

PORTFOLIO MANAGEMENT

ALTERNATIVE INVESTMENTS

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* final level

1. Alternative Investments*

1.1 Managing a property portfolio*

In this chapter, the role that can be played by real estate in portfolios of stocks and bonds is examined. Among other things, the optimal weight which should be allocated to real estate is analyzed. This step, which is known as **inter-asset diversification**, is very important and has a much greater impact on portfolio performance than the decision as to how to invest within each asset category (**intra-asset diversification**).

The positive impact (diversification effect) of including real estate in mixed-asset portfolios is examined in a Modern Portfolio Theory (MPT) framework. First, an efficient frontier of portfolios containing stocks and bonds only is constructed. Second, a frontier which contains combinations of stocks, bonds and real estate is constructed. If the frontier that contains financial assets and real estate lies well above the frontier which is comprised solely of stocks and bonds, then real estate has a positive role to play in diversifying mixed-asset portfolios. It would suggest that for a given return level the risk is lower, or, which is equivalent, that for a given risk level, the return is higher when real estate is considered as an investment alternative.

As will be seen in this chapter, the results differ quite substantially depending on what data series is used to proxy for real estate returns. When an appraisal-based series is used without an appropriate correction being made for smoothing, real estate appears to have a very important role to play in multi-asset portfolios. When securitized data are used, real estate has a more moderate impact in reducing the portfolio's risk for a given return level, or in increasing the portfolio's return for a given risk level. With hedonic indices the results should indicate the true benefits of including real estate in mixed-asset portfolios. The results differ also depending on the time period considered, and it is important to analyze the role of real estate over a long time period which spans over complete cycles for the various asset classes. It is usually admitted that the period of investigation should span a minimum of 12-15 years, but longer periods would be better as they would make it possible to consider various sub-periods contained in the full period. The impact of adding real estate to mixed-asset portfolios is investigated for several different countries. This should enable us to reach a conclusion regarding the role which can be played by real estate in mixed-asset portfolios.

To construct efficient frontiers, the average return and standard deviation for each asset class and the correlation coefficient between each pair of assets is needed. We first will briefly introduce the real estate indices (1.1.1). Then we examine the return and risk characteristics of real estate and compare them to the return and risk characteristics of stocks and bonds (1.1.2). We then examine the correlation coefficients between asset classes (1.1.3). The efficient frontiers are then analyzed (1.1.4). As the liquidity of real estate is usually less than that of stocks and bonds, it is important that it be taken into account.

1.1.1 Real Estate Indices*

Price indices for the various asset classes (stocks, bonds, real estate, etc.) are needed for a variety of reasons. They make it possible e.g. to compute holding period returns which enable, in turn, the calculation of the average return and standard deviation for each of the asset classes. Moreover, the correlation coefficient between each pair of assets can be calculated. With the average return, standard deviation for each asset class and the correlation coefficient between each pair of assets, it is possible, as will be seen in the following chapters, to construct optimal portfolios and to gain knowledge as to the optimal weight which should be allocated to each class of asset. Holding period returns also make it possible to investigate the inflation-hedging effectiveness of the various asset categories. Finally, indices are used as benchmarks in performance measurement analyses.

For stocks and bonds, information concerning prices is readily available. These securities are usually traded on exchanges, often even on a continuous basis, and there is wide knowledge of the price of stocks and bonds. This information is available in some daily newspapers, in on-line systems, in financial databases, etc. Due to the abundance of data on securities prices, indices exist in almost every country. In fact, in most countries several stock market indices are available.

Several important issues, however, need to be considered when securities indices are constructed. First, a decision has to be made as to whether the index will encompass the whole market or only a sample of securities. The Dow Jones index of U.S. stocks, for example, only covers 30 stocks, whereas the S&P 500 index includes 500 stocks. If a sample only is considered, a decision rule has to be agreed upon to decide which securities will be included in the sample. Second, the index can be constructed by taking into consideration both the income return (dividends in the case of stocks and coupons in the case of bonds) and the change in price, or only the change in price. The former type of index is named **performance** or **total return index**, while the latter is a **price index**. Third, a weighting for the individual securities has to be chosen. The two methods which are traditionally used are the market capitalization weighting method and the equally-weighted method. With the former method, the weight for each security is obtained by dividing the market capitalization of that company by the total market capitalization, whereas with the latter method each security is awarded the same weight.

Constructing real estate price indices is much more problematic due to the scarcity of data pertaining to transaction prices. This is particularly true for commercial real estate markets, but also for residential markets. Even if prices can be obtained, prices have to be compared with caution as real estate assets are heterogeneous. In some cases, it is also impossible to obtain information on transaction prices.

The real estate investment policy of the main investors varies substantially from one country to another. In some countries, such as in the U.K., emphasis is placed on retail real estate, in others such as Germany, Italy, Sweden or Finland, institutions mainly invest in office properties, while in yet others residential real estate constitutes the bulk of real estate holdings. This is the case for instance in the Netherlands and Switzerland. The available indices for income-producing real estate in the various countries reflect the investment policy of institutions. Due to the lack of information available on transaction prices for retail and office properties, indices based on a regular valuation of properties are widely used. These are called appraisal-based indices and are considered first (1.1.1.1). We will then present one of the methods based on transaction data which are mostly used in the residential sector: quality-

constant indices can be constructed by means of the hedonic approach (1.1.1.2). Finally, indices of securitized real estate are considered (1.1.1.3).

1.1.1.1 Appraisal-based Indices*

Appraisal-based indices are well suited for markets in which price information is scarce and, therefore, exist mostly for commercial real estate. As it is impracticable to consider all properties of a given market, such indices rely on a sample of properties. The starting point of this method is thus to define a sample of properties which is representative of the property market. The property market can be the national market or a geographical submarket. As the properties in the sample are not sold during each period, the value of the properties included in the sample has to be estimated on a regular basis. If a quarterly index is required, the properties will be appraised every quarter. As can be imagined, estimating the value of several properties on a regular basis is a large task. From a practical perspective, this problem can be solved by selecting, for the index, properties that belong to institutions which are for other reasons legally required to estimate the value of their properties on a regular basis.

Appraisal-based indices exist in several countries. In the United States, the NCREIF Property Index (NPI) is the most widely used index. It has existed since 1978 and tracks institutional-grade commercial real estate returns. Sub-indices exist for apartment buildings, industrial properties, offices, retail real estate, and for geographical regions. The indices are computed on a quarterly basis. Investment Property Databank (IPD) computes indices for a large number of European countries (U.K., France, the Netherlands, Germany, Spain, Sweden, etc.), but also for South Africa and Canada. Other companies also construct indices e.g. for Australia, New Zealand and Hong Kong. As for the number of properties that are included in the sample and the market value of such buildings, they amount e.g. to 10'811 (Euros 148.9 billion) for the U.K., 4'743 (Euros 56.8 billion) for France and 1'692 (Euros 21.4 billion) for Sweden as of year-end 2003.

Several authors have argued that appraisal-based series are smoothed, which means that such indices understate the variability of returns in real estate markets. Smoothing enters index returns from two sources. First, valuations are relatively stable through time. Infrequent transactions leave appraisers with little information to work with in determining market value at specific times. This leads appraisers to combine indications of value from the most recent comparable sale with past appraised values to arrive at the value that is actually reported for a given building each period. Second, in addition to any smoothing introduced at the disaggregate level by the appraisal process, aggregation of property values within an index causes additional smoothing. This phenomenon is known as aggregation bias. If property values are appraised at different points in time throughout each calendar quarter, yet all these valuations are, in effect, averaged together in the index to produce the index value attributed to that quarter, then the index value will be a moving average of spot values.

The smoothing issue has been the focus of much research¹. In particular, the causes of smoothing have been investigated in order to devise desmoothing methods. These either consider that real estate markets are efficient (which is unlikely) and hence eliminate all serial correlation of real estate returns or consider markets as being non-efficient. In the latter case, the desmoothing method in most cases requires that some assumption be made regarding the standard deviation of real estate. This is not ideal as one of the aims of a real estate index is

1 For more details on appraisal smoothing, see M. Ball, C. Lizieri and B.D. MacGregor, *The Economics of Commercial Property Markets*, Routledge, London, 1998 and M. Hoesli and B.D. MacGregor, *Property Investment: Principles and Practice of Portfolio Management*, Pearson Education Limited, Harlow, 2000.

precisely to enable accurate estimation of the risk of real estate. This discussion highlights the fact that caution should be exercised when ascertaining the risk level of real estate. It is usually recommended to use several desmoothing methods and to examine how sensitive the results are to the desmoothing approach being used.

1.1.1.2 Hedonic Indices*

The hedonic method has been devised as a control for the heterogeneity of real estate assets and, thus, make it possible to construct quality-constant indices. Although the hedonic methodology was first developed to track automobile prices, the model is very well suited for real estate. This approach recognizes that a property is a composite product: while the attributes are not sold separately, regressing the attributes on the sales price of the composite product yields the marginal contribution of each attribute to the sales price.

The method requires the calculation of one hedonic regression for the whole period. This is made possible through the use of dummy variables (or binary variables). For each time period (month, quarter, year, etc.) a dummy variable is included in the model. For each property, the dummy variable for a given period is equal to 1 if the property sold during that period and a value of 0 otherwise. The price changes from the base year can be inferred from the coefficients of the time dummy variables.

$$P = \sum_{k=1}^m \beta_k \cdot X_k + \sum_{t=1}^T \delta_t \cdot D_t + \varepsilon$$

where

D_t	time dummy variables (= 1 if property sold in t , = 0 otherwise)
β_k	coefficient of the characteristics of the property
δ_t	coefficient of the time dummy variables
ε	error term

The hedonic approach is very attractive as it relies on transaction prices (rather than appraisals) and corrects for the heterogeneity of assets by taking the characteristics of the assets into account. The resulting indices should, therefore, monitor price changes in a reliable manner. A further advantage of the hedonic method is that it permits valuation of properties based on transaction prices and not on judgments by appraisers. There are also some problems with the hedonic method. For instance, there is a decision of which quality variables to include in the regression model. Also, there is often a lack of data available on the various quality attributes of properties. Some of the hedonic variables that are relevant to valuation may not be observable.

1.1.1.3 Indices of Securitized Real Estate*

Given the difficulties of constructing indices for direct real estate investments due to the scarcity of data, it may seem appealing to use data for securitized real estate investments. Provided such investments behave in a similar fashion to direct real estate investments, indices of securitized real estate can be used as indicators of price changes on the direct real estate market. This debate has been the focus of much research and the main conclusion of that debate is discussed further in this section. In any case, indices of securitized real estate are very useful as benchmarks for investors who own such shares.

A real estate company is a company that invests in income-producing real estate and whose shares are traded on the stock exchange. Such companies exist in almost all countries, although institutional and legal differences exist. For instance, some companies are pure investment companies, whereas others are also development or construction companies. Also, there are differences across countries as to the level of leverage and the way such companies are taxed.

Several national and international real estate securities indices exist. The most comprehensive U.S. index is the NAREIT index computed by the National Association of REITs. In the U.K., the Financial Times-Stock Exchange Property Sector index is widely used. Global Property Research (GPR) computes a world-wide index of property companies, but also indices for various countries as well as continental indices. As of the end of April 2003, the number of companies included in the GPR database was 353, with a market capitalization of approximately Euros 270 billion. The European Public Real Estate Association (EPRA) also computes indices of European real estate securities.

Much research has shown that returns on real estate securities are highly correlated with common stock returns, and that real estate returns and real estate securities returns exhibit far less co-movement. For the U.S., the correlation between real estate securities and direct real estate is -0.06, whereas that between real estate securities and common stocks is 0.54 (quarterly data for the period 1980-2002). For the U.K., these correlations are 0.09 and 0.67, respectively (1987-2002 time period). The high correlation of securitized real estate with common stocks can be seen in Figure 1-1. The figure also highlights the much greater volatility of real estate securities as compared with that of direct real estate.

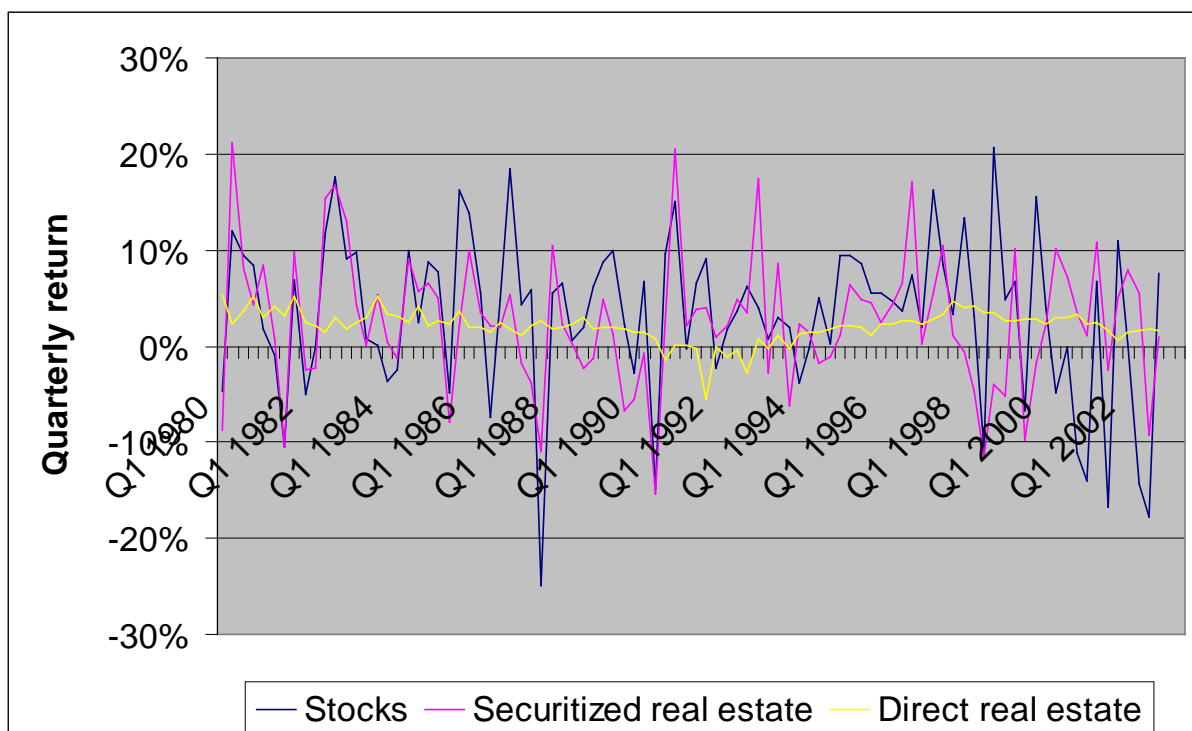


Figure 1-1: Quarterly returns on U.S. securitized real estate, stocks and direct real estate, 1980-2002

1.1.2 Return and Risk of Real Estate*

In this section, first the theoretical notions on return and risk are explained. Then the main conclusions regarding the average return and standard deviation of real estate are presented. A comparison with the return and risk of stocks and bonds is also presented. As mentioned above, the conclusions vary quite substantially depending on what data series is used for real estate. Repeat sales indices have rarely been used in such studies, and indices of averages of transaction prices are considered as having too much bias. Most research that has analyzed the financial characteristics of real estate investments has thus been based on the other three types of real estate indices (appraisal-based, hedonic and securitized). The return and risk characteristics of real estate are presented hereafter separately for each of the following types of real estate indices: appraisal-based indices, averages of transaction prices, hedonic indices and indices of real estate securities. A similar structure is used in sections 1.1.3 and 1.1.4.

