

Real Estate and Private Equity: *A Review of the Diversification Benefits and Some Recent Developments*

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This article examines the literature on the benefits of adding real estate and private equity investments to an investor's portfolio, and also examines some recent and important developments in these two sectors from the investor point of view. The first part of the article is dedicated to real estate investments and the second to private equity.

The real estate section first presents the different forms of private and public equity and debt investments available in the U.S. real estate market, as well as the main indices that have been designed to track the real estate market. Second, it discusses and presents a review of the literature on the diversification benefits of adding real estate to a traditional portfolio, as well as some of the problems that are idiosyncratic to the real estate data, such as the phenomenon known as data smoothing. Third, it presents a digression on the feasibility of real estate market bubbles and comments on the recent growth of alternative investments and derivatives products dedicated to the real estate sector. Finally, the article presents the conclusions of this review.

The private equity section first presents the diverse forms of private equity investments existing in the market, as well as a description of the main indices that have been developed to track private equity markets. Second, it discusses and presents a review of the literature

on the diversification benefits of adding private equity to a traditional portfolio, as well as some of the problems that are inherent to the private equity asset class. Third, the section presents a review of recent research topics in the private equity arena, more specifically on quantitative modeling and statistical properties of this alternative asset class. Finally, conclusions are presented.

REAL ESTATE

Investing in Real Estate¹

Real estate investment strategies increasingly correspond to a significant component of institutional portfolios. However, the sector itself has gone through dramatic transformations in recent years. In the past, the physical real estate market has been characterized by a relative lack of liquidity, high transaction costs, high management costs, high information costs, and product heterogeneity, and has been subject to negative externalities (Hoesli, Lekander, and Witkiewicz [2003] and Solnik and McLeavey [2003]). However, some of the costs of investing in real estate may well have been reduced in recent years as initiatives to enhance liquidity and transparency in the property derivatives markets have been put forth, as per comments below.

With the introduction of securitization, which has considerably improved the

liquidity and accessibility of real estate investments, the meaning of this asset class for institutional investors has expanded to include the following four classes (see Hudson-Wilson, Fabozzi, and Gordon [2003]): 1) private commercial real estate equity, 2) public commercial real estate equity, 3) private commercial real estate debt, and 4) public commercial real estate debt. The performance of each of these real estate investment classes reproduces a combination of equity and debt performances.

Private and Public Commercial Real Estate Equity

Exposure to the equity side of the real estate market can be achieved via two principal modes of investment: private (also known as physical or direct) and public (also known as securitized, financial, or indirect). Private real estate investment involves the acquisition and management of actual physical properties. Public investment involves buying shares of real estate investment companies (REITs) or other forms of indirect financial investment (e.g., futures or exchange-traded funds). The real estate market comprises several segments. These include housing or residential real estate properties, commercial real estate properties, farmland, and timberland.

Housing or Residential Real Estate Properties. According to S&P, the value of residential real estate properties amounted to US\$ 22.4 trillion at the end of 2006, a figure greater than the US\$ 19.3 trillion held in domestic equities and similar to the US\$ 25.9 trillion held in fixed income securities. The decline in the U.S. real estate market of 2007 and 2008 must have reduced this market value, though. The values of U.S. homes or residential real estate properties are tracked by the S&P/Case-Shiller Home Price Indices, which consist of 20 metropolitan regional indices, two composite indices, and a national index. The indices are constructed using a methodology known as "Repeat Sales Pricing," a process that entails recording sale prices of specific single-family homes in any region. When a home is resold later, the new sale price is also recorded, and the two sale prices are referred to as a "sale pair." The difference in the sale pairs in any region are calculated and aggregated into one index. The Chicago Mercantile Exchange now offers futures contracts based on the S&P/Case-Shiller Home Price Indices, as discussed below. Other indirect forms of investing include residential REITs, ETFs, and mutual funds.

Commercial Real Estate Properties. According to the CME, the value of all domestic commercial property at the end of 2005 was estimated to be around US\$ 5.3 trillion, whereas the value of all commercial property globally was estimated to be US\$ 15 trillion.

The National Council of Real Estate Investment Fiduciaries (NCREIF) Property Index (NPI) has been licensed to four investment banks for the purpose of enhancing transparency and liquidity as well as creating investment products. Other indirect forms of commercial real estate investing include REITs, ETFs, and mutual funds.

Private and Public Commercial Real Estate Debt

The private portion of commercial real estate debt comprises a rather small portion of the market. Public commercial real estate debt, the main component of real estate debt, is constituted by commercial mortgage-backed securities (CMBS).

