

Citigroup Alternative Investments Journal



Hedge Funds: Built to Last?

Rui de Figueiredo

Asset Allocation: A New Paradigm

Vineet Budhraj and Rui de Figueiredo

The Premium for Non-Traded Assets

Vineet Budhraj and Ryan Meredith

Portfolio Management with Illiquid Investments

Ryan Meredith

The Impact of the European Union on Real Estate Markets

Stephen Coyle and Jaimala Patel

Investing in Commodities

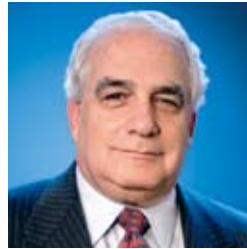
Lynne Engelke and Jerry Pascucci

Understanding Structured Investment Vehicles

Tim Grestorex and Andrew Black



Chuck Prince
Chairman and CEO
Citigroup



Lew Kaden
Chief Administrative Officer
Citigroup

Welcome to the first edition of the *Citigroup Alternative Investments Journal*. We hope you will agree this is an insightful periodical that offers thoughtful perspective on trends, opportunities and issues in the alternative investment arena.

The market turmoil experienced in the early 2000s ended a long period in which both fixed income and equity investors became accustomed to relatively high returns. The lower return environment that has existed over the past several years has encouraged investors to seek “alternative” investment options in search of higher returns and less volatility. As a result, there has been a dramatic inflow of capital into these assets over the last few years.

At Citigroup, we have actively invested in alternatives for decades. We have currently committed over \$11.1 billion of our own proprietary capital to our 13 investment centers, representing 28% of the \$39.3 billion that they manage in private equity, hedge funds, real estate, structured products and managed futures. Our approach is to combine the entrepreneurial skills of our investment teams with Citigroup’s unparalleled intellectual, operational and financial resources.

This publication contains some of our thoughts on the alternatives sector. We hope you enjoy it and that you find the ideas contained in this journal helpful as you formulate your own investment strategies.

Best Regards,

A handwritten signature in cursive script, appearing to read 'Chuck Prince'.

Chuck Prince

A handwritten signature in cursive script, appearing to read 'Lew Kaden'.

Lew Kaden



About the Cover Art

The oceans have long been global trade routes upon which the tall ships inspired partnerships between those who sailed out to seek their fortune and those who provided the capital and waited on the docks for “their ship to come in.”

The sails of the Citigroup Alternative Investments tall ship represent our investment centers. While each investment center retains entrepreneurial qualities, collectively they form a coordinated unit benefiting from the intellectual, operational and financial resources of Citigroup.

Contents

I. Featured Research

Hedge Funds: Built to Last?	2
Asset Allocation: A New Paradigm.....	14
The Premium for Non-Traded Assets.....	22
Portfolio Management with Illiquid Investments.....	26
The Impact of the European Union on Real Estate Markets	32

II. Asset Class Overviews

Investing in Commodities	38
Understanding Structured Investment Vehicles.....	46

III. Market Overviews

Private Equity.....	54
<i>Darren Friedman</i>	
Hedge Funds.....	56
<i>Ray Nolte</i>	
Real Estate	58
<i>Stephen Coyle</i>	



Hedge Funds: Built to Last?

A Review of the Hedge Fund Industry and Prospects for the Future

Authors

RUI DE FIGUEIREDO, Ph.D.¹
Research Leader
Citigroup Alternative Investments

VINEET BUDHRAJA
Senior Research Analyst
Citigroup Alternative Investments

EXECUTIVE SUMMARY

A case can be made that the evolution of the hedge fund industry has been the most important development in asset management in the last 15 years. Following several decades of more modest growth and attention, hedge fund assets under management exploded, growing 125% from 2000 to 2005 to reach nearly \$1.1 trillion.² While this growth has occurred for good reasons, it has also raised concerns about the future prospects for the industry. In this paper, we provide a perspective on these concerns. Our approach begins by taking a step back to consider what hedge funds do and the factors that determine their success or failure. Based on this perspective, we are in a better position to evaluate how growth may affect the industry—and what it means for investors. Specifically, we derive four implications about the industry:

1. Innovation by hedge funds will continue, creating opportunities for appropriately organized hedge funds to generate attractive returns.
2. Structural advantages—such as economies of scale and scope—will become increasingly important for hedge funds.
3. As entry by new managers continues, average returns will fall, but hedge funds with competitive advantages will continue to deliver returns at historically strong levels.
4. The combination of these forces will require investors to become increasingly sophisticated and nuanced in their evaluation process in order to tap into attractive aspects of hedge funds.

THE HEDGE FUND REVOLUTION

A number of factors have contributed to the rise of hedge funds and their increasing influence on asset management. Among these are investors' search for performance in a single-digit return environment, the migration of talented managers to hedge funds and reduced portfolio volatility. The hallmark of hedge fund investing is the use of strategies that are less constrained than traditional approaches. Many of the most talented asset managers have cast off the shackles of long-only investing in stocks and bonds to pursue new approaches. Perhaps, most importantly, the extraordinary growth of hedge funds has been justified by performance as seen in Exhibit 1.

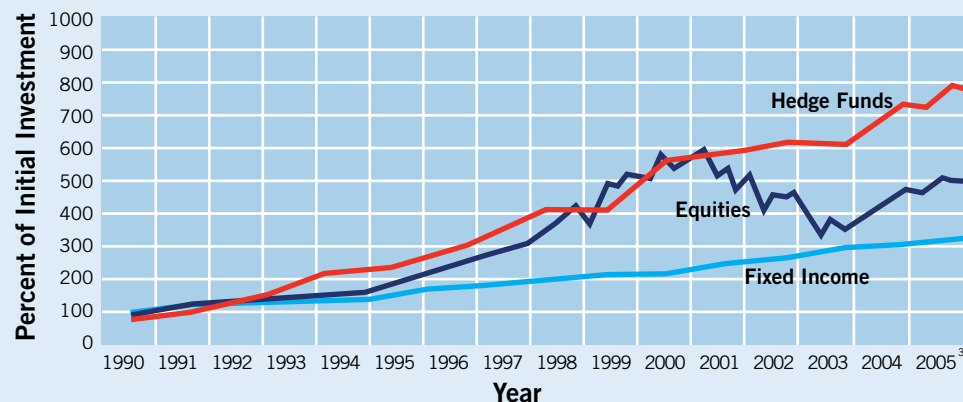
The authors would like to thank Tanya Beder, Mike Bolner, Neil Brown, Nerone de Brito, Janghoon Kim, Ray Nolte, Eric Pai and David Vogel for their valuable comments and conversations.

1 Rui de Figueiredo is a research consultant to Citigroup Alternative Investments. He is also an Associate Professor at the University of California at Berkeley.

2 According to Hedge Fund Research (HFR) Year End 2005 Industry Report.

EXHIBIT 1. COMPARATIVE PERFORMANCE

Since 1990, hedge funds have outperformed equities and fixed income



Source: Bloomberg, CAI Research

Equities: S&P 500 Total Return Index; Bonds: Citigroup Broad Investment Grade Index; Hedge Funds: HFR Fund Weighted Index

Past performance is no guarantee of future results.

THE HEDGE FUND INDUSTRY GROWS UP—AND FACES CHALLENGES

Despite the spectacular growth and stellar performance, the hedge fund industry appears to be facing a number of important challenges as it matures. While Alfred Winslow Jones created the first long-short fund in 1949, the industry did not really begin to gain serious traction until the 1980s when many of today's market leaders were created. Through that decade and most of the 1990s, the majority of hedge fund investors were high-net-worth individuals and larger foundations and endowments. It was not until the beginning of this decade that interest in hedge fund investing became both broad and deep.

As institutional demand for hedge funds has grown dramatically, some critics have been predicting the end of the hedge fund industry in its current manifestation. Just like an adolescent presenting challenges to his parents, there are a number of potentially alarming industry characteristics confronting investors today. Capacity constraints have followed rapid growth at mature managers. Sensational and well-publicized hedge fund failures continue to scare investors. As managers seek new sources of return, there has been a proliferation of trading in complex strategies that are difficult for the average limited partner to understand.

Perhaps the most critical concern is the evidence that performance may be declining. At the end of December 2005, only one of the eight most significant hedge fund strategies outperformed its longer-run average on a three-year basis and none on a one-year basis (see Exhibit 2a). Of course, this could be either because risk has been declining or because market performance has been poor in this period. However, even when we take out the effects of market performance and look at risk-adjusted returns, the conclusion is similar. According to our analysis in Exhibit 2b, the information ratio—a measure of the risk-adjusted value added of a fund manager or strategy after removing the effects of market performance—has declined for seven of the eight hedge fund strategies we analyzed, suggesting that the concerns regarding deteriorating returns should be taken seriously.⁴

Thus, recent developments present a mixed picture of where the industry will go from here. Are recent performance declines the result of a secular downward spiral, or simply a cyclical downturn that will reverse? Can managers continue to add value? Should investors increase or decrease their hedge fund allocations? What will happen to future returns? What will hedge funds look like in 2015? In other words, is this “the beginning of the end” for hedge funds, or “the end of the beginning?”

³ Through December 31, 2005.

⁴ For more details on this analysis, see R. Meredith, V. Budhraj, R. de Figueiredo, and J. Kim, The Factors that Drive Hedge Fund Returns: A Historical Analysis, Citigroup Alternative Investments Whitepaper, 2005. Notably, given the impact of August 1998 on hedge fund returns, we also compared the periods 1990 to 1998 and 1999 to 2005, with slightly less pronounced, but broadly the same results.

Hedge funds are an innovation business that should be evaluated based on structure, strategy and uniqueness.

EXHIBIT 2. EVIDENCE THAT RETURNS MAY BE FALLING

A. RETURNS

Recent performance of many hedge fund strategies has trailed their long-run averages.

	Entire Period Jan 1990– Dec 2005	1 Year Jan 2005– Dec 2005	3 Years Jan 2003– Dec 2005
Convertible Arbitrage	9.6%	-1.9%	2.9%
Distressed Securities	14.4%	8.0%	17.3%
Equity Long-Short	16.5%	10.3%	12.3%
Equity Market Neutral	8.9%	6.1%	4.2%
Fixed Income Arbitrage	8.1%	5.5%	6.8%
Merger Arbitrage	10.1%	6.2%	5.8%
Global Macro	14.9%	6.7%	10.4%
Statistical Arbitrage	8.5%	5.2%	4.2%

Source: HFR, CAI Research; January 1990 to December 2005.
Past performance is no guarantee of future results.

B. INFORMATION RATIOS⁵

Analyzing the information ratio over two periods: from 1990 to 1997 and from 1998 to 2005, shows that excess returns in 7 of the 8 strategies declined.

	1990–1997	1998–2005	Change
Convertible Arbitrage	0.40	0.68	0.28
Distressed Securities	1.48	0.52	-0.97
Equity Long-Short	2.28	1.33	-0.94
Equity Market Neutral	1.40	0.24	-1.16
Fixed Income Arbitrage	1.41	0.19	-1.22
Merger Arbitrage	1.65	0.78	-0.86
Global Macro	1.22	0.32	-0.90
Statistical Arbitrage	1.39	-0.11	-1.50

Source: HFR, CAI Research; February 1990 to December 2005.
Past performance is no guarantee of future results.

STANDARD APPROACHES TO ADDRESSING INDUSTRY CHALLENGES

What is happening to the hedge fund industry? Evaluation usually takes one of two forms:

- Extrapolating a Pattern of Returns.** One approach many have taken has been to evaluate recent patterns of returns and then extrapolate them. Not surprisingly, given that recent hedge fund returns have been below average, the implication is that returns will continue to decline. This approach is problematic, however, since it lacks any real explanation for what has happened to returns, and therefore provides no basis for making reasonable predictions. If there is any lesson that we have learned from the history of financial markets, it is that past performance is not necessarily a good indicator of future results. In order to make better predictions, a deeper evaluation of the underlying dynamics that drive the industry must be undertaken.
- Evaluating Constraints.** A more effective form of analysis of the long-term viability of hedge fund strategies has focused on capacity and potential future constraints in particular styles and strategies. As an example, we recently conducted an analysis of one such constraint: the availability of markets to short equity securities and indices. Without the ability to short, hedge fund strategies such as equity long-short, global macro, statistical arbitrage and equity market neutral would be constrained. Our analysis concluded that this should not be a limiting factor.

Short Capacity Should Not Be a Constraint

Compared to the massive size of the current market for equity shorting—including cash and derivative approaches, which we estimated was about \$78 trillion—the current estimated level of hedge fund equity shorting across a range of hedge fund strategies is about \$157 billion. Therefore, hedge funds are using less than 1% of the overall equity short capacity.⁶ While this analysis concludes that in aggregate short capacity as a constraint may be unfounded, it is important to note that other constraints in other strategies may be more significant.

Notably, both extrapolating returns and analyzing constraints assume that hedge fund strategies and their capacity to generate returns are static. They view a hedge fund pursuing what might be thought of as a fixed “pie”—some inefficiency or anomaly in the market that can be exploited. When there are only a few players in the market and capacity is not too tightly constrained, each of the players may get a healthy piece. As more managers enter, “chasing the same returns”—or inefficiency—the size of each player’s slice (and maybe even the whole pie) decreases.

⁵ For this analysis, a broad range of identifiable factors were used as candidate factor exposures including traditional asset class factors such as the Russell 3000 Index and other factors such as equity volatility. For more details on this analysis see Meredith, Budhraj, de Figueiredo and Kim (2005).

⁶ For more details, see T. Beder, V. Budhraj, R. de Figueiredo and R. Meredith, How Large Could the Hedge Fund Industry Grow?, Citigroup Alternative Investments, 2005.

ALPHA—THE VALUE PROPOSITION OF A HEDGE FUND

In our view, typical analytics are useful for understanding the hedge fund industry, but they are only part of the story. Since the industry has been evolving over the past 50 years and will continue to change, it is critical to evaluate how the industry will adapt to reach conclusions about its future.

In order to make meaningful observations about the future, we start by more carefully considering how hedge funds generate value. Broadly, hedge funds generate returns through a combination of market exposure (“beta”) and manager skill (“alpha”). Exhibit 3 shows the mix of alpha and beta in eight hedge fund strategies. Notably, there is a substantial degree of variation; but in every case, alpha is a substantial component of returns.

EXHIBIT 3. HOW MUCH DOES ALPHA CONTRIBUTE TO RETURNS?

The percentage of performance that is driven by manager skill.

	Percentage due to Market Return	Percentage from Skill
Convertible Arbitrage	49.6%	50.4%
Distressed Securities	39.3%	60.7%
Equity Long-Short	32.2%	67.8%
Equity Market Neutral	38.4%	61.6%
Fixed Income Arbitrage	7.2%	92.8%
Merger Arbitrage	11.3%	88.7%
Global Macro	47.8%	52.2%
Statistical Arbitrage	50.6%	49.4%

Source: HFR, CAI Research; February 1990 to December 2005. Note: All percentages are excess of cash. Past performance is no guarantee of future results.

Given this disaggregation of returns, we can now consider what drives alpha. Indeed, alpha is the only reason to invest in any active manager, including long-only managers. Beta has become increasingly cheap to access (for relatively small fees and/or transaction costs, investors can get exposure to major indices through index funds, exchange traded funds or derivatives). If hedge funds do not generate alpha, there is no reason for an investor to invest in them.

WHAT DETERMINES SKILL-BASED RETURNS?

Consistently successful investing requires skill. To analyze the capabilities required to outperform, it is necessary to move away from treating a hedge fund as one might a financial security—represented solely by its historical returns—and evaluate a hedge fund as an *innovation business*. This has far-reaching implications for how one views particular funds and the hedge fund industry (and its dynamics). Take for example the capacity approach to predicting future hedge fund performance. This approach simply analyzes the current trading strategy employed by a hedge fund; if the fund has a strategy with no apparent capacity left, the prediction is clear: The fund’s returns will slip. But this view may be analyzing the wrong capacity constraint: It ignores the fact that the hedge fund might have the *capacity to adapt*.

An analogy can be made to the pharmaceutical industry. One cannot evaluate a company solely on the prospects for one patented drug. If that patent is set to expire, one might predict that the company is likely to go out of business. But the value of the firm goes beyond the value of its current products. In hedge funds, the scenario is similar. To thoroughly analyze a particular manager and attempt to predict future performance, you need to focus on an organization’s talent and its strengths and weaknesses rather than focus narrowly on its current trading strategies. By viewing a hedge fund manager as an innovation business, you migrate from the traditional domain of financial economics, with its emphasis on market equilibrium and time series analysis, to the world of industrial economics with emphasis on structure, strategy and uniqueness.

In this context, excess returns (or profits) in a business are driven by differentiation. Just as the holder of a monopoly technology garners “excess returns” in the high tech industry, so can a hedge fund that has some unique advantage. For hedge funds, therefore, as in any business, the key to attractive returns is having a competitive advantage that entails barriers to entry. Investors need to determine which managers have the strengths that will enable them to sustain their returns despite market pressures, and which will be more vulnerable. The focus, therefore, should be on fund managers that have competitive advantages.

Since the industry has been evolving over the past 50 years and will continue to change, it is critical to evaluate how the industry will adapt to reach conclusions about its future.

SOURCES OF COMPETITIVE ADVANTAGE IN HEDGE FUNDS

Indeed, for any business to earn attractive returns, it must possess a competitive advantage. Hedge funds are no different. Broadly speaking, hedge funds can establish leadership through either knowledge assets or structural assets.

■ **Knowledge Assets.** Knowledge assets are intangible and can be difficult to evaluate. Unlike a manufacturing company with a cost advantage, or a biotechnology company with a patented molecule, a hedge fund is fundamentally a collection of human capital, technology, incentives and processes. A competitive advantage for a hedge fund is created when it is able to differentiate itself along any of these dimensions and create something that no one else has. If a unique innovation adds value, then the firm can realize excess returns as long as it maintains control over the innovation. Rather than competing for the same “pie” with many others, hoping for a large slice, the innovative firm can have a whole pie all to itself.

While owning an innovation is one component of sustainable excess returns, it is not sufficient. It is unlikely that any firm can defend a monopoly forever. In every industry where innovation is key to achieving an advantage, the value of a specific innovation generally declines over time. Patents expire, competitors reverse-engineer technology, insiders launch competing firms or join existing competitors, or others observe the processes of an innovator and replicate or improve upon the innovations.

A Tale of Two Managers

Firms can get lucky, but sustained outperformance requires skill, not only in financial trading but in the creation and management of an organization that can continue to build on advantages achieved through innovation. A comparison of two managers illustrates this point.

The Good Idea. Many hedge funds start with a single good idea. Recently, one such fund emerged where the key trader identified an inefficiency in the developing market for market volatility options (as represented by the VIX index traded at the Chicago Board of Trade). As often happens when new financial instruments emerge, markets take some time to price the new instruments efficiently. This fund, then, was founded on the insight that there was an opportunity to make money while the pricing of these options was not reflective of their true value. The challenge that this firm didn’t recognize was that once they extracted inefficiencies from the market for volatility, what would they do next? This was not something that the firm had contemplated. An opportunity was there, and the focus was on seizing the value before them. Indeed, it is sensible to take returns where they appear; building the organization solely based on this advantage, however, was a recipe for a rise, but also a fall. Indeed, within one year, the firm’s arbitrage had been dissipated, and the firm was out of business after sustained poor performance.

The Well-Managed Firm. In contrast, consider a firm that has been a consistent top-decile performer for over a decade. The firm has been at the cutting edge of new and profitable trading strategies since its inception. How has it maintained its edge? By investing in talent (culture), organization (incentives) and technology (trading systems). To attract a network of innovators, the firm pays top dollar for creative traders. To keep them, it infuses them with a culture of both internal competition and support for risk-taking. To leverage their insight, it invests heavily in technology. As one top executive commented, “In many ways, we are a tech firm first and foremost that happens to trade.” (*Bloomberg Markets* 2005). By creating a business beyond simply a trading strategy, this firm has created a sustainable and repeatable process that generates outsized returns: a \$100,000 investment would have been worth \$2.6 million dollars 15 years later (an average of 26% per year).

In order to maintain top performance rather than having a fleeting “moment in the sun,” a firm must be able to continuously innovate. Therefore, a key to evaluating a hedge fund lies not only in analyzing its existing strategy—and its historical performance—but in being able to determine whether the firm has the organizational capacity to continue to evolve and identify new opportunities. With change coming from both competitors and the financial markets, firms that are unable to adapt will eventually lose any advantages they once held. This is why evaluating the organizational advantages of a hedge fund—its knowledge assets—is critical to predicting which firms are likely to deliver sustainable top performance.

■ **Structural Assets.** While creating soft, intangible assets is the most common way that hedge funds create sustainable advantages, the other way a business can create a defensible business model is through structural advantages. These are barriers to entry that are difficult for others to replicate. For hedge funds, perhaps the most important example of structural advantages is economies of scale. Industries in which there are economies of scale are those in which “size matters.” Smaller players quickly disappear either through exit or absorption. Scale advantages can occur for the three primary reasons highlighted in the following chart.

THE ELEMENTS OF SCALE ADVANTAGE

Reasons

Hedge Fund Example

HIGH FIXED COSTS

The most common case where economies of scale are the dominant driver of industry structure are those industries with high fixed costs. When average costs are much higher than marginal costs, the incentives of incumbents are different than those of entrants—while the large fixed costs are sunk for incumbents, entrants will have to pay them. This reduces the incentives to enter, meaning incumbents who have the resources to pay the large fixed costs will generally have vastly reduced competition.

To get certain strategies up and running can require large up-front investments. Consider statistical arbitrage, which is based on the analysis of enormous amounts of data—as an example, the ten-year analysis of every trade for each firm in the Russell 3000 Index, constituting literally hundreds of millions of trades. In order to gain an advantage, a hedge fund must invest in both data capture and, more importantly, technology to process and analyze it. This is an expensive proposition. While not insurmountable, only deep-pocketed firms can enter (as opposed to the proverbial “two guys and a *Bloomberg*”).

NETWORK ADVANTAGES

A second driver of scale economies is network advantages. This benefit exists when the parts of a system are more valuable when part of a greater whole. Network advantages are highly evident in high technology businesses. Microsoft's Windows operating system is an example. It may not be the “best” operating system, but its value is much greater to any user than simply its basic features and functionality, precisely because everyone else uses it. Other examples of network businesses include physical networks (airlines or traditional wireline telecommunications), markets (eBay or a stock exchange) and information production networks (news-wire services such as Reuters or Associated Press).

Certain hedge funds have been successful in creating network advantages. One example occurs when a hedge fund gains and maintains an advantage through a proprietary information network. One way funds have done this is to create internal networks that vastly increase the leverage of valuable information: Traders can obtain advantages by accessing information of other traders in the network; if they were on their own, the value of this information would be limited to the one who happens upon it. Similarly, other successful funds have created external networks in which they provide incentives for good ideas to be supplied to them by industry experts, analysts or locals; these provide an edge for which it is almost impossible for second-movers to replicate.

ADVANTAGES OF STABILITY

A final driver of economies of scale occurs when a significant portion of buyers have a preference for larger players. In this case, the industry will tend toward a few large players, and importantly, limited competition. Consumers may prefer large players for a number of reasons—reputation, capacity or certainty that the supplier will remain in business in the future.

The increase in institutional interest in hedge funds has created a greater emphasis on organizational reliability. This has manifested itself by an insistence on hedge funds that have the scale to guarantee that the organization will have the operational robustness to create risk management systems, regulatory compliance and administration of institutional quality; will have a diverse base of investors; and that they will be in for the long haul despite the vagaries of shorter-term performance. In turn, the advantages the larger, more reliable organizations have has a feedback effect of creating greater opportunities to build organizational capacity, further reinforcing other forms of advantage.

IMPLICATIONS FOR THE FUTURE OF THE HEDGE FUND INDUSTRY

Given these views of what drives hedge fund performance, we can now make more thoughtful predictions regarding how the industry is likely to evolve. In particular, as the industry becomes more crowded, we believe that these drivers of competitive advantage will become the most important determinant of individual manager and industry performance.

IMPLICATION 1: INNOVATION BY HEDGE FUNDS WILL CONTINUE, CREATING OPPORTUNITIES FOR APPROPRIATELY ORGANIZED FUNDS TO GENERATE ATTRACTIVE RETURNS

If hedge funds are not able to continue to innovate, prospects for the future could be grim. Will innovation continue? To answer this question, we turn to the two primary models for how the innovative capacity of industries—or economies—evolve over time.

- **“Fishing Out.”** The “fishing out” model posits that all the “low-hanging fruit” is progressively harvested, making it increasingly difficult to innovate; each successive improvement is harder to access than the previous one.
- **“Standing on Shoulders.”** The “standing on shoulders” model argues that innovation begets innovation; that the picture we have of the world today will not look the same tomorrow; that future unpredictable innovations will drive productivity and therefore economic growth. In this framework innovation accelerates as the stock of ideas increases, and innovations occur with increasing frequency.⁷

In our view, the “standing on shoulders” model is the appropriate one for the hedge fund industry. Standing here today, it is very difficult to know what trading strategies will be profitable in two years, let alone in ten. But we believe we can say with confidence that the trading landscape will look much different than it does today. And it is that evolution which will create opportunities for smart, talented and innovative organizations to continue to produce attractive financial returns.

Misguided “Fishing Out” Perspective

The fishing out view brings to mind the dire predictions made in 1972 by Club of Rome. This think tank of leading intellectuals, published a report titled *The Limits to Growth*, where they argued that on its current path, worldwide growth would end as finite resources were exhausted. Indeed, the group has reissued the claim in the intervening 30+ years since the original report was issued. While many of the premises in the book were important, it is certainly apparent that the global economy has continued to grow without reaching the anticipated boundaries.

The flaw in the Club’s logic is that it succumbed to the temptation of projecting a trend line—of assuming the world is static—without considering that the world can change. In other words, the world is dynamic. Future (and unpredictable) innovations will drive productivity and therefore economic growth.⁸

Current consensus in modern economics is that the predictions from models like the Club of Rome, and other Chicken Little-like counterparts, wrongly assume innovation stops. Indeed, it is always easy to make such an argument since specific, future innovations are not predictable. However, while specific innovations cannot be predicted (by definition), it is easy to predict that innovations will occur.

INNOVATION WILL RESULT FROM BOTH INTERNAL AND EXTERNAL FACTORS

- **Internal.** Internal innovations occur when a firm that is deeply involved in a particular activity innovates incrementally to improve its value proposition. The top hedge funds are constantly attempting to gain a new edge by accessing or processing information in their area faster and more effectively. If they are successful, they gain an ongoing advantage.

⁷ For a discussion of these issues, see C. Jones, “R&D-Based Models of Economic Growth,” *Journal of Political Economy*, 1995; R. Barro and X. Sala-i-Martin, *Economic Growth*, 1995.

⁸ See, e.g., P. Romer, “Increasing Returns and Long-Run Growth,” *Journal of Political Economy*, 1986.

