Performance Attribution in Private Equity

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In the public markets, time weighted rate of return (TWRR) performance attribution has been refined to enable the analyst to determine the relative contribution of the stock index, sector allocation and stock selection in order to derive the manager's contribution to investment return, as shown in Exhibit 1 (in which W_M represents the weight of the market segment; $R_{M,}$ the return to the market segment; W_P, the weight of the portfolio segment; and R_P, the return to the portfolio market segment). Public market performance attribution analysis depends, in part, on the availability of an index as the investible alternative; and, in part, on the fact that performance is measured by TWRR, which ignores the timing of interim cash flows. Neither of these critical factors applies to the private markets –there is no investible index in the private markets; and the IRR computation, which is required for private equity performance presentation by the Global Investment Performance Standards (GIPS) of the CFA Institute (CFAI), does take into account the timing and weights of all interim cash flows. As Exhibit 2 makes clear, TWRR is therefore not equal to IRR in most cases with interim cash flows.

Because there is no investible index for private equity, and because TWRR is not equal to (or even reconcilable with) IRR in most cases, the current body of finance literature does not include a reliable method for performance attribution in the private markets. Below, this article puts forward a new method and means for determining performance attribution in the private markets that addresses the lack of an investible index and incorporates the time/cash flow attributes of the IRR computation.

The IRR Calculation

It is well established in the literature of finance that the internal rate of return (IRR) of an investment is calculated by:

$$IRR = r \text{ where } \sum_{i=1}^{n} \frac{CF_i}{(1+r)^n} = 0 \qquad \textbf{(1)}$$

In Equation 1, CF_i is the cash flow at period i (using natural signs, so that investments of capital are negative and both distributions of capital and terminal valuations are positive) and n is the total number of cash flow periods. In Excel's XIRR function, which was used for all of the examples below, n is expressed in days and XIRR therefore calculates IRR using individual dates for each cash flow.[i] If the investment is unrealized, the terminal cash flow CF_n is taken to be a distribution (i.e., a positive cash flow) equal to its valuation on the terminal date.

It is also common knowledge in the finance industry and literature that the discount rate for actual IRR (r) and the discount rate for a pro forma IRR using the same cash flows multiplied by any constant k (r_{pf}) are the same:

$$r = r_{pf} \text{ where} \qquad \textbf{(2)}$$

$$\sum_{i=1}^{n} \frac{kCF_i}{(1+r_{pf})^n} = 0 \qquad \textbf{(3)}$$

This is so because the relative weights of the cash flows are unchanged as a function of time when multiplied by a constant.

Another way to understand why multiplying each cash flow by a constant does not change the IRR of an investment is to look at the original investment as a bond and the IRR as its yield to maturity. It is obvious that buying two identical bonds at the same price on the same date and with the same cash flows (and thus the same yield to maturity) would result in a portfolio with the same yield to maturity as that of the underlying bonds. The same would be true of buying 4 bonds or k bonds. It is a small extension of the principle to apply the same notion to fractional bonds and thus to all the cash flows multiplied by any constant *k*. It is important to note that *k* can be negative, as well as positive, without affecting IRR.

Finally, another technical definition of IRR is the discount rate required to make the positive cash flows (*PCF*) resulting from the investment equal to the negative cash flows (*NCF*) expended in acquiring the investment:

$$\sum_{i=1}^{n}\frac{NCF_i}{(1+r)^n}=\sum_{i=1}^{n}\frac{PCF_i}{(1+r)^n} \qquad \textbf{(4)}$$

It is therefore mathematically obvious that

$$\sum_{i=1}^{n}\frac{kNCF_i}{(1+r)^n}=\sum_{i=1}^{n}\frac{kPCF_i}{(1+r)^n} \qquad \textbf{(5)}$$

The Zero-Base Time (ZBT) IRR

An alternative method of IRR computation is referred to in the private equity industry as the zero-base time or time-zero method. In the zero-base time (ZBT) IRR method, all investments in a portfolio are presumed to begin on the same date (the zero date). In a 1995 white paper entitled *Opportunistic Investing: Performance Measurement, Benchmarking and Evaluation,* Richards and Tierney, a well-known consulting firm, argued that the ZBT method is the best way to determine stock selection ability, since it neutralizes the relative timings of the various acquisitions in a private market portfolio. In other words, the ZBT method, by moving all investments up to a common start date, minimizes the effect of an early winner, which, in the usual IRR calculation, can come to dominate return since inception.