1.1.2.1 Theoretical Notions*

The most common measure of return is the **holding period return**, also called rate of return over a given period. For any asset, including real estate, the rate of return is defined as the appreciation (or depreciation) in the asset's price plus any cash flow (rental income minus expenses) received² divided by the asset's price at the beginning of the period:

$$R_{t-1,t} = \frac{P_t - P_{t-1} + CF_t}{P_{t-1}}$$

where $R_{t-1,t}$ is the return on the asset over the time period from time $t - 1$ to t , P_t is the price of the asset at time t , P_{t-1} is the price of the asset at time $t - 1$ and CF_t the cash flow during period t .

If we want to compute the compound return over several periods, we can either calculate the geometric average of holding period returns (or discrete returns), or calculate at first continuously compounded returns which can be averaged simply using the arithmetic average. The formula for the **continuously compounded return** is³:

$$r_{t-1,t} = \ln \left(\frac{P_t + CF_t}{P_{t-1}} \right)$$

When an investor buys an asset, he must consider not only that asset's return but also the risk associated with such an investment. In practice, there is a risk of upward price movements as well as a risk of downward movements (although only the latter is unpleasant). The exact expected return is hardly ever achieved and the investor will in most cases earn more or less than what he had expected. From this standpoint, measuring risk should involve measuring deviations from the mean. The most common way of doing this is to take the sum of squared deviations from the mean. This measure is called the **variance**:

$$\text{Var}(r) = \sigma^2 = \frac{\sum_{t=1}^T (r_{t-1,t} - r)^2}{T-1}$$

where r is the mean of all measured returns and T the number of observations.

2 For simplification purposes, it is assumed that cash flow is received at the end of the period.

3 The notation for continuously compounded returns is a lower case r . An upper case R is used for discrete returns.

The “squaring” of the deviations from the expected return is used to treat equally both positive and negative deviations from the average return. The **standard deviation** (SD) removes the distorting impact associated with a squared unit of measure:

$$SD = \sigma = \sqrt{\text{Var}(r)}$$

1.1.2.2 Return and Risk with Appraisal-based Indices*

As mentioned in section 1.1.1, appraisal-based indices are mostly used for commercial real estate due to the lack of transaction data for this type of real estate. Thus the results which are presented in this section pertain predominantly – but not exclusively – to commercial real estate.

When appraisal-based real estate series are used, the standard deviation of real estate returns is very low. For the U.K., the following results are obtained for the period 1971-2002:

Asset class	Mean annual return	Standard deviation
Real estate	12.6%	10.7%
Stocks	17.5%	32.6%
Bonds	12.8%	16.7%

Table 1-1: Return and risk on U.K. real estate, stocks and bonds (1971-2002)

These results show that stocks constitute the asset class with the highest return and risk. As compared to bonds, real estate appears as a very interesting asset class: whereas the return on both asset classes is almost identical, the risk of real estate is much lower than that of bonds. Similar results have been reported in other countries.

However, and as discussed in section 1.1.1, appraisal-based indices have been shown to be smoothed. Appraisers tend to stick to their previous valuation, therefore reducing the price changes, which leads the variance to be biased toward zero. Also, aggregation bias, due to the fact that appraisals are carried out over a given time period rather than at a given point in time, leads to additional smoothing. For these reasons, the variance of appraisal-based returns is a biased estimator of the true variance of real estate returns. The average return computed from appraisal-based series, however, should reflect quite well the true return on real estate.

Several authors have desmoothed appraisal-based series in order to obtain more reliable second moments of the distributions⁴. Their results suggest that the standard deviation of real estate should be increased by a factor of 3 to 5 using quarterly nominal returns on the NCREIF Property Index (NPI) index for the U.S. and by a factor of 1.6 using the Jones Lang Wootton (JLW) annual index for the U.K.⁵

Thus, when real estate returns are desmoothed, the return and risk characteristics of real estate are quite similar to those of bonds. Obviously, the conclusion will depend on what type of real

4 For a review, see M. Hoesli and B.D. MacGregor, *Property investment: principles and practice of portfolio management*, Pearson Education Limited, Harlow, 2000.

5 These results are reported in S.A. Ross and R.C. Zisler, “Risk and return in real estate”, *Journal of Real Estate Finance and Economics*, 4(2), pp. 175-190, 1991, and R. Barkham and D. Geltner, “Unsmoothing British valuation-based returns without assuming an efficient market”, *Journal of Property Research*, 11(2), pp. 81-95, 1994.

estate is considered in a given country, but also whether government bonds and/or corporate bonds are considered. When a larger proportion of residential real estate is contained in the index, then such characteristics should be close to those of bonds, whereas somewhat higher return and risk parameters should be obtained when office and retail real estate is heavily weighted in the index. For the U.K., where the index mainly encompasses retail real estate, the return and risk on desmoothed real estate and bonds is 11.0% and 11.5%, and 10.6% and 8.1%, respectively⁶. In Finland, where both the office and stock markets are quite dependant on one single company (Nokia), the return and risk characteristics of office properties in Helsinki are much higher than those of bonds. For the period 1971-2002, we have:

Asset class	Mean annual return	Standard deviation
Helsinki offices	18.3%	18.4%
Stocks	22.6%	42.6%
Bonds	8.9%	6.1%

Table 1-2: Return and risk on real estate, stocks and bonds in Finland (1971-2002)

Real estate thus has lower return and risk characteristics than stocks, and quite similar parameters to bonds. The illiquidity of real estate, however, still hasn't been accounted for. As real estate is an illiquid asset class, an illiquidity premium is incorporated in expected returns which needs to be subtracted from ex post returns. This will make the comparison with other asset classes more meaningful. Some formal studies have attempted to determine empirically the amount of the illiquidity premium by computing the difference between the realized return and the return that would be expected in a Capital Asset Pricing Model (CAPM) framework. Using real annual returns in the U.S., it has been found e.g. that the mean liquidity premium is 2.86% (as compared to a mean return of 11.78%). This premium appears to be time-varying as the range for the premium is 1.40-4.31%⁷.

1.1.2.3 Return and Risk with Hedonic Indices*

As discussed in section 1.1.1, the hedonic method should best reflect the true evolution of prices on real estate markets. It is particularly well suited for residential real estate as more data are available than for the commercial real estate sector, but has been also used in some studies of the U.S. commercial real estate market⁸.

6 M. Hoesli, J. Lekander and W. Witkiewicz, "International evidence on real estate as a portfolio diversifier", *Journal of Real Estate Research*, 26(2), pp. 161-206, 2004.

7 D.N. Leggett, "An empirical analysis of efficient real property liquidity premiums", in *Alternative Ideas in Real Estate Investment*, ARES Real Estate Research Issues, Vol. 2, A.L. Schwartz, Jr. and S.D. Kapplin (Eds), chapter 7, pp. 113-127, Kluwer, Boston, 1995.

8 See e.g. J. Fisher, D. Gatzlaff, D. Geltner and D. Haurin, "Controlling for the impact of variable liquidity in commercial real estate price indices", *Real Estate Economics*, 31(2), pp. 269-303, 2003.

Hedonic indices are used to measure the return and risk parameters of real estate in Switzerland. This is because Swiss institutional investors mainly consider apartment buildings for their allocation to real estate, making it possible to construct hedonic indices. Table 1-3 contains the return and risk for apartment buildings, stocks and bonds for the period 1979-2002⁹. Total returns are used. The results highlight the fact that real estate has a lower return and risk than stocks, and a slightly higher return and risk than bonds.

Asset class	Mean return	Standard deviation
Apartment buildings	5.3%	7.1%
Stocks	9.1%	21.6%
Bonds	4.7%	4.4%

Table 1-3: Return and risk of Swiss apartment buildings, stocks and bonds (1979-2002)

The analysis of the return and risk of real estate is an area in which extensive research is being undertaken. Over the next few years, the further development of hedonic real estate price and performance indices will greatly improve the quality of data available, and a whole range of studies is expected in the area of return and risk analysis. Such developments should permit the analysis of real estate returns by property type and by geographical areas.

1.1.2.4 Return and Risk with Indices of Securitized Real Estate*

As a result of the relative paucity of transaction-based data in direct real estate markets, it may seem appealing to proxy the return and risk of direct investments with data for securitized real estate investments. Securitized real estate, however, has been shown to be an imperfect indicator of direct markets and to capture some stock market factors. However, for investors wishing to invest in real estate through the stock market, the results presented hereafter should prove useful. Table 1-4 reports the return and risk of U.S. Equity Real Estate Investment Trusts (EREITs), stocks and bonds for the period 1980-2002 using data for annual increments, while Table 1-5 reports quarterly results for U.K. property companies, stocks and bonds for the period 1987-2002.

Asset class	Mean return	Standard deviation
EREITs	10.4%	14.7%
Stocks	12.7%	15.8%
Bonds	9.4%	6.5%

Table 1-4: Annual return and risk of U.S. securitized real estate, stocks and bonds (1980-2002)

⁹ For 1981-1986, the returns are from M. Hoesli and F. Hamelink, "An examination of the role of Geneva and Zurich housing in Swiss institutional portfolios", *Journal of Property Valuation and Investment*, 15(4), pp. 354-371, 1997. As from 1987, the IAZI performance index of apartment buildings is used.

Asset class	Mean return	Standard deviation
Property companies	2.0%	11.1%
Stocks	2.4%	9.4%
Bonds	2.4%	3.2%

Table 1-5: Quarterly return and risk of U.K. securitized real estate, stocks and bonds (1987-2002)

The results for securitized real estate are quite similar to those for common stocks. This is not surprising as securitized real estate trades on a stock exchange and thus captures stock market factors.

1.1.3 Correlation between the Returns on Various Asset Classes*

The key input, in addition to the average return and variance, to decide upon inclusion of real estate in a mixed-asset portfolio are the correlation coefficients between real estate and the other assets included in a portfolio. Indeed, the risk of the mixed-asset portfolio will not just be the weighted average of the risks of the individual assets, but will depend on the correlation of the assets. Therefore, we need to examine the correlation between real estate and the different asset classes. The section starts with an overview of the necessary theoretical notions, and then discusses the correlation coefficient between real estate and stocks and that between real estate and bonds for the main real estate index types (appraisal-based indices, hedonic indices and indices of securitized real estate).

1.1.3.1 Theoretical Notions*

The **covariance** between the returns r_X and r_Y of two securities X and Y is defined as:

$$\sigma_{X,Y} = \text{Cov}(r_X, r_Y) = E \left[(r_X - E(r_X)) \cdot (r_Y - E(r_Y)) \right]$$

where $E(\cdot)$ denotes the expectation operator. The covariance is a linear measure of the degree to which the two returns move together, or covary.

The **correlation coefficient** between the returns r_X and r_Y of two securities X and Y is defined as the covariance divided by the product of standard deviations:

$$\rho_{X,Y} = \text{Corr}(r_X, r_Y) = \frac{\sigma_{X,Y}}{\sigma_X \cdot \sigma_Y} = \frac{E \left[(r_X - E(r_X)) \cdot (r_Y - E(r_Y)) \right]}{\sqrt{E \left[(r_X - E(r_X))^2 \right]} \cdot \sqrt{E \left[(r_Y - E(r_Y))^2 \right]}}$$

It is easy to see that when $r_X = r_Y$, that is, $X = Y$, the correlation coefficient equals 1 (perfect positive correlation), and that when $r_X = -r_Y$, that is, $X = -Y$, the correlation coefficient equals -1 (perfect negative correlation). The closer the correlation coefficient is to -1 , the greater the diversification benefits. The diversification benefits diminish as the correlation coefficient increases.

1.1.3.2 Correlation with Appraisal-based Indices*

Numerous studies have made use of appraisal-based series to proxy for real estate returns, mainly in the U.S. and the U.K. where appraisal-based indices have been published regularly for more than two decades. Low positive or negative correlations between real estate returns and the returns on stocks and bonds are observed. Correlation coefficients have been found to be not very stable over time, and it is clear that single years have a dramatic effect on the correlation. The general conclusion, however, is that real estate returns are lowly correlated with the returns of stocks and bonds. In fact, the correlation between real estate and bonds is often slightly negative. Results for the U.S. and the U.K are reported in Table 1-6.

Correlation of RE with	U.S. 1980-2002	U.K. 1971-2002
Stocks	0.08	0.19
Bonds	-0.06	0.08

Table 1-6: Correlation of real estate with stocks and bonds in the U.S. and U.K. using appraisal-based real estate indices

Several authors have argued that due to the smoothing of appraisal-based series, the covariance and correlation of short-interval returns with contemporaneous returns on other assets is biased toward zero. The empirical evidence, however, is somewhat mixed as regards the effect of unsmoothing returns on the magnitude of the correlation coefficient.

Three comments regarding these correlations are in place. First, the confidence intervals around these point estimates are quite large, so caution has to be exercised when interpreting the levels of correlation. Second, these correlations are calculated with quarterly or annual time increments, and it is likely that correlations would be higher if three-year or five-year time increments could be used. Finally, the low correlations are to some extent not surprising. Investors often adopt a “herd behavior” in that they purchase assets whose price is rising and often sell when markets are bearish. This leads to cycles between asset classes being less connected than what could be expected intuitively.

1.1.3.3 Correlation with Hedonic Indices*

Hedonic valuation methods are a promising alternative to the use of subjective appraisal-based series. It is interesting to use the hedonic index of Swiss apartment buildings to analyze the correlation between real estate and stocks and bonds. For the period 1979-2002, the correlation coefficients are as follows (Table 1-7):

Correlation of RE with	Switzerland 1979-2002
Stocks	-0.04
Bonds	-0.31

Table 1-7: Correlation of real estate with stocks and bonds in Switzerland using a hedonic index of apartment buildings

These results suggest that the returns on apartment buildings in Switzerland are lowly correlated with stocks and bonds and that this asset class offers diversification benefits.

1.1.3.4 Correlation with Indices of Securitized Real Estate*

High degrees of correlation between the returns on real estate securities and those on common stocks have been reported for most countries, with the exception of Austria and Germany and, to a lesser extent, Belgium, the Netherlands and Switzerland¹⁰. The correlation coefficient between real estate securities and stocks and bonds in the U.S. and U.K. are reported in Table 1-8.

Correlation of securitized RE and	U.S. 1980-2002	U.K. 1987-2002
Stocks	0.54	0.67
Bonds	0.37	0.20

Table 1-8: Correlation coefficients between quarterly returns on real estate securities and returns on stocks and bonds in the U.S. (1980-2002) and the U.K. (1987-2002)

The fact that real estate securities are highly correlated with stocks is an indication that such investments are viewed by investors primarily as stock-like investments rather than like real estate investments. In this respect, it is worthwhile to examine the correlation between securitized real estate investments and direct real estate investments. In the U.S., the correlation between equity REIT returns and direct real estate returns is -0.06 for the period 1980-2002. In the U.K., the correlation between property company returns and direct real estate returns is 0.09 for the period 1987-2002.

The correlations between real estate security returns and stocks returns have been found to be declining in the 1990s¹¹. Figure 1-2 shows the correlation between U.S. REIT returns and stocks returns computed on moving windows of seven years of data. The first correlation pertains to the period from the 1st quarter of 1980 to the 4th quarter of 1986, while the last correlation is for the period from the 1st quarter of 1996 to the 4th quarter of 2002. Such drops could be an indication that the growing interest of institutional investors for indirect real estate investments has led to an increased efficiency of the securitized real estate market.

10 P.M.A. Eichholtz, "Real estate securities and common stocks: a first international look", *Real Estate Finance*, 14(1), pp. 70-74, 1997.

