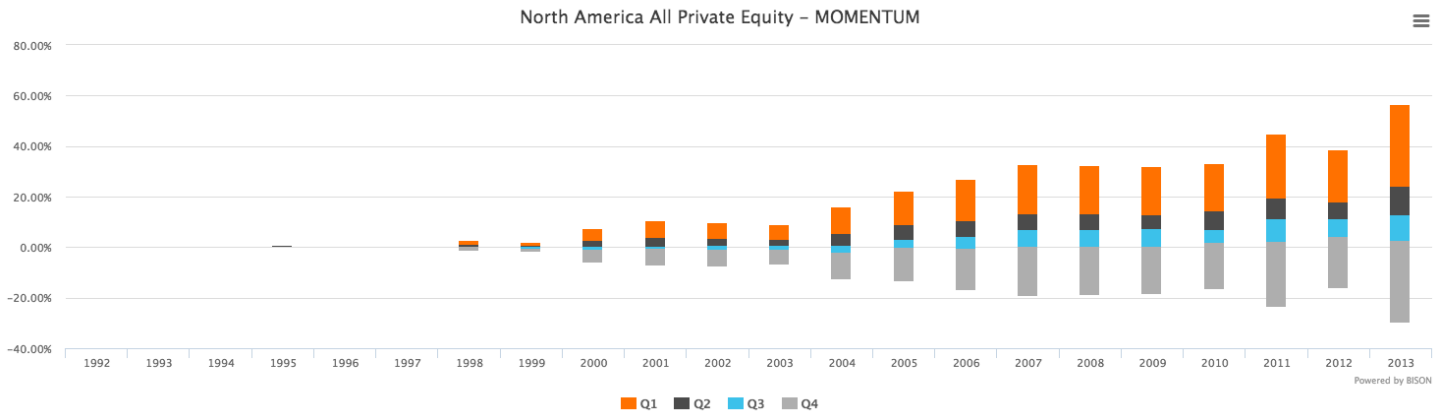
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Upper Fence	39.44%	72.84%	64.59%	77.57%	54.29%	47.39%	28.58%	29.67%	30.88%	45.18%	35.40%	36.17%	26.90%	23.21%	27.19%	28.91%	29.99%	38.90%	33.93%	38.87%	41.45%	59.91%
Q1	28.68%	35.37%	26.22%	26.67%	24.30%	19.93%	10.97%	12.02%	12.89%	18.37%	15.11%	16.40%	11.86%	10.62%	11.49%	15.28%	16.08%	20.97%	18.50%	20.36%	19.66%	20.50%
Q2	17.33%	22.40%	10.85%	13.52%	10.42%	11.89%	5.20%	8.20%	5.97%	6.90%	9.16%	8.67%	7.15%	6.90%	7.48%	10.60%	11.90%	14.32%	14.43%	13.92%	11.13%	6.30%
Q3	8.03%	10.40%	0.64%	-7.26%	4.31%	1.63%	-0.77%	-2.40%	0.90%	0.50%	1.58%	3.22%	1.83%	2.23%	1.03%	6.19%	6.81%	8.87%	8.21%	8.02%	5.12%	-5.77%
Lower Fence	-22.94%	-8.10%	-22.56%	-19.75%	-6.70%	-25.83%	-18.37%	-24.04%	-17.08%	-26.30%	-18.70%	-14.70%	-13.22%	-10.36%	-14.67%	-7.45%	-7.10%	-8.67%	-7.23%	-10.48%	-16.67%	-45.17%
Funds	16	30	22	21	41	31	54	68	105	53	56	45	86	115	136	151	157	59	100	98	91	96
Commitments	29	47	33	29	57	44	92	128	207	89	113	89	172	244	320	369	342	153	215	201	196	213

