

## Chapter 4 Appendix

### 4A Micro-Level Investment Performance Attribution: Parsing the IRR

One of the salient characteristics of investment in the private property market is that investors typically hold individual assets for relatively long periods of time. For example, investors typically hold income properties for 5 to 10 years. This is partly due to the relatively high transaction costs of buying and selling property. It is also due to the ability and desire of many direct real estate investors to earn investment returns through successful operational management of the properties they invest in rather than simply from “trading” (that is, buying and selling assets). With its long individual asset holding periods, real estate contrasts with investment in the stock market, for example, where so-called “active” portfolio managers often change their positions in individual assets (that is, the stocks of individual firms) much more frequently. Another feature of real estate assets is that they tend to be “cash cows” compared to the typical stock market investment. This feature interacts with the long holding period to magnify the importance of operational income generation in the overall investment return.

Both of these features, long individual asset holding periods and income-based returns, make the internal rate of return (IRR) typically a more interesting investment performance measure in real estate than in the stock market. Recall from **Chapter 3** that the IRR can be calculated over a long, multiyear holding period for an investment in a given property, and it provides a meaningful quantification of the investment performance of that asset. The IRR thus can be computed either *ex-ante* (at the outset of the investment), where it measures expected performance, or *ex-post* (at the end of a holding period), where it measures the realized return on the investment.

In either use of the IRR, it is sometimes of interest for diagnostic or analytical purposes to break the IRR down into components that add up to the total IRR and represent, formally speaking, different “sources” of the total return. This process is sometimes called “parsing” or “partitioning”

the IRR, and it may be viewed as a type of micro-level **performance attribution**, because it attributes the overall investment performance to the components that make up the IRR.<sup>1</sup>

IRR attribution is usually broken down into three components: (1) initial-cash-flow yield (IY), (2) subsequent-cash-flow change (CFC), and (3) yield change (YC, or “valuation change”) between the beginning and end of the holding period. IRR attribution is not an exact science, partly because there are interaction effects among the return components and also because the attribution result is sensitive to the length of the holding period. Nevertheless, micro-level return attribution can provide interesting insights into the source and nature of the overall multiperiod return.

Consider the following simple example to see how IRR attribution can be done. (An Excel demonstration of this procedure is provided in the video located in the Chapter 4 online supplements folder.) A property is bought at an initial cash yield of 9 percent and held for ten years. Net cash flow generated by the property grows at a rate of 2 percent per year for each year during that holding period, at the end of which the property is (or could be) sold at a yield of 10 percent based on the upcoming (year 11) operating cash flow projection. The cash flows from this ten-year investment are presented in the first three rows of the table in **Exhibit 4A-1**. The first row is the net operating cash flow (net of capital expenditures); the second row is the capital flow; and the third row is the overall cash flow (the sum of the two previous rows).<sup>2</sup>

#### **EXHIBIT 4A-1** Example Property Investment Cash Flow

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<sup>1</sup> Macro-level performance attribution, that is, analysis of the performance of a professional investment manager or of an actively managed portfolio of many individual properties, will be discussed in **Chapter 25**.

<sup>2</sup> The initial capital outflow of \$11.11 million reflects the initial yield of 9 percent. The terminal capital inflow is the proceeds from property resale at a price reflecting the 10 percent yield on the projected year-11 operating cash flow.