11 D. Brounen, "Real estate stocks: real estate or stocks?", working paper, University of Amsterdam, 2003.

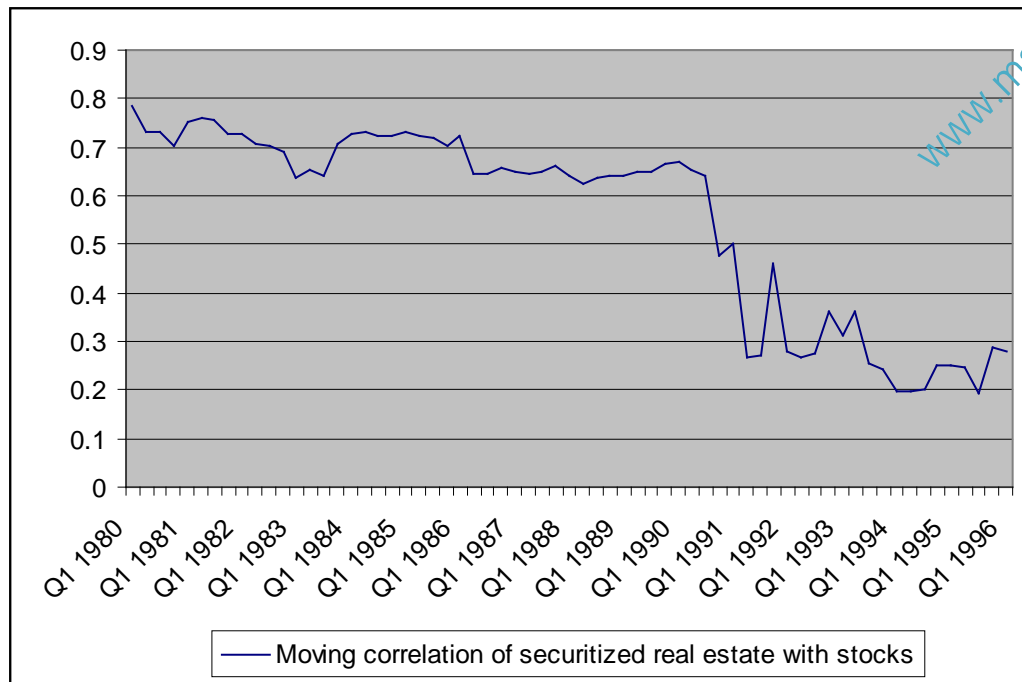


Figure 1-2: Correlation coefficient between quarterly returns on real estate securities and returns on stocks in the U.S. (computed on 7-year moving windows)

1.1.3.5 Conclusion*

The correlation between real estate and stocks, as well as that between real estate and bonds have been analyzed for several different countries and for each type of real estate index. We can conclude that over long periods of time real estate returns are moderately (positively in most cases) correlated with the returns on stocks. In most cases, the correlation between real estate and bond returns is moderately negative. These correlations and the average return and risk for each of the asset classes make it possible to construct efficient frontiers.

1.1.4 Determining the Share of Real Estate in Optimal Portfolios*

Two things are important for inclusion of a new asset in a portfolio: the correlation between the asset and those already included in the portfolio and the return/risk ratios of these assets. The magnitude and sign of the correlation coefficients have a great impact on the role that can be played by any particular asset in a portfolio. The return and risk characteristics of each asset class are also important in determining the optimal portfolio compositions. For instance, if an asset with the highest return and risk is added, it will necessarily lie on the efficient frontier no matter what its correlation with other assets is. Bonds usually lie at the bottom end of the frontier and stocks at the top end of the frontier, whereas portfolios that contain real estate lie in the middle range of the frontier.

After presenting shortly the needed theoretical concepts on portfolio optimization (1.1.4.1), we review the question of the role of real estate in optimal portfolios. As was seen in sections 1.1.2 and 1.1.3, the return and risk characteristics and the correlation coefficients between real estate and stocks and between real estate and bonds vary quite substantially depending on the data series which are used to proxy for real estate returns. The conclusion regarding the role of real estate in diversifying mixed-asset portfolios and regarding the weight which should be allocated to real estate in a portfolio will therefore depend on the type of index being used.

We analyze the role that can be played by real estate in a portfolio for the three main types of real estate indices.

1.1.4.1 Theoretical Notions*

1.1.4.1.1 Return and Variance of a Portfolio*

Ex post, **the average return on a portfolio** is the weighted average of the individual realized returns of the securities contained in the portfolio:

$$\bar{R}_p = \sum_{i=1}^N x_i \cdot \bar{R}_i = x_1 \cdot \bar{R}_1 + x_2 \cdot \bar{R}_2 + \dots + x_N \cdot \bar{R}_N$$

where \bar{R}_p is the average return on the portfolio, \bar{R}_i is the average return on asset i , x_i is the relative weight of asset i in portfolio P , and N is the number of assets available.

Example:

Let there be three securities A, B, and C with realized returns of 10%, 11% and 15%, respectively, over the last year. A portfolio was invested equally in all three assets. What is the realized return of the portfolio over the last year?

$$\bar{R}_p = 33.33\% \cdot 10\% + 33.33\% \cdot 11\% + 33.33\% \cdot 15\% = 12\%$$

The **variance of a portfolio** is the variance of its rate of return. As we have just seen, the portfolio rate of return is a weighted average of the random rates of return of the assets in the portfolio.

One can show that in a portfolio with N assets, we have:

$$\sigma_p^2 = \sum_{i=1}^N \sum_{j=1}^N x_i \cdot x_j \cdot \sigma_{i,j} = \sum_{i=1}^N \sum_{j=1}^N x_i \cdot x_j \cdot \rho_{ij} \cdot \sigma_i \cdot \sigma_j$$

Thus, the risk (standard deviation) of a portfolio is in general not equal to the weighted average of the standard deviations of the assets in the portfolio, as there is an extra term depending on the correlation coefficient (ρ_{ij}) of the assets in the portfolio. In fact, as ρ_{ij} is always between -1 and $+1$, the risk of a portfolio can only be **smaller** ($\rho_{ij} < 1$) **or equal** ($\rho_{ij} = 1$) to the weighted average standard deviation of the assets in the portfolio.

Example:

Let us consider an equally-weighted portfolio with three assets A, B, and C. We know that $\sigma_A = 15\%$, $\sigma_B = 20\%$, and $\sigma_C = 25\%$.

If the assets are perfectly correlated, meaning the correlations are equal to 1, the portfolio standard deviation becomes the arithmetic average of the standard deviation of the three assets:

$$\begin{aligned} \sigma_p &= \frac{1}{3} \cdot (0.15 + 0.20 + 0.25) \\ &= 20\% \end{aligned}$$

If the correlations are different from 1, e.g. $\rho_{AB} = 0.5$, $\rho_{AC} = 0.7$, and $\rho_{BC} = 0.55$ (still highly positive, but not perfectly correlated), the portfolio standard deviation becomes:

$$\begin{aligned} \sigma_p &= \sqrt{\frac{1}{3^2} \cdot (0.15^2 + 0.20^2 + 0.25^2 + 2 \cdot 0.50 \cdot 0.15 \cdot 0.20 + 2 \cdot 0.70 \cdot 0.15 \cdot 0.25 + 2 \cdot 0.55 \cdot 0.20 \cdot 0.25)} \\ &= 17.08\% \end{aligned}$$

Which clearly shows the positive (reducing) effect on portfolio risk of diversification into non-perfectly correlated assets.

The possible combinations between two risky assets can be plotted in the mean-variance scale, where A is the low return/low risk asset and B the high return/high risk asset:

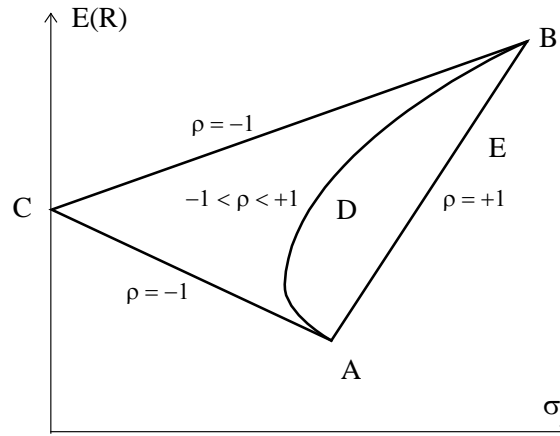


Figure 1-3: The efficient frontier (two risky assets)

- If the correlation is perfectly positive ($\rho = +1$), there is no gain from diversification. The efficient frontier is the **straight line** between the two assets A and B.
- If the correlation is perfectly negative ($\rho = -1$), the diversification benefits are the largest; it is in fact possible to create a risk-free portfolio having a positive return (point C). ACB is the set of possible combinations, but only combinations on BC are efficient.
- For all correlation coefficients between $+1$ and -1 , the combinations are situated on a parabola between A and B. The parabola has always a concave form.

1.1.4.1.2 Risk Preference and Indifference Curves*

The choice of the optimal combination for the investor depends on his attitude towards risk; a highly risk averse investor will prefer a low risk/low return portfolio over a high risk/high return portfolio and vice-versa. The preferences of the investor can be represented graphically through the use of indifference curves.

These curves are the locus of points in the mean-standard deviation plane - usually drawn with the volatility (standard deviation) on the horizontal axis and the expected return on the vertical axis - each point thus representing a particular asset or portfolio, between which the investor is indifferent (A, B). These curves are level curves (in the sense of level curves on a geographical map), the level in question being the level of satisfaction in the fulfillment of the investment objective. **Two portfolios on the same curve are equally desirable**, thus meaning that, for the particular investor whose preferences are depicted, the trade-off between risk and return is appropriately represented by the slope of the line joining the two points. The variation in risk exactly matches the extra yield he wants, thus leaving him with the same “utility” level (or “satisfaction”).

First, all indifference curves are **upward sloping** (from the dominance property, an increase of risk should be rewarded by an increase of expected return if the investor is risk-averse).

Second, the curves located further (higher) in the north-west direction (more towards the upper left corner) correspond to **higher levels of utility**, i.e. to more desirable portfolios in the eyes of the investor represented. Hence, in the figure below, the investor prefers A and B to C and D, but he is indifferent between A and B.

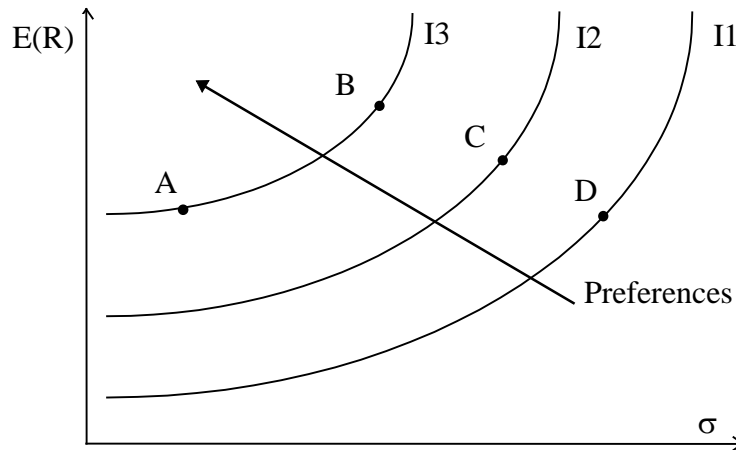


Figure 1-4: Indifference curves and utility levels

Third, the **slope is a measure of risk aversion**: investors are risk-averse, that is, they are not ready to undertake a fair gamble (a fair gamble is a game in which there is an expected return of zero with equal chances of winning and losing). The more an investor is risk averse, the more additional expected returns, i.e. the higher risk premiums, he wants for a certain level of risk. This is equivalent to saying that the indifference curve is steeper for a more risk averse investor.

1.1.4.1.3 Choice of the Optimal Portfolio*

The choice of the optimal portfolio for each investor depends on the investor's risk preference (represented through his individual indifference curve) and the available efficient portfolios (optimizing the risk for a given return).

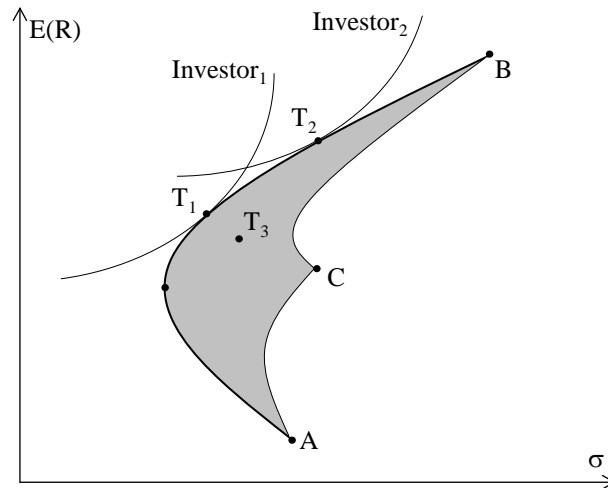


Figure 1-5: Optimal portfolios for two investors

In the above figure, Investor 1 is highly risk averse (steep indifference curves). His optimal portfolio will therefore be at the tangential point (T_1) between his indifference curve and the efficient frontier built from the assets A, B and C. Investor 2 is less risk averse. His optimal portfolio is T_2 , offering a higher return than T_1 , but also a higher risk. The portfolio T_3 can't be an optimal portfolio in any case, as it is situated below the efficient frontier; for the same level of risk, it is in fact possible to construct a portfolio with a higher return.

1.1.4.2 Efficient Sets with Appraisal-based Indices*

Real estate has been reported to have very low standard deviations of returns when appraisal-based series are used. Moreover, real estate's returns appear to be lowly correlated with the returns on financial assets. When such characteristics are used for real estate to ascertain the role that can be played by that asset class in diversifying a portfolio containing stocks and bonds, the conclusion can only be that real estate has a very positive role to play. The weight which should be allocated to real estate will also be important.

Studies that have used raw returns on appraisal-based indices of U.S. real estate find optimal weights for real estate in mixed-asset portfolios from 83 to 98% for the various periods that have been examined. As was seen above, the smoothing problem of appraisal-based series leads to the standard deviations of real estate being underestimated. If this is the case, the weight given to real estate in portfolio analyses would be overestimated. Several authors have attempted to unsmooth appraisal-based real estate indices, and to use return, risk and correlation parameters calculated on such unsmoothed indices to gain a more accurate knowledge as to the weight which should be attributed to real estate.

The overall conclusion of such studies in the U.S. is that real estate has a significant role to play in diversifying mixed-asset portfolios, and that the optimal weight of real estate in multi-asset portfolios is in the 15-20% range¹². Some studies have even reported weights of up to 30-40% for real estate in an optimal mixed-asset portfolio. The results depend in part on whether domestic financial assets only are considered, or whether international stocks and bonds are also taken into account. If the latter is done, the weight of real estate diminishes slightly. A recent study has investigated the role of real estate in mixed-asset portfolios in

¹² See R.M. Ennis and P. Burik, "Pension fund real estate investment under a simple equilibrium pricing model", *Financial Analysts Journal*, 47(3), pp. 20-30, 1991.

several countries (Australia, France, the Netherlands, Sweden, the U.K. and the U.S.) for the period 1987-2001¹³. The optimal allocation to the various asset classes are depicted in Figure 1-6 to Figure 1-8 for Australia, France and the U.K., respectively. In these figures, both domestic and international financial assets are considered, but only domestic real estate. The conclusion that real estate should account for 15-20% in a mixed-asset portfolio is confirmed despite the fact that real estate markets were very often bearish during the period 1987-2001.

