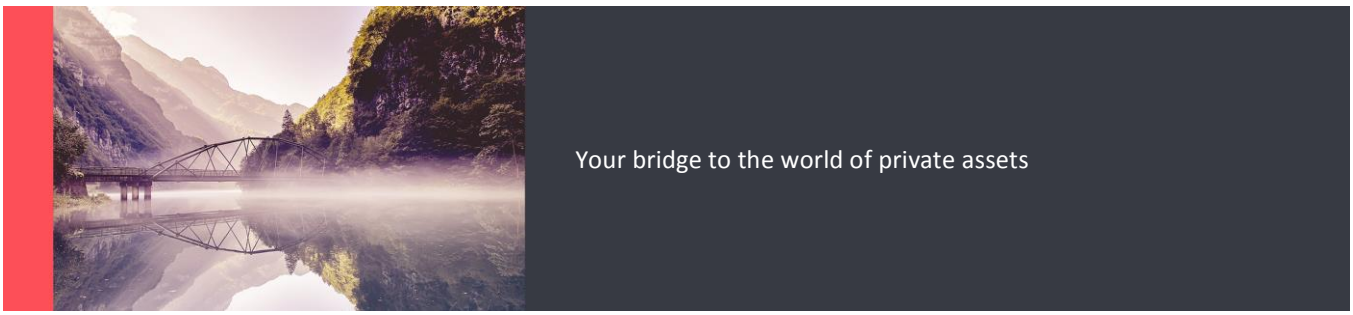
CapitalDynamics



Performance attribution in private equity

A case study of two North American pension funds

April 2016

Abstract

Evaluating and quantifying the strengths and weaknesses of the investment process is key to portfolio managers, senior management, consultants and investors; performance attribution addresses this challenging task. However, the nature of private equity makes it difficult to apply any of the well-established public equity performance attribution models. Therefore, we have developed an innovative model for private equity, which dissects the private equity portfolio performance into a base factor and four premiums: Illiquidity Premium, Strategic Asset Allocation Premium, Tactical Asset Allocation Premium and Manager Alpha. The Tactical Asset Allocation Premium can be further broken down into the Commitment Timing Premium and the Strategy Timing Premium. The base factor is called Passive Public Equity Performance and each premium relates to a distinct step in the investment process, allowing for quantification of strengths and weaknesses throughout the investment process.

In this paper, the model is illustrated using the private equity portfolio of two North American pension funds whose data is publicly available. Firstly, both data sets had to be cleaned up - funds with incomplete cash flows and funds that lack an appropriate benchmark were removed – and then the model was applied to a 10-year time period ranging from 2003 to 2012, which offered good quality data.

As a result, both pension funds were able to collect a positive Illiquidity Premium of above 4% over the Passive Public Equity Performance. The Strategic Asset Allocation Premium was positive for both pension funds as well. The higher strategic allocation to US buyout funds, coupled with the strong US buyout market performance, led to a higher Strategic Asset Allocation Premium for the first pension fund. However, due to very large commitments to the underperforming vintage year 2006, the Tactical Asset Allocation Premium of the first pension fund was negative. The second pension fund exhibited the largest exposure to the 2008 vintage year, which performed better than the pre-crisis vintage year 2006. This led to a higher Tactical Asset Allocation Premium. The second pension fund was able to strike a positive Manager Alpha, while the first pension fund was not able to achieve such. This is not surprising, as the size of these investors forces them to hold highly diversified portfolios and/or focus on the large cap market, thereby reducing the probability of achieving a positive Manager Alpha.

1. Introduction

Evaluating and quantifying the strengths and weaknesses of the investment process is key to portfolio managers, senior management, consultants and investors. Performance attribution is the tool to address this challenging task. The aim of performance attribution is the dissection of the portfolio performance into several components, where each component is associated with a particular decision in the investment process. Basically, performance attribution is conducted through chaining several benchmarking calculations, resulting in a separation of the asset allocation and fund selection component.

Any benchmarking methodology leads to meaningful insights only if the selected benchmark is appropriate. It is accepted that a valid benchmark should exhibit the following characteristics: investable, measureable, specified in advance, unambiguous and reflective of the portfolio manager's investment options. However, in practice it is often difficult to identify a benchmark satisfying all of these properties.

For public equity investments the benchmark is generally defined in the investment policy statement and typically consists of a public equity index or a combination of various such indices. The availability of passive funds tracking the performance of public equity indices guarantees the investability of the benchmark. While such a benchmark is valid at the time of specification, sometimes the investment mandate changes and the benchmark is no longer reflective of the portfolio manager's investment options. On the other side, no investable index exists for private equity. In fact, the situation is even worse as there is no widely accepted private equity index. The family of private equity and venture capital indices compiled by Cambridge Associates[1], which are used by some investors, provide quarterly returns and include all funds irrespective of their vintage year. Such a benchmark is representative of the private equity industry but should not be used to benchmark an investor's private equity portfolio, as the vintage year is an important driver of the portfolio performance.

The lack of a widely accepted and valid private equity benchmark makes it difficult to apply public equity performance models to the private equity world. More importantly, applying public performance attribution models to the private world is meaningless when different performance measures are used. In the public world, the time-weighted rate of return (TWRR) is the prominent measure to track performance while private equity uses the internal rate of return (IRR), which is also called the money-weighted rate of return (MWRR). The IRR measure is more reflective of private equity performance because it incorporates the timing of cash flows. A key characteristic of the TWRR, which is used in most performance attribution models, is its additivity property. The IRR, however, cannot be deconstructed easily.

The difference in performance measures and the difficulty to define a valid benchmark for private equity render it difficult to put public equity performance attribution models into the private equity world. Long (2008)[2] overcomes these two issues by introducing a private equity-specific performance attribution model. The model does not depend on an external benchmark and is based solely on the IRR measure – the preferred private equity performance measure. Long dissects the performance into a Base Performance, Timing Premium and Selection Premium. These three factors are derived from different IRRs obtained by modifying the weighting and/or shifting the timing of the private equity fund cash flows constituting the portfolio:

- Base Performance = IRR of equally weighted[3] funds with all funds anchored to time zero[4]
- Timing Premium = Actual Portfolio IRR - IRR of all fund anchored to time zero
- Selection Premium = Actual Portfolio IRR - IRR of equal weighted funds

The simplicity of these formulas is clearly an advantage. Additionally, these three factors do not depend on an external benchmark. Instead, modified versions of the portfolio cash flows are used to construct a benchmark. The "IRR of all funds

[1] See Global Private Equity & Venture Capital Index and Benchmarking Statistics from Cambridge Associates LLC for instance
[2] Long, Austin, 2008, Performance Attribution in Private Equity, The Journal of Performance Measurement, Fall 2008
[3] The equal weighting is based on capital called, i.e. all cash flows and NAVs of each fund in the portfolio are scaled in such a way that each fund has the same amount of total called capital. Note that whether all funds are scaled to have total called capital of 100 million or 1 million is irrelevant for the IRR, what counts is only that all funds are scaled to the *same* amount
[4] With the expression "anchored to time zero" it is meant that all cash flows and NAVs of each fund are shifted in time so that the all funds have the first cash flow at the exact same date

anchored to time zero" is used as a benchmark to determine the Timing Premium and the "IRR of equal weighted funds" is used as a benchmark to determine the Selection Premium. In other words, bootstrapped portfolio cash flows determine the benchmark.

However, the methodology to calculate the Selection Premium can easily produce misleading results: Consider a portfolio manager who has only committed to top quartile funds. Furthermore, assume that the commitment sizes to the weaker top quartile funds are larger than the stronger top quartile funds. In this scenario, the Selection Premium will be negative in most cases despite all investments being top quartile. This is because the Selection Premium only addresses the question of whether the relatively stronger performing funds of the portfolio are overweighted - the absolute performance of the funds is disregarded. Another shortcoming of the model is that the performance attribution consists of only two premiums, which does not adequately address the multiple steps within the private equity investment process. Last but not least, it is difficult to provide a practical interpretation of the Base Performance.

