IRR-Based Property-Level Performance Attribution

Helping to evaluate management skill.

David Geltner

Investment performance attribution has become more widely used in the past decade, accompanying the rise of style-based investment management and the development of benchmark indexes that represent style-pure investment performance. Performance attribution may be broadly defined as decomposition of the total investment return of a subject manager or portfolio, to enable the diagnosis and understanding of what caused the given investment performance by that manager or portfolio. Performance attribution analysis generally benefits from use of a benchmark index whose return over the same period of time is similarly parsed, so that the subject's performance can be compared to the benchmark's performance, attribute by attribute.

Investment managers use performance attribution to help understand the determinants of their historical performance during given periods of time, helping to identify causes and effects, strengths and weaknesses. Investor clients and their consultants use performance attribution of investment managers for the same reason, and to assist in making judgments about relative manager capabilities.

In the securities investment industry, performance attribution is normally limited to what might be called the *portfolio level*, where total return performance relative to the benchmark is typically divided into two major components, often referred to as the *allocation* and *selection* effects. These two attributes correspond to the two major functions of an active portfolio manager in the

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securities industry: allocation of the overall portfolio among different categories of investments, and selection of specific investment assets within each such category.

Although portfolio-level performance attribution is also important in direct real estate investment, in the private real estate investment management industry, and in firms that manage many real estate investment assets (such as REITs), it is interesting to drill more deeply, to add a second level of performance attribution, what might be called *property-level* performance attribution (see Hamilton and Heinkel [1995], Lieblich [1995], Bradford et al. [1999], Pagliari et al. [2001], and Young and Annis [2002]). This second level is of interest because these real estate investment managers perform additional functions, including operational management of the investment assets, and these additional functions provide additional sources and determinants of investment performance.

This article describes a new way to conduct property-level performance attribution for the management of directly held real estate investment assets. It is based on the internal rate of return (IRR) the investments achieve.

PROPERTY INVESTMENT MANAGEMENT

Property-level performance attribution is motivated by the need to consider two types of property-level investment management functions that are absent from traditional securities investment management. First, operational management of the property is both the responsibility of the investor-owner and a key determinant of the total return achieved. Operational management is important because individual real estate assets are typically held for long periods of time (in part due to high transaction costs), and generate much of their total return through the net cash flow obtained during the long holding period (i.e., core real estate assets are cash cows). Operational management includes such property management functions as marketing and leasing strategy (revenue management) and the management of operating expenses and capital improvement expenditures.

Second, asset transaction execution is a major task that is also the responsibility of the investor-owner. In a private asset market, there are generally neither very clear nor precise indications of the market values of individual assets when these assets are bought or sold. Observable transaction prices in the market provide only an imprecise (or noisy) indication of the current market value of any given asset. Asset transaction deals are often complex and customized, involving extensive and crucial negotiations between parties on buy and sell sides. Thus, transaction management skill is also needed, to obtain the best price possible whenever a transaction is made. On a round-trip basis, returns are enhanced by the manager's ability to buy low, and/or to sell high, relative to the imprecise indication of market value at the time of each transaction.

EXHIBIT 1
Four Major Property-Level Investment Management Functions

1. **Property Selection**
2. **Acquisition Transaction Execution**
3. **Operational Management**
4. **Disposition Transaction Execution**

The essential property-level investment management functions of direct real estate investment are summarized in the four functions listed in Exhibit 1.

Both the operations management and transaction execution performance of the investment manager may be viewed as part of the selection function at the real estate portfolio level. But in direct real estate investment, a given property may perform better than the average property within a category not only because the property was a bargain as found (the traditional equity investment concept of selection performance), but also because the property was operated more profitably during its holding period, and/or because its buy and/or sale transactions were executed well.

Property-level performance attribution in direct real estate investment should therefore go beyond traditional selection performance measurement at the portfolio level, by defining performance attribution measures that are sensitive to property management and transaction execution functions, with the allocation among different categories of properties taken as a given.

IRR-BASED PERFORMANCE ATTRIBUTION

Although investment performance measurement at the *portfolio level* is generally based on the time-weighted rate of return (TWRR), it can be argued in principle that at the *property level* the internal rate of return (IRR) is more appropriate for investment performance measurement than the TWRR. This is because, as a money-weighted

return, the IRR is sensitive to the effect of cash flow timing; the TWRR lacks such sensitivity. At the property level, cash flow timing decisions (e.g., capital improvement expenditures, leasing decisions) are within the responsibility, and under the authority, of the investment manager. For accountability purposes, it is appropriate to measure performance in a manner consistent with the manager's responsibility and authority.

While there is no one uniquely correct method of property-level performance attribution, there is a procedure that is related logically to the major property-level investment management functions of transaction execution and operational management.[1] It requires the performance attribution to be based on the *since-acquisition* IRR of the subject property or properties.

Only a since-acquisition return can capture the acquisition transaction performance. Also, with the long investment holding periods characteristic of private real estate, a since-acquisition return is necessary to more completely capture the selection performance of the manager. Furthermore, since the IRR is a cash flow-based measure, the procedure suggested here will account for and reflect the effect of capital improvement expenditures, a key aspect of successful long-term direct property investment.

The basic idea in the property-level performance attribution approach suggested here is to decompose the property-level IRR since acquisition, identifying three major return components or determinants: initial yield (IY), cash flow change (CFC), and yield change (YC), defined as follows:

- Initial yield (IY): The property's initial annual net cash flow as a fraction of its acquisition price.
- Cash flow change (CFC): The portion of the since-acquisition IRR attributable purely to the effect of the change in the property's annual level of net cash flow subsequent to the first year after acquisition. This component will be positive if the cash flow has increased since the first year, and negative if cash flow has diminished.
- Yield change (YC): The portion of the since-acquisition IRR attributable purely to the effect of the change in the property's current yield (or price/CF multiple) between the time of acquisition (initial yield) and the time the performance analysis is conducted (terminal yield). This component will be positive when the terminal yield is below the initial yield, and negative when the terminal yield is above the initial yield.

