

Transaction Price Indexes and Derivatives

A Revolution in the Real-Estate Investment Industry?

David Geltner*

Abstract: *This article is about two interesting new innovations in the world of real-estate investment that are still flying largely below the radar screen in the U.S., but which I believe have the potential to converge here in this country and revolutionize the industry, and with it, perhaps, even the way many commercial buildings are designed, built and managed. The two innovations are transaction-price-based indexes for tracking commercial-property price movements, and real-estate equity derivatives that allow synthetic trading of investment real estate.*

Transaction-Price-Based Indexes for Real Estate

Every major investment asset class needs indexes that accurately track the movements in its market value. Stock and bond market indexes of periodic price changes abound, and are widely used to study historical risk and return behavior, to understand relative valuations, to help traders predict where they think prices are headed, to serve as benchmarks or targets for mutual funds and Exchange Traded Funds (ETFs), and even to serve as bases for derivatives such as futures contracts that allow synthetic investment in the asset class.

Institutional investment real estate in the U.S. has for over two decades also had a major index that tracks not only asset-price movements but income and total returns, in the form of the NCREIF Property Index (NPI—published by the National Council of Real Estate Investment Fiduciaries). The NPI is an excellent index for key purposes, such as serving as a benchmark for the performance of the major institutional investment managers who are members of NCREIF. It also does an indispensable job tracking the long and intermediate term total investment performance of institutional property, and helping to provide much of the kind of historical risk and return information about real estate that the investment industry needs.

But the NPI has two major characteristics making it difficult for it to carry the burden of being the *only* index of commercial property performance. One is that it directly tracks the performance only of the properties held by NCREIF members, which represent currently about 5,000 properties amounting to somewhere between approximately 5% and 10% of the total commercial-property investible universe by value in the U.S. The other is that the NPI is appraisal-based and

includes staggered, typically annual, reappraisals of properties in an index that reports quarterly returns.

The NPI's relatively narrow property population means that it could miss differences between NCREIF member property performance and the broader U.S. commercial-property market. And its appraisal basis means that the NPI tends to lag and smooth out property-market price movements. For example, if the property market takes a sudden or sharp downturn, the NPI may not register such a change for several quarters, or may show only a dampened version of the price drop.

Both of these problems can be mitigated to a significant degree by the use of transaction-price-based indexes. Such indexes can be constructed using sophisticated econometric techniques developed and honed in the academic community over the past few decades. And thanks to the digital revolution of the past decade, transaction-based indexes can be based on a very broad scope of the U.S. commercial-property population, not limited to holdings by large institutions.

The NCREIF-based Transaction Index (TBI)

The first regularly published transaction-based index (TBI) of U.S. commercial property was developed by the MIT Center for Real Estate (MIT/CRE) in cooperation with NCREIF, and has been updated quarterly since February 2006 on the MIT/CRE web site.¹ Like the NPI, the TBI is based only on NCREIF properties, but it is based on the transaction sale prices of the properties sold from the NPI rather than on the reported appraised values of all properties that underlie the NPI. Chart 5-1 on the next page shows what the cumulative quarterly price growth of the TBI looks like compared to the NPI, from 1984 through the third quarter of 2006.² This

* George Macomber Professor of Real Estate Finance, MIT Department of Urban Studies & Planning, and Director, MIT Center for Real Estate.

¹ <http://web.mit.edu/cre/research/credl/tbi.html>

² TBI returns are preliminary until the end of each calendar year. Thus, finalized 2006 quarterly returns will be published with the fourth-quarter returns, in early February 2007.