Our new model dissects the portfolio performance into five premiums, which are: Illiquidity Premium, Strategic Asset Allocation Premium, Commitment Timing Premium, Strategy Timing Premium and Manager Alpha. An interpretable base factor called Passive Public Equity Performance is also introduced. This level of granularity in premiums enables quantification of the strengths and weaknesses of an investment process. The issue of the Selection Premium in the approach of Long is overcome by constructing a customized index based on private equity market data.

In Chapter 2, the model is explained in detail; each premium is described and put in relation to the investment process. Moreover, the mathematics of each premium is depicted. In Chapter 3, the model is applied and illustrated on the portfolios of two North American pension funds.

2. Model description

The investment process in private equity

Private and public equity share many characteristics and risks. Even though some of the fundamentals differ, private equity is ultimately still equity. As such, various sophisticated investors[5] treat private equity as part of the equity allocation. Once the equity allocation has been identified, the initial question to pose is how to split the equity allocation between private and public equity. Subsequently, a long-term strategic asset allocation (SAA) within private equity needs to be established. The SAA defines the annual target commitment volume to private equity and how this commitment volume is spread over the various private equity strategies. Specific views on the short-term market development will occasionally result in deliberate deviations from the SAA. Such deviations are called Tactical Asset Allocation (TAA) decisions. Finally, the portfolio manager is tasked to allocate the available commitment volume to private equity fund managers; it is his responsibility to select the individual funds and to determine the commitment amount to each fund. The green arrows in Figure 1 summarize the investment process in private equity.

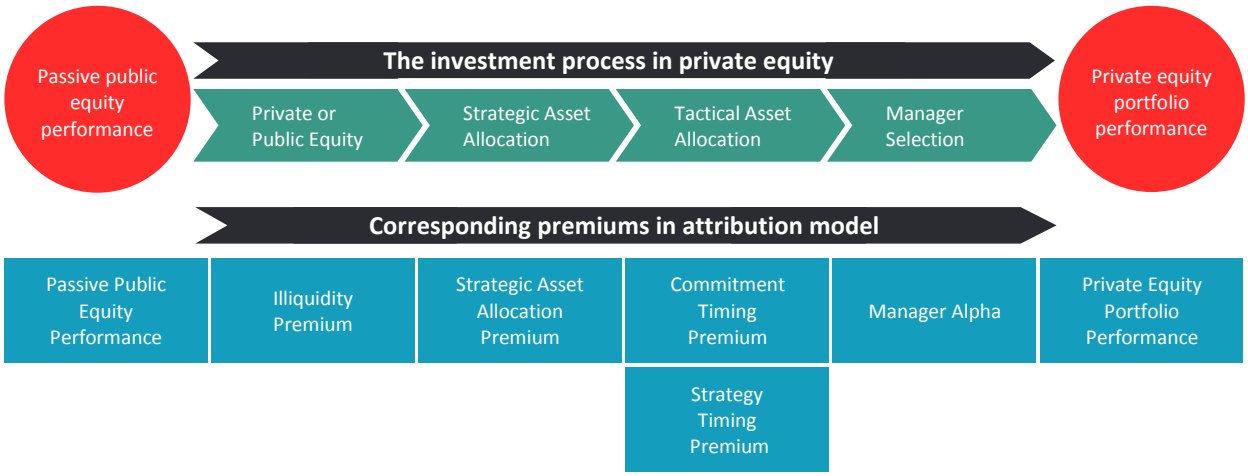


Figure 1: Investment process into private equity and premiums of the performance attribution model

In the following sections, each step of the investment process is examined in detail and quantified with one or more premiums. The blue boxes in Figure 1 provide an overview of the premiums related to the different steps in the investment process. Basically, a premium is defined as the difference between two IRRs that are based on cash flows differing in only one characteristic – the characteristic measured by the premium. Table 1 provides an overview of the calculation of each premium, while Table 2 depicts the calculation of the various IRRs.

Table 1: Definition of the premiums

Illiquidity Premium	Private Equity Market IRR - Passive Public Equity Performance
Strategic Asset Allocation Premium	SAA IRR - Private Equity Market IRR
Commitment Timing Premium	Commitment Timing IRR - SAA IRR
Strategy Timing Premium	Strategy Timing IRR - Commitment Timing IRR
Manager Alpha	Private Equity Portfolio IRR - Strategy Timing IRR

[5] Teacher Retirement System of Texas follow this approach (see here), but also La Caisse de Dépôt et Placement du Québec (see here)

Table 2: Definition of the IRRs

Passive Public Equity Performance	PME+ of the PE market over the investment horizon of the PE portfolio
Private Equity Market IRR	IRR of the PE market over the investment horizon of the PE portfolio
Strategic Asset Allocation (SAA) IRR	IRR of the PE market at the SAA weights of the PE portfolio
Commitment Timing IRR	IRR of the PE market at the strategy weights of the SAA but at the actual annual commitment volumes of the PE portfolio
Strategy Timing IRR	IRR of the PE market at the actual annual commitment volumes and at the actual strategy allocation of the PE portfolio
Private Equity Portfolio IRR	Private Equity Portfolio IRR

Private or public equity

Once the overall target allocation to equity has been identified, the next issue is how to split the equity allocation between private and public equity. The opportunity cost of investing in private equity can be viewed as the return of investing passively in public equity. This opportunity cost is quantified in the performance attribution model by the Passive Public Equity Performance. As opposed to the other factors in the model, the Passive Public Equity Performance cannot be interpreted as a premium, but should be regarded as the passive return of investing in the public index at the private equity market cash flows.

Mathematically, the Passive Public Equity Performance is derived by a PME+ calculation[6] with private equity market data, which is collected and published by various private equity data vendors such as Cambridge Associates. The PME+ of quarterly private equity cash flows and NAVs covering the same time horizon as the private equity portfolio is defined as the Passive Public Equity Performance. The time horizon starts at the year of first investment of the private equity portfolio and ends at the year of the last investment. Even if the portfolio did not invest in certain vintage years, those vintage years are still included in the Passive Public Market Performance. The portfolio manager's decision to skip certain vintage years will be quantified later in the Commitment Timing Premium. The Passive Public Equity Performance should be interpreted as investing in the public market at the cash flows dictated by the private equity market and with the time horizon defined by the private equity portfolio.

As pointed out in the previous chapter, neither the private equity market nor even the corresponding PME+ are investable. Nevertheless, both PME+ and the relevant private equity market performance are often used to benchmark private equity investments. PME+ benchmarks a private equity investment against a select public equity index. Ideally, the public index matches the characteristics of private equity market as closely as possible. To guarantee a fair comparison, the public equity index should be a total return index ensuring that dividend payouts are reinvested.

Private equity investors want to be compensated for the illiquid nature of private equity. Illiquidity risk refers to the fact that private equity investments cannot generally be immediately sold at NAV but only at a discount to NAV. Private equity investors want to be compensated for this risk in the form of the Illiquidity Premium. The Illiquidity Premium is modelled by subtracting the Passive Public Equity Performance from the Private Equity Market IRR. The Private Equity Market IRR is the IRR of the private equity market cash flows and NAVs covering the same time horizon as the private equity portfolio. Therefore, the Illiquidity Premium is simply the outperformance (or underperformance) of the private equity market over a public equity market index as measured by the PME+ methodology. Comparing the public and private equity market with the PME+ methodology is proposed by Rouvinez (2003)[7].