Example of Internal Innovation

Merger arbitrage (also known as risk arbitrage) began from the discovery that when an acquisition or merger between two publicly traded companies was announced, generally the acquiree's stock rose, but below the target price set by the acquirer. As the time-to-acquisition became closer and it became more likely that the acquisition would be consummated, the difference between the market price and the target price generally declined. In its early days, merger arbitrageurs primarily took advantage of this normal movement in the price of the acquiree—if it was believed that an acquisition was highly likely, a trader would simply buy the acquiree's stock (and sell the acquirer's stock as a hedge) at the time the acquisition was announced and then watch the stock rise. The primary risk in this strategy is that the acquisition falls through and the market value of the target would revert to its pre-announcement price. Over time, however, this strategy has evolved. Arbitrageurs in this area realized that what they were really betting on was the probability that the merger would go through. The market discount was simply an alternative view of that probability. In this sense, traders could trade in either direction—if they believed the market was overly optimistic about a merger or acquisition being completed, they could actually trade in the exact opposite way (in other words, “short” acquisition-completion) and if the market was applying too great a discount relative to their view of the likelihood of completion, they could follow the traditional trade. This expansion of the trading strategy was an innovation relative to the original conception of risk arbitrage and created new opportunities for funds in this space to earn profits on any conditions of the merger and acquisition market.

- **External.** The second source of innovation in hedge funds, much broader in scope and potential, is one that arises from occurrences external to the industry. These are innovations that occur independent of, but create new opportunities for, active investment management. The history of the financial industry is rife with examples of external innovations that have created these opportunities. Perhaps the most pervasive is the creation and expansion of new financial instruments.

Example of External Innovation

In the 1970s, the development of derivatives markets—spurred by new technologies such as the Black-Scholes option pricing model—created new opportunities for trading strategies that more effectively priced pieces of financial risk. In the 1980s, the growth of securitization provided similar opportunities. Similarly, the creation of investable and tradable market indices happened because investors increasingly demanded simple ways to gain exposure to markets—rather than being forced to track markets by buying individual securities or actively managed mutual funds. But the emergence of these instruments created new trading opportunities—the rise of index arbitrage could not have occurred without the innovation in the financial markets that had preceded it. In the 1990s, the development of markets for credit derivatives followed a similar path. And in this decade, the growth of the market for catastrophic risk appears to have occasioned comparable circumstances. In all of these cases, the markets developed for reasons that were completely independent of trading—there was fundamental demand between buyers and sellers of these instruments to complete transactions; but in all of the cases, the new markets that emerged created opportunities for traders to extract value from markets that did not operate very efficiently. An analogous set of trading innovations arise when market structure changes. Changes to tax codes, the development of new trading technologies such as electronic clearing networks, and the development of financial markets in emerging countries are examples.

As the industry becomes more crowded, possessing a competitive advantage becomes more important.

It is important to determine whether strong performance is the result of skill or luck.

IMPLICATION 2: STRUCTURAL ADVANTAGES—SUCH AS ECONOMIES OF SCALE AND SCOPE—WILL BECOME INCREASINGLY IMPORTANT FOR HEDGE FUNDS

The increasing importance of structural assets is another area that will drive the evolution of the hedge fund industry. Increased demand by institutional investors and increased importance of information technology are two likely trends that provide benefits to larger managers in certain strategies.

■ **Increased Infrastructure Requirements.** The hedge fund industry is highly fragmented. The industry grew up largely managing capital for high-net-worth investors and their associated educational or charitable institutions (small foundations and endowments). Larger institutional investors, including pension funds, insurance companies and financial institutions, have been late adopters, just now projected to enter the industry in a sizeable way. Institutional investors represented 28% of the \$1.2 trillion in hedge fund assets in 2005. This ratio is expected to grow to 42% institutional money by 2010 in an industry with total assets estimated to be between \$2 trillion and \$3 trillion.⁹ As a result, hedge funds will need to mirror the traditional asset management industry with its emphasis on operational and investment processes.

The growth of institutional assets under management has direct implications on the business structure that will be needed to absorb this asset growth. Institutional investors demand operational robustness and staying power. Both of these suggest a significant advantage to players who have the scale to invest in accounting and financial infrastructure, risk management, client service and regulatory processes that will survive institutional scrutiny. Institutions want to invest with organizations with enough breadth and depth to provide security that the organization will be around for the long haul. These shifts will create additional challenges for small, subscale participants.

■ **Growing Importance of Technology.** A second factor that is increasing the emphasis on scale—by forcing greater fixed-cost investments—is the growing importance of technology. The recent information revolution has led to a wider and deeper availability of information. The rise in the volume and rapidity of data flows has meant that technology itself has become much more important in creating competitive trading advantages. At the same time, there has been a sea change in the nature of trading trends that has also necessitated greater emphasis on technology platforms. Since the beginning of the 1990s, the cycle time of trends has become much more rapid. In the past, traders could follow trends for months. Today trends are fleeting and can often be measured in days or even hours. Expensive information technology infrastructure is required to process large and rapid information flows, and to execute on the results of the analysis. It has become increasingly difficult for small players to operate successfully except in small niches during their emerging stages.

IMPLICATION 3: AS ENTRY BY NEW MANAGERS CONTINUES, AVERAGE RETURNS WILL FALL, BUT HEDGE FUNDS WITH COMPETITIVE ADVANTAGES WILL CONTINUE TO DELIVER RETURNS AT HISTORICALLY STRONG LEVELS

The proverbial 64 thousand (or perhaps 64 million) dollar question is what will happen to returns? In order to address this question, recall that:

- When there is intense competition, industry returns are likely to decline.
- Hedge funds that innovate or have structural advantages will face less competition, and therefore should be able to generate sustainable returns.

Taken together, these two points may suggest that less attractive funds will be weeded out quickly and that the innovative survivors will provide attractive investment theses. In fact, weaker funds are generally not eliminated quickly.

While firms with defensible innovations and structural advantages will continue to generate excess returns, there are two reasons why so many poorly performing hedge fund managers attract capital and survive for longer than one would expect. Ease of entry is one factor, but even more important is the difficulty many investors may have distinguishing luck from skill. In other words, in the hedge fund industry it is difficult for many investors to tell, when evaluating a hedge fund, whether it is truly an innovative organization: Is its strong past performance driven by some underlying advantage or serendipity?

⁹ See D. Putnam, *Adapt or Die Trying—Darwinism and Intelligent Design in the Hedge Fund Industry*, *Grail Partners*, 2005.

This information asymmetry—that investors cannot easily distinguish what drives a hedge fund manager’s returns (whether the fund is managed by a skillful organization)—is the key to understanding how hedge fund returns may evolve. One of the central tenets of information economics—where the idea of information asymmetries has been deeply explored—is that they can lead markets to behave in noncompetitive ways. In the context of hedge funds, information asymmetries mean that even weak players with no real skill or advantages can “hang around” longer than would be the case if markets were completely transparent.

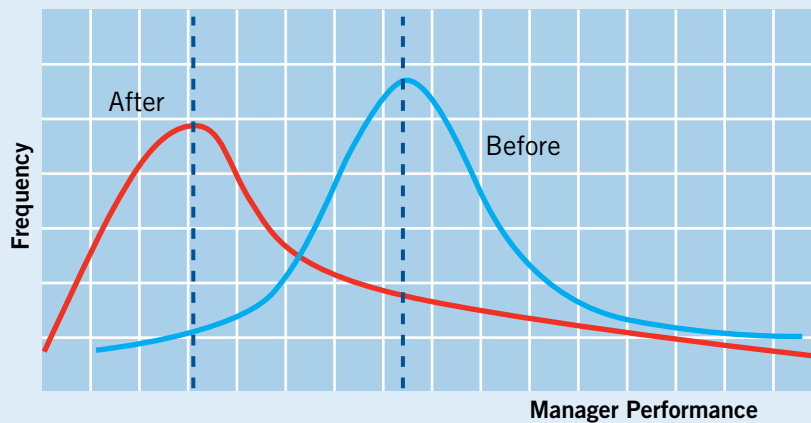
This means that concerns regarding declining average returns may be well founded. Because firms with no real advantages can survive for a time, fighting over a common pie with others who also have no advantages, they can bias industry returns downward. But at the same time, the existence of these inferior managers means very little to those who have sustainable innovations. In other words, the market can be segmented: Certain segments, where managers of lesser skill reside, may be highly competitive; other segments, dominated by highly skilled managers capable of generating excess returns, may be less competitive. When we observe the industry overall, however, and lump all competitors together to form a single return distribution, average returns may indeed appear to decline.

What does all of this mean? As the hedge fund industry matures, the distribution of manager performance is likely to shift. Firms with true competitive advantages should continue to deliver results at historical levels. Firms with nothing uniquely valuable will find rougher going—exactly the concern that many investors have about the growth of the industry. This leads to our predictions about the future performance (as shown in Exhibit 4):

- Average performance in a given strategy should decline¹⁰
- Continued outsized investment returns for those who are true monopolists
- The skewness and fatness of the right tails of the distribution of manager performance will increase, as managers who have advantages should continue to generate strong performance

Hedge funds that have real advantages should continue to generate strong performance.

EXHIBIT 4. PREDICTED EVOLUTION OF THE DISTRIBUTION OF MANAGER PERFORMANCE



¹⁰ While we predict that average returns will decline, this is not to say that the average hedge fund will not be attractive. Because of the uncorrelated nature of alpha, as long as the average excess return is positive, it remains useful to investors. We only postulate that relative to historical performance, average returns will not be as attractive.

In order to evaluate the degree to which this process has already commenced, we examined performance statistics of over 3,000 managers from 1990 to 2005. Exhibit 5 shows the characteristics of the monthly risk-adjusted alpha performance (the information ratio) for seven strategies for which we have sufficient manager data over two periods: from 1990 to 1997 and from 1998 to 2005. The first column shows the change in the average information ratio in the strategy, the second column shows the change in skewness (where a more positive number means that the performance distributions are becoming more skewed to the right) and the final column shows the change in kurtosis (where a larger number means that the tails of the performance distributions have gotten fatter), in the two periods.

Exhibit 5 shows that while not uniform, the dynamics we predict for the future may have already commenced. First, in every strategy, the average information ratio has declined from the first period to the second period.¹¹ Perhaps more interestingly, the performance distributions have skewed substantially to the right in four of the seven strategies. In two others, there is no perceptible shift, and in one, Global Macro, there is actually a skew to the left. If we examine the fatness of the tails, the results point even more strongly in this direction: in all of the strategies except for Global Macro, there has been a large increase in the fatness of the tails of the manager performance distributions.

EXHIBIT 5. THE SHIFTING DISTRIBUTION OF MANAGER PERFORMANCE

Distribution of Monthly Manager Information Ratios; Difference between 1990 to 1997 and 1998 to 2005

	Change in Average	Change in Skew	Change in Kurtosis
Convertible Arbitrage	-0.20	0.92	6.97
Distressed	-0.05	1.56	1.54
Equity Long-Short	-0.07	-0.04	3.94
Equity Market Neutral	-0.19	-0.06	4.88
Event Driven	-0.10	0.99	11.18
Fixed Income Arbitrage	-0.31	1.70	11.83
Global Macro	-0.07	-1.77	-3.05

Past performance is no guarantee of future results.

In other words, except for Global Macro, there seems to be evidence that our predictions are already occurring. Faced with increased competition, weak performers do drive down the average performance, while those with some unique advantage maintain their risk-adjusted returns, independent of what else is happening in their market.

¹¹ Notably, August 1998, which happened in our second period, was particularly adverse for hedge funds. Therefore, we asked: does this result hold if we delete that arguably outlying month? When we do that, the result is somewhat tempered, but broadly the same: Five of the seven strategies had such a performance decline. The other two (convertible arbitrage and event driven) saw slight increases across the two periods.

IMPLICATION 4: INVESTORS HAVE TO BECOME MORE SOPHISTICATED IN IDENTIFYING ATTRACTIVE HEDGE FUND OPPORTUNITIES

We have discussed two trends that increase the necessity for more sophisticated methods to separate luck from skill. While lack of entry barriers and potential crowding are likely to reduce average returns, as in any industry, hedge funds that have a competitive advantage—either through defensible innovations, structural advantages, or both—will remain attractive investments. There are three ways that an investor can access the hedge fund market to pursue the most attractive opportunities.

- **Identify Managers with Sustainable Advantages.** Investors need to focus on identifying hedge fund businesses that have developed and demonstrated sustainable advantages. This can be difficult, however, since funds with no distinctive features can do well for a while, but the likelihood of their continued strong performance is low. Investors need to do thorough due diligence to identify those funds that have knowledge or structural advantages. Structural assets are more easily identified; but even in these cases, the quality of the structural advantage—for example the degree to which scale is deployed effectively, or the degree to which a network truly adds value—can be difficult to evaluate.
- **Identify Emergent Markets and/or Opportunities.** To the extent that investors can identify and evaluate either new markets (such as those of lesser-developed countries in which crowding is less severe), new instruments (for example, the emergence of markets for catastrophe risk) or new strategies (for example, the recent emergence of credit arbitrage strategies), they will have opportunities in new strategies whose performance may be similar to what was seen in existing strategies. That said, investors will have to be cautious and prudent to find general partners who can evaluate and navigate greenfield areas which also are often accompanied by substantial risk.
- **Greater Expertise Required for Manager, Strategy and Market Selection.** Effectively evaluating managers, markets and strategies can be difficult. The due diligence challenge has increased the sophistication required to identify firms with real advantages and new strategies and markets with risks worth taking. As the hedge fund industry evolves and competition among “pretenders” becomes more intense, the role of a skilled analyst becomes increasingly important. To appropriately evaluate hedge fund managers will increasingly require specially trained professionals with the expertise, resources and networks to evaluate opportunities more deeply in order to separate luck from skill—to be able to separate businesses with sustainable advantages from “one-trick ponies.”

CONCLUSION

When any industry is growing and transforming dramatically, it is often accompanied by a great deal of uncertainty and anxiety by participants. The hedge fund industry—with its spectacular rise—is no different. As a case in point, many observers have recently commented that the industry is set for stagnation precisely because of its growth.

We disagree with this conclusion, believing that a more nuanced understanding of the industry provides a better and more variegated picture of its future. We argue that while the industry will present challenges for investors in the future, the prospects for good businesses to continue to generate attractive returns—to generate alpha—will persist. Investors who can harness the power of these organizations in their portfolios will gain substantial benefits.

Hedge fund businesses with real advantages should continue to generate attractive returns by delivering alpha.



Asset Allocation: A New Paradigm

Authors

VINEET BUDHRAJA
Senior Research Analyst
Citigroup Alternative Investments

RUI DE FIGUEIREDO, Ph.D.¹
Research Leader
Citigroup Alternative Investments

JANGHOON KIM
Research Analyst
Citigroup Alternative Investments

RYAN MEREDITH, CFA, FFA
Senior Research Analyst
Citigroup Alternative Investments

INTRODUCTION

Private equity, hedge funds and real estate are evolving to become significant components of many investors’ portfolios. As allocations to alternative investments increase, investors must confront new and complicated portfolio questions. Unfortunately, the investment theory and technology needed to help investors manage portfolios that include a broad range of alternative investments has not advanced at the same rate as asset growth—in other words, in the new world of investing, the standard asset allocation frameworks are simply wrong.

In this paper, we outline a new and comprehensive framework for how to deal with the portfolio challenges of incorporating alternatives. Whether considering traditional investment choices or alternatives, the primary portfolio question is a variant of the same central challenge: trading among different sources of return. Unfortunately, given the complexities of adding alternatives, a new paradigm for evaluating these tradeoffs is required—a more nuanced approach that addresses sources of return beyond what is captured by the “classic” asset allocation framework that deals with risk and return as a relatively simple tradeoff.

It is our belief that a “multidimensional” approach is necessary—in contrast to the two-dimensional risk and return framework canonized by the fathers of Modern Portfolio Theory (“MPT”), Markowitz and Sharpe.

Our multidimensional approach recognizes that investments like private equity and hedge funds generate returns from multiple sources: exposure to fundamental factors, manager skill, illiquidity and downside premiums. Individual investment choices (stocks, bonds, hedge funds, private equity, real estate, mutual funds, etc.) need not be categorized by asset classes (i.e., Equities, Fixed Income, Hedge Funds, Private Equity, etc.); rather, they should be viewed as “bundled” sources of returns that may be assigned to one or more return classes.

Our multidimensional paradigm, like the classic approach, still requires two decisions to be made, as illustrated below.

	CLASSIC APPROACH	MULTIDIMENSIONAL APPROACH
Step 1	Determine asset class exposures	Determine return class exposures
Step 2	Select specific investments within an asset classes	Identify individual return bundles that collectively provide the desired multi-dimensional return profile

The authors would like to thank Mike Bolner, Neil Brown, Nerone de Brito and Jay Reingold for their contributions to this paper.

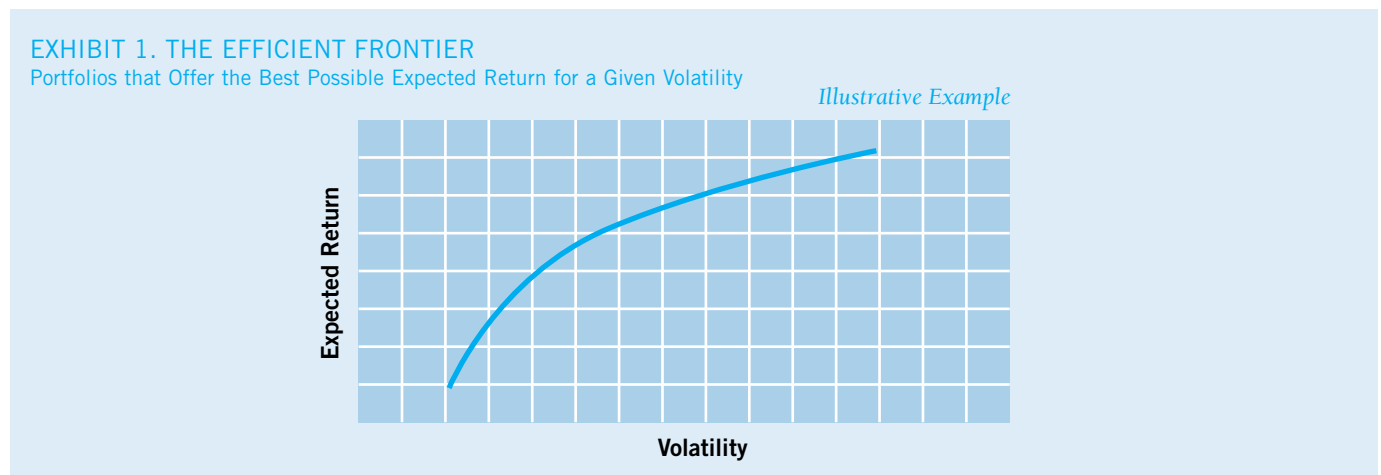
1 Rui de Figueiredo is a research consultant to Citigroup Alternative Investments. He is also an Associate Professor at the University of California at Berkeley.

Utilizing the multidimensional approach, asset allocation and security selection become a holistic exercise, since every investment selected affects the overall return profile in a multitude of ways. In this paper, we outline our proposed multidimensional asset allocation framework. This discussion is meant to introduce the concept. In future issues of the Citigroup Alternative Investments Journal and other forums, we look forward to sharing more detailed perspectives on these concepts.

MODERN PORTFOLIO THEORY AND ITS LEGACY

Over the last 50 years, Modern Portfolio Theory (MPT), pioneered by Nobel Laureates Harry Markowitz and William Sharpe, has offered investors a useful framework for analyzing investment choices and allocating assets within portfolios. Central to the MPT framework is the concept that investors seeking greater returns must assume additional risk. In the standard implementation of this approach, illustrated in Exhibit 1, investors formulate views on the performance of various asset classes, construct a multitude of portfolios and then identify the specific portfolio that offers the highest level of return for a given level of risk (volatility). Collectively, these optimal portfolios comprise an “efficient frontier.” Investors then choose from among the portfolios that reside along the efficient frontier according to their individual risk tolerance.

One of the major strengths of the MPT (and, we argue, its major weakness) is that it serves to radically simplify investment choice. Despite the multiple traditional investment choices—the myriad styles of stocks, bonds and cash—the investment decision is always analyzed along two basic dimensions—risk and return.



Risk, in the MPT framework, is described entirely by the volatility of investment return. Investors simply have to decide how much additional volatility they are willing to tolerate given the incremental expected return they hope to achieve. Investors always expect to be “paid” (earn a premium) for assuming additional risk. Absent this premium, investors should refuse to assume the additional risk.

THE ASSUMPTIONS THAT UNDERLIE STANDARD ASSET ALLOCATION MODELS

Modern Portfolio Theory serves investors quite well when the primary choices consist of traditional investments (stocks, bonds, cash), since these can be characterized primarily in terms of their returns and volatility. The success of standard MPT-based asset allocation techniques in the context of traditional investments, however, has obscured the significant number of *implicit assumptions* that underlie most of these models.

These assumptions include:

- Returns and risks are measured comparably and accurately across asset classes.
- Investors possess comparable information regarding different investment choices.
- The liquidity in each asset class is roughly the same.
- Markets are efficient and new information about particular markets or securities is priced immediately.
- Volatility accurately reflects risk and investors are chiefly concerned about the variance of their returns.
- Investors will choose to invest passively at the broad asset class level.

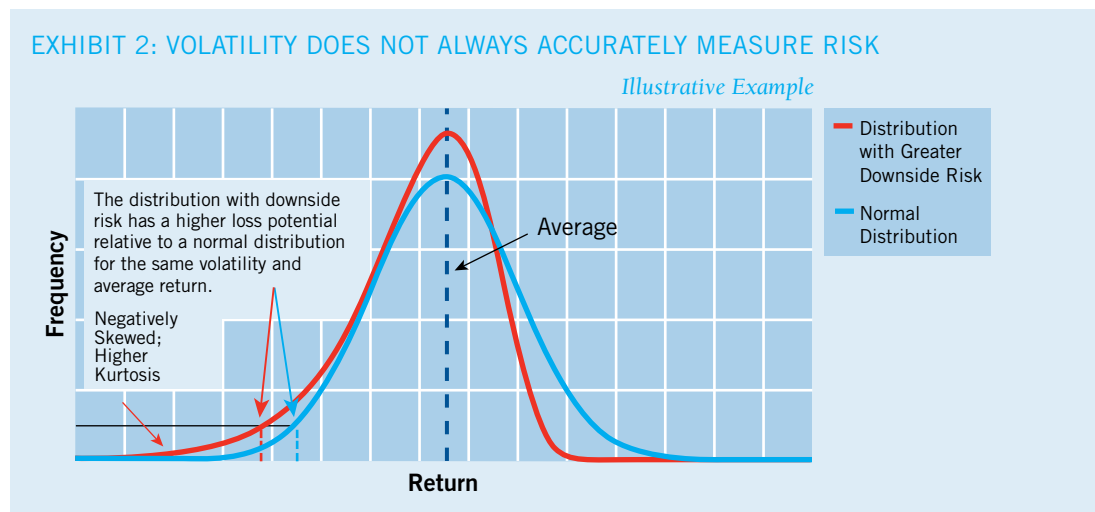
The increased use of alternative investments has fundamentally challenged the utility of standard asset allocation models.

Collectively, these assumptions present a reasonable approximation of reality in cases where investors and managers restrict themselves to traditional investment opportunities. When alternatives are added into the mix, however, these assumptions result in a cloudy view of the “real world.”

THE CHALLENGE OF ALTERNATIVE INVESTMENTS

Over the last few decades, investors have increasingly adopted a broad range of alternative investments. Hedge funds, private equity, private real estate, structured products and managed futures have become a staple in many institutional portfolios. The increasing use of alternative investments has fundamentally challenged the utility of standard asset allocation models. The assumptions that underpin these models render them incapable of accounting for the complexities presented by alternative investments. For example:

- **Returns and Risks Are *Not* Measured Comparably and Accurately in Alternative Asset Classes.** Unlike traditional investments, in which market prices are observable on a virtually continuous basis, it is not possible to observe market prices for many alternative investments such as private equity or private real estate. This makes it difficult to compare the risk/return profiles.
- **The Quality of Information Regarding Different Investment Choices Is Often *Not* Comparable.** While broadly diversified traditional asset class performance has been tracked for decades, historical performance data for many alternative—and indeed, active traditional investments—is much less robust. Further, even in cases where data is available, the evolving nature of these strategies means that, even more than is generally the case, past performance may be a particularly poor input for formulating views on future performance. It is therefore difficult to be as confident in attempting to predict the performance of alternative investments relative to traditional asset classes.
- **The Liquidity in Each Asset Class Is *Not* the Same.** Many alternative investments contain significant tradability restrictions—investors may have their principal “locked up” for anywhere up to 12 years.
- **Markets that Many Alternative Investment Managers Access Are *Not* Efficient.** Unlike traditional investments, alternative investment managers may seek out restricted markets so that they can identify and exploit inefficiencies. These less-efficient markets often have additional forms of risk (e.g., funding risk) that need to be accounted for.
- **Volatility Does Not Accurately Reflect Risk.** Returns for many alternative investments are not distributed symmetrically (normally) around their mean. For this reason, the use of volatility to measure risk is insufficient. Most investors are concerned about downside risk in addition to volatility. The typical volatility measure—standard deviation—may drastically understate the downside risk inherent in many alternative investment strategies, as shown in Exhibit 2.



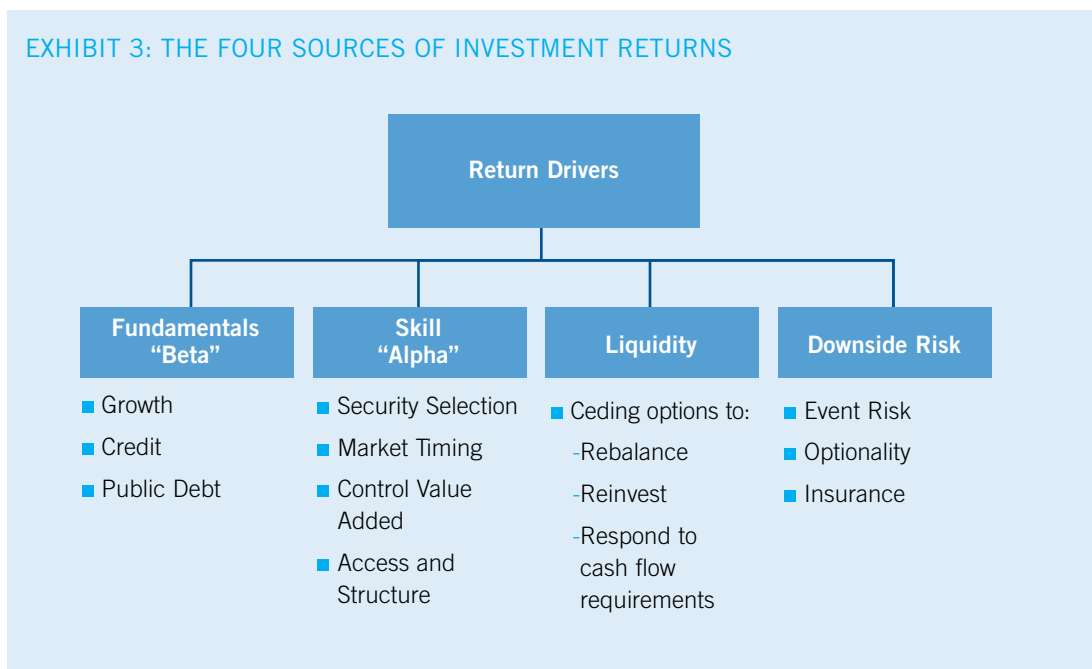
THE INVESTOR'S DILEMMA

Given this gap between the classical assumptions underlying standard asset allocation approaches and the complexities that alternative investments present, investors are left with a dilemma. Many investors understand that alternative investments can add value to a portfolio, because of their potentially attractive risk-adjusted returns and their potential diversification benefits. Unfortunately, investors who want to incorporate alternatives into their portfolio via a rigorous asset allocation process do not have adequate models utilizing an appropriate set of assumptions. The tools are not commonly available that provide a systematic evaluation of the risk/return characteristics for an alternative investment under consideration.

