



WEIGHING THE ALTERNATIVES

HOW FIVE NON-TRADITIONAL
INVESTMENTS STACK UP

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Weighing the alternatives

How five non-traditional investments stack up

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Executive summary

As the term implies, alternative investments provide exposure to asset classes beyond mainstream equities and fixed income. Less obvious are the tremendous differences among alternative investments. In light of this complexity, how should investors determine the right mix of alternatives to meet their unique needs?

To help answer this question, we present a framework to estimate key asset allocation inputs – expected return, risk, correlation and liquidity – for five alternative investments:

- ▶ Hedge funds,
- ▶ Private equity,
- ▶ Real estate,
- ▶ Commodities, and
- ▶ Real assets.

We employ a build-up approach to define risk and return from traditional beta, non-traditional beta, and illiquidity premium sources. We also suggest approaches to guard against common pitfalls associated with the historical performance of alternative investments.

Each type of alternative investment offers a risk and return profile that is differentiated from the others and from traditional investments. Hedge funds pursue a diverse set of actively managed strategies, with a return profile that is highly dependent on selecting alpha-generating managers. We consider private equity as a close substitute to public equity, with greater leverage, much greater illiquidity and an accompanying higher level of risk and expected return. Real estate is

expected to provide income generation from rent and diversification benefits relative to traditional assets. We estimate that commodities have low expected return and high risk, but still merit consideration for investors seeking inflation protection and increased diversification. Lastly, real assets represent a diverse category of tangible and productive assets that are income-generative and sensitive to inflation.

Along our journey through alternatives, we explore a number of topics related to implementation. Hedge funds and private equity are characterised by significant dispersion among funds, reinforcing the importance that investors should place on manager selection. When choosing between direct investment and funds of funds, investors should consider a range of factors from fees to risk management. And for real estate, private equity, and real assets, the choice of exposure vehicle – whether privately held or publicly listed securities – often pivots on the trade-off between precise exposure and higher liquidity.

Investors are confronting a range of challenges from low yields to high correlations among traditional investments. By considering the individual merits and limitations of these alternative investments along with their own unique needs, they may be able to improve the structure of their total portfolio.

Introduction

While equity markets continue to suffer from a lost decade, alternative investments have exhibited strong performance. From 2002 to 2011, a diversified allocation to alternatives returned 8.9%, compared with 2.5% for equities and 4.2% for a traditional balanced portfolio of 60% equity and 40% fixed income.¹ Not surprisingly, alternative investments have experienced significant inflows, as many institutional investors have moved alternatives from a peripheral to a core role in an effort to enhance risk-adjusted returns.

Leaving historical performance in the past, the challenge for investors is determining forward-looking expectations and identifying the right mix of alternatives that will meet their needs. That can be particularly daunting for alternative investments, given their high degree of diversity. Evidence of this heterogeneity can be found among the five prominent alternative investments that are considered in this paper:

- ▶ Hedge funds are themselves a diverse category, with managers pursuing a wide set of investment strategies making use of traditional investments.
- ▶ Private equity is closely related to public equity, with greater leverage and much greater illiquidity.
- ▶ Real estate provides an income stream similar to that of fixed income and, like equity, a link to economic growth.
- ▶ Commodities are valued based on their intrinsic utility rather than cashflows.
- ▶ Real assets often produce commodities to generate cashflows that are otherwise absent from owning a commodity directly.

Compounding this asset allocation challenge is the data gap, which makes it difficult to draw meaningful conclusions. The lack of public market pricing for private assets can lead to valuation techniques that artificially smooth returns and understate reported volatility. Voluntary reporting from fund managers can introduce survivorship bias, leading to overstated reported performance. Idiosyncrasies in the appraisal process for certain private assets can introduce seasonality effects, leading to understated reported correlations to traditional investments. Each of these data issues presents a rosier picture for alternatives than might otherwise be the case.

How should investors weigh the alternatives in light of these challenges? Here we provide a forward-looking framework to estimate four dimensions – return, standard deviation, correlation and liquidity – that are integral to the asset allocation decision. This helps create a common playing field for traditional investments. Our framework is based on a build-up approach that relates return sources across traditional beta, non-traditional beta and illiquidity premia for our chosen dimensions. We estimate ranges of expected return, excluding the impact of alpha and fees given the inherent difficulty in forecasting performance and the disparity in manager skill and costs within each investment type.

¹ The alternatives portfolio is based on an equal weight to hedge funds (HFRI FOF Composite Index), private equity (Venture Economics All PE), real estate (NCREIF Property Index), commodities (S&P GSCI Index), and real assets (equal weight between NCREIF Timberland Index, NCREIF Farmland Index, and Venture Economics Energy). The 60/40 equity/fixed income portfolio is based on the MSCI World Index (US dollar hedged) and Barclays Capital Global Aggregate Index (US dollar hedged).

CAPITAL MARKET ASSUMPTIONS

Return, risk and correlation expectations for each traditional and alternative investment are based on long-term, 10-year forecasts. We start with forecasts for traditional investments that serve as a foundation for these expectations:

- ▶ **Cash:** Estimated to return 1.5%. Long-term capital markets history suggests that cash outpaces inflation over very long horizons. For example, in the US from 1926 to 2011, the Citigroup 3-Month US Treasury Bill Index outperformed the consumer price index by 0.60% per year. However, in response to current market conditions, with central banks signalling a prolonged period of low interest rates, we estimate cash will lag inflation by 0.50% over the next 10 years.
- ▶ **Fixed income:** Estimated to return 2.5% with 3.5% volatility. Our return estimate is based on the approximate yield of the Barclays Capital Global Aggregate Index as of 31.12.11. Our risk estimate is based on the Barclays Capital Global Aggregate Index (US dollar hedged) from its inception in 1990 to 2011, with a modest upward adjustment to account for higher volatility observed in fixed income indices with longer track records.
- ▶ **Equity:** Estimated to return 7.5% with 17% volatility. Our return estimate is based on a building block approach that decomposes return into four sources: income return (2.5%), real earnings growth (3%), inflation (2%), and a P/E repricing effect (0%) that assesses whether the equity market is over- or underpriced relative to long-term fundamentals. Our risk estimate is based on the MSCI World Index (US dollar hedged) from 1990 to 2011, with a modest upward adjustment to account for the unlikely repeat of the low volatility environment from 2004 to 2007.

- ▶ **Inflation:** Estimated to be 2%. Our inflation estimate is based on the approximate yield spread between 10-year nominal and inflation-linked bonds in the US and Europe as of 31.12.11. In addition, our estimate reflects the inflation targets of key central banks.

In certain sections of the paper, we focus on historical data from the US market, given its breadth and depth. Our expectation is that this data is also relevant for other markets, in part because of the high correlation observed between traditional assets across geographic regions.

RESEARCH LIMITATIONS

It is important to note that the choice of standard deviation and correlation as measures of risk and dependence, respectively, can have meaningful implications. This is particularly the case for alternatives, which often can be more fully characterised by non-normal distributions. For example, hedge funds have historically exhibited more frequent and severe negative tail events than predicted by a normal distribution. By employing measures based on a normal distribution, we are advantaging hedge funds (and other investments) that have greater downside risk. While estimating forward-looking non-normal measures of risk and dependence is outside the scope of this paper, it is certainly warranted and worthy of continued research.

Hedge funds

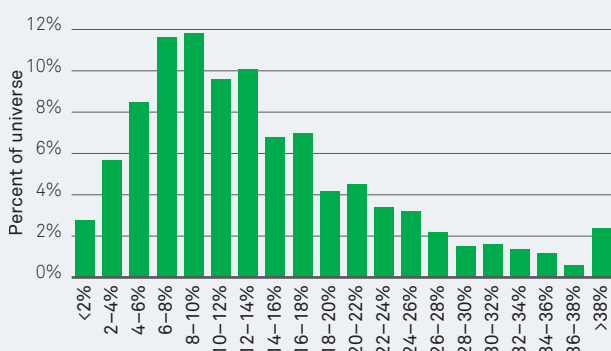
Hedge funds collectively pursue a diverse set of actively managed strategies that operate across a wide range of assets. Unlike other alternative investments, hedge funds lack a shared set of investment attributes; instead, they are defined by common structural elements. These funds are typically focused on generating absolute returns rather than returns relative to a benchmark, have significant investment flexibility, and charge management and incentive-based fees. This fee structure – along with the manager’s own material investment in the fund – is intended to promote greater alignment between manager and investor than traditional fund types. Investors in hedge funds generally seek attractive risk-adjusted performance and diversification benefits relative to their existing portfolio.

Hedge funds operate across single or multiple strategies, consisting of *relative value*, *event driven*, *long/short*, *macro*, *managed futures* and direct sourcing approaches. It is important to emphasize the heterogeneous nature of the hedge fund universe – performance, risk, and correlation can

vary meaningfully both within and across strategies. Exhibits 1 and 2 present historical standard deviation and equity correlation for active hedge funds within the broad universe based on the lesser of time since their respective inception date or the last 10 years. This diversity allows investors to select hedge funds that conform to their particular investment goals and constraints. However, regardless of customization, a successful hedge fund portfolio requires positive alpha in excess of fees.

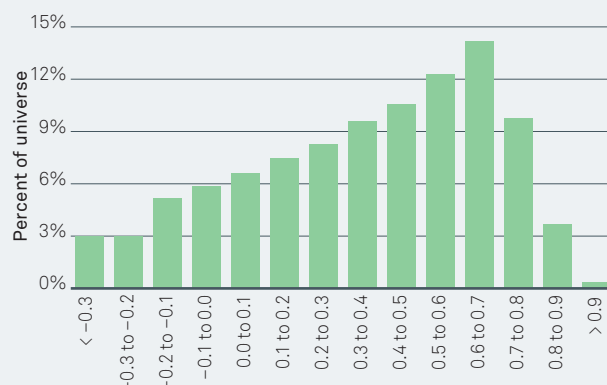
For our analysis – and notwithstanding the heterogeneity of the universe – return, risk, and correlation expectations are based on a broadly diversified allocation to hedge funds, as proxied by the HFRI Fund of Funds Composite index. Fund of funds indices are typically less biased than non-investable hedge fund indices (which have significant attrition) and are more representative than investable hedge fund indices (which can have a small number of constituents). These estimates may differ materially when considering a particular strategy or an individual hedge fund.

