

## ***Real Estate Cap Rates and Interest Rates – A Complex Relationship***

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### Research

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Real estate investment performance has held up remarkably well since the economic recession in 2001. Despite soaring vacancy rates and falling rents in most property types and markets, strong investor demand for safety and yield has helped to sustain real estate asset values and to prevent a repeat of the distressed conditions in the last property market downturn. Instead, real estate capitalization rates have plunged amid fierce competition for core assets with secure, predictable cash flows and, increasingly, for non-core assets that can be repositioned for the space market recovery.

While many factors have contributed to the downward trend in cap rates over the last three years, low interest rates have played a key role in the recent decline. Falling interest rates have enabled real estate investors to pay a premium for assets by using leverage to enhance their returns and have made real estate yields relatively attractive compared with other asset classes. However, with cap rates near historic lows and short-term interest rates likely to increase as the Fed follows through on its promise to gradually raise rates, investors are growing more concerned about the effects that higher interest rates will have on asset values during the recovery phase of the property market cycle.

Intuitively, it seems obvious that real estate cap rates and interest rates should be related. The real estate industry is capital intensive and relies heavily on debt, so the cost of debt capital in particular should be important. Further, from an investor's perspective, real estate investments typically have bond-like qualities that make their value sensitive to interest rate movements. But the relationship between interest rates and real estate values is complex. This report examines the recent trend in cap rates and uses duration, a concept borrowed from the fixed-income market, to develop a model for estimating the impact of higher interest rates on real estate values.

#### **The Recent Decline in Capitalization Rates**

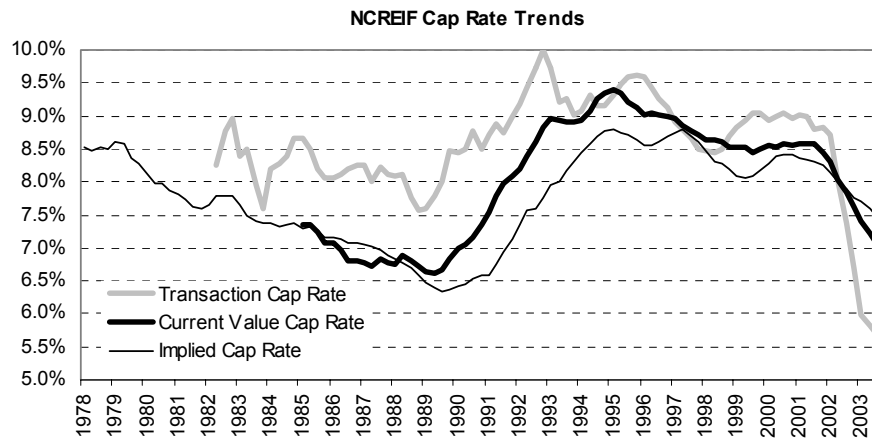
A capitalization rate is simply a ratio of a property's net operating income (NOI) to its market value, much like the inverse of a price-earnings ratio in the stock market. (Methodologies for calculating

NOI can vary widely, however.) Although most investors associate movements in cap rates with changes in asset values – e.g., falling cap rates signal rising property values – changes in income or asset prices (or both) can cause cap rates to move up or down.

However, because property income and asset values normally are positively correlated, movements in one variable frequently dilute the cap rate effects of movements in the other. For example, when rents (income) are rising, property values also tend to increase, such that both the numerator and denominator of the cap rate equation increase; and when rents are falling, property values usually fall, although this has not been the case for the last few years.

By almost any measure, cap rates have fallen dramatically in the US over the last three years even as property market fundamentals, outside of the retail sector and a few markets, have weakened considerably. **Exhibit 1** shows the historical cap rate trends for three data series from the National Council of Real Estate Investment Fiduciaries (NCREIF). Although the magnitude of the recent decline varies across the different cap rate measures, all three series reveal a downward trend since 2001.