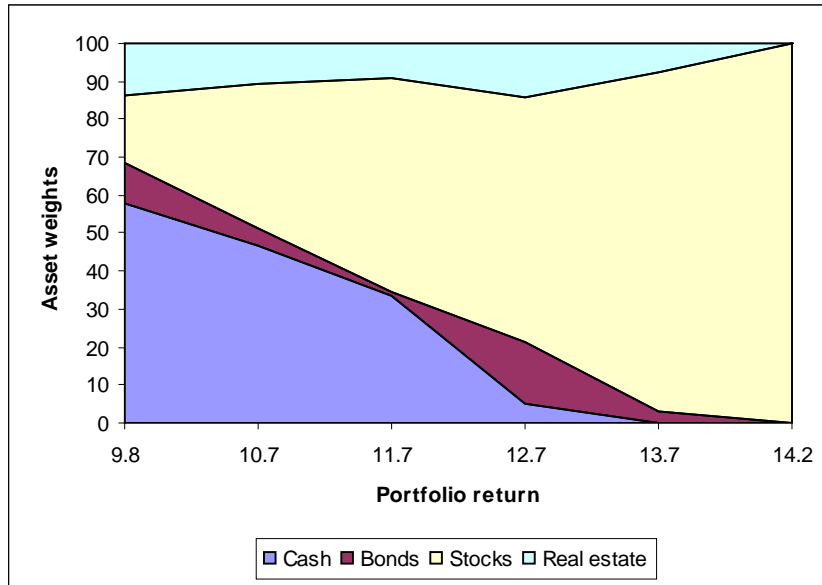


Figure 1-6: Optimal allocations to the various asset classes in Australia, 1987-2001

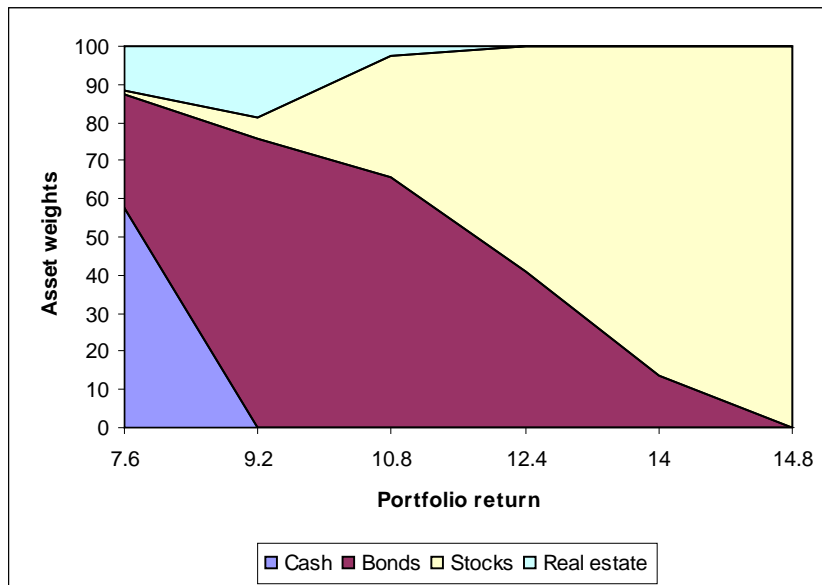


Figure 1-7: Optimal allocations to the various asset classes in France, 1987-2001

13 M. Hoesli, J. Lekander and W. Witkiewicz, "International evidence on real estate as a portfolio diversifier", Journal of Real Estate Research, 26(2), pp. 161-206, 2004.

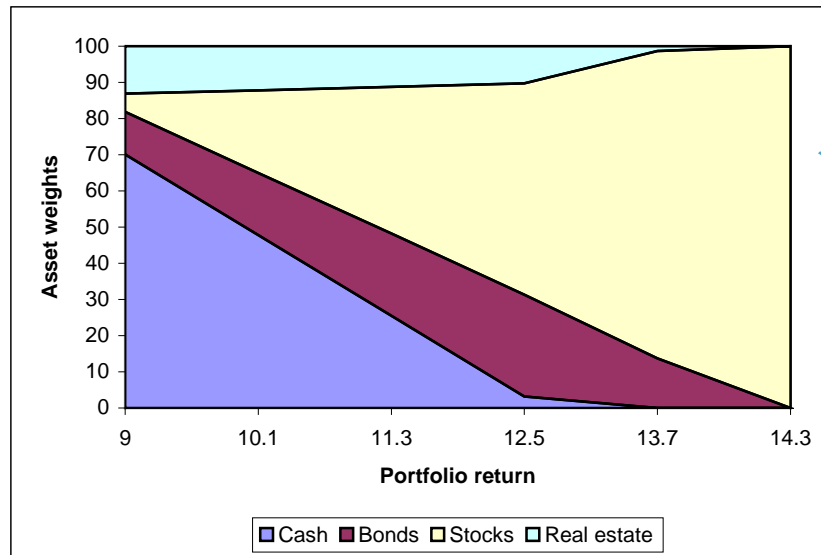


Figure 1-8: Optimal allocations to the various asset classes in the U.K., 1987-2001

The risk reduction benefits that stem from incorporating real estate in a mixed-asset portfolio are in the 10-15% range in most countries¹⁴. This means that the portfolio's standard deviation can be reduced by 10-15% for a given return level when real estate is included in a portfolio. Figure 1-9 shows the efficient frontier of assets with and without real estate for the U.K. for the period 1971-2002. The results are considered both without and with a 100 basis points liquidity premium that has been subtracted from the average return on real estate. This figure clearly shows the benefits from including real estate in a mixed-asset portfolio: at low risk levels, the average return can be enhanced by 100-150 basis points. This increase is quite substantial as it relates to the average return. Alternatively, the standard deviation can be decreased by 200-400 basis points for a given return level. Also, real estate makes it possible to reach lower absolute risk levels, which is an important feature for many investors. At the upper end of the efficient frontier, the positive effect of including real estate is more limited.

14 M. Hoesli, J. Lekander and W. Witkiewicz, "International evidence on real estate as a portfolio diversifier", *Journal of Real Estate Research*, 26(2), pp. 161-206, 2004.

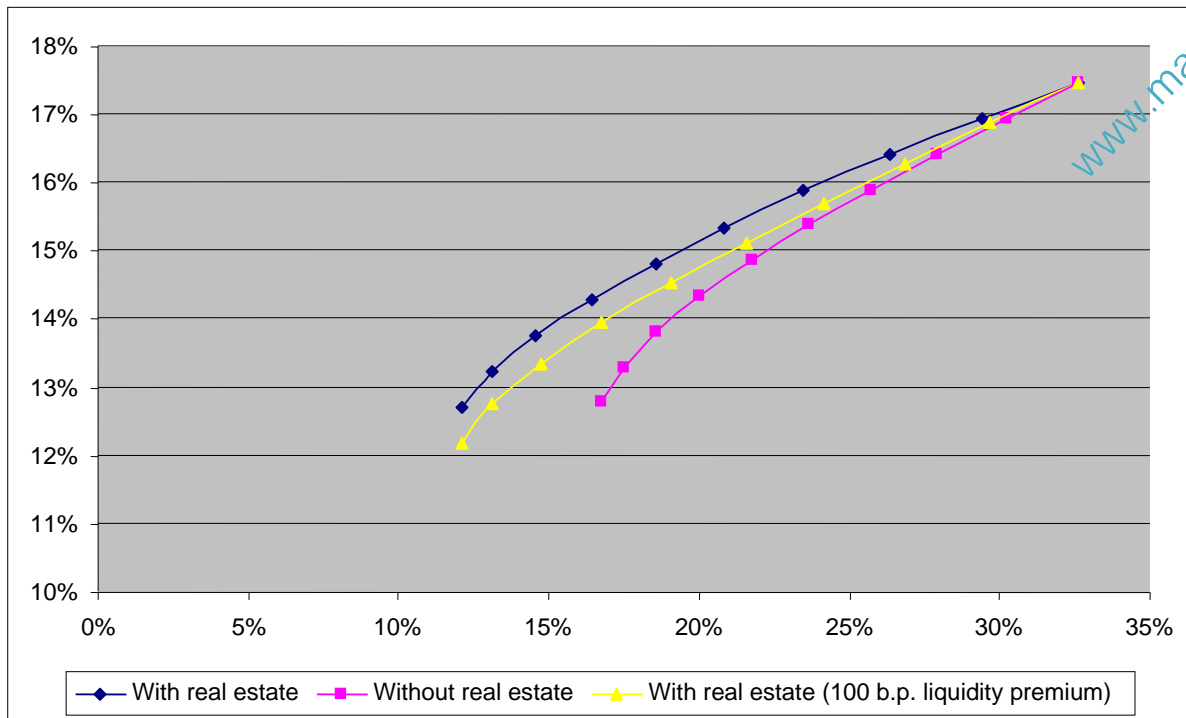


Figure 1-9: U.K. efficient frontiers with and without real estate, 1971-2002 (desmoothed data)

The positive benefits from including real estate are even greater when international real estate investments are considered in addition to domestic real estate assets. The risk reduction benefits often rise to 20% and the weight that should be allocated to real estate is approximately 25%. International diversification in real estate appears to be much more useful than for financial assets. This is because real estate markets are not very integrated on an international basis as compared to financial markets.

Investors usually hold the bulk of their real estate allocation in domestic assets (this is known as home bias¹⁵). This is because local knowledge, and local representation, is very important when investing in real estate. If an investor does not have local understanding and local presence, she or he bears the risk of being less informed than the local investor. Further, location has a strong impact on property values, and determining the quality of location requires specialized knowledge of the local market. Last but not least, the legal and tax dimensions of overseas real estate investment should be understood. The interest of investors for overseas real estate investments has clearly increased in the recent past. Investors are seeking vehicles that enable such investment while taking into account the local specificities. Recent years have seen an increase both in number and market values of private indirect real estate vehicles to respond to this need. Unlike property securities, such investments behave in a very similar fashion to direct real estate investments.

15 See M. Hoesli, J. Lekander and W. Witkiewicz, "Real estate in the institutional portfolio: a comparison of suggested and actual weights", *Journal of Alternative Investments*, 6(3), pp. 53-59, 2003.

1.1.4.3 Efficient Sets with Hedonic Indices*

Hedonic indices have been used very seldom to ascertain the role of real estate in mixed-asset portfolios. As mentioned previously, Swiss institutional investors invest in real estate through the purchase of apartment buildings. A hedonic index has been developed for this type of real estate in Switzerland and that index is used to construct Figure 1-10. Again, the positive impact of including real estate appears clearly.

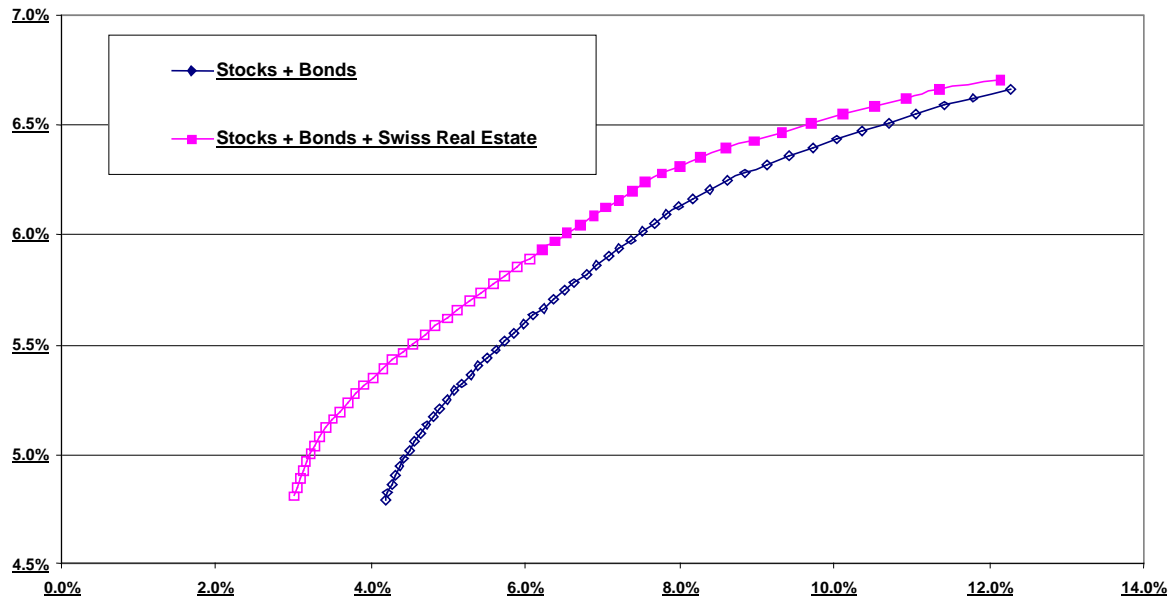


Figure 1-10: Efficient frontiers for Switzerland with and without real estate, 1979-2002

1.1.4.4 Efficient Sets with Indices of Real Estate Securities*

The return and risk characteristics of securitized real estate investments are quite similar to those of common stocks. Further, the correlation coefficient between securitized real estate returns and stock returns is relatively high. Consequently, real estate securities only play a modest role in diversifying mixed-asset portfolios¹⁶.

Finally, it is of interest to examine which of direct or securitized real estate should be included in mixed-asset portfolios, and whether both types of real estate should be considered. Of the two types of real estate, direct holdings provide the greater diversification benefits. Similar benefits are obtained from indirect private vehicles. These are well suited for investors whose portfolio size does not permit the constructing of a well diversified portfolio of direct real estate assets. Securitized real estate investments provide some diversification benefits, but less than direct investments. Such investments usually provide limited benefits when direct investments are contained in a portfolio.

¹⁶ G.R. Mueller, K.R. Pauley and W.K. Morrill, "Should REITs be included in a mixed-asset portfolio?", *Real Estate Finance*, 11(1), pp. 23-28, 1994.

1.1.5 Conclusion*

The results regarding the return and risk of real estate, the correlation of real estate's returns with the returns on stocks and bonds and the role of real estate in mixed-asset portfolios depend quite heavily on the type of real estate index which is used to proxy for real estate returns. When "raw" (i.e. smoothed) appraisal-based series are used, real estate appears to have the most important role to play in diversifying multi-asset portfolios. Alternatively, when securitized data are used, real estate appears to play a more moderate role in reducing a portfolio's standard deviation (for a given return level), or in enhancing a portfolio's return (for a given risk level).

More emphasis should be placed on the results pertaining to some types of indices. This is the case for the unsmoothed appraisal-based series which have been developed in the U.S. and U.K., but more recently in many other countries as well. This is also the case for the results with hedonic indices, whenever such indices are available.

When these results are considered, the following conclusions can be drawn. **Real estate appears to have a lower return and a lower risk than an investment in stocks. Real estate usually appears to have a higher return and risk than bonds**, but this conclusion depends on what type of real estate is considered, as well as on what bonds are taken into consideration. An investor wishing to increase his return by switching from one asset class to another will therefore have to increase his risk exposure. The correlation between real estate returns and stock returns is positive but moderate. Real estate returns and bond returns are also lowly correlated. With these characteristics, **real estate appears to be an interesting portfolio diversifier**. It is reasonable to think that the optimal weight which should be given to real estate in mixed-asset portfolios is in the 10% to 20% range.

All of these conclusions are based on **ex post** studies which have been undertaken in various countries. For a portfolio manager, it is not so much the ex post results which are of interest but much more what will happen in the future (i.e. the **ex ante** scenarios). It is not sure that what has occurred in the past will happen again in the future. When ex post data is analyzed for long periods, as is the case for most of the results which have been discussed in this chapter, the conclusions should be strong enough to hold over future periods provided that these periods are of sufficient length.