These three components of the IRR are computed at the individual property level. They are then compared with the corresponding components of a benchmark IRR based on a suitable universe of properties held by competing managers. The comparison benchmark should consist only of properties that are within the same category as the subject property (i.e., same market segment). Otherwise, the comparison will partially reflect the effect of the portfolio-level allocation function, instead of only property-level selection and management functions.

The benchmark portfolio IRR must be based on an inception date equal to the subject property's acquisition date. Such individual property, individual component, comparisons with the benchmark can be aggregated across the subject manager's properties in various ways (e.g., by market segment, by acquisition date cohort). When carefully done, such comparative analysis of the three IRR components plausibly relates the subject manager's relative performance to the four basic property-level real estate investment management functions: property selection, acquisition transaction execution, property operational management during the holding period, and disposition transaction execution.

The relationship is essentially as described below, and as conceptualized in Exhibit 2.

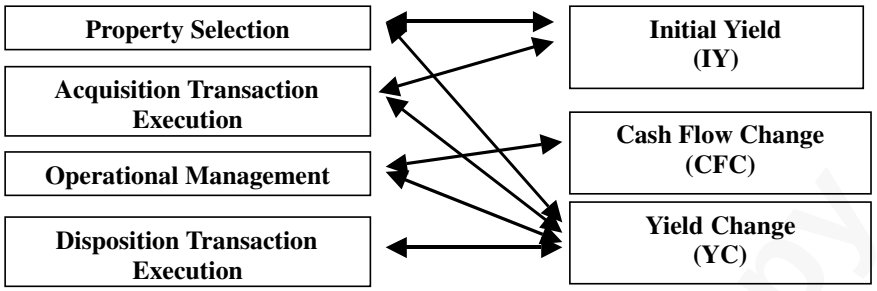
Initial yield (IY). Reflects a combination of: 1) Traditional asset *property selection and/or allocation* performance (finding and picking assets that are relatively superior within a given category of assets, and/or among categories of assets); and 2) *Acquisition transaction* execution performance (buying low relative to market value at the time of acquisition). Other things equal, a higher initial yield relative to that of the benchmark reflects better selection and/or acquisition performance.

Cash flow change (CFC). Reflects primarily the performance of the property *operational management* function during the holding period, including marketing, leasing, vacancy management, expense management, and capital improvement management. Cash flow change may also reflect some selection or acquisition effects in the impact of the expiration of vintage leases that were in the property at the time of acquisition, in which case one would expect an offsetting relationship between the CFC component and the IY component.[2]

Yield change (YC). Reflects a *combination* of several functions of property level management, including:

EXHIBIT 2

Relationship Between Four Major Property-Level Investment Management Functions and Three Performance Attributes of the Since-Acquisition IRR



1. Property selection.
2. Acquisition transaction execution.
3. Disposition transaction execution (if the terminal value is based on a disposition price; otherwise the YC component may reflect the nature of the terminal appraisal).
4. Operational management during the holding period regarding how well management has positioned the property for the future beyond the terminal period (e.g., capital improvement and leasing strategy).

Note that each IRR component can reflect at least one of the four basic property-level investment management functions, and each function will tend to be reflected in at least one of the IRR components. Furthermore, each IRR component will tend to reflect a different combination of, or a different perspective on, the four basic management functions. Through comparative analysis of the information provided by the three IRR components, it should be possible to gain insight regarding the nature and determinants of property-level investment performance and the relative strengths and weaknesses of the investment manager regarding the four underlying management functions.

A key to obtaining insight from the performance attribution measures lies in this comparative analysis, with respect to both benchmarks and one another, and in view of the relative level of the total IRR. For example, suppose a given property (or a subject portfolio of properties) has a total since-acquisition IRR exactly equaling that of an appropriate benchmark, but the subject's initial yield component exceeds that of the benchmark by 100 basis points, while its cash flow change component falls short of the benchmark by 100 basis points. In this case, the conclusion is not necessarily superior selection/acquisition performance and inferior operational management performance on the part of the manager—it is normal for investments to provide a trade-off between initial yield and future growth. Since the overall IRR in this case equals the benchmark, it is reasonable to presume that this type of normal trade-off lies behind the higher initial yield and the lower growth component, relative to the benchmark.[3]

On the other hand, suppose the subject's IRR is below the benchmark IRR by 50 basis points, and this difference is attributable entirely to a similar difference in the initial yield (that is, the CFC and YC attributes exactly equal the benchmark). This might then be viewed as evidence of inferior performance of the selection and/or acquisition functions of the investment manager regarding the subject property, relative to the benchmark. Further investigation would then be appropriate to consider the difference between the subject property and the benchmark properties. Is the subject property of a type generally perceived as lower-risk than the benchmark properties? If so, then the poorer IRR performance may be justified by the lower risk and not reflect inferior management performance.[4]

If not, a follow-up question might consider whether the below-benchmark performance is due only to bad luck subsequent to acquisition rather than to any weakness in management. For example, was it reasonable at the time of acquisition to expect the property to provide higher growth, relative to its benchmark, than what subsequently transpired, through no fault of the manager? On the other hand, if the subpar IY performance appears systematically or persistently (not offset by superior CFC or YC per-

formance), this may indicate a relative weakness in selection and or acquisition management, a problem that also could perhaps be further investigated and corrected.

Uncovering systematic performance attributes requires comprehensive and regular application of property-level performance attribution analysis, encompassing all a manager's property holdings. In principle, the type of comparative analysis described here may provide insights even just between groups of the manager's own properties, without using an external benchmark or treating any one group as the benchmark per se.[5]

In addition to providing insight regarding property-level investment management quality, performance attribution can be used to monitor property-level investment performance related to acquisition and disposition policies. For example, all the properties in a portfolio could be regularly ranked according to their since-acquisition IRR performance relative to their benchmarks. The top and bottom quartiles of that ranking might then be examined in more depth in terms of their component performance attributes. Are there systematic differences between the top and bottom quartiles in terms of performance attribution? If so, are there action implications in terms of acquisition or disposition policy?