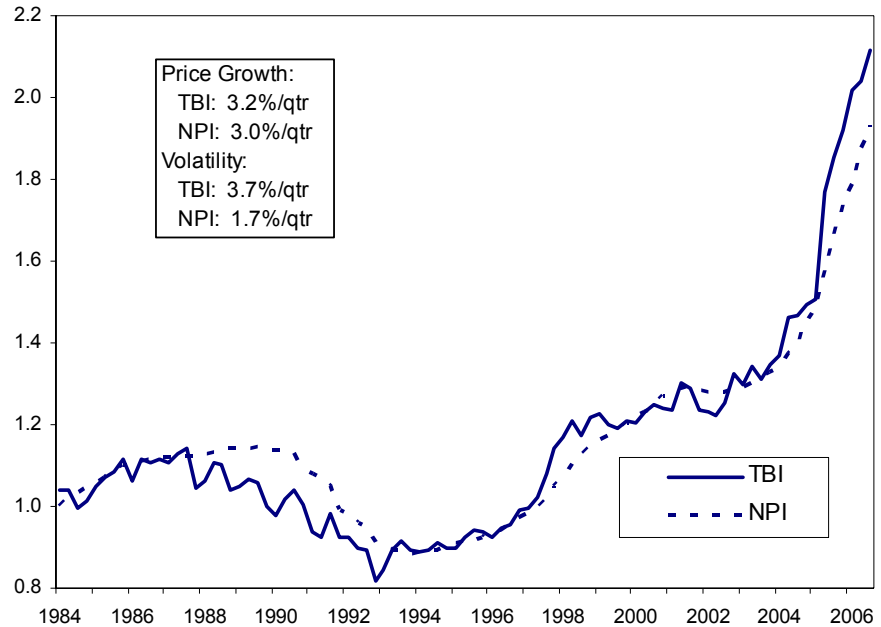
comparison essentially shows the pure effect of basing an index on transaction prices rather than appraised values, holding constant the property population tracked by the index. Note that the TBI has more volatility than the NPI and tends to lead the NPI in time.

The TBI is published not only for the aggregate of all NCREIF sold properties as depicted in Chart 5-1, but since 1994 also for each of the four major property types: apartments, industrial, office and retail. And the TBI is published not only for price changes (capital returns) as depicted in Chart 5-1, but for investment total returns including property level income. The latter reveals that retail property has been among the strongest investment performers in NCREIF. As shown in Chart 5-2, since 1994 retail properties have averaged total returns of 15.3% per year, versus an average of 14.6% for the other property types.³

The RCA-based Indexes

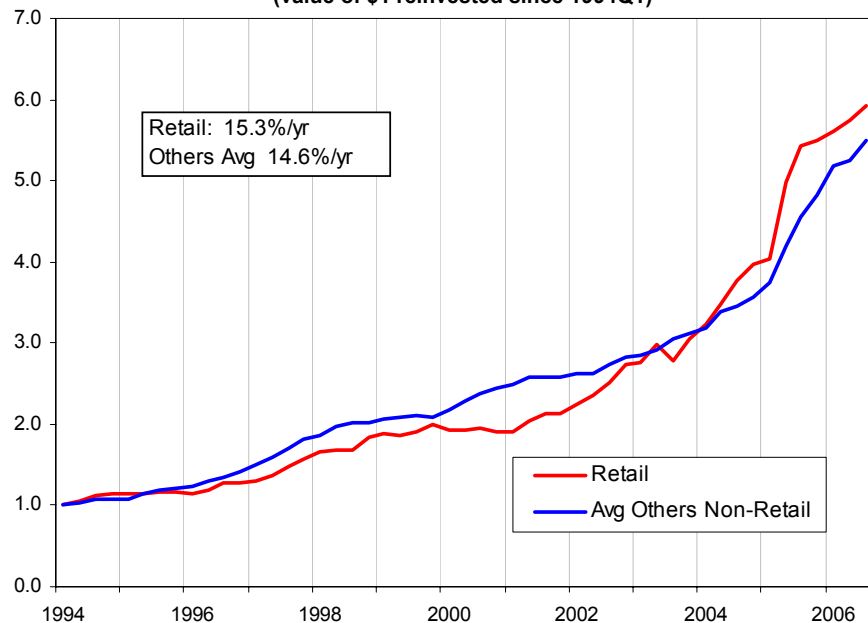
In December 2006, publication and monthly updating of a new commercial-property price index commenced, based on the Real Capital Analytics Inc. (RCA) database of commercial-property sales prices. The RCA-based index includes an initial suite of 29 “realized price” indexes designed to support derivatives trading. The index construction methodology was developed by the MIT Center for Real Estate with the cooperation of RCA and a consortium headed by Real Estate Analytics LLC (REAL), which is developing the derivatives trading platform. The RCA-based