In any case, a portfolio manager should outline hypotheses regarding the return and risk of the various asset classes and the correlation between these asset classes. With these figures, he will be able to construct ex ante efficient portfolios. Of particular interest is to examine the sensitivity of the optimal portfolios to changes in the return, risk and correlation parameters.

1.2 Alternative assets / private capital*

When people think of “investing”, they usually have in mind buying traditional investment vehicles, such as money market instruments, publicly traded bond or stocks, as well as mutual funds. But in parallel to these well known asset classes, there is also an ever-growing array of so called “alternative investments” that one might consider. The term regroups all investments that are generally not included in the above-mentioned asset classes. It is in fact a broad term, spanning a large spectrum of investment styles and strategies and regrouping various types of assets. All have gained some acceptance but are still not accepted sufficiently widely to be considered as “traditional”. They can be “alternative” because of the way they are traded or not traded (i.e. the investment method is non-traditional), or because of what is traded (i.e. the underlying asset itself is non-traditional).

Can one establish a list of alternative investments? The answer depends on the period considered. For instance, stocks and actively managed bond portfolios were considered as alternative investments in the 1960s; so were international stocks in the 1970s or real estate and emerging market in the 1980s. Today, all these investments are likely to be considered as traditional. The new alternative assets consist mostly of private equity type securities (venture capital, unlisted securities, mezzanine finance, etc.), hedge funds, real estate (REITs, etc.), derivatives to some extent, infrastructures and natural resources (commodities, timber, etc.), as well as more exotic forms of investment (art, wines, cigars, etc.). In the following sections, we will focus primarily on the two largest categories, namely private equity type securities and hedge funds.

1.2.1 Unlisted non-property securities and Private Capital*

For centuries, going public – i.e. listing on a public stock exchange – has been the most important way to raise large amounts of capital. It also conveyed a prestigious mark of recognition for the managers of the listing company and facilitated the marketability of its securities to both private and institutional investors. On the negative side, listing a new company was usually extremely costly – stock exchanges require a sufficiently long and audited track record, a minimum market capitalization, and a minimum free float, which implies a certain loss of control for existing shareholders. In addition, publicly traded firms must operate with much more stringent accounting and reporting standards and information disclosure requirements than do private firms. As a result, the shares listed on most exchanges tended to be those of blue chips established companies. Smaller firms tended to remain private or financed themselves primarily via private placements.

Of course, there have been several recent attempts to set up organized markets with less stringent requirements for smaller companies. As an illustration, in 1980, the London Stock Exchange (LSE) created the unlisted securities market (USM) for trading shares of small to medium sized companies that did not qualify for a full listing on the LSE. The USM was discontinued at the end of 1996 and replaced by the Alternative Investment Market (AIM). The AIM provides an opportunity for smaller companies to raise capital for expansion, a trading facility and a way of establishing a market value for their shares. It lists more than 1'100 companies for a total market capitalization of GBP 37 billion – a clear sign of success. But many other attempts have not been as successful, and there still exist a majority of firms which do not qualify for a full listing but nevertheless require some financing to pursue their activities. This is precisely where private equity steps in.

1.2.1.1 Definition*

Private equity is a form of investment that finances firms that are not listed on a stock exchange, i.e. privately-held companies or those that are taken private in the process. Private equity typically deals with businesses ranging from startups to medium size companies, at any stage of their lifecycle, although private equity investors will generally focus its investing in a particular segment along this range of maturity.

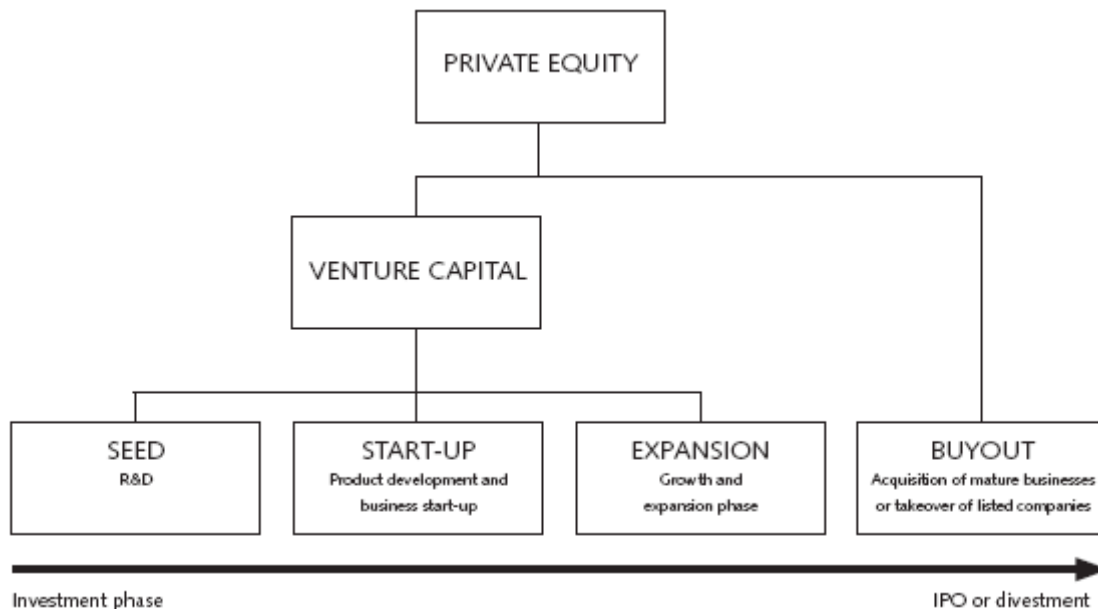


Figure 1-11: The private equity market and different investment phases for unlisted companies

Common subclasses of the private equity universe are represented on Figure 1-11. Venture capital focuses on young entrepreneurial companies that are in the first phases of the company life cycle and often do not generate profit or even sales yet. Many people tend to associate venture capital and technology companies, but reality is that the activity applies to all sectors of the economy.

- Seed financing provides financing to entrepreneurs to enable the development of ideas or concepts or products that may ultimately lead to the start-up of a business.
- Start-up financing provides financing to set up companies and develop products. The targeted companies typically have some management in place, a business plan, and a working prototype.
- Expansion financing is provided for the growth and expansion of an existing company.

By contrast, buyout investors invest in more mature companies with steady (free) cash flows and a larger stock of tangible assets. The natural exit for a buyout investment is an IPO or a sale to another firm. Buyouts also comprise the acquisition of unlisted companies or the takeover of listed corporations. Other forms of private equity funds are related with mezzanine financing or distressed securities. These latter categories will not be discussed because of their minor importance in the private equity industry.

Each of these stages offers a unique trade-off of risk and return and has its own distinct capital cycle. However, all of them share a common point: the financing they provide is very different from the one obtained from traditional sources of financing such as banks and public

markets. There are several reasons for this. First, private equity investors are shareholders and thus bear a greater risk – and therefore require a higher return – than lenders. Second, private equity investors want to be involved in the decision process. They actively support their companies to analyze new markets, recruit top talent, build a solid customer base, and provide access to their own network of business and financial contacts. And finally, the exit possibilities of private equity investors are usually pre-arranged prior to any investment.

1.2.1.2 Why invest in private equity?*

The primary attraction of private equity is the potential to generate **higher returns** on the long run. As an illustration, Table 1-9 shows the historical performance of the different sectors of private equity funds, as of 31/12/07. Although the exact performance numbers vary as a function of the period considered, historically and on the long run, private equity investors seem to have earned a higher return than common stock investors.

Fund Type	3Yr	5Yr	10Yr	20Yr
Seed/Early VC	4.6	4.2	35.4	20.9
Balanced VC	13.9	12.4	15.7	14.6
Later Stage VC	12.0	10.5	9.2	14.3
All Venture	9.5	8.6	18.3	16.7
Small Buyouts	7.3	8.1	4.2	11.9
Medium Buyouts	12.8	12.0	9.4	12.6
Large Buyouts	11.4	15.0	7.9	12.8
Mega Buyouts	15.1	16.5	9.1	12.3
All Buyouts	14.0	15.5	8.6	12.4
Mezzanine	5.5	5.5	5.9	8.3
All Private Equity	13.0	13.3	10.8	13.7
NASDAQ	7.7	15.5	6.0	11.3
S&P 500	8.6	12.8	5.9	11.8

Table 1-9: private equity performance by sector

(Source: Thompson Venture Economics/National Venture Capital Association)

Academics and practitioners have offered a number of explanations for this apparent superior performance. Let us mention some of them:

- **Liquidity premium:** Private equity investments are relatively illiquid, and investors must get a premium for bearing that liquidity risk; that is, they expect to earn a higher cumulative return as compensation for giving up liquidity on a short-term basis.
- **Focus on long term performance:** Private equity investors are not constrained by the analysts' demands for short-term performance (read: growth of quarterly earnings). They are free to make business decisions enhancing long-term shareholder value without fear that their stock price will be battered by short-term market expectations.
- **Alignment of interests:** The managers of companies owned by private equity groups are also shareholders. And more generally, in private companies, the percentage of ownership in the hands of operators is much higher than for public companies.
- **Higher risks:** The riskiest segments of the private equity market (e.g., early stage venture) tend to produce the highest long-term returns. This suggests that there are some risks in private equity and that investors are rewarded for them.
- **Use of leverage:** Some private equity strategies – in particular leverage buy-outs – use a high level of debt financing, which magnifies the return to equity.

Private equity also enhances the **diversification of traditional portfolios**. First, it invests in businesses or industries that are not necessarily represented fully in the public security markets. Second, the returns on private assets tend to have a low volatility, and are often said to be uncorrelated with those of publicly traded assets. This makes private equity a great addition in traditional portfolios. However, this argument needs to be considered with caution. By definition, private equity is private and therefore not quoted on a regular basis. Valuations are driven by models and assumptions rather than markets. As a result, one cannot exclude that the low volatility and correlation of private equity with other asset classes are simply due to the absence of a market, and therefore to the absence of official quotes. Reality is that private equity returns run in cycles and its “real” returns are likely to be strongly influenced by market conditions, credit markets, company valuations, and liquidity for exits.

1.2.1.3 How to invest in private equity*

For most investors, **investing directly** in private equity is difficult. First, identifying and following promising companies at an early stage requires important and rare skills, which most investors and traditional managers do not have. Second, early stage companies usually exhibit a low amount of market risk but a much higher amount of specific (business) risk. It is therefore recommended to diversify holdings across several firms rather than holding a large investment in a single firm. This typically requires relatively large amounts of capital, e.g. at least 50 to 100 million USD. Most investors are not able to allocate that amount of money to private equity, and this explains why they prefer to use specific investment vehicles. Some private equity investments are done through captive or semi-captive vehicles, such as wholly owned subsidiaries of investment corporations or investment banks. But the most common structure is the private equity fund.

Private equity funds are typically structured as independent private limited partnerships. The individual manager of a fund is called the general partner (GP) while the capital providers – individual and institutional investors – are called the limited partners (LPs). The actions and roles of the general and limited partners are carefully specified in a detailed partnership agreement signed by the parties involved. In addition, when raising a fund, a private equity firm will typically produce a private placement memorandum (PPM). This document provides detailed information on: (i) the private equity firm itself; (ii) the funds and investments it previously and currently manages and their performances; (iii) the valuation of unrealized investment and valuation policy; (iv) the firm's executives and their relevant experience; (v) the fees chargeable and management incentives; (vi) the fund's investment strategy; and (vii) reporting methods and details of how often reports will be published.

The lifecycle of a private equity fund is usually limited to 10 or 12 years. It can be divided in four phases that are overlapping. All of the four phases are crucial to the performance of a private equity fund.

- **Capital raising phase:** The fund raising phase starts the cycle and normally takes between half a year and two years. Without funds a private equity fund is not able to invest. The GP therefore needs to create the legal framework of the partnership, prepares the offering memorandum and talks to potential investors. At this stage, the actual investments are not specified, since they have not yet been made. If they are convinced, investors may decide to commit some capital and become LPs. A commitment is essentially the agreement to make a certain sum of money available to the private equity fund at the request of the GP. When enough capital has been committed (but not yet invested), the GP stops raising capital and “closes” the partnership. The year in which a partnership closes to new investors is known as its “vintage year.”

- **Investing phase:** After the fundraising phase private equity funds start investing for a period of 4 to 6 years. The GP looks for specific investments opportunities. Each time one attractive investment is found, the GP sends a capital call to each of the LPs for a portion of their commitment. The LPs have usually a few days to send the money to the GP. Debt may be raised alongside the commitments if necessary. Over the course of the investing phase, a GP may purchase stakes in ten to twenty different underlying private firms. Thus, each private equity fund is actually a portfolio of individual company investments. The target companies are either privately held or publicly listed. In the latter case, they are usually delisted.
- **Holding phase:** In this phase, the target companies are restructured or strategically reoriented to maximize their value. Improvements can be made on the stakeholders side (for instance by aligning managers' interest with those of shareholders), on the operational side (implementing active cost controls, refocusing on core activities, etc.) or on the financial side (restructuring the liabilities). The holding phase can typically last 4 to 6 years, but it often overlaps with the investing and the divesting phase.
- **Divesting phase:** After a few years, private equity funds progressively start divesting from their target companies. This can be done by an Initial Public Offering (IPO), a trade sale, a secondary buyout or even a complete write-off if necessary. The proceeds from the liquidations are generally not reinvested but are distributed immediately to the LPs, as specified in the terms of the partnership agreement. As the end of the partnership period approaches, most of the underlying assets will have been sold. Thus, all private equity partnerships are by construction self-liquidating, generally over a period of about eight to twelve years.

The GP usually earns a management fee and a performance incentive fee, also known as a *carried interest*. The management fee is charged on the committed capital; it is typically in the range of 1% to 3% p.a. The carried interest is normally charged at the realization of the underlying assets. It is based on value growth beyond a certain level, the *hurdle rate*. For example, a private equity fund may specify a hurdle rate return of 10% and a carried interest of 20%. This means that as soon as the LPs have received their initial investment back plus a return of 10%, all future additional profits are distributed 20% to the GPs and 80% to the LPs.

The typical net cash flow pattern of a private equity fund is often called the J-Curve. In the early years, the fund obviously generates negative cash flows as it calls capital and invests it. In its later phase, positive cash flows are generated as the fund starts divesting. An illustration of a typical J-curve is provided in Figure 1-12.

Clearly, investors in private equity should have a relatively long investment horizon as returns in the early years are almost always negative and positive returns on commitments do not materialize for several years. Investors who are new to private equity are often horrified by the sudden drop in value of their investment, but more experienced investors recognize that the J-Curve effect is almost inevitable. Moreover, the J-curve effect is magnified by management fees – since private equity funds generally charge management fees on the committed capital, these fees are applied in the early years against a smaller asset base as not all the capital is deployed yet.