CMBS are a type of mortgage-backed security that is backed by mortgages on commercial—rather than residential—real estate. They consist of many single mortgage loans of varying size, location, and property type that are pooled and then transferred to a trust. CMBS issues are typically structured as multiple tranches, similar to collateralized mortgage obligations (CMOs). The trust then issues bonds that may vary in yield, payment priority, and duration. Interest received from all of the loans is passed to investors, starting with the highest-rated bonds, until all accrued interest on those bonds is paid. After that, interest is paid to the investors holding the next-highest-rated bonds and so on. The same practice is followed with respect to the principal as payments are received.

DIVERSIFICATION BENEFITS OF REAL ESTATE INVESTMENT: A REVIEW

Real estate prices can be explained by numerous factors. For example, according to Case and Shiller [2003] and Sabal [2005], real estate prices are affected by: 1) disposable income and availability of financing, 2) uniqueness of the property, 3) government planning and regulations on the use of land, which affect the real estate supply, 4) long-term population growth, 5) the cost of managing a property, maintenance, and repairs



to be paid out, including insurance costs, and 6) the tax treatment of real estate investments. Ling and Naranjo [1997] find that growth in consumption, the term structure of interest rates, real interest rates, and unexpected inflation are systematic factors that can explain real estate returns. However, the inflation-hedging potential of real estate investments has been analyzed in the literature with mixed results (for a review on this topic, see Goetzmann and Valaitis [2006]).

The role of real estate in an investor's portfolio is a controversial issue that is far from settled. Modern portfolio theory predicts that, while individual assets can exhibit a high volatility, a diversified portfolio of investments in them can have risk levels comparable to, or even below, those of less-volatile assets. Academic research has also shown that adding real estate to an investor's portfolio may reduce risk and produce an improvement of mean-variance efficiency. This is because real estate investments tend to have low correlations with traditional asset classes. For example, in a recent study, Garay [2008] shows that real estate investments (measured by an index on real estate investment trusts) exhibited a higher annualized return and a slightly lower volatility than stocks for the period 1990–2007. Compared to alternative investments such as hedge fund and CTA returns, the real estate index also showed a higher return and a higher volatility. Lastly, relative to commodities, REITs had higher returns and less volatility, and relative to private equity, REITs had lower returns and less volatility.

It has been amply documented in the literature that property prices series tend to exhibit low volatility when compared to other assets. However, many authors caution that this apparently low volatility, which would suggest that the risk of investing in real estate has been underestimated, arises as a result of a phenomenon known as data smoothing. For example, Marcato and Key [2007] define smoothing as a phenomenon that generates a lag effect and compressed volatility in valuation-based real estate indices when compared to the underlying property market prices. Smoothing can arise as a result of many factors, most notably from "anchoring" to past values when definite current market prices support is missing. Smoothing is problematic, as it impacts asset allocation decisions. For example, according to the mean-variance model of Markowitz, real estate would show an optimally high weight, in part because valuation-based real estate indices exhibit artificially low risk

levels. However, contrary to this, institutional investors normally have a real estate allocation of only between 5% and 10% of their total portfolios.

To complicate matters, there exists ample disagreement on the role of real estate in a strategic asset allocation, even though this asset class represents a large proportion of the investable universe. Hudson-Wilson, Fabozzi, and Gordon [2003] argue that real estate should be included in investors' portfolios at their market weights. Furthermore, Idzorek, Barad, and Meier [2007] contend that the largest investors' recommended allocations should be more heavily concentrated in direct commercial real estate investments (such as acquiring and managing actual physical properties), whereas smaller investors are expected to obtain exposure to this asset class via investments in real estate investment trusts (REITs) and stocks of listed companies that belong to the real estate sector, as well as direct investments in commercial real estate in some cases.

Exhibits 1 and 2 present a summary of the evidence documented in recent studies on the benefits of diversification in real estate investments (U.S. and international evidence, respectively).

RECENT TOPICS IN REAL ESTATE: PRICING BUBBLES, ALTERNATIVE INVESTMENTS, AND PROPERTY DERIVATIVES

Real Estate Pricing Bubbles

To many economists, most notably Robert Shiller, the astonishing performance of real estate prices at the beginning of this century, when yearly percentage increases in the double digits became the norm, suggested the existence of a real estate pricing bubble.² Herring and Wachter [1999 and 2003] and Sabal [2005] contend that bubbles are more likely to occur in real estate than in the stock markets for the following reasons: 1) real estate markets are illiquid and lack a central exchange, 2) no short-selling is possible in the underlying real estate market,³ 3) lenders provide as much capital as possible during real estate booms and limit lending during market declines, 4) real estate supply adjusts only gradually as information arrives, and 5) many real estate markets tend to be subject to stricter planning and regulations on building, something that delays supply adjustments.