[6] The PME+ methodology is an established method to benchmarking private equity against public equity. Essentially the method works as follows: Shares of a public market index are bought whenever a private equity capital called occurs and shares are sold whenever a distribution happens. PME+ scales the cash flows in a way that the index is not being shorted. For more details see Rouvinez, Christophe, 2003, Private Equity Benchmarking with PME+, Venture Capital Journal, August, 34-38

[7] Rouvinez, Christophe, 2003, Private Equity Benchmarking with PME+, Venture Capital Journal, August, 34-38

Strategic Asset Allocation

Once a private equity allocation is on the agenda, a long-term strategic asset allocation (SAA) within private equity needs to be established. For private equity, the SAA involves three components: vintage year, sector and geography, where the combination of the latter two will be often summarized as strategy. The vintage year component defines the annual future target commitment volume. Sector and geography determine how the annual commitment volume is spread over the various sectors (i.e. buyout and venture capital) and geographies (i.e. US and EU). The SAA is likely to differ from the asset allocation of the private equity market. For instance, in a given vintage year the private equity market may exhibit a sector allocation of 80% to buyout and 20% to venture capital, while the SAA of the investor prescribes only a 10% allocation to venture capital and the remaining 90% to buyout. Similarly, the allocation could also differ with respect to the geographic focus.

Whether investing based on the SAA or based on the private equity market, allocation results in a higher performance when measured by the Strategic Asset Allocation Premium. For instance, if the buyout sector of the market outperforms the venture sector then the Strategic Asset Allocation Premium would be positive in the previous example, since the SAA to buyout is 10% higher than the private equity market allocation to buyout. It is important to note that the performance of the private equity portfolio itself is not relevant at this stage - what matters is only whether the SAA of the investor was able to identify and overweight the long-term outperforming strategies and vintage years.

In practice, the SAA of a private equity investor is often defined in terms of a target private equity NAV as percentage of total asset value. However, private equity funds build up the NAV over time, which makes it difficult to reach a precise target NAV within a short period of time. Typically, a long-term commitment plan to reach the strategic allocation is set up. Such a long-term plan can be achieved by applying the model from Jost and Herger (2013)[8]. In essence, the plan specifies the annual strategic commitment volumes for the next couple of years. The plan is reviewed and revised annually to incorporate any fluctuations in the private equity NAV or in the total asset value.

Mathematically, the Strategic Asset Allocation Premium is obtained by subtracting the Private Equity Market IRR from the SAA IRR. The SAA IRR is the IRR achieved by investing the amounts prescribed by the SAA into the private equity market. Any of the major private equity data vendors provide pooled quarterly private equity cash flows segregated by vintage year and strategy, which can be used to calculate the SAA IRR. The cash flows and NAV used for the SAA IRR and for the Private Equity Market IRR differ only in the weighting factor applied to each vintage year and strategy.

Tactical Asset Allocation

Views on short-term market developments will occasionally result in deviations for the SAA. Short-term deviations from the long-term SAA are called Tactical Asset Allocation (TAA) decisions. In the case of private equity, tactical deviations from the SAA can be observed in two ways: deviations from the strategic commitment volume and deviations from the strategic strategy allocation. The model captures the former by the Commitment Timing Premium, while the latter is measured by the Strategy Timing Premium. A current over- or under-allocation to private equity or changes in the general private equity market outlook might justify deviations from the strategic commitment volume. Deviations from the strategic strategy allocation might be explained by a lack of strong managers in certain strategies or a perceived (un)attractiveness of certain private equity strategies.

As stated, the TAA is broken down into two premiums. The order in which the two premiums are calculated matters. In the case of private equity it seems natural that an investor first determines the tactical commitment volume and only thereafter the tactical strategy allocation; therefore the model first measures the Commitment Timing Premium. Another possibility would be to treat the two premiums independently and introduce a residual (or interaction) premium representing the

[8] Jost, Philippe and Herger, Ivan (2013), Private Equity Asset Allocation: Robust but adaptable

joint/combined effects. However, since there is a natural order in private equity they are treated sequentially and no residual is necessary.

The Commitment Timing IRR is derived from investing in the private market at the actual private equity portfolio commitment amounts and at the strategy defined by the SAA. Mathematically, the Commitment Timing Premium is obtained by subtracting the SAA IRR from the Commitment Timing IRR. The difference between these two IRRs lies solely in the annual commitment amounts; the strategy allocation is the same for both. If the short-term view of a portfolio manager constitutes a strong private equity market outlook then an increase in the private equity allocation, above the levels prescribed by the SAA, increases the Commitment Timing Premium - assuming the short-term view actually materializes.

The Commitment Timing Premium quantifies the tactical decision to deviate from the strategic commitment amounts. However, deviations from the SAA can not only occur by under- or overcommitting but also by adjusting the strategy allocation. These deviations are captured by the Strategy Timing Premium. Mathematically, this premium is calculated by subtracting the Commitment Timing IRR from the Strategy Timing IRR. The Strategy Timing IRR is derived from investing in the private equity market at the actual commitment amounts and the actual strategy allocation. Note that the Strategy Timing IRR has the same allocation as the actual portfolio. The only difference is that the Strategy Timing IRR is based on the private equity market cash flows, while the actual portfolio is based on the cash flows of the actual funds being selected.

Manager selection

Finally, the portfolio manager is tasked with allocating the available commitment volume to private equity fund managers. It is his responsibility to select individual funds and the corresponding commitment size. The portfolio manager is accountable for the number of selected funds, the commitment amount to each fund and the ultimate performance of each fund. The Manager Alpha bundles the success of these three interrelated decisions into a single number. It is important to note that the overall portfolio performance is driven by both the performance of the selected funds and the commitment amount to each fund. For instance, a portfolio may perform poorly if several but small commitments are made to top quartile funds together with a large commitment to a bottom quartile fund.

Mathematically, the Manager Alpha is calculated by subtracting the Strategy Timing IRR from the Private Equity Portfolio IRR. Both of these IRRs are based on the same annual commitment amounts and strategy allocation. The only difference is that the Strategy Timing IRR is derived from investing the private equity market whereas the Private Equity Portfolio IRR is based on the actual funds selected by the portfolio managers. Hence, the Manager Alpha quantifies the success of deploying the available commitment capacity.

3. A case study on portfolios of two North American pension funds

The data sets

To demonstrate the performance attribution model on real world examples, data of two North American pension funds have been collected from public sources such as annual and quarterly pension fund reports or the Preqin database. Finding complete cash flow data for all private equity holdings of an investor is challenging. For each of the two pension funds, it was possible to identify complete cash flow data for more than 90% of the funds with vintage years ranging from 2003 to 2012. Due to the lack of reliable private benchmarks, both data sets had to be pruned. The portfolio for the first case study is restricted to US/EU focused buyout funds and venture capital funds. In the second case study, energy funds were included as well. The second portfolio is invested into approximately a dozen funds of funds and secondary funds which are benchmarked against buyout funds invested over three consecutive vintage years. In both case studies, funds with incomplete cash flow history were dropped from the analysis. For both portfolios, we have to make assumptions about the strategic asset allocation based on publicly disclosed investment policies. The lack of complete data may have had a meaningful impact on the following results. It is therefore important to note that we see the two case studies as illustrative, as a truly fair analysis would have to be based on better input data.

First case study

Figure 2 depicts the commitment volumes by strategy of the first North American pension fund ("*Portfolio 1"*). Over the 10-year period, Portfolio 1 committed more than USD 21bn to 95 private equity funds. The annual commitment volume successively increased until the maximum of approximately USD 5bn was reached in 2006. Subsequently, the commitment volume fell to a minimum of below USD 0.5bn after the height of the global financial crisis in 2010 and recovered thereafter. The allocation to US and EU buyout was roughly constant with a bias towards US buyout. Before 2008, the Portfolio committed to venture capital funds. Thereafter, only a single venture capital commitment was made in 2011.