**Exhibit 1: Sharp Decline in Cap Rates in Recent Years**



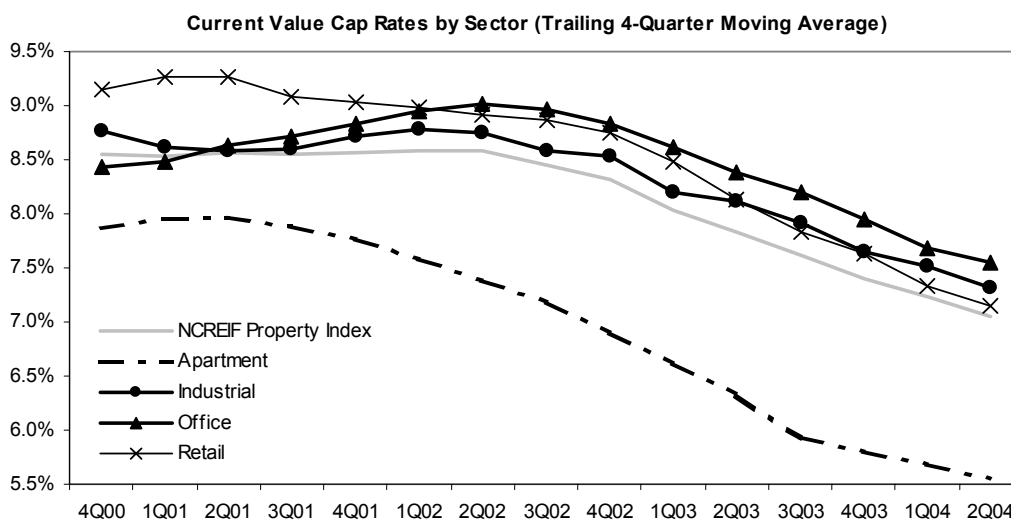
Sources: National Council of Real Estate Investment Fiduciaries (NCREIF, through 2Q2004); Prudential Real Estate Investors

The average “implied” cap rate, which includes all properties in the NCREIF Property Index (NPI) and, consequently, suffers most from the “stale appraisal problem” typically associated with the NPI, has declined a relatively modest 100 bps or so since the start of 2001. The “transaction” cap rate, which, as the name implies, is based on actual transactions involving properties in the NCREIF database, has plunged more than 300 bps. And the “current value” cap rate, which is calculated using only those properties in the NCREIF database that were appraised in the most recent quarter, has fallen about 150 bps, or nearly 18%, over the same period.<sup>1</sup>

<sup>1</sup> While all three cap rate measures have strengths and weaknesses that make them more or less appropriate for different analyses, we focus here on the current value cap rate series because we believe it provides a more balanced view of the recent cap rate trends in the US institutional real estate marketplace. This series also allows an analysis of cap rate trends by property types, shown in **Exhibit 2**.

Without question, the low interest rates and ample liquidity that have dominated the real estate investment market in recent years have contributed to the downward trend in cap rates. Strong investor demand for properties has supported asset values and pushed valuations higher in many cases, including record prices in a few high-profile transactions. Notably, the downward trend in yields has been broad-based. Cap rates have fallen across all the major property types over the last three years (see **Exhibit 2**). The decline has been most dramatic in the apartment sector, where the average cap rate has fallen nearly 30%, from about 8% at the end of 2000 to just 5.6% at mid-year 2004. Retail cap rates, which were the highest among the major property types at year-end 2000, have tumbled nearly 23%, from 9.2% to 7.1% as of the end of the second-quarter 2004. Even the office and industrial sectors, which, along with hotels, were most directly affected by the largely corporate recession, have seen meaningful declines in cap rates in recent years.