Chart 5-1
Transaction-Based Index & NCREIF Property Index Since 1984:
Cumulative Quarterly Capital Return (Price Level 1984Q1=1.0)



Sources: NCREIF & MIT/CRE

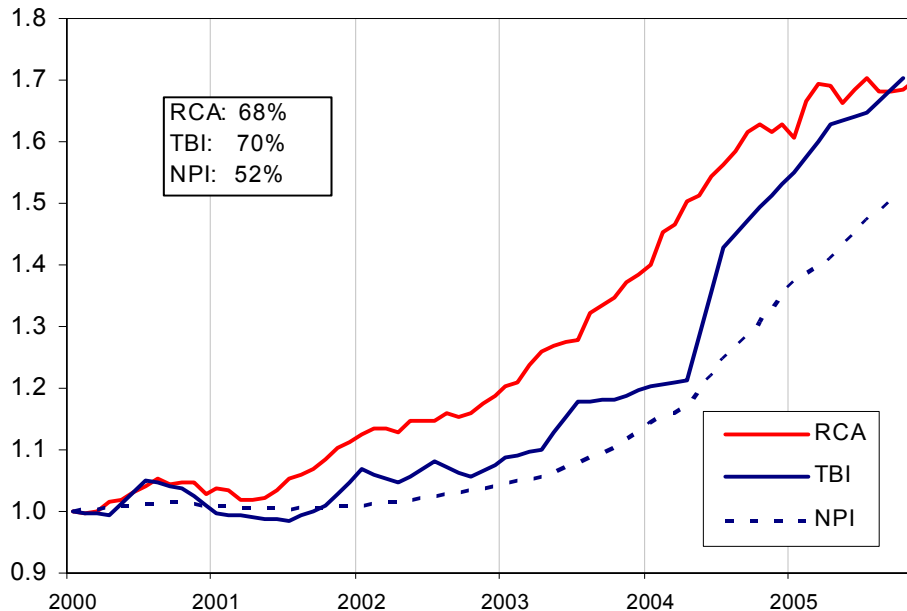
Chart 5-2
Retail vs Other Property Types:
Cumulative Total Return since 1994
(value of \$1 reinvested since 1994Q1)



Sources: Transaction Based Index on NCREIF Sales & (MIT/CRE)

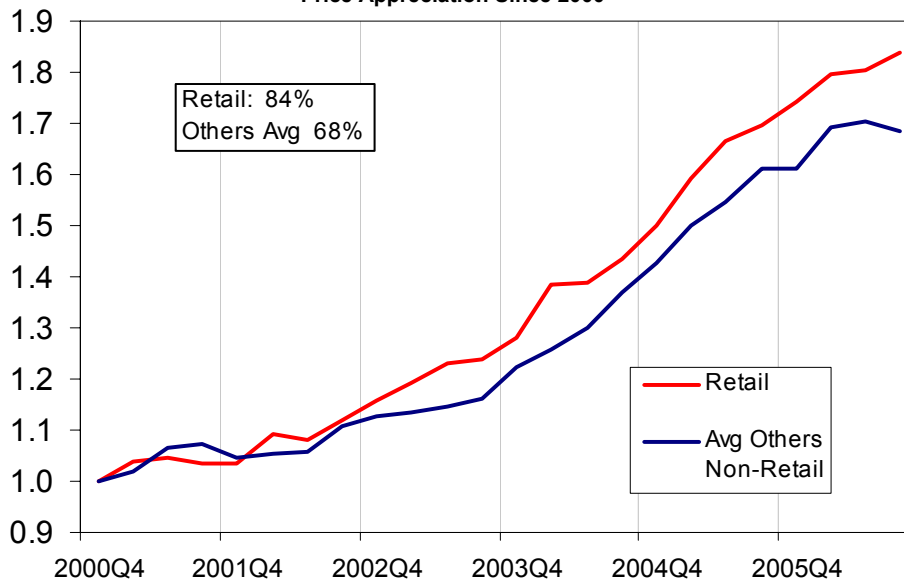
³ This is based on an equal-weighted average of the other three property types. At the disaggregate level, apartment properties just barely lead retail properties, with 15.4%/yr to retail's 15.3%.