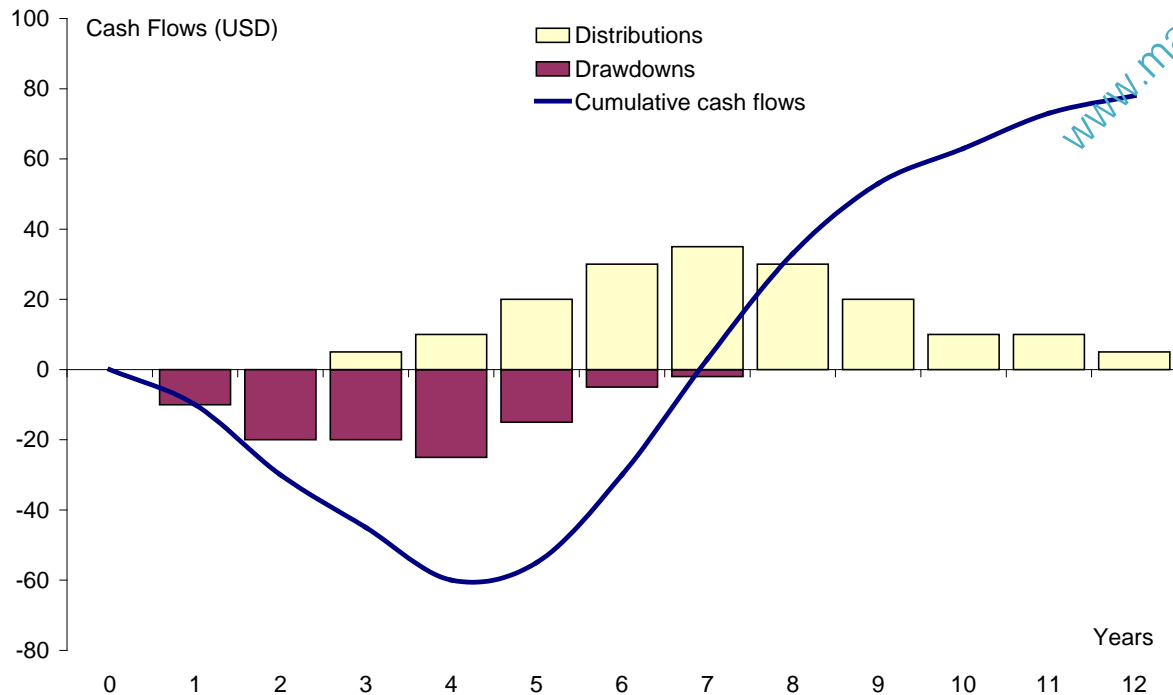


Figure 1-12: The J-curve effect

Note that most LPs normally allow GPs to raise capital for their next fund while they are still operating their earlier vintage. A common rule is that the next phase of capital raising should not start until at least 50% of the earlier fund has been drawn and invested. Moreover, existing LPs usually have a preference in terms of committing capital to the next vintage.

Due to their particular organizational structure, private equity funds suffer from two major drawbacks:

- **High minimum investment.** Since the maximum number of partners in a private equity fund is usually limited¹⁷, the minimum individual commitment is high, commonly between 5 and 20 million USD. This may represent a challenge for a private client or a small institutional investor.
- **Low liquidity.** There is no public exchange on which to buy and sell interests in private equity funds. And when secondary over the counter markets exist, prices depend on the supply and demand for the shares and have only an indirect link with the value of the assets corresponding to each share. Very often, unless the fund manager is exceptionally talented, there exists a large liquidity discount that ruins out any performance if there is an early exit need. Therefore, investors are basically locked-in until they receive their final distributions, that is, for a 10 or 12-year period.

¹⁷ This is particularly the case in U.S. private equity funds. According to the Investment Company Act of 1940, private equity firms can accept up to 499 so-called “qualified investors” as limited partners in their partnerships, or a maximum of 99 limited partners. Under Regulation D of the Securities and Exchange Commission’s rules that govern the private placement of fund shares, private equity firms can’t have more than 35 unaccredited investors as limited partners. To be “qualified”, an individual investor must have assets for investment of USD 5 million or more, and an institutional investor USD 25 million or more. To be “accredited”, an individual investor must have a net worth of USD 1 million (or joint net worth with spouse), or have earned at least USD 200’000 in each of the prior two years (or joint income with spouse of at least USD 300’000) and have a reasonable expectation of making at least the same amount the next year.

In addition, the disparity of returns between the upper quartile performers, the median and the bottom quartile performers is dramatic, underscoring the importance of gaining access to the top private equity funds. But information about the performance of private equity managers is hard to come by. And gaining access to what are perceived to be the top-performing venture capital and buyout funds is problematic, since the fund managers often have more demand for their funds than they can accommodate.

As a consequence, **private equity funds of funds** have grown rapidly in popularity during the past few years. Their function is relatively simple: the fund of fund manager comingles the assets of many investors into a single pool and then uses this pool to create a portfolio of private equity funds. A smaller part of the assets is sometimes used for direct investments (mostly late stage or bridge investments) and co-investments. The advantages of a private equity fund of funds are a lower minimum commitment (typically around USD 500'000), an instantaneous access to a diversified set of private equity investments, and a professional management. The main drawback is the additional layer of fees for the fund of fund manager, which is typically an annual flat fee of 1 to 2 percent plus a small carried interest, or share of profits, in the 5 percent to 10 percent range. This layer of fees is in addition to the management fees (typically 1.5 percent to 2.5 percent) and carried interest (typically 20 percent to 30 percent) charged by the underlying fund managers. However, unless the fund of fund is listed, the structure does not really solve the problem of the long-term commitment.

Finally, some investors prefer **publicly listed private equity vehicles** because of liquidity issues. A key disadvantage of listed private equity vehicles is that their stocks usually trade at a discount to the Net Asset Value (NAV) of the underlying fund. In addition, these stocks are often highly correlated to stock market movements, a potentially undesired characteristic.

1.2.1.4 Valuation issues and performance assessment for Private Capital*

Tracking down information on securities that are listed on an exchange is easy. Daily share prices for the major exchanges are listed in most newspapers, and numerous online services supply up to the minute information on trades and prices. Time-series of historical prices are easily obtained and can be used to estimate risk parameters, investment style, required return, cost of capital, etc. However, the major problem with unlisted securities is that the absence of a well-defined pricing mechanism creates an information gap. It is therefore difficult to find their objective valuation, or to verify a manager's valuation, if any. Nevertheless, measuring performance in an adequate way is essential for all private equity funds, as the GP usually earns a management fee and a performance incentive fee, also known as a *carried interest*. The carried interest is based on value growth beyond a certain level, the *hurdle rate*. For example, a private equity fund may specify a hurdle rate return of 10% and a carried interest of 20%. This means that as soon as the LPs have received a return of 10% on their initial investment, all future profits are distributed 20% to the GPs and 80% to the LPs.

Most private equity funds nevertheless provide a net asset value (NAV) to their investors on a regular basis, i.e. quarterly or semi-annually. But for LP's, it is still difficult to measure precisely the performance of their private equity investments. First, the valuation of the portfolio of underlying companies includes a relatively large degree of subjectivity. Second, the timing and magnitude of capital calls and the timing and magnitude of return distributions are normally unknown. Let us discuss these two issues.

Historically, most private equity funds followed the general principles of the International Accounting Standards and kept their direct investments in unlisted securities at the initial **investment cost**, unless they had to be corrected downward with obvious write-offs. This was at the discretion of the general partner and occurred only if a company's performance and potential had significantly deteriorated. Upward adjustments were rare and only done to reflect the development of the individual companies or the liquidation of an investment. As a consequence, the "fair value" of a private equity funds thus contained considerable hidden reserves, but their realization was highly dependent upon the success of the final exit. As an illustration, here is the stated policy of Private Equity Holding, a European venture capital fund managed by Bank Vontobel:

"Net asset value (NAV) of venture investments are valued at cost and are only adjusted in the case of extraordinary events. Devaluations (seldom, but at 25% or 50% quite considerable) are only undertaken should development of the investment deviate significantly from initial expectations. Upward revaluations only take place in the case of a revaluation related to a further round of financing. Investments in profitable and listed companies are valued at market less a discount due to poor marketability. The fund holdings are valued annually by the fund managers.¹⁸"

In the recent past, however, most private equity funds have been gradually forced to follow the Financial Accounting Standards Board (FASB) Statement 157 and shifted to a **fair value** accounting policy. This has introduced much more volatility in the valuations, although manager still have considerable flexibility.

When measuring private equity performance, capital calls and cash distributions are usually analyzed in a cash flow framework using an internal rate of return (IRR) calculation or alternatively, a multiple of the invested capital. The IRR is the discount rate that results in a NPV of zero when considering all cash flows as well as the residual valuation. The multiple is the ratio of the cash inflow and the cash outflow plus residual valuation. If this multiple is larger than one, the private equity fund has created value. Usually when investments are held for longer periods the private equity fund is able to create more value. However, considerable caution should be used when comparing these two statistics across partnership as their calculation methodology and valuation methodologies may differ significantly.

18 Source: Vontobel Bank, "Private Equity Investments Going Strongly in Europe", December 1998.

Portfolio Management

Characteristic	Early-stage new ventures	Later-stage new ventures	Middle-market private firms	Public and private firms in financial distress	Public buyouts	Other public firms
Size	Revenues between zero and USD 15 million	Revenues between USD 15 million and USD 50 million	Established, with stable cash flows between USD 25 million and USD 500 million	Any size	Any size	Any size
Financial attributes	High growth potential	High growth potential	Growth prospects vary widely	May be over leveraged or have operating problems	Under performing High levels of free cash flow	Depend on reasons for seeking private equity
Reason(s) for seeking private equity	To start operations	To expand plant and operations To cash out early-stage investors	To finance a required change in ownership or capital structure To expand by acquiring or purchasing new plant	To effect a turnaround	To finance a change in management or in management incentives	To ensure confidentiality To issue a small offering For convenience Because industry is temporarily out of favor with public equity markets
Major source(s) of private equity	“Angels” Early-stage venture partnerships	Later-stage venture partnerships	Later-stage venture partnerships Non-venture partnerships	“Turnaround” partnerships	LBO and mezzanine debt partnerships	Non-venture partnerships
Extent of access to other financial markets	For more mature firms with collateral, limited access to bank loans	Access to bank loans to finance working capital	Access to bank loans For more mature, larger firms, access to private placement market	Very limited access	Generally, access to all public and private markets	Generally, access to all public and private markets

Source: Federal Reserve

Table 1-10: Characteristics of major issuers in the private equity market

1.2.1.5 Private equity investors*

The common belief is that private equity as an asset class is generally restricted to a minority of large investors and only accessible through specific investment vehicles. But reality is that there are additional circumstances in which an investor may end-up holding unlisted securities. Here are a few examples:

- Many investors accumulate shares in the company they are working for through an **employee stock ownership plan** (ESOP) or through the exercise of **stock options**. But these instruments are typically not listed.
- A listed company may suddenly decide to go private (through a private company's tender offer, a management buyout, a leverage buyout, a reverse stock split, etc.), leaving out some shareholders with unlisted securities. For instance, on March 2000, Seagate Technology Inc., the world's biggest disk-drive maker, announced a USD 20 billion deal to buy back all its stock and going private. The stock market's tendency to undervalue the company and the new opportunity to pursue strategic plans aggressively without divulging sensitive business strategies to the public were the prime motivation for the transaction.

In both cases, a private investor could find himself holding securities that are not traded. But so far, the most important investors in private equity remain pension funds and banks – see Table 1-11. As an illustration, the large corporate pension funds, such as those of AT&T, General Motors, IBM and Bell Atlantic allocate at least 5 per cent to alternative investments and as much as 9 per cent or 8 per cent in the cases of Bell Atlantic and AT&T respectively. Many of the large state funds, such as California and Pennsylvania, allocate 5 per cent of their fund to alternative investments whilst Washington State and Oregon allocate 15 per cent. The fact that such investors are prepared to commit a significant amount of their overall funds to private equity investment suggests that it is an asset class that should not be ignored.

Investor type	Percentage of assets
Banks	18%
Pension funds	23%
Fund of funds	16%
Insurance companies	11%
Government Agencies	9%
Corporate Investors	5%
Private Investors	7%
Others	11%

Table 1-11: Type of investors in private equity funds raised in the 2002-2007 period

(Source: EVCA/ Thomson Financials)

1.2.2 Hedge funds*

Hedge funds represent a major component of alternative assets. They have grown significantly in size and influence in recent years – according to industry estimates, from 1994 to 2007, the number of funds grew from more a few hundreds to more than 10'000 and assets under management from a few billion to more than USD 2 trillion globally. As a result, hedge funds as a group have become key players in some markets such as distressed debt, convertible bonds, credit derivatives, etc.

Sophisticated institutional investors such as endowments, foundations, insurance companies and pension plans have invested in hedge funds and contributed importantly to their rapid growth. This had a significant positive impact on the hedge fund industry, as institutions are typically more demanding than individual investors in requiring more formal procedures and controls. It also resulted in a high concentration of the assets in the hands of a few firms. At the end of 2007, the largest 100 hedge funds accounted for three-quarters of total industry assets, and the largest 3% of hedge funds accounted for four-fifths of total industry assets. One should therefore be extremely prudent when discussing of the “average hedge fund” versus the “average dollar managed in hedge funds”, as the result is dramatically different.

*1.2.2.1 Definitions and major characteristics**

Although financial service providers, regulators and the media commonly refer to “hedge funds,” the term has no precise legal or universally accepted definition. The term hedge fund originated from the equally long and short positions employed by the first hedge fund manager, Alfred Winslow Jones, to hedge the market risk of his portfolio. Nowadays, it is applied somewhat indiscriminately and beyond the scope of its original meaning to refer to any pooled investment vehicle that is not a conventional investment fund – that is, any fund using a strategy or set of strategies other than investing long in bonds, equities, money markets, or a mix of these. As a result, some investment funds are categorized nowadays as hedge funds, but they do not actually hedge anything. Consequently, hedge funds are better identified by their common structural characteristics rather than by their “hedged” nature. Let us examine some of them.

First, hedge funds seek to add value through **active management**. They do not accept the efficient market hypothesis and the traditional modern portfolio theory that leads to the systematic tracking of market indices. They believe that some assets are not fairly priced by financial markets and set up strategies to exploit these inefficiencies. They build their competitive advantage by having faster information collection, cheaper access to markets, better analysis of investment opportunities, and/or superior trade execution or portfolio structuring.

The ability to pursue a variety of investing options provides a greater possibility of outstanding returns. Therefore, hedge fund managers generally have **broad discretion over the investment styles, asset classes and investment vehicles** they will use. They can typically combine both long and short positions, concentrate on specific investments rather than diversify, borrow and leverage their portfolios, invest in illiquid assets, or trade derivatives and OTC securities. It is important, however, to understand that a hedge fund does not necessarily employ all of these tools at a given point in time – its manager simply has them available, if necessary.

Because of their specific investment strategies and particular assets, most hedge funds require, rather than suggest, a **long-term outlook**. Therefore, hedge funds may be forced to impose lock-up periods (i.e., a minimum duration for new investments, of generally at least one year) and only allow periodic redemption dates (typically quarterly). Some funds may also charge decreasing redemption fees to dissuade early redemption.

The fees charged by hedge funds typically include both a **management fee** and a **performance fee**. The **management fee** usually ranges from 1 to 3% of the assets under management and is charged annually or quarterly regardless of the performance. Generally speaking, most managers expect to be able to cover the fixed costs of running their business with this management fee. By contrast, the **incentive fee** typically represents 20 to 25% of the

annualized performance and is there to encourage managers to achieve maximum returns. It is charged on a schedule ranging from monthly to annual¹⁹.

This particular fee structure enables funds to attract the high-end talent necessary to run a successful hedge fund. It also explains why several hedge funds aim for **absolute returns**, as opposed to traditional investment vehicles, which aim to outperform a standard market benchmark (such as the S&P 500 or the Swiss Market Index).

Performance-based fees represent a strong incentive for excessive risk taking. To mitigate this, a hedge fund manager will generally share both the upside and downside risks with investors by taking a **significant personal stake** in the fund. Combined with the incentive fee, this closely aligns the hedge fund manager's interests with those of his or her investors, and encourages managers to seek to achieve substantial total returns while somehow prudently controlling risk.

