Past and Future Sources of Real Estate Returns in Hong Kong

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Abstract. **Historical commercial real estate returns are attributed to three fundamental factors: initial current yield, growth in net operating income, and changes in going-in versus going-out capitalization rates (i.e., pricing movements). Separating returns into these three factors appears to provide more insightful information than the traditionally reported income and appreciation returns. Using this three-factor model, historical real returns and inflation pass-through rates are estimated for each major type of real estate (residential A/B/C, residential D/E, office, retail, industrial).**

Introduction

If aggregate real estate returns have at all been unbundled, it traditionally has been into their income and appreciation components. However, such an approach tends to obscure the fundamental sources of return. Returns from real estate investments can be attributed to three fundamental factors: initial current yield (net operating income divided by beginning value), growth in income (NOI), and changes in the going-in versus the going-out capitalization rates (i.e., price movements). For similar applications, see Graham, Dodd and Cottle (1962), Pagliari (1991) and Pagliari and Webb (1992) among others. The growth of NOI, relative to inflation, may be viewed conceptually as an indication of the property's long-run real (versus nominal) performance. If income growth keeps pace with inflation and the property is sold at or near the capitalization rate at which it was purchased, then the initial current yield is an effective indicator of the property's real yield (see Hartzell, Shulman, Langetieg, and Liebowitz, 1988; Pagliari, 1991). Since pricing movements have a declining importance as the investor's holding period lengthens, the initial current yield and the growth in income are the most important determinants of long-term yield.

Using data from the Hong Kong Government for unleveraged real estate by property type for 1979 through 1995, this study examines the historical performance of these three fundamental factors (current yield, growth in income, and pricing movements) and constructs a framework for evaluating future expected yields on Hong Kong real estate.

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The Data

The data used for these analyses are from the Rating and Valuation Department of the Hong Kong Government for the period January 1, 1978 through December 31, 1995. Several different series are available. For purposes of this study, the following series were used: Residential—Class A/B/C; Residential—Class D/E; Office; Retail; Industrial. The data are quarterly total returns separated into their income and appreciation components. Though much has been written—see Geltner, 1989, 1991, and Quan and Quigley, 1991—about the inadequacies of appraisal-based valuations, this study assumes these values to be generated from market-based data and therefore approximately correct. For a discussion on the validity of appraised values, see Cole, Guilkey and Miles (1986).

Research Design

Overview

For each property type the nominal and real price changes and incomes are estimated. In addition, an implied capitalization rate is calculated (methodology shown below) for each property type for each year.

   Next a performance summary is shown for each property type that is divided into three subperiods (1979–81, 1982–86, 1987–95). Each summary includes an inflation pass-through rate (increase in income as a percent of inflation), nominal and real income growth, initial yield, pricing movement, and nominal yield estimated by the DDM model (explained below).

   Finally the nominal and real price indices, nominal and real income indices, and implied capitalization rates are graphed for each property type.

Theoretical Underpinnings

This study reconstructs returns into their underlying nominal income streams and market values. Using a variation of the Dividend Discount Model, these underlying incomes and values are restated into their fundamental components: initial current yield, growth in income (NOI), and pricing movements (i.e., changes in capitalization rates). These components then become the items equaling total return.

   The terms of the Dividend Discount Model—see Gordon and Shapiro (1956) and Miller and Modigliani (1961)—have been rearranged to provide:

$$k = \frac{NOI_n(1+g)}{P_n} + g \,, \tag{1}$$

where:

k = the discount rate (or yield);
NOI_n = income received at the end of the nth quarter;
P_n = capital value at the end of the nth quarter; and
g = constant growth rate of NOI.

The DDM assumes an infinite holding period or, alternatively, a finite holding period with the asset sold at the same capitalization rate at which it was purchased. This assumption is quite obviously not suited to all periods. Accordingly, equation (1) is modified to allow for a finite holding period and changing capitalization rates or pricing movements (m). Thus, these three fundamental components sum to the estimated discount rate or yield where:

$$k = y + g + m,$$ (2)

$$y = \frac{NOI_n(1+g)}{P_n} = \frac{NOI_{n+1}}{P_n}.$$

This procedure is chronologically followed through the seventeen-year period in order to estimate the underlying nominal income streams and market values for each of the property-type data series.

Initial Current Yield

The underlying calculations of these yield components are relatively straightforward. The annualized initial current yield is the ratio of net operating income in a particular quarter divided by the index's capital value at the beginning of the period and the result is multiplied by four.

$$y_n = NOI_n / P_{n-1} \times 4,$$ (3)

where:

y_n = initial (annualized) current yield for period n;
NOI_n = income generated in the nth quarter; and
P_{n-1} = capital value at the begining of the nth quarter.

Growth in Income

The growth in income is simply the geometric mean return of NOI at the beginning of the period versus the NOI at the end of the period. Mathematically, this is stated as:

$$g = \left[\sqrt[N]{\frac{NOI_N}{NOI_{n-1}}} - 1 \right] \times 4,$$ (4)

where:

g = the annualized growth in net income over N quarters;
NOI_N = income generated in the final quarter;

NOI_{n-1} = income generated in the period immediately prior to the analysis period; and

N = number of quarters in the analysis.

Pricing Movements

The pricing movements due to changes in capitalization rates are more difficult to quantify. They require two internal rate-of-return (*IRR*) calculations for each period. The first *IRR* calculation consists of using all of the factors associated with the index's actual performance (i.e., the beginning capital value, the quarterly cash flow components, and the ending capital value). This figure results in an annualized *IRR* (the base *IRR*) which is roughly equal to the actual quarterly weighted return computed on a geometric return basis. Then an adjusted figure is calculated (the adjusted *IRR*) in which all inputs are the same as the base *IRR*, except for the ending capital value that is repriced to reflect what that value would have been if the capitalization rate (for that quarter's net operating income) had been equal to the rate at the beginning of the investment period. The difference between the two *IRR* figures isolates the impact of changing capitalization rates over the period in question. Mathematically, the fundamental return attributable to such pricing movements (*m*) is stated as:

$$m = [IRR_{Base} - IRR_{Adjusted}] \times 4 , \tag{5}$$

where:

m = change in annualized yield attributable to changes in capitalization rates;

IRR_{Base} = quarterly *IRR* computed based upon the index's imputed value; and

$IRR_{Adjusted}$ = quarterly *IRR* computed with the ending capital value based upon the going-in capitalization rate.

The result of these calculations is an estimate of the interaction of the going-in capitalization rate vis-à-vis the going-out capitalization rate, the holding period and the growth in net operating income.

Real Returns

The nominal return (*k*) was then converted to the real (i.e., inflation-adjusted) return (*r*). This was accomplished by using the Hong Kong Consumer Price Index as an estimate for inflation (*p*) as follows:

$$\frac{(1+k)}{(1+\rho)} - 1 = r . \tag{6}$$

In the final analysis, it is the real return that should be of the most interest to investors.