Exhibit 2: North America All Private Equity IRR Benchmark



Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Upper Fence	4.10x	6.10x	4.08x	4.70x	3.89x	2.68x	2.48x	2.98x	2.78x	3.13x	2.93x	2.73x	2.67x	1.94x	1.84x	2.18x	1.61x	1.67x	1.20x	1.01x	0.46x	0.31x
Q1	3.30x	3.39x	2.16x	2.30x	2.28x	1.70x	1.48x	1.67x	1.60x	1.67x	1.64x	1.56x	1.35x	1.11x	0.99x	1.11x	0.83x	0.82x	0.60x	0.45x	0.20x	0.13x
Q2	2.19x	2.32x	1.56x	1.63x	1.72x	1.47x	1.22x	1.25x	1.20x	1.28x	1.16x	1.11x	0.93x	0.85x	0.67x	0.72x	0.53x	0.40x	0.33x	0.21x	0.09x	0.04x
Q3	1.52x	1.58x	0.88x	0.71x	1.21x	1.05x	0.82x	0.79x	0.81x	0.69x	0.77x	0.78x	0.47x	0.56x	0.42x	0.39x	0.30x	0.20x	0.21x	0.07x	0.04x	0.01x
Lower Fence	0.04x	0.77x	0.42x	0.20x	0.67x	0.07x	0.07x	0.11x	0.09x	0.01x	0.01x	0.11x	0.01x	0.00x	0.01x	0.01x	0.00x	-0.00x	0.01x	-0.00x	-0.01x	-0.00x
Funds	17	30	23	21	40	33	60	72	114	57	62	51	91	120	138	151	157	63	98	83	81	78
Commitments	31	48	34	31	57	49	112	149	240	102	130	103	191	269	347	382	348	168	227	189	208	208

Exhibit 3: North America All Private Equity DPI Benchmark



Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Upper Fence	0.00%	0.08%	0.07%	0.43%	0.11%	0.00%	2.10%	1.56%	7.01%	10.19%	9.47%	8.61%	15.70%	21.87%	26.49%	32.14%	31.77%	31.41%	32.47%	44.37%	38.04%	56.15%
Q1	0.00%	0.03%	0.00%	0.17%	0.03%	0.00%	0.74%	0.17%	2.08%	3.56%	2.98%	2.68%	4.90%	8.50%	10.12%	12.81%	12.60%	12.55%	13.98%	18.84%	17.54%	23.89%
Q2	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.53%	0.33%	0.51%	3.00%	3.94%	6.59%	6.74%	7.27%	6.81%	11.10%	11.01%	12.54%
Q3	-0.00%	0.00%	-0.04%	0.00%	-0.02%	0.00%	-0.17%	-0.75%	-1.21%	-0.86%	-1.35%	-1.28%	-2.31%	-0.41%	-0.79%	-0.07%	-0.17%	-0.01%	1.65%	1.82%	3.88%	2.38%
Lower Fence	-0.00%	-0.05%	-0.11%	-0.26%	-0.10%	0.00%	-1.52%	-2.13%	-6.13%	-7.48%	-7.84%	-7.21%	-13.11%	-13.77%	-17.16%	-19.40%	-19.34%	-18.87%	-16.84%	-23.71%	-16.61%	-29.88%
Funds	16	28	22	21	38	30	59	69	112	55	62	48	82	108	131	141	150	61	95	95	90	83
Commitments	21	35	30	30	52	43	103	138	228	93	121	93	156	228	308	344	304	158	218	203	214	206

Exhibit 4: North America All Private Equity Momentum Benchmark

Authors' Bios

Mike Nugent
CEO/Co-founder, Bison

Prior to founding Bison, Mike Nugent held senior roles at SVG Advisers, LP Capital Advisors and HarbourVest Partners, and has more than $3B in private market commitments to his credit. Mike started his career in the public markets with the NASDAQ Stock Market, and also gained significant operating experience while running operations for a textiles manufacturer. He received his MBA from Boston College, and his BA from St. Bonaventure University. Mike lives on the North Shore of Massachusetts with his wife and two sons.