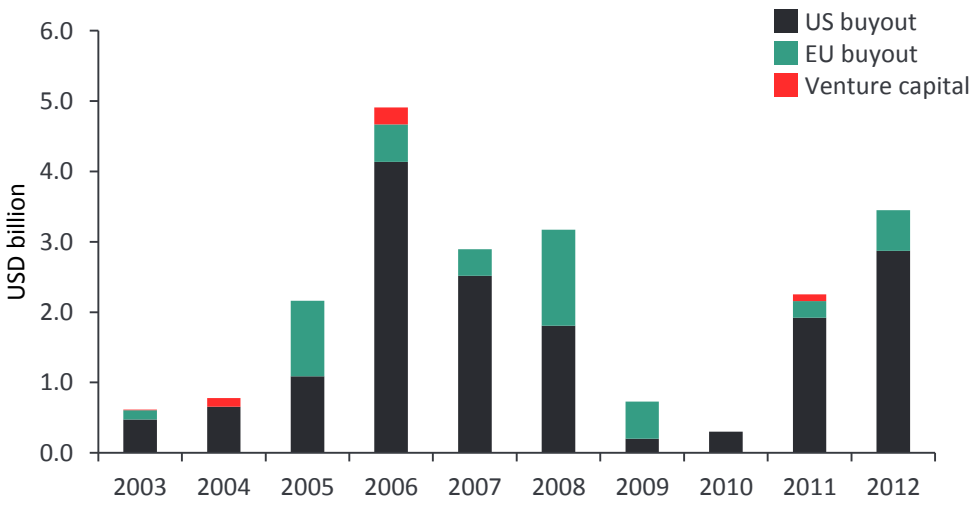


Figure 2: Commitments of Portfolio 1 by vintage year and strategy

Figure 3 shows the performance attribution model applied to Portfolio 1. By December 31, 2014, the 10-year investment program returned a 9.3% IRR which corresponds to an outperformance of 2.7% over the Passive Public Equity Performance of 6.7% IRR. The Illiquidity Premium and Strategic Asset Allocation Premium generated a combined value of 5.9% IRR while the Tactical Asset Allocation Premiums and the Manager Alpha diminished the performance by 3.2% IRR resulting in a total 2.7% IRR increase compared to passively investing the public market at the private equity portfolio cash flows.

In the following paragraphs, each premium in Figure 3 is investigated in more detail. By examining and comparing the private equity market allocation and performance together with the private equity portfolio allocation and performance the magnitude of each of the premiums becomes clear and intuitive.

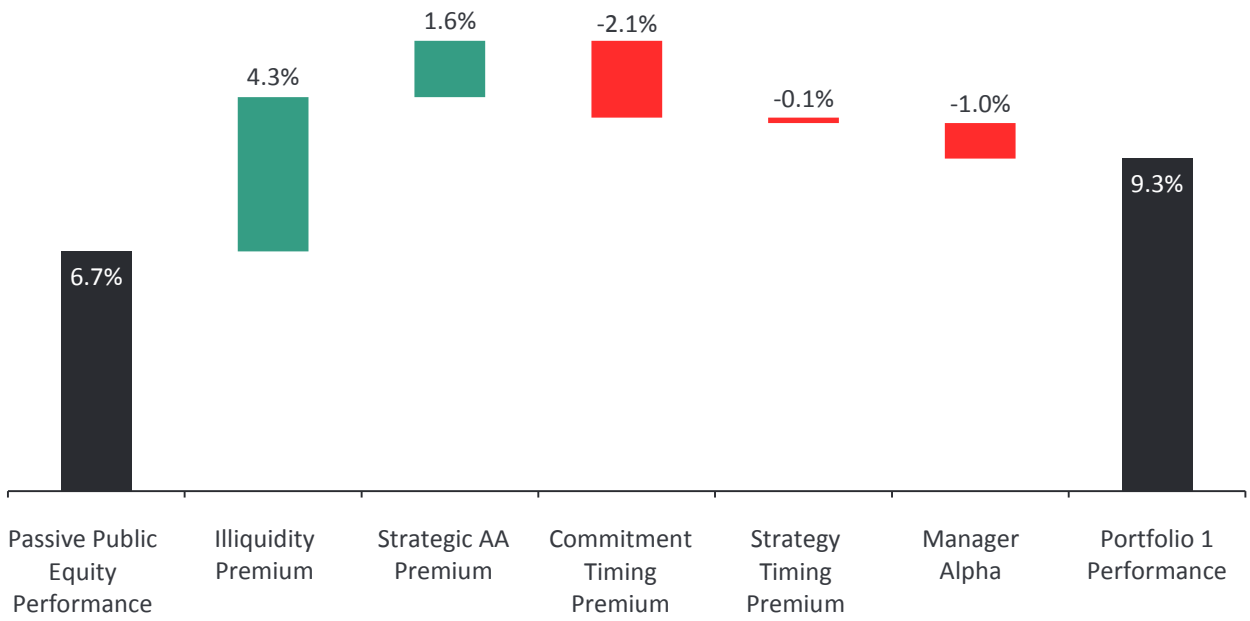


Figure 3: Performance attribution of Portfolio 1

The Passive Public Equity Performance and the Illiquidity Premium

The Passive Public Equity Performance is the PME+ of private equity market cash flows over the investment horizon of Portfolio 1. Only US/EU buyout and venture capital have been included in the private equity market, which reflects the investment universe of Portfolio 1. As a proxy of the private equity market, the Cambridge Associates database[9] is used. Cambridge Associates provides quarterly cash flows and NAVs together with the corresponding commitments (so-called market capitalization) by vintage year and strategy. Figure 4 shows these market capitalizations for the time period under consideration. The PME+ of the private equity market results in a 6.7% IRR which is the Passive Public Equity Performance. The IRR of the private equity market data yields an 11.0% IRR. Therefore, the Illiquidity Premium is 4.3% (=11.0% - 6.7%). The PME+ is based the MSCI World Total Return Index, which captures over 1,600 mid and large cap companies from 23 developed countries.

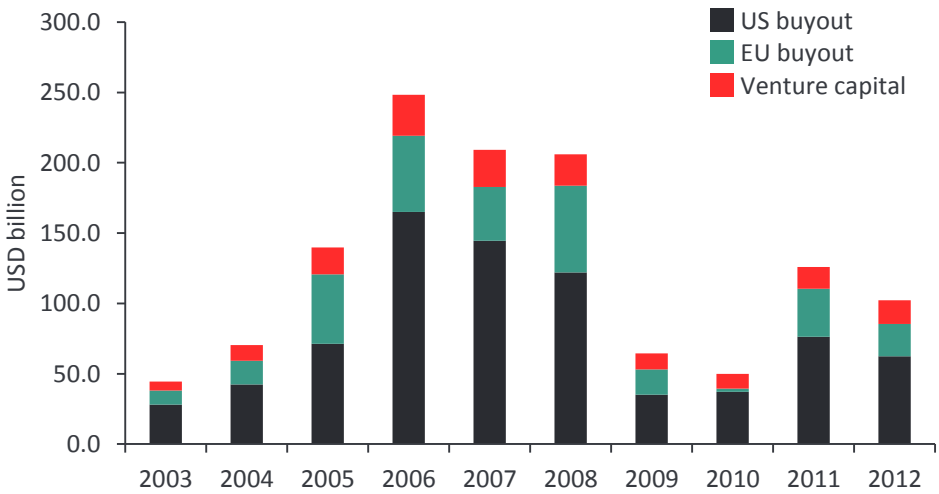


Figure 4: Market capitalization by vintage year and strategy

[9] Quarterly private equity cash flows and NAV from the Cambridge Associates LLC as of December 31, 2014. Cambridge Associates LLC obtains data from LPs and from GPs who have raised or are trying to raise capital. Therefore, it might have a bias toward well performing funds. However, given the large coverage of the database, this bias is likely to be relatively low

The Strategic Asset Allocation Premium

The strategic asset allocation to private equity is often specified in terms of a target private equity NAV as a percentage of total plan assets. However, for private equity such a target alone does not directly imply the annual required commitments (the *strategic commitments*) since the private equity NAV builds up over time and not instantaneously as in public equity investment. Therefore, to meet a target private equity NAV, a long-term commitment plan containing the strategic commitments must be established and regularly reviewed.