**Exhibit 2: Declining Cap Rate Trend Evident Across All Major Property Types**



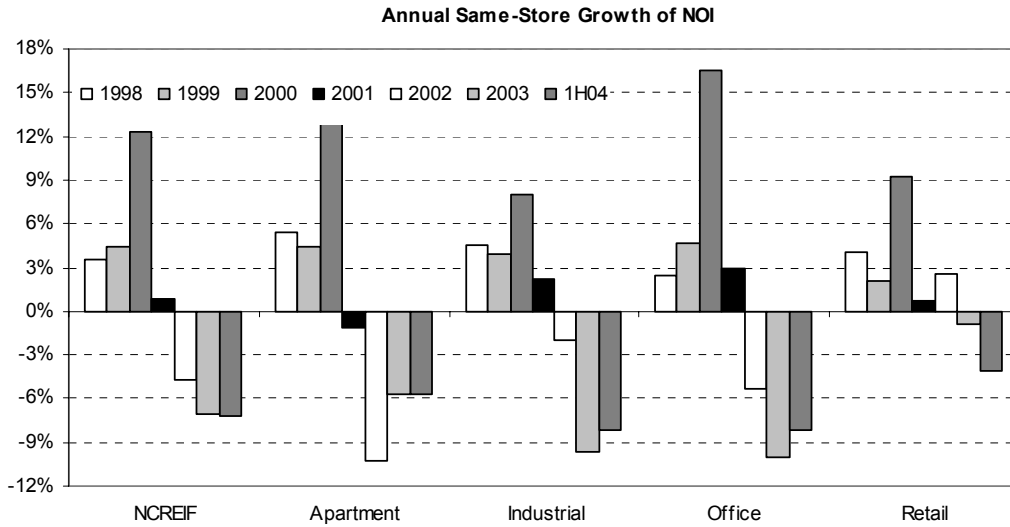
Sources: NCREIF; Prudential Real Estate Investors

### Declining Income – The Other Side of the Coin

But low interest rates and the competitive transaction market are only part of the story. Declining property income, from rising vacancies, falling rents and higher operating expenses, have also contributed to the recent downward trend in cap rates, particularly in the apartment, industrial and office sectors. Apartment cap rates reacted fairly quickly to the collapse in tenant demand brought about by the significant job losses and rising homeownership rate. As **Exhibit 3** shows, apartment NOI growth turned negative in 2001, a full year before the other major property types, which were insulated somewhat from the economic downturn by longer-term leases. Office and industrial income growth turned negative in 2002 and then fell sharply in 2003 as vacancies soared.

Only the retail sector managed to survive the economic recession without a sharp downturn in property income. Although income growth for retail properties in the NCREIF database slowed in 2001 and was negative in 2003 and the first half of this year, space market fundamentals in the retail sector have remained relatively healthy throughout the recession thanks to the continued strength in consumer spending.

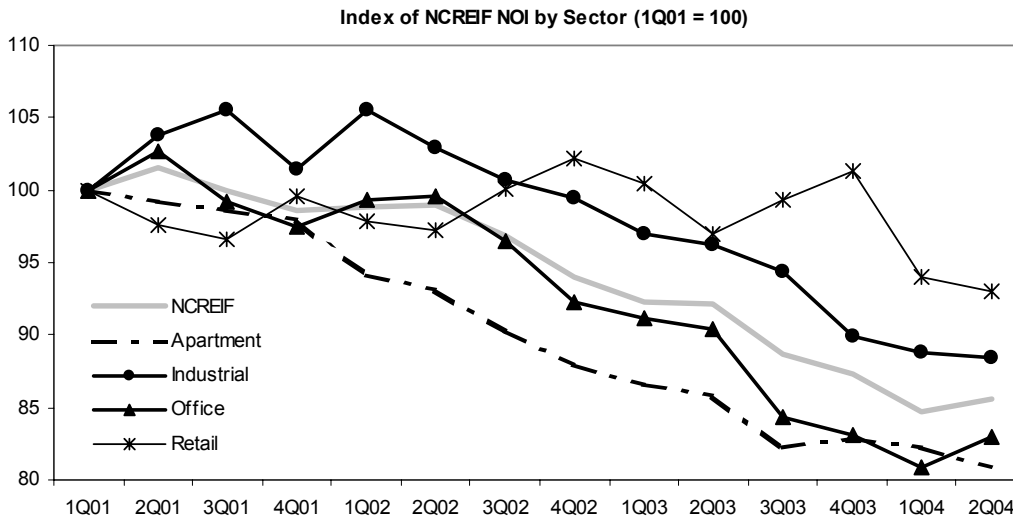
**Exhibit 3: Weak Market Fundamentals Hurt Property Income**



Sources: NCREIF; Prudential Real Estate Investors

As a result, retail property income has fallen only modestly, by about 7%, since first-quarter 2001. Office and apartment property income have both fallen nearly 20% during the same period (see Exhibit 4).