EXHIBIT 1: HISTORICAL STANDARD DEVIATION FOR ACTIVE HEDGE FUNDS



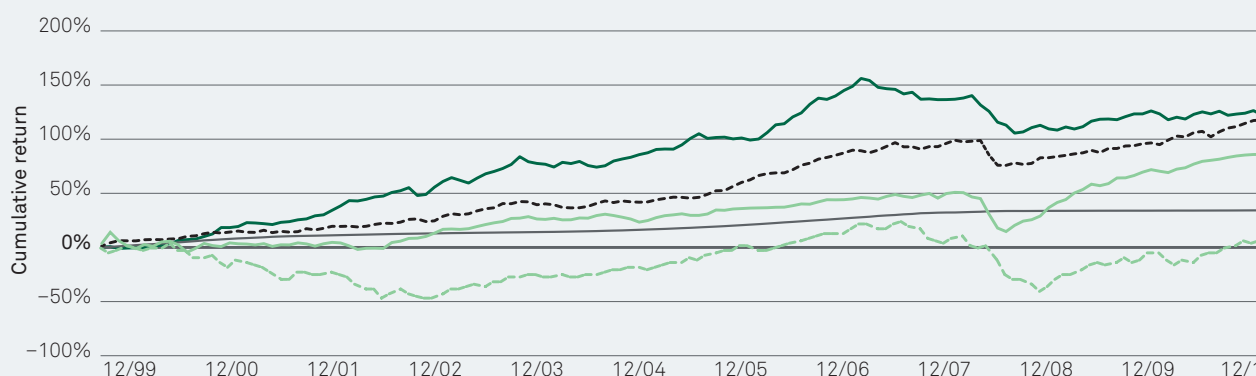
Sources: Lipper TASS database and BlackRock, 01.01.02.–31.12.11. Funds with less than three years of performance have been excluded.

EXHIBIT 2: HISTORICAL EQUITY CORRELATION FOR ACTIVE HEDGE FUNDS



Sources: Lipper TASS database and BlackRock, 01.01.02.–31.12.11. Funds with less than three years of performance have been excluded.

EXHIBIT 3: HISTORICAL PERFORMANCE FOR NON-TRADITIONAL RISK PREMIA



Sources: Bank of America Merrill Lynch, Credit Suisse, Barclays, and BlackRock, 01.2000 – 12.2011.

	Return	Risk	Sharpe	Regression to MSCI World		
				Alpha	Beta	Correlation
Convertible hedging	4.6%	8.6%	0.25	2.9%	0.30	0.54
Merger spread	6.5%	4.8%	0.84	4.2%	0.15	0.48
Currency carry	6.9%	6.0%	0.74	4.6%	0.07	0.19
MSCI World Index	-0.4%	15.4%	-0.19	—	—	—
Merrill Lynch 3-mo T-Bills	2.5%	0.6%	0.00	—	—	—

Sources: Bank of America Merrill Lynch, Credit Suisse, Barclays, and BlackRock, 01.2000 – 12.2011.

RETURN

Hedge funds generate returns from three sources: traditional beta, non-traditional beta, and alpha. We estimate a return of 2–4% over cash, or 3.5–5.5% in absolute terms, excluding alpha and fees, for a broadly diversified hedge fund allocation.

- **Traditional beta:** While hedge funds have an absolute return orientation, the hedge fund universe typically maintains a long bias to traditional risk premia. Any hedge fund strategy can exhibit sensitivity to traditional market factors, but this is particularly evident in long/short strategies. Beta of the HFRI Fund of Funds Composite Index to equity markets has historically been approximately 0.25. Based on our expectation of the equity risk premium, we estimate that traditional beta will contribute a 1.5% return.

- **Non-traditional beta:** Hedge funds are also exposed to risk premia that are not present in traditional asset classes. Non-traditional risk premia arise from strategies that take on liquidity risk or other forms of tail risk and are often characterised by consistent, low returns in normal environments and large drawdowns during periods of systemic stress. For example, a merger arbitrageur might enter into a long position in an acquiree versus a short position in an acquirer, expecting that the acquiree price will converge to that of the acquirer when the deal closes. The arbitrageur earns a premium by accepting that the deal may not close, which is a distinct risk to that of traditional asset classes.

Two other common hedge fund strategies that introduce non-traditional beta include: (1) long exposure to

convertible bonds versus delta-adjusted equity hedges where the relative cheapness of convertibles has historically provided an attractive spread, and (2) long exposure to high-yielding currencies versus short positions in low-yielding currencies, as historical spot prices have not fully reflected the expectations of interest rate parity. Each of these strategies are pursued by hedge funds and other levered market participants that may contribute to an unwind and poor performance in a financing or liquidity shock. Over the long term, non-traditional risk premia have exhibited positive risk-adjusted returns and moderate correlation to equities (Exhibit 3). Since not all hedge funds are exposed to these sources of risk, we estimate that non-traditional beta will contribute an additional 0.5–2.5% return.

- **Alpha:** Paramount to investing in hedge funds is the expectation of positive alpha on a net-of-fees basis. However, with low barriers to entry resulting in thousands of active hedge funds, we assume that the average fund manager does not have the requisite skill to generate meaningful alpha. It is therefore essential to select skilful managers. As mentioned in the introduction, we have not defined an alpha level given the inherent difficulty in forecasting skill across fund managers and the disparity in realised outcomes that has been observed historically (see ‘The importance of manager selection’ on page 12).

RISK

We estimate an 8% standard deviation for a broadly diversified hedge fund allocation. Hedge fund performance tends to be characterised by fat tails, particularly excess downside risk compared with a normal distribution, which is not fully captured in a risk measure such as standard deviation. The presence of fat tails arises from the poor performance that hedge funds tend to experience in times of systemic stress, as restrictions in financing and liquidity prompt deleveraging.

Since inception in 1990, the HFRI Fund of Funds Composite Index has exhibited a volatility of 5.9%. There is also evidence of return smoothing with

serial correlation of 0.35 at a one-month lag. Return smoothing will understate volatility, so we apply a correction to counteract these effects that results in an adjusted volatility of 8.7%. Hedge funds also tend to have more operational risk than traditional vehicles, due to greater complexity in their investment strategy and fewer regulatory requirements.

CORRELATION

We estimate a moderate correlation to equities (0.6) and low correlation to fixed income (0.1). While hedge funds often have low correlation to risk assets on an individual basis, a broadly diversified portfolio can diversify idiosyncratic sources of risk and increase overall correlation. Correlation to risk assets can also differ meaningfully across strategies, with managed futures and macro typically offering lower correlations than long/short and event driven. Since inception, the HFRI Fund of Funds Composite Index has had a 0.6 correlation to equity markets. This correlation profile is expected to persist due to the modest long bias of certain hedge fund strategies and the presence of non-traditional beta exposures that are correlated to risk assets, particularly in periods of systemic stress.

LIQUIDITY

Depending on the hedge fund, liquidity may range from daily redemption to a lock-up of several years. However, the majority of hedge funds offer liquidity on a monthly or quarterly basis. Hedge funds can also restrict liquidity by suspending redemptions or enacting gates, techniques that were employed by many funds in the aftermath of the financial crisis.

Hedge funds pursue a diverse set of actively managed strategies, with a return profile that is highly dependent on selecting alpha-generating managers.

The importance of manager selection

A key aspect of alternatives, particularly hedge funds and private equity, is the wide dispersion among successful and poorly performing funds. This feature places heightened importance on the manager selection process and increases the benefits of owning a diversified portfolio.

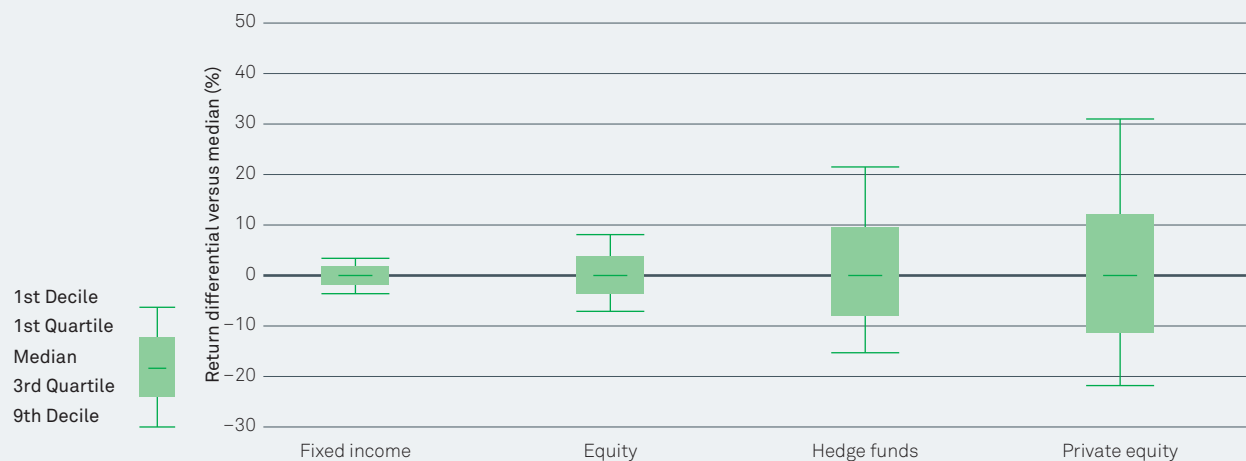
QUANTIFYING THE MANAGER SELECTION IMPACT

Exhibit 4 highlights the dispersion in annual performance among managers of fixed income, equity, hedge funds and private equity strategies. Managers within alternative investments have displayed significantly greater dispersion than those in traditional

asset classes. Private equity has had the greatest level of dispersion, where the difference between the top and bottom quartile performer is a stark 28%.

Exhibit 5 offers a more refined perspective by controlling for differences in strategy or sector focus. These differences account for a large portion of the dispersion in traditional asset classes, whereas the difference in manager performance mainly remains for alternative investments. In particular, strategy differences in hedge funds account for only a small portion of manager dispersion, which highlights the tremendous heterogeneity of the universe and the impact associated with the manager selection decision.

