

Private Equity Real Estate Risk
The Good, the Bad, and the Ugly

Richard Gold

May 13, 2014

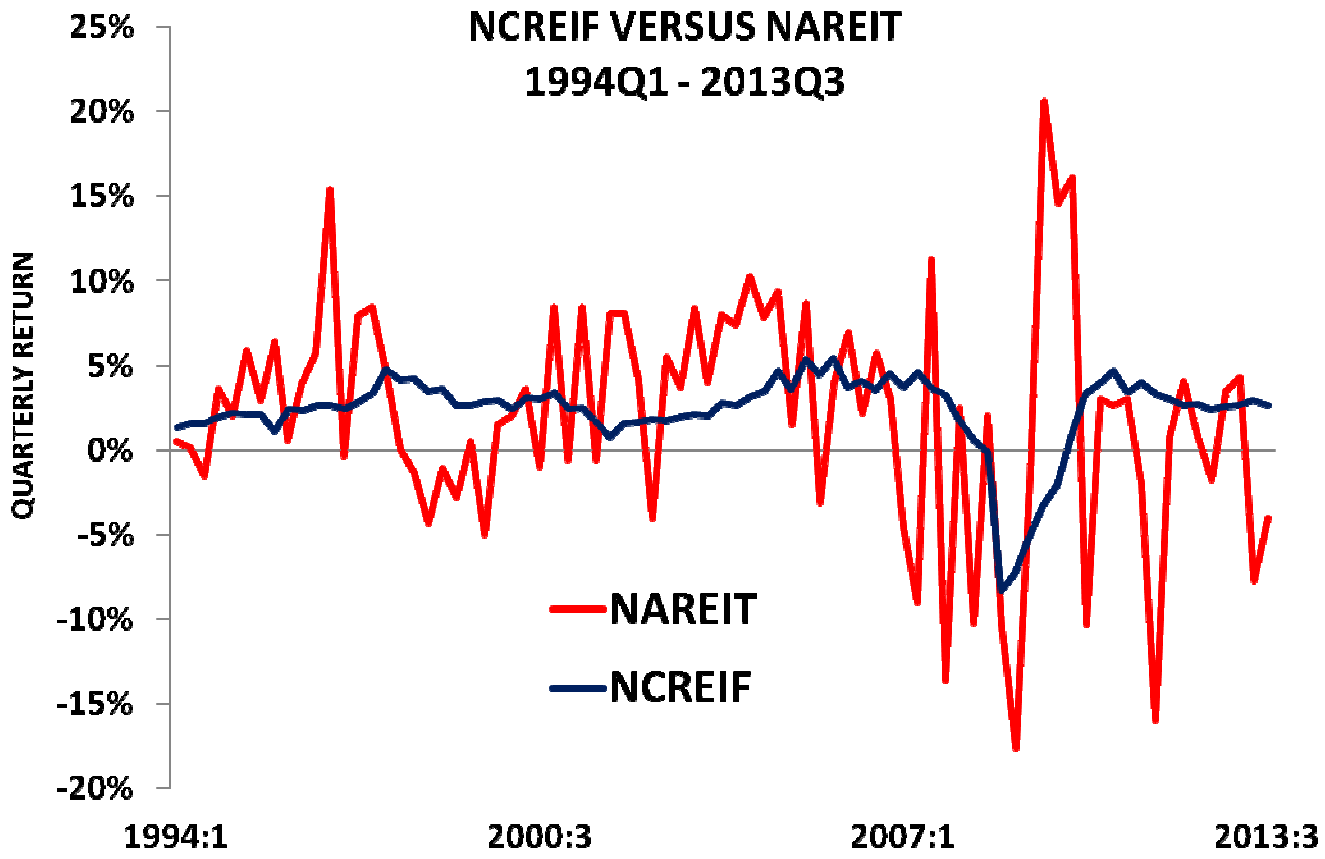
NORTHFIELD modeling financial markets worldwide

www.northinfo.com

What is the Problem?