EXHIBIT 1

Recent Studies on the Benefits of Diversification in Real Estate Investments: U.S.

Study	Sample, Period and Methodology	Summary of Findings and Conclusions
Fugazza, Guidonin, Nicolano [2008]	The authors calculate the ex-post, realized portfolio performance that would have been obtained by an investor who diversifies among U.S. bonds, stocks, REITS, and cash during the period 1972–2004. Simulations are performed for scenarios involving two different samples and six different investment horizons and for two alternative asset allocation frameworks—classical and Bayesian.	It is found that adding real estate to optimal portfolios usually implies higher realized volatility. However, even though this higher volatility is matched by a more than offsetting increase in realized returns, the increase in mean returns may be insufficient to increase the Sharpe ratio of optimal portfolios.
Garay [2008]	This article analyzes the impact of adding securitized real estate investments (REITs) to traditional stock and bond portfolios as well as mixed traditional (stocks and bonds) and alternative (hedge funds, CTAs, private equity, and commodities) portfolios. The paper also studies the recent growth in alternative real estate investment vehicles (e.g., mutual funds, closed-end funds, hedge funds and exchange traded funds that invest in real estate).	While there were benefits to investing in real estate over the period 1990–2006, real estate investments significantly outperformed stocks and bonds during the 2001–2006 period, a finding that has led a number of economists to argue that the real estate market has been experiencing a price bubble in the U.S.
Fisher and Goetzmann [2005]	The authors simulate the experience of an institutional investor active in the commercial real estate market over the period between 1997 and 2004 using transactions and intermediate cash flows to compute the returns to property portfolios that are subsets of the actual investable universe.	The authors find that the unlevered, realized internal rate of return of commercial property investment was about 7.5%. This number is lower than the time-weighted rate of return of 9.4% that the authors find.
Hudson-Wilson, Fabozzi, Gordon [2003]	This study presents a definition of real estate investments that includes both public and private debt and equity investments in the sector, constructs a cap-weighted real estate index, and calculates the optimal allocation for real estate in a mixed-asset portfolio of stocks, bonds, and cash between 1987 and 2002.	Real estate is found to be both a low-risk asset and an excellent risk reducer in a stock and bond portfolio. However, the authors find that it is not justifiable to include real estate for the sole reason of bringing high absolute returns to the portfolio.
Giorgiev, Gupta and Kunkel [2003]	This article explores the benefits of direct and indirect real estate investments (REITs) between 1990 and 2002.	Results suggest that direct real estate investment offers some diversification benefits when added to a stock and bond portfolio, while securitized real estate (through REITs) may not. Therefore, investment in REITs does not substitute for direct real estate investments.
Kullmann and Siegel [2003]	This article analyzes the portfolio choice of households as a function of their exposure to real estate risk. Using data from 1984 to 1999, the authors test predictions of portfolio choice models that account for real estate risk.	It is found that, after controlling for income, wealth, and other-possibly unobserved household characteristics, real estate exposure reduces relative holdings of stocks and other risky financial assets. On the other hand, higher mortgage balances are associated with increased risky financial asset holdings.

In a recent article, DeMarzo, Kaniel, and Kremer [2008] develop a finite overlapping generations model and demonstrate that, under certain conditions, investors who care about their wealth relative to others (i.e., “keeping up with the Joneses”) will have an incentive to invest in the same securities held by other investors, even if they believe that these assets are overvalued. This herding behavior can generate financial bubbles. The authors also demonstrate that the bubbles can persist for prolonged periods of time even if investors are assumed to behave rationally and realize that a financial bubble exists and is about to burst.

Case and Shiller [2003] also argue that there is evidence that property prices are “sticky downwards” in the declining phase of real estate cycles. They contend that real estate prices have a resistance to fall because

owners tend to set minimum reservation prices below which they are reluctant to sell. As a result, the number of real estate transactions decreases when property prices fall. Genovese and Mayer [2001] find, after analyzing data from the Boston real estate market in the 1990s, that loss-aversion explains seller behavior in the housing market and that there is a positive price-volume relation in the real estate market. Research on asset bubbles in finance has been developing quickly during the past few years and hopefully will be able to provide answers to some of the questions.