Data and Methodology Limitations

Constant Growth Assumption

The DDM approach relies, in part, upon a constant growth rate. As shown in subsequent exhibits, the underlying income streams have not demonstrated constant growth. The difference between actual *NOI* growth and its assumed constant-growth counterpart and the length of the assumed holding period will impact the comparison between the estimated return and the returns. Also, see Gehr (1992).

NOI versus Cash Flow

Without access to capital improvements data, it is not possible to subtract the proper amount of capital improvements from income in order to arrive at a cash flow net of capital improvements. As noted previously, this study's methodology assumes capital improvements to be zero.

The authors have examined the impact of this simplifying assumption by modeling assumed capital improvements as a constant percentage of net operating income ranging from 5% to 50%. The difference in total returns, as measured by an *IRR* approach on "actual" cash flows (with capital improvements ranging from 5% to 50% of net operating income) as compared to the same approach on "implied" cash flows (with capital improvements assumed to be zero), is quite small: .04% to .50% per annum under a variety of assumed relationships between the growth rate of *NOI* and property values.

Because of the nature of conventions that include the capital improvements in the denominator of the calculations for both income and appreciation returns, the impact of increasing capital improvements (given the simplifying assumption used in this study to analyze historical returns) is to overstate operating cash flow (i.e., net income less capital improvements) and, correspondingly, understate property values. This misstatement of the timing, but not the total amount, of cash flows partially accounts for the small difference in total returns.

Cap Rate Bias

Because of the aforementioned tendency for this study's methodology to understate property values as capital improvements increase as a percentage of *NOI*, the "implied" capitalization rates are biased slightly upwards. This bias increases with time.

Changing Mix

The mix and number of properties are constantly changing. To some degree, this will reduce comparability between periods.

Results

Residential—Class A/B/C

Exhibit 1 shows the nominal and real price and income returns for Residential—Class A/B/C property. The inflation rate is also shown along with the implied capitalization rate. Over the 1979–95 period, price and income returns have been very volatile. The

Exhibit 1
Descriptive Statistics for Residential—Class A/B/C

| Year	Inflation Rate (%)	Price (%)		Income (%)		Implied Cap Rate (%)
		Nominal	Real	Nominal	Real	
79	12.7	42.5	26.3	37.9	22.4	8.7
80	12.9	39.2	23.4	26.7	12.0	7.9
81	12.0	23.3	10.5	27.8	14.4	8.1
82	10.0	−13.6	−21.4	3.6	−5.8	9.8
83	7.7	−17.1	−23.0	−8.4	−14.8	10.8
84	8.0	−4.2	−11.5	−3.3	−10.7	10.9
85	2.9	12.3	9.0	5.7	2.7	10.3
86	4.6	11.6	6.7	6.2	1.5	9.7
87	5.3	21.5	15.3	11.7	6.0	8.9
88	7.2	22.8	14.4	16.7	8.8	8.5
89	9.3	27.2	16.6	27.1	16.4	8.5
90	8.6	11.8	2.9	13.4	4.5	8.8
91	8.9	38.0	26.4	8.8	−0.1	7.2
92	7.3	41.9	32.5	9.6	2.1	5.6
93	5.8	10.6	4.5	5.5	−0.3	5.5
94	7.7	25.0	16.2	19.3	10.7	5.3
95	9.2	−7.7	−15.5	1.8	−6.6	5.7
Mean	8.25	16.77	7.85	12.36	3.71	8.24
Std Dev.	2.65	18.38	16.36	11.87	9.58	1.78

Exhibit 2
Performance Summary for Residential—Class A/B/C

	1979–81 3 Yrs (%)	1982–86* 5 Yrs (%)	1987–95 9 Yrs (%)	1979–95 17 Yrs (%)
Inflation Rate	13.67	6.44	8.03	8.18
Pass-through rate	157.19	9.03	147.18	119.81
Capital Growth				
Nominal	26.65	−0.37	18.65	13.67
Real	11.41	−6.40	9.83	5.07
Income Growth				
Nominal—(g)	21.49	0.58	11.82	9.81
Real	6.88	−5.50	3.51	1.50
Initial Yield—(y)	9.54	8.96	8.98	9.54
Pricing Movement—(m)	3.56	−0.48	1.08	0.06
Yield (DDM Model)				
Nominal $g+y+m$	34.59	9.06	21.88	19.40
Real	18.40	2.46	12.82	10.37

*recession

range for real returns was from 32.5% (1992) to −23.0% (1983)! The range for real income growth was from 22.4% (1979) to −14.8% (1983)! The range of implied capitalization rates which combine price and income was much more moderate and

Exhibit 3
Price Indices for Residential—Class A/B/C

Price Index—Residential (Class A/B/C)

– – Nominal —— Real
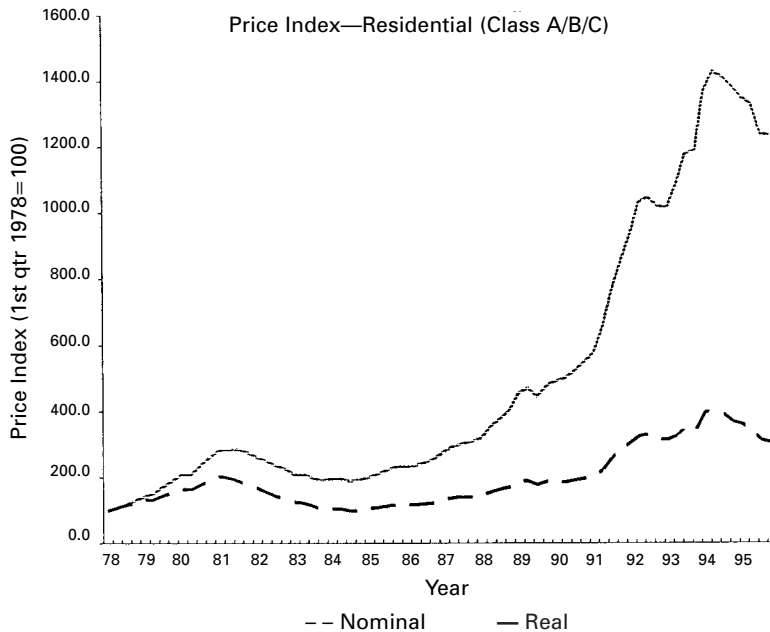
Exhibit 4
Income Indices for Residential—Class A/B/C

Income Index—Residential (Class A/B/C)

– – Nominal —— Real

varied from 10.9% (1984) to 5.3% (1994). In addition, the implied capitalization rate shows a definite downtrend since 1984.

Exhibit 2 summarizes several important property performance measures for three separate periods—1979–81, 1982–86 (recession) and 1987–95, as well as the aggregate (1979–1995). Several notable facts present themselves. First, the recession was severe. Income growth was almost zero and capital growth was negative! However, during the other periods inflation pass-through was over 147%! Another noteworthy trend is that real rates-of-return (yield) are declining over the period.