Chart 5-3
Real Capital Analytics vs Transactional-Based Index vs NCREIF Property Index
Aggregate Commercial Property Price Appreciation Since 2000



Source: RCA-based Repeat-Sales Index

Chart 5-4
Retail vs Other Property Types:
Price Appreciation Since 2000



Source: RCA-based Repeat-Sales Index

indexes are based on the “repeat-sales” methodology that is also employed by the S&P/Case-Shiller housing price indexes that underlie the housing futures contract launched last spring by the Chicago Mercantile Exchange. The RCA-based index features a monthly-frequency aggregate index, as well as property-sector and geographic-region-specific quarterly and annual indexes (the latter in four versions, one based in each quarter of the year). The RCA database attempts to track all commercial-property sales in the U.S. over \$2.5 million and includes very extensive coverage of this population which measures in the several hundreds of thousands of properties nationwide.⁴

Chart 5-3 depicts the cumulative price level of the monthly all-property RCA-based index since its inception in 2001, along with the corresponding index levels for the TBI and the NPI (all set to equal 1.0 at the end of 2000). Note that all three indexes depict the historical bull market in U.S. commercial property during 2003-2005, with the RCA tending to lead the TBI.

The RCA-based suite of indexes includes quarterly retail indexes at the national level and for a multi-state “Western Region” defined by NCREIF, as well for the “primary markets” defined by a national aggregate of the top 10 metro areas by RCA trading volume. It also includes annual retail indexes for the (NCREIF)

⁴ The RCA-based index is currently published simultaneously on the MIT/CRE, RCA, and REAL web sites. The MIT/CRE site includes a downloadable white paper describing the index methodology. The RCA website includes a downloadable white paper describing the data source for the index.



East and South regions and for a Southern California combination of the Los Angeles and San Diego metro areas. As we saw earlier with the TBI, Chart 5-4 shows that the RCA-based indexes also indicate that retail has been a superior price gainer compared to other property types, at least during the period covered so far by the RCA-based indexes.⁵

Commercial Real Estate Equity Derivatives

These transaction-based price indexes are an exciting development in their own right, promising new information that will be useful for the real-estate industry in a variety of ways. What is even more exciting, however, is the advent at the same time of commercial-property equity derivatives. These derivative products are based on commercial-property periodic return indexes, and effectively offer futures contracts to allow synthetic investment in commercial property and hedging of real-estate market exposure (e.g., “real-estate market risk insurance”). Various derivative products based on the indexes can be conceived, ranging from basic index-return swaps to more exotic options and credit-default swaps. To see how such derivatives work, let us consider a simple example of a price-index-return swap, as follows.

First consider a small pension fund, let’s call it the Littleton Firemen’s Fund⁶, that is presently invested \$150 million in stocks and \$150 million in long-term bonds, but Littleton’s trustees have decided they want to increase their diversification by moving to an equal one-third investment in stocks, bonds and commercial real estate (\$100 million in each asset class). However, Littleton’s lack of scale and expertise has traditionally made them shy away from property investment either directly or via commingled funds. But now suppose a commercial-property capital-return swap is available in the form of a three-year contract based on the monthly RCA price index, and suppose the market for such swaps currently offers pricing that will pay the investor the price-index return plus 15 basis points per month. Littleton’s trustees might view such an opportunity very favorably from a portfolio perspective, as follows.