EXHIBIT 4: DISPERSION OF FUND PERFORMANCE
Average calendar year, 2002–2011



		Fixed income	Equity	Hedge funds	Private equity
Percentiles	10%	9.5%	14.2%	23.5%	40.5%
	25%	4.3%	6.3%	10.0%	17.1%
	50%	0.0%	0.0%	0.0%	0.0%
	75%	-3.3%	-5.4%	-8.2%	-10.6%
	90%	-6.1%	-10.4%	-16.3%	-22.8%
Interdecile range		15.6%	24.5%	39.8%	63.4%
Interquartile range		7.6%	11.7%	18.2%	27.8%

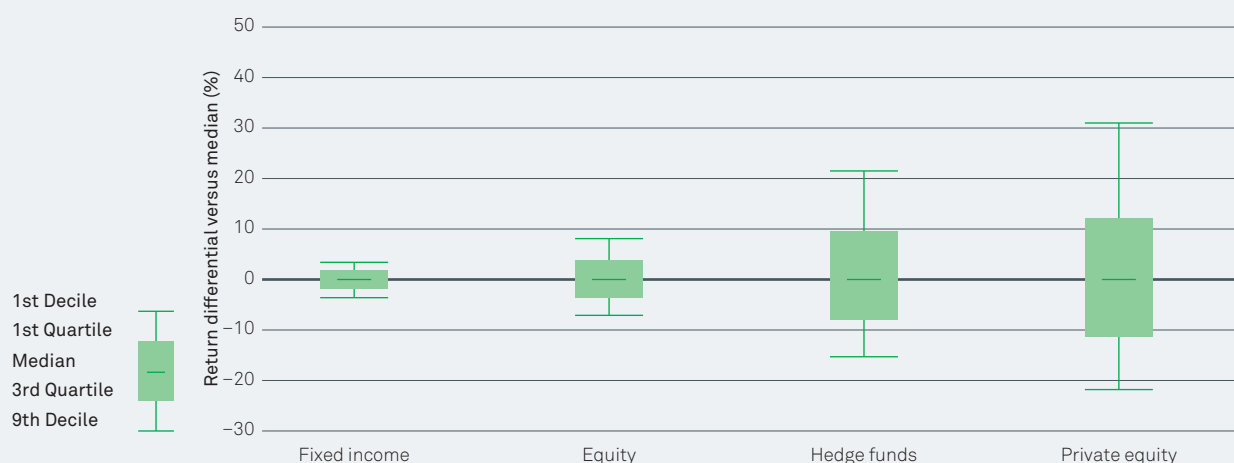
Sources: Morningstar, Lipper TASS, Venture Economics, and BlackRock.

Key tenets of a successful manager selection programme

- ▶ Given the impact of the manager selection decision, investors should address the following organisational, operational, and investment criteria in their own hiring process; see Witham 2011 for a more expansive list.
- ▶ Strong alignment of interest, where there should be significant principal, firm, and employee investments alongside clients.
- ▶ Operational framework characterised by a robust infrastructure and valuation procedures within a strong culture of compliance.
- ▶ Differentiated investment strategy with a diverse set of strategies that target unique opportunities to generate alpha.
- ▶ Liquidity offered to investors that is matched to that of portfolio assets.

EXHIBIT 5: DISPERSION OF FUND PERFORMANCE CONTROLLING FOR STRATEGY DIFFERENCES

Average calendar year, 2002–2011



		Fixed income	Equity	Hedge funds	Private equity
Percentiles	10%	3.4%	8.1%	21.5%	31.0%
	25%	1.8%	3.8%	9.6%	12.1%
	50%	0.0%	0.0%	0.0%	0.0%
	75%	-1.8%	-3.6%	-7.9%	-11.4%
	90%	-3.6%	-7.1%	-15.3%	-21.8%
Interdecile range		7.0%	15.3%	36.8%	52.7%
Interquartile range		3.6%	7.4%	17.5%	23.5%

Sources: Morningstar, Lipper TASS, Venture Economics, and BlackRock.

Private equity

In the broadest sense, private equity is simply the equity of businesses that are not publicly quoted or traded on a stock exchange. However, when investors refer to private equity, they primarily mean investment partnerships where fund managers provide equity-related financing in order to create change in a business, where the business was either originally unquoted or becomes so after the transaction. Investors in private equity are drawn by expected outperformance relative to their public equity allocation.

Private equity funds are typically structured as closed-end partnerships, with lifespans of 10 to 12 years. The main private equity strategies are **buyout capital** and **venture capital**; secondary strategies include **growth capital**, **restructuring**, and mezzanine. Fee structures include management and incentive-based fees.

From a portfolio perspective, private equity can be considered a substitute for public equity but with greater leverage and illiquidity. Like public equity, private equity is exposed to macroeconomic and industry-specific dynamics. The public equity markets also influence the valuation and terms on which private equity funds acquire and exit from companies.

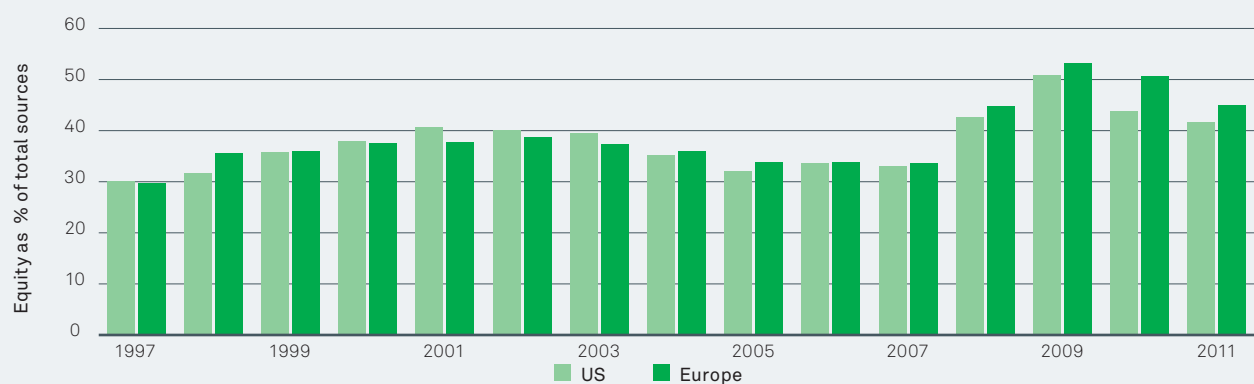
Because of their closed-end structure, private equity funds are evaluated based on realised cashflows and corresponding money-weighted return measures (such as internal rate of return and return multiple) rather than time-weighted returns. To derive expected return, risk, and correlation, we use public equity data and make adjustments in order to account for the unique aspects of private equity. (We avoid using index providers' time series of private equity performance because of the subjective nature of unrealised valuations reported by fund managers.)

Our estimates for private equity reflect a geographically diverse set of partnerships with a 75/25 weighting of buyout and venture capital based on the asset breakdown of the broad industry. Due to the diversification benefits from holding multiple partnerships, these estimates may differ materially when considering an individual partnership.

RETURN

Private equity generates returns from three sources: traditional beta, illiquidity premia and alpha. We estimate a net return of 9.5–11.5% over cash, or 11–13% in absolute terms, excluding alpha and fees.

EXHIBIT 6: EQUITY CONTRIBUTION TO LEVERAGED BUYOUTS



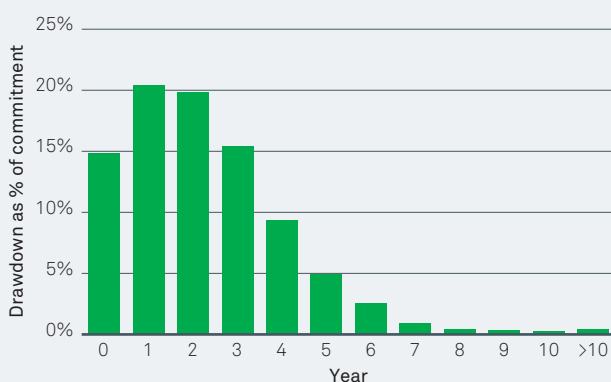
► **Traditional beta:** Because private equity is closely related to public equity, the equity risk premium is a key component of expected return.

- *Buyouts:* As the name suggests, leveraged buyouts involve a material level of debt that helps finance the acquisition, though the level varies with the cost and availability of financing (Exhibit 6). Because financial leverage typically exceeds that of the average public company, the equity beta for buyouts is higher than 1. Considering the current financing environment, and the fact that leverage is expected to decrease in the years following an acquisition, we estimate a long-term beta of buyouts to public equity to be 1.4.² Since we estimate the equity risk premium to be 6%, traditional beta contributes 8.5% ($6\% \times 1.4$) to our return estimate for buyouts.
- *Venture capital:* While financial debt is rarely employed in venture capital, there is an expected higher degree of operating leverage due to its focus on smaller, newer and more speculative companies. To gauge the impact on equity beta, we consider the Russell Microcap Growth Index, which has a beta of 1.32 versus the S&P 500

since its inception. The beta for venture capital is expected to be modestly higher, given selection bias inherent in an index of companies that have successfully gone public. We estimate the equity beta of venture capital to be 1.4 and that traditional beta contributes 8.5% to performance, the same level as buyouts.

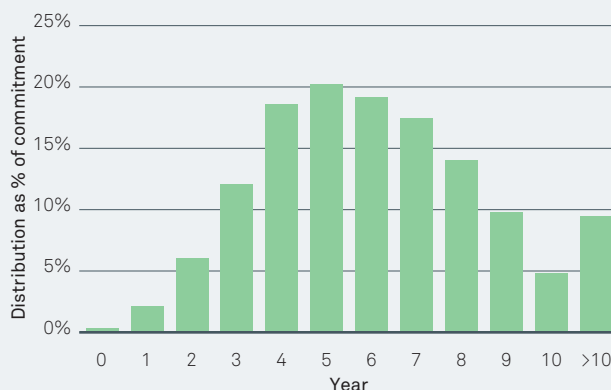
- *Illiquidity premium:* Private equity fund managers benefit from the stability of capital that the illiquid partnership structure offers. For buyouts, this allows fund managers and company management to focus on long-term value creation instead of being fixated on short-term quarterly earnings. For venture capital, fund managers can contribute equity to start-up businesses at attractive terms. In an analysis of the US buyout fund universe, Malinowski (2011) finds historical outperformance of 3–5% over public equities, net of fees and after accounting for differences in leverage, capitalisation and industry. We estimate a more conservative illiquidity premium of 1–3%.
- *Alpha:* Private equity alpha refers to returns in excess of traditional beta and illiquidity premia that arise from superior company identification, exit

EXHIBIT 7: PRIVATE EQUITY ANNUAL DRAWDOWN
Average vintage year, 1990–2010



Source: Venture Economics, as of 31.12.10.

EXHIBIT 8: PRIVATE EQUITY ANNUAL DISTRIBUTION
Average vintage year, 1990–2010



Source: Venture Economics, as of 31.12.10.