Exhibits 3 and 4 contain graphs of the nominal and real price and income indices, respectively, for Residential—Class A/B/C property. While the nominal graph grows explosively toward the end of the period for both, the real graph exhibits moderate, but positive growth. Somewhat troublesome is the growth of prices to over 1,400 on the index, while income has only increased to about half of that! Remember, both started at 100 on the index in 1978.

The implied capitalization rate is shown in Exhibit 5. This would appear to explain a large part of why the price increase is much larger than the increase in income. The implied capitalization rate declined from 10.9% in 1984 to 5.3% in 1994. This is a 50% drop in the capitalization rate! However the decrease is only from 8.7 to 5.7 over the entire period, but still a 34.5% decrease.

Residential—Class D/E

As expected, Residential—Class D/E property performance is close to that of

Exhibit 5
Implied Capitalization Rate for Residential—Class A/B/C

Implied Capitalization Rate—Residential (Class A/B/C)
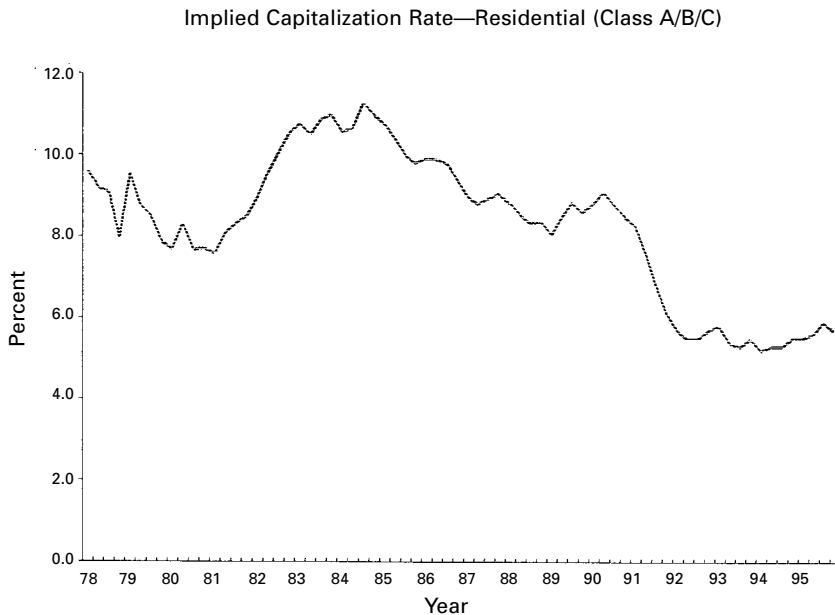
Exhibit 6
Descriptive Statistics for Residential—Class D/E

| Year	Inflation Rate (%)	Price (%)		Income (%)		Implied Cap Rate (%)
		Nominal	Real	Nominal	Real	
79	12.7	62.0	43.5	49.2	32.6	7.6
80	12.9	44.0	27.8	34.8	19.1	7.0
81	12.0	23.4	10.7	34.4	20.2	7.6
82	10.0	−17.0	−24.4	−2.3	−10.9	9.0
83	7.7	−27.5	−32.7	−16.7	−22.5	10.4
84	8.0	−12.8	−19.6	−11.2	−18.2	10.6
85	2.9	20.9	17.1	16.3	12.9	10.2
86	4.6	12.7	7.9	16.5	11.4	10.5
87	5.3	16.7	10.7	7.6	2.1	9.7
88	7.2	23.2	14.7	16.6	8.6	9.2
89	9.3	25.4	15.0	23.6	13.3	9.0
90	8.6	4.8	−3.6	0.6	−7.3	8.6
91	8.9	28.4	17.6	3.9	−4.7	7.5
92	7.3	52.4	42.2	15.0	7.1	5.6
93	5.8	21.7	14.9	14.0	7.8	5.3
94	7.7	40.8	31.0	33.6	23.8	5.2
95	9.2	−9.7	−17.2	2.2	−6.1	6.0
Mean	8.25	18.19	9.16	14.00	5.25	8.17
Std Dev.	2.65	23.99	21.56	16.96	14.68	1.81

Exhibit 7
Performance Summary for Residential—Class D/E

|	1979–81 3 Yrs (%)	1982–86* 5 Yrs (%)	1987–95 9 Yrs (%)	1979–95 17 Yrs (%)
Inflation Rate	13.67	6.44	8.03	8.18
Pass-through rate	191.02	−2.43	143.50	120.67
Capital Growth				
Nominal	31.15	−4.45	20.24	13.33
Real	15.38	−10.23	11.30	4.76
Income Growth				
Nominal—(g)	26.12	−0.16	11.52	9.88
Real	10.95	−6.20	3.23	1.56
Initial Yield—(y)	8.76	8.46	10.07	8.76
Pricing Movement—(m)	3.55	−2.34	1.24	0.06
Yield (DDM Model)				
Nominal $g+y+m$	38.42	5.96	22.83	18.70
Real	21.77	−0.45	13.70	9.72

*recession

Residential—Class A/B/C property, but somewhat more volatile (see Exhibit 6). The range for real price changes is from 43.5% (1979) to −32.7% (1983). The range for real income growth was from 32.6% (1979) to −22.5% (1983). The implied capitalization rate ranged from 10.6% (1984) to 5.2% (1994).

Exhibit 8
Price Indices for Residential—Class D/E

- - Nominal   — Real
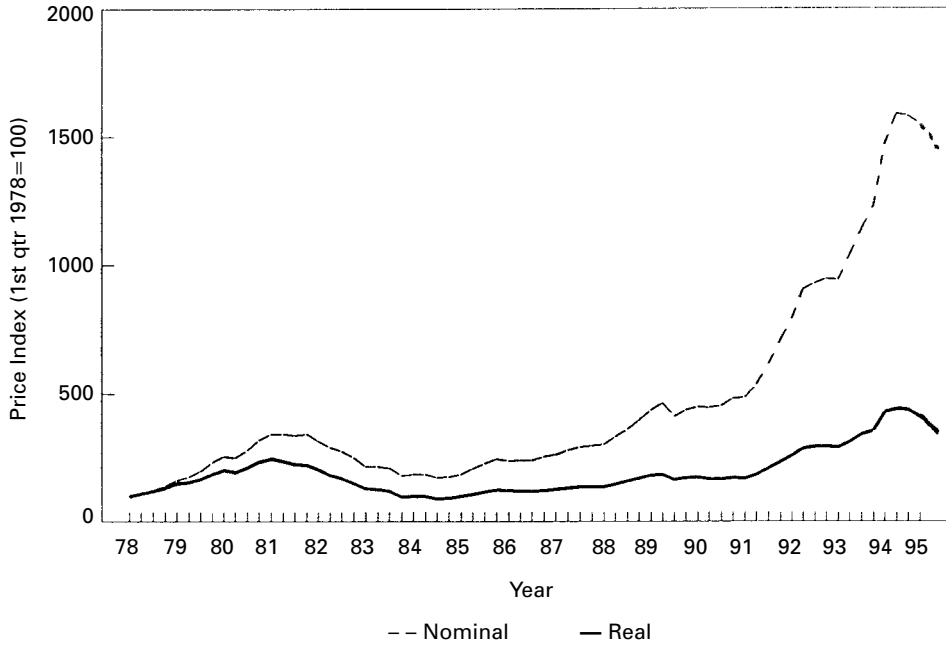
Exhibit 9
Income Indices for Residential—Class D/E