After an unprecedented multi-year rise, the S&P/Case-Shiller Home Price Index of 20 U.S. cities peaked in July 2006. From then until May of 2008, the index plunged an astonishing 18.4%. To complicate the situation, and related to this sharp fall in home prices,



EXHIBIT 2

Recent Studies on the Benefits of Diversification in Real Estate Investments: International

Study	Sample, Period and Methodology	Summary of Findings and Conclusions
Fugazza, Gidolin, and Nicodano [2008]	The authors use commercial property data corresponding to 21 countries to examine the relationship between GNP changes and property returns between 1987 and 1997. The authors also attempt to measure the diversification benefits of investing in real estate internationally.	The correlations among international real estate markets are found to be surprisingly high, given the degree to which they are segmented. The greatest percentage reduction in risk through international diversification is achieved by the industrial properties while the least percentage of reduction in risk is achieved by office markets. In general, the evidence presented suggests that the international diversification benefits to real estate are similar to those of the equity markets. The authors contend that this finding is surprising given the fundamentally location-specific nature of real estate as an investment.
Fugazza, Gidolin, and Nicodano [2006]	This article examines the risk and return characteristics of publicly-traded real estate companies from 14 countries between 1990 and 2001 using monthly data on country-level commercial real estate indexes.	Evidence is found of a strong global market risk component in the real estate sectors of most countries. Furthermore, a country-specific value risk factor also provides some explanatory power in addition to the country-specific market factor. However, U.S.-based market, value and size risk factors do not have any additional explanatory power. The authors argue that the presence of a strong local market risk factor confirms the utility of diversification programs across real estate markets for U.S.-based investors, although these programs are likely to be more effective in Asia-Pacific markets than in European markets.
Hamelink and Hoesli [2003]	The authors investigate the role of real estate in a portfolio when the maximum drawdown is used as the measure of risk. They argue that the maximum drawdown concept is a more natural measure of risk than standard deviation. The empirical analysis is conducted for the period 1980–2002 from the perspective of Swiss pension funds who have legal constraints on the weights that can be allocated to the various asset categories. Direct and indirect real estate investments in Switzerland are considered and then compared to direct real estate investments in the U.S. and the U.K., as well as traditional stocks and bonds.	The authors argue that while the suggested allocation to real estate is in the 20%–30% range, the actual allocation in most countries is less than 10%. More specifically, in Switzerland, the actual proportion of assets invested in real estate is close to just 15%. The optimal allocations to real estate using the maximum drawdown framework proposed by the authors are much more in line with the actual allocations, which implies that the real estate holdings by institutions appear not to be that inefficient.

a mortgage crisis ensued in 2007–08. Mian and Sufi [2008] contend that this crisis can be explained by the rapid expansion in the mortgage supply that started at the beginning of the new millennium. This phenomenon, in turn, had been determined by the disintermediation process experienced by the mortgage industry, and can also explain a large proportion of the initial house price appreciation in the United States. These authors also show that this growth in the mortgage supply was directed at the sub-prime sector of the market, which has been the hardest hit by the falling real estate prices that started in the second half of 2006.⁴

Real Estate Alternative Investments and Derivatives

In the last few years there has also been considerable growth in the diversity and quantity of investment alternatives that are available in the real estate sector. There are now numerous mutual funds (both open and closed-end funds), exchange-traded funds, and hedge funds that are accessible in the real estate investment arena. As these relatively new investable real estate products gain acceptance among market participants there will

be a considerable increase in transparency and liquidity in the real estate market in forthcoming years.

It is also expected that the recent introduction of property derivatives will facilitate a significant increase in transparency and liquidity in the real estate market in forthcoming years, as these new investable real estate products become available and achieve acceptance among market participants.⁵ For Shiller [2008], the near nonexistence of markets for real estate derivatives has been a cause for great concern until very recently. The correct hedging of risks arising from real estate investments is extremely important, since all economic risks (not only stock and bond risks) should be dealt with. Furthermore, this author argues that the recent subprime crisis might be explained as the result of failure to manage risks appropriately. Case, Shiller, and Weiss [1995] had already shown, using a model that they developed, that holders of residential mortgage portfolios could have, in theory, hedged part of the risk of default by investing in derivatives markets for residential real estate prices during the period 1975–93.

PRIVATE EQUITY

Investing in Private Equity

Private equity, as the name suggests, is the process by which companies or individuals invest in a company through a negotiated process. Private equity is a term that encompasses any type of equity investment in a firm that is not publicly listed. The growing interest in this alternative investment has been due, at least partially, to its superior historical long-term returns and to the diversification benefits it provides. These investments usually involve active management strategies that are able to add value. Private equity investments can be categorized into venture capital and buyouts (see Meyer and Mathonet [2005] and Fraser-Sampson [2007]):

1. **Venture capital:** These are investments where the main goal is to create a new company or expand a smaller company that has undeveloped or boosting revenues. Venture capital can be divided into two sub-categories depending on the stage of development of the funded company:

- *Early stage.* Early stage firms are riskier because they have an unproven ability to generate profits and because of their small size. This stage is further split into seed and start-up stages.