² Beta is an approximation based on an adjustment to reflect the greater financial leverage in buyouts relative to that of public companies. This adjustment is based on an option-based approach to corporate valuation that incorporates data on LBO equity contribution, public company debt levels, and stock volatility. See Malinowski (2011) for an additional discussion of this adjustment.

timing or other aspects of the investment process. Similar to hedge funds, we assume that the average private equity fund manager does not have the requisite skill to generate meaningful alpha, which makes the selection of skilful managers essential. As mentioned in the introduction, we have not defined an alpha level given the inherent difficulty in forecasting skill across fund managers and the disparity in realised outcomes that has been observed historically.

RISK

We estimate a 30% standard deviation for private equity. As discussed above, we estimate a beta of 1.4. Taking into account the public equity correlation estimate defined below (0.8), our estimate of public equity volatility (17%), and the relationship between correlation, volatility and beta, we arrive at an expected standard deviation for private equity of 30% ($1.4 \times 17\% / 0.8$).

Similar to hedge funds, private equity strategies are less regulated than publicly offered investments and may have higher operational risk.

CORRELATION

We estimate a high positive correlation to risk assets and, in particular, a correlation of 0.8 to public equity. If we were to accept the proposition that private and public equity are indistinguishable except for the liquidity available to investors, then a correlation of 1 would be appropriate. However, there are unique aspects of private equity; for example, buyout fund managers target value-oriented companies with high cashflows, and venture capital funds focus on emerging companies in the healthcare and technology sectors. In addition, private equity portfolios are typically concentrated, which may add idiosyncratic risk, even for a diversified private equity portfolio.

LIQUIDITY

Private equity is highly illiquid. Unlike open-end pooled funds, such as mutual funds, private equity funds cannot be redeemed. Once committed to a fund, investors are effectively locked-in for the full term and are liable to the full extent of their capital commitment. Investors may be able to sell their fund investment on the secondary market, but it will likely be at a discount to stated value. Because returns take the form of realised gains over the long term, private equity funds do not generate regular income. Investors commit a fixed sum initially, which the fund manager draws down over the first several years as suitable investment opportunities are found.

Exhibit 7 (page 15) highlights the typical drawdown pattern for a private equity fund.

Until capital is drawn, commitments remain with the investors. Investors choosing to hold uncalled capital as cash suffer from a potential drag on portfolio performance, whereas investors holding risky assets may have trouble meeting the commitment if these assets decline in value. The cashflows from a successful fund should turn positive after a few years, as the fund begins to exit portfolio companies and distribute proceeds to investors. Exhibit 8 (page 15) presents a distribution profile for the average vintage year from 1990 to 2010. (Distributions can vary dramatically, depending on the market environment.)

Private equity is a close substitute to public equity, with greater leverage, much greater illiquidity, and an accompanying higher level of risk and expected return.

Direct investment or funds of funds?

Investors should diversify across alternative strategies, particularly where there is wide performance dispersion, as is the case for private equity and hedge funds. This can be done by self-selecting funds, hiring an external specialist, or both. The specialist could be an external advisor who recommends funds for inclusion in the portfolio or the manager of a fund of funds (FOF) that invests in specific funds of alternatives. There are a number of factors to consider.

Manager sourcing and due diligence: Due diligence must be conducted for each potential fund from multiple perspectives. Assessment of the fund's personnel, back-office resources, organisational and management skill is required in addition to understanding the fund's investment strategy, trading and investment capabilities. A well-resourced advisor or FOF manager is also more likely to include experts in niche sectors within the particular class of alternatives, providing better sourcing and referencing through industry contacts.

Portfolio monitoring and risk management: Managing risks of investing in alternatives can be resource intensive. Hedge fund managers can evolve their strategies and shift exposures quite rapidly. Investors must monitor changing exposures, particularly with respect to liquidity and financing risk. Ongoing diligence allows the investor to validate performance and claims of managers and identify red flags such as style drift, where a manager ventures beyond their core area. Non-investment risks such as personnel changes and operational controls also must be tracked. Additionally, it is necessary to assess the potential impact of each fund on the investor's broader portfolio, to mitigate unintended risks.

Fees: External advisers and FOFs may charge both a flat fee and, particularly for FOFs, a performance-related fee, typically in addition to those due to the managers of individual funds. Self-directed investment avoids these additional fees. However, the cost of replicating these services could exceed the fees. Typically the fees for FOFs are higher than for advisory relationships, though this will vary with the levels of discretion granted to, and

ongoing service provided by, the advisor. If the advisory relationship extends to discretionary management, it becomes in effect a segregated FOF and will charge commensurately.

Market power: FOFs may be able to negotiate terms with some alternatives funds that are more favourable than those received by all but the largest individual investors. These terms are typically in relation to fees, liquidity, governance rights and investment restrictions. Greater industry relationships may also allow greater access to individual funds, particularly for new fund launches.

Alignment: FOFs typically have better alignment of interest with clients than do external advisors because they often invest their own capital in the fund and are incentivised by a performance fee.

Liquidity: Broadly, the liquidity terms of a portfolio of alternatives funds should reflect that of the underlying assets. A large FOF with many individual investors may enjoy somewhat better liquidity if this results in opportunities for crossing trades between investors entering and leaving the fund.

Minimum investment sizes: Many alternatives funds impose a minimum investment. Especially for investors with limited capital, a FOF might allow greater potential diversification through the pooling of individual investors' commitments than either self-directed investment or the use of external advisers.

Multi-strategy funds: Another approach to diversification is to invest in a single alternatives fund that follows a multi-strategy approach. This should mitigate the investment risk of individual strategies, and it avoids the additional layer of fees charged by a FOF or external adviser. However, investors in a single multi-strategy fund have not diversified the business and operational risk that comes from exposure to a single fund. Further, the multiple strategies may, to some extent, reflect a common investment view, thereby sharing some common investment risks. Multi-strategy funds may also face challenges in providing superior skill across a wide range of strategies.

Real estate

Given its prominence in institutional portfolios, real estate is considered separately from the real assets section that follows. Real estate exposure can be acquired through equity or debt securities, on a private or public basis. Here we analyse the equity of private real estate, as it is the most common way institutional investors obtain real estate exposure. (Private debt lacks robust data and public debt is often held within a traditional fixed income portfolio.)

Investors in real estate equity primarily seek stable income from rent and diversification benefits from exposure to non-traditional risk premia. Rental income may be positively related to inflation, which suggests some value preservation in inflationary environments (Hodges et al. 2011).

Real estate funds invest in apartment, industrial, office, retail, hotel, and hospital properties through **core**, **value-added**, or **opportunistic** investment approaches. Real estate managers typically charge management-based fees for core strategies, and management and incentive-based fees for value-added and opportunistic strategies.

Our return, risk and correlation estimates are based on a core strategy that is diverse in terms of geography and

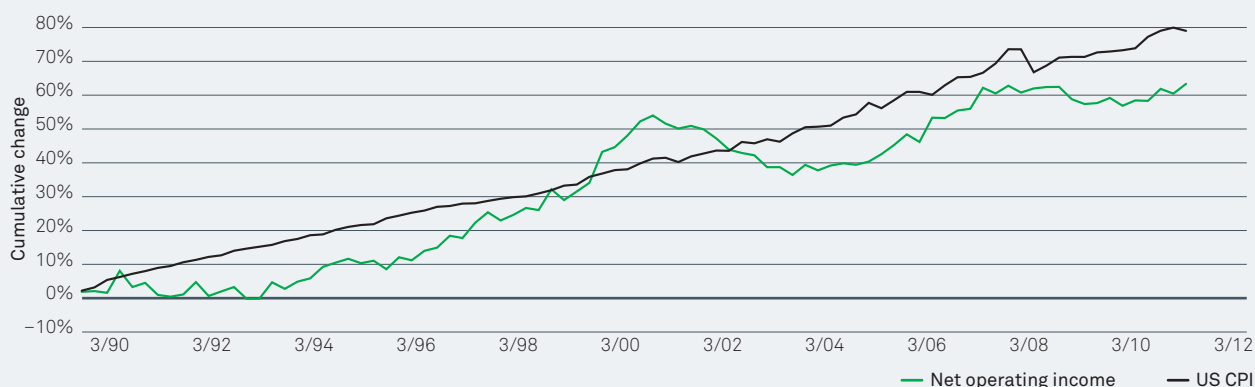
property type. Although most real estate managers employ some degree of leverage, we consider an unlevered investment, as leverage differs substantially across funds. We primarily draw on the NCREIF Property Index in setting our expectations; because this is an index of privately held assets, we must first account for potential data biases. Finally, given the breadth and depth of historical data for the US, these estimates may similarly be relevant to other developed real estate markets.

RETURN

Based on our framework, we consider performance for real estate as arising from non-traditional beta and illiquidity premia. In practice, performance can be attributable to income from rent and a capital return from income growth and changes in capitalisation rates. According to Tse, Palumbo and Ziering (2010), 66% of long-term real estate performance has resulted from income, 25% from income growth, and the remaining 9% from changes in capitalisation rates. We estimate a return of 5–7% in absolute terms.

► **Income return:** Real estate generates income by charging customers rent for use of a property. In

EXHIBIT 9: REAL ESTATE OPERATING INCOME AND THE CPI



Sources: NCREIF and the Bureau of Labor Statistics.

order to maintain a property, capital expenditures are required, which reduce the income paid to investors. From 2005 through 2011, the annualised income return for the NCREIF Property Index was 5–7% before capital expenditures and 3–5% after expenditures. We assume that this environment will continue, and therefore estimate that income will contribute 3–5% to real estate performance.

- **Capital return:** The capital return for real estate, like other productive assets, should be consistent with changes in the discounted value of its expected future cashflows. In particular, this can arise from the impact of income growth on the level of future cashflows or changes in capitalisation rates on the discounted value. As noted earlier, rental income may be positively related to inflation. In order to explore this further, we compare cumulative changes in net operating income for the NCREIF Property Index to the consumer price index (CPI) since 1990 (Exhibit 9). We find a positive relationship where rental income appears to trend in the same manner as inflation. It is worth emphasizing that this comparison is over a relatively low inflationary environment and may not persist should inflation spike. In fact, income growth did trail in the period of high inflation from 1977 to 1982. As we expect a relatively benign environment of 2% inflation, we estimate that income growth will trend with inflation, resulting in a contribution from capital return of 2%.

RISK

While the return profile of real estate has been dominated by income and income growth, the risk profile has been primarily driven by capitalisation rate effects. We draw on historical performance to estimate a 14% standard deviation.