**Exhibit 4: Net Operating Income Lower Across All Major Property Types**



Sources: NCREIF; Prudential Real Estate Investors

**Attribution of Cap Rate Decline**

To estimate how much the decline in property income has contributed to the fall in cap rates, we first isolated the effects of the change in NOI on the cap rates for each major property type and for the overall NCREIF Index (see Exhibit 5). Since we know the beginning and ending cap rates and the percentage change in NOI for the Index and each property type, we can estimate the “NOI effect” of the change in income on the cap rate by holding property values constant. To illustrate, the average NCREIF cap rate (current value) declined from 8.5% at the start of 2000 to

7% at the end of second-quarter 2004. During this time, NOI for the Index declined 14.5%. Holding property values constant, a 14.5% decline in NOI alone would have produced a 120 bp drop from the initial 8.5% cap rate. However, because the average NCREIF cap rate actually fell 150 bps, the remaining 30 bp decline can be attributed to a change in property values.

**Exhibit 5** dramatically illustrates the powerful effects of declining property income on cap rates in recent years. Based on the methodology described above, falling income explains most of the decline in the average cap rates in every property sector except retail. To be sure, a number of high-profile transactions in recent years have commanded record prices (on a price per square foot or per unit basis) within certain markets. But, outside of the retail and apartment sectors, rising asset prices do not appear to have contributed meaningfully to the fall in cap rates.

**Exhibit 5: Decomposition of Cap Rate Changes**

	Current Cap Rate	Yr 2000 Cap Rate	Change in Cap Rate	NOI Effect	% Change in NOI Since 2000	Price Effect	Implied Appreciation Since 2000 <sup>a</sup>	Adjusted NCREIF Appreciation <sup>a, b</sup>
NPI	7.0%	8.5%	-1.5%	-1.2%	-14.5%	-0.3%	3.8%	7.0%
Apartment	5.6%	7.9%	-2.3%	-1.5%	-19.1%	-0.8%	14.1%	12.5%
Industrial	7.3%	8.8%	-1.5%	-1.0%	-11.6%	-0.5%	6.6%	8.5%
Office	7.5%	8.4%	-0.9%	-1.4%	-17.0%	0.5%	-7.0%	-2.1%
Retail	7.1%	9.2%	-2.1%	-0.6%	-7.0%	-1.5%	20.5%	22.6%

(a) Cumulative, not annualized. (b) Quarterly NCREIF appreciation is calculated as (Change in Market Value + Partial Sales)/(Beginning Market Value), which differs from the official NCREIF appreciation return.

Sources: NCREIF; Prudential Real Estate Investors

To test the reasonableness of our approach, we compared the implied appreciation based on the methodology used above with an adjusted appreciation measure based on actual property value and sale data from the NCREIF database.<sup>2</sup> In most cases, the implied appreciation and adjusted NCREIF appreciation estimates, both of which reflect cumulative value changes since 2000, are quite similar, particularly when expressed as annual rates. The estimates also are consistent with our observations in the transaction market. On average, industrial property values seem to have appreciated modestly (on an annual basis) since 2000, while office property values generally have held relatively stable or declined modestly. Strong investor demand has propelled apartment values noticeably higher, despite the sharp fall in income. And the retail sector, where property market fundamentals have remained fairly healthy, has experienced strong growth in asset values in recent years.<sup>3</sup>

By definition, both space and capital market forces affect cap rates. Space market forces influence cap rates directly through income, while capital market forces affect pricing. The weakness in the space markets can be easily measured by changes in income. For example, the income for the overall property market, as measured by the NPI, has declined 14.5% since 2000. In a perfect world, a 14.5% decline in income should produce a similar decline in property value. However, in the case of the NPI, capital market forces more than offset the decline in income. Thus, the 3.8% cumulative implied appreciation for the NPI severely understates the full impact

<sup>2</sup> For purposes of this analysis, we modified the calculation NCREIF normally uses to report the appreciation component of the Index return.