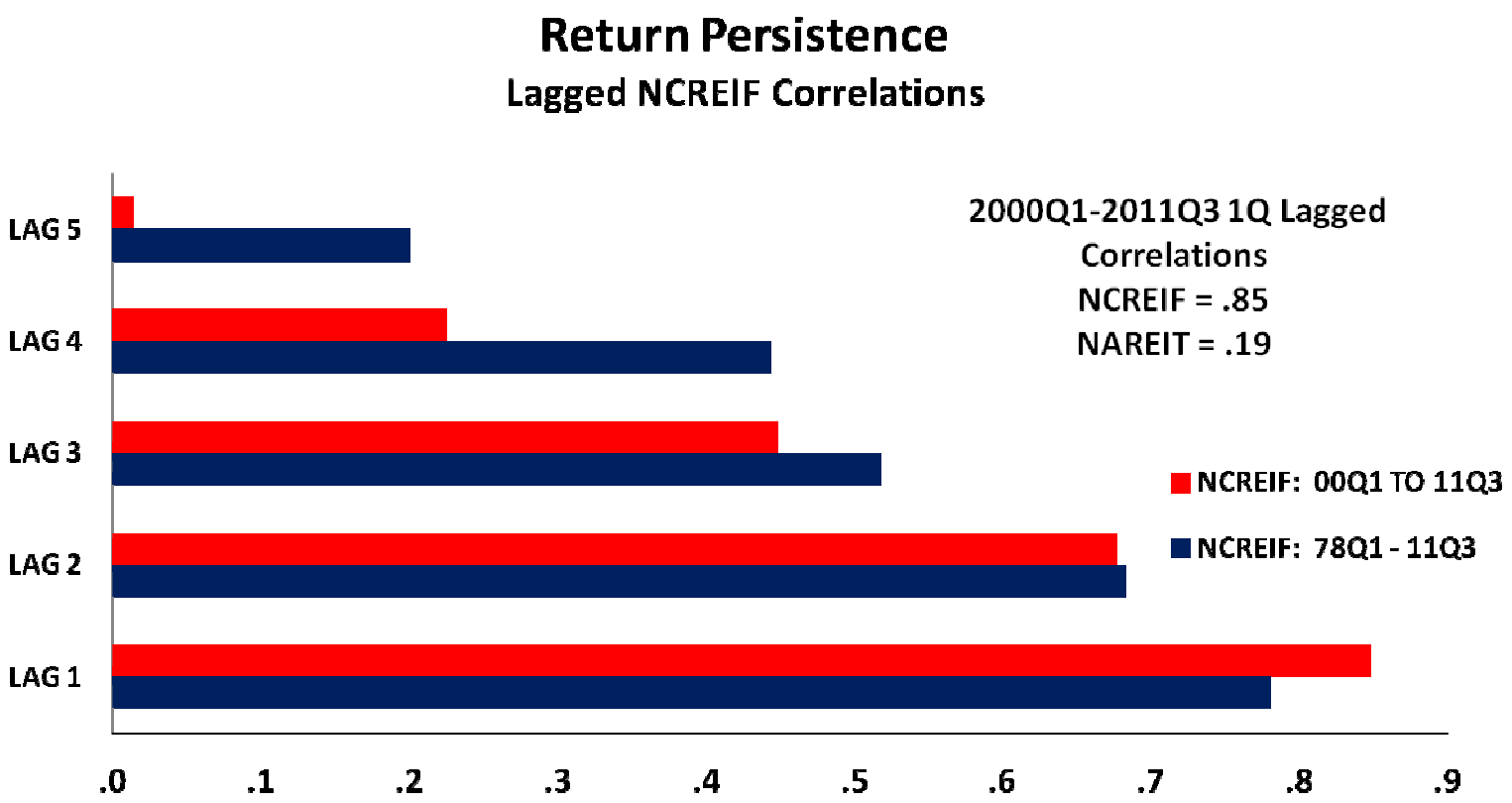
- There is no arm's length price data within long periods of time for illiquid assets; interim appraisals are required
- This clashes with basic principles of MPT and arbitrage-free pricing
- Appraisal bias leads to serial correlation
  - Serial correlation is correctable but creates other challenges
- "Location, Location" as a factor does not integrate well with the classical equity or fixed income factors such as value/growth, size, yield curve factors, etc.
  - Fama-French" is not common jargon in real estate investment departments
  - Unlisted investment experts tend to think of risk in terms of first distributional moment, i.e. return, not volatility
- **Therefore, given this intractable problem how do you determine how much real estate to include in your portfolio?**