In order to help solve this dilemma, we believe a new approach to portfolio allocation is required. The cornerstone of this new approach is a reframing of the traditional strategic asset allocation problem around multiple classes of return. The investment community needs a new asset allocation paradigm that explicitly integrates the complexities of alternative investments—including illiquidity, asymmetric return distributions and active management techniques—into the portfolio construction process.

TOWARD A NEW ASSET ALLOCATION PARADIGM: THE FOUR CLASSES OF RETURN

Investors have literally millions of investment options: Every financial security, every building and every privately owned company in every country of the world is a potential investment. Despite the variety and complexity of investment options, however, for all of them, there are only a few drivers of return. We categorize these into four classes as illustrated in Exhibit 3.



■ **Fundamentals.** A primary way in which investors seek to make money is by investing in fundamentals—what is often referred to as “beta.” These are investments in the fundamental characteristics of the economy. Economic growth, credit cycles and public debt—each of which drive more proximate performance metrics such as corporate earnings and interest rates—are all examples of fundamental factors. In practice, when investors invest in fundamentals, they determine exposures to traditional asset classes—such as equity and fixed-income markets—which are driven by these fundamental factors. Indeed, diversified, passive investments—perhaps via an index fund or an ETF—are the easiest way for investors to access returns from fundamentals.

The investment community needs a new asset allocation paradigm that integrates the complexities of alternatives including illiquidity, asymmetric return distributions and active management.

The multi-dimensional framework focuses on four risk/return classes.

- **Skill.** A second source of investment returns is the skill of an investment manager to add value to fundamental investments. This added value is commonly referred to as “alpha.” Managers seek to generate alpha in a number of ways: through security selection—buying undervalued securities and selling overvalued ones; through tactical investing—by attempting to time entry and exit in various markets; or through control value added—by actively intervening in firm governance, financial structure, strategy and/or operations.
- **Liquidity.** A third way that investors make money is based on liquidity. When investors purchase assets that do not trade, they give up an option to trade out of these investments. Investors should be compensated for “selling” this option. In other words, they should obtain a “tradability” premium. (For further discussion of the tradability premium see “The Premium for Non-Traded Assets” in this volume.)
- **Downside Premiums.** Finally, investors can also make money by assuming the risk of a large loss. In standard asset allocation models, it is assumed that the returns of an investment are symmetrically distributed around a mean return. In many investments, however, this is not the case. For example, one way insurance companies earn returns—in addition to aggregating and diversifying risk—is by assuming event risk. This is the low-probability, yet potentially catastrophic, risk that resides in the left tail of a probability distribution (see Exhibit 2). Insurance companies demand a premium in exchange for underwriting this risk. When investors pursue short option strategies or purchase high-yield bonds they take on similar risks—in this case related to the performance of a particular market or security. As compensation for this downside risk, sellers of options earn an explicit premium.

TOWARD A NEW ASSET ALLOCATION PARADIGM: COSTS ASSOCIATED WITH EACH RETURN CLASS

One of the primary principles of finance is that there is no free lunch. Any investment that generates returns also entails a cost. As a simple example, investing in stocks generates attractive average returns, but the cost for achieving these returns corresponds to the potential for a loss. The standard two-dimensional framework uses volatility to measure this cost. While this works well for the fundamental return class, it breaks down for others. In our multi-dimensional framework, the costs vary substantially across return classes, and are as follows:

- **Cost of Fundamental Returns.** In seeking return from fundamental sources or beta, investors hope to earn a risk premium—in excess of the cash or risk-free return—for assuming excess volatility. They face the risk that their portfolio value will fluctuate in response to general macroeconomic conditions.
- **Cost of Manager Skill.** Investors allocate to active investment managers because they believe that they can add alpha to their portfolio. However, this alpha entails active risk, which stems from two sources. First, like beta, alpha itself varies from period to period. This “alpha volatility” represents a unique source of active risk. Further, it is very difficult to judge *ex ante* whether or not a particular investment manager is capable of generating alpha. Thus investors who seek alpha also face the chance that their belief in a manager’s alpha-generating ability will be inaccurate; in other words, they face the risk that their prediction, and therefore their selection, is wrong. The alpha that investors strive to earn may be viewed as compensation for both components of active risk: the alpha volatility and the forecast risk that they face.
- **Cost of Illiquidity.** Investors who purchase non-traded assets relinquish the ability to liquidate their position. This prevents the investor from pursuing new investment opportunities, meeting unanticipated spending requirements or rebalancing their portfolio.
- **Cost of Downside Premiums.** Investors who generate returns by providing insurance are exposed to downside risk, or the chance that a low probability outcome can destroy a large percentage of portfolio value.

INVESTMENT CLASSIFICATION IN A MULTIDIMENSIONAL FRAMEWORK

When we view the asset allocation challenge from a multidimensional perspective, every investment opportunity can be assigned to one or more of the return classes that we have identified.

While traditional investments generally involve the fundamental and skill-based return classes, alternative investments broadly span all four. Hedge funds, private equity and private real estate generate returns based on a mixture of fundamental returns, manager skill, liquidity and downside premiums.

We believe that thinking about investment options in this cross-sectional manner as combinations of return classes is much more valuable from an asset allocation standpoint than thinking about them as asset classes as in the traditional “silo” approach. The reason is that these return classes behave very differently within a portfolio. Treating combinations of these return classes as monolithic categories ignores these differences.

EXHIBIT 4: COMPARING THE RETURN CLASSES EMBEDDED IN VARIOUS INVESTMENTS

As an example, consider the three types of investments illustrated below. The top bar represents an S&P 500 ETF—a liquid, passive investment. All of the returns for this investment are derived from fundamentals. The middle bar represents an actively managed large-cap equity fund. The returns for such a fund generally consist of two components. Some of the returns will be generated by the performance of the overall equity market (i.e., passive risk) while the remaining returns will be generated by the manager’s security selection and portfolio construction skills (i.e., active risk). The lower bar represents a private equity fund. This asset class is even more complex. Some portion of the returns may be attributable to fundamental factors; another portion to the general partner’s skill in identifying, sourcing and managing investment opportunities; and the remaining portion to the tradability premium.



MULTIDIMENSIONAL ASSET ALLOCATION

Now that we have outlined return classes, we can address the asset allocation problems from a multidimensional perspective. As discussed earlier, traditional asset allocation is limited to fundamental returns. It tries to determine the combinations of fundamental returns that best meet an investor’s objectives. Alternative asset classes like hedge funds and private equity are modeled in the same way as fundamental returns, even though they behave very differently.

The multidimensional approach focuses on allocating across return classes, instead of across asset classes. This frees us to more accurately characterize each source of return and identify the combinations of these returns that best meet an investor’s objectives.

THE SIMULTANEOUS PROBLEMS THAT THE MULTIDIMENSIONAL APPROACH MUST SOLVE

- How should assets be allocated *across* the four return classes—fundamental returns, manager skill, illiquidity and downside premiums? What should this “strategic return profile” look like?
- How should assets be allocated *within* each return class? In other words, what specific investments should we select in order to obtain the desired strategic return profile? Recognizing, of course, that individual investment options may span multiple classes.

Answering these two questions provides a more appropriate way to define a risk budget. Within the classic framework, the term risk budget means something different to nearly every investor. Utilizing the multidimensional approach, the concept takes on new meaning. Rather than thinking of a risk budget as an apportionment of volatility to particular investments, our approach suggests that risk budgeting is the choice of how to allocate risk across and within various sources of return, independent of how those risks are bundled.

EXAMPLE OF MULTIDIMENSIONAL ASSET ALLOCATION

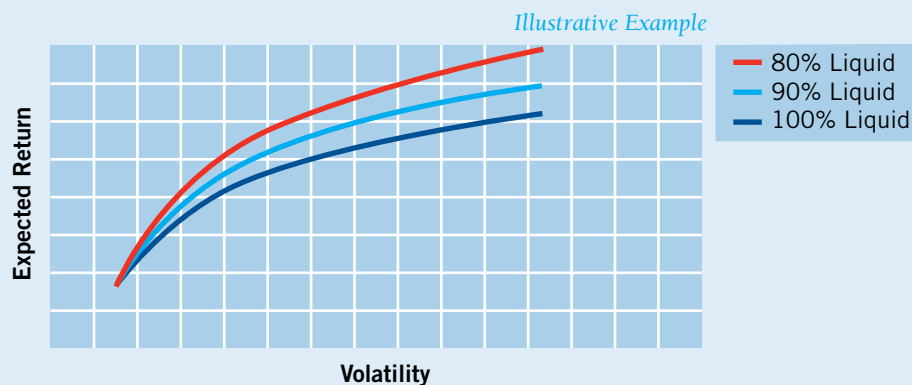
In order to solve the two-step problem of determining exposures and selecting investments, we must recognize that, as in classic approaches to asset allocation:

- Portfolio construction is about linking investor objectives to portfolio choices.
- To make the connection between objectives and portfolios, investors have to understand *tradeoffs*.

In the classic asset allocation approach, this was done by uncovering an investor's risk tolerance—expressed in terms of the incremental return required for tolerating additional levels of volatility. In our multidimensional approach, the problem is more challenging, because each return source embeds a different cost. Investors must simultaneously express their preferences across four dimensions: fundamental risk (e.g., volatility), manager risk, illiquidity and downside risk. Portfolio construction then boils down to finding the combination of return classes that provides the most attractive profile given these preferences.

To shed some light on the problem, consider an example involving two return classes—fundamentals and liquidity.

EXHIBIT 5. A THREE-DIMENSIONAL EFFICIENT FRONTIER: RISK, RETURN AND LIQUIDITY



Source: CAI Research

To analyze illiquid investments, we make a clear division in terms of the tradability of assets, so that certain investments—for example private equity and private real estate—are classified as illiquid, and traditional assets and hedge funds as liquid.² On the basis of these assumptions, we then construct efficient frontiers in three dimensions—volatility, return and liquidity—as illustrated in Exhibit 5. The lowest frontier (in dark blue) represents a fully liquid portfolio. The next-highest frontier (in light blue) represents a portfolio with a 10% allocation to illiquid assets. The highest frontier (in red) represents a portfolio with a 20% allocation to illiquid assets. As shown, higher levels of volatility enable investors to obtain higher levels of return. We also observe that, holding volatility constant, increasing levels of return may be obtained by increasing one's exposure to illiquid investments. This diagram enables us to isolate the portion of return attributed to the tradability premium from what is attributable to increases in volatility. We estimate that for each 10% increase in allocation to illiquid investments, an investor can earn a 30- to 50-basis-point premium at a portfolio level.³

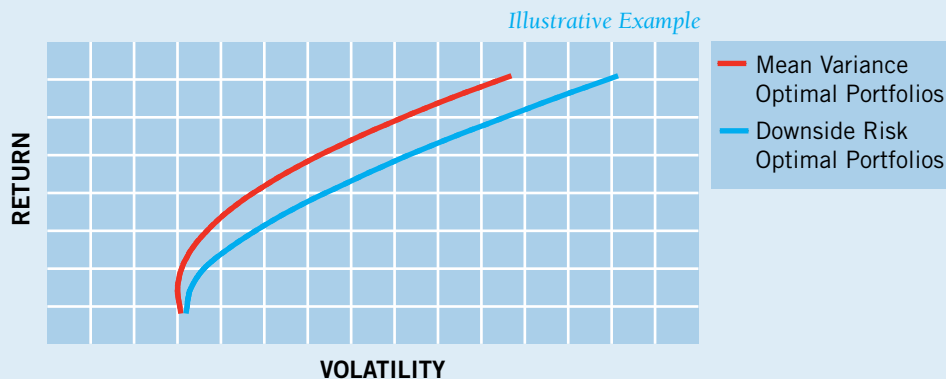
As a second example, consider what happens to the traditional analysis of return and volatility when we account for downside risk. In Exhibit 6, we illustrate the tradeoffs across return, fundamental risk and downside risk by plotting efficient frontiers across these three dimensions. Exhibit 6 illustrates two efficient frontiers consisting of four underlying hedge fund strategies. The red frontier represents combinations of the hedge fund strategies that have the highest return per unit of volatility, ignoring downside risk. The blue frontier shows the same analysis, except it considers portfolios that minimize downside risk, and not volatility. The gap between the two frontiers means that if investors are concerned about downside risk, simply allocating based on volatility and return will lead to unaccounted-for downside risk. Alternatively, when investors try to minimize downside risk, they will have to accept either lower returns or higher volatility. In practice, based on how investors trade off return, volatility and downside risk, investors may choose portfolios that reside between these two frontiers.

² This approach, known as liquidity filtering, has recently been explored in A. Lo, C. Petrov and M. Wierzbicki, "It's 11 p.m.—Do You Know Where Your Liquidity Is? The Mean-Variance Liquidity Frontier," 2003, unpublished manuscript.

³ See V. Budhraj and R. de Figueiredo, "Asset Allocation with Alternative Investments: A New Approach," Citigroup Alternative Investments, 2005.

EXHIBIT 6. DOWNSIDE RISK IN HEDGE FUNDS⁴

Investing simply on the basis of volatility can lead to potentially unaccounted-for—and possibly unwanted—downside risk



Source: CAI Research

Moving from the three dimensions in the two examples above to five dimensions is difficult to illustrate graphically in a three-dimensional world. The principle, however, is largely the same as the move from two dimensions (volatility/return) to three dimensions (volatility, return and liquidity, as illustrated in Exhibit 5, or volatility, return and downside risk, as illustrated in Exhibit 6) that we depict above. By selecting a single portfolio from among the infinite number of efficient portfolios that are available across five dimensions, an investor simultaneously expresses a preference for the level of fundamental risk, active risk, illiquidity and downside risk that they are willing to tolerate in order to attain a given level of return.

IMPLEMENTING THE NEW ASSET ALLOCATION PARADIGM

The most important question to address is how can investors implement the multidimensional framework? In broad terms, there are three important steps:

- **Decompose Investments into Classes of Return.** As a first step in implementing the new paradigm, individual investment opportunities must be decomposed to identify how their returns are generated. In other words, for a given investment, we must determine what proportion of return is attributable to each return class.
- **Measure Cost Within Each Return Class in a Comparable Manner.** Critical to the success of this approach is the ability to explicitly rate costs within each category. For example, fundamental risk is measured using standard deviation. Similar metrics need to be utilized across the other risk classes so like-for-like comparisons can be made to better understand tradeoffs.
- **Link Characteristics of Return Classes to Investor Objectives.** In the classic approach, the connection between the efficient frontier and the choice of portfolio only required an investor to specify their volatility tolerance. In the new framework, investors need to consider their tolerance for fundamental risk, active risk, illiquidity and downside risk. This requires understanding how to trade off one return source versus another, and answer questions such as, “If I reduce my downside risk, increase my illiquidity and increase my return, am I better off?” While this is more complicated than standard approaches, it allows investors to select the portfolio that best meets their needs.

FINAL THOUGHTS

The popularity of alternative investments has increased in recent years. Integrating alternative investments into portfolios, however, is very difficult to do in a rigorous manner because the asset allocation technology that is available to many investors is ill equipped to handle the complexities that alternative investments present.

We believe that a more sophisticated asset allocation paradigm must evolve to address the investor’s dilemma. We refer to the new paradigm we advocate as multidimensional asset allocation. This approach seeks to address a richer set of returns than what is addressed by classical asset allocation models grounded in the tenets (and burdened by the assumptions) of Modern Portfolio Theory. We look forward to elaborating upon these ideas in subsequent editions of the *Citigroup Alternative Investments Journal* and in other forums.

⁴ For the purposes of this example, we use characteristics based on an approach to allocating to hedge fund strategies developed by Citigroup Alternative Investments. To focus here on the substantive implications, and not the assumptions, we suppress the numerical characteristics in this illustration. For the purposes of this example, we use a particular downside risk measure—conditional variance (measured from the tenth percentile).



The Premium for Non-Traded Assets

Authors

VINEET BUDHRAJA
Senior Research Leader
Citigroup Alternative Investments

RYAN MEREDITH, CFA, FFA
Senior Research Analyst
Citigroup Alternative Investments

When constructing portfolios of traditional assets, investors normally consider the tradeoff between risk and return. This approach is sensible when the assets under consideration are comparable in their level of tradability. However, as investors increase their portfolio allocations to alternative investments, their portfolios often accumulate infrequently traded assets such as private real estate, leveraged buyout and venture capital funds, which involve substantial “lockup” periods and have limited secondary markets. As investors mix non-traded, or illiquid, assets with traded assets, it may not be sufficient to classify assets simply in terms of market risk and return. This article shows how it may be possible to isolate a tradability premium for investments in non-traded assets that may justify investors locking up their money.

THE VALUE OF TRADABILITY

Consider an example that illustrates the need for a tradability premium. Exhibit 1 shows two \$100 private equity investments with identical internal rates of return (IRR). In Investment A, the investor earns a 10% IRR, which can be taken in any of years 1, 2 or 3. Investment B also generates an IRR of 10%, but only allows the investor to take that return at the end of the third year.

Which investment is more valuable? All else being equal, Investment A is hypothetically worth more than Investment B, because it delivers the same IRR while also providing greater liquidity. The difference between the two is the “price” of tradability. In other words, unless investors are compensated for locking up their capital, it does not make sense to invest in Investment B.

EXHIBIT 1. ALL IRRS ARE NOT EQUAL

Investment Value in Years When Funds Can Be Withdrawn²

YEAR	0	1	2	3	IRR
	INVESTMENT VALUE				
A	100	110	121	133	10%
B	100			133	10%

¹ Rui de Figueiredo is a research consultant to Citigroup Alternative Investments. He is also an Associate Professor at the University of California at Berkeley.

² Note that we ignore, for the purposes of this illustration, issues such as expectations about inflation, interest rates and other factors that would influence the actual pricing of investments such as these.

The authors would like to thank Rui de Figueiredo¹ and T. Michael Johnson for their contributions.

WHAT AFFECTS THE TRADABILITY PREMIUM?

Three factors are among those that impact the magnitude of the tradability premium:

- Market Volatility.** By investing in an asset that restricts trading, an investor gives up (or “sells”) an option to trade the asset. Such investors deserve to be compensated for giving up this option. Since, as option pricing theory suggests, the value of an option increases as the risk of the underlying position increases, assets with higher volatility such as venture capital and leveraged buyouts should earn a higher premium than assets with lower volatility, such as real estate.³
- Portfolio Diversification.** Illiquid assets that act as broad diversifiers against other assets in a portfolio need not earn as high a “reward” for non-tradability as illiquid assets that act simply as proxies for traditional assets. In other words, assets such as private real estate, with their relatively low correlation to stocks and bonds, are likely to carry a lower premium than assets such as leveraged buyouts, which are highly correlated with public equities.
- Length of Lockup and Redemption Frequency.** An asset with a ten-year lockup is more restrictive than an asset with, say, a one-year lockup and quarterly redemptions. It should therefore “pay” the investor a higher tradability premium.

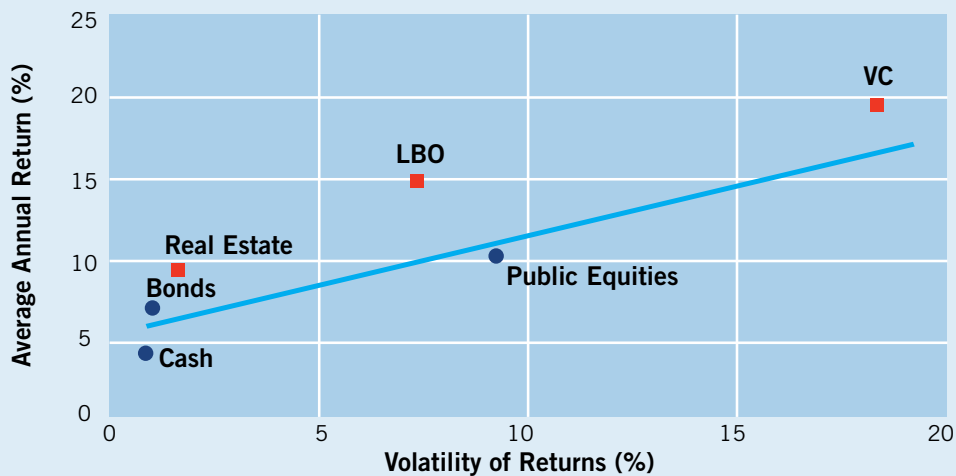
QUANTIFYING THE PREMIUM

The concept of a tradability premium can actually be quantified by considering the historical relationship between market volatility and average levels of returns. We consider the period from 1992 to June 2005.⁴

The first step in calculating the premiums over this period is to compare volatility across liquid and illiquid investments. While prices for liquid assets can be observed over short intervals, such as daily or monthly, the same observations cannot be made for illiquid assets, in which actual investment returns might not be known until the end of the investment period. In the long term, however, all assets are on a level playing field: the prices and returns of both liquid and illiquid assets are measurable based on realized values. Therefore, when comparing liquid and illiquid assets, we do not measure the volatility of annual returns, which are not comparable, but rather use average returns over much longer horizons, which are more readily comparable. In this example, we calculated the volatility of rolling seven-year returns in each asset class.⁵

EXHIBIT 2. THE TRADABILITY PREMIUM

Risk vs. Return: Traded vs. Non-Traded Assets (1992 – Q2 2005)



Note: Risk is calculated as the standard deviation of the rolling seven-year average returns over the time period. Average returns are geometric. Cash: 90-day T-bills; Bonds: Lehman Intermediate Gov/Credit Index; Public Equities: S&P 500; Real Estate: NCREIF NPI; LBO and VC: Venture Economics' pooled, time-weighted returns. Source: CAI Research. Past performance is no guarantee of future results.

³ Indeed, this argument is similar to that of Chaffe (1993), who argues that an illiquidity premium could be modeled as a put option on the investment.

⁴ This period was chosen in part to deal with obtaining a sample that at once reflects sufficiently long cycles and at the same limits potential biases in the reporting of returns in illiquid assets.

⁵ We chose seven years to reflect an “average” holding period for illiquid investments. We also examined five- and ten-year periods with very similar results.

The return premiums earned by illiquids are significant.

Exhibit 2 plots our results by showing the risk versus return for several asset classes during the period from 1992 to June 2005. The blue circles, which represent cash, bonds and equities, show that riskier assets did attract higher average returns, consistent with expectations. To determine how much extra return is obtained, on average, for taking increasingly higher levels of risk beyond cash, bonds and equities, we plotted a regression line using the three blue circles, also known as the “risk premium” of liquid investments.⁶

Now, if we add illiquid investments to this chart, such as private real estate, leveraged buyouts (“LBOs”) and venture capital (“VC”), represented here with red squares, we see that all three lie above the risk premium line. This indicates that—at least for the period we studied—a tradability premium indeed existed over and above the premium obtained for market risk. In other words, if investors were only compensated for market risk, all of the red, illiquid-asset squares would lie on the risk premium line. But, since they do not—they lie above the line—we conclude that a tradability premium was indeed earned.

The risk-premium line also helps estimate the size of a tradability premium during a given period by showing how much excess return was accounted for by variations in market values. As Exhibit 3 indicates, the premiums we estimate over this period are quite substantial, from 3.1% for real estate to as high as 5.9% for leveraged buyouts. Furthermore, as expected, a positive relationship exists between the size of the premium and three key factors: correlation to traditional assets, market volatility and degree of non-tradability. We would have expected real estate, which has both the lowest volatility and lowest correlation, to have the smallest tradability premium—and indeed it does. LBOs and VC both have a higher tradability premium due to both higher correlation and volatility characteristics. Interestingly, the effect of correlation seems to be more important than volatility over the period we measured since the most highly correlated class, LBOs, has a higher premium than the highest volatility class, VC.

EXHIBIT 3. THE SIZE OF THE PREMIUM DEPENDS ON CORRELATION, VOLATILITY AND LOCKUP

The Tradability Premium and Its Drivers (1992 – Q2 2005)

	Implied Premium ⁷	Correlation ⁸	Volatility ⁹	Typical Lockup
Expected Effect		▲	▲	▲
Real Estate	3.1%	0.22	1.2%	7+ years
Leveraged Buyouts	5.9%	0.75	5.5%	7+ years
Venture Capital	4.3%	0.54	13.8%	7+ years

Source: CAI Research

Past performance is no guarantee of future results.

⁶ In this exposition we use a straight line with a limited number of traditional assets. A broader set of traditional assets and a number of different specifications for the risk premium (e.g., curvilinear) would show approximately the same result.

⁷ Implied premium is calculated as difference between observed return and that predicted based on the regression line in Figure 2. Real Estate based on NCREIF NPI; LBO and VC based on Venture Economics’ pooled, time-weighted returns.

⁸ Correlation is highest correlation to stocks, bonds or cash estimated based on Citigroup Alternative Investments’ methodology (see “How Risky Are Illiquid Investments?: A Practical Approach to Estimating Volatilities and Correlation of Non-Traded Assets,” V. Budhraj and R. de Figueiredo, Journal of Portfolio Management, Winter 2005.)

⁹ Volatility is standard deviation of rolling seven-year annual returns.

CONCLUSION

The tradability premium that illiquid assets appear to earn suggests that they can be attractive additions to a portfolio. But how attractive will depend in part on how each investor values liquidity. To calculate allocations to illiquid investments, investors will need to consider:

- Tolerance for the substantial risks involved.
- Cash flow requirements (and time horizons).
- Reinvestment opportunities.
- Portfolio rebalancing frequency.

Because we believe that there is a premium for non-tradability, in addition to the premium for risk, investors will increasingly have to evaluate portfolios using more than the traditional risk-return framework. For those that move to this more-sophisticated approach, they will have an opportunity to at once access the excess returns that may be generated by non-traded assets—and therefore potentially improve portfolio performance, but do so in a manner that better recognizes the inherent risks.

Investors will increasingly have to evaluate portfolios using more than the traditional risk-return framework.

References: Chaffe, D., "Option Pricing as a Proxy for Discount for Lack of Marketability in Private Company Valuations: A Working Paper," Business Valuation Review, December 1993.



Portfolio Management with Illiquid Investments

Authors

RYAN MEREDITH, CFA, FFA
Senior Research Analyst
Citigroup Alternative Investments

NERONE DE BRITO
Research Analyst
Citigroup Alternative Investments

RUI DE FIGUEIREDO, Ph.D.¹
Research Leader
Citigroup Alternative Investments

Historically, investors in non-traded assets such as private equity and private real estate have enjoyed attractive risk-adjusted returns. Managing a portfolio that includes illiquid asset classes, however, is not without its challenges. Establishing and maintaining a target allocation to illiquid assets is quite complicated. First, one cannot, by definition, trade in and out of these investments at will. Second, one must contend with uncertainty regarding investment valuations, and the magnitude and timing of capital calls and distributions.

In this paper, we examine the impact that illiquidity and uncertainty have on the volatility of allocations to illiquid investments. We focus our study on private equity, yet we believe that our conclusions apply to other non-traded asset classes such as private real estate.

We start by taking a closer look at historical patterns of capital calls and distributions by private equity funds to gain a clearer understanding of the nature of these uncertainties. Next we consider transition dynamics—how do illiquidity and uncertainty impact one's ability to achieve a stable allocation to private equity? Taking a step further, we then ask: how challenging is it to achieve a diverse mix of vintage-year exposures within a private equity allocation? Finally, we examine the impact of the sources of uncertainty on the volatility of a private equity allocation—both in isolation and within a portfolio context—in an effort to quantify the extent of the portfolio drift that investors in illiquid asset classes may expect.