Exhibit 3 illustrates the problem of a very successful early investment that dominates a portfolio's return since inception, as well as the effect of applying the ZBT method to the same cash flows.

The Neutrally-Weighted Portfolio (NWP) IRR

In a diversified portfolio setting, although the IRR of ***each investment*** is unchanged when all its cash flows are multiplied by a constant as shown above, we have discovered that multiplying or dividing each of the *i* period cash flows of each of *j* investments in a portfolio of *m* investments by a scaling factor f_s changes the IRR of the ***portfolio*** to a constant value IRR_k while leaving the IRR_j of each investment unchanged, as shown in the equations below:

$$IRR_k = r_{pf} \text{ where } \sum_{i=1}^{n}\frac{\sum_{j=1}^{m} f_s CF_{i,j}}{(1+r_{pf})^n}=0 \text{ and } f_s=\frac{k}{\sum_{i=1}^{n} NCF_j} \qquad \textbf{(6)}$$

Note that, in Equation 6, NCF_j represents the net cash flow of period *j* (some periods may have more than one cash flow, in which case they are netted together to result in a single cash flow for the period); and *f* is calculated so as to result in scaling each of the investments in the portfolio to contain the same amount of invested capital.

The neutrally-weighted portfolio IRR is a constant because the relative weight of each investment's contribution to the portfolio's cash flows is the same as a function of time. Since the relative weights are the same no matter what constant is used to scale the cash flows of the individual investments (i.e., the portfolio is neutrally weighted to any common standard, as shown in Exhibit 4), the IRR of the neutrally-weighted portfolio is a constant, as is its total value to paid in ratio (TVPI, calculated as [Distributions + Ending Value] / Paid-In Capital). This is so without regard to the value of *k*, including negative values.

The numerical examples in Exhibit 4 make it clear that a neutrally-weighted portfolio, in which the cash flows of all investments in a portfolio are scaled to a common constant, has two important financial and mathematical characteristics: the IRRs of the individual investments are unchanged; and the portfolio's IRR and TVPI measures are constant, no matter what factor is used to scale the portfolio to a neutral weight.

Combined Use of the Zero-Based Time and Neutrally-Weighted Portfolio (ZBT-NWP Analysis) in Private Equity Performance Attribution

The investment meaning of the neutrally-weighted portfolio's constant IRR can be used as a performance diagnostic by comparing it to the conventional portfolio IRR. The difference between the two is caused by the relative weighting of investments (or, in public stock terms, stock selection). In private market terms, this comparison determines the relative efficiency with which the managers invested their capital. If the neutrally-weighted portfolio's IRR is less that the conventional portfolio IRR, the managers invested more money in the best-performing transactions and less money in the worst-performing transactions. Conversely, if the neutrally-weighted portfolio IRR is greater than the conventional portfolio IRR, the managers invested more money in the worst-performing transactions and less money in the best-performing transactions. Obviously, the former is preferable to the latter in terms of investment efficiency.

It is also important to note that, for all the reasons cited above as to why the neutrally-weighted portfolio's IRR is constant, the total value to paid in ratio (TVPI) is also different from actual and is also a constant. In the same fashion as cited in the previous paragraph, a TVPI measure in the actual portfolio that is greater than that of the neutrally-weighted portfolio indicates that the managers invested more money in the best-performing transactions and less money in the worst-performing transactions. Conversely, if the neutrally-weighted portfolio TVPI measure is greater than the conventional portfolio TVPI, the managers invested more money in the worst-performing transactions and less money in the best-performing transactions. Again, the former is preferable to the latter in terms of investment efficiency.

The paragraphs below show in detail how the neutrally-weighted portfolio's constant IRR, as calculated above, and both the zero-based IRR and actual IRR, also as calculated above, can be used to analyze performance attribution in the private markets in terms of:

1. relative weighting of investments (i.e., stock selection, whether the managers put more money in the better transactions);
2. relative timing of investments (i.e., whether the managers' track record reflects fortunate timing, rather than investment skill); and
3. return against the base portfolio (as defined in the box below).

In order to analyze performance in these terms, we need to know the following:

	Weight	Time	
I	Neutral Weight	Zero-based	Portfolio base return
II	Actual	Zero-based	Actual weights, w/ common start date
III	Neutral Weight	Actual	Neutral-weight portfolio, w/ actual start dates
IV	Actual	Actual	Actual portfolio IRR

Taking up these topics in order:

I. Using both the neutrally-weighted portfolio IRR and the time zero IRR together eliminates both time and investment weighting. The return to the portfolio after eliminating the effects of both weighting/investment selection and timing results in what we term the base portfolio. Exhibit 5 shows the result.