Public Versus Private Property Returns



Source: NCREIF & NAREIT

Appraisal Bias Remains an Issue



The “Global” Total Portfolio Risk Problem

- Multiple portfolios with diverse characteristics
- Across countries, across asset classes
- Asset classes such as “direct-owned” property and infrastructure investments have no visible pricing, return, or risk information

Segregated Solutions

- One approach: model asset class separately and aggregate risk only through covariance matrix:
- Overall covariance matrix resembles a chessboard where each square is a sub-model segment of the covariance matrix
- As aggregate number of factors increases relative to the limited number of observations, the matrix becomes unstable
- Fixing the problem by extending the historic observation period of the sub-models discounts the importance of the dynamics in the market place embedded in more recent observations

Illiquid Assets Compound the Total Portfolio Problem

- In the absence of reliable risk metrics, practitioners default to a naïve global geographical diversification scheme - “distance is diversification!”
- Current real estate modeling practice produces yet another silo factor set in the total portfolio covariance matrix
- Current models de-smooth appraisal indices to arrive at “actual” asset returns, then apply MPT techniques to these derivative time series within a risk model:
  - This extra layer of estimation error compounds across the modeled global markets and exponentially decreases effective confidence of the risk metrics from 90% in one market to just 35% in ten markets
  - Unlike individual security econometric estimation errors which diversify, factors errors compound across the portfolio

Fully Integrated Approach

- Employ a single parsimonious factor model across all asset classes across all geographies
- All investable assets are related to the same consistent set of factors, so interrelationships are easily observed and understood
- Limited number of factors allows for stable estimation of factor relationships, and fluid regime shifts

Fully Integrated Approach (con't)

This solution addresses:

- Appraisal bias
  - Volatility and pricing levels
- Structural factor differences between liquid and illiquid assets
- Covariances automatically are corrected as a result

What is the solution?

Factor Model:

Generic Factors

- Regions
- Sectors
- Investor Confidence
- Currencies
- Energy Costs
- Transient (Blind) Factors
- Interest Rates / Yield Curve

The Solution (con't)

How does a factor model apply to Illiquid assets? We look at an illiquid asset as a "composite asset" :

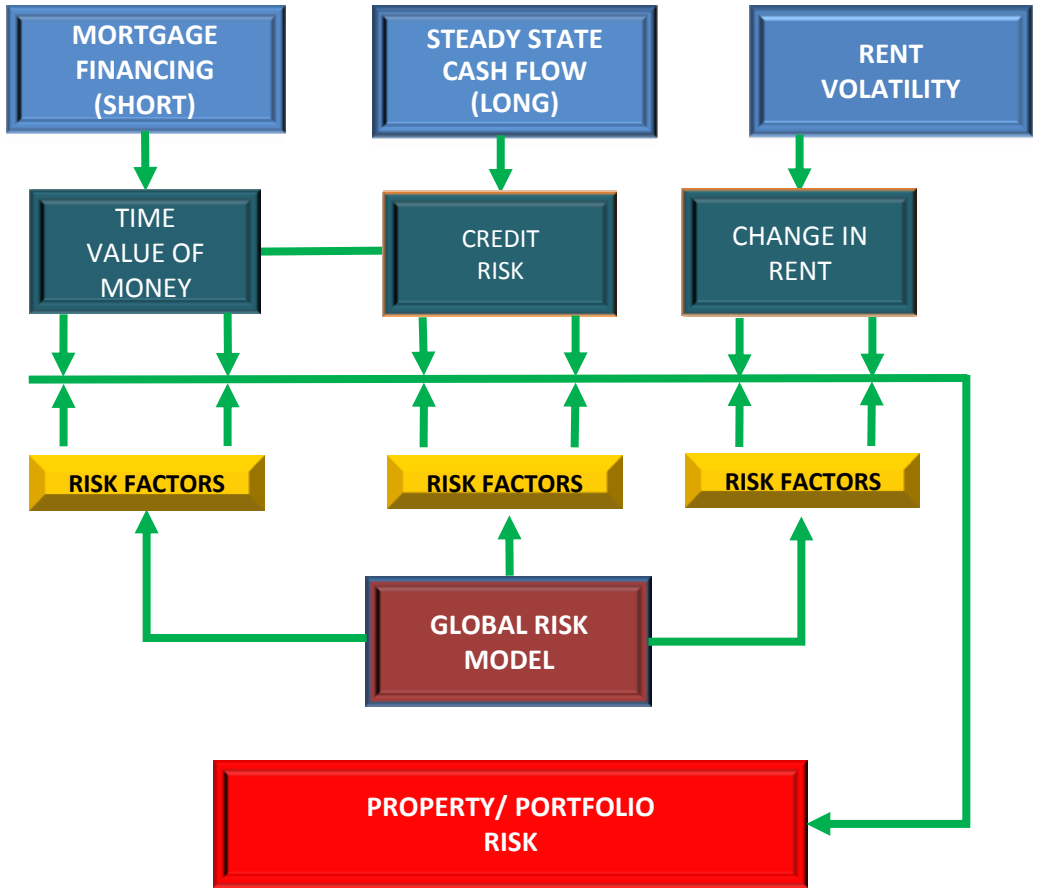
- **Risks based on "steady-state" cash flow assumptions for existing and expected leases**
  - **Uses lease structure, renewal, credit quality of tenants, vacancy dynamics, revenue and expense schedules**
- **Risks related to mortgage financing (if any)**
  - **Takes into consideration floating rate, fixed rate, interest-only, balloon clauses, prepayment behavior, etc.**
- **Risks of future fluctuations in market rents**
  - **Takes into consideration the combined impact of lease rollover, vacancy, renewal, and market volatility of rents**