Mike Roth
Research Manager, Bison

Mike Roth is the Research Manager at Bison and oversees the data collection and content production. Before Bison, Mike spent six years on the investment team at SVG Advisers. There, he conducted research and due diligence on buyout and venture capital funds in the Americas. Mike received his BA in Economics from Boston College and is a CFA Charterholder.

Benchmarking and Analysis Through the IPD Global Quarterly Property Fund Index

Max Arkey
Vice President
Product Management
MSCI Real Estate

Continued Strong Global Performance

While the equity market slowed and the listed real estate market turned negative during the second quarter, the IPD Global Quarterly Property Fund Index (GPFI) posted another strong quarter with a 3.5% return, or an annualized 13.1% return. These were the second strongest quarterly returns since the financial crisis —the previous one being 4.1% in Q3 2010— and were based on the continued strong performance of the U.S. and a bounce-back in the European markets. The performance of the index has been particularly strong since the end of the financial crisis, with an average annual return of 11.5% over the past five years. Over this time, fund and direct returns have been very similar, unlike the years of the financial crisis when the use of leverage dragged fund level returns well below direct market returns.

With the U.S. funds representing more than 60% of the index, the robustness of the U.S. recovery since the financial crisis has been a major driver of the strong performance of the GPFI. Over the past five years, the U.S. has exceeded the global average for most quarters with other regions varying in their influence over that time period. Over the past year, the U.K. and the Pan-European funds have outperformed the U.S., while Asia-Pacific funds have recorded the lowest performance, although still showing a relatively healthy 9.3% return.

The relative strength of the European funds is a reversal of much of the 2011-2014 period when they tended to be lower than the global index.

The relatively high leverage levels, especially at a time of strong capital appreciation, helped boost fund level returns in the U.S. over 1, 3 and 5 years, as shown in Exhibit 2. This is also the case for the Pan-European funds over the past year, given the recovery in fundamentals for that market and the high levels of leverage.