The pension fund in this case study does not provide a publicly available commitment plan and therefore the following approach is implemented to estimate the strategic commitments; Historical simulations suggest that to smoothly reach and maintain a *constant* target NAV exposure of *x* (dollars) in the future, annual commitments of approximately *x* divided by 6.5 are required. However, if the target exposure of x_t at time t is growing at a constant rate g then the required strategic commitment in year *t* to reach the *growing* target NAV exposure can be approximated by

$$strategic\ commitment\ in\ year\ t = \frac{x_t\,(1+g)^r}{6.5}, \qquad (1)$$

where *r* is the number of years it takes for a fund to reach its maximum NAV. Historically, the maximum NAV of a fund is reached after 4.5 years in the median case. Figure 5 shows the annual strategic commitment amounts calculated according to this methodology. The jump in 2007/2008 is due to the pension fund increasing its private equity allocation. The remaining fluctuations are due to total plan assets varying from year to year.

At this stage, the strategic commitment amounts are determined. The breakdown of the strategic commitments into the different strategies (i.e. sector and geographic) needs to be established as well. This strategy breakdown of the strategic asset allocation will be called *strategic strategy allocation*. The pension fund increased the private equity allocation in 2008, suggesting that the periods before and after 2008 should be treated separately. For the periods 2003-2007 and 2008-2012, the strategic strategy allocation is defined as the average of actual allocation to each strategy over each of the two time periods. For instance, the USD 11.4bn commitments during 2003-2007 are made up of commitments of USD 8.9bn to US buyout, USD 2.1bn to EU buyout and USD 0.4bn to venture capital. Therefore, the strategic strategy allocation for these three strategies are 78%, 19% and 3% respectively for the 2003-2007 period. For the 2008-2012 period we apply the same methodology, but disregard the single venture capital commitment in 2011. The pension fund had made statements that it would not invest into venture capital any longer and hence this single commitment is part of the tactical and not the strategic asset allocation.

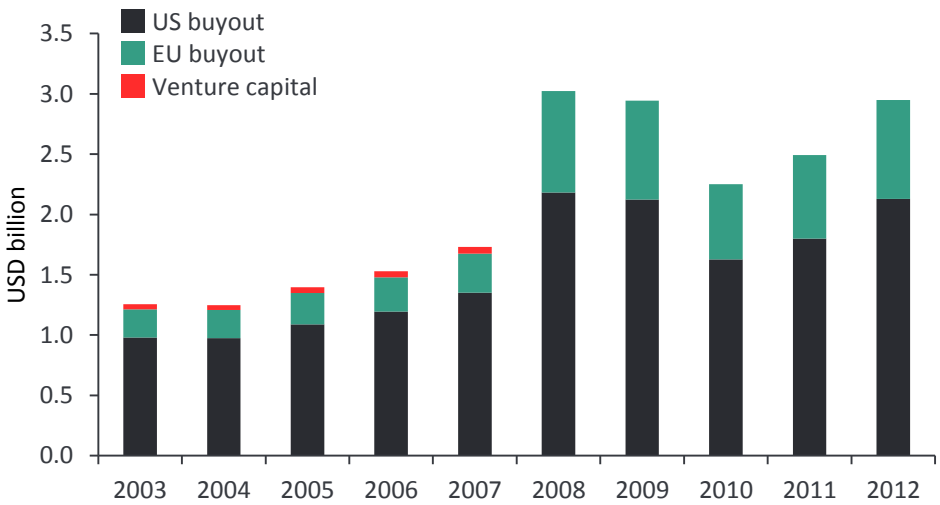


Figure 5: Strategic asset allocation of Portfolio 1

The fact that the Strategic Asset Allocation Premium is positive for Portfolio 1 becomes evident when comparing the market commitment volumes in Figure 4 with the market performance depicted in Figure 6. The market capitalization is largest when the market IRRs are lowest (i.e. 2005-2007). On the other hand the strategic asset allocation of Portfolio 1 prescribes relatively lower commitment amounts to the underperforming vintages 2005-2007 which contributes to the positive Strategic Asset Allocation Premium. In addition, in nine out of ten years US buyout outperforms EU buyout; coupled with Portfolio 1's strategic overweight of US buyout compared to EU buyout, this leads to a positive Strategic Asset Allocation Premium. Only in 2004 did EU buyout outperform US buyout.

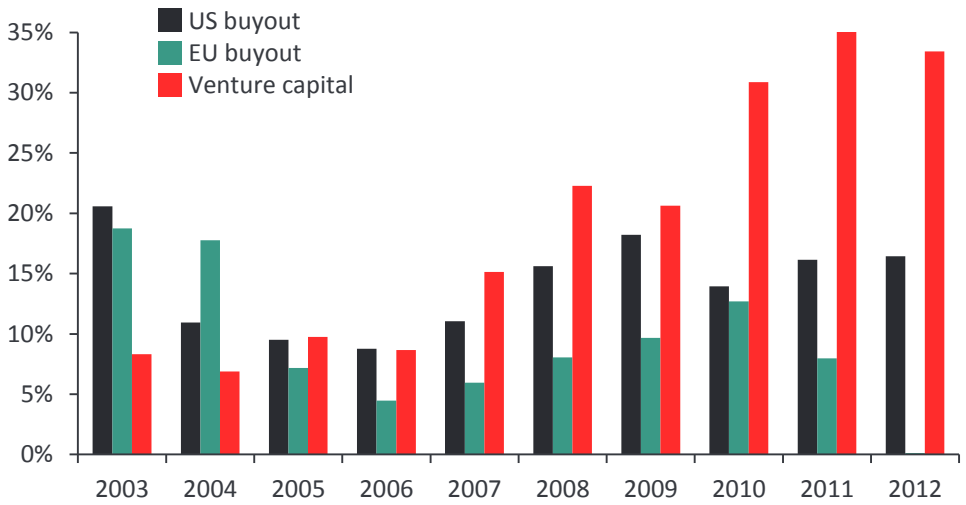


Figure 6: Market IRRs

The Commitment Timing Premium

The Commitment Timing Premium of the Portfolio 1 is -2.1%. As previously discussed, this premium measures the tactical decisions to deviate from commitments specified by the strategic asset allocation. Figure 7 depicts the actual (tactical) commitment amounts. The pattern of tactical commitments resembles the market capitalization from Figure 4. The tactical commitments are large during 2005-2008. During that time fund raising was very strong. It is likely that various managers appealing to the investor were in the market at that time and the investor did not want to miss them. In hindsight, too much capital was chasing deals and the hit caused by global financial crisis leads to weak performance of those vintage years. Investing into the private equity market along the allocation from Figure 7 yields a Commitment Timing IRR of 10.5% which is subtracted from the SAA IRR of 12.6% resulting in the -2.1% Commitment Timing Premium.