Littleton could sell \$50 million of long-term bonds and \$50 million of stock, and place the \$100 million proceeds into 3-year Treasury bonds which might be yielding, say, 4% per year. Littleton could then purchase

\$100 million notional value of the RCA swaps, which requires no cash outlay up front, as it is a futures contract. Each month thereafter for the next three years Littleton will then receive the monthly RCA price return, which might be expected to equal, on average, say, 2% per annum, plus the 15 bps/month (1.8%/year) fixed payment, all based on a \$100 million notional investment. Thus, the risk and return characteristics of the \$100 million that Littleton would have invested in 3-year T-bonds would now effectively provide an expected total return of 7.8% per annum (4% T-bond yield + 2% average RCA price appreciation + 1.8% fixed payment) with volatility (risk) characteristics essentially like that of commercial real estate (as the T-bond yield and the fixed payment are constant, so the volatility of the \$100 million position is determined by that of the RCA index). Thus, from a risk and return perspective, Littleton has effectively replaced its 50/50 stock/bond portfolio with a one-third each weighting in stocks, bonds, and real estate. And the real estate component of the portfolio would be highly diversified (representing the national aggregate commercial-property market, perfectly correlated with the RCA benchmark), and without any transaction costs or management fees.

To see the nuts and bolts, suppose for example that after the first month the RCA index reports an increase of 10 basis points. Then on their \$100 million notional investment Littleton will receive \$100,000 (0.1% of \$100 million) for the RCA return, plus \$150,000 for the index-swap fixed payment (15 bps), plus \$333,000 from the T-bond holding (4% annual yield divided by 12 months = 33 bps), for a total of \$583,000. Suppose in the next month the RCA index reports a return of negative 60 basis points (a fall of 0.6% in the market price of commercial property). Then for that month Littleton would have to pay \$133,000, calculated as the receipt of the \$150,000 fixed leg of the swap plus the \$333,000 T-bond payment minus the \$600,000 Littleton would owe on the floating leg of the index swap. Monthly settlement would continue in this way, maintaining the \$100 notional investment, through the 36 months of the swap contract (and the maturity of the covering T-bond investment). Subsequently, a similar new position could be sought based on market prices in the swap market at that time.⁷

⁵ Note that the RCA indexes are preliminary and subject to adjustment for the first three months after initial publication. Thus, the August 2006 return depicted in Chart 5-3 is final while the September and October returns also indicated in that figure are subject to revision as of the December publication. The “Others Average Non-Retail” returns in Chart 5-3 are based on an equally weighted composite of the other three property types, whereas the RCA aggregate index portrayed in Chart 5-3 is not generally equally weighted but reflects relative trading volumes across the property types.

⁶ All the names used in this article are purely fictitious, for illustrative purposes, not meant to represent any specific parties in the real world.

⁷ If a secondary market for the swaps develops, then investors would not have to wait for their contracts to expire before altering or renewing their synthetic real-estate investments.

The Index Swap Short Position (Hedging Property Market Risk)

But what about the other side of the position? Littleton would not be able to buy the swap unless there is another investor that wants to take the short position in the RCA index. Who might that be? Often it would be an entity that regards itself as being overexposed to commercial-property market risk, and that therefore wants to hedge (or take out “property market risk insurance”) against such risk. This might be a pension fund that wants to reduce its real estate exposure, or an investment bank exposed to CMBS warehousing risk, or it might be a non-real-estate investment entity that is forced through its corporate real-estate holdings to be in the real-estate investment business even though it does not wish to be (e.g., this could include some retail firms). But another type of hedger could be a professional real-estate investor who has particular expertise in real-estate investment, operation and/or development, that is, an entity that believes it can earn “positive alpha” relative to the broad commercial-property market (as represented by the RCA index). Let us consider such an investor in the short side of the RCA swap contract.