Privately held indices, such as the NCREIF Property Index, are widely acknowledged to suffer from data biases that are not present in publicly traded indices. Biases arise from the appraisal process of valuing real estate holdings, which introduces seasonality and return smoothing. Appraisals have historically been

conducted on an annual basis, often taking place in the fourth quarter; the average absolute value of fourth quarter capital return is 2.5%, compared with 1.1%, 1.3%, and 1.3% for the first, second, and third quarters, respectively. Quarterly returns can provide a misleading picture of risk and correlation, so we rely exclusively on annual performance.

The more damaging bias associated with the appraisal process is return smoothing, where valuations may be slow to reflect the current market environment, resulting in risk measures that are artificially low. Serial correlation, defined as the correlation of contemporaneous to lagged performance, is a common measure to identify return smoothing. For indices of publicly traded securities, serial correlation is expected to be close to zero, as performance for a given period reflects all information available at that time and there is no delayed impact on future returns. Privately held indices, on the other hand, are expected to have positive serial correlation, due to a gradual reflection of market conditions that extends over multiple time periods. The S&P 500 had serial correlation at a one-year lag of 0 relative to 0.55 for the NCREIF Property Index, based on annual performance from 1978 to 2011. Return smoothing is a more significant issue with higher periodicity data; we initially address this bias in the same manner as our response to seasonality, using annual rather than quarterly data. We subsequently apply a desmoothing adjustment to annual returns that is discussed in Geltner (1993) and Budhraj and de Figueiredo (2005). The effect of these approaches on risk is significant. Since inception of the NCREIF Property Index, the annualised standard deviation has been 4.5% based on quarterly returns, 8.1% based on annual returns, and 15.2% based on desmoothed annual returns.

Exhibit 10 (page 20) presents annualised standard deviation for the NCREIF Property Index as well as the NCREIF Townsend indices, which are based on reported fund performance across the three strategy types and include the impact of leverage. We apply a similar approach to adjusting standard deviation of the NCREIF Townsend indices, which results in a significant increase

in their risk profile. This comparison also demonstrates the material effect that leverage and strategy focus can have on risk, as opportunistic strategies have greater than twice the standard deviation of core strategies.

Other risk factors include lease structure, tenant quality, tenant industry concentration and geographic concentration. Extended-term leases tend to have reduced risk, as do properties with high-quality tenants. Portfolios that are geographically concentrated typically have higher risk, given that fluctuations in the local economy can have a significant impact on real estate valuations.

CORRELATION

We estimate a moderate correlation to equities (0.45) and a low correlation to fixed income (0.25). As mentioned above, changes in capitalisation rates are a significant contributor to real estate risk. To understand correlations between real estate and other assets, we focus on the determinants of capitalisation rate effects: changes in the opportunity cost of capital, growth expectations of future property cashflows, and risk perceptions with respect to commercial real estate.

Since interest rates represent the opportunity cost of capital, one might expect a material correlation between fixed income and real estate. However, Exhibit 11 demonstrates a weak relationship between capitalisation rates and Treasury yields; periods of stress for commercial real estate (e.g., 2008–09, 1990–92) exhibit an inverse relationship, while more benign environments (e.g., 1995–2003) show a moderately positive relationship. The relationship is stronger for corporate bonds, particularly during the financial crisis. As a result, while real estate intuitively

has interest rate sensitivity, the risk profile tends to be dominated by growth expectations and risk perceptions that lead us to estimate a relatively low correlation.

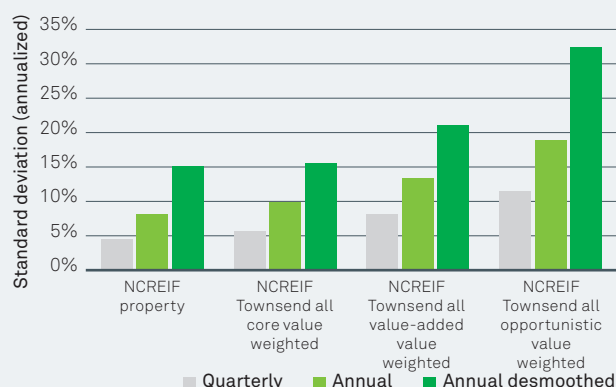
Since 1978, the NCREIF Property Index has had a 0.13 correlation to the S&P 500, based on annual performance. However, return smoothing not only understates standard deviation, it also tends to understate correlation, because moves in publicly traded assets are not reflected in the privately held asset until later periods. In order to account for this effect, we run a multivariate regression and find that the NCREIF Property Index has a 0.06 and 0.19 beta to contemporaneous and one-year lagged performance of the S&P 500, respectively. Summing the contemporaneous and lagged beta gives us a more accurate measure of beta (0.25). Taking into account our beta estimate and standard deviation expectations, we arrive at a presumed correlation of 0.3 ($0.25 \times 17\% / 14\%$). Since equities and real estate both share a common link to the economy, we estimate a modestly higher correlation than that of our empirical analysis.

LIQUIDITY

Real estate varies in liquidity from core strategies that offer open-end vehicles with quarterly liquidity and potential redemption queues to opportunistic strategies with closed-end partnerships similar to private equity.

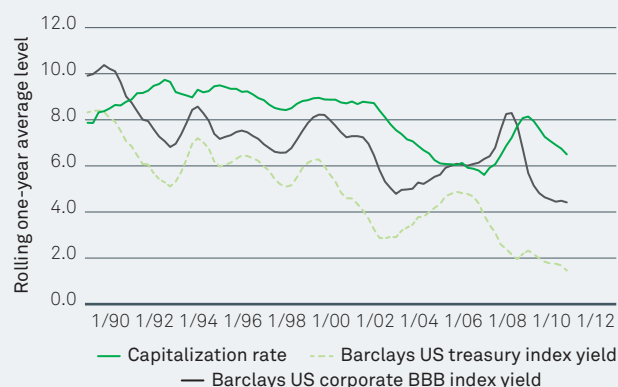
Real estate is expected to provide income generation from rent and diversification benefits relative to traditional assets.

EXHIBIT 10: STANDARD DEVIATION FOR REAL ESTATE INDICES



Source: NCREIF. As of: NCREIF Property = 1978–2011; NCREIF Townsend Core = 1978–2011; NCREIF Value-Added = 1984–2011; NCREIF Opportunistic = 1989–2011.

EXHIBIT 11: REAL ESTATE CAPITALISATION RATE, TREASURY YIELDS AND CORPORATE YIELDS



Sources: NCREIF and Barclays, 1990–2011.

Privately held or publicly listed?

To gain exposure to many alternative investments, investors can choose privately held assets or publicly listed securities. While the comparison of privately held to publicly listed is a relevant question for private equity and real assets, it is most often associated with real estate, where investors must decide whether to invest directly in properties or indirectly through real estate investment trusts (REITs). The choice depends on the investor's particular needs.

PUBLIC VERSUS PRIVATE TRADE-OFFS

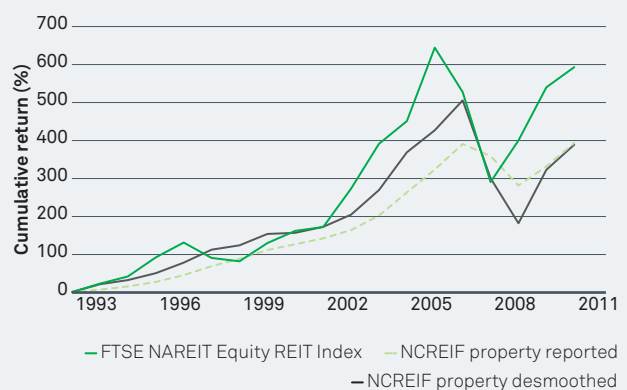
For institutional investors, choosing between private and public real estate exposure often boils down to assessing the trade-off between precise exposure and higher liquidity (Exhibit 12). Overall, private real estate strategies are generally considered to provide purer exposure, while public real estate strategies typically have greater liquidity.

Returns of private and public real estate equity are comparable. According to Geltner and Rodriguez (1998), private real estate does, however, suffer from slower transfer of pricing information, which results in some performance lag to public real estate in the short term (Exhibit 13). There have been less significant differences in the long term.

EXHIBIT 12: COMPARING PRIVATE AND PUBLIC EXPOSURE

Private real estate benefits	Public real estate benefits
More precise exposure	Higher liquidity
Potentially tax efficient	Tax efficient
Ability to customize exposure	Transparency of holdings
Lower correlation with equity markets	Transparency of financials
Market breadth us\$2.6 Trillion globally, compared with \$0.8 Trillion for public equity ³	More current valuation

EXHIBIT 13: CUMULATIVE RETURNS OF PRIVATE AND PUBLIC REAL ESTATE EXPOSURE



Sources: NCREIF, Bloomberg, and BlackRock, 1.1.92–31.12.11.

³ Sources: DTZ Research (based on top 20 regional markets, or 90–95% of aggregate real estate market), BlackRock, as of 12/31/10.

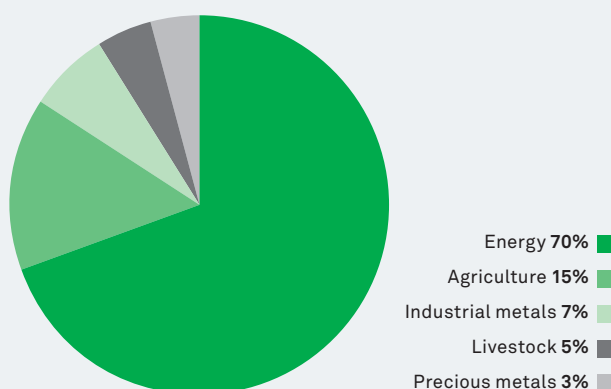
Commodities

Commodity funds can gain exposure through physical assets or futures. Sectors include energy, industrial metals, precious metals, agriculture, and livestock (Exhibit 14). Commodities may offer diversification benefits as well as inflation protection to conventional portfolios. They differ from capital assets in that valuations are not derived from cashflows but rather from their intrinsic utility.

Institutional investors generally gain exposure to commodities through futures, to avoid the inconvenience and storage costs of holding physical assets. Here we focus on the beta characteristics of a basket of commodity futures exclusively rather than fund structures that invest in commodities, such as commodity trading advisors (CTAs) or other actively managed commodity products. The two most widely used commodity futures indices are the S&P GSCI, which is production weighted, and the Dow Jones-UBS Commodity Index, which limits exposure of index components to 33%. We assess the expected return, risk, and correlation characteristics of the S&P GSCI, given its extensive data history (back to 1970).