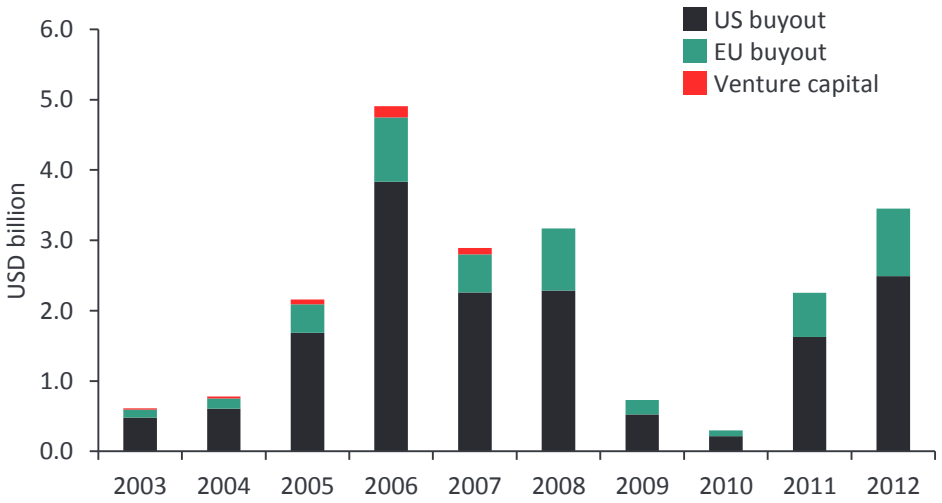


Figure 7: Actual commitment volumes but strategy allocation from SAA of Portfolio 1

The Strategy Timing Premium

The Strategy Timing Premium captures tactical deviations from the strategy allocation defined in the SAA. Figure 8 shows Portfolio 1's tactical strategy allocation together with the tactical commitment amounts. This allocation is the same as the actual allocation of Portfolio 1, as previously been shown in Figure 2. The tactical decision to make a single venture capital commitment in 2011 is included in Figure 8. Portfolio 1's tactical strategy allocation does not significantly differ from the strategy allocation of the SAA, resulting in a Strategy Timing Premium of only -0.1%. Mathematically, the Strategy Timing Premium is the difference between the Strategy Timing IRR and the Commitment Timing IRR.

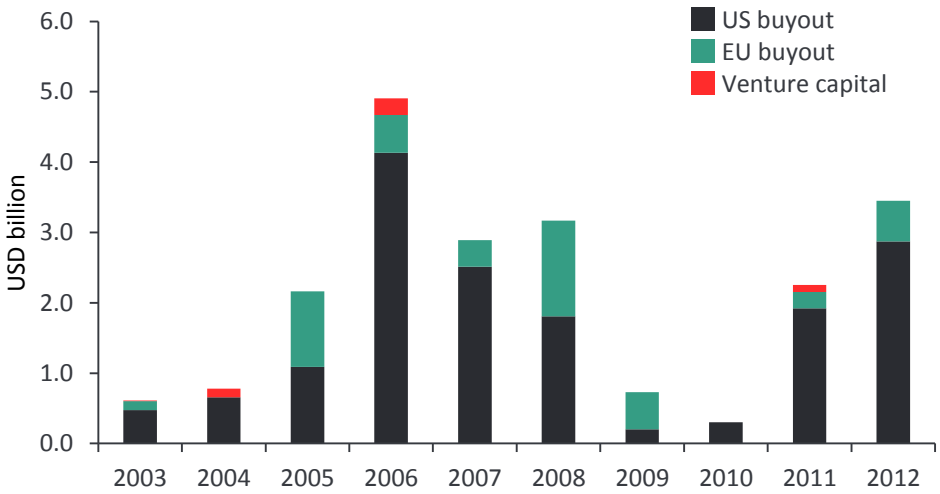


Figure 8: Actual allocation in terms of commitments and strategy allocation of Portfolio 1

The Manager Alpha

The allocation used in deriving Portfolio 1's IRR (9.3%) and the allocation used in calculating the Strategy Timing IRR (10.3%) coincide in terms of timing and strategy; the only difference is that Portfolio 1's IRR is based on the cash flows of the actual funds selected by the portfolio managers and not the private equity market cash flows as used in the Strategy Timing IRR. The portfolio managers decide on the fund selection, but also the commitment amount to each fund and the number of funds being committed to. These decisions are summarized in the Manager Alpha, which turns out to be -1.0% for Portfolio 1. The portfolio managers selected below-market average managers. From a statistical point of view, it is very difficult to generate a positive alpha for portfolios with a large number of funds. More concentrated portfolios have a higher probability of generating a positive alpha, but are also riskier.

Second case study

Figure 9 depicts the commitment volumes by strategy and by vintage year of a second North American pension fund ("*Portfolio 2*"). Over the 10-year period, Portfolio 2 made commitments of over USD 26bn to 104 private equity funds. The annual commitment volume increased until the maximum of about USD 6bn is reached in 2008. Subsequently, the commitment volume fell below USD 2bn and recovered thereafter. Portfolio 2 only made commitments to venture capital up until 2005 and invested into energy thereafter. The pension fund made its first energy commitment in 2006, but since no cash flow data was available for that fund, the commitment had to be removed from Portfolio 2.

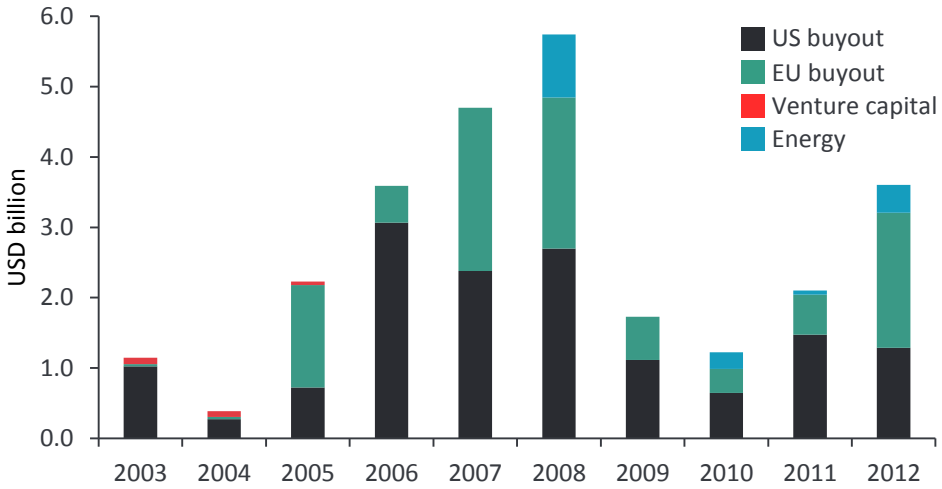


Figure 9: Commitments of Portfolio 2 by vintage year and strategy

The result of the performance attribution for Portfolio 2 is displayed in Figure 10. Portfolio 2 had an IRR of 10.8% as of December 31, 2014. The Passive Public Equity Performance and the Illiquidity Premium are similar to Portfolio 1 and would be identical if the energy sector was to be excluded from the private equity market. The Strategic Asset Allocation Premium is 0.6%. The Tactical Asset Allocation Premiums decreased the performance by 1.2% while the Manager Alpha contributed 0.5%.