- *Expansion stage.* Companies in this stage have already established the market for their product and the technology but require further financing to be able to achieve a more rapid growth.

2. **Buy-out:** This is acquisition of a controlling stake in a more mature company, which implies a change of ownership. Buyouts comprise the following sub-categories:

- *Management buyouts*—where the current management acquires the company.
- *Management buy-ins*—where new managers come from outside the company.
- *Public-to-private transactions*—where companies are de-listed as a private equity company acquires their shares.

In all of these cases, a buyout fund may intervene as intermediary owner, usually alongside the management.

3. **Special situations:** Investments in a distressed company, where value can be unlocked as a result of a one-time opportunity.

The major players in the private equity markets are of three kinds (Fenn, Liang, and Prowse [1995]):

The issuers. These are usually firms that cannot raise capital in the regular equity and debt markets. The best examples of such issuers are young and small start-ups with innovative technologies.

The intermediaries. There are a number of different channels through which investors can access private equity investments. However, few institutional investors (pension funds, insurance companies, endowments, etc.) have the incentive and the necessary experience that would allow them to invest directly in private equity. As a result, most institutions seek intermediation through the limited partnership structure (see Meyer and Mathonet [2005]). For these types of investors, the most relevant approaches to investing in private equity are via fund-of-funds specialists as intermediaries, or through similarly structured dedicated “in-house” private equity investment programs that invest directly in funds. Other channels are via publicly quoted private equity investments, or through opening a dedicated account managed by a private equity specialist.

The intermediaries are mostly limited partnerships. Under such structures, which are governed by

the *limited partnership agreement*, institutional investors have the role of limited partners as well as the role of professional private equity managers that work together and are the general partners, who are usually associated with a venture capital firm. Examples of such firms include Kleiner, Perkins, Caufield, and Byers, and the buyout group Kohlberg, Kravis, Roberts; others belong to big financial institutions such as insurance companies, banks, and investment banks.

Investors. Investors in the private equity market can be made up of public and corporate pension funds, which are the largest investor groups currently supplying close to 50% of all new funds raised by partnerships. The next-most-important groups of investors are comprised of endowments, foundations, bank holding companies, and wealthy families, totaling about 10% of total private equity. Insurance companies, investment banks, non-financial corporations, and foreign investors are the remaining major investor groups.

According to Meyer and Mathonet [2005], the design of a private equity portfolio can begin once an investor has determined what proportion of his total portfolio will be allocated to private equity. Private equity portfolios can be designed either bottom-up or top-down. The top-down approach analyzes first the macroeconomic conditions, and then determines the strategic asset allocation (i.e., the combination of fund styles, industry sectors, and countries that will benefit most under the likely scenarios). The emphasis of the bottom-up approach is on the fund manager, and consists of screening all private equity investment opportunities that are available (including an intensive analysis and due diligence) and then choosing the perceived best fund managers. Manager selection and access is one of the keys to sustainable out-performance in private equity. It forms a distinct part of the investment process that can be efficiently structured.

The bottom-up and top-down approaches are complementary and are usually employed in tandem. This method of combining the two approaches is known as the mixed approach, and starts with a bottom-up strategy, with increasing top-down optimization.

Investable and Non-Investable Private Equity Indices⁶

Private equity provides a great opportunity for investors to reap great return opportunities in investment

vehicles in privately held companies that are not usually available to common investors. As mentioned earlier, the different ways to participate in private equity are through *venture capital*, *leveraged buyouts*, and *mezzanine and distressed debt*.

In the case of *venture capital*, the investment opportunity comes from the fact that start-up companies usually lack the credibility and the track record to raise cash through the traditional methods such as banks and lending institutions. Venture capitalists raise cash through investors that act as the limited partners. As a matter of fact, there are several private equity investment trusts that trade on the London Stock Exchange. The most common non-investable indices are the Post Venture Capital Index, the Cambridge Capital Index, and the Wilshire Associates Venture Capital Index. Investable indices such as the LPX Venture are rarer.