Consider properties that are in the top quartile of relative IRR performance and also have high CFC or YC components relative to their benchmarks. Such properties' superior since-acquisition IRRs relative to the similar properties in their benchmarks are attributable not to relatively high initial yields, but rather to changes or events that have occurred since acquisition. Whether these changes were caused by actions deliberately taken by the manager, or by chance, their positive impact on the properties' IRRs may have more or less played out by now. Successful capital improvements or favorable turns in the market may have finished making their impact on cash flow growth or on property yield (as indicated by the high CFC and YC components). Such a high-IRR/low-IY pattern might suggest an opportune sale time for at least some of these properties.

It should be clear that the type of performance attribution analysis suggested here can add additional perspective to the traditional periodic TWRR-based attribution approach. No performance attribution technique is without ambiguities or limitations, of course. A fundamental point in this regard is that there is not a simple one-to-one correspondence between each of the three IRR components defined here and the four basic property-level investment management functions. Furthermore, events beyond the control of the manager (indeed, events that the manager could not have reasonably foreseen at the time of acquisition) will also tend to intervene in the history reflected in the realized IRR of any given property or group of properties.

This is a major reason property-level performance attribution should never be viewed as a definitive indicator of the quality of manager performance. Use of quantitative performance attribution will always remain more of an art than a science, a management tool useful for raising probing questions, gaining insight, aiding transaction decisions, and promoting a culture of accountability in an organization or institution.

GENERAL CONSIDERATIONS IN IMPLEMENTING PROPERTY-LEVEL IRR ATTRIBUTION

The property-level performance attribution approach is based on the since-acquisition IRR of a subject property (or of a static portfolio of properties all acquired at the same time). The technique also uses a benchmark IRR measured for an appropriate universe of similar properties held by managers competing with the subject manager. Comparisons between the subject and the benchmark must always be based on the same span of time, and that span must begin with the acquisition date of the subject property. Thus, differential performance between the subject and benchmark must be computed at the individual property level (or at the cohort level).

In all cases, IRRs are computed on the basis of net cash flow histories, beginning with the acquisition price (or initial valuation) as of the time of the subject property acquisition, as a cash outflow, and ending with a disposition price (or terminal valuation) as of the time of the performance evaluation, as a cash inflow. In between are what might be called operating cash flows, which represent the net cash flow generated by the property (or by the pooled cohort of properties) each period (e.g., month or quarter) between the acquisition date and the time of performance evaluation. Property-level performance attribution will be most meaningful as an indicator of management performance when conducted over holding periods of at least several years.

In the case of the benchmark portfolio, the cash flows from all the properties in the benchmark universe may be pooled to compute the benchmark IRR.[6] Ideally, all the properties in the benchmark portfolio would also have been acquired as of the same date as the subject property or cohort. In practice, however, it may be necessary to use

EXHIBIT 3

Example Computations to Derive Property-Level Since-Acquisition IRR-Based Performance Attributes

		Year											
	IRR	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
(1) Actual Operating CF			1.0000	1.0200	1.0404	1.0612	1.0824	1.1041	1.1262	1.1487	1.1717	1.1951	1.2190
(2) Actual Capital CF		-11.1111										12.1899	
(3) Actual Total CF (= 1 + 2)	**10.30%**	**-11.1111**	**1.0000**	**1.0200**	**1.0404**	**1.0612**	**1.0824**	**1.1041**	**1.1262**	**1.1487**	**1.1717**	**13.3850**	
(4) Initial Operating CF constant			1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
(5) Capital CF @ Initial Yield on (4)		-11.1111										11.1111	
(6) Initial CF @ Initial Yield (= 4 + 5)	**9.00%**	**-11.1111**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**12.1111**	
(7) Capital CF @ Initial Yield on (1)		-11.1111										13.5444	
(8) Actual Operating CF @ Initial Yield (= 1 + 7)	**11.00%**	**-11.1111**	**1.0000**	**1.0200**	**1.0404**	**1.0612**	**1.0824**	**1.1041**	**1.1262**	**1.1487**	**1.1717**	**14.7395**	
(9) Capital CF @ ActualYield on (4)		**-11.1111**										10.0000	
(10) Initial CF @ Actual Yield (= 4 + 9)	**8.32%**	**-11.1111**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**11.0000**	
(a) Overall Total IRR	**10.30%**												
(b) Initial Yield (IY) Component = (6)IRR	**9.00%**												
(c) Cash Flow Change (CFC) Component = (8)IRR – (6)IRR	**2.00%**												
(d) Yield Change (YC) Component = (10)IRR – (6)IRR	**-0.68%**												
(e) Interaction Effect = (3)IRR – Sum(Components)	**-0.02%**												

Source: Geltner and Miller [2001, pp. 232-235].

appraisal-based valuations of some or all of the benchmark properties as of the time of the subject property's acquisition, in order to compute the since-acquisition IRR for the benchmark portfolio.[7]

DECOMPOSING THE IRR FOR PROPERTY-LEVEL PERFORMANCE ATTRIBUTION

For both the subject property and the benchmark, the since-acquisition IRR must be broken into mutually exclusive additive components, in order to quantify the performance attribution components, initial yield, cash flow change, and yield change. There are various ways to do this, and no one way is theoretically correct. A procedure based on the initial annual cash flow at the time of acquisition seems most intuitive and most consistent with the conceptual definitions of the attributes and the purposes of property level performance attribution.

This procedure is illustrated using a simple numerical example. The information and the calculations are shown in Exhibit 3.

SIMPLE EXAMPLE

Suppose the subject property was bought at the end of 1991, and its performance is being evaluated after a ten-year holding period, as of the end of 2001. The property's investment performance on which the attribution analysis is based is its since-acquisition IRR covering the 1992-2001 period.

The property was bought for a price of \$11,111,000 at the end of 1991. During its first year of holding (1992), the property's initial net cash flow was \$1 million (defined as net operating income (NOI) net of capital improvement expenditures, sometimes referred to as the property before-tax cash flow—PBTCF). Note that this implies the property was purchased at an initial yield (IY) rate of 9% (computed as \$1,000,000/\$11,111,000).