- - Nominal   — Real
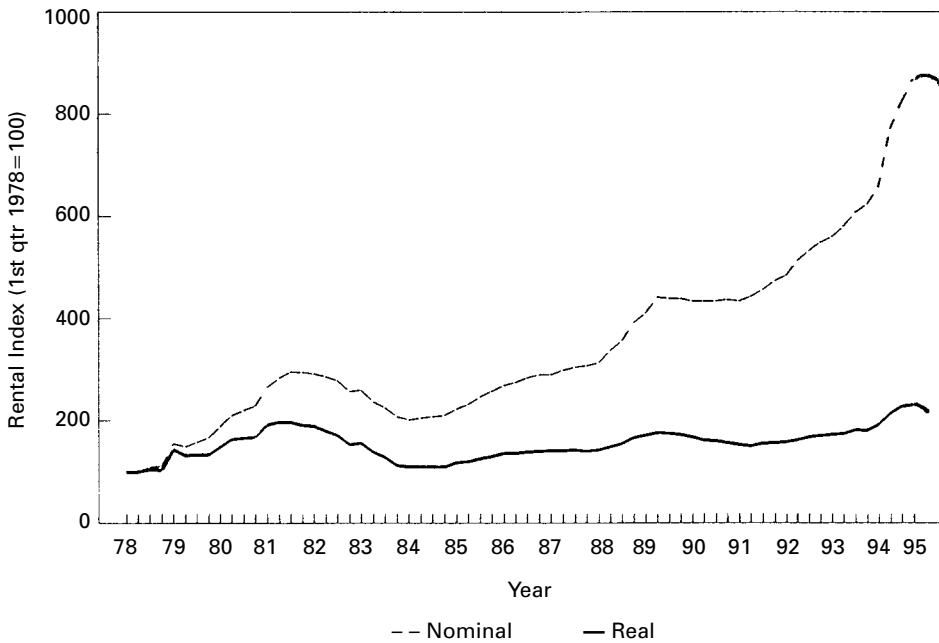
The performance summary for Residential—Class D/E property in Exhibit 7 shows declining rates-of-return over the period and a severe recession during 1982–86. However, the inflation pass-through was in excess of 120% over the period.

Exhibits 8 and 9 contain the graphs for the nominal and real price and income indices, respectively. However, prices and incomes did not rise quite as much over the period as Residential—Class A/B/C property did. Nevertheless, by the end of the period incomes had risen about half as much as prices! Again, however, the answer lies in the implied capitalization rate (Exhibit 10) which declined from 10.6% in 1984 to 5.2% in 1994—a decline of over 50%! But for the whole sample period the decline is only 21% (7.6% to 6.0%).

Office

The range for real office property prices over the sample period was from 72.2% (1980) to −44.7% (1983)! The range for real office income was from 67.5% (1980) to −29.6% (1983). See Exhibit 11. Implied capitalization rates ranged from 10.6% (1986 and 1987) to 5.7% (1993).

The performance summary for office property indicates much more volatility than for either grouping of residential property (A/B/C or D/E). During the 1982–86 recession, the inflation pass-through rate was −75.79%. Real returns were declining over the period for this property type also.

The price and income indices (nominal and real) shown in Exhibits 13 and 14, respectively, indicate more growth for office income and prices over the sample period than was true for residential property. While the income index increased to over 1,000, the price index only went to over 1,500 and then turned down.

The implied capitalization rate graph (Exhibit 15) shows rates declining from 10.6% in 1986 and 1987 to 5.0% in 1994—a decrease of 53%, but for the entire sample period the decline is only 3.3% (from 6.1% to 5.9%)!

Retail Property

Retail property had real price changes from 30.3% (1992) to −27.4% (1982 and 1983) and real income growth of 22.6% (1980) to −14.6% (1984). See Exhibit 16.

The retail property performance summary shown in Exhibit 17 shows real rates-of-return declined over the period, but does not demonstrate anything near to the volatility for offices. The inflation pass-through was about 153% over the period and real capital growth was a modest 4.3% over the sample period.

Prices and incomes remained much more in balance than for any other property type thus far. As shown by Exhibits 18 and 19, the price index rose to over 1,200 before declining to about 1,100. The income (rent) index rose to almost 950 during the same period. The implied capitalization rate declined from 12.0% (1984) to 5.9% (1994)—a 51% decline, but from 1979 to 1995 increased .3% from 6.0% to 6.3%.

Industrial

Exhibit 21 contains the descriptive statistics for industrial property. Real price changes ranged from 34.5% (1988) to −27.9% (1982). Real income growth ranged from 35.3%

Exhibit 10
Implied Capitalization Rate for Residential—Class D/E

Exhibit 11
Descriptive Statistics for Office

Year	Inflation Rate (%)	Price (%)		Income (%)		Implied Cap Rate (%)
		Nominal	Real	Nominal	Real	
79	12.7	61.5	42.3	38.5	22.0	6.1
80	12.9	93.3	72.3	88.9	67.5	5.8
81	12.0	25.1	12.3	39.0	24.7	6.5
82	10.0	−5.9	−14.5	−1.1	−9.7	6.9
83	7.7	−40.6	−44.7	−24.1	−29.6	8.8
84	8.0	−24.6	−30.4	−10.6	−17.4	10.5
85	2.9	4.7	1.5	0.8	−2.2	10.1
86	4.6	11.6	6.7	18.0	12.8	10.6
87	5.3	29.6	22.9	29.8	23.1	10.6
88	7.2	54.3	43.7	24.5	16.1	8.7
89	9.3	59.2	46.1	63.9	50.0	8.8
90	8.6	−3.8	−11.3	0.8	−7.0	9.3
91	8.9	1.0	−7.4	−5.7	−13.5	8.3
92	7.3	37.2	27.8	5.8	−1.5	6.3
93	5.8	20.0	13.4	9.7	3.7	5.7
94	7.7	39.4	29.5	21.1	12.4	5.0
95	9.2	−14.8	−21.8	−0.7	−8.9	5.9
Mean	8.25	20.43	11.08	17.56	8.38	7.88
Std Dev.	2.65	33.76	30.00	27.50	23.85	1.89

Exhibit 12
Performance Summary for Office

|	1979–81 3 Yrs (%)	1982–86* 5 Yrs (%)	1987–95 9 Yrs (%)	1979–95 17 Yrs (%)
Inflation Rate	13.67	6.44	8.03	8.18
Pass-through rate	401.76	−75.79	157.82	164.87
Capital Growth				
Nominal	50.90	−12.13	19.72	13.59
Real	32.75	−17.45	10.82	4.99
Income Growth				
Nominal—(g)	54.93	−4.88	12.67	13.49
Real	36.30	−10.64	4.30	4.91
Initial Yield—(y)	6.58	7.48	11.04	6.58
Pricing Movement—(m)	−2.87	−4.28	0.55	0.00
Yield (DDM Model)				
Nominal $g+y+m$	58.64	−1.68	24.25	20.08
Real	39.56	−7.63	15.02	11.00

*recession

(1988) to −25.7% (1983). The implied capitalization rate ranged from 11.7% (1986) to 8.2% (1980).