From our analysis we draw several conclusions. First, we observe that achieving a stable allocation to private equity takes a substantial amount of time due to the combined effects of illiquidity and uncertainty. Next, we confirm that investors in non-traded assets are subject to additional costs—chiefly in terms of greater portfolio drift—that investors in traded assets do not have to bear. Finally, we find that the magnitude of these costs is often overstated. Our findings indicate that the various sources of uncertainty are not perfectly correlated and tend to dampen each other in a portfolio context—lowering their net impact on the volatility of the illiquids allocation.

WHAT DRIVES UNCERTAINTY IN ILLIQUID INVESTING

Establishing and maintaining a target allocation to illiquid asset classes is complicated by the following factors:

- **Illiquidity.** Investors in illiquids are typically “locked up” for as long as 12 years with no direct access to their principal. Since there are limited secondary markets for illiquid investments, investors cannot easily dynamically rebalance their allocation if they fall short or exceed their target allocation. In contrast, investors in liquid securities may do so with much greater facility.

The authors would like to thank John Barber, Vineet Budhraj, Cali Cole, T. Michael Johnson, Janghoon Kim, Phil Neidoff and Jay Reingold for their assistance with this paper.

¹ Rui de Figueiredo is a research consultant to Citigroup Alternative Investments. He is also an Associate Professor at the University of California at Berkeley.

- **Uncertainty Regarding the Timing and Magnitude of Capital Calls.** A prospective investor in a private equity or private real estate fund generally commits to invest a specific amount of money up front in order to participate. The fund's general partner issues capital calls against these commitments over the life of the fund as investment opportunities emerge. Since it is impossible to know precisely what investment opportunities will arise, the timing and magnitude of capital calls are largely uncertain.
- **Uncertainty Regarding the Timing and Magnitude of Distributions.** Distributions from private equity or private real estate funds emerge as investments are realized—through public offerings, sales, and so on. Since the nature and timing of realizations are not perfectly predictable, the timing and magnitude of fund distributions are uncertain.
- **Valuation Subjectivity.** It is difficult at any given time for an investor to know the current value of their entire private equity and private real estate fund holdings for a few reasons. First, these investments do not trade very often, in part because efficient secondary markets generally do not exist. Second, accounting rules and conventions often encourage general partners to carry these assets at book value for extended periods. Third, asset appraisals can never be perfectly accurate—valuations generally rely on older comparables and may vary based upon the methodology used.

Each of these issues represents a source of uncertainty that prevents investors from accurately measuring their portfolio weightings. This, in turn, makes it difficult to rebalance appropriately, to respond to unforeseen cash flow requirements and to react to new investment opportunities. In essence, these uncertainties are similar in character to one of the standard building blocks of portfolio construction—risk. In aggregate they add an additional element that an investor must contend with when allocating to illiquid asset classes—the risk that their portfolio will diverge too far from its target allocations.

In light of this additional risk, many investors pause before allocating to private equity and private real estate. How well founded is this concern? Are the “costs” associated with investing in illiquid asset classes understated or exaggerated? Investors often find it difficult to address this question because they lack a fact base about the nature of these risks.

HOW UNCERTAIN ARE CASH FLOWS?

To answer this question, we provide an analysis of private equity, where a rich set of data is available. Although for the sake of brevity we focus on one particular asset class, we believe that the broad findings of our study are generally applicable across all illiquid asset classes. Utilizing data from Venture Economics we analyzed the cash flow patterns of hundreds of leveraged buyout (“LBO”) funds over the period 1985 to 2004.

- **How Uncertain Are Capital Calls?** Exhibit 1 shows the patterns of capital calls for the LBO funds we analyzed.² The line chart shows the average percentage of the original commitment that was called each year, over the life of the fund. Additionally, the exhibit shows the variability around the average in each year. Two conclusions can be drawn. Not surprisingly, capital calls principally occur in the early years of the fund's life, peaking in the second year and declining thereafter. The average private equity fund called 18% of committed capital in the first year, 20% in the second year and so on. We also observe a substantial degree of dispersion around the averages, indicating a significant amount of uncertainty regarding the percentage of capital that may be called in any given year over the life of a fund.
- **How Uncertain Are Distributions?** Exhibit 2 shows the patterns of distributions for the funds in our study. As expected, average distributions are low in the early years of a fund, peak in the fifth year and then decline slowly. Once again, we observe a substantial amount of variation around the average in each year—making it difficult for an investor to precisely predict when cash distributions will occur.

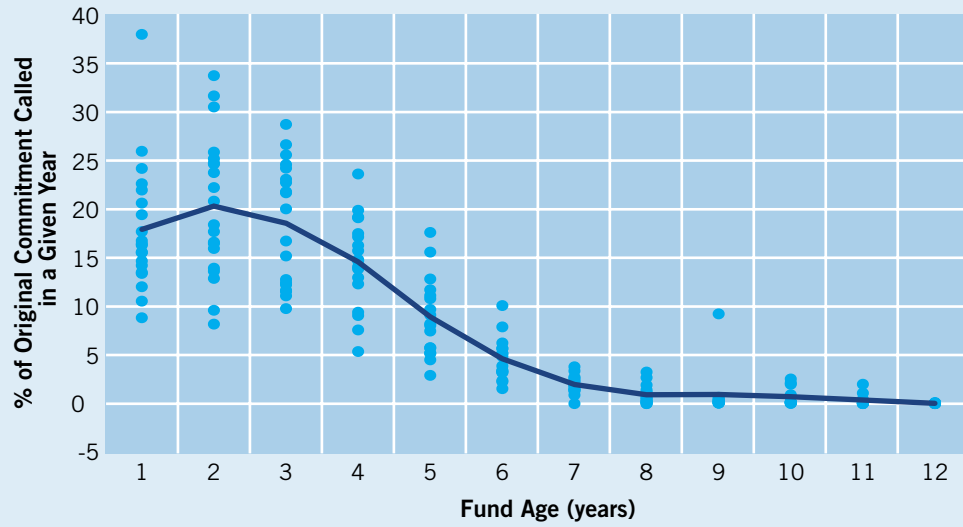
² In both Exhibit 1 and Exhibit 2 we do not correct for the effect of market movements. The % magnitude of capital calls and distributions may be affected by the growth or decline in value of the original investment. A less ambiguous approach would be to consider rates of capital calls and distributions as a percent of the remaining capital balance, an approach that we take in a forthcoming paper; Evaluating Private Equity Commitment Strategies. Draft 2006, CAI Research.

Our findings indicate that the various sources of uncertainty are not perfectly correlated and tend to dampen each other in a portfolio context.

The timing of capital calls and distributions is difficult to predict.

EXHIBIT 1. PATTERNS OF CAPITAL CALLS VARY WIDELY ACROSS FUNDS

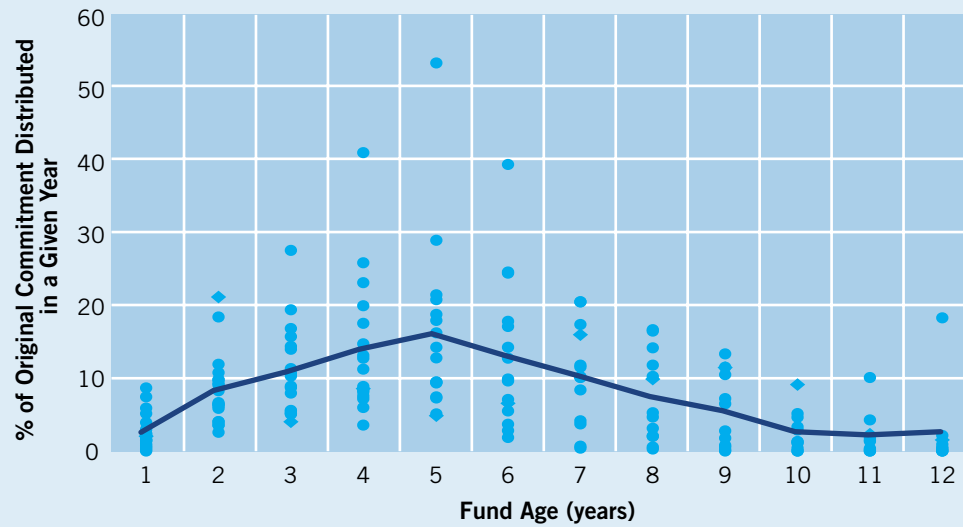
Leveraged Buyout Capital Calls by Age of Fund



Source: Venture Economics, 1985 to 2004, CAI Research

EXHIBIT 2. PATTERNS OF DISTRIBUTIONS VARY WIDELY ACROSS FUNDS

Leveraged Buyout Distributions by Age of Fund



Source: Venture Economics, 1985 to 2004, CAI Research

PORTFOLIO MANAGEMENT IMPLICATIONS

Given that illiquidity and uncertainty are inherent in investing in non-traded assets, the question is what impact do these factors have on our ability to manage portfolio exposures? To put it another way, how confident can we be that the actual portfolio allocations match the target allocations at any point in time?

To study this problem, we constructed a model portfolio with initial allocations of 0% private equity, 65% public equity and 35% fixed income, which seeks to migrate to steady state allocations of 25% private equity, 50% equities and 25% fixed income over time. We then used Monte Carlo analysis to simulate the performance of this portfolio under thousands of scenarios involving different levels of asset class returns and cash flow patterns. To facilitate our study, we made certain assumptions regarding the performance of our private equity, public equity and fixed-income investments over time.³ From our earlier analysis, we also assumed that the historical levels of cash flow uncertainty associated with private equity investing would persist going forward. Finally, we adopted a private equity commitment strategy described by Nevins (2005) whereby unfunded commitments plus invested capital amount to a constant percent of the overall portfolio's value (i.e., 38%) each year, over the entire investment horizon.⁴

In the following sections we present the findings from our study.

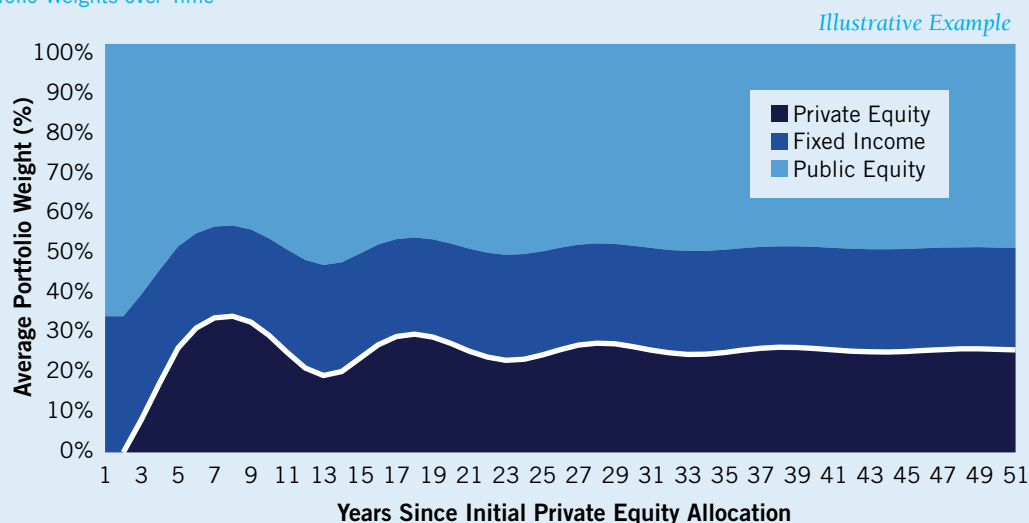
ESTABLISHING A STEADY STATE ALLOCATION TO PRIVATE EQUITY

Over the first half of the time horizon, the process of transitioning the portfolio to its target allocations largely drives the volatility of the portfolio's exposures. In Exhibit 3 we illustrate the evolution of the average asset class exposures over time. Immediately we observe that we do not reach our 25% target private equity allocation until the fifth year and that it takes over 25 years to achieve a stable (or "steady-state") 25% allocation—simply due to the asynchronous nature of capital calls and distributions and the inability to trade in and out of private equity investments with ease. Note that it may be possible to arrive at a steady state in a shorter amount of time or by a smoother path by pursuing a different commitment strategy, if the magnitude of the transition is lower (rather than the large 0% to 25% shift that we consider here), or if an asset generates cash flow such as private real estate.

Extending this analysis a little further, Exhibit 4 presents a breakdown of the private equity exposure by vintage year over time. Here we observe that it takes almost 35 years to achieve steady state exposure across vintage years—once again due to the non-tradability of the asset class, the "term structure" of capital calls and distributions, and the inability to control prior private equity commitments.

EXHIBIT 3. ACHIEVING STABLE EXPOSURE TO PRIVATE EQUITY TAKES A LONG TIME

Average Portfolio Weights over Time

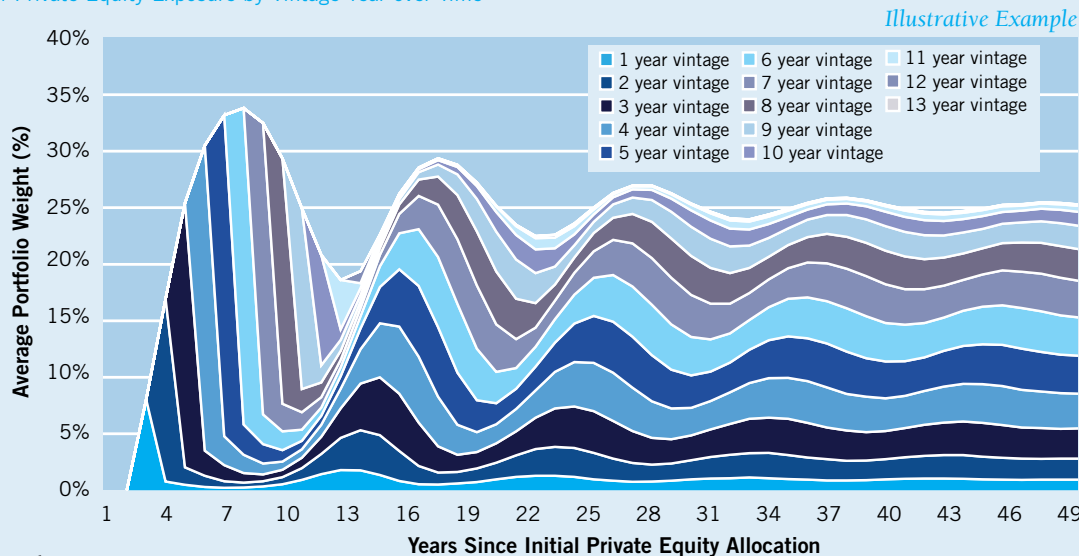


Source: CAI Research

³ For the purposes of this simulation we rely upon risk and return assumptions based upon forecasts conducted by Citigroup's GWM Investment Strategy Committee and Citigroup Alternative Investments research. See P. Goldwhite and Nobuya Nemoto. "Long-Term Asset Class Return Forecasts," Strategic Perspectives, Citigroup Asset Management, 2003. The parameters used are for illustration only.

⁴ Investors would ideally like to maintain a steady allocation of their portfolio over time to private equity investments. Based on this target we calculate a percentage of the portfolio that should be committed to private equity to achieve a stable allocation to private equity investment using the approach outlined by Nevins (2005) and refined by Citigroup Alternative Investments. In particular, the rule defines the sum of committed but undrawn capital plus invested capital that should be maintained to achieve stable average investment levels. For example, if the investor wants to achieve a 25% allocation, then she should maintain an amount committed as 38% of her portfolio based on this formula.

EXHIBIT 4. ACHIEVING A DIVERSE MIX OF VINTAGE YEARS TAKES EVEN LONGER
 Breakdown of Private Equity Exposure by Vintage Year over Time



Source: CAI Research

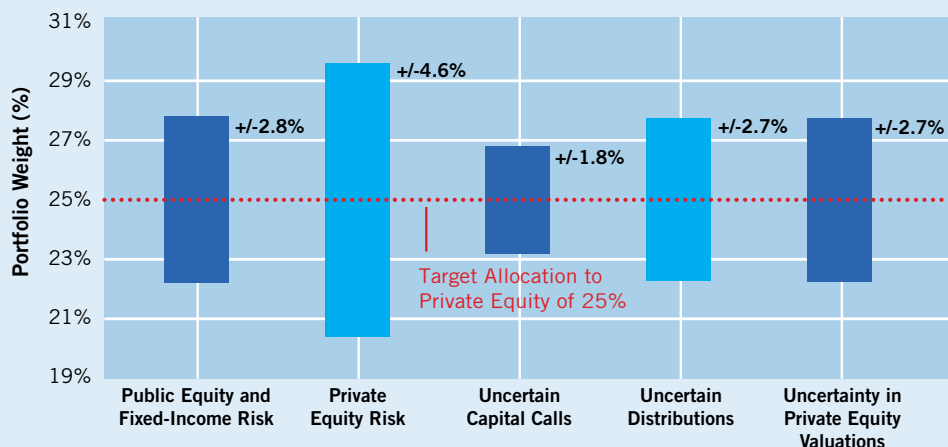
PRIVATE EQUITY EXPOSURE IN A STEADY STATE

Once the model portfolio has achieved a steady-state allocation of 25% to private equity, the impact of uncertain cash flows and investment valuations on the volatility of the private equity exposure is easier to evaluate.

In Exhibit 5 below, we illustrate the extent to which individual sources of risk, viewed in isolation, affect the volatility of our private equity exposure. Each bar represents a 68% (i.e., +/- one standard deviation) confidence interval around our 25% target allocation.⁵ The first bar indicates that, on a stand-alone basis, volatility in the performance of the other assets in the portfolio (i.e., public equity and fixed income) leads to approximately +/- 2.8% volatility in the private equity allocation. Likewise, volatility in the performance of the private equity investments generates +/- 4.6% volatility in the portfolio's private equity exposure. Uncertain capital calls and distributions lead to +/- 1.8% and +/- 2.7% volatility, respectively, on a stand-alone basis. Finally, uncertainty regarding private equity valuations, on its own, generates +/- 2.7% volatility in the private equity allocation.

EXHIBIT 5. INDIVIDUAL RISK FACTORS GENERATE SIGNIFICANT VOLATILITY IN ALLOCATIONS ON A STAND-ALONE BASIS

Impact of each source of uncertainty on the volatility of the private equity allocation. Expressed as 68% confidence intervals around the 25% target allocation.⁶

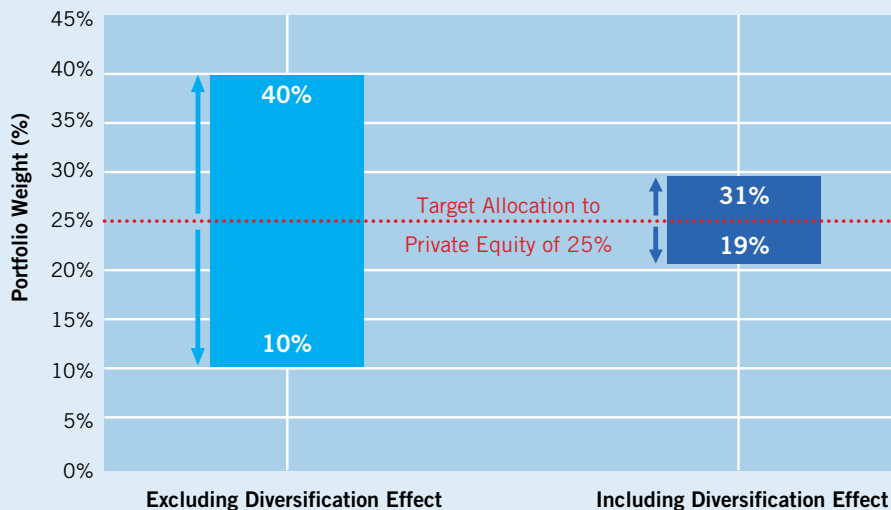


Source: CAI Research

⁵ In essence a 68% confidence interval (+/- one standard deviation) indicates that we can state with 68% confidence that the actual private equity allocation falls within the defined range of values. Throughout this article we reference annual volatility statistics.

⁶ This analysis examines the effect of each factor in isolation—assuming temporarily that the other factors exert no impact on the private equity portfolio weighting.

EXHIBIT 6. DIVERSIFICATION SIGNIFICANTLY REDUCES POTENTIAL VOLATILITY IN ALLOCATIONS
 Combined impact of risk factors on the volatility of the private equity allocation excluding and including the effect of diversification. Expressed as 68% confidence intervals around the 25% target allocation.



Source: CAI Research

Our analysis concludes that cumulatively all of the uncertainties associated with private equity investing result in a volatility of the allocation of around 6%, a level below what many assume.

On the surface it would appear that the combined effect of these risk factors would have a tremendous impact on the volatility of the allocation. Indeed, if we assume that these five factors are highly correlated, the volatility of our private equity allocation amounts to almost 14.7%. In this scenario, as Exhibit 6 indicates, a 68% confidence interval around our target 25% private equity allocation ranges from 10% to 40%. Clearly, this would amount to a substantial loss of control over the portfolio’s asset class exposures and objectives from year to year.

Luckily, however, these sources of uncertainty are not perfectly correlated. For example, our analysis estimates the correlation between the rate of capital calls and distributions over the period 1985 to 2004 as only 0.18. Less than perfect correlation presents opportunities for diversification. Taken together, the impact of uncertain investment returns, uncertain cash flows and uncertain valuations on the volatility of the private equity allocation is dampened by the diversification effect. Overall volatility of the private equity allocation amounts to only 6%—a 60% reduction in volatility from the “no diversification” scenario discussed above. Likewise, a 68% confidence interval around the 25% allocation ranges only from 19% to 31%.

Given the fact that many institutional investors allow their target asset class allocations to drift within a certain range (often around 5%) before rebalancing in an effort to reduce transaction and administration costs, the 6% allocation “drift” that we observe in the private equity allocation due to the uncertainties that we have identified does not appear unreasonable. Viewed in this context, the “cost” that private equity imposes on a portfolio is not much different from the costs that institutional investors willingly assume when applying certain common rebalancing rules. In this sense, then, although illiquid assets do raise unique concerns for investors, because the various sources of uncertainty diversify each other, these concerns may be greatly overstated.

CONCLUSIONS

Investing in non-traded asset classes has historically proven to be highly rewarding to investors, yet is not without its unique challenges. We observe that achieving a stable allocation to non-traded asset classes takes a great deal of time due to the combined effects of illiquidity and uncertainty. Further, we confirm that investors in non-traded assets are clearly subject to costs that investors in traded assets do not have to bear. These costs are generally expressed in terms of loss of control over the portfolio’s asset class exposures due to greater portfolio drift. In absolute terms, however, we find that these costs are not excessively large. The sources of uncertainty unique to investing in illiquid asset classes are not perfectly correlated. These risks tend to dampen one another within a portfolio context—reducing their net impact on the volatility of portfolio exposures and preserving the portfolio’s ability to achieve its defined objectives.

References: Nevins, D.; Conner, A. and McIntire, G., “A Portfolio Management Approach to Determining Private Equity Commitments,” *Journal of Portfolio Management*, Spring 2005.



The Impact of the European Union on Real Estate Markets

Authors

STEPHEN COYLE

Chief Investment Strategist
Citigroup Property Investors

JAIMALA PATEL

Senior Research Analyst
Citigroup Property Investors

On January 1, 2007, the European Union (“EU”) will officially welcome Romania and Bulgaria into their supranational coalition of 25 member states. In anticipation of this event, fundamental reforms and adjustments are under way so that these two nations may integrate with the EU while still maintaining their respective identities. Much is at stake to ensure that this transition occurs as seamlessly as possible. Since the EU represents a single space of mobility among member countries, the full integration and alignment of accession countries is necessary to preserve the original order of the EU. Countries joining the EU, in turn, will benefit from the economic stability and vitality that membership promises. In recent years, the proliferation and cohesion of the EU provided its intended benefit with Europe migrating from a slow- to a moderate-growth economy.

EU accession transforms the economies of new member countries while impacting the property markets in current and would-be EU countries. Collectively, EU accession has been linked to a revitalization of property markets in formerly dormant areas. As new countries, such as Romania and Turkey, continue to join the EU, favorable opportunities should continue to evolve throughout the region.

In particular, the four freedoms of movement that membership in the European Union entitles—the movement of goods, capital, services and people—have significant impact on real estate markets.

1. Movement of goods. Allows for a larger distribution network to exist in Europe, thus increasing the demand for warehousing and logistics space and shifting where there is demand for production.
2. Movement of capital. Enables investors to place money into burgeoning markets that were previously out of reach.
3. Movement of services. Facilitates the establishment of businesses in emerging and lower-cost markets, thereby creating the need for office buildings.
4. Movement of people. Precipitates the need for new and improved residential structures.

In this paper, we review how these four freedoms of movement impact real estate opportunities, outline key challenges still faced by the EU and provide our real estate outlook.

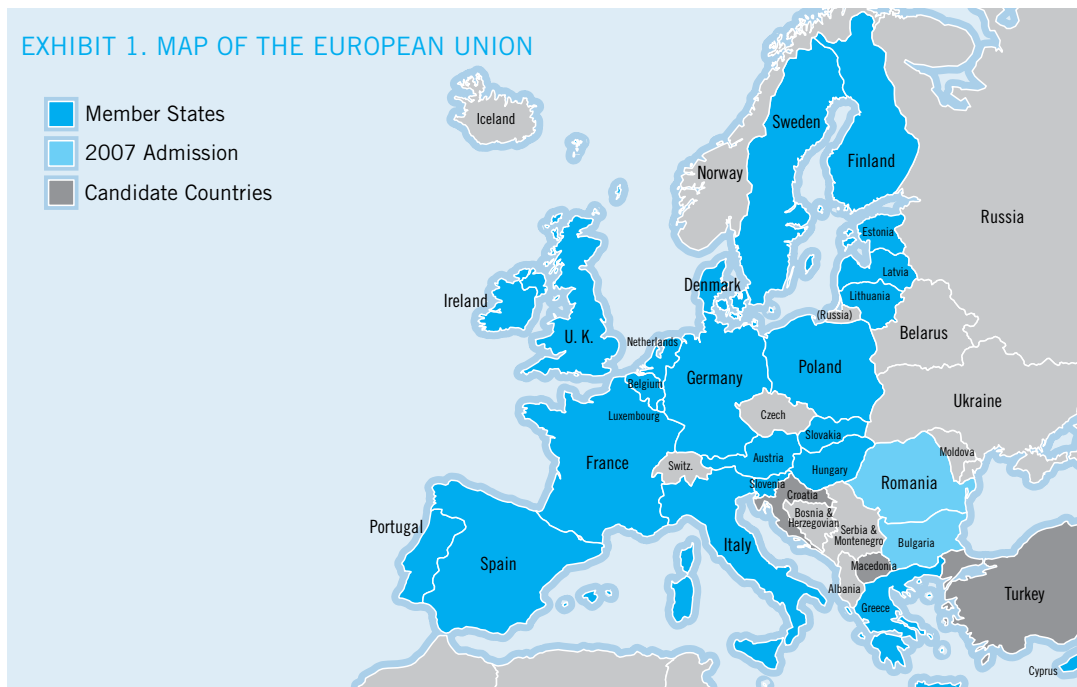
Note: Subject to relevant local laws and regulations, this asset class may not be available through Citigroup in certain jurisdictions.

MOVEMENT OF GOODS SUPPORTS INDUSTRIAL MARKETS

The creation of a free-trade zone within the EU, along with a single customs unit and common trade policy, has dramatically increased the demand for industrial space in Europe. In 2005, intra-EU trade accounted for 57% of total trade for EU countries—the consequences of this are twofold.