Each of the 3 components has risk exposures to common risk factors plus idiosyncratic risks

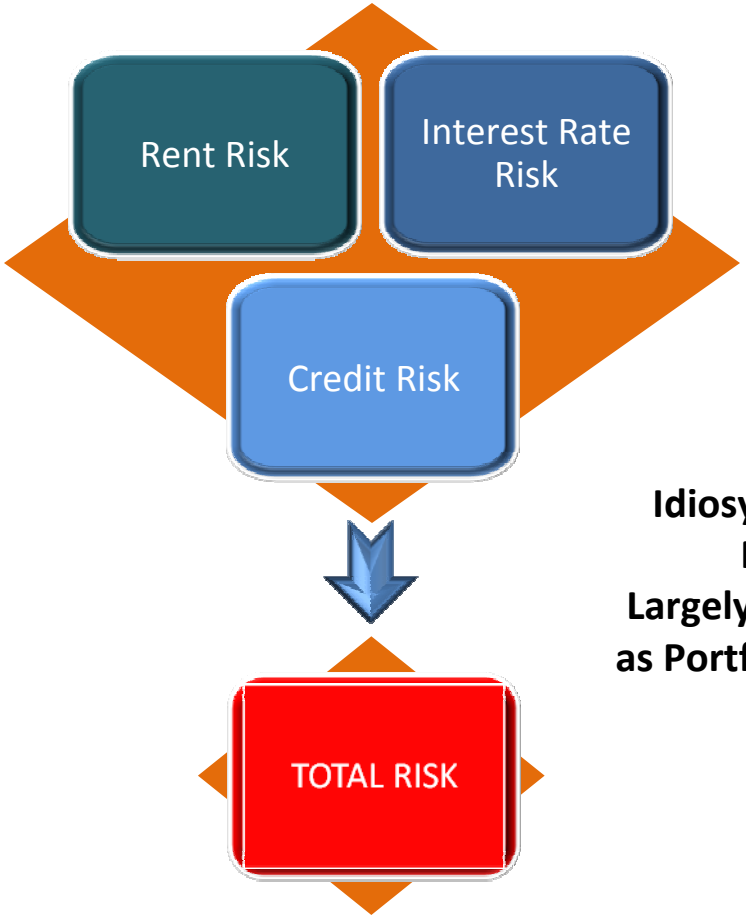
Real Estate Property Risk Approach

- Main Inputs To Model:
  - Current Operating Income and Expenses
  - Current and structural vacancy
  - Renewal rate and down-time between leases
  - Growth of rent and expense cash flows over time
  - Useful life of building as well as Leases Contract Length
  - Main / Anchor tenants
  - Rent time series
  - Financing terms – rate, floating fixed, balloon, amortization, etc.