Much has been made of the strong historical returns of commodity futures (Gorton and Rouwenhorst 2006; Erb and Harvey 2006). Indeed from 1970–2011, the S&P GSCI delivered annualised returns that were virtually equivalent to those of the S&P 500 (9.7% versus 9.8%).

EXHIBIT 14: COMPOSITION OF THE S&P GSCI



Source: Standard & Poor's, as of 31.12.11.

We expect commodity futures to deliver far more modest returns going forward, as the bulk of the basket's historical performance was driven by large positive roll returns in the 1970s and 1980s, which we do not anticipate will be replicated. The rationale for incorporating commodities into a portfolio should be based on their diversification benefits as well as their ability to protect portfolios in periods of rising inflation.

Commodities have exhibited a strong relationship to changes in inflation. This sensitivity, however, cuts both ways – as inflation recedes, commodity prices tend to drop (Hodges et al. 2011). Exhibit 15 depicts this relationship since 1995; over other time horizons, the relationship is positive and statistically significant, though the beta estimates fluctuate. We address the potential implications of this property on expected returns below.

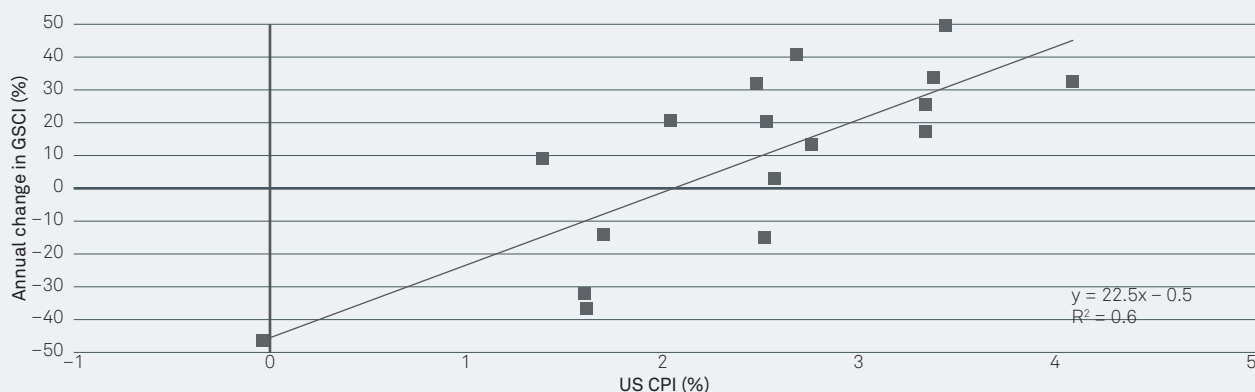
RETURN

We consider performance for commodity futures as arising from non-traditional beta. Forecasting expected returns for commodity futures requires a more indirect approach than that typically used for traditional asset classes; for example, fixed income where yields are directly observable, and equities where dividends and earnings are directly observable. Here we evaluate expected returns using two complementary approaches. We use both a build-up approach based on forecasting the underlying components of commodity futures returns as well as a risk-factor approach, which evaluates the underlying risk premia. After consideration of both methodologies, we estimate a return of 0.5–1.5% over cash, or 2–3% in absolute terms.

Build-Up approach

For financial futures, the lack of arbitrage conditions ensures spot prices and future prices are directly related through the cost of carry. In other words, there is no systematic return advantage from investing in either physical or futures exposures.

EXHIBIT 15: RELATIONSHIP BETWEEN THE S&P GSCI AND INFLATION



Source: Thomson Reuters Datastream 1995–2011.

In contrast, commodity futures can return more than the underlying physical commodities. Commodity physicals can provide tangible benefits relative to commodity futures because holding inventory creates the option to consume it immediately, which has material value. This is known as the convenience yield.

We can gather insight into the difference between underlying commodity (spot) return and commodity futures return by decomposing the return of the GSCI index into:

$$\text{Total return} = \text{Spot return} + \text{Roll return}^4$$

The spot return represents the rise or fall in the price of a commodity in the spot market and is analogous to capital gains on equities or bonds. Over time, the level of commodity prices is influenced by factors exerting downward price pressure (such as technological advances in extraction and new discoveries) as well as factors driving upward price pressure (such as growing global demand and the potential scarcity of nonrenewable resources). These factors have historically balanced each other in real terms, as the annualised real return of the spot GSCI from 1970 to 2011 has been -0.1% . On a long-term basis, we believe a reasonable estimate of the spot commodities return is 0% in real terms. Our long-term inflation estimate of 2% implies a 2% nominal return.

We define roll return as the return earned by rolling futures positions forward on a regular basis plus the return on cash collateral. The slope of the commodity term structure can vary significantly over time and is dependent on the balance between hedgers and speculators, prevailing cash rates and a variety of technical factors. We estimate the long-horizon

expected annualised roll return is on the order of 1.0% , consistent with the annualised historical roll return for the S&P GSCI over the past 25 years of 1.3% .

In aggregate, the build-up approach suggests an expected return of 3% (2% spot + 1% roll), or 1.5% over cash. (Note that this estimate is beta return, and thus does not reflect roll yield—maximising strategies pursued by enhanced index commodity managers, such as holding futures with longer maturities.)

Risk-factor approach

Another way to evaluate expected returns is by using insights from financial theory. Asset exposures that contribute to systematic risks should have positive risk premia, while asset exposures that hedge systematic risks should confer negative risk premia. Commodities confer significant exposures to three risk factors, as detailed in Exhibit 16.

The inflation-hedging benefit, as well as the ability to hedge away some political risks, is expected to detract from expected return. In aggregate, the risk premia approach suggests a modest expected return of around cash plus 50 basis points.

Overall, both methodologies lead to forecasts significantly lower than historical experience.

RISK

We forecast a long-term volatility of 24% for the S&P GSCI. This high volatility is driven largely by the fact that the GSCI futures basket is composed of roughly two-thirds energy futures (with volatility of 32% over the past 30 years). As each of the other GSCI basket constituents has lower risk and all five components are

⁴ We define roll return as the difference between the current futures price and the implied fair value of the future given spot rates and the cost of carry. This implies that total return is not influenced by rising interest rate levels, as higher cash collateral yields (which would add to yield) would be precisely offset by higher futures prices (which would increase contango and cause a compensatory decrease in yield).

relatively uncorrelated, the overall risk is significantly lower than the energy component.

Commodities returns can exhibit a positive skew because of supply disruptions caused by external risks, including weather and geopolitical events (the Arab Spring, for example). Again, this hedging benefit can contribute to lower expected returns, other things being equal.

CORRELATION

Evaluated over a long-term horizon (1970–2011), commodities have had very low correlations with both stocks (0.09) and bonds (–0.02). This is expected, as commodities prices are far more sensitive to current conditions (prevailing supply and demand dynamics) than stocks and bonds, for which valuations are generally based on the assessment of long-term discounted future cashflows.

Exhibit 17 shows that the correlation between stocks and commodities has varied significantly over time. Stocks and commodities moved in opposite directions during the supply-side shocks of the 1970s and early 1990s. More recently, correlations have increased,

driven largely by the synchronized collapse of commodity prices and large equity drawdowns during the 2008 crisis.

Generally, we expect variation in commodity demand to be linked to the health of the global economy. We expect a long-term, forward-looking correlation estimate with stocks of 0.25 and 0.00 with bonds.

LIQUIDITY

In contrast to other alternatives, commodities (when proxied by the S&P GSCI futures index) are highly liquid, as the markets for its underlying constituents are deep.

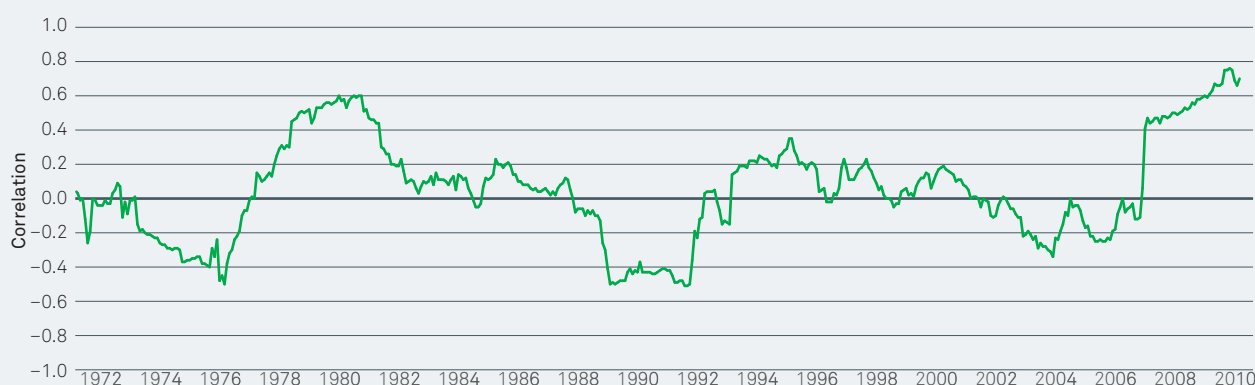
Commodities have low expected return and high risk, but still merit consideration for investors seeking inflation protection and increased diversification.

EXHIBIT 16: COMMODITY RISK PREMIA

Risk factor	Characteristic	Estimated risk premium
1) Economic growth	Sensitivity to business cycle	+125 bp
2) Inflation	Hedging properties	–50 bp
3) Political risk	Event risk hedge	–25 bp
		+50 bp

Source: BlackRock, as of 31.12.11.

EXHIBIT 17: Correlation between the S&P 500 and S&P GSCI



Sources: NCREIF, Bloomberg, and BlackRock, 1.1.92–31.12.11.:

Real assets

Real assets represent a diverse category of investments that are both tangible and productive, including (but not limited to) timberland, farmland, infrastructure, and energy-related investments. While most real assets yield commodities, the difference lies in their production capacity and a lifespan that extends beyond immediate consumption. Real assets may offer a degree of long-run protection against inflation, as they provide inputs into the price levels of broader goods and services, and because of inherent utility that should withstand currency devaluation. As with real estate, investors in real assets seek income, diversification benefits and value preservation in inflationary environments. Real assets managers often charge management and incentive-based fees, similar to hedge fund and private equity managers.