Suppose that each year after acquisition the property's net cash flow grew by exactly 2% per year, so that its 2001 net operating cash flow was \$1,195,090 (equal to $\$1,000,000 \times 1.02^9$). Now let's say the property's valuation as of the end of

2001 was \$12,189,900, based on a 10% terminal yield rate and a projected further 2% growth in cash flow during 2002 (to \$1,218,990 = \$1,195,090 × 1.02). This terminal valuation would be obtained either as the net sales proceeds if the property were sold at that time, or as a current appraisal of market value net of selling cost.

In this example, the first component of the IRR performance attribution, the initial yield attribute, clearly equals 9%, the initial yield at acquisition. This definition of the IY component can be derived in either of two mathematically identical ways. It is either the simple initial year ratio of operating cash flow to purchase price (\$1,000,000/\$11,111,000); or, equivalently, it is the IRR if the property were held for its actual holding period, producing its initial level of cash flow each year, and then sold at a terminal yield equal to its initial yield. In other words, the 9% IY component equals what the IRR would have been if the property were purchased at its actual initial yield and both the other two IRR performance attributes were zero (CFC = 0 and YC = 0).

In this procedure, the IY component is viewed as a sort of base component of the actual total realized IRR. In essence, the IY closely reflects the objective information that was available as of the time of property acquisition.[8] If the property owner-manager simply always maintains the initial level of cash flow from the property, and nothing happens to cause any change in the property's valuation yield rate, the total IRR achieved would exactly equal the IY component as we have defined it.

With this perspective in mind, the other two performance attributes are now defined as positive or negative increments to the IY component, so as to reflect the pure effect of cash flow change and the pure effect of yield change on the actual total realized IRR, taking the IY as the base component.[9] Thus, the cash flow change component reflects the incremental impact on the actual IRR caused by the pure effect of the actual historical cash flow changes relative to the initial cash flow level, holding all else constant (that is, holding the yield constant at the initial yield rate). Similarly, the yield change component reflects the incremental impact on the actual IRR caused by the pure effect of the actual yield change between the initial and actual terminal yields, holding all else constant (that is, holding the cash flow constant at the actual initial cash flow level). The CFC and YC attributes are thus computed by comparing two hypothetical IRRs with the IY (which is itself the IRR provided the purchase by a level annuity of the initial cash flow, plus the purchase price paid back at the terminal date).

To derive the CFC component, one computes the IRR of a cash flow stream equal to the actual realized operating cash flow stream, except with the purchase price payback revised to hypothetically equal what the property's terminal value would have been if the terminal yield equaled the actual initial yield. The IY is subtracted from this hypothetical IRR, and the resulting difference is equal to the CFC component.

To derive the YC component, one computes the IRR of a level annuity of the initial cash flow plus a payback amount derived by applying the actual terminal yield to the initial cash flow level. The IY is subtracted from this hypothetical IRR, and the resulting difference is equal to the YC component.

Row (1) in Exhibit 3 shows the actual operating cash flows by year (in millions of dollars). Row (2) shows the actual capital cash flows (initial purchase price and terminal reversion valuation). Row (3) sums the two rows to get the actual net total cash flow stream, which is seen to provide a total actually realized IRR of 10.30% per year.

Row (4) then depicts the initial operating cash flow level hypothetically held constant in each year of the holding period. Row (5) depicts the capital cash flows that would have occurred if the initial yield rate had been maintained on the initial cash flow level (causing the hypothetical payback to equal the actual purchase price). Row (6) sums rows (4) and (5) to get the hypothetical cash flows that would have prevailed if both the cash flow and the yield remained unchanged at their initial values throughout the holding period. The IRR of the row (6) cash flow stream equals 9%, the IY component of the performance attribution. (By construction, this will also always equal the actual initial annual cash flow divided by the actual purchase price.)

Moving on to calculate the CFC component, row (7) equals the hypothetical capital cash flows that would have occurred if the terminal yield equaled the actual initial yield applied to the actual (projected) operating cash flow for the year beyond the terminal year (\$13,544,400 = \$1,219,000/0.09). Row (8) equals the sum of the row (1) actual operating cash flows and the row (7) hypothetical constant-yield capital cash flows based on the actual operating cash flows. The IRR of the row (8) cash flow stream is 11%, equal to the 9% initial yield rate plus the 2% actual constant annual growth rate in the operating cash flows. (It is a basic mathematical characteristic that a constant-growth annuity with a constant value multiple will have an IRR exactly equal to its initial yield plus the annual growth rate in the cash flows and asset value.)

The difference between the row (8) IRR and the row (6) IRR (that is, the IY) equals the CFC component, the incremental impact of the actual historical cash flow changes on the actually realized IRR, holding the yield constant at the initial rate. As noted, the CFC component is exactly 2% in this simple constant-growth example, as: 2% = 11% – 9%.

We then move on to calculation of the YC component, by computing the capital flows in row (9), which equal those that would have occurred if the payback value were derived by applying the actual terminal yield to the initial operating cash flow level (i.e., if cash flows had remained constant at the initial level but yield changed as it actually did). The actual terminal yield of 10% applied to the initial cash flow level of $1 million implies a hypothetical payback amount of $10 million.

Row (10) then sums the row (4) hypothetical constant operating cash flow level and the row (9) hypothetical capital flows based on the actual yields applied to that hypothetical constant operating cash flow. The IRR of the row (10) hypothetical cash flow stream (8.32%) thus depicts what the IRR would have been if the yield changed as it actually did between the initial and terminal periods, but the operating cash flow remained constant at the initial level. The difference between the row (10) IRR and the IY equals the YC component, the pure effect of yield change within the since-acquisition IRR, based on the initial cash flow and initial yield. In this case, the YC component is –0.68%, as: 8.32% – 9.00% = –0.68%.[10]

The pure effect of the yield change is negative in this case, because the yield increased between the initial and terminal periods, resulting in a negative impact on the return. The 100 basis point increase in yield (actually, a 1/9 or 11.11% increase in the yield measured in percent, from 9.00% to 10.00%) results in this case in a loss of only 68 basis points in the annualized IRR, because the capital value loss attributable to the yield change is spread out over the ten-year holding period.

Finally, note that the three pure component measures do not exactly sum to the total actually realized IRR of 10.30%, as: IY + CFC + YC = 9.00% + 2.00% – 0.68% = 10.32%. The residual difference is assigned to an *interaction effect* of –0.02%, so that all the components together sum exactly to the realized IRR, including the interaction effect. The interaction effect results from the combined effects of all three of the pure attributes.