II. As mentioned above, the so-called time zero IRR (ZBT) calculation restates all the investments in a portfolio to a common start date. The portfolio effect is to eliminate the relative timing of each of the investments in determining portfolio IRR. Cash flow weights, on the other hand, remain actual. Exhibit 6 shows the result.

III. The neutrally-weighted portfolio gives equal weight to each investment in a portfolio, eliminating the effect of the relative weight of each investment in determining IRR and thus yielding a constant portfolio IRR. As noted above, if more capital has been invested in the poorest investments, the actual IRR of the portfolio will be less than the portfolio scaled IRR. If the more capital has been invested in the best investments, the actual IRR will be greater than the portfolio scaled IRR. Exhibit 7 shows the result when all cash flows are scaled to a common standard so that each investment's invested capital is the same. The timing of all cash flows is actual.

    Since the 45.9% IRR of the neutrally-weighted portfolio exceeds the 43.1% IRR of the manager's portfolio, the example shows that the manager's stock selection (i.e., relative weighting of the investments in the portfolio) actually detracted from returns. In other words, naïve or neutral weighting would have yielded returns superior to the actual weighting of the portfolio's investments.

IV. The actual portfolio return (i.e., the IRR using both actual cash flow weights and actual cash flow timing), using the numerical example cited above, is shown in Exhibit 8.

With all of these figures known, we can analyze the manager's performance in Exhibit 9. Note carefully that the IRRs total properly to the manager's return in this analysis, a property derived from the fact that the selection IRR and timing IRR each have only a single changed parameter, whether dollar weight or time, from the line immediately preceding. There are thus no intervening unexplained factors.

Using ZBT-NWP Performance Attribution on an Actual Portfolio

In the example shown in Exhibit 10, performance attribution analysis of a real-world portfolio shows that the portfolio manager did put the most money into the best investments (**II – I** = 112 bp of value added over the base portfolio). Timing was also good (**IV – II** = 95 bp of value added), but timing is the investment aspect least controllable by the manager in the private markets.[ii] The total manager contribution was positive (**IV – I** = 207 bp), although it is important to keep in mind that this addition to performance came on top of an excellent base portfolio return of 20.5%. In other words, the manager did extremely well, obtaining a 20.5% IRR and then adding 207 bp in additional return, although only 112 bp of the added return was attributable to factors within the manager's control. In portfolios with lower base returns, selection and timing begin to dominate the portfolio's return, thus putting a premium on manager skill (in the case of selection return) and/or luck (in the case of timing return).

Attribution of Additional Aspects of Performance

In addition to calculating the return to selection and timing for the IRR of an individual investment or any aggregation of investments, including vintages, asset classes, investment strategies and the like, ZBT-NWP portfolio analysis can analyze the performance of any of these relative to a public market index (the opportunity cost of the same cash flows in the public market) in the same way. When analyzing opportunity cost return in this way, ZBT-NWP analysis takes on a new meaning in which performance attribution has to do with the influence of market conditions and timing on performance of a private equity portfolio relative to the public market. These are critical insights into the quality of the manager's earnings relative to the public market index, including how much of the return relative to the index was the result of the weights of the investments in the portfolio (a measurement of selection skill) and how much of the return relative to the index was the result of timing (a measurement of luck, since the manager cannot influence the performance of the market over a particular – or, indeed, any – time period.

In Exhibit 11, the performance of a private equity investment relative to the S&P 500 index was calculated using the original Long-Nickels method[iii] later adopted by Venture Economics as the public market equivalent (PME) return. Note that ZBT-NWP analysis makes it possible to separate the performance over the index attributable to investment weight and the performance over the index attributable to the timing with which the investment cash flows occurred. In the example in Exhibit 11, the portfolio base return performed extremely well against the index, outperforming by 942 basis points. However, the relative weights of the investments in the portfolio, a measure of selection skill, actually subtracted 814 basis points of performance versus the index. If these two elements are taken together, 942 bp – 814 bp = 128 bp of return over the index is attributable to elements of return within the manager's control.

The return to timing in Exhibit 11, however, is an enormous 1,956 basis points over the index. This return was not within the manager's control, since it would be impossible to know in advance how the market would behave so as to time the private equity portfolio's cash flows to conform to its performance. The conclusion these outcomes point to is that this manager's performance versus the index, while truly outstanding (a total of 2,084 bp over the index), was predominately the result of timing and therefore attributable almost exclusively to factors outside the manager's control. To state the obvious, the track record of a manager whose performance versus the index is the result of adventitious (and advantageous) timing is not as strong as the track record of a manager whose performance is the result of factors within the manager's control, include the relative weights of the investments in the portfolio. ZBT-NWP analysis therefore provides an important screening tool in reviewing private equity deal flow.