<sup>3</sup> Asset values for all types with long-term, predictable cash flows from credit-quality tenants have appreciated sharply in recent years.

of the capital market forces on property values. In reality, the total price effect of the capital market forces on the NPI in recent years has been about 18.3%, which includes a 14.5% decline in income plus 3.8% price appreciation.

### **Mathematical Relationship Between Cap Rate and Interest Rate Change**

While investors may take some comfort in the fact that falling income, rather than rising prices, explains most of the decline in cap rates over the last few years, rising interest rates still pose a risk. An increase in the cost of capital and more attractive yields in other asset classes could adversely affect demand for all types of real estate investments, particularly now that real estate yields have been pushed lower and market rents have fallen. Although rising property income during the recovery phase of the property market cycle could cause cap rates to rise even if property values remain stable, cap rates could rise sharply if investors demand a higher yield from real estate to compensate for the increase in interest rates.

Quantifying the effects of higher interest rates on property values is challenging, however. In the fixed-income market, investors use duration, a measure of a bond's effective maturity, to assess a bond's sensitivity to interest rate movements. Bond prices and yields are inversely related, so an increase in interest rates will cause a bond's price to fall and vice versa. While a complete discussion of duration is beyond the scope of this report, modified duration allows investors to approximate the change in a bond's price resulting from small movements in interest rates.<sup>4</sup> This relationship can be expressed as follows:

$$\Delta P/P = -MD \times \Delta i, \quad (1)$$

where  $\Delta P/P$  equals the percentage change in price, MD equals the modified duration and  $\Delta i$  equals the absolute change in the interest rate. With some admittedly brave assumptions about cash flows, reversion value and interactions between rents, property values and interest rates, we can calculate the modified duration of a hypothetical income-producing property to estimate the impact of interest rate movements on property values using the following formula:

$$MD = D/(1+y),$$

where D equals duration (the weighted average of times until each cash flow) and y equals the property's discount rate or internal rate of return (IRR).

By definition, the cap rate (C) equals the net operating income divided by the price (P), or:

$$C = NOI/P.$$

To estimate the cap rate sensitivity to interest rate change, we need to hold income (NOI) constant. As a result, the following holds:

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<sup>4</sup> Mathematically, a bond's duration is the weighted average of the times until each payment, where the weights are proportional to the present value of each payment and the discount rate is the bond's yield to maturity. In practice, investors use "modified duration," which equals the duration divided by 1 plus the current yield to maturity divided by the number of payments in a year, to approximate a bond's interest rate sensitivity.

$$\Delta C/C = -\Delta P/P, \quad (2)$$

where  $\Delta C/C$  is the percentage change in the cap rate and  $\Delta P/P$ , as before, denotes the percentage change in price. Combining equations (1) and (2), we have:

$$\Delta C/C = MD \times \Delta i.$$

Alternatively stated:

$$\Delta C = C \times MD \times \Delta i. \quad (3)$$

### Estimating the Relationship

**Exhibit 6** presents the assumptions and calculations for the modified duration of an investment property with a typical 10-year holding period. For illustration purposes, we assume the property generates \$100 in cash flow in year one of the holding period. Income is forecast to grow at 4% per year, and the terminal cap rate, for estimating the value of the property at the end of the holding period, is assumed to be 7.5%. A discount rate of 8% is applied to all cash flows and to the reversion value of the property to calculate their present values. The assumptions result in an initial cash yield of about 6% and a modified duration of 7.2 years.