Investments in real assets are differentiated by stage, forming a continuum from a project in development to one that is fully operational. The developmental stage implies a higher level of risk and potential reward, given the uncertainty that, for example, there may be insufficient demand for an infrastructure project or higher costs than anticipated for an upstream energy

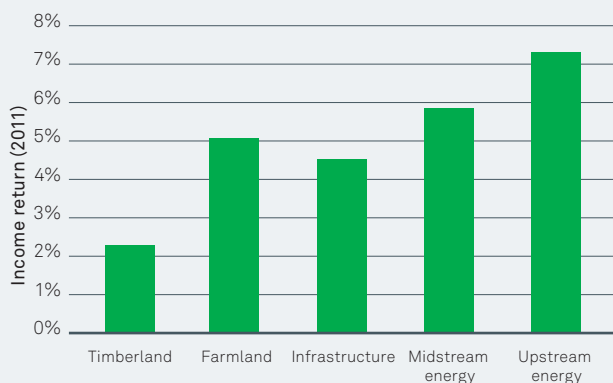
project. Mature projects that are fully operational often have lower levels of risk and generate consistent income, although risk reduction will be offset by any increase in leverage.

Return, risk, and correlation estimates are based on an unlevered portfolio diversified by asset type and geography, with a greater weight to operating projects. Given the diversity across real assets, there are no broad indices to draw from in setting our expectations. However, we do consider real asset sub-indices, including the NCREIF Timberland Index, NCREIF Farmland Index, and Venture Economics Energy Index. As with other indices of privately held assets, there are data biases that must be addressed in order to achieve reliable inputs. To a lesser extent, we also consider publicly listed and commodity indices.

RETURN

Like real estate, we consider performance for real assets as arising from non-traditional beta and an illiquidity premium in our simplified framework, which takes the form of income and capital return in practice. Our return estimate is 6–8% in absolute terms.

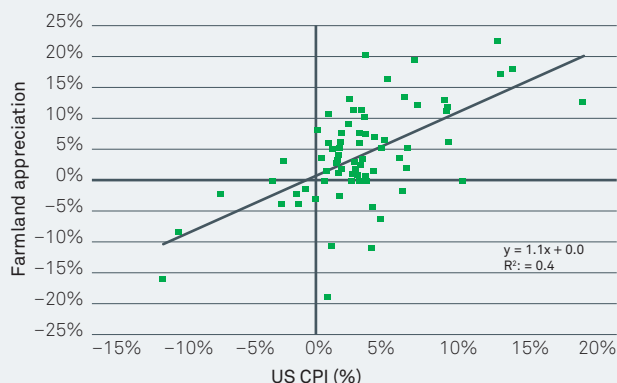
EXHIBIT 18: RECENT INCOME RETURN FOR SELECT REAL ASSETS



Sources: NCREIF and Bloomberg, as of 31.12.11.

Timberland = NCREIF Timberland Index (in excess of capital improvements); farmland = NCREIF Farmland Index (in excess of capital improvements); infrastructure = Macquarie Infrastructure Index dividend return; midstream energy = Wells Fargo Midstream MLP Index dividend return; upstream energy = Wells Fargo Exploration & Production MLP Index dividend return.

EXHIBIT 19: RELATIONSHIP BETWEEN FARMLAND AND INFLATION



Sources: US Department of Agriculture, NCREIF, and Bureau of Labor Statistics, 1925–2011.

- ▶ **Income return:** Most real assets, including timberland, farmland and upstream energy, produce commodities that are sold to generate income. As a result, the amount of income generated will vary with commodity prices. Other real assets, including infrastructure and midstream energy, produce income by charging customers for access to a facility. Exhibit 18 presents income return for 2011 across various real asset types. Based on current levels, we expect a 4–6% return contribution from income.
- ▶ **Capital return:** Appreciation for real assets, like other productive assets, should be consistent with changes in the discounted value of expected future cashflows. As noted earlier, real assets are expected to hedge against inflation. In order to explore the relationship of real assets to inflation, we examine historical annual returns from farmland, which has the longest available price history of any asset in our analysis, beginning in 1925 (Exhibit 19). We find a strong relationship between farmland appreciation and inflation, with a beta of 1.1 and an R² of 0.4. If we assume a comparable beta for other real assets and an inflation expectation of 2%, we estimate that appreciation contributes 2% to the return for real assets.

RISK

We estimate a 13% standard deviation for real assets. In order to define our risk and correlation estimates, we draw on privately held and publicly listed indices.

Privately held indices, such as the NCREIF Timberland and NCREIF Farmland indices, rely on an appraisal process for valuation due to the illiquidity and lack of public market pricing for these assets. As a result, these indices suffer from the same seasonality and return smoothing biases that were discussed in the real estate section. Seasonality is particularly apparent in real asset indices. For example, timberland appraisals occur more frequently in the second and fourth quarter; the average absolute value of fourth-quarter capital return for timberland has been 5.3%, compared with only 0.5% in the third quarter. To account for these data biases, we apply the same approach as discussed in the real estate

section, relying exclusively on annual performance and further adjusting performance to remove the effects of return smoothing.

Publicly listed indices highlighted in Exhibit 20 (page 27) are composed of companies that operate within a particular real asset type. For commodity producers, we have also provided indices of the underlying commodities. We find that publicly listed indices have had greater volatility than privately held indices, which may be due in part to the operational and financial leverage employed by public companies. Commodities have also exhibited higher risk than privately held indices.

We believe that a more reflective estimate of real assets risk will sit between privately held and publicly listed indices. By assuming a moderate level of diversification across the various real asset types, we arrive at our 13% risk estimate. Investors should also be aware of the significant idiosyncratic risks of investing in real assets, including natural disaster, pest infestation, government seizure and regulatory risk.

CORRELATION

We estimate a moderate correlation to equities (0.45) and a low correlation to fixed income (0.25). The diversity of real assets presents challenges in arriving at a single correlation estimate. In particular, commodity producers are expected to be highly correlated to their respective commodity markets, and facility providers to interest rates. Both are sensitive to the market appetite for illiquidity. Despite these challenges, we pursue a similar analysis to that in the risk section. Exhibit 21 shows that correlation of privately held indices to equity markets ranges from near zero to low levels. Publicly listed indices, on the other hand, range from moderate to high. We believe that the correlation observed for publicly listed indices may overstate the ‘true’ relationship, as companies likely hedge a portion of their commodity exposure and leave behind risks that are shared with other public companies. In addition, investors may under appreciate the differences between real asset-focused and broader companies in the short term. That being said, it is also

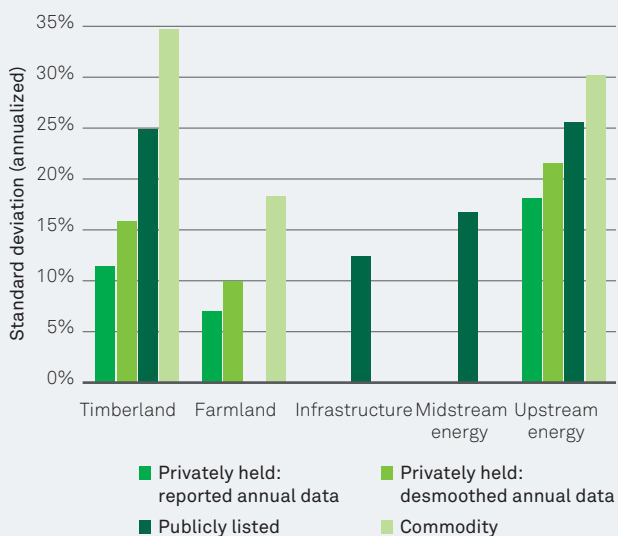
likely that privately held indices understate the true correlation, due to the lack of public market pricing and corresponding appraisal process. Similar to our risk estimate, we believe that a more moderate estimate of correlation lies at the midpoint between that observed for privately held and publicly listed indices.

Real assets represent a diverse category of tangible and productive assets that are expected to be income-generative and sensitive to inflation.

LIQUIDITY

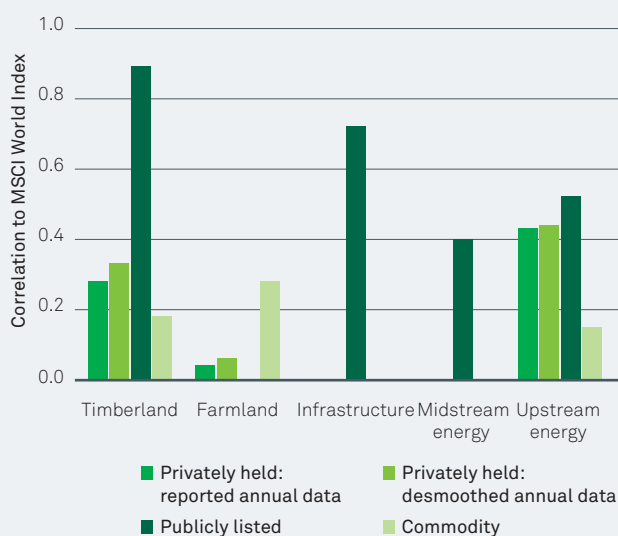
Real asset partnerships are typically closed-end structures that are highly illiquid, sharing the same investment considerations as private equity.

EXHIBIT 20: STANDARD DEVIATION OF SELECT REAL ASSETS*



Sources: NCREIF, Venture Economics, and Bloomberg. Missing bars reflect that there is no available index.

EXHIBIT 21: CORRELATION OF SELECT REAL ASSETS WITH EQUITIES*



Sources: NCREIF, Venture Economics, and Bloomberg. Missing bars reflect that there is no available index.

* Standard deviation/correlation since respective index inception dates: timberland privately held = NCREIF Timberland Index (1/87 inception); timberland publicly listed = S&P Global Timber and Forestry Index (12/03); timberland commodity = lumber future (5/86); farmland privately held = NCREIF Farmland Index (1/91); farmland commodity = Dow Jones UBS Agriculture Index (2/91); infrastructure publicly listed = Macquarie Infrastructure Index (7/00); midstream energy publicly listed = Wells Fargo Midstream MLP Index (1/00); upstream energy privately held = Venture Economics Energy Index (10/99); upstream energy publicly listed = Wells Fargo Exploration & Production MLP Index (7/03); upstream energy commodity = Dow Jones UBS Energy Index (2/91).

The final weigh-in

Exhibit 22 summarizes the return, risk, correlation, and liquidity estimates for the five alternative investments.