Uses of ZBT-NWP Private Equity Portfolio Performance Attribution

One use of ZBT-NWP private equity portfolio performance attribution is in the screening of deal flow. While it might seem obvious to say so, it is critically important to understand the origins of a private equity investment manager's returns and perhaps even more important to understand the manager's returns against the relevant public market index. Great performance, including great performance versus the index, is not as impressive when it was generated by factors not in the manager's control. Conversely, great performance, including great performance versus the index, that has been generated by factors within the manager's control represent the best hope that the manager will likely be able to replicate those returns in the future. This is particularly the case when a manager can demonstrate a lengthy track record of generating excellent performance using replicable elements of return. Viewed in this light, the manager featured in Exhibit 11 represents an example of excellent returns versus the index that are attributable principally to the vagaries of timing and not to factors within the manager's control. ZBT-NWP performance attribution thus provides an objective means for discerning the truth of a track record, as opposed to taking at face value the various claims made by managers attempting to present their returns in the most positive light.

Another important use of ZBT-NWP performance attribution is to monitor the staff's contribution to the returns of an institutional investor's private equity portfolio. The only difference between using ZBT-NWP analysis for this purpose, as opposed to deal flow screening, is that in deal flow screening performance analysis is done at the **deal level** while in monitoring staff contribution to a private equity portfolio the analysis is done at the **fund level**. In other words, ZBT-NWP analysis can isolate the returns (and the returns relative to the index) stemming from weighting vintages, asset classes or individual funds within the institutional private equity portfolio and the returns (and the returns relative to the index) stemming from the timing of the same vintages, asset classes or individual funds. While subjective factors will always be important in determining institutional staff incentive compensation, ZBT-NWP performance attribution can provide senior management or the board of trustees an objective view of private equity performance attribution that separates returns due to timing (i.e., good fortune) from returns due to selection (i.e., superior judgment). Presumably most boards would choose to compensate the latter more liberally than the former.

Intellectual Property Rights in ZBT-NWP Performance Attribution Analysis

The performance attribution method discussed in this paper is the subject of U.S. patent 7,058,583, issued June 6, 2006, which is the property of Alignment Capital Group, LLC. This publication is intended solely for research purposes. For further information, please log onto www.alignmentcapital.com.

Exhibit 1

Sector	W_M	R_M	I. $W_m * R_m$	II. $R_M * W_P$	III. $W_M * R_P$	W_P	R_P	IV. $W_P * R_P$
Consumer	30.0%	15.0%	4.5%	1.5%	5.4%	10.0%	18.0%	1.8%
Technology	10.0%	20.0%	2.0%	6.0%	2.5%	30.0%	25.0%	7.5%
Cyclical	35.0%	30.0%	10.5%	4.5%	7.0%	15.0%	20.0%	3.0%
Energy	25.0%	-5.0%	-1.3%	-2.3%	1.3%	45.0%	5.0%	2.3%
	100.0%		15.75%	9.75%	16.15%	100.0%		14.6%

I. Index return	15.8%
II. Index and portfolio allocation returns	9.8%
III. Stock selection	16.2%
IV. Portfolio return	14.6%

Attribution

Market index	I.	15.8%
Asset allocation	II - I	-6.0%
Security selection	IV - II	4.8%
Manager's total return	IV	14.6%
Manager's contribution	IV - I	-1.2%

Exhibit 2

Period	Beginning Value	Amount (In) / Out	Ending Value	Index Return	End of Period Index	IRR CF
0					1	
1	100	($100.00)	$110.00	10.0%	1.100	($100.00)
2	$110.00	($100.00)	$220.92	5.2%	1.157	($100.00)
3	$220.92	($100,000.00)	$89,998.39	-10.2%	1.039	($100,000.00)
4	$89,998.39	$89,000.00	$1,131.17	13.3%	1.177	$89,000.00
5	$1,131.17	$0.00	$1,197.91	5.9%	1.247	$0.00
6	$1,197.91	$0.00	$1,102.08	-8.0%	1.147	$1,102.08