The majority of the hedge funds are registered or incorporated **offshore**, with the Cayman Islands being the most popular location (57% of the number of offshore funds), followed by British Virgin Islands (16%) and Bermuda (11%). This offshore registration provides an exemption from many investment protection and disclosure requirements, as well as favourable tax rates. However, the management of all these funds is predominantly conducted in or near major international financial centres such as London and New York – offshore hedge funds typically contract with an investment adviser, which may employ a U.S. entity to serve as sub-adviser. Note that the U.S. are still the most popular onshore location (with funds mostly registered in Delaware) accounting for nearly two-thirds of the number of onshore funds, with European countries accounting for most of the remainder.

The hedge fund industry has traditionally been characterized by a **limited transparency**. This can be explained through two major reasons. First, because of their particular legal structure and/or offshore registration, hedge funds are not required to publicize performance information, detailed asset allocations or earnings. Second, by definition, more transparency means more information. When a hedge fund implements or wishes to implement a particular investment strategy, making it public could cancel its results or even put the fund in a difficult situation. Think for instance of the consequences of a short squeeze when a fund is short in an illiquid market. Moreover, it could incentivize some investors to free ride and replicate the hedge fund strategy without paying the management fee. Therefore, hedge funds must remain discrete and sometimes non-transparent, at least when compared to mutual funds.

In some cases, as we will show, hedge funds are even forbidden to advertise about their existence. Nevertheless, this does not hurt them much, as they do not even need or want to attract new investors, due to their **limited capacity**. By capacity, we mean that there is a maximum size of assets that a hedge fund can manage before the performance on the additional marginal dollar starts to deteriorate. This restriction can arise because a fund operates in a small niche market, or because its research and investment process is non-scalable.

¹⁹ Most funds include a “high-water mark” also known as a “loss carry forward provision clause” which states that all previous losses must be recouped by new profits before an incentive fee is to be paid. Some hedge funds also specify a hurdle rate, i.e. they will not charge a performance fee until the fund's performance exceeds a benchmark rate, such as Libor or a fixed percentage

1.2.2.2 Hedge fund service providers*

Hedge funds usually rely on a variety of external service providers to conduct their day-to-day business. This outsourcing of functions often surprises investors who are used to in-house integration, but it has proved to result in better quality of service and cost effectiveness. The primary service providers used by hedge funds include prime brokerage, fund administration, custody and audit.

Prime brokers offer financing, clearing and settlement of trades, securities lending to facilitate short selling, custodial services, risk management and operational support facilities, access to research, on-line reporting and consulting. Some prime brokers also offer introductions or referrals to lawyers, accountants and investors. For a long time, prime brokerage has been a major growth area for investment banks which were typical providers of such services. Since 2008, however, hedge funds tend to favor brokers with a strong balance sheet such as commercial banks and increasingly use the services of more than one prime broker to be able to switch rapidly if there is a problem.

Fund administrators are in charge of handling outsourced administrative functions such as accounting and reporting services; advice with reference to comply with the applicable laws; and more importantly, pricing independently the fund's portfolio of securities and calculating its net asset value.

Custodians' primary responsibilities include safekeeping of the fund's assets, clearing and settling all trades (that is, confirming transactions with counter parties, providing payment when securities are bought, and receiving payment when securities are sold) and monitoring corporate actions such as dividend payments and proxy-related information.

Auditors are in charge of reviewing and validating the annual financial statements of the hedge fund, and must ensure that that the hedge fund is in compliance with accounting practices and any applicable laws.

1.2.2.3 Hedge funds styles*

It is essential to understand that there is no single market strategy or investment approach pursued by hedge funds as a group. In fact, hedge funds do not form a homogenous asset class – they follow a large number of distinct investment strategies. Even among hedge funds that purport to use the same investment strategy or invest within the same asset class, there is a wide range of investment activities, performance and risk levels. Nevertheless, these strategies are often grouped into different investment styles in order to compare performance, risk, and other characteristics. In the following, we present the style classification used by CSFB/Tremont, one of the leading providers of hedge fund indices.

1.2.2.3.1 Long-Short Equity

Long/short equity is the most commonly recognized and utilized hedge fund strategy. Simply stated, long/short equity strategies involve holding a long equity portfolio offset by a portfolio of short equity holdings (or short equity index). The short portfolio typically serves as a hedge against market declines but also provides an opportunity for managers to add value by selecting stocks more likely to underperform the long positions.

Let us illustrate the implementation of the strategy by considering the following example. We consider a hedge fund that has a hypothetical initial equity capital of, say, USD 1'000 to invest. Its manager is convinced that stock A is undervalued while stock B is overvalued. He wants to engage in a long/short strategy to profit from this perceived mispricing.

Step 1: The fund manager opens an account at a prime broker and deposits the fund's capital (USD 1'000).

Step 2: The fund manager purchases USD 900 worth of stock A and pays them cash. After the trade, the fund has a long position in stock A for USD 900 and a long cash position of USD 100. So far, this is very similar to a traditional investment fund's position.

Step 3: The manager now sells USD 600 worth of stock B. This increases the fund's cash balance by USD 600. However, since the fund does not own any B shares, this is a short sale. It is therefore necessary to borrow these shares from a third party in order to deliver them to the buyer.

Step 4: The prime broker arranges to borrow USD 600 worth of the required shares from a stock lending institution or a large institutional investor. To agree to lend his shares, the stock lender requires a rent (say for instance a one percent p.a. fee, that is, USD 6 after one year). To secure the transaction, the broker requires some collateral (for instance the USD 600 that the fund just cashed in, plus some of the A shares). If the share price increases, the broker will issue a margin call.

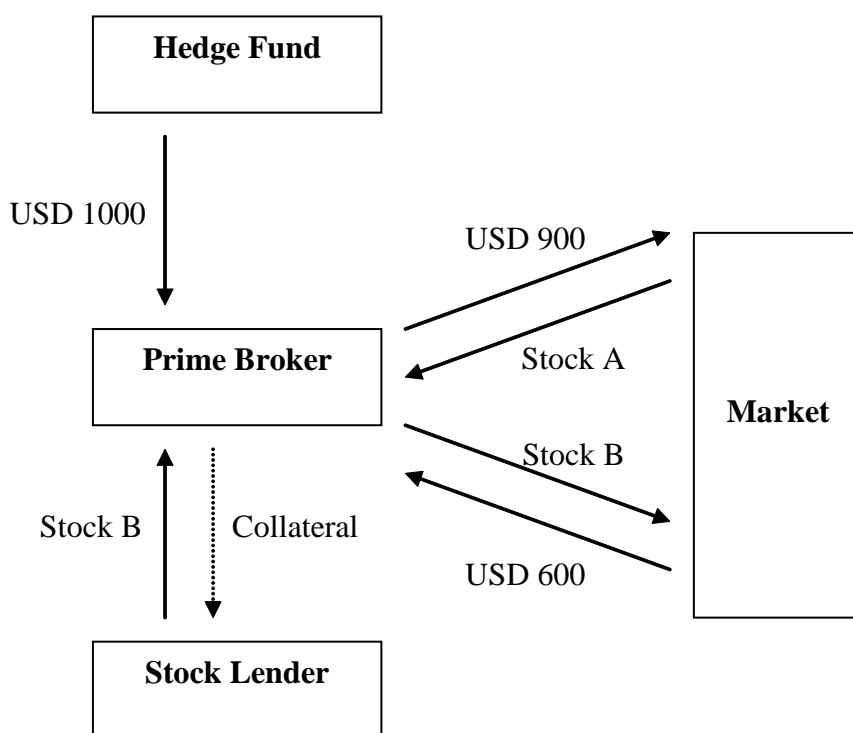


Figure 1-13: Typical flows in long-short equity investing

Note that simple long/short investing position results directly in the creation of leverage. At the end of the process, our fund's assets consist of USD 900 of stock A (long), USD 600 of stock B (short), plus USD 700 in cash. Cash is usually neglected when calculating leverage or exposures. As a result, one would say that the leverage of our fund is 1.5 times or 150% (USD 1'500 of assets for USD 1'000 of equity capital). Alternatively, one can say that the fund is 90% long and 60% short, or equivalently, that the fund exposure is 150% gross and 30% net. These numbers will change continuously over time as the value of the underlying securities changes.

Long-short equity strategies have potentially four sources of return:

- The spread in performance between the long and the short positions.
- The interest rebate on the proceeds of the short sale.
- The interest received on the liquidity that remains at the broker.
- The spread in dividends between the long and the short position. Stock borrowers need to reimburse stock lenders for dividends paid on borrowed stocks, while they cash in dividends on the long position.

Ideally, the stocks on the long side should appreciate in value while the shorted stocks should decrease in value. This is why long/short investing is often referred to as a 'double alpha' strategy – one alpha may come from the long side (the undervalued stock appreciates in value) and the other alpha may come from the short side (the overvalued stock depreciates in value). But a remarkable property of long/short investing is that the manager may be partly wrong in his choice of securities, but the position will still be profitable as long as the long position outperforms the short position on a relative basis. This explains why long/short funds have the ability to perform well in both bear and bull markets.

The negative aspects of long/short investing are essentially the following:

- A long/short fund trades in a much larger amount than its initial capital, which means that the trading costs relative to the initial capital are usually high.
- The long and the short position value will usually vary over time, meaning that some rebalancing may be necessary to face margin requirements and avoid significant drops on the liquidity buffer.
- Although investing in equities, the fund manager does not capture any equity risk premium, nor can he offer the long-term upside potential of long only equity investing.
- Because of its reduced exposure, the fund will generally lag the long only index in a bull market.

Finally, note that the long-short equity group usually contains a small category of hedge funds called "shareholder activists". These funds typically manage a long-biased concentrated portfolio of small to mid cap stocks and attempt to influence the management of the associated companies.

1.2.2.3.2 Equity Market Neutral

Equity market neutral goes one step beyond long short equity. Rather than just reducing risk by combining long and short equity positions, equity market neutral funds balance exactly their long and short positions to ensure a zero or negligible net market exposure and consequently a performance pattern that is independent of market movements. The term "market exposure" should be taken in a broad sense here, as funds can choose to be dollar neutral, beta neutral, sector neutral, etc.

Most equity market neutral funds use factor models to measure their exposure to various risk factors. As more and more risk factors are systematically hedged away, active returns are likely to decrease – in theory, a perfectly hedged portfolio should yield the risk-free rate, minus transaction costs. In practice, since the portfolio is not hedged against some residual factors, the strategy should still yield a small risk premium. Leverage is commonly applied in order to magnify this small risk premium.

1.2.2.3.3 Dedicated Short

Dedicated short investing is essentially traditional asset management (long only) flipped upside down. Dedicated-short funds seek to profit from a decline in the value of stocks by taking primarily or even exclusively short positions – i.e. borrowing stocks and selling them on the market with the intention of buying them back later at a lower price. Their performance depends upon the security selection and timing skills of their manager.

Short-seller funds were very popular during some periods (e.g. just after the 1987 or the 2000 crash), but long bull markets gave them a tough time. As a result, funds that focus solely on short-selling stocks are now rare.

1.2.2.3.4 Emerging Markets

Emerging market hedge funds primarily take positions in all types of emerging market asset classes, including equities, bonds, currencies and more recently, credit. These funds enjoy much more flexibility and are more opportunistic than traditional mutual funds. Their portfolios usually differ significantly from market indices. However, they tend to have a long bias because short selling is not permitted or at least difficult to implement in many emerging countries. The set of assets considered varies depending on the strategy. On the equity side, emerging market hedge funds can invest in local securities or in American Depositary Receipts (ADRs²⁰). On the fixed income side, they can invest in local bonds, Eurobonds²¹ or Brady bonds²².

1.2.2.3.5 Fixed Income Arbitrage

Fixed income arbitrage attempts to profit from observed relative pricing inefficiencies between related fixed income securities and/or expected changes in inter-market spreads. The strategy typically involves taking long and short positions in interest-rate-sensitive securities. Since the expected gains on each position are usually a few basis points, the strategy requires significant leverage to magnify returns. This has resulted in dramatic effects on a few occasions, e.g. the summer 1998 with the LTCM collapse, or March 2008 when all leverage providers suddenly cut off credit lines, forcing massive portfolio liquidations at the worst possible time.

20 ADRs are certificates issued in the U.S., quoted in U.S. dollars and traded on a U.S. exchange (such as the New York Stock Exchange) that represent and are backed by shares of a foreign company held at a U.S. bank.

21 Eurobonds are issued in the Eurobond market and denominated in any of the major currencies.

22 Brady bonds are dollar-denominated, zero-coupon bonds backed by the U.S. Treasury, at least for the repayment of principal at maturity.

1.2.2.3.6 *Convertible Arbitrage*

The basic postulate of convertible arbitrage is that convertible securities are usually sold at a discount to their theoretical value. The reasons are threefold. First, the majority of convertible issuers are rated below investment grade, which makes them suitable only for a limited set of investors and significantly reduces their liquidity on the market. Second, several convertible issues are small in size and analysts do not necessarily follow them. This latter fact is confirmed by the observation that the degree of undervaluation usually increases as the market capitalization decreases. Finally, there is some evidence that markets for different types of securities, such as stocks and bonds, are not closely integrated. Investors tend to prefer a security whose type is clearly identified, and discount securities such as convertibles that can change type several times during their life.

Convertible arbitrage funds attempt to profit from this mispricing of convertible securities and/or expected trends in factors influencing convertible securities prices (volatility, credit, etc.). In general, convertible arbitrage entails purchasing undervalued convertible securities (bonds, preferred shares, and warrants) and hedging simultaneously the underlying equity risk by selling short delta shares of the issuer²³. Certain managers may also seek to hedge interest rate exposure by selling Treasury futures. When properly executed, this strategy creates a net hedged position which is substantially neutral to the movements in the underlying equity and has an attractive return potential.

However, the term “arbitrage” is somehow misleading as the strategy is not necessarily risk free and does not necessarily guarantee profits. Although the residual position is delta neutral, it is still exposed to volatility risk (long vega) as well as to credit risk.

1.2.2.3.7 *Merger Arbitrage*

Merger arbitrage – also called risk arbitrage – is a particular investment strategy specifically focusing on firms involved in mergers and takeovers. It aims at creating a relatively simple position that will generate a profit when a takeover or a merger is successful.

Let us illustrate the process of merger arbitrage in the case of a cash takeover, that is, an acquiring company offering a fixed amount of cash (say USD 100) in exchange for each share of a target company. To convince investors to tender their shares, the bid price usually includes a premium (say USD 20) with respect to the target’s current share price on the market (USD 80 in our example). Following the announcement and filing of the acquisition bid, the market price of the target firm should naturally adjust upward. In practice, it does, but usually does not reach the bid price. Let us say for instance that the new market price is USD 95. The remaining gap between the bid and the market price (USD 5) is called the **merger arbitrage spread**. Technically, it is usually defined as the percentage difference between the initial bid price and the target’s closing price on the day after the acquisition announcement. This spread will fluctuate over time, reflecting the unwillingness of other market participants to take on transaction-based risk, i.e., the risk that the transaction may not be completed. This could occur because of regulators, unsatisfied shareholders, management actions or any other reason. Merger arbitrageurs are specialists in precisely evaluating this transaction risk. If they are confident that the takeover will succeed on time and on the terms originally announced, they just buy some target company’s shares and wait to capture the corresponding spread. However, if the takeover is delayed, renegotiated or abandoned, the price of the acquired

²³ Delta is the change in the convertible bond price for a very small change in the underlying stock price and is adjusted periodically

company usually falls and arbitrageurs incur a loss, usually much larger than the profits obtained if the deal succeeds.