■ **Increased Demand for Logistics and Warehousing Facilities.** As the EU continues to grow (Exhibit 1), more firms are establishing logistics and warehousing buildings in order to transport goods throughout markets. Currently, companies operating in the EU have at their disposal 3,130 airports, 222,293 km of railways and 4,634,810 km of roadways by which to distribute their products. Furthermore, with accession, the EU continues to grant funds to build airports, roads, railways and other infrastructure in poorer countries, thereby supporting the growth of new transportation corridors and permitting goods to move freely through borders without debilitating delays. Logistics and warehousing activity over the past three years has been the strongest in new and upcoming EU member states such as the Czech Republic, Hungary, Slovakia, Romania and Bulgaria, which serve as entry-points to the rest of Eastern Europe and the larger Russian market. Modern, large logistics and warehousing facilities in these countries have predominantly been constructed in capital cities, which offer better accessibility and more transparency relative to smaller cities. The logistics and warehousing market in Turkey is also heating up in expectation of its admittance to the EU sometime over the next ten years. Turkey provides a strategic gateway into Asia and key land access to India and China. Speculators have already started to develop the Turkish industrial market in order to capitalize on future demand.

The movement of goods, capital, services and people within the EU has significant impact on real estate markets.



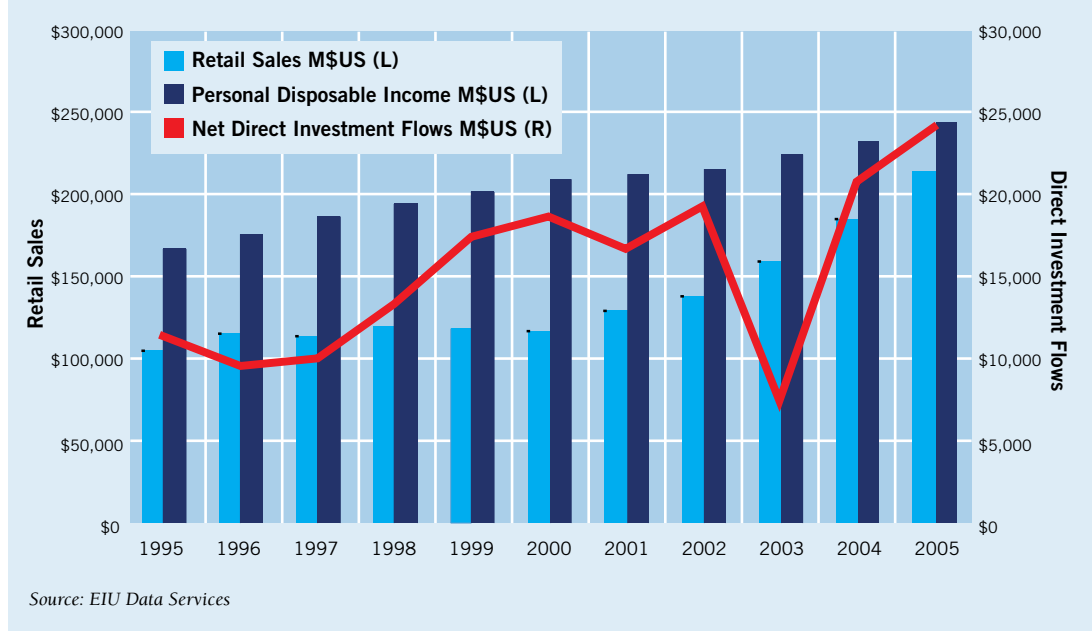
■ **Migration of Production to Cost Effective Markets.** Second, the creation of EU free trade zones has allowed companies to set up production facilities in cost-effective markets without encountering typical high barriers to entry. Two prime examples are the entrance by automotive manufacturers such as Volkswagen, Peugeot and Audi into Central and Eastern Europe (CEE) and the movement of pharmaceutical production to Hungary and Slovakia. Many Communist-era manufacturing companies in these regions are either struggling or have disappeared completely, so the establishment of new industry hubs is both a welcome addition for CEE cities and a source of competitive advantage for European companies.

MOVEMENT OF CAPITAL BOLSTERS BURGEONING ECONOMIES

Before former Eastern bloc nations entered the EU, concerns existed about doing business in those countries due to lack of transparency, instability, insufficient infrastructure and corruption. Few investors ever considered putting money in these markets, concerned that the risks outweighed the rewards. Today, businesses and investors alike are becoming increasingly more comfortable with moving capital from their home countries to new EU countries in search of higher returns. Since EU membership is preceded by lengthy economic and political reforms, countries that finally enter the union are more closely aligned with other member nations. This development has both directly and indirectly benefited property markets in this region.

- Increased Interest in Tertiary Markets.** Real estate investors who have been priced out of traditional primary and secondary markets have recently set their sights on the tertiary markets of new and future EU countries. Hungary, the Czech Republic, Poland, Romania, Bulgaria and Turkey are the most attractive areas for foreign direct investment (FDI) by private equity funds, REITs, institutional investors and high-net-worth individuals. These countries are becoming progressively more stable and transparent; however, their real estate markets still have room for income growth and appreciation.
- Increased Consumer Spending.** The inflow of capital to accession countries has led to significant personal income growth, thereby strengthening consumer confidence, consumption patterns and the demand for retail goods (Exhibit 2). Modern shopping centers and retail warehouses are now being constructed in emerging markets at an unprecedented pace, as international retailers seek to penetrate these areas. New retail development in Eastern Europe is rivaling Western Europe in terms of modernity and sophistication. Recently, the largest shopping center in Europe (and second largest in the world), Cevahir Shopping Mall, opened in Istanbul with a gross floor area of 420,000 square meters. Although this mall was 16 years in the making, its timing coincides remarkably with the inflow of capital and growth of income in Turkey. With continued FDI into nascent EU member states, retail markets should flourish in the near term. Longer-term, however, these markets may saturate if supply growth is excessive.

EXHIBIT 2. RETAIL SALES CATCHING UP WITH RISE IN DISPOSABLE INCOME IN NEW EU COUNTRIES¹



¹ Aggregate Data of Czech Republic, Hungary, Poland and Slovakia

MOVEMENT OF SERVICES LINKED TO NEAR-SHORING AND OFFICE GROWTH

Legislation that encourages the movement of services within the EU has aided business expansion and relocation, especially in new EU member nations. Specifically, the phenomenon of near-shoring has rapidly taken over markets and boosted office demand in former Eastern Bloc countries. Near-shoring involves the redeployment of back-office jobs like information technology (IT) and business process outsourcing (BPO) to areas with a combination of cost and labor advantages. Unlike off-shoring, near-shoring shortens the geographical distance between where services are contracted from and where they are performed, thus increasing efficiency. Near-shoring in Central and Eastern European countries is successful due to a number of factors: the low cost of doing business, talented and relatively young workforce, favorable business climate and strong work ethic. As a result of near-shoring demand, office vacancy rates in these locations are declining, while rental rates are increasing. Over a six-month period ending December 2005, Central Business District (“CBD”) vacancy rates dropped an average of 365 basis points in the EU’s six most active near-shoring markets (Bratislava, Budapest, Prague, Riga, Sofia and Warsaw). Over a one-year period ending 2005, vacancy rates in these markets (except Riga and Bratislava) fell an average of 595 basis points and rental rates grew an average of 3.7%.

Each country that participates in near-shoring has its inherent advantages and disadvantages (Exhibit 3). For the most part, all of these countries have a highly skilled and technically trained workforce. The biggest concern facing each of these markets, though, is escalating costs, in part due to accession into the EU. The window of opportunity in which near-shoring is financially advantageous may be narrowing. Still, if governments and service providers become more proactive in fostering these types of businesses, then near-shoring may have a longer expansion period. Regardless, near-shoring’s short-term effects on the office market have been evident. New supply has increased rapidly in order to meet the demand for contemporary office space for firms. Currently, 828,000 square meters of office space are under construction in Bratislava, Budapest, Prague, Riga, Sofia and Warsaw, which is equivalent to 14.6% of inventory. The pipeline shows no signs of slowing down in the near future.

EXHIBIT 3. NEAR-SHORING OPPORTUNITY MATRIX

Country	Opportunities, Risks and Costs	Office Market Indicators 4Q05
Poland	Strong near-shoring demand from continental Europe. Poland is popular among Western defense contractors due to its educated IT workforce, strong systems, writing and R&D skills, and good infrastructure. Its future lies in recent membership in the EU, though costs will rise.	Warsaw Gross Prime Rents: €22.00 Prime Yield: 7.0% Vacancy Rate: 12.2%
Czech Republic	Well positioned for near-shoring from the EU, with a stable political system, good infrastructure, English proficiency and a highly educated and productive labor pool. Future is limited by growing costs and small labor pool.	Prague Gross Prime Rents: €23.30 Prime Yield: 6.5% Vacancy Rate: 13.0%
Hungary	A good near-shoring destination in Europe, with a well-educated and highly qualified IT workforce, high cultural compatibility, low legal risk and good infrastructure. But rising costs and lack of resources will limit future competitiveness.	Budapest Gross Prime Rents: €16.50 Prime Yield: 6.75% Vacancy Rate: 18.2%
Ireland	Currently a top player, Ireland offers excellent IT services and business process outsourcing, a top workforce and education system, strong cultural skills and little risk. Reasonable cost control will be difficult to maintain in the future.	Dublin Gross Prime Rents: €40.30 Prime Yield: 4.5% Vacancy Rate: 7.8%
Romania	Romania’s many well-educated and highly skilled IT workers are particularly strong in specialized software development and Internet-based services. Costs and cultural risk are low, and legal risk is declining. Western work ethic and business knowledge is an issue.	Bucharest Gross Prime Rents: €21.50 Prime Yield: 5.5% Vacancy Rate: 11.0%
Latvia	Excellent outsourcing destination: good infrastructure and skills, highly educated labor pool with strong software development skills. But costs are growing, thanks to EU integration and limited labor pool, and work ethic is also an issue. Will likely remain a minor player, together with Estonia and Lithuania.	Riga Gross Prime Rents: €18.50 Prime Yield: N/A Vacancy Rate: 2.0%

Source: CIO Insight, Colliers International.

The expansion and further development of the EU will continue to change the European property markets for years to come.

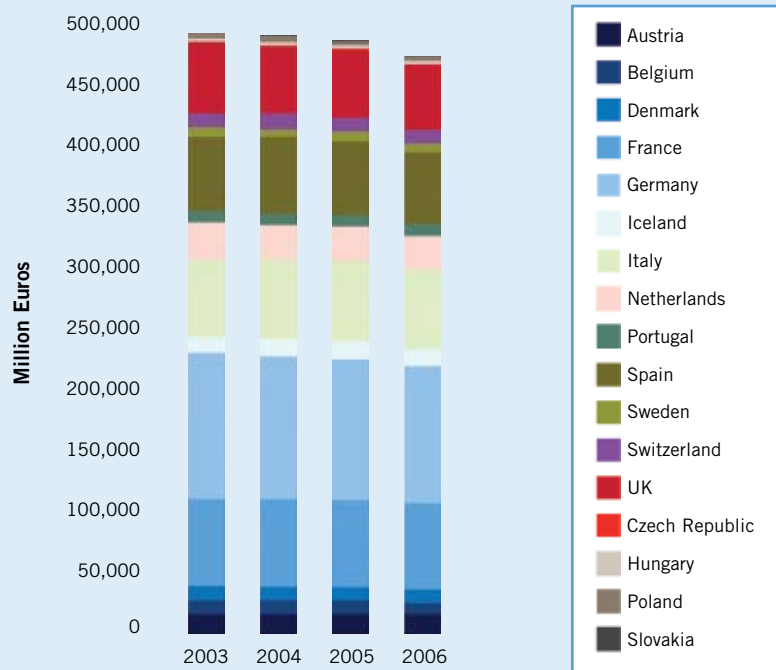
MOVEMENT OF PEOPLE PROMPTS RESIDENTIAL CONSTRUCTION

As the boundaries between EU member states become increasingly permeable, various migration patterns have begun to emerge. EU citizens are granted the freedom to live and work anywhere within the region provided they can support themselves. This has led to two distinct waves of movement.

- Retirees Heading for the Sunbelt.** The first is by retirees, and make up approximately 20% of the current EU population, and are shifting from industrialized areas in the United Kingdom, Benelux and Germany to the sun belts in Spain and Italy. Since most pension benefits are portable in the EU, retirees are seeking a higher quality of life by moving to warmer and more affordable areas.
- Migration from Rural Areas to Urban Centers.** The second wave involves workers from rural areas in Greece, Italy, Poland, Portugal and Spain traveling to commercial centers in the United Kingdom and Germany in search of higher wages and standards of living. Although the growth of near-shoring jobs and incomes has helped retain workers in some of these economies (like Poland), there is still considerable interest among the working-age population to move away from their current homes to larger business centers.

The net effect has been an increase in the demand for residential real estate (Exhibit 4). Many parts of the EU, specifically Central and Eastern Europe, have large housing blocks that were built after World War II and now have become functionally obsolete. Combine the obsolescence with large population influxes and supply constraints, and it becomes immediately clear that there is a pressing need for new and affordable housing in the rapidly emerging urban areas within these countries. Countries that have already begun addressing the need for more worker and retiree housing include Germany, Greece, Benelux and France. Between 2000 and 2010, these nations will add in excess of 12 million new housing units to their existing stock of 84 million homes. Housing demand will likely increase in Turkey and Spain as EU residents look to purchase second homes in these areas. However, there is major concern of overbuilding in Spain as well as in the United Kingdom and Ireland, leading some individuals to suggest that a housing bubble exists. The upside of residential construction will be a revitalization of local communities along with an increased demand for retail properties. However, if housing needs are not met in certain areas, living standards will decrease and local populations will move elsewhere, taking their jobs with them.

EXHIBIT 4. RESIDENTIAL CONSTRUCTION OUTPUT 2003 – 2006



Source: EC Harris

GOVERNANCE ISSUES REMAIN

While the ideals of the EU have been firmly established, there still remain a number of governance issues that jeopardize the existence and expansion of the EU. Two primary concerns have been the inability to ratify a constitution and questions regarding the efficacy of a central bank.

- **The Failure of the EU Constitution Has Been a Major Setback.** Many reasons have been cited for the French and Dutch rejection of the Constitution, among which include: erosion of national sovereignty and identity; concerns about the future enlargement of the EU; fear of more liberal social policies; and reluctance to shift from unanimous decision-making to majority-voting on EU initiatives. Without a constitution, the process of accepting new nations into the union could be formally blocked, or would be at least encumbered with heavy bureaucracy. In addition, country risk will remain a lingering issue for investors, since differences will persist between fiscal environments in each country. One of the intentions of the Constitution is to reinforce a common economic framework for all countries, without which nations are left to their own devices. Lastly, and perhaps most worrisome, the rejection of the Constitution could lead to the dismantling of the EU. Although it is too early to tell whether such a scenario is likely, many analysts believe that the failure of the Constitution could be indicative of future integration problems. Ultimately, the Constitution aims to enhance the EU's legitimacy, but its rejection could eventually lead to economic and political divergence for member nations.
- **Concern Regarding the Creation of the Economic and Monetary Union (EMU).** The EMU is the agreement for a single European Central Bank (ECB) and a single European currency that will replace national banks and currencies for those European states that qualify. All 25 member states of the EU belong to the EMU but only 12 states have adopted the EU's single currency—the Euro. Implementation of the Euro will reduce currency risk, facilitate the movement of capital across borders, increase the liquidity, breadth and depth of financial markets, foster competition and improve price transparency. The ECB's primary objective is to rein in inflation and to ensure macroeconomic stability. Although the goals of the EMU are noble, it is not without its challenges. The first and foremost is how to apply a “one size fits all” economic policy to countries as disparate as Germany and Greece, Sweden and Spain, Luxembourg and Lithuania. Each nation in the EU has its own growth rates, maturity cycles and economic history to contemplate before moving toward a single economic agenda. An inflexible single interest rate may benefit some nations while stifling growth in others. Additionally, adoption of the euro in accession countries will cause costs to rise, eliminating some of their price-based competitive advantages. Finally, the ECB's sole purpose is to control inflation through monetary policy but it does not consider other objectives such as battling high unemployment, promoting growth and encouraging exchange rate stability. Many critics regard this singular policy focus of the ECB as its biggest shortcoming.

CONCLUSION

The expansion and further development of the EU will continue to change the European property markets for years to come. With the addition of Romania and Bulgaria in 2007, as well as possibly Turkey, Macedonia and Croatia down the road, the demand for industrial, retail, office and residential properties should continue to mature. The fluidity of goods, services, capital and people will create winners and losers in different markets; however, countries joining the EU will stand to gain the most from conscientious urban planning in conjunction with the development of their real estate sector. Through time, the quality and quantity of real estate in Central and Eastern Europe should converge with that of Western Europe, thereby creating more harmonization within the EU. This phenomenon, along with sustained economic advancement, should result in Poland, Hungary, the Czech Republic and eventually Turkey becoming long-term winners of EU accession. These nations are agile enough to adapt to global market conditions while possessing the greatest potential for diversified growth vis-à-vis other emergent European economies. As for traditional Western European economies, growth in Ireland has had a tremendous run, but is nearing capacity. The United Kingdom, and possibly Spain, will prove successful due to their relatively liberal economies and strong patterns of in-migration while France, Italy and Germany will suffer because of their aging populations, protectionist social policies, inability to modernize and political uncertainties.

Aside from governance issues, there remain additional risks to the EU. A potential backlash against immigration may be brewing in Western Europe, stemming from waves of immigrants from Central and Eastern Europe. Although EU policies only allow immigration if certain conditions are met, there is no mechanism for enforcement. This leads to resentment by many Western Europeans that immigrants are taking away their jobs and siphoning off their resources. There is also a high level of protectionism for certain industries in countries that the EU will not be able to touch. Telecommunications, airlines and banking are examples of sectors that are unlikely to be owned by nondomestic companies. Finally, one of the tests that the EU will confront with respect to real estate markets in Europe is how to navigate the taxation, legal and financial systems in various countries. Differing stamp duties, entitlement procedures, lending processes and the like will continue to make European real estate markets less transparent and harder to maneuver than the United States, for example. As property markets under EU influence continue to evolve, it will be interesting to see how they cope with this new set of challenges.



Investing in Commodities

Authors

LYNNE ENGELKE

Head of Performance Analysis
& Risk Monitoring
Citigroup Managed Futures

JERRY PASCUCCI

Chief Investment Officer
Citigroup Managed Futures

DARYL DEWBREY

Head of Product Development
Citigroup Managed Futures

JACK YUEN

Analyst
Citigroup Managed Futures

Dramatic price appreciation in commodities such as gold, silver, copper, sugar and petroleum products has made headline news during the past year, piquing interest in these products and the investment opportunities they offer. Aside from favorable short-term returns, there are several longer-term arguments for investing in commodities:

- **Continued Price Appreciation.** Economic development and growth in large emerging economies such as China and India should result in increased industrial consumption and a growing consumer base, which should in turn send raw material prices higher until world production increases to meet this burgeoning demand.
- **Diversification Benefits.** Commodities have historically shown little correlation to traditional asset classes such as stocks and bonds and thus can, over the long term, provide portfolio diversification benefits.
- **Inflation Hedge.** Commodities can serve as a natural hedge against inflation.

The growing popularity of commodity investing has in part been fueled in recent years by a proliferation of investment vehicles. This article explores seven methods available to investors for gaining commodity exposures and highlights the advantages and disadvantages of each.

1. DIRECT CASH INVESTMENT

Direct purchase of commodities is an obvious method, although an approach that has a number of disadvantages. Purchasing can be problematic due to the variability in asset quality. Storage charges, insurance expenses, cash opportunity costs, assay and valuation expenses increase the cost and complexity of holding commodities. In addition, when holding physical commodities no current income is earned. Returns are only obtained when the commodity is sold. During the period of ownership, the above-mentioned costs constantly erode the value of the investment.

HOW HOLDING COSTS ARE REFLECTED IN COMMODITY PRICING

In financial terms, the ongoing costs and expenses involved with owning long physical commodities means that they have what is referred to as a “negative cost of carry.” The cost is the sum of the risk-free rate of return plus all costs associated with the purchase and holding of the commodity. As commodity forward prices are quoted they will, to a great extent, reflect the term structure of the futures curve, which can be seen as another way of measuring the costs over varying time periods. Normally, the longer the term, the greater the cost. This time-based term structure, in which the price rises along with the amount of time remaining until delivery, is known as “contango.” The market is fairly efficient at arbitraging the cost structure and spot prices to appropriately value forward prices. One exception is when markets move into a cost structure called “backwardation” in which short-term usable supply is not ample to meet short-term needs. This usually only occurs occasionally and, in recent years, has happened primarily in the petroleum and natural gas market.

Note: Subject to relevant local laws and regulations, this asset class may not be available through Citigroup in certain jurisdictions.

Another way to physically own commodities is to go long on a futures exchange and take delivery of warehouse receipts. These receipts are fungible and can later be redelivered against a short sell and retendered for delivery. This reduces the complexity of quality control involved with buying and selling of physical commodities because the exchange sets the quality standards for delivery, but it does not elevate the term structure of price.

Whether purchasing commodities directly or via futures exchanges, the investor incurs the risk of concentration in one particular market and a single bet on price movement. Multiple physical purchases multiply the complication and can usually only be handled by institutions with professional staff with expertise in the buying and selling of individual commodity groups.

Some high-profile investors have turned to the purchase of hard, nonperishable commodity assets such as timber-growing properties and water resources. These assets are only for the most sophisticated investors who can manage the ownership of such properties and have longer-term investment objectives. There is difficulty valuing these assets, which is a problem if interim pricing and mark-to-market are important to the investor.

In summary, while direct purchase is the most straightforward way to capture a commodity's return and appreciation, it is impractical for many investors.

2. FUTURES

To avoid many of the drawbacks of outright purchase, investors can buy commodities indirectly via instruments linked to the hard commodity such as futures contracts. This approach allows investors to enter the futures markets themselves, and manage a portfolio of commodities contracts.

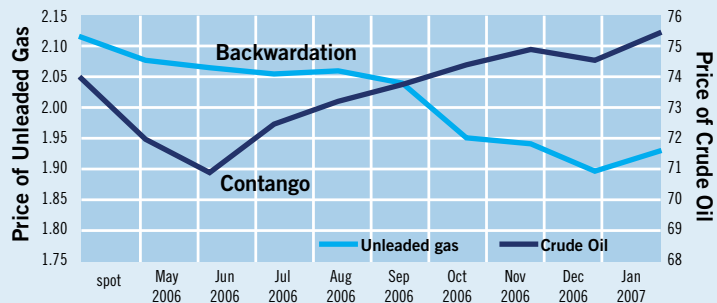
A futures contract confers the obligation to buy (or sell) the commodity at a specified future date and price. Before the date upon which delivery of the physical commodity would occur, the investor "rolls" the contracts, selling the expiring contracts and simultaneously purchasing contracts for later delivery, thus maintaining exposure to the commodity without taking actual delivery.

As discussed, the price of a futures contract will differ from the physical commodity spot price because the futures contract price takes into account the carrying costs incurred during the contract holding period. As these costs are generally time sensitive, a longer-term futures contract should cost more than a nearer-term contract, reflecting the additional costs during the longer holding period (i.e., contango). As a result, simply investing and rolling forward is normally a losing situation. However, the nearby contract may in some circumstances cost more than the farther-delivery contract (i.e., backwardation), implying an availability premium. Oil, for example, is frequently in backwardation, reflecting the difficulty of holding inventory and supply concerns from weather, geopolitical risks and other factors.

Direct purchase of commodities involves complications. Several more practical investment options exist.

EXHIBIT 1. BACKWARDATION VS. CONTANGO

As of April 2006



Past performance is not necessarily indicative of future results.

An experienced futures trader may take advantage of the term structure of the futures curve, as well as anticipated price movements. However, because of the volatility of commodities and their dependence on seasonal, weather and economic factors, investing in these instruments requires considerable market expertise. For this reason, most investors look for a means of investing that has been packaged by professional managers, such as commodity index products.

3. INVESTABLE COMMODITY INDICES

A commodity index offers broad exposure to commodity assets or subsectors through futures markets. Institutions often find these passive, long-only indices attractive because many are limited to benchmarkable, replicable investments. According to a report in the *Financial Times* (March 29, 2006) approximately \$80 billion is invested in funds tracking the main commodity indices, an enormous increase from the \$15 billion invested in these indices in 2003. There are several major investable indices, with a range of compositions and methods of construction.

EXHIBIT 2. FIVE POPULAR INVESTABLE COMMODITY INDICES

- **Goldman Sachs Commodity Index (GSCI)** 24 commodities, world-production weighted and therefore dominated by an energy weighting of 75%. The GSCI has the largest market share of its index peers.
- **Dow Jones-AIG Commodity Index** 19 commodities, limits weight of individual commodity sectors and thus considerably lower weight in energy than GSCI at around 30%.
- **S&P Commodity Index** 17 commodities, six sectors, constant dollar exposure across underlying commodities. Weights determined using the dollar value of commercial open interest in futures markets.
- **Deutsche Bank Liquid Commodity Index** selects the most liquid market from each of six sectors: crude, heating oil, gold, aluminum, corn and wheat. Weighting factors include world production, usage and stocks.
- **Reuters/Jefferies CRB** 19 commodities from broadly diversified basket, weighted by liquidity and “significance” (as of 2005).

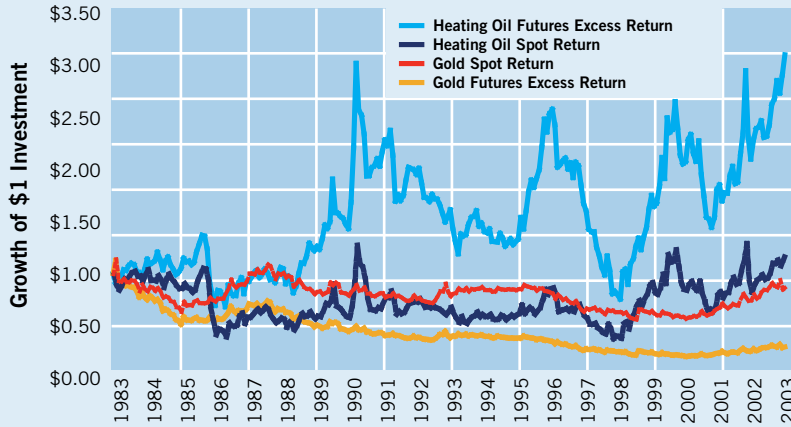
There are several points of access for investors seeking exposure to these benchmarks. Most of the indices have publicly traded commodity futures index contracts, which can be purchased and rolled. There are also mutual fund managers who offer funds tied to various indices by investing in structured notes or swaps that receive the index total return in exchange for paying the T-bill component of the index plus fees. The Pimco Commodity Real Return fund tracks the Dow Jones/AIG Commodity Index through swaps, while Oppenheimer Real Asset fund (actively managed) invests in notes tied to the GSCI. One may also enter into an OTC swap with a counterparty to gain direct participation in these indices.