TWROR	IRR
2.3%	-9.8%

Exhibit 3

	Actual		
Period	Invstmnt 1	Invstmnt 2	Portfolio
1/1/2000	$ -	$ (8.0)	$ (8.0)
1/1/2002	$ -	$ 20.0	$ 20.0
1/1/2004	$ (20.0)	$ -	$ (20.0)
1/1/2006	$ 25.0	$ -	$ 25.0
	$ 5.0	$ 12.0	$ 17.0
IRR	12%	58%	42%
TVPI	1.3	2.5	1.6

	Zero-Base Time		
Period	Invstmnt 1	Invstmnt 2	Portfolio
1/1/2000	$ (20.0)	$ (8.0)	$ (28.0)
1/1/2002	$ 25.0	$ 20.0	$ 45.0
1/1/2004	$ -	$ -	$ -
1/1/2006	$ -	$ -	$ -
	$ 5.0	$ 12.0	$ 17.0
IRR	12%	58%	27%
TVPI	1.3	2.5	1.6

Exhibit 4

	Actual			
Period	Invstmnt 1	Invstmnt 2	Portfolio	Times Earned
1/1/00	$ (4)	$ -	$ (4)	
1/1/01	$ 2	$ (2)	$ -	
1/1/02	$ (8)	$ 3	$ (5)	
1/1/03	$ -	$ (8)	$ (8)	
1/1/04	$ 14	$ -	$ 14	
1/1/05	$ -	$ 35	$ 35	
	$ 4	$ 28	$ 32	**2.882**
IRR	13.435%	91.074%	**43.1%**	

	Pro Forma Scaled to Mean			
Period	Invstmnt 1	Invstmnt 2	Portfolio	Times Earned
1/1/00	$ (3.7)	$ -	$ (3.7)	
1/1/01	$ 1.8	$ (2.2)	$ (0.4)	
1/1/02	$ (7.3)	$ 3.3	$ (4.0)	
1/1/03	$ -	$ (8.8)	$ (8.8)	
1/1/04	$ 12.8	$ -	$ 12.8	
1/1/05	$ -	$ 38.5	$ 38.5	
	$ 3.7	$ 30.8	$ 34.5	**3.043**
IRR	13.4%	91.074%	**45.9%**	

$ (2.0)	Pro Forma Scaled to Arbitrary			
Period	Invstmnt 1	Invstmnt 2	Portfolio	Times Earned
1/1/00	$ (0.7)	$ -	$ (0.7)	
1/1/01	$ 0.3	$ (0.4)	$ (0.1)	
1/1/02	$ (1.3)	$ 0.6	$ (0.7)	
1/1/03	$ -	$ (1.6)	$ (1.6)	
1/1/04	$ 2.3	$ -	$ 2.3	
1/1/05	$ -	$ 7.0	$ 7.0	
	$ 0.7	$ 5.6	$ 6.3	**3.043**
IRR	13.4%	91.074%	**45.9%**	

	Pro Forma Scaled to Inv 1			
Period	Invstmnt 1	Invstmnt 2	Portfolio	Times Earned
1/1/00	$ (4.0)	$ -	$ (4.0)	
1/1/01	$ 2.0	$ (2.4)	$ (0.4)	
1/1/02	$ (8.0)	$ 3.6	$ (4.4)	
1/1/03	$ -	$ (9.6)	$ (9.6)	
1/1/04	$ 14.0	$ -	$ 14.0	
1/1/05	$ -	$ 42.0	$ 42.0	
	$ 4.0	$ 33.6	$ 37.6	**3.043**
IRR	13.4%	91.074%	**45.9%**	

	Pro Forma Scaled to Inv 2			
Period	Invstmnt 1	Invstmnt 2	Portfolio	Times Earned
1/1/00	$ (3.3)	$ -	$ (3.3)	
1/1/01	$ 1.7	$ (2.0)	$ (0.3)	
1/1/02	$ (6.7)	$ 3.0	$ (3.7)	
1/1/03	$ -	$ (8.0)	$ (8.0)	
1/1/04	$ 11.7	$ -	$ 11.7	
1/1/05	$ -	$ 35.0	$ 35.0	
	$ 3.3	$ 28.0	$ 31.3	**3.043**
IRR	13.4%	91.074%	**45.9%**	

Exhibit 5

	Neutral Weight and Zero-Based					
Period	Invstmnt 1		Invstmnt 2		Portfolio	
1/1/2000	$	(3.7)	$	(2.2)	$	(5.9)
1/1/2001	$	1.8	$	3.3	$	5.1
1/1/2002	$	(7.3)	$	(8.8)	$	(16.1)
1/1/2003	$	-	$	-	$	-
1/1/2004	$	12.8	$	38.5	$	51.3
1/1/2005	$	-	$	-	$	-
	$	3.7	$	30.8	$	34.5
IRR		13.4%		91.101%		**52.8%**