	IRRs	Year											
		0	1	2	3	4	5	6	7	8	9	10	11
(1) Actual Oper. CF		\$ 1.00	\$ 1.02	\$ 1.04	\$ 1.06	\$ 1.08	\$ 1.10	\$ 1.13	\$ 1.15	\$ 1.17	\$ 1.20	\$ 1.22	
(2) Actual Capital CF		\$ (11.11)										\$ 12.19	
(3) Actual Total CF (=1 + 2)	10.30%	\$ (11.11)	\$ 1.00	\$ 1.02	\$ 1.04	\$ 1.06	\$ 1.08	\$ 1.10	\$ 1.13	\$ 1.15	\$ 1.17	\$ 13.39	
(4) Init. Oper. CF constant		\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	1.00
(5) Capital CF @ Init. Yld. On (4)		\$ (11.11)										\$ 11.11	
(6) Init. CF @ Init. Yld (= 4 + 5)	9.00%	\$ (11.11)	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 12.11	
(7) Capital CF @ Init.Yld.on (1)		\$ (11.11)										\$ 13.54	
(8) Actual Oper. CF @ Init.Yld (= 1 + 7)	11.00%	\$ (11.11)	\$ 1.00	\$ 1.02	\$ 1.04	\$ 1.06	\$ 1.08	\$ 1.10	\$ 1.13	\$ 1.15	\$ 1.17	\$ 14.74	
(9) Capital CF @ Actual Yld. on (1)		\$ (11.11)										\$ 10.00	
(10) Init. CF @ Actual Yld (= 4 + 9)	8.32%	\$ (11.11)	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 11.00	

The first step in performance attribution is to compute the overall actual IRR and the initial yield. These act as the two reference points on which the cash flow growth and yield-change components will be defined. The overall actual IRR is based on the actual operating and capital cash flows depicted in the third row of the exhibit. The actual IRR is 10.30 percent. The **initial yield component (IY)** is then defined simply as the net cash flow yield obtained in the first year of the investment based on the purchase price. As noted, this is **9.00 percent** (\$1,000,000/\$11,111,100). Note that it is equivalent to computing the initial yield as the IRR over the holding period based on the actual purchase price but holding the cash flows constant at the initial level and assuming the terminal yield remains the same as the initial yield. This is seen in row 6 in the exhibit, which is the sum of rows 4 and 5.

The next step is to compute the **cash flow change return component (CFC)** defined on the initial yield. This is the IRR increment to the initial yield that would be caused purely by the actual change in cash flows over time, holding the other two factors constant, in particular, holding the initial cash flow at its actual level and holding the yield (valuation cap rate) constant at the initial going-in rate. The CFC is thus computed by figuring what the IRR would have been given the actual operating cash flows (in row 1) but with a terminal capital cash flow based on the initial yield of 9 percent rather than the actual terminal yield of 10 percent. A 9 percent terminal yield would have produced the capital cash flow indicated in row 7 in the exhibit. That is, if it were possible to sell the property at the end of year 10 for the same 9 percent yield as the property obtained at the beginning of the holding period, then the resale price would be \$13.544 million instead of the \$12.190 million price that reflects the 10 percent yield actually obtained. This results in the 11.00 percent IRR indicated in row 8 (which is the sum of the cash flows in row 1 and row

7).<sup>3</sup> Then, the cash flow growth component is computed as  $11.00\% - 9.00\% = 2.00\%$ , row 8 IRR minus the initial yield (row 6 IRR).

Finally, we compute the **yield-change (YC) component** as the IRR increment of the pure effect of a change in valuation yield over the given holding period on a constant cash flow level equal to the actual initial cash flow. In other words, the YC component is based on what the overall property cash flows would be if the initial net operating cash flow remained constant throughout the holding period, but the yield changed as it actually did between the initial purchase and the resale. In that case, the operating cash flows would remain at their initial level of \$1,000,000 per year (as indicated in row 4), and the resale price of the property at the actual terminal yield of 10 percent would then be \$10,000,000 (as indicated in row 9). This would result in the overall cash flows indicated in row 10 (the sum of rows 4 and 9), which provide an IRR of 8.32 percent on the initial purchase price of \$11.11 million. This is the IRR that would result if there were no growth in property net operating cash flow, but the yield changed as it actually did from 9 to 10 percent between the initial purchase and the subsequent resale. The yield-change component (YC) is then computed as **-0.68 percent** = 8.32 percent — 9.00 percent, the difference between the row 10 IRR and the initial yield (or row 10 IRR minus row 6 IRRs).