Real Estate Model Structure



Components of Portfolio Risk



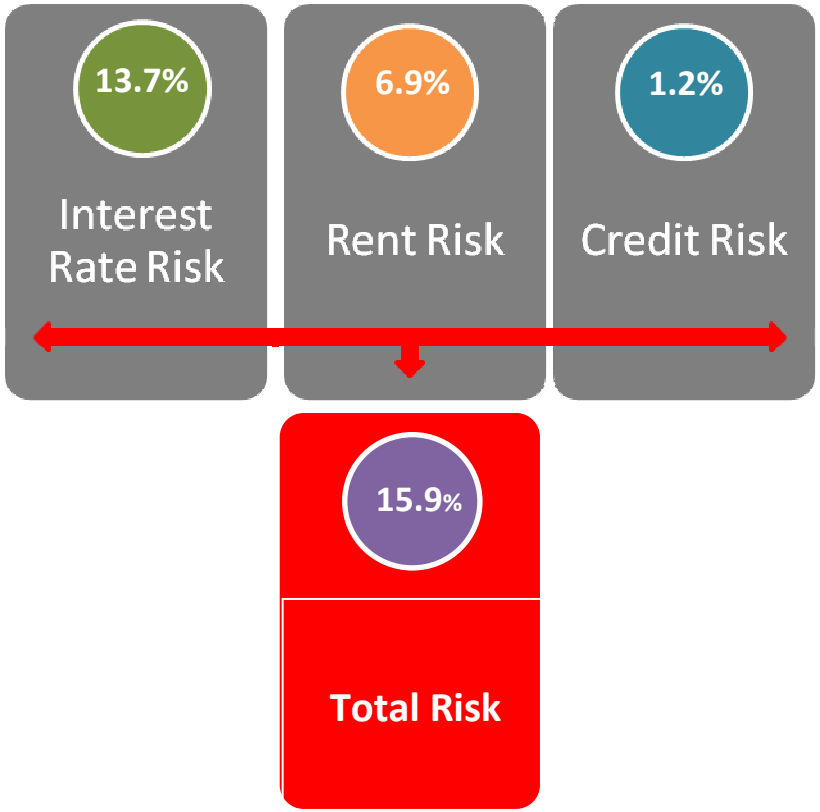
Idiosyncratic Risk Still Present But Largely Diversified Away as Portfolio Size Increases

Model Results – A Sample Portfolio: 15% Gearing

PORTFOLIO PROFILE				
Metro	Apartment	Office	Industrial	Retail
Berlin	1			
Budapest				1
Frankfurt		1		
Rome			2	
London	1	2	1	
Marseilles				1
Amsterdam			1	
Paris		1		
Bucharest	1			
Stockholm				1

Model Results – Property Risk by Source

Apartment Building – Romania (No Leverage)



Model Results: Output

Single Property: Bucharest Apartments (Leverage Removed)

Factor	PortExp	BenchExp	ActiveExp	FactorVar	VarContr
ENERGY MINERAL SECTOR	0.00	0	0.00	235.60	0.00
INDUSTRIAL SECTOR	0.00	0	0.00	247.12	0.01
TECHNOLOGY&HEALTH SECTOR	0.00	0	0.00	161.43	0.05
INTEREST RATE SENSITIVE SECTR	0.00	0	0.00	204.85	0.06
NON-ENERGY MINERALS	0.00	0	0.00	423.90	0.06
DEVELOPING MARKET	0.01	0	0.01	115.72	0.13
VALUE/GROWTH	-0.02	0	-0.02	6.47	0.13
CONSUMER SECTOR	0.00	0	0.00	134.21	0.29
CONTINENTAL EUROPE	0.28	0	0.28	208.25	25.97
TREASURY CURVE FACTOR1	-17.88	0	-17.88	0.30	121.76
TREASURY CURVE FACTOR2	-221.58	0	-221.58	0.00	145.07
TREASURY CURVE FACTOR3	-1590.87	0	-1590.87	0.00	-79.82
Factor Tracking Variance					212.94
Stock Specific Tracking Variance					39.97
Total Tracking Variance					252.92
Tracking Error					15.90
Total Risk of Portfolio					15.90
Total Risk of Benchmark					0.00
R-Squared					0.00