#### **Exhibit 6: Modified Duration of a Hypothetical Property**

**Assumptions:**

Discount Rate	8.0%
Terminal Cap Rate	7.5%
Income Growth	4.0%
Year 1 Cash Flow	\$100

Year	Cash Flow	Present Value	% of PV	(%PV) x (Time)
0	-\$1,665			
1	100	93	5.6%	0.06
2	104	89	5.4%	0.11
3	108	86	5.2%	0.15
4	112	83	5.0%	0.20
5	117	80	4.8%	0.24
6	122	77	4.6%	0.28
7	127	74	4.4%	0.31
8	132	71	4.3%	0.34
9	137	68	4.1%	0.37
10	\$2,040	945	56.8%	5.68
		\$1,665	100.0%	7.73
		Duration (years)		7.73
		Modified Duration (years)		7.16
		Initial Yield		6.0%

Source: Prudential Real Estate Investors

**Exhibit 7** presents a sensitivity analysis of the modified duration shown above using different assumptions for the discount rate, terminal cap rate and income growth rate. The top half of the table shows the range of values for the modified duration that result when only one variable is changed. For example, if the discount rate were 7% instead of 8%, holding all other variables

constant, the modified duration would increase to 7.3 years from 7.2 years. Likewise, if the discount rate were 9%, the modified duration would decrease to 7.0 years, assuming no change in the terminal cap rate or income growth rate.<sup>5</sup>

**Exhibit 7: Sensitivity Analysis of Modified Duration**

Discount Rate	MD	Terminal Cap Rate	MD	Income Growth Rate	MD
7.0%	7.3	7.0%	7.2	5.0%	7.2
8.0%	7.2	7.5%	7.2	4.0%	7.2
9.0%	7.0	8.0%	7.1	3.0%	7.1

	Discount Rate	Terminal Cap Rate	Growth Rate	MD
High Case	7.0%	7.0%	5.0%	7.5
Base Case	8.0%	7.5%	4.0%	7.2
Low Case	9.0%	8.0%	3.0%	6.9

Source: Prudential Real Estate Investors

The bottom half of the table shows the modified duration for three scenarios using the values shown for each of the three variables (the “base case” is as shown in **Exhibit 6**). The relatively narrow range in values for the modified duration based on the different scenarios in **Exhibit 7** provides some confidence in our base case scenario. A key variable we have not considered, however, is time to maturity, or in the case of our example above, the holding period. In reality, holding periods can vary widely depending on the investment and/or the investor’s objectives.

**Exhibit 8** shows the effects of a 100 bp change in interest rates on the cap rates for the major property types and the NCREIF Index overall, based on each sector’s current cap rate and a modified duration of 7.2 years.<sup>6</sup> The results show a fairly tight range across the various property types, ranging from a 40 bp increase in apartment cap rates to 54 bps in the office sector.

**Exhibit 8: Cap Rate Sensitivity to Interest Rate Change**

	Current Cap Rate	New Cap Rate	Change (bps)
NPI	7.0%	7.5%	50
Apartment	5.6%	6.0%	40
Industrial	7.3%	7.8%	53
Office	7.5%	8.0%	54
Retail	7.1%	7.6%	51

Assumptions: modified duration = 7.2 years; 100 bp increase in IRR

Source: Prudential Real Estate Investors

For small fluctuations in interest rates, say 10 to 25 bps, the corresponding changes in cap rates may be imperceptible. Several forces mute the cap rate effects of small changes in interest rates. First, cap rates tend to respond to trend changes in interest rates rather than random short-term movements. Second, private real estate lacks a perfect price index. Therefore, very small variations in prices are extremely difficult to detect, particularly over the short term. Lastly,

<sup>5</sup> This is consistent with a fundamental property of duration: holding all else constant, duration is higher for lower coupon bonds.

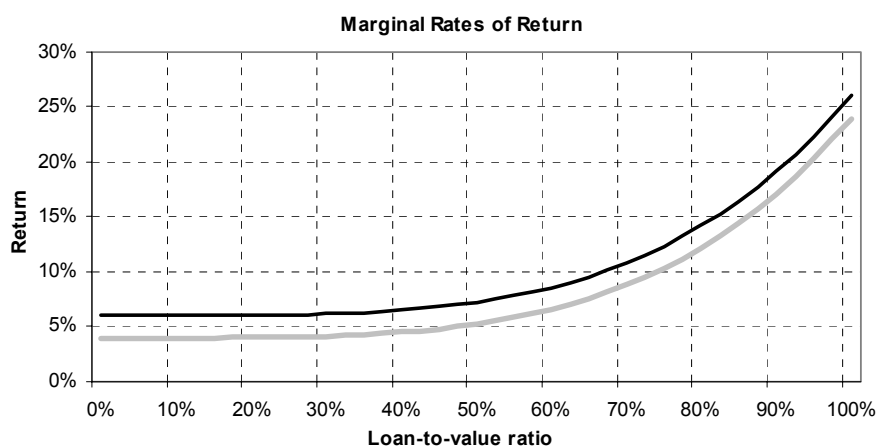
<sup>6</sup> Please refer to equation (3) for calculation.