There is no way to define pure attributes that always exactly sum to the total IRR, because the multiperiod IRR is not a linear function of the pure attributes. And there is no way to disentangle the three pure effects within an interaction effect. In most cases of the performance of stabilized income property, the interaction effect will be quite small.[11]

MORE REALISTIC EXAMPLE

To demonstrate the procedure more concretely, we describe actual core property investments held on behalf of a large pension fund, modifying elements to avoid disclosing proprietary information. The subject properties are two apartment complexes located in Charlotte, North Carolina, which we will say are named Rentleg Pines and Rentleg Gardens. The former contains 332 units and the latter 280 units, in two- and three-story buildings in good-quality suburban locations.

Both properties were purchased in June 1993, shortly after they achieved stabilized operation, and both were sold in June 2001, after an eight-year holding period. Rentleg Pines was bought for $12,900,000 and sold for $15,463,000. Rentleg Gardens was bought for $9,800,000 and sold for $12,860,000.

The actual booked monthly net operating cash flow from the two properties are depicted in Exhibits 4 and 5. These are the property before-tax cash flows net of capital improvement expenditures, effectively the property-level distributable cash flow.

This cash flow during the first year after purchase (July 1993–June 1994) was $1,131,447 in the Pines, and $923,765 in the Gardens, providing realized initial yields of 8.77% for the Pines and 9.43% for the Gardens (based on cash flow, not NOI). The net cash flow during the last year of the investor's holding period (July 2000–June 2001) was $988,156 in the Pines and $1,152,937 in the Gardens, which gives the sale prices realized terminal yields of 6.39% on the Pines and 8.97% on the Gardens, computed on a backward-looking basis.[12]

Given these cash flow data, the realized IRRs on these two investments over the entire holding period were 11.46% per year for the Pines and 13.31% for the Gardens. Exhibit 6 shows the decomposition of this annualized IRR.[13]

We see that the bulk of the IRR earned by both properties is attributable to the initial yield rate at which they were purchased. This is typical of investments in stabilized core properties, particularly those held for long spans of time. The effect of cash flow changes during the holding period is slightly negative for the Pines, and sub-