The case of a *leveraged buyout*, as the name suggests, consists of taking a publicly traded company into private hands. The most famous case was the Nabisco leveraged buyout in the 1980s. The most common leveraged buyout indices include the Wilshire Associates LBO index. The last case considered here is *mezzanine and distressed debt investing*. Such investment serves various purposes, such as providing a company's funds to complete specific projects or helping a company meet its obligations just before an IPO. The most common indices include the Wilshire Associates Mezzanine index.

Private Equity Investment: A Review and Diversification Benefits

A Review. As Fenn et al. [1995] indicate, the analysis of private equity returns is limited and handicapped because private equity securities are not registered with the Securities and Exchange Commission and, for this reason, the source and amount of data is limited. Further, many of the firms that issue private equity securities are private, and they do not disclose financial and operating data about themselves. In addition, relatively little has been written about the market. Moreover, a private equity fund can be thought of as having unpredictable streams of cash flows, both coming into and out of the fund, therefore making the task of computing returns already much harder than for other asset classes. To the extent possible, researchers have tended to rely on public sources of data, primarily organizations that collect data and publish newsletters, and

EXHIBIT 3

Recent Studies on the Benefits/Characteristics Private Equity Returns

Study	Paper Abstracts of Findings and Conclusions
Anson [2007]	When contemporaneous and lagged market returns are included in the analysis, current valuations in private equity portfolios demonstrate considerable exposure to prior public equity returns. In addition, a large component of a private equity manager's alpha can be explained by non-synchronous public equity returns. Finally, private equity managers exhibit the behavior of managed pricing in the valuation of their portfolio holdings.
Driessen, Tse-Chun Lin, and Ludovic [2008]	We develop a methodology with good small sample properties to assess the abnormal performance and risk exposure of a non-traded asset from a cross-section of cash flow data. In contrast to existing work, our methodology mainly uses actual cash flow data and not intermediary self-reported net asset values. We find a beta for venture capital funds above 3 and a beta for buyout funds below 1. Venture capital funds have significantly negative abnormal performance while the abnormal performance of buyout funds is close to zero.

reports for the private equity community. Extensive interviews with market participants are also often held.

Quoting Fraser-Sampson [2007] helps us understand why "learning private equity without first understanding how the returns work is rather like learning to play bridge without understanding how to score." First, we must understand that private equity returns cannot be measured annually, but must be measured in terms of the lifetime of the investment. Normally, when one invests in private equity, it can take several years until one recovers the committed capital together with a return. For this reason, returns are not measured annually but on a compound basis. Returns are therefore measured on a vintage-year basis, meaning from the year the fund started until a specified year. This is an essential feature to remember when dealing with private equity.

Second, because in the early stages of the investment there will be more cash outflows than inflows, the internal rate of return (IRR) will be negative in the first years. However, there will be a moment when the IRR is equal to zero—when the amount of the cash inflows equals the outflows. Later on, the IRR will increase with time. This phenomenon is referred to in the private equity literature as the J-curve. According to Meyer and Mathonet [2005], some years ago it was considered that the introduction of the new International Private Equity and Venture Capital Valuation Guidelines in 2005 would drive the J-curve to extinction. However, Mathonet and Monjanel [2006] document that the J-curve for young funds has not been removed, but only reduced, conserving a gap that monotonically decreases up to a

fund's fifth or sixth year, a time when the interim IRR becomes a reliable estimator of the final performance.

There are several statistics that can be used to measure the return in private equity (Fraser-Sampson [2007]). The measure that should be used instead of the average return is that of the upper quartile of a set of private equity investments. The reason why this upper quartile is seen with suspicion is because of a clear misunderstanding of the nature of private equity per se. If the latter measure cannot be used, the best thing to do is to use a capital weighted average instead of a normal average or median return (Fraser-Sampson [2007]). Even though European guidelines in terms of valuations of private equity funds are more rigidly applied than their North American counterparts, they are more certain. Furthermore, it is common knowledge that all private equity funds will normally underestimate the Net Asset Value (NAV) on exit of their current investments (Jost et al. [2008]).

A Diversification Benefit. As noted in Szado [2008], private equity is a very broad term regarding any equity-type investment in a company not listed publicly. The purchase of shares is therefore privately negotiated. This is the main reason why private equity holders can realize capital gains only through the sale to another private equity investor.

It is common knowledge, as noted by Szado [2008], that private equity has been seen as an investment that offers investors the opportunity to achieve superior long-term returns compared to traditional stock and bond investment vehicles. The main reasons for offering a higher return than traditional investment instruments are:

- Private equity allows participating in a vast and growing marketplace of privately held companies not available in traditional investor products.
- One can also generate value by proactively influencing invested companies' management and operations, thereby providing the opportunity to gain excess returns over conventional stock and bond investments.