Exhibit 6

	Actual Weight and Zero-Based		
Period	Invstmnt 1	Invstmnt 2	Portfolio
1/1/2000	$ (4)	$ (2)	$ (6)
1/1/2001	$ 2	$ 3	$ 5
1/1/2002	$ (8)	$ (8)	$ (16)
1/1/2003	$ -	$ -	$ -
1/1/2004	$ 14	$ 35	$ 49
1/1/2005	$ -		$ -
	$ 4	$ 28	$ 32
IRR	13.4%	91.101%	**49.4%**

Exhibit 7

	Neutral Weight and Actual Time		
Period	Invstmnt 1	Invstmnt 2	Portfolio
1/1/2000	$ (3.3)	$ -	$ (3.3)
1/1/2001	$ 1.7	$ (2.0)	$ (0.3)
1/1/2002	$ (6.7)	$ 3.0	$ (3.7)
1/1/2003	$ -	$ (8.0)	$ (8.0)
1/1/2004	$ 11.7	$ -	$ 11.7
1/1/2005	$ -	$ 35.0	$ 35.0
	$ 3.3	$ 28.0	$ 31.3
IRR	13.4%	91.074%	**45.9%**

Exhibit 8

	Actual Weight and Actual Time		
Period	Invstmnt 1	Invstmnt 2	Portfolio
1/1/2000	$ (4)	$ -	$ (4)
1/1/2001	$ 2	$ (2)	$ -
1/1/2002	$ (8)	$ 3	$ (5)
1/1/2003	$ -	$ (8)	$ (8)
1/1/2004	$ 14	$ -	$ 14
1/1/2005	$ -	$ 35	$ 35
	$ 4	$ 28	$ 32
IRR	13.435%	91.074%	**43.1%**

Exhibit 9

	Weight	Time	Explanation	
I	Neutral Weight	Zero-based	Portfolio base return	52.8%
II	Actual	Zero-based	Actual weights, w/ common start date	49.4%
III	Neutral Weight	Actual	Neutral-weight portfolio, w/ actual start dates	45.9%
IV	Actual	Actual	Actual portfolio IRR	43.1%

I	Base Return	52.8%
II - I	Selection (relative weighting)	-3.3%
IV - II	Timing	-6.4%
IV	Manager's return	43.1%
IV - I	Manager's contribution	-9.7%

Exhibit 10

	$	Time	Explanation	
I	Neutral Weight	Zero-based	Index of portfolio	20.54%
II	Actual	Zero-based	Actual weights, common start date	21.66%
III	Neutral Weight	Actual	Neutral-weight portfolio, actual start dates (timing)	23.73%
IV	Actual	Actual	Actual weights, actual timing (conventional IRR)	22.61%

I	Portfolio index	20.54%
II - I	Selection (relative weighting) against portfolio index	1.12%
IV - II	Timing	0.95%
IV	Manager's return	22.61%
IV - I	Manager's contribution	2.07%
IV - III	Selection (relative weighting) against actual outcome	-1.12%

Exhibit 11

	Money	Time	Explanation	Return > Index
I	Neutral Weight	Zero-based	Portfolio base return	9.4%
II	Actual	Zero-based	Actual weights, common start date	1.3%
III	Neutral Weight	Actual	Neutral-weight portfolio, actual start dates	50.9%
IV	Actual	Actual	Actual weights, actual timing	20.8%

		Return > Index
I	Portfolio base return	9.4%
II-I	Selection	-8.1%
IV-II	Timing	19.6%
IV	Manager's return	20.8%
IV-I	Manager's contribution	11.4%

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[i] XIRR returns for time periods less than one year must be annualized in order to be expressed in terms consistent with XIRR returns for time periods greater than one year.

[ii] Actually, perfect timing would suggest luck, rather than skill. Timing, in this analytical method, is simply a means of isolating the effect of one component of the return computation.

[iii] Invented in 1992 and perfected in 1993 by Austin Long and Craig Nickels, who were then managing the private equity portfolio of The University of Texas System. Available in the Research section of the Alignment Capital Group Web site (www.alignmentcapital.com) as “A Private Equity Benchmark,” by Austin Long and Craig Nickels, published at the AIMR Venture Capital Conference in San Francisco, February 13, 1996.