The performance summary for industrial property (Exhibit 22) shows less inflation pass-through for the sample period than for any other property type, but still significantly
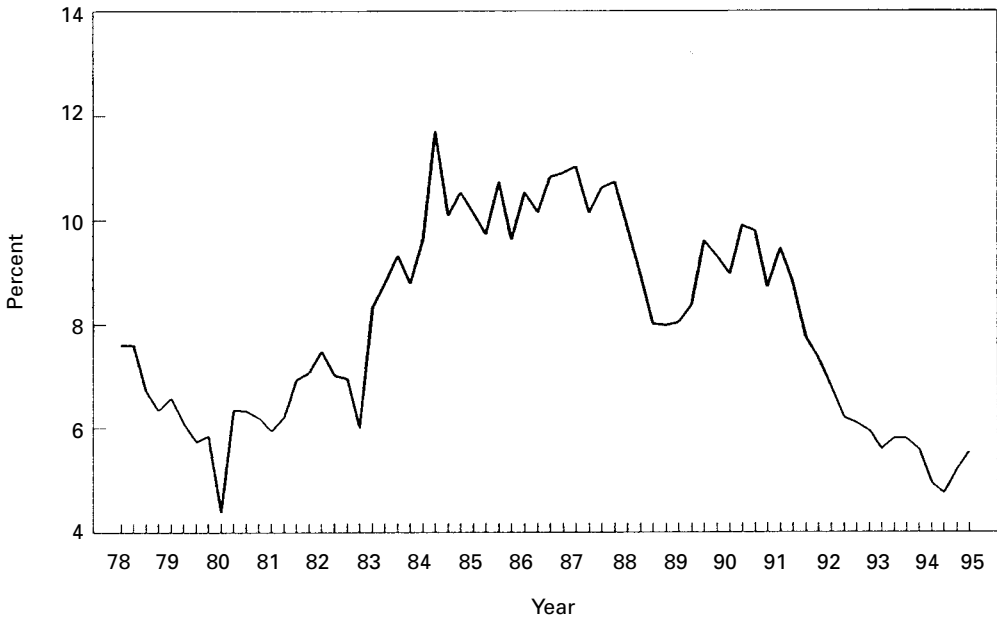
Exhibit 13
Price Indices for Office
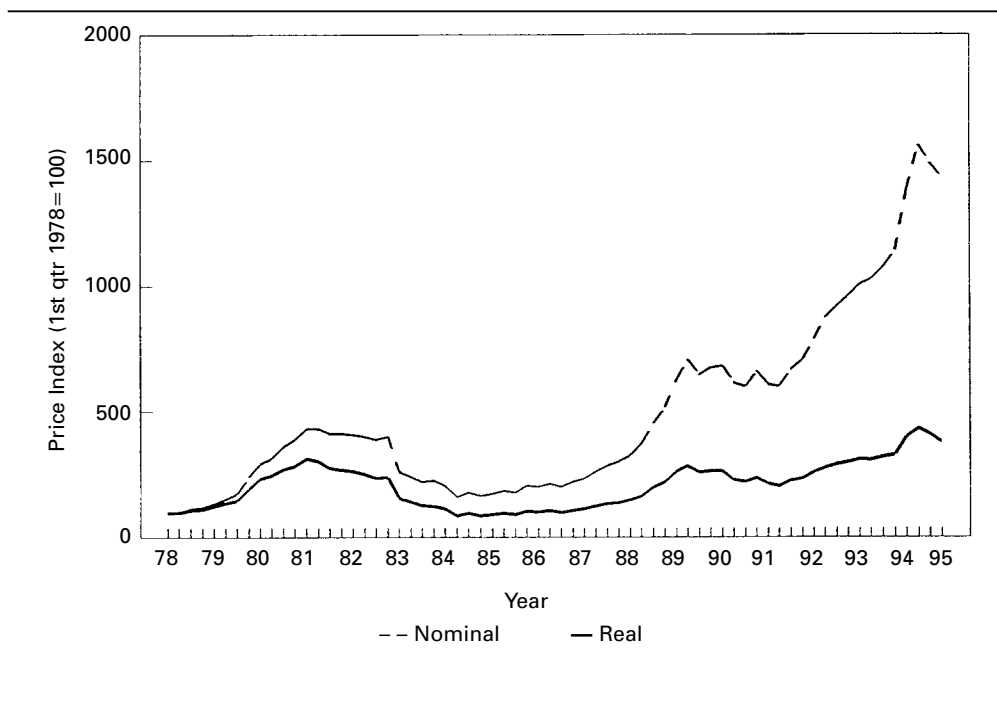
Exhibit 14
Income Indices for Office
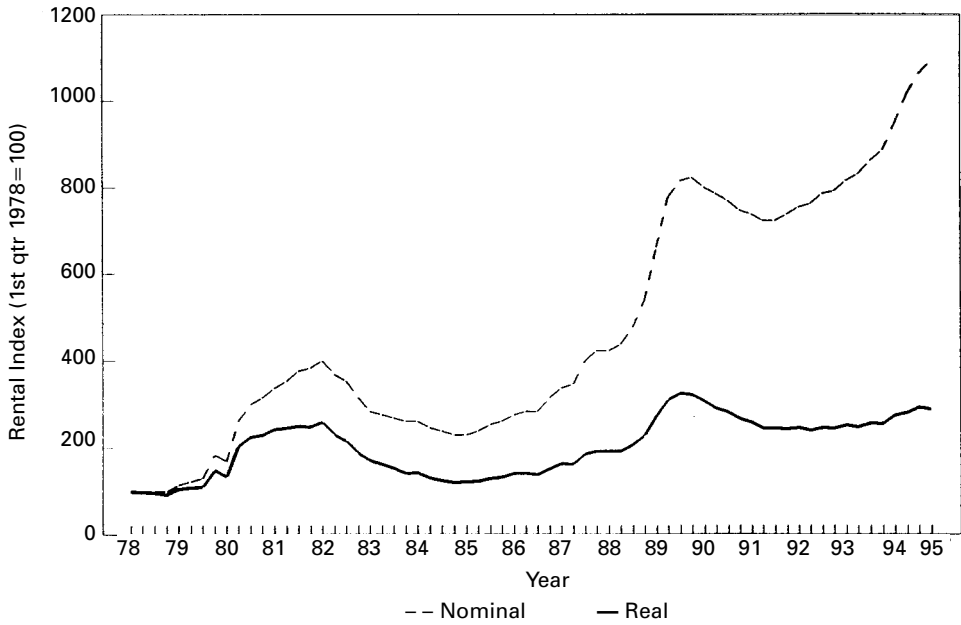
Exhibit 15
Implied Capitalization Rate for Office