In the case of a stock for stock merger, for instance, the classic merger arbitrage strategy consists of being long on the stock of the target company while simultaneously selling short the stock of the acquiring company. If the merger is successful, the prices of the two stocks will ultimately converge and the arbitrageur will pocket the spread. If the merger is not successful, the two prices may diverge and the arbitrageur will incur a loss.

In reality, things are far more complicated. The probability of a deal succeeding depends on several factors, such as the approval of the management, any anti-takeover devices used by the target company, the number of small shareholders willing to tender, the attitude of regulators, and ... the reaction and number of arbitrageurs active on the deal. Indeed, the number of risk arbitrageurs trying to capture the spread will also influence the final outcome, since they are usually more likely to tender and favour the bidder. This results in an asymmetry of information in favour of large arbitrageurs, because they know the exact number of shares that they control. This also explains why after a tender offer, the trading volume usually increases dramatically, in large part because of risk arbitrageurs accumulating shares.

1.2.2.3.8 Distressed Securities

Hedge funds active in the distressed securities space are typically buying or selling short the securities of companies experiencing financial, legal or operational difficulties. These securities include but are not limited to, debtor-in-possession loans, senior secured bank debt, public high-yielding bonds, subordinated and junior debt, trade claims, sub-performing real estate loans and mortgages, letters of credit, mezzanine debt, convertible bonds, preferred stock and common stock.

The market for distressed securities is disorganized, illiquid and has no firm bid-price structure. Most of the order book is concentrated on the sell side, with traditional investors reluctant to buy, institutional investors forced to sell and analysts are not interested to cover these securities. In contrast, hedge funds can act as liquidity providers and attempt to profit from the market's lack of understanding of the true value of these securities. Some funds are simply buying these securities at deep discount to their fair value, in an attempt to capture the difference between the market price and what they think the intrinsic value is. Other hedge funds prefer to play the price differences between two securities issued by the same distressed company, typically a senior and a more junior issue.

But the real game with distressed securities starts with the restructuring process, which requires extensive legal, financial and business know-how, strong valuation and negotiation skills, plus a strong network of relationships. Active hedge funds usually attempt to obtain a significant position in the outstanding debt and then use the size of their holdings to influence the restructuring process and to participate in the reorganization, refinancing and even acquisition process, if any. This forces them to be restricted in their trading activities, as they have access to privileged information. When markets are not transparent, some of these funds do not hesitate to engage in bond mailing activities, that is, threatening the other claimants and forcing them to make concessions, even though the size of their ownership stake does not make them a pivotal claimant. By contrast, passive hedge funds simply follow a buy and hold approach and try to free ride on the coat-tails of the reorganizers. They are more trading orientated and primarily rely on public information to take their decisions.

In general, investing in distressed securities is a long term strategy – as it takes time to harvest profits from the seeds sown during difficult periods. The typical time horizon is 2 to 4 years. Portfolios are created exclusively using a bottom up approach and literally deal by deal. Hedging is minimal, although some funds have started using credit default swaps to hedge somehow their overall credit exposure.

1.2.2.3.9 Global Macro

Global macro funds have long been the most successful and most visible category of hedge funds. Their reputation is essentially due to the phenomenal success of a few star managers such as George Soros. Despite their name, these hedge funds do not hedge anything. Rather, they make very large directional bets that reflect their forecasts of market directions as influenced by major economic trends and/or particular events. In a sense, one could say that macro hedge fund managers attempt to anticipate price changes before they occur. They then take a leveraged position and wait until the expected price adjustments occur.

Global macro managers typically employ a top-down global approach to concentrate on forecasting how political trends and global macroeconomic events affect the valuation of financial instruments. Profits are made by correctly anticipating price movements in global markets and having the flexibility to use a broad investment mandate, with the ability to hold positions in practically any market with any instrument. Their edge can be derived from the research side (lower turnover and riding out short term pain whilst focusing on longer term returns) or from the trading side (highly tactical, taking profits from short term gains).

Global macro hedge funds are usually not specialized. They tend to invest globally, wherever they see value, in both developed and emerging markets. They switch from one investment opportunity to another, from one asset class to the next. They use leverage and derivatives extensively to hold large market exposures and to boost returns. Consequently, their risks and returns are often very volatile in comparison with other hedge funds.

1.2.2.3.10 Managed Futures

Managed futures are funds that invest almost exclusively in futures and forward contracts, and to a lower extent, in options and swaps. Historically, they were called Commodity Trading Advisors (CTAs) because the first futures contracts were exclusively on commodities. However, today, managed futures are no longer limited to commodities and they trade futures on equity indices, interest rates and exchange rates around the world.

Managed futures can be divided into three subcategories:

- Systematic managed futures form the largest category. They trade based on the systematic and automated application of quantitative models that use moving averages, break-outs of price ranges, or other technical rules to generate buy and sell signals for a set of markets. Most of them are long-term trend-followers, i.e. their computer trading models attempt to identify the beginning of a trend, take a position (long or short) and exit it as the trend ends. The same set of models is usually applied on a variety of markets simultaneously.
- Discretionary managers apply opportunistic strategies drawing on both fundamental and technical market analysis. They rely less on computer generated signals and more on their experience and trading skills.
- Active and fast systematic trading approaches are designed to capture short-term profit opportunities in highly liquid futures markets. These models can target time horizons that are below a few minutes.

Whatever their investment approach, managed futures usually have a strong directional bias, i.e. net long or net short, but this bias can change over time. Some people also call them “bi-directional strategies”.

1.2.2.3.11 Multi-Strategy

Multi-strategy funds employ several strategies run by different portfolio managers under a common organizational umbrella. Their primary advantage is their ability to allocate capital very efficiently to the best strategies and move this capital around opportunistically. In addition, all strategies can be supervised by a centralized risk model.

1.2.2.4 Risk and returns of hedge funds*

Table 1-12 illustrates the long term performance of hedge funds, as measured by the CSFB Tremont set of indices²⁴ in USD terms.

	Annualized			Annualized		
	Total Return	Average Month	Best Month	Worst Month	Standard Deviation	Sharpe Ratio
Convertible Arbitrage	6.72%	0.56%	3.57%	-12.26%	5.95%	0.48
Dedicated Short Bias	-1.50%	-0.01%	22.71%	-8.69%	16.89%	-0.32
Emerging Markets	8.01%	0.75%	16.42%	-23.03%	15.53%	0.27
Equity Market Neutral	9.55%	0.77%	3.26%	-1.41%	2.85%	1.99
Distressed	11.79%	0.95%	4.10%	-12.45%	6.35%	1.25
Risk Arbitrage	7.28%	0.59%	3.81%	-6.15%	4.23%	0.8
Fixed Income Arbitrage	5.06%	0.42%	2.07%	-6.96%	4.47%	0.27
Global Macro	12.89%	1.06%	10.60%	-11.55%	10.53%	0.86
Long/Short Equity	10.47%	0.88%	13.01%	-11.43%	10.08%	0.65
Managed Futures	6.59%	0.59%	9.95%	-9.35%	11.93%	0.23
Multi-Strategy	8.25%	0.67%	3.61%	-7.35%	4.92%	0.89
General Hedge Fund Index	9.69%	0.80%	8.53%	-7.55%	7.70%	0.75
S&P 500	8.38%	0.76%	9.78%	-14.46%	14.26%	0.32
Dow Jones World Index (USD)	4.81%	0.47%	9.00%	-14.19%	13.99%	0.07

Table 1-12: Performance statistics of various hedge fund strategies (Jan 1994 to September 2008)

As one can see, with the exception of the Dedicated Short Bias group, average annual returns are high and volatility is rather low in comparison to traditional equity indices. Moreover, the correlation between hedge funds and traditional equity indices remain relatively modest – as an illustration, the General Hedge Fund Index and the S&P 500 display a correlation figure equal to 0.51. This strongly supports the idea of using hedge funds in a diversified portfolio in conjunction with traditional equity and fixed income investments.

²⁴ The Credit Suisse/Tremont set of hedge fund indices are asset-weighted indices that use the Credit Suisse/Tremont database, which tracks over 5000 funds, and consists only of funds with a minimum of US\$50 million under management, a 12-month track record, and audited financial statements. The indices are calculated and rebalanced on a monthly basis, and are net of all performance fees and expenses.

Adding an **adequate** mix of hedge funds in a traditional portfolio can offer investors several important potential advantages:

- **Better returns.** Over long investment horizons, we can say that the **average** hedge fund has outperformed the **average** mutual fund. Of course, returns and risk have varied among styles, with some having provided superior performance in both areas. A few individual hedge funds have demonstrated a remarkable capacity to produce strong and consistent returns while avoiding risk. These are the funds that one should favour.
- **Better downside protection.** Hedge funds generally have also tended to provide better returns in depressed equity markets than either broad market indicators or U.S. mutual funds. Adding them in a portfolio therefore reduces the amount of losses during difficult times.
- **Low correlation and ability to diversify.** Although the magnitude of the benefit will greatly depend on both the hedge fund and the traditional portfolio styles, on average, correlation between the average hedge fund and traditional asset class indices are low.

As illustrated already, hedge fund managers can employ trading strategies that traditional asset managers are prohibited to use. Therefore the returns on hedge funds can be quite substantial, if their strategies are successful. However, one should also remember that these new strategies are also exposed to a variety of risks. Let us recall some of the key ones:

- **Market risk.** In most hedge fund strategies, the risk of price fluctuation is reduced due to the mix of long and short positions, but it is still there particularly if there is a non-null net position. Some strategies are also directional in nature and are therefore subject to market variations.
- **Liquidity risk.** Many hedge fund strategies use assets which are less liquid than traditional stocks and bonds. Moreover, hedge funds themselves are relatively illiquid. Investors therefore incur the risk of being stuck with their hedge funds longer than they would want to.
- **Leverage.** Using leverage magnifies risk and returns, which can work both ways depending on performance. Leverage also exposes funds to the risk of a leverage provider pulling the plug and forcing liquidation – usually at the worst possible time.
- **Credit risk.** Several hedge fund strategies buy assets which carry some credit risk. In addition, hedge funds deal with counterparties such as prime brokers and other hedge funds who carry some credit risk and could default at any time.
- **Legal risk.** Hedge funds are typically lightly regulated and domiciled offshore, which creates additional risks for their investors.
- **Operational risk.** The majority of hedge funds remain relatively small boutiques, and the consequences of an operational problem can be dramatic. Let us mention as an illustration the risk of fraud, the risk of assets being diverted outside the fund, and the risks inherent in the asset valuation processes of hedge fund assets

All these risks should be cautiously analyzed and understood before making any investment in hedge funds. Moreover, when analyzing the issue of the optimal hedge fund portfolio, it is essential to take into consideration the negative skewness and excess kurtosis displayed by a majority of hedge fund strategies. Including hedge funds in a portfolio of stocks and bonds may significantly improve that portfolio's mean/variance characteristics, but it can also be expected to lead to significantly lower skewness as well as higher kurtosis

Confronted with non-normal distributions, it is therefore no longer appropriate to use the standard deviation as the sole measure of risk. Indeed, risk analysis based only on the standard deviation would lead to an over-allocation to these strategies and an under-estimation of the real risk. In other words, the traditional mean-variance framework is not appropriate for the non-normality of hedge fund return distributions!

Since most private investors do not have the time, skills, or willingness to select and monitor hedge funds directly and do these complex analyses, they usually invest in a fund of hedge funds. Funds of hedge funds diversify risk by allocating capital to what they consider to be the best hedge funds in a series of strategies. In a sense, their function is quite similar to the one offered by multi-strategy funds, but they are free to select their portfolio managers in the whole hedge fund universe rather than to the subset of portfolio managers employed by one investment platform. Their drawback – as for the private equity funds of funds – is the additional layer of fees charged by the fund of fund manager, as well as the relative illiquidity of the underlying assets which makes capital reallocation a relatively slow process.

1.2.2.5 The hedge fund industry in the aftermath of the sub-prime crisis*

The hedge fund industry’s exposure to subprime assets was similar to that of commercial banks in the US. As a result the industry lost significant amounts of asset under management (AUM), both in the form of capital losses and outflows.

The figure below depicts the evolution of AUM for the hedge fund industry since 1997. We can observe a substantial growth until 2007 for both hedge funds and fund of funds and then a severe drop of approximately 30%. As of 2011, the recovery has been substantial for hedge funds while outflows have continued to erode the AUM for the funds of funds.

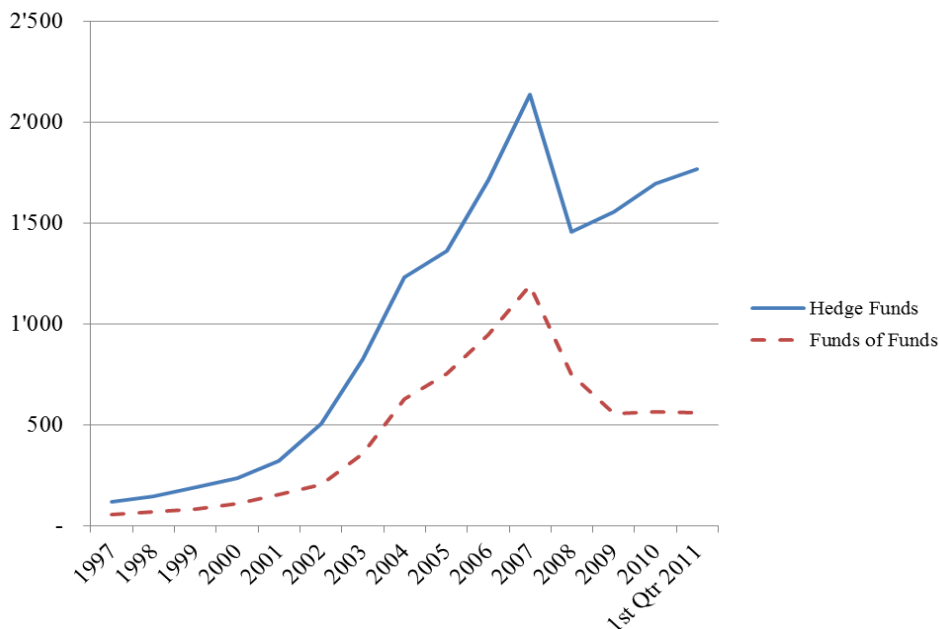


Figure 1-14: Asset under management by hedge funds

While the role of the hedge fund industry in the subprime crisis is still widely debated, this period rendered apparent some of the important limitations of this type of investment (we have hinted at in previous sections), namely transparency and liquidity.

In the aftermath of the crisis there was a strong political will to regulate the hedge fund industry further. This has led the European Union to strengthen its regulation for this type of investment. In Particular, the EU regulation for a particular type of investment products has been developing over the past 10 years under the acronym UCITS (Undertakings for Collective Investments in Transferable Securities). This set of rules is much more restrictive than the Cayman based regulation, or other EU funds types such as the Dublin "QIF" (Qualifying Investor Fund), the Luxembourg "SIF" (Sophisticated Investor Fund), or the Maltese "PIF" (Professional Investor Fund). It aims at providing increased liquidity and transparency and is targeted at more regulated investors such as pension funds. Many of the inherent restrictions in UCITS prevent the implementation of some traditional hedge fund strategies as they limit the leverage possibility and impose stringent liquidity constraint. For example the UCITS regulated funds are redeemable at net asset value at least twice per month, and most actually provide daily valuation.

The crisis has therefore led to a shift of a significant part of the industry towards more regulated products that tend to resemble classical mutual funds. However these new products do not satisfy all hedge fund investors as traditional hedge funds still manage large amount of assets.