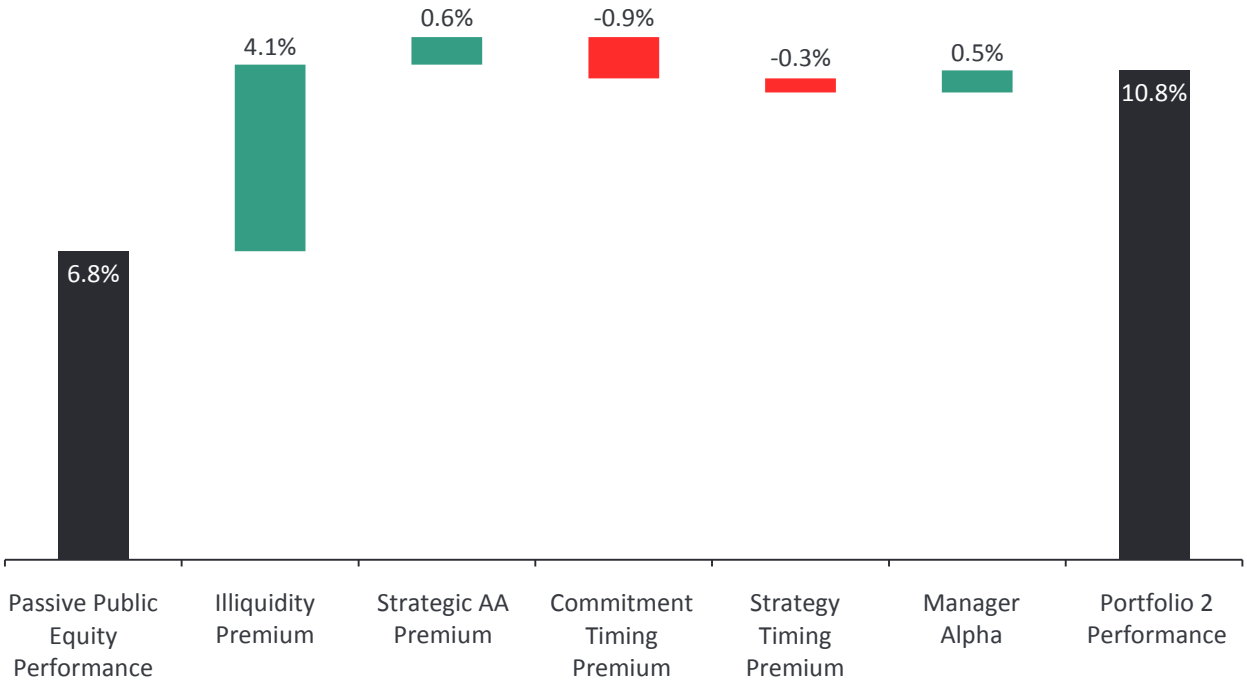


Figure 10: Performance attribution of Portfolio 2

The Passive Public Equity Performance and the Illiquidity Premium

Besides buyout and venture capital commitments, Portfolio 2 has made several considerable energy commitments. In order to reflect this additional investment choice, the energy sector has been included in the private equity market universe. Figure 11 shows the private market universe used to derive the Passive Public Equity Performance of 6.8% and the Illiquidity Premium of 4.1% in this second case study. The addition of the energy sector to the market universe results in the Passive Public Equity Performance and the Illiquidity Premium of Portfolio 1 and 2 being slightly different.

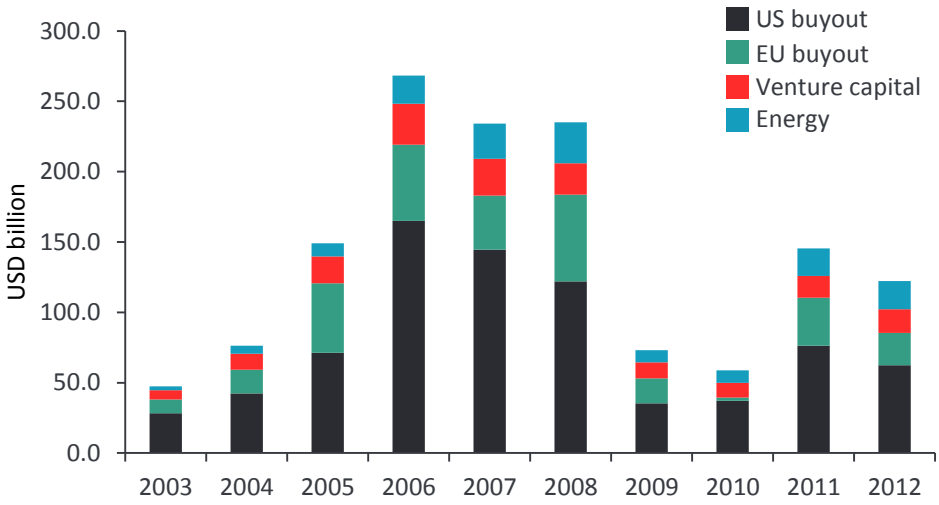


Figure 11: Market capitalization by vintage year and strategy

The Strategic Asset Allocation Premium

The strategic asset allocation depicted in Figure 12 has been determined in the same way as described in the methodology surrounding equation (1) of the first case study. As opposed to the first case study, where the private equity target allocation changed from 2007 to 2008, this pension fund exhibits a constant private equity allocation target over the 10-year horizon. Therefore, the fluctuations of the strategic commitments are solely due to the fluctuations of the total plan assets.

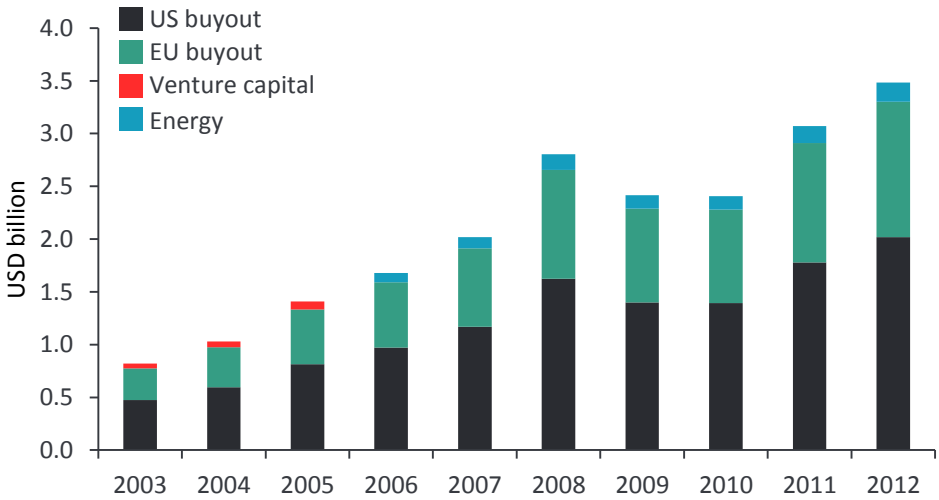


Figure 12: Strategic asset allocation of Portfolio 2

The Strategic Asset Allocation Premium of Portfolio 2 is only 0.6%, which is 1% smaller than for Portfolio 1. A key driver for this reduction is the different strategy allocation of the two portfolios: Portfolio 1 has a larger allocation to EU buyout and a smaller allocation to US buyout in comparison to Portfolio 2. The market performance in Figure 13 shows that EU buyout

underperformed US buyout in all but one vintage year. Therefore an increase in the strategic asset allocation to EU buyout will decrease the Strategic Asset Allocation Premium.

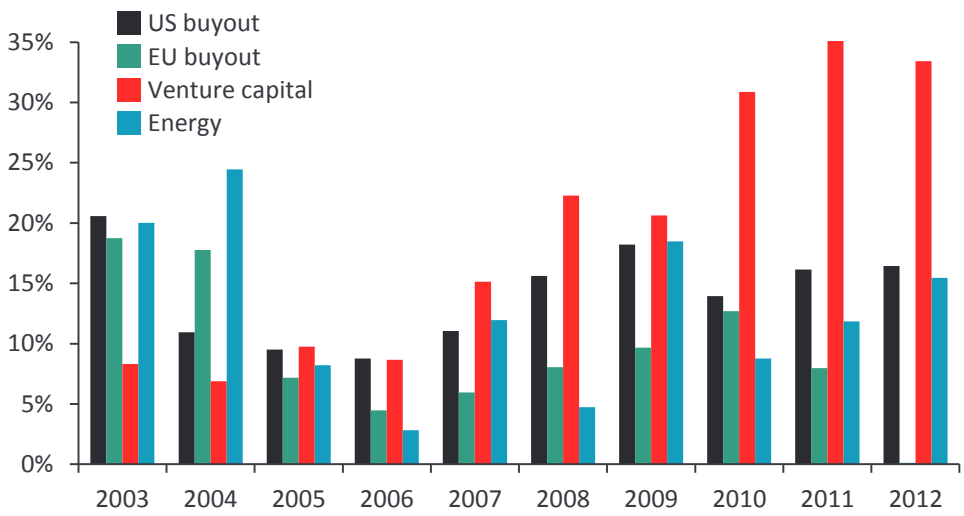


Figure 13: Market IRRs

The Commitment Timing Premium

The actual commitment amounts, together with the strategy allocation implied by the strategic asset allocation, are shown in Figure 14. Investing in the private equity market according to the allocation from this figure results in a Commitment Timing IRR of 12.6%. Note that the SAA IRR is 11.5% resulting in a Commitment Timing Premium of -0.9% for Portfolio 2. This negative premium can be explained by the considerable commitment amounts in the weaker performing vintage years 2006 and 2007. By contrast, the strategic asset allocation prescribed commitment amounts of less than half of the actual amounts for these two vintage years. The Commitment Timing Premium of Portfolio 1 is -2.2% below Portfolio 2. Investigating the vintage year exposure of each portfolio sheds some light on this difference; the single largest vintage year exposure of Portfolio 1 is 2006, which is also the weakest performing vintage year hampering the Commitment Timing IRR. Even though Portfolio 2 also has a significant exposure to 2006 its largest exposure is to 2008, which in terms of performance shows a considerable recovery compared to 2006.