Consider the SmartFund private equity fund that specializes in making commercial real estate investments that have risk characteristics similar to that of the RCA index. But whereas the typical commercial property presents, say, an expected total return of 8% per annum, consisting of the 2%/year price appreciation noted earlier for the RCA index plus, say, a 6% per year operating cash flow yield, let us suppose that SmartFund feels that through their superior expertise they can achieve, on average, a 10% total return on their properties, consisting of 3% per year price appreciation plus 7% per year operating cash yield, without any more risk than the typical RCA-tracked property. Thus, SmartFund expects “alpha” of 200 bps/year.

While this positive alpha is nice for SmartFund (and their investors), it won’t protect them from posting a capital loss if the property market turns sufficiently down, for example, a drop of 6% in a given year. In such a year, even with SmartFund’s positive alpha of 100 bps in capital return, they will post a 5% loss in their property values. In such a year, if SmartFund still achieves their expected 7% cash yield, they will post a total return of 2%, compared to 0% for the typical property (6% capital loss plus 6% cash yield for a net of zero). While SmartFund’s relative performance might be

somewhat comforting, neither SmartFund nor its investors are likely to be very pleased with a 2% total return for the year. And the frustrating part is that SmartFund has no control over the overall commercial property market that is responsible for their disappointing performance.

But now suppose that SmartFund has taken the opposite side of the index-swap contract that Littleton invested in as described earlier. In particular, suppose that at the time Littleton bought their long position for the previously noted 15-basis-point fixed spread, SmartFund was able to buy a short position with a 20-basis-point fixed spread (2.4%/year). This means that, with no money changing hands up front, SmartFund would pay each month on the notional amount of the trade the RCA index return plus 20 basis points. Of course, whenever the RCA capital return is negative, SmartFund will *receive* that amount of cash on the floating leg of the swap. And in addition, SmartFund still owns all of its properties (hopefully superior-performing), which will be yielding their total returns each month.

Under this scenario, what do SmartFund’s *ex ante* risk and return prospects look like for the \$100 million worth of property that it has hedged with the swap contract? The expected total return on the property is, as noted, 10%/year (though this is admittedly risky, as we saw in the 6% market-loss scenario described above). SmartFund is facing an expected payment of 4.4% each year on the \$100 million notional trade, including the expected RCA capital return of 2% and the 2.4% fixed leg on the trade. This leaves SmartFund with an expected return of 5.6% net on its \$100 million real estate portfolio, which is now hedged by a short position in the RCA swap. This hedging effectively eliminates most of the risk (especially the non-diversifiable *systematic* risk) in their real-estate portfolio.

For example, in the 6% RCA capital-loss scenario described previously, SmartFund would be paid \$6 million on the floating leg of its short position in the index swap, plus the \$2 million total return from its own (superior-performing) real estate, minus the \$2.4 million owed on the fixed leg of the swap, to give it positive earnings of \$5.6 million on a \$100 million real-estate portfolio (5.6%), even though it was a down year in the overall property market.

With most of the risk in SmartFund’s real-estate holdings thusly eliminated, the expected 5.6% net return

on its real estate as hedged by their swap looks pretty good compared to the 4% yield on 3-year T-bonds that we posited earlier (that is, SmartFund faces a 160 bps/year expected return risk premium on a position that looks to have *very little* risk).

Two Key Summary Points...

Note that in this example (whose return numbers are of typical realistic average historical magnitudes), ShortFund is paying a 20-basis-point monthly fixed leg on the swap while Littleton is receiving only 15 bps/month. The five basis points in between (60 bps/year) are available to cover the administrative costs and profit requirements of the facilitators and servicers of the derivative market (e.g., the brokerage, investment and custodial banking, and back office functions necessary to operate the market).

Finally, note that the availability of the derivatives in the above example enables money to flow either to or from real-estate investment without directly causing either the purchase or sale of actual physical properties (that is, without effecting either the ownership or the elimination of ownership of the underlying real properties). Littleton effectively placed \$100 million in a “synthetic” real-estate investment by directly placing up-front investment cash only into government bonds. SmartFund effectively eliminated the systematic real-estate market component of its property ownership while retaining the ownership of all of their specific properties.