Exhibit 16
Descriptive Statistics for Retail

Year	Inflation Rate (%)	Price (%)		Income (%)		Implied Cap Rate (%)
		Nominal	Real	Nominal	Real	
79	12.7	41.6	25.6	32.2	17.5	6.0
80	12.9	42.5	26.4	38.7	22.6	5.8
81	12.0	17.1	4.7	36.4	21.8	6.8
82	10.0	−20.6	−27.4	11.1	1.3	9.7
83	7.7	−21.7	−27.4	−4.8	−11.4	11.6
84	8.0	−10.8	−17.7	−7.6	−14.6	12.0
85	2.9	9.5	6.2	4.5	1.5	11.5
86	4.6	16.0	11.0	5.2	0.6	10.4
87	5.3	27.1	20.6	13.6	7.8	9.3
88	7.2	29.7	20.9	16.4	8.5	8.4
89	9.3	29.0	18.3	25.0	14.4	8.1
90	8.6	12.3	3.3	11.8	3.0	8.1
91	8.9	27.6	17.0	13.0	3.7	7.4
92	7.3	39.8	30.3	17.6	9.6	6.4
93	5.8	21.7	15.1	12.3	6.2	6.0
94	7.7	16.9	8.6	14.8	6.6	5.9
95	9.2	−3.8	−11.9	1.3	−7.2	6.3
Mean	8.25	16.12	7.27	14.21	5.40	8.21
Std Dev.	2.65	19.56	17.67	12.70	10.09	2.11

Exhibit 17
Performance Summary for Retail

|	1979–81 3 Yrs (%)	1982–86* 5 Yrs (%)	1987–95 9 Yrs (%)	1979–95 17 Yrs (%)
Inflation Rate	13.67	6.44	8.03	8.18
Pass-through rate	263.92	5.50	170.80	152.65
Capital Growth				
Nominal	27.32	−5.37	19.84	12.92
Real	12.00	−11.10	10.93	4.38
Income Growth				
Nominal—(g)	36.08	0.35	13.72	12.49
Real	19.72	−5.72	5.26	3.98
Initial Yield—(y)	6.23	7.32	9.24	6.23
Pricing Movement—(m)	−6.55	−3.05	0.90	0.00
Yield (DDM Model)				
Nominal $g+y+m$	35.76	4.63	23.86	18.72
Real	19.43	−1.70	14.65	9.73

*recession

above 100% (121%). Returns also declined over the period for this property type and the recession was almost as severe for industrial property as for offices.

Prices and income were fairly well balanced for industrial property (Exhibits 23 and 24,

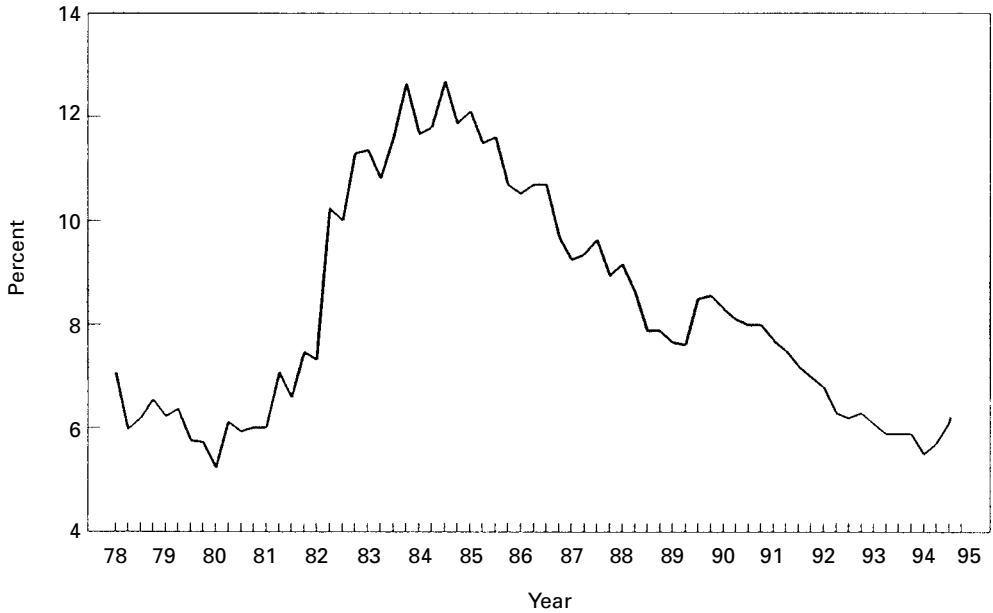**Exhibit 18**
Price Indices for Retail
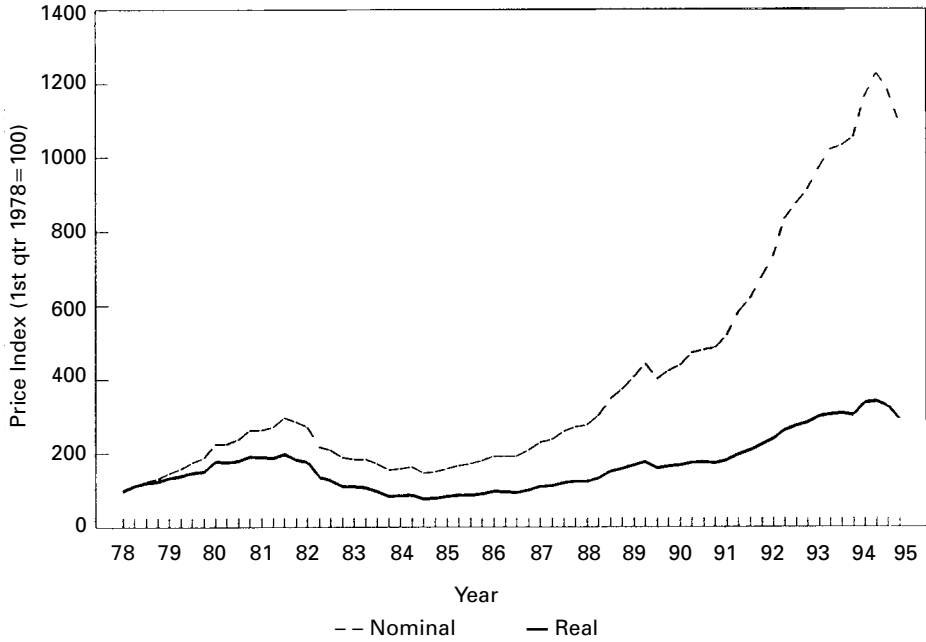
Exhibit 19
Income Indices for Retail
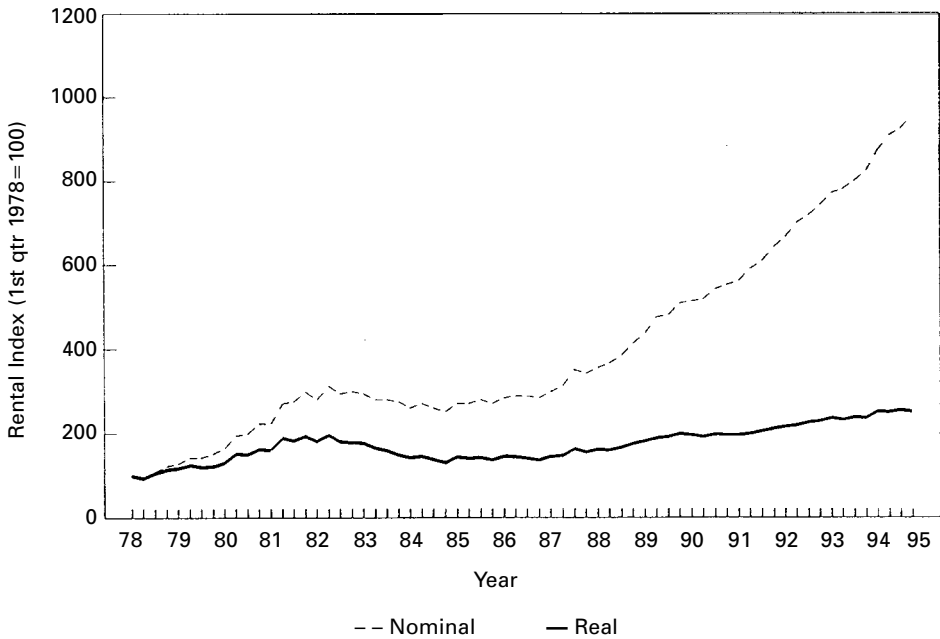
Exhibit 20
Implied Capitalization Rate for Retail