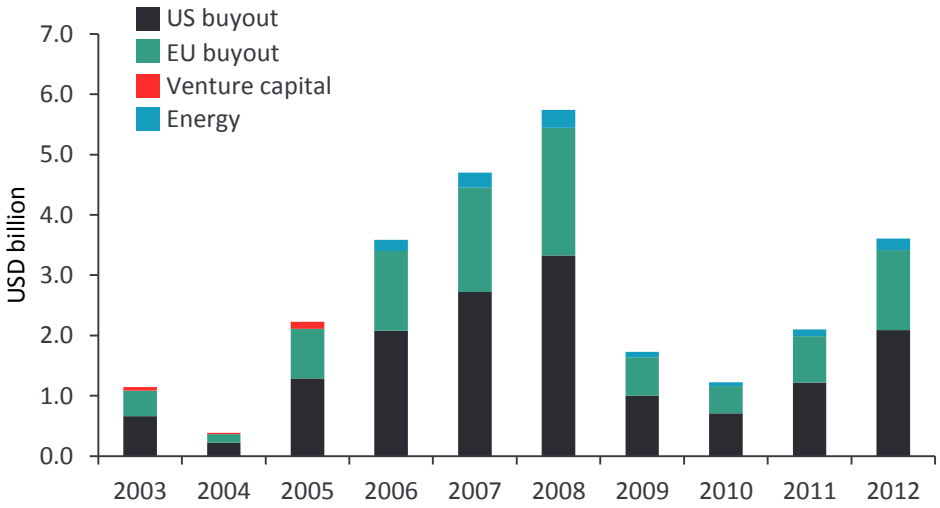


Figure 14: Actual commitment volumes but strategy allocation from SAA of Portfolio 2

The Strategy Timing Premium

The actual strategy allocation in Figure 15 and the strategic strategy allocation in Figure 14 are similar and therefore the Strategy Timing Premium is -0.3%. An important factor contributing to this negative premium is the under-allocation (compared to the strategic asset allocation) of EU buyout in vintage year 2004. This is the only vintage year for which EU buyout actually outperformed US buyout and hence an under-allocation of EU buyout in this year was a sub-optimal tactical asset allocation decision. In addition, the significant over-allocation to EU buyout in 2012 decreased the Strategy Timing IRR, since 2012 EU buyout is particularly weak. Another factor contributing to the negative premium is the energy allocation in 2008, which is the weakest vintage year for energy funds. The over-allocation to US buyout in 2006 (in which US buyout performance is almost twice as high as EU buyout performance) is positively contributing to the Strategy Timing Premium.

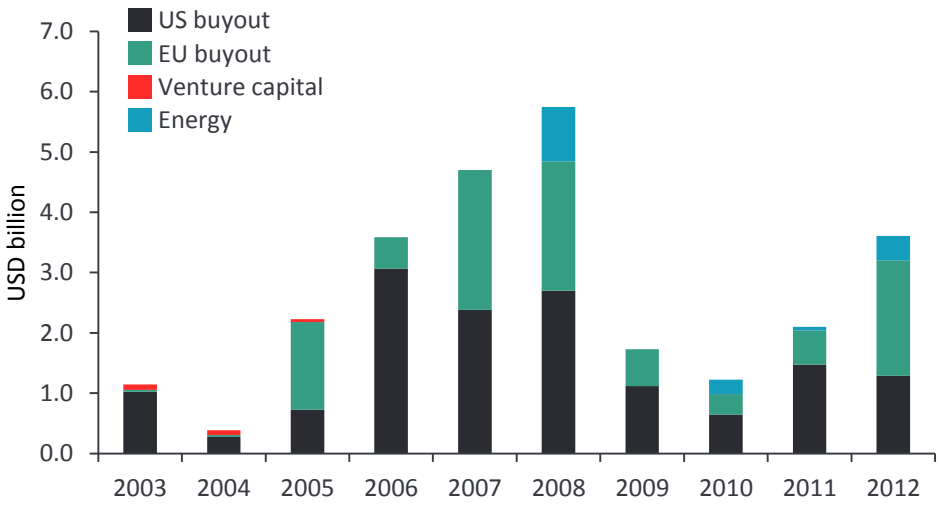


Figure 15: Actual allocation in terms of commitments and strategy allocation of Portfolio 2

The Manager Alpha

Investing in the market according to Portfolio 2's actual allocation as shown in Figure 15 leads to an IRR of 10.3%. By allocating capital to superior managers, Portfolio 2 was able to generate a 10.8% IRR leaving a Manager Alpha of 0.5%. In both case studies the Manager Alpha is a relatively small driver of the overall portfolio performance. The portfolio performance is dominated by asset allocation decisions. The importance of asset allocation is already pointed out by Brinson et al (1986)[10] by asserting that more than 90% of the variation in quarterly portfolio returns is explained by the asset allocation.

[10] Gary P. Brinson, L. Randolph Hood, and Gilbert L. Beebower (1986) Determinants of Portfolio Performance, The Financial Analysts Journal

Summary

Achieving a positive Manager Alpha is challenging. Even more so, if an investor is required to deploy several hundred millions of dollars every year. This forces him to build highly diversified portfolios or portfolios focusing primarily on large to mega cap funds. With respect to asset allocation, the two case studies illustrate that staying the course of a predefined strategic asset allocation is a wise decision. In both case studies tactical decisions were market cyclical and diminished value. However, investors of the size considered in the case studies inevitably move with the market to some degree as the market might not offer sufficient investment opportunities at all times. The result is that during recessions when fewer suitable funds are in the market, the deployed capital decreases and during booms the committed capital increases. It is in the hands of the portfolio managers to resist the temptation of over-allocating during bull years and try hard to find suitable investments in a bearish environment.

In the search of market alpha, various large pension funds and insurance companies recently accessed the direct private equity market through active ownership of companies or co-investing along other funds. They hope that these more concentrated portfolios have higher potential to generate outperformance. Tapping the direct market increases the investable universe significantly and might facilitate the deployment of capital during a bearish environment when too few suitable funds are in the market. However, the challenges of direct investing should not be underestimated as the skillset required is clearly different from that of a private equity fund investor.

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About Capital Dynamics

Capital Dynamics is an independent, global asset manager, investing in private equity and clean energy infrastructure. It is client-focused, tailoring solutions to meet investor requirements. It manages investments through a broad range of products and opportunities, including separate account solutions, investment funds and structured private equity products. Capital Dynamics currently has USD 21 billion in assets under management/advisement[11].

The firm's history dates to 1988. Its senior investment professionals average over 20 years of investing experience across the private equity spectrum[12]. It believes that its experience and culture of innovation give it superior insight and help it deliver returns for its clients. It invests locally while operating globally from its London, New York, Zug, Tokyo, Hong Kong, Silicon Valley, Munich, Birmingham, Seoul, and Scottsdale offices. More information about Capital Dynamics is available at www.capdyn.com.

[11] Capital Dynamics comprises Capital Dynamics Holding AG and its affiliates; assets under management/advisement, as of September 30, 2015, include assets under discretionary management, advisement (non-discretionary), and administration across all Capital Dynamics affiliates. Investments are primarily on behalf of funds managed by Capital Dynamics.

[12] Average years of experience held by Capital Dynamics' 20 most-senior investment professionals.

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