As with any allocation decision, investors should evaluate the impact on expected portfolio risk-adjusted return when determining the role of alternatives. To explore this question, we develop efficient frontiers based on our return, risk and correlation estimates but also the standard fee schedules charged by fund managers. Exhibit 23 (page 29) is based on the lower end of our estimated return ranges for alternative investments with no assumed alpha. Exhibit 24 (page 29) is based on the higher end of our estimated return ranges with an assumption of material positive alpha generation that differs by investment type.⁶ Alpha assumptions are meant for illustrative purposes only, given the difficulty in forecasting manager skill and its disparity within each investment type. As mentioned above, an investor must have skill at manager selection in order to identify alpha-generating fund managers.

In the low return and no alpha case, traditional investments dominate, with limited allocations to alternative investments. In the high return and positive alpha case, there are sizeable allocations to alternative

investments, with hedge funds playing a large role in low-to-moderate-risk portfolios, real assets and real estate in moderate-to-high-risk portfolios, and private equity in high-risk portfolios. As is often the case with portfolio optimisation exercises, expected return is the dominant dimension in determining optimal weights. Unfortunately, expected return is also the most challenging dimension to estimate, which is exacerbated in alternatives given the heterogeneity both across and within investment types.

In addition to evaluating portfolio risk-adjusted return, unique investor needs may also impact the optimal mix of alternatives. These may include a desire for inflation protection that will generally guide investors to commodities, real assets or real estate, or a preference for income to real assets or real estate. Liquidity is likely the most important unique need, as it will depend upon an investor's liability profile and utility derived from maintaining portfolio flexibility.

Given that liquidity is a missing dimension in the traditional asset allocation approach, that approach may be particularly ill-equipped to deal with illiquid alternative investments, such as private equity and

EXHIBIT 22: ALTERNATIVE INVESTMENTS EXPECTATIONS

	Fixed Income	Equity	Hedge Funds	Private Equity	Real Estate	Commodities	Real Assets
Return	2.5%	7.5%	3.5–5.5%	11–13%	5–7%	2–3%	6–8%
	Excluding Alpha and fees						
Standard deviation	3.5%	17%	8%	30%	14%	24%	13%
Correlation to equity	0.15	–	0.60	0.80	0.45	0.25	0.45
Correlation to fixed income	–	0.15	0.10	0.15	0.25	0.00	0.25
Liquidity	High	High	Moderate	Low	Low to moderate	High	Low

⁵ Fixed income reflects a 0.25% management fee; equity reflects a 0.50% management fee; commodities reflect no fees; hedge funds reflect a 1.5% management and 20% performance fee with no hurdle; private equity reflects a 1.5% management and 20% performance fee with an 8% preferred return; real estate reflects a 1.0% management fee; real assets reflect a 1.5% management and 20% performance fee with an 8% preferred return.

⁶ Illustrative gross alpha assumptions are 0.5% for fixed income, 1.5% for equity, 4% for hedge funds, 5% for private equity, 2% for real estate, 0% for commodities (assumes index implementation), and 3% for real assets. These assumptions are based loosely on the manager dispersion charts in the 'Importance of Manager Selection' section on page 12, with the exception of real estate and real assets. We assume that top-quartile managers can be selected, which, for example with hedge funds, corresponds to 10% outperformance relative to the median manager in a single year. This translates to a measure of annualised outperformance over a 10-year period of 3% net, which translates to approximately 4% gross (single-year percentile outperformance multiplied by the square root of the number of years to arrive at cumulative percentile outperformance, subsequently divided by the number of years to arrive at annualised percentile outperformance over the entire period).

real assets. To understand the impact of liquidity requirements on asset allocation, investors with illiquid alternative investments may want to consider more advanced quantitative techniques, such as stochastic modelling, which incorporates expected cashflows into the portfolio construction process. In an upcoming

paper, we will explore this topic by incorporating liquidity risk into the asset allocation decision, addressing investor questions such as “What is my capacity for illiquid assets?” and “What reward should I expect for taking on liquidity risk?”

EXHIBIT 23: EFFICIENT FRONTIER – LOW END OF RETURN RANGE AND NO ALPHA

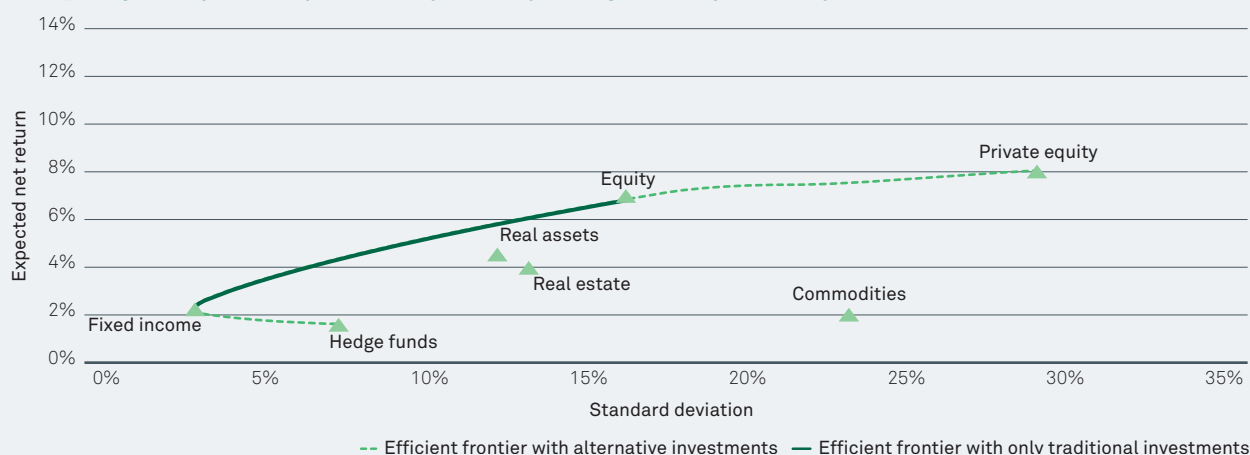
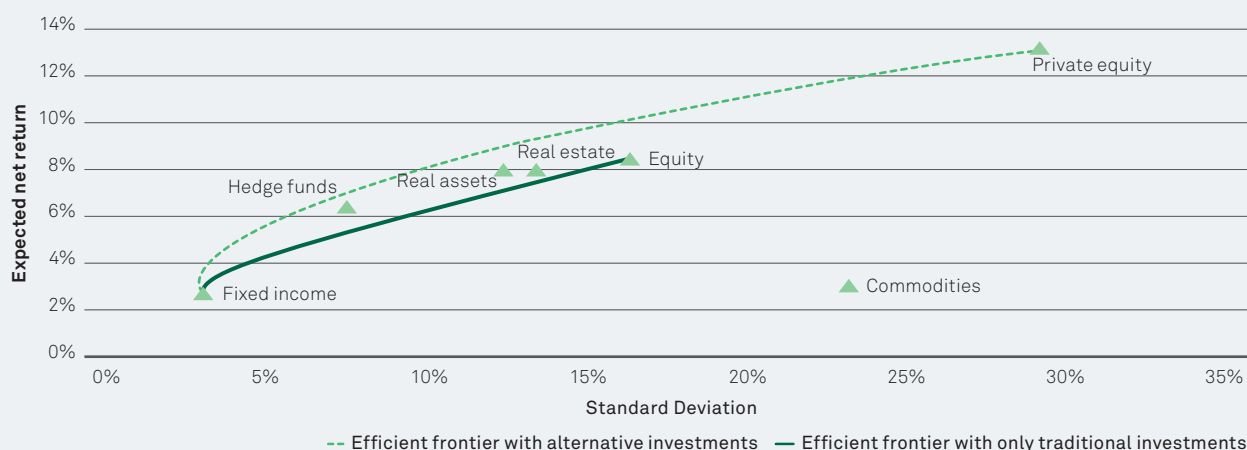


EXHIBIT 24: EFFICIENT FRONTIER – HIGH END OF RETURN RANGE AND MATERIAL POSITIVE ALPHA



Glossary

Buyout capital – Private equity strategy where equity capital is used to buy an existing business so that the business is subsequently privately held. Most buyouts also involve significant leverage, an increase of debt relative to the equity capital (in which case they are called ‘leveraged buyouts’ or ‘LBOs’).

Core real estate – Investment strategy that focuses on operating assets with a low degree of leverage that are expected to provide stable income and the lowest risk profile.

Direct sourcing – Hedge fund strategy where funds seek to profit from the increasing disintermediation of the financial services sector by entering into direct transactions with traditionally underserved entities. An example of this strategy is direct lending.

Event driven – Hedge fund strategy that focuses on companies subject to corporate events in order to profit when the price of a security changes to reflect the likelihood and potential impact of the event. Examples include distressed, merger arbitrage and special situations.

Growth capital – Private equity strategy, also known as development or expansion capital, where capital is used by more mature companies bringing new products to market, investing in new resources or expanding through acquisitions.

Infrastructure – Real asset that includes both economic infrastructure projects (such as roads, bridges, and utilities) and social infrastructure (schools, hospitals, etc.). Infrastructure companies often act as a monopoly in the provision of a facility or service of an agreed standard, with obvious investment implications.

Long/short strategy – Hedge fund strategy where funds buy or sell predominantly corporate securities (equity or credit) believed to be materially under- or overvalued by the market relative to their potential value.

Macro – Hedge fund strategy where funds seek to profit from changes in macro-level exposures, such as the direction of equity markets, interest rates, currency or commodity prices, or relationships among these variables across different geographic regions.

Managed futures – Hedge fund strategy where funds typically employ technical signals based on price or price-derived data to identify trends or counter-trends in futures prices.

Mezzanine – Private equity strategy where debt financing is provided to a company, typically as part of a leveraged buyout.

Midstream energy – Real asset strategy related to the construction and operation of the infrastructure required to process, store, and transport energy-related commodities.

Opportunistic real estate – Investment strategy that focuses on development assets and employs a high degree of leverage, with generally higher expected return and risk.

Real estate investment trusts, REITs – Investor-owned corporation, trust, or association that sells shares to investors and invests in income-producing property.

Relative value – Hedge fund strategy that seeks to profit from the mispricing of related financial instruments based on an assessment of fair value or relationship to historical norms. Examples include convertible, statistical and fixed income arbitrage.

Restructuring – Private equity strategy, also known as distressed or special situations, where capital is provided to distressed companies undergoing financial or operational reorganizations.

Upstream energy – Real asset strategy related to the exploration and production of energy-related commodities.

Value-added real estate – Investment strategy focusing on assets that require some degree of physical improvement and employ a moderate degree of leverage.

Venture capital – Private equity strategy that includes seed money and funding for start-up and early-stage companies. Often these companies operate in the technology or healthcare sectors.

Vintage year – Year in which a private equity fund first draws capital from investors.



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