While the indices provide passive, long-only commodities exposure, their reliance on price appreciation as a major source of inherent return has not been a successful strategy over the long term. Commodities have historically gone through cycles of bull and bear markets; however, prices tend to mean-revert to the cost of production, which has been gradually falling over the long term. In fact, some studies have shown that the average long-term appreciation in commodity prices is zero. For this reason, collateral return (interest component) and roll return (in backwarddated contracts) become substantial sources of return for commodity indices. During periods of backwardation, positive return from rolling forward will result in return greater than the appreciation of the commodity. Conversely, when in contango, rolling will create a drag on performance. For much of the past several years, the energy markets have been backwardated and the GSCI, which is overweighted energy, provided extra roll return. More recently, however, the energy complex has gone into contango.

Investors should be aware that long-term passive investing will expose them to short-term volatility and risks of losses during commodity price downturns, little appreciation in spot prices over the long term, and if the term structures of the futures curves remain in contango for extended periods, to built-in losses during systematic monthly rolls. Diversification and composition should be carefully considered when selecting a commodity index. Timing is also key. Investors often wait for evidence of a price trend before investing, and by the time they do, the asset may no longer be cheap.

EXHIBIT 3. AVERAGE SPOT RETURN OF SEVERAL COMMODITIES¹

Over a long period (12/82 – 5/04), the average spot returns of heating oil (a market mostly in backwardation) and gold (in contango) are close to zero. Positive roll return from the backwardated heating oil market results in a positive futures excess return, while negative roll return from the contangoed gold market reduces the futures excess return.



Past performance is not necessarily indicative of future results.

When investing in equities, three types of exposures are obtained:

- (1) company-specific
- (2) equity market
- (3) commodity market

4. COMMODITY-BASED EQUITIES

One of the most common ways investors participate in commodity markets is by purchasing stock in companies whose businesses are related to or dependent on various commodities. There are a number of factors to consider before investing in equities, such as which commodity sectors or markets to focus on, where to invest along the value chain and the company's geographic domicile and capitalization. For example, in the oil & gas sector an investor would have to consider whether to invest in integrated, exploration & production, refining, drilling, services or transportation companies. One could implement a view on the Canadian oil sands via positioning in Suncor or Birch Mountain shares. With regard to geography, an investor might consider the risk tradeoff between a domestic large-cap company, such as Archer Daniels Midland or Monsanto, versus the country risk inherent in the purchase of a Latin American soybean-processing firm that was locally listed.

In all instances, however, when purchasing equity shares the investor assumes both the idiosyncratic risk associated with a specific company as well as the systematic risk of the overall equity and commodity markets. To highlight the risks associated with individual equities as proxy for commodity exposure, consider how Enron may have looked as a proxy for broad-based commodity exposure earlier in the cycle. As the chart below illustrates, the correlation of equities and commodity prices has not been high or stable. As a result, the degree of basis risk between company shares and underlying commodities can vary dramatically.

¹ Erb and Harvey. "The Tactical and Strategic Value of Commodity Futures," January 2006, Financial Analysts Journal.

EXHIBIT 4. CORRELATION OF COMMODITIES AND EQUITY PRICES

April 2001 – April 2006
360-Day Rolling Correlation

			Crude Oil	Natural Gas	Copper	Aluminum	Gold	Soybean	CRB Index	GSCI Total Return	GSCI Energy Subindex	GSCI Industrial Metals Subindex
Top 5 Positions in iShares DJ Energy Index	Exxon Mobil	Min	(0.04)	(0.03)	0.04	(0.00)	(0.24)	(0.03)	0.02	0.00	(0.00)	(0.03)
	Exxon Mobil	Max	0.39	0.23	0.21	0.17	0.21	0.16	0.38	0.40	0.39	0.14
	Exxon Mobil	Avg	0.18	0.10	0.14	0.11	(0.03)	0.05	0.17	0.21	0.20	0.06
	Chevron Corp	Min	0.01	0.07	0.08	0.01	(0.18)	(0.05)	0.06	0.06	0.06	0.05
	Chevron Corp	Max	0.46	0.28	0.26	0.24	0.23	0.12	0.43	0.47	0.46	0.20
	Chevron Corp	Avg	0.24	0.17	0.18	0.15	0.02	0.04	0.21	0.27	0.26	0.12
	ConocoPhillips	Min	0.05	0.04	0.08	0.03	(0.16)	(0.04)	0.05	0.10	0.11	0.04
	ConocoPhillips	Max	0.52	0.30	0.25	0.24	0.25	0.14	0.49	0.52	0.50	0.16
	ConocoPhillips	Avg	0.29	0.16	0.17	0.14	0.04	0.04	0.27	0.32	0.31	0.10
Top 5 Positions in iShares DJ US Basic Materials Index	Schlumberger	Min	0.05	0.16	0.08	0.04	(0.11)	(0.07)	0.16	0.17	0.15	(0.03)
	Schlumberger	Max	0.50	0.31	0.22	0.16	0.21	0.16	0.46	0.51	0.51	0.18
	Schlumberger	Avg	0.27	0.22	0.16	0.13	0.06	0.02	0.26	0.33	0.32	0.09
	Occidental Petroleum	Min	0.09	0.10	0.04	0.03	(0.12)	0.01	0.14	0.18	0.17	0.04
	Occidental Petroleum	Max	0.53	0.31	0.25	0.26	0.29	0.19	0.51	0.54	0.52	0.19
	Occidental Petroleum	Avg	0.30	0.18	0.16	0.16	0.07	0.07	0.30	0.35	0.33	0.12
	E.I. DuPont de Nemours	Min	(0.26)	(0.11)	0.08	0.04	(0.36)	(0.05)	(0.11)	(0.24)	(0.26)	0.06
	E.I. DuPont de Nemours	Max	0.04	0.01	0.27	0.19	0.09	0.14	0.06	0.07	0.05	0.19
	E.I. DuPont de Nemours	Avg	(0.13)	(0.06)	0.16	0.14	(0.14)	0.04	(0.02)	(0.11)	(0.12)	0.13
Top 5 Positions in iShares DJ US Basic Materials Index	Dow Chemical	Min	(0.20)	(0.17)	0.02	0.05	(0.29)	(0.09)	(0.07)	(0.19)	(0.22)	(0.02)
	Dow Chemical	Max	0.01	0.04	0.26	0.20	0.14	0.09	0.09	0.04	0.02	0.18
	Dow Chemical	Avg	(0.09)	(0.06)	0.17	0.14	(0.10)	0.01	0.00	(0.07)	(0.09)	0.11
	Alcoa	Min	(0.13)	(0.07)	0.11	0.07	(0.31)	(0.06)	(0.02)	(0.09)	(0.12)	0.08
	Alcoa	Max	0.09	0.09	0.35	0.30	0.24	0.13	0.20	0.12	0.10	0.30
	Alcoa	Avg	(0.01)	0.02	0.25	0.22	(0.05)	0.04	0.08	0.02	0.00	0.21
	Newmont Mining	Min	0.06	(0.01)	0.00	(0.04)	0.51	(0.02)	0.15	0.07	0.05	(0.01)
	Newmont Mining	Max	0.27	0.17	0.35	0.33	0.68	0.11	0.41	0.30	0.27	0.31
	Newmont Mining	Avg	0.12	0.09	0.17	0.16	0.61	0.04	0.28	0.16	0.13	0.17
	Monsanto	Min	(0.18)	(0.10)	0.02	(0.00)	(0.18)	(0.08)	(0.14)	(0.17)	(0.18)	0.01
	Monsanto	Max	(0.00)	0.05	0.16	0.13	0.12	0.10	0.07	0.02	0.01	0.16
	Monsanto	Avg	(0.08)	(0.04)	0.09	0.07	(0.02)	0.00	(0.04)	(0.07)	(0.08)	0.09

Past performance is not necessarily indicative of future results.

Natural resource or other commodity-focused mutual funds are also widely available, with gold and energy-based products most prevalent. These funds entail risks similar to the risks involved in share purchases including systematic, basis and correlation risks but with lower idiosyncratic risks. However, investors will face the added constraints of long-only investing as well as cost considerations. One should also have a long investment horizon to reap the potential diversification benefits of these investments, especially given current valuations of many commodity-based companies.

Certain suitable investors could purchase share baskets or enter into any number of equity swap constructs or custom derivatives as a means to curtail idiosyncratic risk. Access to this market is limited and requires an understanding of the mechanics and costs associated with specialized products.

Exposure to commodity-based equities can also be gained through an investment in a natural-resources-focused or directional long-short equity hedge fund. Here the investor, or their advisor, must assess manager skill or the models behind the quantitative strategies used. In the latter strategy, exposures may be shifted away from the investor's target levels based on value or sentiment factors that consider fundamentals and relative value propositions external to the commodities. For example, a sector rotation strategy might allocate away from or sell oil stocks in favor of financial services companies that are expected to benefit more from anticipated shifts in monetary policy and their impact on interest rates and yield curve shape.

5. EXCHANGE TRADED FUNDS (ETFs)

For retail investors, exchange traded funds could possibly be the landmark invention of the 1990s. Since the creation of the Standard & Poor's Depository Receipt (SPDR) in January 1993, ETFs have matured significantly. The American Stock Exchange (AMEX) now offers 196 different ETFs, including broad-based indices, international equities and sector-specific funds. While ETFs were initially created for institutional investors as a hedging instrument, retail investors now comprise a significant portion of the overall ETF market. One of the most important benefits of an ETF is to provide investors with opportunities to capture the potential appreciation in value of a particular market segment, including commodities or regional economic trends without the risk of single-stock exposure. The implicit diversification benefits, combined with lower-cost structures versus similar mutual funds as well as the tax benefits of a passively managed portfolio makes ETFs an effective and flexible instrument for investors.

EXHIBIT 5. SOME OF THE MORE POPULAR COMMODITIES-RELATED EXCHANGE TRADED FUNDS

Assets as of April 2006

EXCHANGE TRADED FUND	ASSETS (IN MILLIONS)
DJ Energy Sector Fund (IYE)	\$1,006.8
S&P Global Energy Sector Inx (IXC)	\$773.9
Goldman Sachs Natural Resources Fund (IGE)	\$1,556.6

Once again, investing indirectly through equities introduces additional sources of risk to that of the underlying commodity, namely corporate management risk and general market risk. In fact, commodities-linked equities tend to have as strong or a stronger correlation with the S&P than with the underlying commodities themselves. (For example, the DJ Energy Sector fund shows a 0.51 correlation with the S&P, versus a 0.48 correlation with the GSCI Energy subindex.)

6. COMMODITIES-LINKED ETFs

A new, fast-growing segment of the ETF industry provides exposure to commodities themselves, rather than related equities. Currently, there are specialized commodity-linked ETFs for gold and crude oil, and a silver ETF. These commodity-specific ETFs are limited and nondiversified, but the sector is expanding rapidly, and may soon include others. Following is a brief outline of each.

EXHIBIT 6. AN OUTLINE OF COMMODITIES-LINKED EXCHANGE TRADED FUNDS

■ Gold ETFs

- Barclays Global Investors iShares Comex Gold Trust (started 1/21/05). Seeks to correspond to the day-to-day movement of the price of gold bullion. The objective of the Gold Trust is for the price to reflect the price of gold owned by the Gold Trust at that time, less the expenses and liabilities of the Trust. (4/06 assets: \$774.3 million)
- State Street, StreetTracks Gold (started 11/04). Holds physically allocated gold bullion with the objective of reflecting performance of the price of gold bullion less expenses. (4/06 assets: \$7,123.8 million)
- Other Gold ETFs trade in London, Johannesburg and Australian stock exchanges as well as Euronext in Paris.

- **US Oil Fund.** (started 4/06) The USOF is a commodity pool that invests in oil futures contracts and other oil interests to track the performance of West Texas intermediate crude futures. The fund issues units that may be purchased on the AMEX.

- **Deutsche Bank Commodity Index Tracking Fund (DBC).** (started 2/06) Attempts to mirror the DB Commodity index by investing in exchange-traded futures on the commodities comprising the index.

- **Silver ETF.** (started 4/06) Barclays' iShares Silver Trust is designed to reflect the price of silver bullion owned by the Trust, less Trust expenses.

Commodities can provide benefits as a source of absolute return, as an inflation hedge and as a diversifying noncorrelated asset.

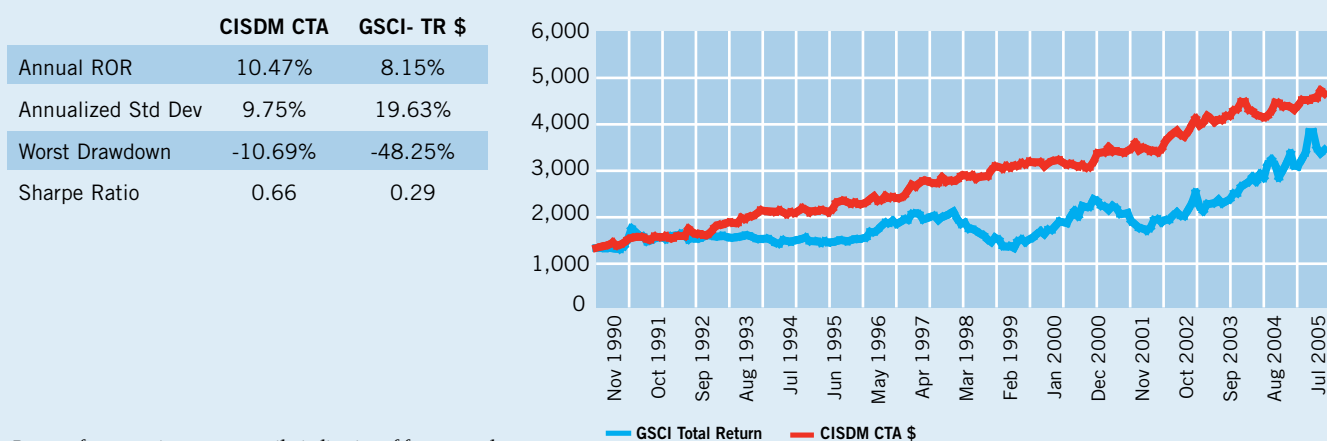
The ease of trading and low transaction costs associated with ETFs can tempt an investor to trade in and out of these instruments to capture short-term price movements. However, once again, such trading requires expertise and experience to make this a successful strategy over the long term. Many ETF investors are tempted to follow the hot sector because they have the power to effortlessly move in and out of any fund. Consequently, they could easily suffer losses from inopportune entries and exits as the prevailing trends reverse.

7. MANAGED FUTURES

Because of the low average long-term return of commodities, active trading—which can take advantage of short-term cycles and trending markets—is often preferable to a passive investment approach. There is substantial evidence that a good manager can generate returns superior to those of an index. “Managed Futures” is an asset class that allocates to money managers called Commodity Trading Advisors (CTAs). CTAs typically trade a diversified basket of futures contracts, including financial and commodity markets. Managed futures is an active strategy that uses either systematic or fundamental techniques to evaluate and take long or short positions in futures markets. According to Barclay Trading Group, Ltd., as of December 2005, the managed futures industry managed assets of over \$130 billion.

Access to a professional manager who will actively manage a portfolio allows the investor to potentially profit in down markets as well as in appreciating markets. An actively managed portfolio should be less subject to commodity market downturns, and therefore offers the potential for a better risk-adjusted return. With a diversified portfolio of commodities, an active manager can opportunistically allocate assets to those sectors or markets that offer the best risk/reward scenario, which should ultimately result in a higher risk-adjusted return than that of a passive, statically weighted portfolio. As an example, examine the long-term performance of the passive GSCI² index, versus the CISDM³ actively managed index of managed futures traders. The GSCI’s average return of 8.15% is less than the CISDM’s 10.47%, while its volatility is much higher, annualized at 20% versus 10% for the active index. The drawdown is likewise much more severe, at 48% for the GSCI compared to the CISDM index’s 11%.

EXHIBIT 7. ACTIVE VS. PASSIVE CISDM CTA INDEX VS. GSCI
Value of a Hypothetical \$1,000 Investment 1/90 – 12/05



Past performance is not necessarily indicative of future results.

² Goldman Sachs Commodity Index (GSCI): a composite index of commodity sector returns, representing an unleveraged, long-only investment in commodity futures that is broadly diversified across the spectrum of commodities. The returns are calculated on a fully collateralized basis with full reinvestment. The GSCI is world-production weighted; the quantity of each commodity in the index is determined by the average quantity of production in the last five years of available data. Currently, the GSCI contains 24 commodities from all commodity sectors: six energy products, two precious metals, five industrial metals, eight agricultural products and three livestock products. Index returns do not include the fees and expenses associated with an actual investment in an index-based product.

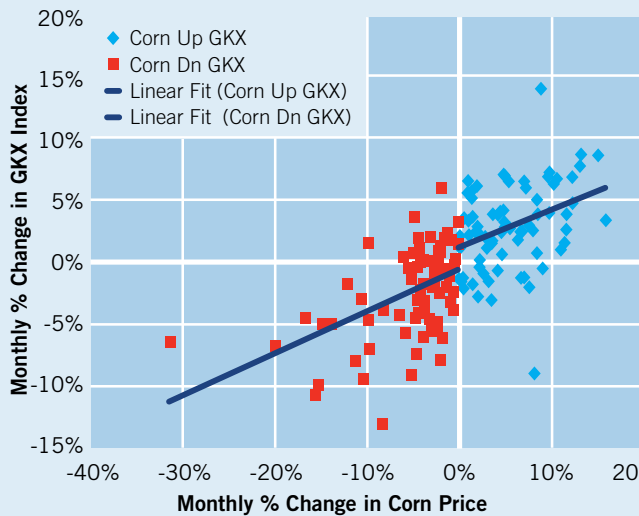
³ The CISDM CTA Assets Weighted Index (Managed Futures): a dollar-weighted index of over 300 Commodity Trading Advisors published by the Center for International Securities and Derivatives Markets, which is affiliated with the Isenberg School of Management at the University of Massachusetts-Amherst. To qualify for the index, a trading advisor must have at least \$500,000 under management and 12 months of trading client assets, or act as a trading advisor in a public fund that is listed in CISDM’s funds table. The returns are reported net of all fees and expenses.

The ability of active managers to profit in market downturns is reflected in their tendency to be positively correlated with market prices in upturns, but negatively correlated in down markets. Statistics drawn between the GSCI Agricultural Sub-Index (a passive portfolio) and Barclay Agricultural Traders Index (an active portfolio), show that in a declining market environment in corn, sugar and wheat, the agricultural subindex is positively correlated with each of these markets and therefore losing value, while the actively managed Traders Index has a positive return. As an example, Exhibit 8 displays the correlation between the passive portfolio and the active portfolio, respectively, with the corn market.

EXHIBIT 8. CORRELATION IN UP AND DOWN MARKETS

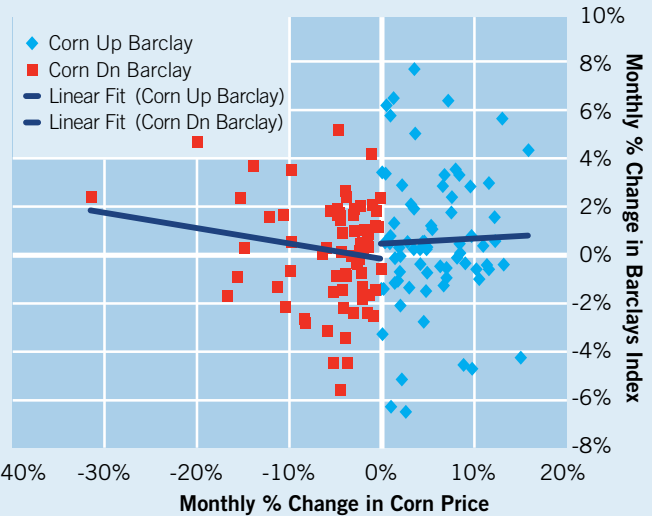
GSCI Agricultural Sub-Index

The passive portfolio displays positive correlation in both up and down markets. Investors lose value in down markets.



Barclays Agricultural Trader Index⁴

The active portfolio displays negative correlation in down markets and positive correlation in up markets. Investors may profit in both up and down markets.



Past performance is not necessarily indicative of future results.

Another advantage of an actively managed program employing the futures markets is the implicit use of leverage. As only a small percent of the total notional value of a contract is required to be put up as margin, a manager has the ability to leverage his trading, while the remaining assets continue to earn interest, adding an interest-income component to the strategy's total return.

Managed futures also offer the advantage of being highly regulated. CTAs must be registered in the U.S. with the CFTC, and are subject to periodic audits. Most trading takes place on regulated futures exchanges in the U.S. and abroad, offering access to global markets with price transparency and liquidity. Clearing firm and clearing house mechanisms minimize counter-party risk and provide additional financial strength.

SUMMARY

Commodities can provide benefits as a source of absolute return, as a hedge against inflation and as a diversifying, noncorrelated asset in a traditional portfolio of stocks and bonds. Recent innovations in the capital markets have resulted in more varied avenues for investment in this asset class. Ultimately, each investor must choose which method of accessing the market is most suitable, based on their risk appetite and sophistication.

⁴ Barclay's Agricultural Traders Index: an equal-weighted composite of managed programs that trade agricultural markets, e.g., grains, meats, foods. In 2006 there are 15 agricultural programs included in the index.



Understanding Structured Investment Vehicles

Authors

TIM GREATOREX

Managing Director

Global Credit Structures

Citigroup Alternative Investments

ANDREW BLACK

Managing Director

Global Credit Structures

Citigroup Alternative Investments

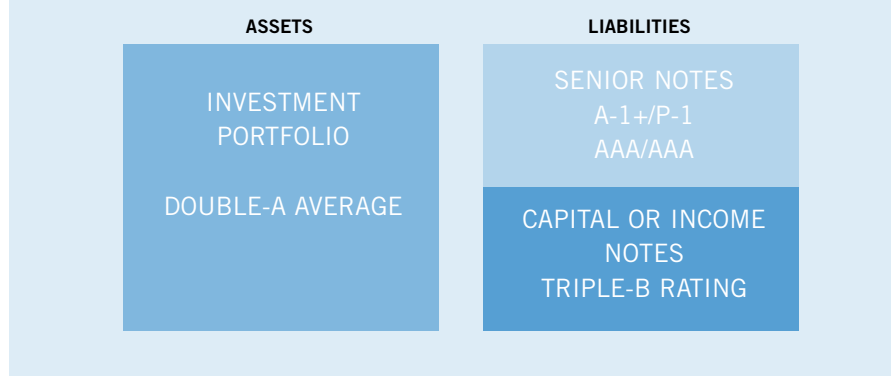
In the late 1980s, much like today, the fixed-income markets were characterized by tight credit spreads. In response to investor demand for yield, Citibank conceived of and launched a new product called Alpha Finance Corporation, which used financial leverage to generate enhanced returns from a portfolio of debt securities. Alpha became the first of a new asset class that was later to be labeled Structured Investment Vehicles or “SIVs.”

Alpha’s original design has been refined over time and today’s SIVs typically carry an investment-grade rating on their capital and seek to provide returns of 200 – 250 basis points over LIBOR to an institutional investor base that includes banks, insurance companies and other money managers.

In this article, we profile the SIV market and discuss the basic principles and risks of the product. We conclude with our observations on recent market developments and our expectations for the future.

EXHIBIT 1. TRADITIONAL SIV STRUCTURE

Illustrative Example



HISTORY OF THE SIV MARKET

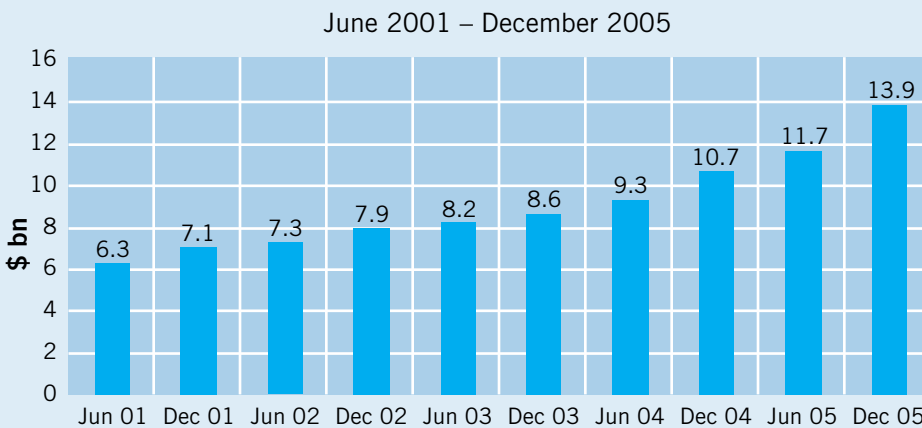
In contrast to many other products in the structured credit market, the SIV sector has a relatively long history. When Alpha Finance Corporation was launched by Citibank in 1988, it had a maximum allowable leverage of five times its capital base, could only buy single-A or higher-rated assets and was structured with a ten-year life. With only \$100 million of capital it was considerably smaller than its successors and by today's standards had a relatively primitive design. Nonetheless, its initial success paved the way for a new sector spawning a succession of larger and more sophisticated vehicles. With a continuing track record of success the SIV sector has enjoyed particularly strong growth over the past few years.

THE SIV MARKET TODAY

With around \$200 billion of assets under management, the SIV market is now well established within the world of structured credit. A recent S&P article¹ reported that at the end of 2005, 13 sponsors were advising a total of 19 vehicles. According to the article, paid-in SIV capital had reached \$13.9 billion (see Exhibit 1) and was supporting approximately \$185 billion of senior funding.

With approximately \$200 billion of AUM, the SIV market is a well-established sector.

EXHIBIT 2. SIV MARKET TOTAL PAID-IN CAPITAL



Source: Standard & Poor's

THE SIV BUSINESS MODEL

In its basic form, the SIV balance sheet comprises investment-grade assets funded by a combination of medium- to long-dated capital and relatively short-term senior debt. Allowable leverage is governed by clearly defined capital adequacy criteria and in normal operations is generally in the range of 12 to 17 times. Senior borrowings are secured on the whole SIV portfolio, typically under the terms of a security trust deed. SIVs are designed to be market risk neutral so that they do not take interest rate or currency risk. As a result, the net spread between the vehicle's assets and liabilities after payment of expenses and fees is available for periodic distribution to investors. In order to ensure that taxes are minimized the SIV is typically established in a corporate tax-free jurisdiction such as the Cayman Islands.

¹ Standard & Poor's article "Assets Top \$200 Billion in Global SIV Market While Continued Growth Expected in 2006," February 2006.

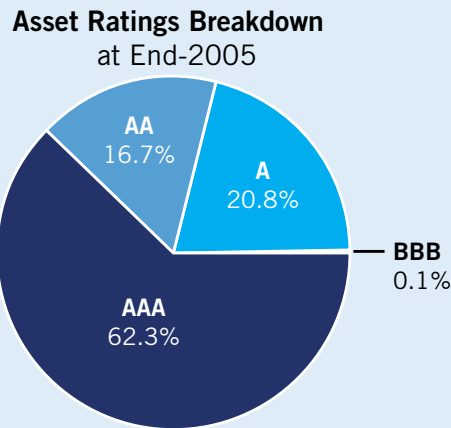
SIVs earn a spread by financing high-quality assets with low cost debt.

SUCCESS FACTORS

In the SIV business model, success is primarily driven by the following factors: (a) high-quality investment assets; (b) low-cost borrowings; (c) efficient financing structure; (d) market risk hedging; and (e) clear operating limits and prudent execution.