Exhibit 21
**Descriptive Statistics for Industrial**

Year	Inflation Rate (%)	Price (%)		Income (%)		Implied Cap Rate (%)
		Nominal	Real	Nominal	Real	
79	12.7	26.4	11.8	13.8	0.9	8.7
80	12.9	44.8	28.6	38.3	22.4	8.2
81	12.0	31.4	17.8	40.5	25.3	8.7
82	10.0	−20.8	−27.9	−3.4	−11.7	10.7
83	7.7	−20.3	−25.9	−19.9	−25.7	10.8
84	8.0	−8.7	−15.9	−3.1	−10.5	11.4
85	2.9	9.5	6.4	10.3	7.1	11.4
86	4.6	3.1	−1.5	5.2	0.6	11.7
87	5.3	30.7	23.9	14.4	8.4	10.2
88	7.2	44.2	34.5	44.9	35.3	10.3
89	9.3	32.9	21.8	33.3	22.0	10.3
90	8.6	2.2	−5.8	4.7	−3.4	10.6
91	8.9	7.3	−1.6	3.6	−5.0	10.5
92	7.3	29.2	20.3	8.1	0.7	8.9
93	5.8	20.2	13.6	9.8	3.8	8.3
94	7.7	6.5	−1.0	3.3	−4.1	8.5
95	9.2	−8.4	−16.1	−1.3	−9.6	9.3
Mean	8.25	13.55	4.89	11.92	3.33	9.91
Std Dev.	2.65	20.30	18.37	17.12	15.10	1.15

Exhibit 22
Performance Summary for Industrial

|	1979–81 3 Yrs (%)	1982–86* 5 Yrs (%)	1987–95 9 Yrs (%)	1979–95 17 Yrs (%)
Inflation Rate	13.67	6.44	8.03	8.18
Pass-through rate	241.61	−39.57	149.81	121.35
Capital Growth				
Nominal	35.30	−4.68	15.27	11.33
Real	19.02	−10.45	6.70	2.91
Income Growth				
Nominal—(g)	33.03	−2.55	12.03	9.93
Real	17.03	−8.44	3.70	1.61
Initial Yield—(y)	10.30	10.30	10.70	10.30
Pricing Movement—(m)	1.52	−1.00	0.21	0.00
Yield (DDM Model)				
Nominal $g+y+m$	44.86	6.76	22.94	20.24
Real	27.44	0.30	13.80	11.14