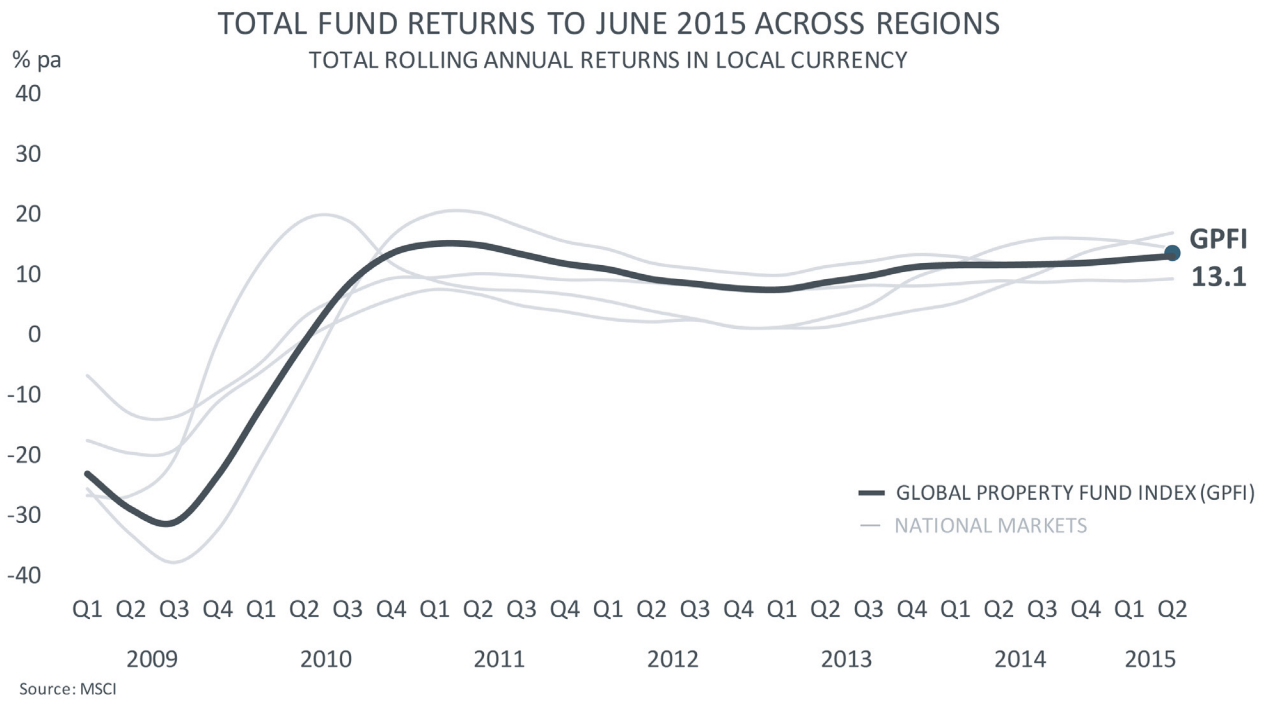


Exhibit 1: Continued strong performance of GPFI

PROVIDING SOME EXPLANATION FOR RECENT PERFORMANCE DIFFERENCES ACROSS REGIONS

ASIA PACIFIC

	2Q 2014	1 Yr	3 Yr	5 Yr
Net of Fees Fund Return	2.8%	9.3%	8.7%	9.0%
Direct Real Estate Return	2.6%	9.9%	9.3%	9.8%
Spread	**0.2%**	**-0.6%**	**-0.6%**	**-0.8%**

PAN EUROPE

	2Q 2014	1 Yr	3 Yr	5 Yr
Net of Fees Fund Return	4.6%	17.0%	8.6%	6.9%
Direct Real Estate Return	4.0%	14.8%	8.8%	7.6%
Spread	**0.6%**	**2.2%**	**-0.2%**	**-0.7%**

NORTH AMERICA

	2Q 2014	1 Yr	3 Yr	5 Yr
Net of Fees Fund Return	3.6%	13.6%	12.3%	13.8%
Direct Real Estate Return	3.1%	12.5%	11.4%	12.5%
Spread	**0.5%**	**1.1%**	**0.9%**	**1.3%**

UNITED KINGDOM

	2Q 2014	1 Yr	3 Yr	5 Yr
Net of Fees Fund Return	3.2%	14.4%	10.4%	8.6%
Direct Real Estate Return	3.5%	15.6%	11.4%	9.5%
Spread	**-0.3%**	**-1.1%**	**-1.0%**	**-0.9%**

Source: MSCI

Exhibit 2: Regional fund and direct real estate performance to Q2 2015

Over the longer term and when the years of the financial crisis are included, however, leverage hindered performance in the U.S. In the low leverage markets of U.K. and Asia-Pacific, fund returns have been lower than direct, asset level returns, because of the costs of running the funds and the impact of cash holdings.

As real estate becomes an increasingly global asset class, the development of the GPFI represents an important step in helping the evolution of the industry. Measuring fund performance presents challenges of comparability, consistency and transparency, particularly when investing globally. Although the GPFI is still at its infancy, it's a useful tool on a range of dimensions. First, it helps monitor and compare quarterly real estate performance across global markets at both the asset and fund levels. In addition, it helps managers and investors better understand the reasons for their performance relative to a benchmark, providing insights to improve transparency and facilitating the investment decision process. These insights, which represent significant achievements for the real estate industry, will continue to deepen and increase, as more funds join the index.

Author's Bio

Max Arkey
Vice President
Product Management
MSCI Real Estate

Max Arkey works in product management at MSCI Real Estate where he heads up indexes and market information products. These analytics are mission critical to the investment process for 19 of the top 20 largest global asset managers, all the way through to specialized domestic investors.

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