transaction times in the private real estate market are usually measured in months. Although sudden and large changes in capital market conditions can affect the eventual closing price and, in the extreme, cause investors to terminate transactions, small fluctuations in interest rates rarely compel investors to renegotiate closings.

### Caveats

Although the analysis suggests a 1:2 relationship between changes in real estate cap rates and interest rates, a few major caveats may limit the usefulness of the results. First, we have assumed a 1:1 relationship between movements in the interest rate and IRR to estimate the impact of a change in the interest rate on cap rates. While the validity of this assumption is debatable, we have some theoretical basis for it. **Exhibit 9** shows the marginal rates of return for a hypothetical property. The lower curve shows the marginal rates of return along the entire loan-to-value spectrum assuming a risk-free rate of 4%. The upper curve is the “new” curve if the risk-free rate increases to 6% and the discount rate moves in parallel with changes in interest rates.

**Exhibit 9: Parallel Movement in Marginal Rates of Return**



Source: Prudential Real Estate Investors

An increase in the risk-free rate will produce one of three outcomes at higher loan-to-value ratios (LTVs). Investors will demand the same return spread over the risk-free rate (a parallel shift, as shown in **Exhibit 9**; although the two lines may appear to converge at higher LTVs, they are parallel), a larger spread or a narrower spread as the risk-free rate increases. If investors demand a higher risk premium, holding all else constant, the new curve would slope upward more steeply at higher LTVs. And if investors demand a lower risk premium, the new curve would be flatter at higher LTVs.

While it is impossible to know for certain which of these three scenarios would actually occur, a parallel shift has some appealing properties. The property-level returns, the weighted average of the marginal rates along each curve, for the lower and upper curves are 8% and 10%, respectively. Both curves cross their respective property-level returns at the same LTV, which suggests that the relative risk at any point along the two curves, holding everything constant except the change in interest rates, is essentially the same. Likewise, the leveraged equity returns will also move up in parallel. And although the absolute magnitude of the return shift is the same (2%) along the entire curve, the *percentage* increase in the marginal rates decreases at higher

LTVs. This feature confirms our intuition that less risk-averse investors will demand some incremental return if interest rates rise, but are likely to be less sensitive (i.e., would demand a smaller percentage increase in required rate of return) to interest rate movements than more risk-averse investors.

A more troubling caveat of this analysis is the matter of “which interest rate?” If the yield curve were perfectly flat, this question would be less important. However, the yield curve is rarely flat, and each point along the curve represents a different interest rate and, perhaps, a different constituency of investors. And when the yield is steep, as it has been in recent years, rates at the short end and long end of the curve can differ dramatically. As a result, interest rates along the yield curve rarely move in parallel. In fact, the recent increases in short-term rates in the US have had little or no effect on longer-term rates. The yield on 10-year Treasury notes is still hovering around 4% despite three quarter-point increases in the fed funds rate since the start of 2004. Rather, the yield curve has flattened somewhat since the year began.

Most importantly, the cap rate sensitivity is estimated using the concept of duration, which works well in the bond market, where cash flows do not depend on the discount rate, but is rarely used to analyze stocks, in part because earnings are sensitive to changes in interest rates. Real estate investments exhibit characteristics of both equities and fixed income, and interest rate movements likely do affect property income. Thus, duration may be meaningful for a segment of the market, namely stabilized properties with reasonably predictable cash flows, but is essentially useless for empty buildings or properties that either generate little income or have volatile cash flows.