Furthermore, the academic literature has been able to demonstrate that private equity not only provides stand-alone, superior long-term return opportunities not available through traditional stock and bond investments, but also provides a certain degree of diversification to the latter (Szado [2008]). Lossen [2006] provides a systematic analysis of the impact of diversification on the performance of private equity funds, where very different levels of diversification can be observed across sample funds. While some funds are highly specialized, others are highly diversified. The empirical results show that the rate of return of private equity funds declines with diversification across financing stages, but increases with diversification across industries. Accordingly, the fraction of portfolio companies that has a negative return or no return at all increases with diversification across financing stages. Diversification across countries has no significant systematic effect on the performance of private equity funds.

RECENT TOPICS IN PRIVATE EQUITY: QUANTITATIVE MODELING AND STATISTICAL PROPERTIES

Quantitative Modeling

De Malherbe [2005] was, to the best of our knowledge, the first to propose a quantitative framework to model the uncertainty in the reported NAV as well as the randomness of the NAV variations, drawdown strategies, and repayment policies. The interesting feature of this work is that private equity databases usually provide three sorts of statistical time series for each private equity fund: the outstanding drawn or undrawn committed capital, the reported NAVs, and the observed return distributions. The interesting method is clearly limited by the small amount of time series available. It is usual to have only 40 data points when dealing with a 10-year fund, which is a fairly standard maturity (de Malherbe [2005]). This work takes into account the various factors affecting the timing and

the size of the cash flows. This problem is therefore tackled by splitting the modeling of the drawdowns—the investment performance as well as the modeling of the distributions and repayments—and simulating from each one of the three pieces separately. A limitation in the model is the assumption of independence among the three variables. Other shortcomings include the limited amount of data and the potential selection bias in the computation of private equity returns (Cochrane [2005]), as well as the impact of public offerings (Anson [2007]).

More and more, the finance academic community has developed a greater interest in Bayesian methods, which allows us not only to deal with problems such as the limited amount of data available, but also to introduce expert opinion in the returns distributions (Rachev et al. [2008]). Kaplan and Schoar [2005] are the first to mention how a “Bayesian investor would weigh one observation of fund returns less heavily than an investor in a first time fund.”

Statistical Properties

The question of selection bias is an important issue that needs to be dealt with when analyzing private equity data. Cochrane [2005] measures the mean, standard deviation, alpha, and beta of venture capital investments, using a maximum likelihood estimate that corrects for selection bias. Since firm returns can only be measured when a firm goes public, is acquired, or gets a new financing round, and since these events very likely happen only when the firm achieves good returns, this leads to overly optimistic returns. The interesting feature is that the estimate of the mean log return drops from 108% to 15%, while the market model intercept drops from 92% to -7%. These figures have to be viewed with a certain degree of caution, for these log returns are fairly volatile, exhibiting an 89% standard deviation. The selection bias correction dramatically attenuates but does not eliminate high arithmetic average returns: It reduces the mean arithmetic return from 698% to 59%, and it reduces the arithmetic alpha from 462% to 32% (Cochrane [2005]).

CONCLUSIONS

We have reviewed the benefits of including real estate and private equity investments in an investor's portfolio. We have also commented on some recent topics that are idiosyncratic to each of these alternative investments. In the case of real estate investments,

several developments, including the introduction of new real estate products, have been initiated in the past few years in an attempt to enhance transparency and liquidity in the real estate markets, at the same time real estate markets throughout the developed world entered into a severe bear market. Futures contracts as well as other financial derivatives in both residential and commercial real estate sectors are among the new real estate financial instruments that have been recently introduced. There are now also many mutual funds, closed-end funds, exchange-traded funds, and hedge funds that are dedicated to real estate investments. Many of them have only recently been launched. It can be predicted that there will be an important increase in liquidity and transparency in the real estate market in the coming years as other new investable real estate products become available and gain the recognition of market participants.

We have also reviewed the benefits of including private equity investments in an investor's portfolio and digressed about some recent topics that are specific to private equity investments. As mentioned, there are several developments, specifically the modeling of private equity returns so as to construct a return distribution through Monte Carlo methods, allowing better understanding of such returns. Furthermore, as we saw, one should pay extreme care when naively computing private equity returns without taking into account the selection-bias correction, which attenuates the spectacular returns that one observes, and disclosing private equity results should be dealt with serious caution. One can only predict that there is an open unexplored field in the study of private equity returns, where there are still many questions, such as what is the exact probability distribution for equity returns and how they change through time.