*recession

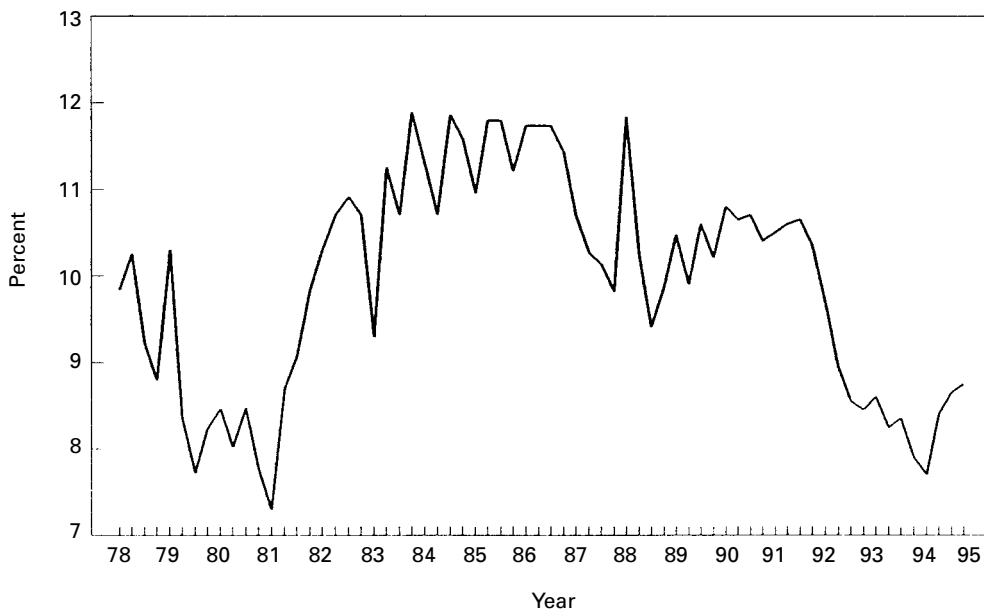**Exhibit 23**
Price Indices for Industrial
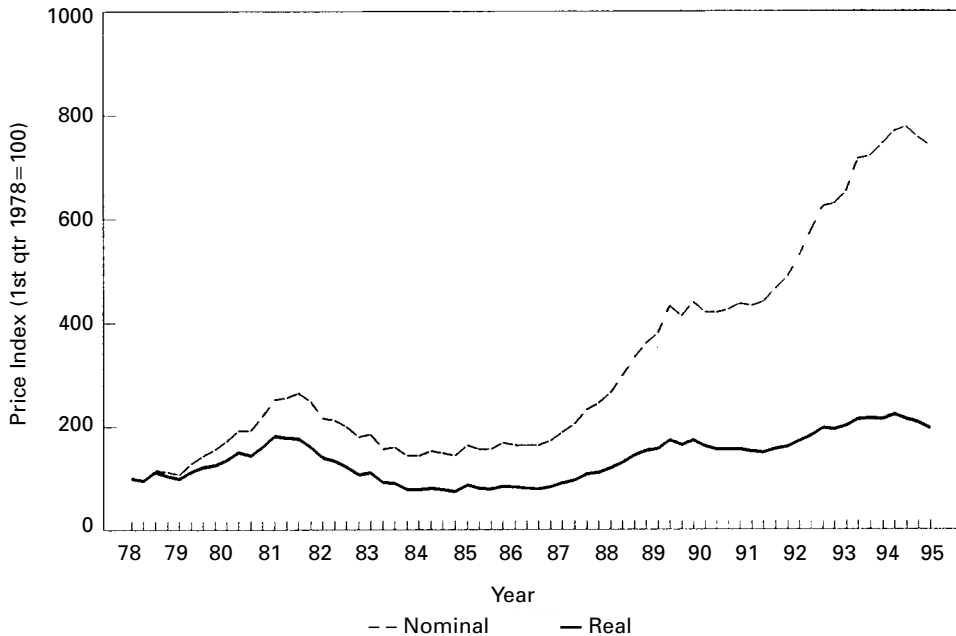
respectively). The price index rose to about 776 before declining slightly to 740 while the income index rose to about 580 over the same period. The implied capitalization rate graph for industrial property (Exhibit 25) shows the rate at 8.7% in 1979 and increasing to 9.3% in 1995—a 6.9% increase.

Exhibit 24
Income Indices for Industrial
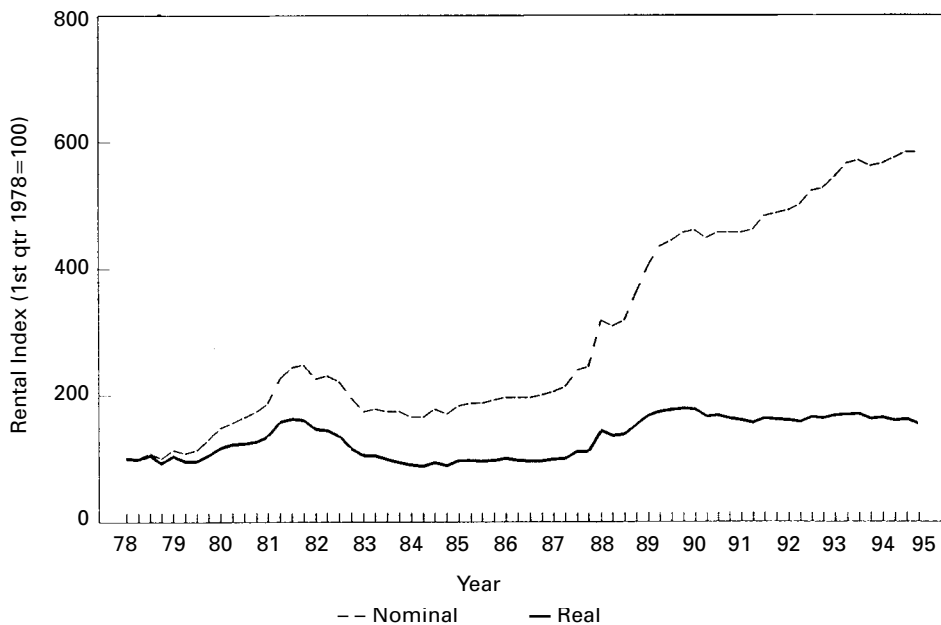
Exhibit 25
Implied Capitalization Rate for Industrial

Exhibit 26
Summary of All Property Types

	1979 Cap Rate (%)	1995 Cap Rate (%)	% Change Cap Rates	I Pass-Through (%)	Real-Cap Growth (%)	Real-Inc Growth (%)	Real Yield (%)
Residential Class A/B/C	8.7	5.7	−34.5	120	5.07	1.50	10.37
Residential Class D/C	7.6	6.0	−21.1	121	4.76	1.56	9.72
Office	6.1	5.9	−3.2	165	4.99	4.91	11.00
Retail	6.0	6.3	+5.0	152	4.38	3.98	9.73
Industrial	8.7	9.3	+6.9	121	2.91	1.61	11.14

Conclusions

Real estate returns are attributable to three fundamental factors: initial current yield, growth in *NOI*, and changes in capitalization rates. The impact of changing capitalization rates on investment returns decreases substantially as the investment horizon lengthens. Over the long term, an investor's real (i.e., inflation-adjusted) yield is largely determined by the initial yield and the ability of the asset's income to keep pace with inflation. If this income stream keeps pace, then the going-in capitalization rate is a strong indication of the asset's real return.

Exhibit 26 contains a summary of the most salient facts for all Hong Kong property types analyzed in this study. The difference between the columns labeled Real-Cap Growth and Real-Income Growth would approximate the returns due to a decline in the capitalization rate over the 1979–95 study period. For some property types it is substantial, but for others very little. For example, only .09% per year (4.99% minus 4.91%) return for office property was due to the change in capitalization rate over the 1979–95 period. At the other extreme was Residential—Class A/B/C property, where 3.57% (5.07% minus 1.50%) of the annual return of 10.37% was due to the capitalization rate change! The Residential—Class A/B/C property rate decreased the most during the study period. The capitalization rate for office property changed the least of any property type (34.5% from 8.7% to 5.7%).

It should be remembered that any real estate portfolio consists of aging buildings. The capacity of these existing buildings to generate cash flow that keeps pace with inflation will decline over time. Thus, for each existing building, assuming that the capital market's view of required capitalization rate for new, leased-up properties remains constant, the going-out capitalization rate should increase over time. This also highlights the importance of identifying the going-in capitalization rate in estimating a real estate investment's return.

Lastly, investors should perform this type of analysis on their own portfolios. The experience of individual investor portfolios may be very different from that indicated by the averages. Moreover, access to an investor's portfolio data would help refine the analysis (e.g., the inclusion of capital improvements, advisory fees, etc.) and, one hopes, generate more precise estimates of future property and/or advisor performance.

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