EXHIBIT 4
Rentleg Pines Monthly Net Cash Flow Booked

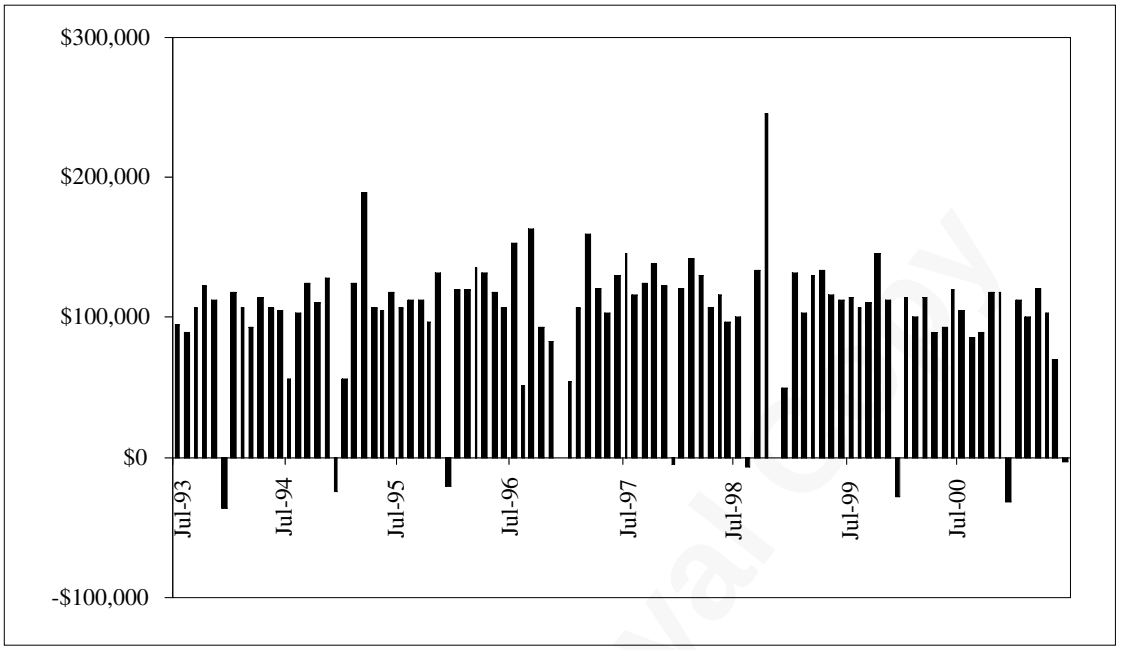


EXHIBIT 5
Rentleg Gardens Monthly Net Cash Flow Booked

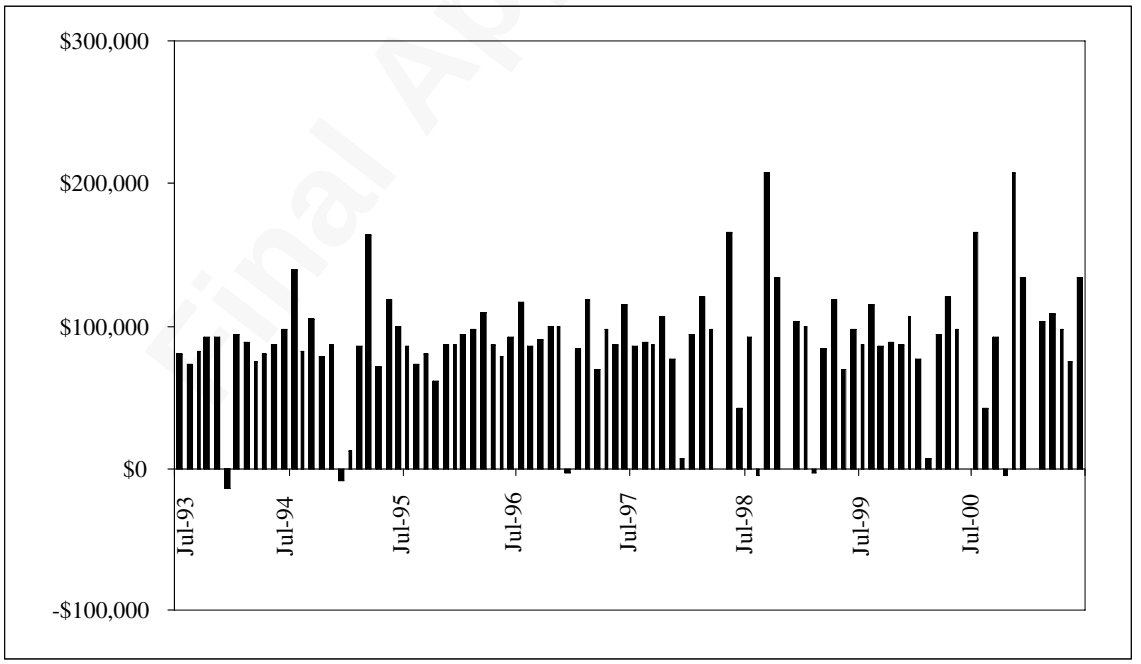


EXHIBIT 6
Decomposition of Rentleg IRR

Return Component	Rentleg Pines	Rentleg Gardens
Total Since-Acquisition IRR	11.46%	13.31%
Initial Yield (IY)	8.77%	9.43%
Cash Flow Change (CFC)	-0.25%	3.40%
Yield Change (YC)	3.48%	0.88%
Interaction Effect	-0.54%	-0.40%

stantially positive for the Gardens (increasing the IRR by 340 basis points in the latter case). The effect of yield change between the purchase and sale dates is positive for both properties, especially for the Pines (even though it was purchased at an initial yield that was already lower than that of the Gardens).

In part, these positive yield change effects reflect the fact that property markets were generally still rather depressed in 1993, when the economy was still struggling out of a recession and the property market had hardly yet bottomed out of a major slump, while the June 2001 disposition date was at, or just slightly past, a peak or plateau in the market. Of course, care must be exercised in interpreting this positive impact of the yield change, given that we are comparing a backward-looking terminal yield with a forward-looking initial yield (of necessity). Backward-looking yields would generally be expected to be slightly lower than forward-looking yields even when the actual yield is constant on a consistently defined basis, assuming property cash flow and value trends have a positive growth rate in nominal terms (which may be true only in the Gardens, in this example). In general, the effect of yield change in the IRR diminishes exponentially with the length of the holding period of the investment.[14]

USING THE NCREIF INDEX TO COMPUTE A SYNTHETIC BENCHMARK

Attribute-by-attribute comparisons between subject and benchmark performance can provide greater insight. This requires computation and decomposition of the since-acquisition IRR for a benchmark set of properties. For core properties held by institutional investors, such a benchmark can be constructed using the market segment subindexes of the NCREIF Property Index (NPI). While data limitations in the NPI render such a benchmark less than perfect, it will often serve the basic purpose: gaining insight and enhanced accountability regarding manager performance from property-level performance attribution.

Although the NPI is a periodic return index designed for computing time-weighted rates of return, it is possible to use the NPI to compute "synthetic" IRR cohort benchmarks to use in performance attribution analysis. In fact, NCREIF uses this approach to provide IRRs and the components we describe, automatically calculated for website users of NCREIF's query screens, for any customized subindex and any time span covered by the index.

The procedure uses the NPI income and appreciation return components to derive a synthesized operating and capital cash flow stream (indexed to an arbitrary starting value level) representative of the properties in the index during any given period. The resulting synthesized cash flow stream is then used to compute and decompose the IRR.

The general formula for relating income and appreciation return components to relative cash flow levels is as follows. First, define the simple periodic return components:

$$\text{Income Return} = y_t = \frac{CF_t}{V_{t-1}}$$

$$\text{Appreciation Return} = g_t = \frac{V_t - V_{t-1}}{V_{t-1}} \qquad (1)$$

where CF_t is the net operating cash flow (NOI minus capital improvement expenditures) during period t, and V_t is the property asset value as of the end of period t.[15]

Then an index of the periodic relative net cash flow levels can be derived from the published NCREIF return components as follows:

$$\frac{CF_t}{CF_{t-1}} = (1 + g_{t-1})\frac{y_t}{y_{t-1}} \qquad (2)$$

This gives a cash flow-level index with an arbitrary starting value.

The property value levels at the beginning and end of any specified holding period, V_s and V_T, can be synthesized by compounding the appreciation returns through the respective periods s and T.[16] The relative cash flow levels derived from Equation (2) can then be calibrated to the asset values by multiplying all the relative cash flow levels by a constant that equates the first cash flow in the holding period (CF_{s+1}) to the value $(y_{s+1})V_s$, the actual first period's cash flow level relative to the initial asset value level. This lets us measure the adjusted cash flow-level

index in dollars per dollar of the initial property asset value level (V_s).

The IRR of the NCREIF subindex during the specified holding period is then computed from the cash flow stream: ($-V_s$, $+ CF_s + 1$, $+ CF_{s+2} + \ldots + CF_T + V_T$). This synthesized cash flow stream can also be used to decompose the IRR as in the Rentleg example. The IRR and its constituent IY, CFC, and YC performance attribution components can be calculated in this way for any NCREIF subindex.

APPLICATION OF BENCHMARKED PERFORMANCE ATTRIBUTION

Consider again performance attribution of the Rentleg apartment properties during their 1993–2001 holding period. Since these properties are located in Atlanta, Georgia, we might select as an appropriate benchmark the NCREIF Southeast Division Apartment Subindex.[17] We can gain additional insight into the manager's performance in the Rentleg apartment investments by comparing the subindex and the Rentleg IRRs and property-level performance attributes over the same 1993–2001 holding period.

The comparisons are presented in Exhibits 7-9. Consider first the Rentleg Pines property.

The Pines total IRR performance is virtually identical to that of the benchmark. This overall matching of the benchmark masks some substantially different performance with regard to the individual return attributes.