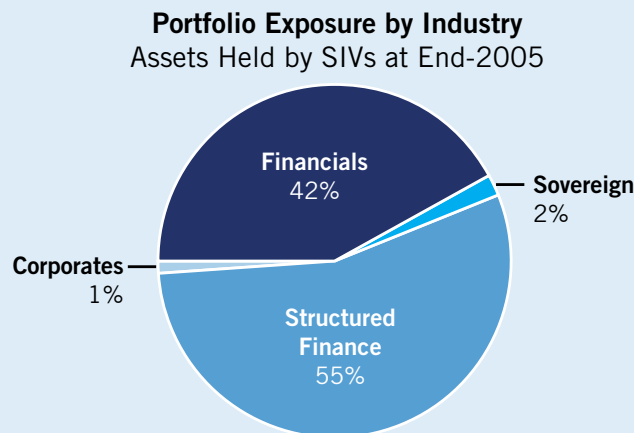
■ **High-Quality Investment Assets.** SIV investment managers are normally restricted to purchasing investment grade assets but, subject to a variety of portfolio composition requirements, have relatively broad discretion on asset selection. However, in order to achieve the targeted performance, investment managers to date have typically focused on two preferred sectors: asset-backed securities (“ABS”) and financial institution issuance. Given that higher risk securities require more capital to be reserved against them, SIV investment managers have a preference for triple-A, double-A and single-A-rated credits, as shown in Exhibit 2. This highly rated paper is readily available in both the ABS and financial institution sectors. Furthermore, as an asset class ABS has a track record of rating and price stability and benefits from an attractive, albeit shrinking, spread for risk. In general, financial institutions in the OECD are well capitalized and as regulated entities present suitable fundamental credit profiles.

EXHIBIT 2. SIVS INVEST IN HIGH-QUALITY ASSETS
Portfolios Asset Ratings Breakdown



Source: Standard & Poor's

EXHIBIT 3. SIVS INVEST PRIMARILY IN STRUCTURED FINANCE AND FINANCIAL ASSETS
Portfolios Sector Allocation



Source: Standard & Poor's

■ **Low-Cost Borrowings.** The SIV business model involves interdependent management of assets and liabilities. In order to generate a profit from a high-quality and relatively low-yielding portfolio, funding costs must be kept as low as possible. This requires the highest debt ratings, which is only achievable if: (i) the borrowings are fully secured on a high-quality and stable pool of assets; (ii) operating procedures and limits are clearly defined and adhered to; and (iii) a process exists to protect debtholders in the event of uncured limit breaches or other credit deterioration.

■ **Efficient Financing Structure.** Since capital is required to over-collateralize the SIV's senior borrowings, the starting point in establishing a vehicle is the issuance of junior funding. In the early days, capital was provided in the form of shares or a combination of shares and capital notes. More recently, SIVs have established subordinated debt programs from which income notes can be issued. Historically, investors had been predominantly financial institutions, principally banks and insurance companies. However, as the product has become more established, the investor base has become more diverse. In the past, investors were willing to purchase capital in the form of unrated securities. Today, most SIV capital is structured in the form of subordinated notes and benefits from a low-investment-grade credit rating.

In order to achieve broad diversity of funding, SIVs generally establish four senior debt programs: Commercial Paper ("CP") and Medium Term Note ("MTN") programs in both the U.S. and the European debt markets. The SIV itself issues directly into the Euromarkets whereas a U.S.-domiciled funding subsidiary is normally established to facilitate issuance in the U.S. CP programs attract the top short-term credit ratings and the MTN programs are rated triple-A, generally by at least two of the main credit agencies.

SIV assets typically have a tenor of three to five years whereas the senior funding generally has an average life of around six months. As a result, SIVs must repay much of their maturing debt by issuing new liabilities. In other words, they are subject to refinancing risk. In order to cover the risk of temporary loss of access to financial markets, all SIVs must establish contingency liquidity arrangements at the time of launch. Unlike some asset-backed structures, such back-stop liquidity is partial and is only sufficient to cover a portion of the vehicle liabilities. It is generally arranged in the form of committed bank liquidity facilities or breakable bank deposits or both. In addition, SIVs employ what is known as asset-based liquidity, which comprises holdings of highly liquid assets specifically purchased for the purpose of providing short-term liquidity should the need arise.

■ **Market Risk Hedging.** SIVs are managed to avoid taking interest rate and foreign exchange risk. In practice, this is achieved through a process of micro-hedging and match funding. Most SIVs use U.S. dollars as their base currency, at least one has been established with euros as a base currency and a few operate with both dollar and euro subbalance sheets. The SIV either purchases floating-rate securities that pay a margin over LIBOR (or EURIBOR) or purchases securities in conjunction with a swap that converts the income into a spread over the relevant benchmark. The funding is then executed to match the underlying asset profiles and eliminate all material interest rate risk. This micro-hedging approach needs careful administration and requires the SIV to have swap lines with a number of counterparties. Suitability is determined by reference to counterparty credit rating and since all such credit exposure results in a capital charge, SIV managers have a strong preference for higher-rated banks. The requirement for minimal risk means that the efficacy of the SIV's hedging arrangements is subject to daily tests.

■ **Clear Operating Limits and Prudent Execution.** As with any business model, effective and prudent execution is key. One of the most important factors governing the success of the SIV sector to date has been the establishment of clear operating limits and controls and managing carefully within them.

SECTOR DOMINATED BY LARGER PARTICIPANTS

As the SIV sector has become more established and the underlying structured finance concepts more mature, the number of SIV sponsors has grown. However, the market is still dominated by the larger and more-established players. This is because although the basic operating model for an SIV is relatively straightforward, putting it into practice is more complicated and needs significant resources. Furthermore, the larger players benefit from scale efficiencies with better access to both asset and funding opportunities and an ability to cover fixed operating costs more efficiently.

A key requirement in establishing an SIV is the procurement of top credit ratings on the senior debt programs. These ratings are dependent on many criteria but fundamental to the process is demonstration by the sponsor of the ability to provide investment, funding and operational management and support to the SIV in accordance with detailed operating criteria and limits. To achieve this, the sponsor needs to establish an appropriate infrastructure with sophisticated operating systems and a credible management team. This is an expensive undertaking.

Liquidity and credit are the primary risks that must be managed.

RISK MANAGEMENT

As with most investment disciplines, SIV managers need to have strong risk controls. Disciplined management is characterized by strict and well-defined operating limits, a focus on high-quality assets and the establishment of dedicated investment management and funding teams. Controls are reinforced by the rating agencies, which not only need to approve the initial structure and management capabilities but also monitor operating performance and compliance closely. In addition, most SIVs publish audited accounts twice a year, a process that provides further third-party oversight. The recognition by managers that they are under constant surveillance by the agencies, the funding markets and their accountants serves to concentrate the minds of all involved and results in high standards of care.

A combination of a high-quality asset portfolio, prudent liquidity management, strong operational processes and the maintenance of capital adequacy has ensured the success of SIVs. The primary risks that must be managed are liquidity risk and credit risk.

■ **Liquidity and Liquidation Risk.** In our view, the most important issue to manage is liquidity and portfolio liquidation risk. This is because SIVs tend to run a funding book with a much shorter average life than their three to five year asset portfolios. It is very important for an SIV to avoid being forced to sell assets since this could lead to market-related losses, which would impact the junior note investors. History has shown that, providing the companies are able to hold on to their fundamentally high-quality assets, short-term changes in value should not affect investor returns.

The two principal scenarios under which the SIV may be forced to liquidate are:

- A liquidity failure where the vehicle is unable to issue senior debt for a period of time and has to sell assets to meet maturing liabilities; and
- A market dislocation that requires reducing portfolio risk and protecting senior creditors. This could be brought about by a dramatic fall in asset values and hence an increase in the effective leverage of the vehicle which could potentially threaten the ratings on the senior notes. This may mean the company is forced to sell assets at a time when prices are depressed.

A total liquidity failure is unlikely since the major debt markets, particularly in the United States, have provided consistent liquidity even in the worst market conditions. We believe this will continue to be the case providing the vehicles maintain their credit strength, which in turn is largely a function of asset quality and asset values. However, it is important to mention one potential source of a liquidity squeeze: that of contagion risk from other SIVs facing problems in the market. There have been a limited number of examples of such potential events, and none of them has resulted in a sector-wide problem. Nonetheless, commercial paper investors, who are the key source of liquidity to SIVs, are fast to react to news and it is possible to imagine a scenario where credit lines to many SIVs are at least reviewed based on problems at one entity. Building strong relationships with key debt investors is therefore crucial to enable quick communication in the event of such problems and thereby to maintain investor willingness to purchase the paper.

The major protection against forced liquidity due to deterioration of asset values is the ability and willingness of the manager to operate well within the permitted risk envelope to avoid the need for deleveraging in all but the most extreme market conditions.

Since all the assets are effectively floating rate, prices are a function of market credit spreads over LIBOR. The period since 1988 has seen several occasions where spreads widened and asset values fell significantly. During the most recent periods of decline of 1998 and 2002, most SIVs navigated successfully through by maintaining a large-enough capital buffer to avoid becoming “forced sellers.”

■ **Credit Risk.** The second key risk facing an SIV emanates from the underlying credit exposure to the obligors making up the portfolio. Clearly, credit analysis is fundamental to selecting assets to avoid not only default, but also rating migration and extreme price volatility. However, while credit risk certainly requires strict selection discipline and ongoing monitoring this is not generally the most important risk faced by an SIV. This is because of the very high quality of most SIV portfolios and the tendency for SIVs to focus on Structured Finance and Financial credits, which generally offer either greater structural protection or have inherent credit strength. As a result, well-managed SIV portfolios have historically evaded default.

■ **Other Risk.** Other risks facing an SIV may not be so apparent. With interest rate and currency exposures fully hedged in accordance with rating agency requirements, the most important residual risk is operational. Managing all the moving parts of an SIV is complex, and requires an experienced operator with the staff, systems and infrastructure to ensure the rules are all followed and operating errors are minimized. It is here that the role of the sponsor is critical, both in supplying the expertise and resources to facilitate the safe and smooth running of the company.

CAPITAL ADEQUACY

There are basically two generations of companies operating in the sector, with the key difference being the design and sophistication of the capital model. This has a significant impact on the dynamics of the vehicle and the capacity to deal in certain products.

Initially, SIVs used a capital monitoring “equation” to verify the triple-A rating of their senior liabilities. This equation simply discounted the value of the company’s assets by some factor to take account of the various risks. Although such a model can take account of multiple risk factors by, for example, having different discount rates according to the ratings, sector and maturity of the assets, it is still fundamentally a static analysis. Nevertheless, it does have the advantage of relative simplicity, making it easy to understand and use in managing a portfolio and there are still many SIVs successfully using a variation of this approach today. The disadvantage of this approach is that it will not allow the same ultimate leverage, product array and capital options as the more sophisticated “simulation” approach.

When it launched Centauri Corporation in 1996, Citibank introduced the use of Monte Carlo simulation to determine capital sufficiency and over the past decade several other managers have followed suit. The only disadvantage of the simulation approach is that it is more complex and requires more sophisticated data analysis to manage a portfolio under its constraints.

BENEFITS OF SIMULATION TECHNOLOGY

The key benefits associated with simulation technology include:

■ **Ability to Increase Leverage.** Most importantly, more accurate risk measurement allows higher operating leverage, aligned to greater flexibility to change the key characteristics of the portfolio and yet remain efficient. The lower capital demands of a sophisticated capital adequacy modeling system also mean that, at any given leverage, there is greater “operating space” before any deleveraging would be required to maintain senior note ratings.

■ **Ability to Use Credit Derivatives.** More recently, the benefits of the simulation approach have allowed SIVs to utilize the credit derivative market, in particular by assuming credit risk via writing single name default swaps. Simulation techniques are ideal for isolating the risks associated with these contracts and giving the appropriate benefit for the reduction in liquidity risk compared with that associated with buying cash assets.

■ **Ability to Offer Multicurrency Product.** The simulation approach opens up the possibility for an SIV to offer multicurrency capital, since the risks involved are automatically captured in the simulation process. Offering capital in euros alongside U.S. dollars has attracted significant investor interest and enabled SIVs to further diversify their portfolios.

Modern SIVs use simulation to allow vehicles to be more effectively managed.

The most significant development in the SIV market over the past few years has been the advent of structures with three tranches of liabilities.

RECENT DEVELOPMENTS

The most significant development in the SIV market over the past few years has been the advent of structures with three tranches of liabilities. The advent of three-tier vehicles has provided a broader range of products for investors with, typically, a much more highly leveraged first-loss tranche and a lower-risk mezzanine layer. The risk/return profile of traditional SIV capital is generally neatly sandwiched between these two new forms of SIV product. The junior notes of the three-tier structure are designed to offer a significantly higher return by virtue of their greater leverage, without increasing the key liquidation risk discussed above, while the mezzanine layer offers investors a lower-risk entry point into SIVs and the prospect of greater liquidity.

As alluded to above, 2005 also saw the first foray into the world of synthetic risk-taking by SIVs. The use of single-name Credit Default Swaps (CDS) to assume credit risk has been seen in several SIVs over the past year or so. The key attraction is the potential for reduced capital requirements, since default swaps reduce the liquidity and liquidation risk normally associated with short funding cash assets. There is, therefore, the potential for an SIV to run higher leverage using CDS than is possible with a purely cash portfolio. However, there are also several issues that an SIV manager needs to address, the most crucial probably being the definition of default events, since it is possible that a credit derivative contract would trigger and cause losses when a cash position would be largely unaffected. Nevertheless, with properly defined and well-documented transactions, the attractions of synthetic risk-taking are likely to outweigh the potential negatives, and we would expect to see continued growth in this form of credit exposure.

The most recent development we have seen has been the creation of so-called “SIV-lite” structures by a number of investment banks. These structures are seeking to take advantage of one of the key benefits of an SIV—namely cheap, short-term funding from the world’s money markets—to finance investment-grade bond portfolios. Although these structures share some similarities with SIVs, they do not typically have an open-ended life or size and hence are more akin to money-market funded CDOs. Some also appear to be seeking higher-yielding assets within the various rating categories, while most traditional SIVs have avoided this “spread-for-rating” approach. It is interesting to note that in a recent article S&P declined to include these structures as true SIVs and rather categorized them as CDOs.

THE FUTURE

Following a year that saw almost 40% growth in assets under management, it would seem that the SIV sector is well positioned for future expansion. It is certainly true that there is a wider acceptance of SIV capital as suitable investments for a range of institutional buyers, from the still-dominant bank investors to insurance companies, pension funds and money managers. As for senior debt funding, the sector is now firmly established with its own identity. The risks are well understood by a wide variety of players and easy to monitor. As a result, liquidity is stronger than ever.

To set against this, the contraction of investment-grade credit spreads over the past two years is leading to lower returns for capital investors and may limit the emergence of new sponsors. Furthermore, the reduced returns available from some of the more generic forms of asset-backed securities is likely to force SIV managers to look at other structures for their staple diet.

One of the more important events in the near future is the advent of the Basel II regulations on capital treatment for bank investors. While the treatment of any particular asset under the new regime will always be subject to the requirements of individual national regulators, it is clear that instruments like SIV capital will have to carry public ratings to achieve acceptable risk weightings. During 2006 we are likely to see many managers taking what have historically been private ratings on their capital instruments into the public domain. We expect this to increase the acceptance of the instrument in the wider capital markets but if SIV managers wish to maintain ratings at any given level, particularly at times of market stress, they may find that they have to manage portfolio and funding risks within new constraints.

Tighter asset markets and reduced returns for investors combined with profit sharing arrangements will also lead to lower fee revenues for SIV managers. This is likely to make scale ever more important for the sponsors and may even result in some of the smaller operators disappearing. We have already seen one recent instance of a manager transferring his contract to another entity and further consolidation appears likely, whether as a result of future mergers or natural attrition as the bigger managers dominate.

One thing does seem certain—SIVs are here for the long run and they will continue to evolve to meet investor needs. With the oldest SIV in the market, Beta Finance Corporation, due to enjoy its 18th birthday next year, this sector has already come of age.

One thing does
seem certain—
SIVs are here for
the long run and
they will continue
to evolve to meet
investor needs.

Private Equity Managers Need to Be at the “Top of Their Game” Given the Competitive Environment

Author



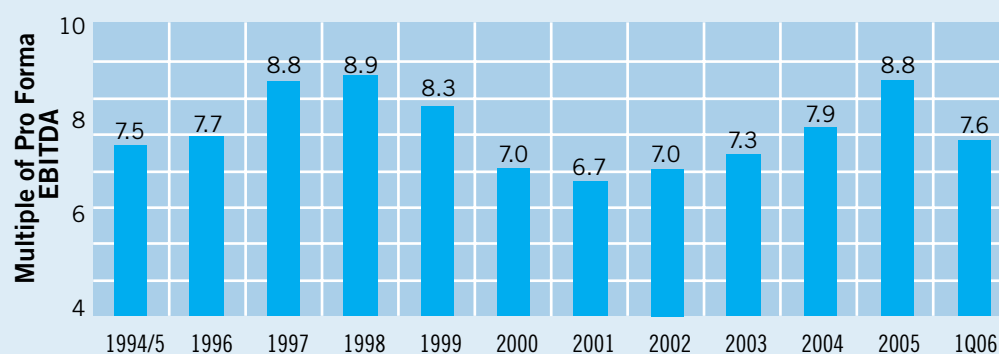
DARREN FRIEDMAN
Managing Director
Citigroup Private Equity

The S&P 500 Index posted gains reflecting positive earnings growth in 2005 and continued to perform well through the first quarter of 2006. However, recent indications of a slowdown in the U.S. housing market, continuing high oil and gas prices, and fifteen rate increases in a row from the Fed could be precursors of curtailed consumer spending, which has largely underpinned the current cycle of economic growth. Any potential cooling in the global economy may translate into lower average returns in the equity markets in 2006 and 2007. We continue to believe that the private equity asset class benefits from its structural advantages regardless of prevailing economic or capital market conditions. This discussion focuses on how private equity managers leverage these advantages throughout the investing cycle, including two popular exit strategies.

ACQUISITION PRICING REMAINS RELATIVELY HIGH

Debt and equity capital has been widely available for LBO transactions, and these flows continue to support transaction prices that present a challenge to value-oriented private equity investors. To successfully invest in this environment requires that private equity managers leverage all the potential advantages of private equity including the ability to: (i) construct a more extended and robust due diligence process, (ii) control the investment, (iii) manage for long-term value creation versus short-term quarterly earnings, and (iv) efficiently use leverage to potentially enhance equity returns, albeit with increased risk.

EXHIBIT 1: AVERAGE PURCHASE-PRICE MULTIPLE FELL IN FIRST QUARTER 2006, PARTIALLY REFLECTING STRONG EBITDA GAINS



Includes transactions valued at \$500 million or more.

Source: Standard & Poor's Q1 2006 Leveraged Buyout Review.

HIGHER PRICING MAGNIFIES THE IMPORTANCE OF ADDING VALUE POST-ACQUISITION

While higher transaction valuations are good for managers who are seeking to exit investments, they remain a buyer's challenge that must be addressed in the current investing environment. Managers with the unique skills and transaction flow required to successfully navigate this type of environment continue to invest in situations where they see opportunities to drive growth and create value. The best private equity managers are well equipped to meet this challenge because their primary focus is to improve company performance once an investment is made. Instead of competing only on price, top buyout firms bring operating personnel and experience to the negotiating table. In this context, there are several advantages a private equity buyer can offer:

- Upgrading Management.** Experienced buyout firms may have the ability to identify and recruit world-class operating management to augment an acquired company's existing line up. Many of the best buyout firms have built a board of advisors, comprising top-tier business leaders and alumni, who have the experience and network to seek to identify and enlist the best candidates. Furthermore, private firms often have ample flexibility in designing incentive structures for senior managers, offering highly competitive compensation and managerial independence.

■ **Implementing Entrepreneurial Incentives.** The preeminent buyout shops work to align management and shareholder interests. Strategies include structuring the transaction so that management has a significant ownership stake and interest in the future of the firm, thereby providing motivation for all parties to drive growth and multiply the company's value within a prescribed timeline.

■ **Insights and Network to Drive Operational Improvements and Growth.** Seasoned buyout managers often have significant operating experience and expertise along with expansive networks. These perspectives and networks, often global in scale, provide a resource for private equity managers to attempt to optimize an acquired company's cost structure. In addition, these networks can present an immediate platform for scaling distribution and growing an acquired company's revenue line.

As the investment environment unfolds over the course of 2006 and 2007, private equity firms that can deliver differentiated value characteristics such as those outlined above will be well positioned to compete for attractive acquisitions at reasonable valuations.

SECONDARY BUYOUTS AND DIVIDEND RECAPITALIZATIONS REMAIN POPULAR

Of course, the other half of the investing cycle involves generating realizations. Private equity managers can accomplish this objective through a variety of means including the IPO market, strategic sales, asset divestitures, sales to other private equity funds, and dividend recapitalizations. We are highlighting the latter two methods because they are increasing in popularity and have received recent attention from the financial media.

■ **Secondary Buyouts.** It has been said that secondary (fund-to-fund) transactions amount to nothing more than private equity firms selling assets back and forth to one another. On the contrary, secondary sales occur because there are natural buyers and sellers at every transition point in the investing lifecycle for companies with growth potential. For example, a successful family-backed company may ultimately become a prime candidate for sale to a middle-market buyout firm. If the buyout firm is successful in generating growth at the portfolio company, the middle-market firm in turn may choose to sell the company to a large-market buyout fund that has the expertise to expand the company to the global arena. At every stage, the private equity investor is acquiring an asset perceived to be attractive that it intends to improve in order to drive a profitable exit. Furthermore, private equity buyers often are attracted to secondary transactions because generally the portfolio company already has learned to operate in a leveraged environment under private equity owners that likely already have sought to optimize the company's operating and capital structure. Finally, management teams frequently retain a substantial ownership position in the secondary buyout and therefore have a significant incentive to accelerate the company's growth trajectory.

■ **Dividend Recapitalizations.** Some in the popular financial press have suggested that dividend recapitalizations burden portfolio companies with years of new debt payments. However, private equity managers pursue recapitalizations to accomplish several objectives and only under certain conditions. A company typically becomes a recapitalization candidate after demonstrating measurable EBITDA growth. Supported by this established growth, a dividend recapitalization enables the sponsor to control the same asset but with significantly less capital at risk. At the same time, the private equity owners and the management team retain their stake in the future of the business and have every incentive to make financing and operating decisions that will promote continued growth and an ultimately profitable exit. Moreover, dividend recapitalizations motivate owners and managers to maintain capital discipline and focus at the portfolio company, and prevent companies from accumulating idle capital reserves that can depress equity returns.

From the point of view of private equity limited partners, if the return of capital from a dividend recapitalization occurs within 12 to 18 months of investment (and the general partner is still operating inside the contractual investment period), then the capital returned via the dividend often may be recycled and invested into a new portfolio investment. While the same capital commitment from an investor is at work, the investor's management fees are spread out over a larger investment pool due to the recycling of assets and the addition of incremental investments. This can enhance limited partners' returns by effectively enabling the same dollar of capital to be invested more than once without being subject to an additional management fee.

We believe that the private equity asset class should benefit from its structural advantages regardless of the prevailing economic or capital market conditions.

Solid Recent Performance; Forward Environment Generally Looks Attractive

Author



RAY NOLTE
CEO
Funds of Hedge Funds Group
Citigroup Alternative Investments

Hedge funds have started off 2006 with a solid first quarter. The general improvement in the environment began in the third quarter of 2005, accelerated into the end of last year, and has clearly continued into 2006. In contrast to the last several years, managers are benefiting from the ability to generate returns from a diverse number of strategies and opportunities. For the quarter, the HFRX Global Hedge Fund index was up 3.85% while the S&P Hedge Fund index gained 4.07%. While both of these indexes are investable, most multi-manager funds of funds actually outperformed these indices with performance of between 5% and 7%. Compared to stocks and bonds, hedge funds fared well. The S&P 500 gained 3.75%, while the Lehman Aggregate bond index declined by -0.82%.

Looking out over the remainder of the year, investors should not expect to see gains continue at this pace. While individual managers may post gains well in excess of 20% for the year, it is unlikely that as a group hedge funds will post returns north of 20%. Coming off of last year's returns, which were in the mid-to-high single digits, projected returns for a diversified multimanager fund of hedge funds should increase to the low-to-mid teens. With this backdrop, investing in a diversified portfolio of hedge fund strategies or a multi-manager fund of funds remains an attractive means to diversify a balanced portfolio—given their volatility characteristics and their low correlation with most traditional equity and fixed-income investments.

OUTLOOK BY STRATEGY

The external hedge fund management group within CAI breaks the hedge fund universe down into four categories: Directional Macro, Directional Equity, Relative Value Arbitrage and Event Driven, with each of these categories divided into a number of substrategies. Within this broad universe of hedge fund strategies, expectations for returns vary. Given the opportunity set that currently exists, managers focused on Directional Macro and Directional Equity strategies should continue to see average to above-average returns, while most Relative Value Arbitrage strategies as well as several of the Event Driven strategies should experience average to below-average returns.

- **Directional Macro.** This category is well positioned in the current environment. The opportunity set traded by managers in this sector generally includes: global interest rates, currencies, equities and commodities. Managers in this space tend to perform better as volatility in the underlying markets pick up or as markets approach inflection points and central banks change policy. Looking out over the remainder of the year, the expectation for central bank activity is supportive of increased volatility in interest rates and currencies. This view anticipates that the U.S. central bank will shortly end its policy of tightening rates, while the European central bank will continue to increase rates and the Japanese central bank, after a protracted period of easy monetary policy, will likely move toward a more restrictive policy later in the year. These differing policy positions should create a number of opportunities in both outright and spread-related positions in the interest rate and currency markets. The continued global demand for energy and base and precious metals, as well as soft commodities, will also offer attractive trading opportunities.
- **Directional Equity.** This category is also positioned to continue to achieve above-average returns. The environment for equities remains robust with expectations for continued positive but moderating economic growth both in the U.S. and overseas. This will benefit the beta exposure that is a result of the generally long-biased nature associated with this category. More importantly, the alpha proposition associated with these managers is quite robust as the equity markets are expected to reward good companies while punishing bad companies. We expect a stock picker's market to exist for the foreseeable

future, as the high tide will not float all ships. Sector rotation and opportunities across market capitalizations will also be supportive for long-short equity-focused managers. In addition, the asymmetrical return patterns associated with these managers will likely benefit investors if the equity markets were to come under pressure from any negative news events.

- Relative Value Arbitrage.** Opportunities in the Relative Value category have improved over last year's lackluster return profile; however, expectations still remain below historical averages and in fact it is reasonable to expect this situation to continue for some time. Within the Relative Value category the outlook for convertible arbitrage, while improved and positioned to generate positive returns this year, continues to struggle with a supply demand imbalance which, when coupled with the potential for a continuation of widening credit spreads and rising interest rates and only modest increases in equity volatility, does not yet warrant a direct increase in allocation. A multi-strategy, rotational arbitrage manager likely would provide the best way to gain exposure to this space. Market neutral equity as well as certain long-short credit-focused event strategies should continue to benefit from the current environment. The market neutral managers are benefiting from modestly higher levels of equity volatility as well as the increase in sector rotation activity and the importance being placed on fundamental factor models. The long-short credit managers continue to have access to interesting opportunities. The focus and attention should be on managers with strong origination teams and talented credit analysts. Given where credit spreads are, investors should avoid directional long-biased credit managers as the risk/reward ratio of being long credit spread risk at these tight levels is not attractive. A final risk to be aware of is the potential for a significant dislocation in the credit derivative market, which could result from any significant market-dislocating event. This risk is most pronounced in certain synthetic credit-based strategies and certain credit-default swap positions. In this substrategy, manager selection remains critical.
- Event Driven.** The Event Driven category offers opportunities that are more attractive than the Relative Value space, but the returns will diverge across substrategies. The continuation of heavy merger activity both in the U.S. and overseas is offering managers focused on merger arbitrage interesting opportunities. Returns in this substrategy have improved over those of the past several years, however, they still remain below the levels seen in the late 1990s and early 2000. In fact, it is possible that past levels will not be seen again. That said, modest exposure to the strategy should add value to a portfolio and focus should be on non-U.S. and global-focused merger managers.