Bigger Picture Implications

While the above example demonstrates how commercial-property price indexes and derivatives can be useful and profitable at the micro-level of individual investors and traders, hopefully you can see through the trees to the forest of how such a financial engineering development could improve the functioning of the real-estate industry as a whole. By allowing a more flexible disarticulation of real-estate investment financial capital flows from the direct operation of real-estate physical capital, both arenas of business action can operate more efficiently and effectively.

If commercial-real-estate-indexes and derivatives take off in a big way, the *physical* side of the commercial-real-estate industry (entrepreneurial developers and direct investment managers or property operators) can function less fettered by the inevitably somewhat transient needs and dictates of “money

partners” who don’t have actual expertise and interest in real estate as a physical product *per se* but rather reflect primarily the financial investment preferences of money sources. Those who have expertise and interest in real estate as a physical product, as evidenced by their ability to generate positive “alpha” in that product, will face greater profit opportunities by their ability to concentrate on their areas of relative expertise: the design, development and operation of “bricks and mortar”. Meanwhile, those who are interested in real estate primarily as a purely financial investment play will also be able to carry out those types of money operations more efficiently and effectively, facing lower transaction and management costs, better diversification (less “basis risk” or “tracking error”), and the ability to sell “short” if they want to.

Conclusion: Is a New World Dawning?

Once upon a time, the financing and the making of clothing was done pretty much by the same people who used the clothing. It was a time of cottage craft, over 200 years ago. But everywhere the effect of modern science and technology has been to increase efficiency by increasing specialization, and the Industrial Revolution came early to the textile and clothing business. This process came relatively late to real estate. As recently as three or four generations ago most buildings were financed and built largely by those who would use them, and this unity of money source, developer and user helped to make buildings and developments of generally high physical quality and character for the needs and technology of the time. Subsequent specialization and separation of the physical and financial aspects of real estate led at times to excesses or mismatches between supply and demand in the underlying physical property market (as epitomized by the money-driven tax-loss building developments of the 1980s).

New types of commercial-property price indexes and the advent of property-equity derivatives raise the possibility for the growing sophistication of the investment industry to reunite property control and usage in a more efficient manner than ever before. Already, commercial-property derivatives are taking off in Great Britain, with over £2 billion of IPD Index swaps trading since 2005.⁸ NCREIF Index swaps, available in the U.S. since 2005, have yet to take off in a similar way, but may yet do so. And as described in this article, new transaction-price-based indexes are now available to

⁸ The IPD Index is published by the Investment Property Databank and is similar in the U.K. to the NCREIF Index in the U.S.



help support the development of commercial-property derivatives.⁹ The retail-real estate sector may be especially well placed to take advantage of the resulting opportunities, as the unique characteristics of retail real-

estate design, development and ownership may offer particularly intriguing profit opportunities for specialized players. The next few years look to be *very interesting!*

David Geltner, Ph.D., is the George Macomber Professor of Real Estate Finance in the MIT Department of Urban Studies & Planning, and the Director of the MIT Center for Real Estate, where he has been since 2002. Prior to that Dr. Geltner was the REEAC Professor of Real Estate in the University of Cincinnati College of Business Administration, where he went after obtaining his doctorate at MIT in the Department of Civil and Environmental Engineering in 1989. Geltner also serves as Academic Advisor to NCREIF, and is on the Real Estate Investment Committee of the State Teachers Retirement System of Ohio. He is widely published in academic real-estate economics journals, and is a co-author of *Commercial Real Estate Analysis & Investments*, a leading graduate-level text that has just launched its Second Edition published by Thomson/South-Western.

⁹ Recently, too, the Chicago Mercantile Exchange has announced plans to trade commercial property derivative contracts based on an average-price-per-square-foot index, and the Chicago Board of Trade has announced plans to trade futures contracts on the Dow Jones Real Estate Index based on publicly-traded REIT and REOC share prices. All of this is indication that many in the investment industry think the time is ripe to develop synthetic trading of commercial real estate in the U.S.