Finally, as noted earlier, the real estate and private equity markets throughout the developed world entered into a severe bear market (2007–2008). Private equity returns declined by over 64% in 2008 as measured by the S&P Listed Private Equity Index, while real estate returns declined by over 37% as measured by the FTSE Nareit All Index. The total impact of these difficult market conditions on the investment products reviewed in this article and their resilience to these market conditions will be watched closely by industry and academia alike.

ENDNOTES

¹This sub-section draws heavily from Garay [2008].

²For example, Garay [2008] reports that, between 2001 and 2007, the real estate asset class (measured by an index on real estate investment trusts) exhibited a much higher annualized return than the S&P 500 (e.g., 17.4% vs. 3.9%), even as REIT prices declined sharply in 2007, and a slightly lower volatility. Compared to the returns on bonds, real estate investments again reported significantly higher rates of return albeit with higher volatility.

³However, the recent introduction of real estate futures, ETFs that invest in real estate (and which can be sold short), and the possibility of shorting REITs shares, might help mitigate this problem.

⁴For instance, Demyanyk and Van Hemert [2008] document that the sub-prime portion of the mortgage market recorded an explosive growth between 2001 and 2006. In the same vein, Gramlich [2007] reports that sub-prime mortgage originations grew to \$205 billion in 2005, representing around 20% of total originations in that year. This was partially due to the creation of mortgage backed securities (MBS), a product that experienced increasing demand as investors searched for higher yields in a low rate environment.

⁵In May 2006, the Chicago Mercantile Exchange launched futures and options markets on the Standard & Poor's/Case-Shiller Home Price Indices. The futures contracts possess a February quarterly cycle of expiration dates, are settled at \$250 times the index, and were launched for 10 U.S. cities and for an aggregate index. This market has been much more successful than other previous efforts, such as the introduction of a property futures market in the London Futures and Options Exchange in 1991.

⁶For more on private equity investable and non-investable indices, see Szado [2008].

⁷This sub-section draws heavily from the document by Szado [2008].

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pre-157 valuation practices. The optimism of 2006—an era of seemingly unlimited credit expansion, where deals with exotic names like Mantoloking and Ballantyne saw fantastically low yields and AAA ratings—has dissipated. It is always tempting to shoot the messenger, and financial accountants had an unpleasant job to do, with or without new accounting principles. With this background in mind, it is easier to see how the turn in the business cycle might have rather more to do with the calls for a suspension of FAS 157 than the actual principles of the standard. This article provides a detailed analysis of FAS 157 with emphasis on valuation hierarchy, exit price concept, and illiquidity discounts as they relate to auction-rate securities, restricted securities, LP interests, warrants, and convertible securities.

PERSPECTIVES

VOLATILITY EXPOSURE OF CTA PROGRAMS AND OTHER HEDGE FUND STRATEGIES 68

MARC H. MALEK AND SERGEI DOBROVOLSKY

This article examines the dependence of trend-following CTA performance on underlying market volatility, both quantitatively and conceptually. While it is generally believed that CTAs have a long volatility exposure, tests conducted by the authors indicate that it is not quite true. The perception that CTA strategies are long volatility came from academic research and became widespread among traders. The notion of volatility exposure is sometimes confused with a dependence on volatility levels. If a CTA makes money in periods of high volatility and loses in periods of low volatility, its performance depends on the level of volatility. Volatility

exposure, on the other hand, means that the CTA makes money when volatility rises and loses money when volatility falls. Both effects have comparable strength, are directly related, and thus are quite easy to confuse. By the same token, they need to be studied together, as is done in this article. The authors note that volatility exposure—i.e., dependence on volatility changes—should not be confused with dependence on volatility levels.

REAL ESTATE AND PRIVATE EQUITY: A Review of the Diversification Benefits and Some Recent Developments 90

URBI GARAY AND ENRIQUE TER HORST

This article discusses the recent literature on the benefits of including real estate and private equity investments in an investor's portfolio, and examines certain topics that have attracted academic and practitioners' interests in these two areas. In the case of real estate, several recent developments, including the introduction of new real estate products (e.g., derivatives, mutual funds, closed-end funds, exchange-traded funds, and hedge funds dedicated to real estate), have helped to enhance the transparency and liquidity of investments in this asset class, while at the same time real estate markets throughout the developed world entered a severe bear market (2007–2008). In the case of private equity investments, there have been several recent developments, such as the introduction of new investable products and the development of statistical models for private equity returns. Performance measurement issues in the area of private equity investments remains a sparsely explored topic, with several unanswered questions such as the exact nature of the probability distributions of private equity returns and how they change through time.