SUMMARY

In summary, returns for diversified funds of hedge funds look more attractive than they have been for the past several years. A reasonable expectation for returns over the course of 2006 is in the low-to-mid teens. The volatility associated with this pickup in return should also move slightly higher with expectation for volatility to be in the mid-single digits. Based on the expected return, volatility and attractive correlation benefits, a diversified portfolio of hedge fund strategies remains an attractive way to diversify and potentially add value to a balanced portfolio. Of course, past performance and past correlation are no guarantees of future results.

Reasonable expectation is that returns for 2006 diversified funds of hedge funds will be in the low-to-mid teens.

CAI OUTLOOK BY STRATEGY FOR 2006

STRATEGY	OUTLOOK
Directional Macro	Average to Above Average
Directional Equity	Average to Above Average
Event Driven	Average to Below Average
Relative Value Arbitrage	Average to Below Average

Challenges in a Rising Interest Rate Environment

Getting Back to Basics: Creating Value by Working the Real Estate

Author



STEPHEN COYLE

Chief Investment Strategist
Citigroup Property Investors

JAIMALA PATEL

Senior Research Analyst
Citigroup Property Investors

ELYSIA TSE

Senior Research Analyst
Citigroup Property Investors

While some markets are further into their recovery than others, we expect that most of the world's office markets will experience declining vacancy rates over the year ahead. However, it is always important to focus not only on what can go right, but also what can go wrong. New supply is rising rapidly in Asia. While much of Asia offers unprecedented demand growth, new supply can ramp and is ramping up rapidly. If economic growth in the U.S. or Europe were to unexpectedly slow, then Asian demand would likely weaken, creating a downturn in the property markets. For this reason, it is always important to choose markets carefully and to diversify one's real estate investments by geography, strategy and property type.

The U.S. appears to be in a "sweet spot" in terms of real estate fundamentals. Demand is strong, new supply is limited (outside of shopping centers) and the economic outlook is moderate to bright. Our greatest near-term U.S. real estate concern is the impact that rising Treasury rates could have on cap rates. Longer-term, we are focused on how quickly new supply ramps up and what low yields could mean to the development pipeline going forward.

In Europe, increased transparency is likely the key to opportunistic real estate investing. While European opportunities are not necessarily tied to a German recovery, if Germany slides further downward, this would negatively affect the entire region. It remains to be seen whether the European Monetary Union can function under a "one-size-fits-all" interest rate policy. We believe that this is the greatest challenge to Europe going forward and we continue to question how one can apply a similar monetary policy across nations as diverse as Germany, Spain, Italy, Ireland and Hungary, for example. In our minds, Germany needs a lower interest rate, while Spain, Ireland and Hungary would benefit from higher interest rates.

Despite challenges ahead and potential downsides, commercial real estate will continue to offer attractive returns over the next several years. Unfortunately, the days of falling yields and 20%+ returns for core, unleveraged real estate are over. However, we believe that they can continue to achieve strong risk-adjusted returns, if they are able and willing to "work the real estate" and carefully pick their opportunities while measuring risk.

U.S. REAL ESTATE MARKETS

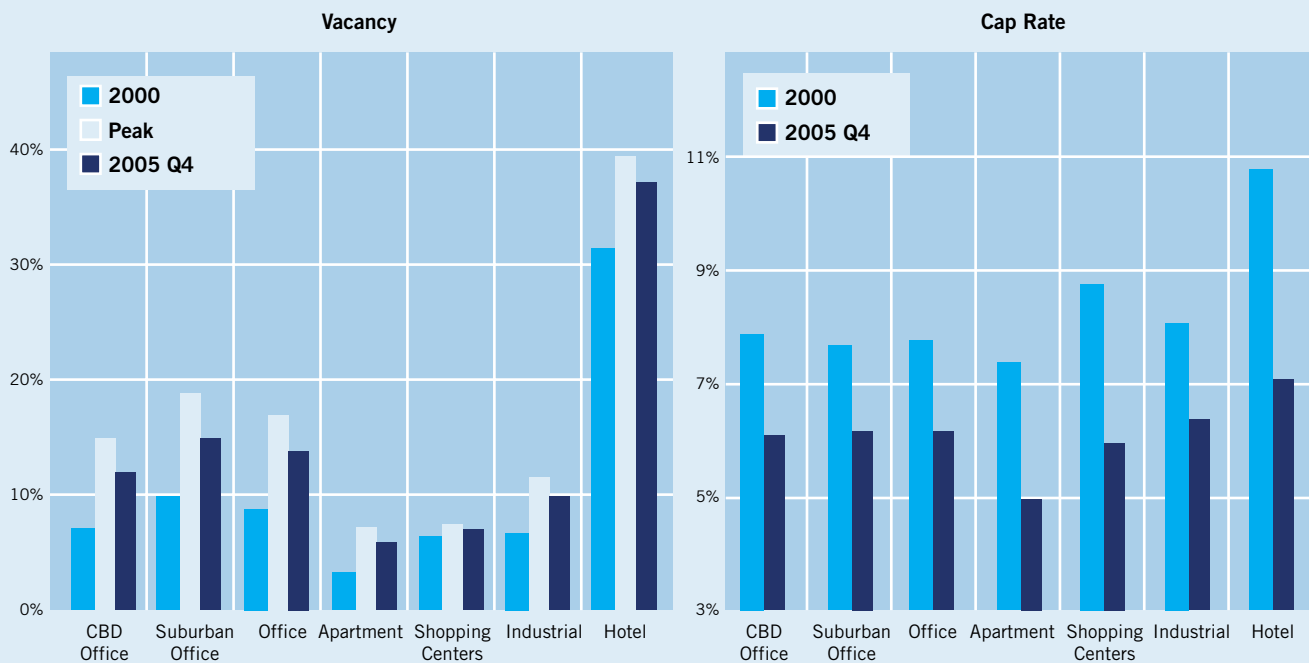
Property fundamentals are improving across all of the major U.S. property types, with vacancies falling fastest in offices and hotels. New supply remains constrained, especially for hotels and offices. Barring a recession, the outlook for 2006 and 2007 is generally positive. The best U.S. real estate opportunities will be tied to taking property-level risk and managing properties into a recovering market. Therefore, we advocate taking select development risk and significant leasing risk. Given the current capital markets, our view toward rising interest rates, and recovering market fundamentals, we do not advocate buying and leveraging properties with strong cash yields.

■ **Office Market.** U.S. office vacancy rates fell 150 basis points during 2005 and are now 13.5%. Importantly, at this vacancy level, we typically begin to see rent growth. Perhaps even more importantly, suburban office vacancies fell 180 basis points to 14.5%. With higher cap rates and strong demand fundamentals, many suburban office markets offer the potential for strong rent and value growth over the next several years.

Note: Subject to relevant local laws and regulations, this asset class may not be available through Citigroup in certain jurisdictions.

- Hotel.** The U.S. hotel market also continues to post a robust recovery. As of the end of April 2006, revenue per available room had climbed 8.9% from a year earlier, and occupancy and average daily room rates were up 1.5% and 7.2%, respectively. While new supply of hotel rooms increased 0.4% in 2005, overall construction levels remain extremely low. Hotel rates will continue to increase at a fairly strong pace over the next 18 to 30 months.
- Industrial.** Industrial markets are projected to recover during 2006; however, the recovery is expected to be less broad-based across markets than the office and hotel recoveries. There will likely be limited opportunities in this sector.
- Apartment and Retail.** CPI Research is less bullish on apartment and retail investments. While vacancies are declining for apartments and retail, cap rates are extremely low and could increase disproportionately (relative to office, hotels and industrial) if interest rates rise. Further, shopping center construction in 2006 is expected to be at its highest level since 1990, and apartments could suffer from a potential pullback by condo converters. As a result, we are less enthused about opportunities in these two property types.

EXHIBIT 1. U.S. REAL ESTATE MARKET FUNDAMENTALS AND INVESTMENT TRENDS



CBD=Central Business District.

Source: TWR, REIS, NCREIF and Smith Travel Research (STR). Data as of December 31, 2005.

Past performance is not necessarily indicative of future results.

Europe's real estate recovery is not as widespread as in the U.S.

EUROPEAN REAL ESTATE MARKETS

Europe's real estate recovery is neither as widespread as in the U.S., nor is the European recovery beginning from as strong a starting point. Despite these challenges, Europe's property markets offer the ability to capture strong risk-adjusted returns within the opportunistic real estate space. Most of these opportunities will likely be tied to: (1) dispositions of corporate and government-owned real estate; (2) demographic shifts that favor "niche" property types such as resort/secondary housing, senior living, etc.; (3) strong economic growth in Central and Eastern Europe creating the need for modern housing, industrial and office space; and (4) the continued recovery in hotel demand.

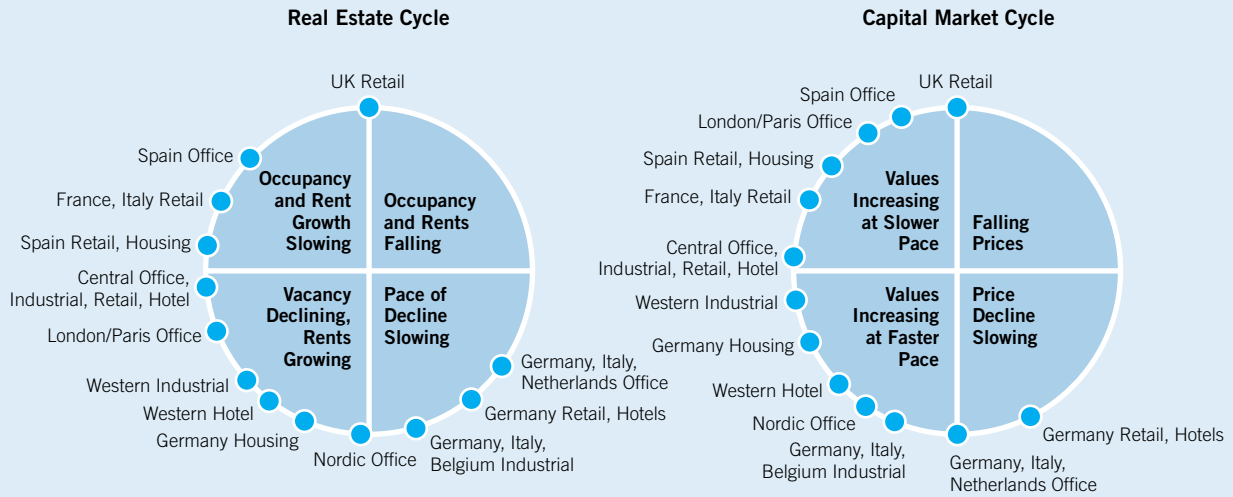
■ **Office Market.** This has been a difficult real estate cycle for many of Europe's office markets, and many are several years away from rent growth. Among the region's weakest office markets are the German, Dutch, Nordic and Italian markets. While most markets are now witnessing declining vacancies, many markets are just beginning to recover from near-record vacancy rates. Many of these markets are unlikely to witness rent growth for several years. While this is negative for yield-oriented investors, it may represent a buying opportunity for those with more risk tolerance, as prices react to high vacancies and declining income streams.

While offices offer limited near-term upside outside of a handful of markets (such as London, Paris and Madrid) we are generally bullish on a European hotel market recovery. Likewise, we expect that strong growth in many (although not all) of the recently admitted European Union countries will create strong demand for real estate. The Czech Republic, Poland, Slovakia, Hungary and, perhaps, Turkey (if it ascends) will benefit from the strongest potential upside.

■ **Germany.** In Germany, local governments control approximately 10% of the entire housing stock and corporations control another 3%. As corporate and government owners have faced budget crises and earnings pressures, many of these owners have recently begun selling their housing portfolios. Many of these housing assets have not been efficiently managed. Further, many have been "capital starved." By enhancing the properties, negotiating with tenant boards and cutting operational costs, one can achieve strong returns. Further, Germany's home-ownership level is among the lowest in the Western world at 43%. Home-ownership levels in Germany have been slowly rising, creating the ability to sell some units to retail investors. Finally, after declining from 1994 through 2001, residential rents in Western Germany are finally showing signs of a slow recovery. Based on recovering rents, low levels of new construction, rising home-ownership and the ability of owners to add value through better operations, CPI Research believes that there is still upside in the German residential markets. If German REIT legislation passes in 2007, this could add further upside for owners of residential portfolios.

■ **Impact of Aging Population.** Based on strong growth in the number of 50- to 55-year-olds, demand for second housing and resort housing will surge over the next several years. With 4%+ growth in the number of 50- to 55-year-olds in Germany, the United Kingdom and other wealthy Western European nations, we project record demand for second homes. Markets that will likely benefit from this surge in demand include coastal and mountainous regions in Spain, Italy, the Alps, Turkey and select other locations. The key to becoming a successful second home destination is access to airports, highways and hospitals, proximity to the aging populations of Europe (within a 1.5- to 2-hour flight), service from low-cost airlines, and both real and perceived political stability.

EXHIBIT 2. CURRENT CYCLE VIEW: EUROPEAN REAL ESTATE AND CAPITAL MARKETS

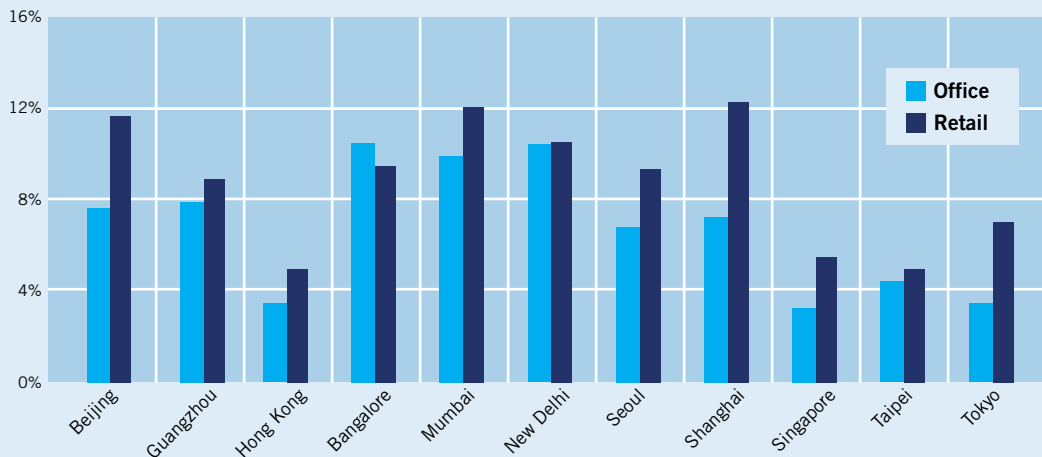


Source: CPI Research

ASIAN REAL ESTATE MARKETS

CPI Research anticipates real estate fundamentals to improve steadily in Asia over the next two to three years. Although yields may continue to fall in emerging Asian markets, these markets will potentially create enhanced returns for investors due to their strong growth. Asian markets are significantly more volatile than most of their western counterparts. New supply tends to be less regulated and demand is less stable. However, given the expectation for extremely strong growth in the region and continued integration into the global economy, we believe Asian investments should prove attractive over the next several years.

EXHIBIT 3. PROPERTY YIELDS IN SELECT ASIAN METROPOLITAN AREAS



Source: CPI Research, DTZ, Jones Lang La Salle, CB Richard Ellis, Knight Frank and Colliers. Data as of 4Q 2005, except Guangzhou office as of 1Q 2005 and Guangzhou retail as of 2Q 2005.

Past performance is not necessarily indicative of future results.

Stellar economic growth, urbanization, increasing wealth and a growing middle class are the fundamental drivers for real estate demand in China and India.

- **China and India.** Stellar economic growth, urbanization, increasing wealth and a growing middle class are the fundamental drivers for real estate demand in China and India.

The rapid expansion of China's domestic consumption is reflected in the housing market. Over the past three to four years, housing prices have risen substantially. Despite overbuilding in markets such as Shanghai and Guangzhou, demand has been robust, and it is driven by the rising level of wealth and more liberal lending systems. The government has taken measures to cool down the housing market. Despite rising concerns, the future appears bright as China's economic and income growth and high savings rate continue to support the demand for housing. We believe residential markets in select secondary cities located in the Bohai, Yangtze and Pearl River Deltas will be strong since housing prices in these cities are still much lower relative to incomes than primary cities such as Beijing, Shanghai, Guangzhou and Shenzhen.

In India, "off-shoring" has generated strong demand for back office space, call centers and R&D space from multinational companies in financial and high-tech industries. Foreign investors are now allowed to invest up to 100% in real estate projects (with some limitations) and this will foster growth in India's real estate market. However, there is a crucial need for better infrastructure in order for India to continue to emerge as a world growth leader.

We expect the story of strengthening domestic demand to play an important role in creating rising demand in China and India. As the labor market improves and incomes increase, retail sales should remain strong in 2006 and 2007. Going forward, demand for retail space in China will be exceptionally strong, as both domestic and foreign retailers seek to gain market share. India's retail markets will be constrained, however, by strict FDI rules that continue to limit the entry of many foreign retailers and by a recent spike of heavy overbuilding.

The outlook for hotels and serviced apartments in China and India is also strong. Off-shoring businesses to India and China have boosted international travel. Further, the increasing wealth of these two countries also results in more intra-regional leisure travels. These trends indicate a more vibrant hotel market going forward. Additionally, there is an increasing population of expatriates and white-collar workers in China and India. They are likely to take managerial and professional positions and are usually paid at a much higher salary than the national average. We believe serviced apartments will see rising demand for many years to come.

There are risks of investing in India and China. Market volatility and oversupply are the major concerns. Although demand for office space in Beijing, Guangzhou and Chennai is strong, the large amount of new supply coming online will depress rents going forward. We believe that markets such as these will likely suffer near-term weakness. While this may eventually create distressed opportunities, investors should be cautious with regard to investing in markets that are oversupplied relative to their near-term demand outlook. By contrast, office markets in Shanghai and Bangalore are expected to continue to witness strong rent growth over the near term. The amount of new supply is significant in these two cities but fortunately, Shanghai enjoys strong demand from local and international firms. Furthermore, less than a third of its supply is in today's primary business center, Puxi. Office demand in Bangalore, the "Silicon Valley" of India, and other technology areas is supported by the growth of the high-tech industry.

■ **Japan.** Japan's GDP grew 2.7% in 2005, as the corporate restructuring and structural reform began to take effect. Rising employment and wages have helped strengthen Japan's domestic demand. As business investment resumes, we expect an improvement in the office market. At a 4.2% vacancy rate, the Tokyo office market is tight. We anticipate rents to continue to rise with low vacancy rates in Tokyo. Exports and industrial production will finally pick up in Japan. This should help to boost demand in industrial properties over the next several quarters.

A more optimistic economic outlook and rising inflation expectations could suggest that BoJ (Bank of Japan) will raise interest rates from the near-zero level. Although core inflation has risen for three consecutive months in 2006, it is unlikely that BoJ will raise rates in the near term as the broader indicator of inflation is still falling. If BoJ does raise rates, it is likely to be at an extremely measurable pace. The concern, however, is whether raising interest rates could potentially affect real estate returns. Most real estate investors have realized stellar returns by using cheap leverage to capitalize on what would otherwise be very low-cap rates, in the 3.5% to 4.0% range. It is unlikely cap rates will rise in the near term, as private equity investors and J-REITs are still actively buying properties. Therefore, if interest rates were to substantially rise, real estate returns would fall, despite stronger demand and rising rents.

■ **Hong Kong and Singapore.** The four Asia tigers (Hong Kong, Singapore, South Korea and Taiwan) are also experiencing improvements in their real estate fundamentals, thanks to the continuing strength of their economies. Hong Kong's GDP grew 7.3% in 2005, following 8.6% growth in 2004. Driven by booming global finance, the Hong Kong office market has experienced strong rent growth. The market should witness continued increases in prime office rents, as supply remains tight. However, high rental rates are likely to drive some firms to relocate outside of the prime office area.

After years of high vacancy rates, the Singapore office market shows signs of a recovery. This recovery is driven by economic expansion in office-related employment. We expect demand to strengthen alongside limited supply. Although market fundamentals are promising in Hong Kong and Singapore, we are cautious about investing in offices in these markets due to today's very low yields (3% to 4%) and relatively high interest rates (5% to 6%).

We believe Asian
investments
should prove
attractive over the
next several years.

IMPORTANT INFORMATION

Asset classes, products and services of CAI may be offered through the local entities listed on the back cover. Subject to relevant local laws and regulations, there may be asset classes, products or services that are not available in certain jurisdictions.

This Journal is communicated by Citibank International plc in the EU. Citibank International plc is registered with the Netherlands Authority for the Financial Markets.

This Journal does not constitute an offering and is meant only to provide a broad overview for discussion purposes. All information provided here is subject to change. If and when an investment opportunity is structured, all investors must obtain and carefully read the related Offering Memorandum, which will contain the information needed to evaluate the potential investment and provide important disclosures regarding risks, fees and expenses. All information provided herein is qualified in its entirety by the Offering Memorandum and the related subscription agreement. **Past performance is not necessarily indicative of future results.**

While some information used in this Journal has been obtained from various published and unpublished sources considered to be reliable, neither Citigroup Alternative Investments (“CAI”) nor any of its affiliates guarantee its accuracy or completeness and accepts no liability for any direct or consequential losses arising from its use. All expressions of opinion are as of the date hereof, are not intended to be a guarantee of future events, and may differ from the views held by other businesses of Citigroup.

An investment in alternative investments is speculative and not suitable for all investors. Investing in alternative investments is only intended for experienced and sophisticated investors who are willing to bear the high economic risks associated with such an investment. Investors should carefully review and consider potential risks before investing. Certain of these risks may include:

- loss of all or a substantial portion of the investment due to leveraging, short-selling, or other speculative practices;
- lack of liquidity in that there may be no secondary market for the fund and none is expected to develop;
- volatility of returns;
- restrictions on transferring interests in the Fund;
- potential lack of diversification and resulting higher risk due to concentration of trading authority when a single advisor is utilized;
- absence of information regarding valuations and pricing;
- complex tax structures and delays in tax reporting;
- less regulation and higher fees than mutual funds; and
- advisor risk.

Individual funds will have specific risks related to their investment programs that will vary from fund to fund.

Investing in managed futures is speculative and involves a high degree of risk. Some of the risks you should be aware of include the following:

- Trading of commodity interests is speculative, volatile and involves a high degree of leverage. A small change in the market price of a contract can produce major losses for a managed futures investment.

- You could lose all of your investment.
- Managed futures investments will incur substantial fees and expenses, including brokerage and management fees. Trading profits and interest income may not offset these fees. These fees may be paid during a year even though the managed futures investment may have incurred a net loss.
- An investment in managed futures will not provide any benefit of diversification for your overall portfolio unless it is profitable and produces returns that are independent from stock and bond market returns. Diversification does not insure against loss.
- Commodity Trading Advisors’ (CTAs) trading strategies may not perform as they have performed in the past. CTAs have from time to time incurred substantial losses in trading on behalf of clients.
- CTAs may trade on behalf of client accounts in commodity contracts on exchanges outside the U.S. Foreign exchanges are less regulated than U.S. markets and trading is subject to risks that trading on U.S. exchanges is not, such as exchange rate exposure, lack of investor protection regulation, and economic and political instability. These risks can be accentuated in emerging markets.

If you decide to consider investing in managed futures through a pool structure or “fund,” you should be aware of these additional risks:

- Substantial incentive fees may be paid to one or more trading advisors even if a commodity pool experiences a net loss for the full year.
- Your ability to redeem units is limited and no market exists for the units. Some investments may have an initial three-month holding period and then are redeemable only on a monthly basis.
- If you hold principal protected managed futures products until maturity, you will receive an amount equal to at least 100% of your initial investment. Notwithstanding this capital protection at maturity, the net asset value of a principal protected product prior to maturity may be substantially lower than your initial investment. Thus, if an event occurs which triggers early redemption or if you wish to sell a managed futures product prior to maturity due to liquidity needs, there is no principal protection and you may suffer a loss of principal.
- Managed futures funds are subject to numerous conflicts of interest including those that arise from the facts that the general partner and broker are affiliates; each of the trading advisors, the commodity broker and their principals and affiliates may trade in commodity interests for their own accounts; and your representative ongoing compensation for providing services to your account.
- If you are a U.S. investor and you invest through a fund structure, you will be taxed on your share of a fund’s income, even though a fund may not make any distributions. Non-U.S. investors should read the offering materials carefully and consult with their tax advisors.
- A general partner at any time may select and allocate the commodity pool’s assets to advisors that are not described in the prospectus. You may not be advised of such changes in advance. You must rely on the ability of a general partner to select advisors and allocate assets among them.

INVESTMENT PRODUCTS: • NOT FDIC INSURED • NO BANK GUARANTEE • MAY LOSE VALUE



Understanding the potential benefits of alternative investments, Citigroup has committed over \$11.1 billion to alternatives, representing 28% of the capital that CAI manages.

Citigroup is a significant cornerstone investor in most of our products, therefore its interests are aligned with those of our investors.

Benefit from the intellectual insight, operational strength and broad reach of one of the world's leading financial services companies... consider investing with Citigroup Alternative Investments.

Navigate the Markets with Citigroup

With over \$39 billion of assets under management, Citigroup is one of the world's largest managers of alternative investments.

- private equity
- hedge funds
- real estate
- structured products
- managed futures

www.citigroupai.com

citigroup
alternative investments

CAI OFFICES

New York 731 Lexington Avenue New York, NY 10022 Jay Reingold, CFA Phone: 212-559-4279	London 41 Berkeley Square Mayfair London, W1J 5AN Philip Anker Phone: +44-207-508-8042	Bahrain Citibank N.A. P.O. Box 548 Manama Kingdom of Bahrain Zahed Goma'a Phone: +973-17-588-646	Jordan Citibank Abdoun Branch Amman, Jordan Jamal Al-Naif Phone: +9626-592-2629
Mexico City Paseo De La Reforma No. 390 Col. Juarez Mexico City 6695 Mexico Daniel Pastor Phone: +5255-2226-2612	Hong Kong Citibank, N.A. 15/F Three Exchange Square 8 Connaught Place, Central Hong Kong David Seex Phone: +852-3551-5356	Tokyo Citicorp Securities (Japan) Ltd. Tokyo Ginko Kyokai Building 8th floor 1-3-1 Marunouchi Chiyoda-ku Tokyo 100-0005 Yasuaki Higashibe Phone: +81-3-5220-8206	Tokyo¹ Citigroup Global Investments Japan K.K. Tokyo Ginko Kyokai Building 12th floor 1-3-1 Marunouchi Chiyoda-ku Tokyo 100-0005 Akihito Kusumoto Phone: +81-3-3213-5901

1 As of the date of this printing, Citigroup Global Investments Japan K.K. and its named representative are pending approval of the legal entity's non-discretionary investment advisor license and thus are not yet authorized to engage in any business activity.

For additional information about CAI please visit our website (www.citigroupai.com). Access to some information is restricted to certain qualified investors. Please contact us to obtain a password.