The Pines property was purchased at an initial yield that was 130 bp above the benchmark (Pines IY of 8.77% versus benchmark IY of 7.47%). Subsequently, the Pines suffered a cash flow change effect 294 bp below that of the benchmark (Pines CFC of –0.25% versus benchmark CFC of +2.69%). Then it turned in a yield change performance 204 bp above the benchmark (Pines YC of 3.48% versus benchmark 1.44%).

One way to explain these differential results is as follows. The relatively high initial yield at which the Pines was purchased did not really represent a superior selection or acquisition execution performance at that time, but rather reflected lower expected future cash flow growth prospects than the typical property, perhaps due to a need for capital improvement expenditures.[18] Capital improvement expenditures, made after the first operating year and continuing even late in the holding period, caused the low CFC performance, but also had the salutary effect of preparing the property well for its sale in 2001. Thus, the property was sold in better condition than when it had been purchased, providing for a substantially positive yield change boost in the realized IRR, offsetting the CFC effect and bringing the overall holding-period performance up to the benchmark level.

The Rentleg Gardens property presents a very different picture. The Gardens substantially outperformed the benchmark in the total holding period IRR, beating it by 190 bp (13.31% versus 11.41%). This superior performance is seen to be attributable largely to the property's very favorable initial yield. The Gardens IY component beat the benchmark IY by 196 bp (Gardens 9.43% IY versus benchmark 7.47%).

The Gardens also beat the benchmark by a smaller amount in the cash flow change effect (3.40% versus 2.69%, for a 71 bp differential). There is, however, some evidence for the hypothesis that this superior CFC performance was purchased at the expense of deferring some capital improvement expenditures, as the yield change effect differential with respect to the benchmark is negative, even though the Gardens was purchased at a very high initial yield (which should normally make it relatively easy to obtain a favorable YC component).

The Gardens was sold in 2001 at a (backward-looking) terminal yield of 8.97%, much higher than the Pines' terminal yield of 6.39% at the same time, and also higher than the benchmark terminal yield of 6.60%.[19] While the Gardens' terminal yield was still below its initial yield (hence, its positive YC component of 88 bp), this apparently reflects only the fact that the initial yield was so high. The evidence of the negative 56 bp comparison with the benchmark in the YC attribute suggests either that the Gardens property was in need of some deferred capital improvements at the time of its sale in 2001, or that the investment manager provided inferior performance in the disposition transaction execution function of management, or some combination of these two.

Note that this is only a hypothesis suggested by the performance attribution analysis. An alternative explanation might be forthcoming from the manager on the ground. In any case, weakness on the back end in the Gardens investment did not erase the overall superior performance of that investment, evidenced by its total IRR comparison with the benchmark. The performance attribution analysis does suggest that most of the credit for this superior performance may be due to the manager's selection and/or acquisition transaction execution performance that netted such a high initial yield back in 1993.

EXHIBIT 7
Performance Comparison—Rentleg and NCREIF Cohort

	IRR	Initial Yield	Cash Flow Change	Yield Change	Interaction
Pines	11.46%	8.77%	-0.25%	3.48%	-0.54%
Gardens	13.31%	9.43%	3.40%	0.88%	-0.40%
NPI Cohort (Apts SE)	11.41%	7.47%	2.69%	1.44%	-0.18%
Relative Performance					
Pines	**0.05%**	**1.30%**	**-2.94%**	**2.04%**	**-0.36%**
Gardens	**1.90%**	**1.96%**	**0.71%**	**-0.56%**	**-0.22%**

EXHIBIT 8
Rentleg Properties versus NCREIF Cohort Performance: IRR and Components

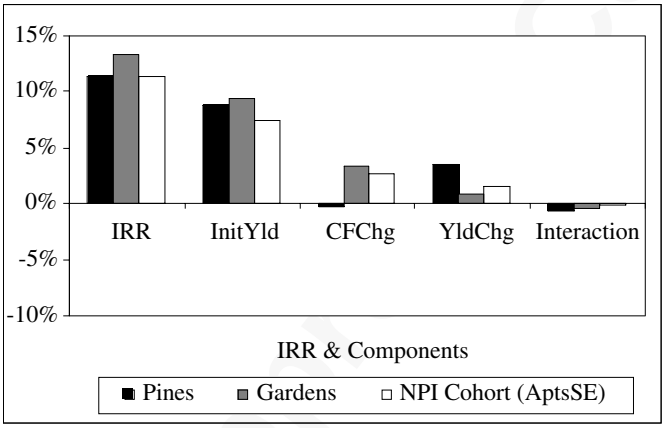
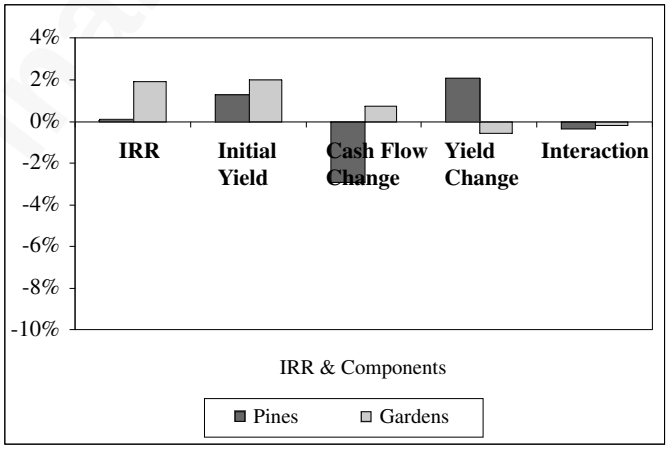


EXHIBIT 9
Rentleg Properties versus NCREIF Cohort Relative Performance: IRR and Components



CONCLUSION

We have shown how one can use since-acquisition IRR-based property-level performance attribution analysis as an investigative tool to develop plausible hypotheses about the relative strengths and weaknesses in property-level investment management performance, especially when combined with benchmark comparison in a comprehensive manner. This type of analysis can shed light on the performance of the fundamental property-level functions of the manager: property selection, acquisition transaction execution, operational management during the holding period, and disposition transaction execution. The since-acquisition IRR-based performance attribution exercise can be applied to individual properties or to cohorts or groups of properties, to assist in management diagnosis and transaction decision-making.