Now note that the three IRR components defined earlier do not exactly add up to the overall total IRR: 9.00% initial yield + (-0.68%) yield-change effect + 2.00% cash flow growth effect = 10.32%. This is **two basis points more** than the total IRR of 10.30 percent. This difference may be considered an “interaction effect” or a combined effect of the cash flow growth and the yield-change effect based on the initial yield and cash flow level.<sup>4</sup>

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<sup>3</sup> The row 8 IRR in **Exhibit 4A-1** happens to be an example of the special case noted in **Chapter 3** in which the IRR exactly equals the sum of the initial yield and the constant-growth rate (of both the cash flows and the asset value). This is a peculiarity of the simple numerical example depicted here. In general, of course, property cash flows will not necessarily grow at a constant rate every year during an investment holding period (either ex post or ex ante, due in part to the effect of long-term leases and capital expenditures). So the equating of the IRR to the sum of initial yield and the overall growth rate is the particular result in this example.

<sup>4</sup> The interaction effect will not always be as small as it appears in the numerical example in **Exhibit 4A-1**. However, within the property-level IRR the yield-change and cash flow growth interaction effect is a second-order effect and,

This method of defining the three components of the IRR gives a logical, common-sense result; for example, it is clear in this case that the CFC component should be +2 percent, as the cash flows do, in fact, grow at exactly that rate every year in this simplified illustration. Similarly, it makes sense that the YC component should be negative in this case, as the yield increased between the going-in and the going-out rates. The magnitude of this increase, from 9 percent to 10 percent, would be sufficient to cause a roughly 10 percent decline in value (e.g., the actual \$12.19 million terminal value in row 2 is 90 percent of the \$13.54 million terminal value in row 7 that would have prevailed had the yield not fallen). However, this 10 percent decline in value is spread over the ten-year investment. When discounting and compounding are considered, it makes sense that the IRR impact would be a bit less than 1 percent per year, as indicated by the —0.68 percent YC component we computed. It is also desirable that the method of parsing the IRR results in components that add up very nearly to the exact total IRR, which we see is the case in this simple example.

It is important to remember that the attribution of IRR components represents only a *formal* breakdown of the sources or determinants of the IRR. They are simply a mathematical decomposition of the overall IRR, with no necessary correspondence to, or implication regarding, what the investor did or what the property market did over the period covered by the IRR computation. For example, the formal analysis does not address the reasons the yield increased from 9 percent to 10 percent or the property operating cash flows grew an average of 2 percent per year.

Nevertheless, if used carefully, this type of logical performance attribution can provide interesting investment insights. In **Chapter 25**, we will see how this type of property-level investment performance attribution can be applied ex-post to help diagnose why or how an investment manager or asset manager achieved the investment performance that they did. (This is particularly

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therefore, tends to be less important than it often is in macro-level portfolio performance attribution as described in **part VI** of the book.

useful when the performance attribution can be *benchmarked* against a relevant “universe” of similar properties and/or similar types of investors.) The three performance attributes defined here can be related to the four fundamental investment-management functions at the property level: property selection, acquisition transaction execution, operational management (during the holding period), and disposition transaction execution.

Alternatively, the type of performance attribution described in this appendix can be used in an ex-ante (“going-in” or forward-looking) perspective based on the prospective investment’s proforma cash flow projection (including reversion). When used in this ex-ante way, performance attribution is usually less about diagnosing management strengths than understanding where an investment’s projected return is expected to come from. This can be helpful in at least two ways: (1) to help judge the reliability of the expected return projection (e.g., CFC or YC components may be viewed as less reliable than the IY component in many cases), and (2) to help relate the investment to the investor’s return component preferences (see **section 4.4.2**). For example, some investors may prefer short-term and continuing-income yield as presented by the IY attribute. In contrast, other investors may prefer longer-term growth in the income yield, as presented by the CFC component, or even longer-term growth in capital value without intermediate payback, as presented by the YC component. As noted, such preferences may be based either on ultimate investment objectives or on the investment manager’s perception of her particular strengths (or weaknesses) as an asset manager or property operator. For example, a property investor/operator may feel that they have a particular ability to enhance returns through operational improvements that enhance the CFC or YC components. In any case, such ex-ante analysis can help to match investor preferences to investment alternatives when all investment alternatives appear to present an equal NPV (given that typically  $NPV = 0$  measured on a market value basis, as noted in **section 4.4.2**).