Most real estate investments probably fall somewhere between these two extremes – i.e., between an empty building with no income and a fully occupied building with long-term leases to credit tenants. Since increasing interest rates in the current recovery most likely will reflect improvements in the economy generally and in the labor market in particular, investors’ perceptions about future real estate cash flows should also improve. These two forces combined will determine the future direction of cap rates and, unfortunately, cannot be separated.

### **Looking Ahead**

As the above analysis demonstrates, property income growth and interest rates will affect the direction and magnitude of any movements in cap rates during the recovery phase of the property market cycle. Although we can isolate the potential effects of a change in either variable on cap rates, the two variables almost certainly interact and cannot, therefore, be “held constant.” Further, a third factor, investor sentiment (e.g., confidence in growth rates and the relative attractiveness of real estate versus other asset classes) also influences cap rates. Although investor sentiment is difficult to measure and virtually impossible to quantify in terms of its impact on real estate investment values, sentiment can exert a powerful influence on asset values.

Still, we should be able to get some sense of how cap rates might move over the next year or so. Using duration to isolate the effects of rising interest rates, we estimated a 50 to 75 bp increase in cap rates for every 100 to 150 bp increase in interest rates. The impact of any increases in interest rates on cap rates depends, of course, not only on the magnitude of the interest rate movement, but also on which interest rate is most the appropriate benchmark for real estate investments. Nearly everyone expects short-term rates will increase over the near term. But

considerable disagreement exists about longer-term interest rates, which, under more “normal” capital market conditions are probably most relevant in the real estate industry. (Due to the steepness of the yield curve over the last few years, this has not been the case recently, however.)

The outlook for long-term interest rates hinges on inflation. Those in the higher long-term interest rate camp point to inflationary pressures from rising energy and commodity prices, ballooning US trade and fiscal deficits, and the global economy’s insatiable appetite for commodities of all types driving long-term rates higher. But the arguments for lower inflation and modestly higher long-term interest rates are also compelling. In fact, within the past few years, many economists have worried more about a global deflationary trend as developed countries, including the US, most western European nations and Japan, are fully engaging China and India, the two most populous countries, for goods and services.

Outsourcing is certainly not a new trend in the manufacturing sector, which has been losing jobs to lower-cost markets for decades. But access to China’s massive surplus labor market may have a much more dramatic deflationary effect than the cost savings from outsourcing to places like Malaysia or Thailand, which have relatively small labor markets by comparison. Likewise, India and the Philippines may have a similar effect on the service sector, where China is less competitive due to the language barrier. Presumably, access to these markets and fewer barriers generally throughout the global economy are at least partly responsible for the modest inflation over the last few years despite the increase in energy and commodity prices. If inflation remains subdued and long-term interest rates remain fairly stable even as short-term rates rise, the impact on cap rates could be muted.

Space market forces and investor sentiment must also be factored into the cap rate outlook, however. Property market fundamentals should begin to improve noticeably over the next 12 to 18 months. Vacancy rates have peaked and new supply, outside of the apartment and retail sectors, is at a cyclical low point and should remain fairly modest for the next few years. As vacancy rates recede and the rent cycle begins anew, property income should begin to recover. In the near term, improvements in property income may cause cap rates to increase as anticipatory buying dissipates. But healthier property market fundamentals should make real estate more attractive, which, at the very least, should help support asset values and, perhaps, drive prices higher.

### **Closing Thoughts**

Falling property income and stable to rising asset values have both contributed to the downward trend in real estate cap rates over the last several years. Although historically low interest rates have helped to support asset values and to avoid widespread distress, we do not expect rising interest rates alone will lead to sharply higher cap rates. From a purely interest rate perspective, the relationship between cap rates and interest rates is about 1:2. That is, holding all else constant, cap rates should increase by about 50 to 75 bps for every 100 to 150 bp increase in interest rates. But this sensitivity has serious practical limitations, the most important of which is probably that it does not apply to all properties. Nevertheless, as long as inflation expectations remain modest and long-term interest rates do not rise sharply, improving property market fundamentals should temper any large increases in cap rates in the near future.

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