ENDNOTES

[1]A similar procedure has been presented by Pagliari et al. [2001]. That approach works with periodic returns and time-weighted averages rather than the IRR, and it does not anchor on the acquisition dates of specific properties or cohorts.

[2]For example, if a property is purchased with vintage leases that are about to expire and that call for rents significantly above the current rental market equilibrium, it would be normal for the initial yield to be relatively high, and the cash flow change to be relatively low, as the expiring leases are replaced by lower-rent new leases.

[3]Again, the property might have had above-market vintage leases, or it may be in a market segment that is characterized by lower growth than the benchmark.

[4]In principle, the risk should be the same, as the benchmark should consist of properties of the same category as the subject property. Property categories can be defined at various different levels and from different perspectives, however, such as subcategories within categories, or consideration of the quality dimension as well as usage type and location dimensions. Ultimately, no two properties are exactly identical, and some such differences may plausibly be systematically related to differences in risk (e.g., differences in lease structure and tenancy).

[5]For such analyses, the *groups* of the manager's properties may be defined in various ways, such as: by acquisition time period, by relative performance with respect to various benchmarks (e.g., a winner group of properties that exceeded the benchmark in overall IRR versus a loser group of properties that fell short of the benchmark), by property type, by region, by originating broker, and so forth.

[6]Alternative procedures are possible, such as median IRR or equal- or value-weighted mean IRR across the benchmark property universe. Another approach is to construct a synthetic since-acquisition IRR for the benchmark portfolio based on a TWRR index, such as the NCREIF index.

[7]Systematic differences between appraisal valuations and transaction prices should be considered. Appraisals tend to lag transaction prices, and if the market is moving strongly in a particular direction as of the time of valuation, the appraised value may not be an unbiased indication of expected transaction price.

[8]The IY is a function only of the purchase price and the initial year's net cash flow. The former was clearly known and agreed upon by the manager at the time of acquisition, and normally it is possible at that time to very accurately predict the cash flow in the first year subsequent to acquisition.

[9]Pagliari et al. [2001] provide an alternative derivation of this system of total return decomposition based on the classic Gordon growth model (or the constant-growth perpetuity model of asset present value).

[10]It is mathematically equivalent to calculate the YC component as: RATE [N, IY, –1, (IY/TY)] – IY, where RATE( ) is the interest rate in a level annuity plus terminal single-sum present value problem (of the type hard-wired into business calculators or computer spreadsheet programs); N is the holding period (in years); IY is the initial yield rate; and TY is the terminal yield rate. If cash flows are recorded m periods per year, then to obtain the YC component in annual terms the formula is expanded to: $YC = (1 + RATE[mN, IY/m, -1, IY/TY)]^{m} - 1 - IY$.

[11]The interaction effect associated with IRR decomposition as defined here is a second-order effect that is usually much smaller than the interaction effect between the pure allocation and selection components in the portfolio-level attribution of the periodic return differential with respect to a benchmark.

[12]In general, a forward-looking terminal yield rate cannot be objectively computed because data are not available on the future cash flow after the end of the holding period. Similarly, a backward-looking initial yield rate cannot be objectively computed because we do not have the preceding year's cash flow data.

[13]In practice, the example procedure must be modified because of the missing data (for measuring a forward-looking terminal yield or a backward-looking initial yield). Thus, the IRR components are based on a forward-looking initial yield and a backward-looking terminal yield. This modification does not significantly affect the interpretation of the performance attribution when the analysis is based on comparison with a benchmark, assuming the modification is applied consistently in both the subject property and the benchmark IRR decomposition.

[14]The effect of inconsistent yield definition will often be modest. For example, if the actual yield is a constant 8% on a forward-looking basis, and the property value and cash flow grow at an annual rate of 2% per year, the backward-looking yield will be a constant 7.84% (equal to 8.00%/1.02), only 16

basis points below the forward-looking yield. The effect in the IRR yield change component is greater than this, however, and exponentially so as the holding period is shorter. For example, assuming monthly cash flows, the difference between an 8.00% initial yield and 7.84% terminal yield will provide a positive YC component of 237 basis points for a one-year holding period, 65 bp for a five-year holding period, 44 bp for a ten-year holding period, 37 bp for a 15-year holding period, and 34 bp for a 20-year holding period.

[15]The property cash flow and asset value in these return formulas refer to a single asset or a static portfolio of a fixed set of properties, between the beginning and end of each return period (quarters, in the case of the NPI). Of course, the NCREIF universe does not remain constant over time, but rather evolves to reflect the current holdings of NCREIF's members. Note also that, in order to conform to the definitions in Equation (1), the official NCREIF published index return components must be adjusted to remove capital expenditures from the income component and to add back the capital expenditures that NCREIF subtracts from the appreciation return component. This is necessary to allow the derived index to reflect property cash flows and property price changes rather than NOI and pure market value movements. (This adjustment to express the income component on a net cash flow basis can be automatically made on the NCREIF website query screens.) In addition, the time-weighted investment denominators used to compute the official NCREIF returns must be replaced by the simple holding-period return denominator (the beginning asset value) indicated in Equation (1). NCREIF publishes the information necessary to make this adjustment.

[16]The NCREIF appreciation returns must again be adjusted to add back the capital expenditures that are subtracted in the official returns. This can be done automatically on the NCREIF query screens by selecting the cash flow-based definition of the return components.

[17]The more narrowly one limits the benchmark universe with regard to specific market segment, the more one limits the scope of the manager's investment selection function, thereby widening the scope of what falls into the investment allocation function. Recall that at the portfolio level, there are only these two investment management functions. What is not selection is allocation. Drawing the line between the allocation and selection functions is inevitably an arbitrary decision. The guiding principle should be to draw the line so as to be useful for diagnostic purposes, and to consider the basic management principle of equation of responsibility and authority. Another important consideration is enough properties in the benchmark index to give it reasonable statistical credibility to represent the property category.

[18]Vintage leases are not usually an issue with apartment properties.

[19]All these terminal yields, including that of the benchmark, are computed on a backward-looking basis.

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