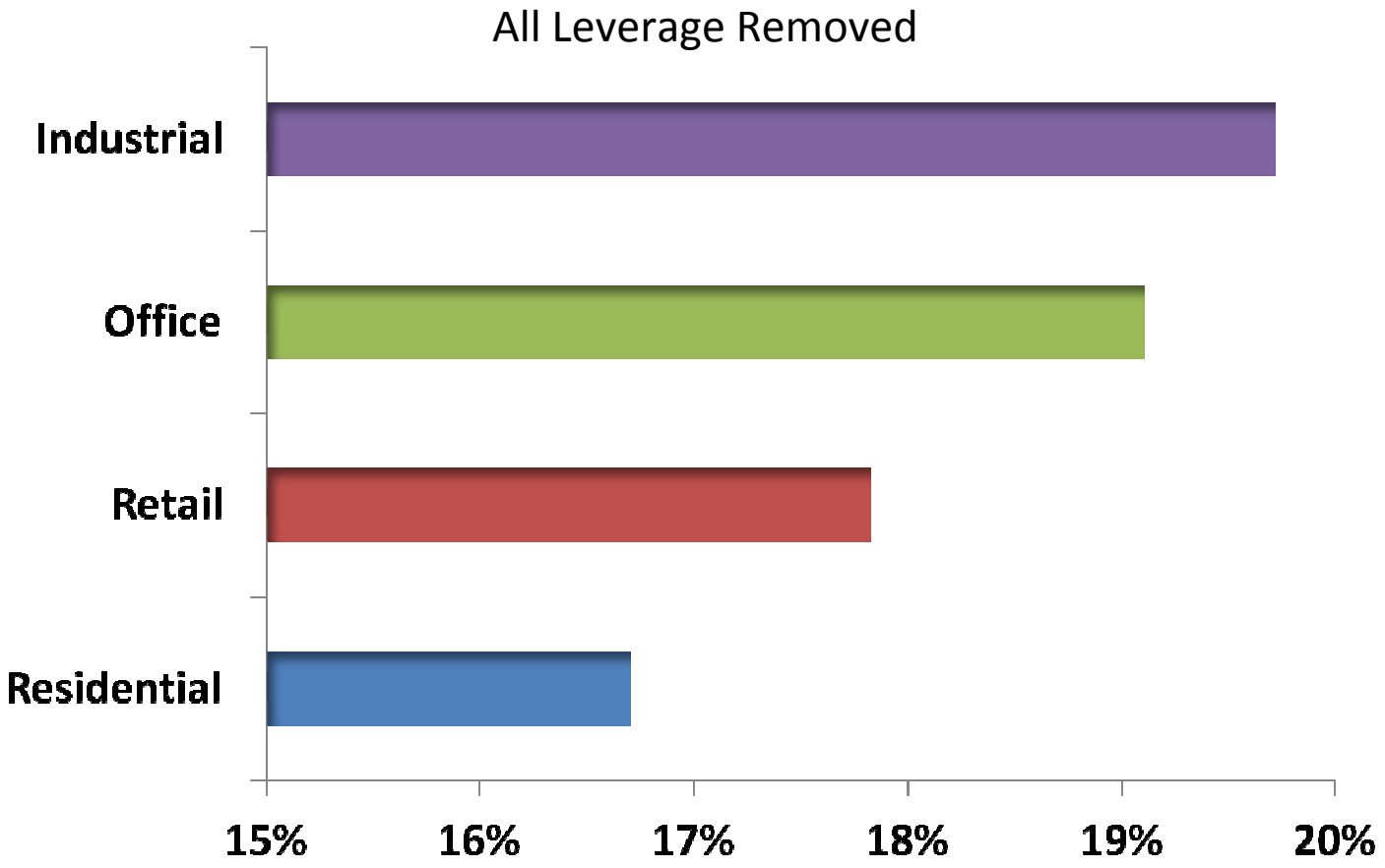
Model Results – Geospatial Risk

Country Risk

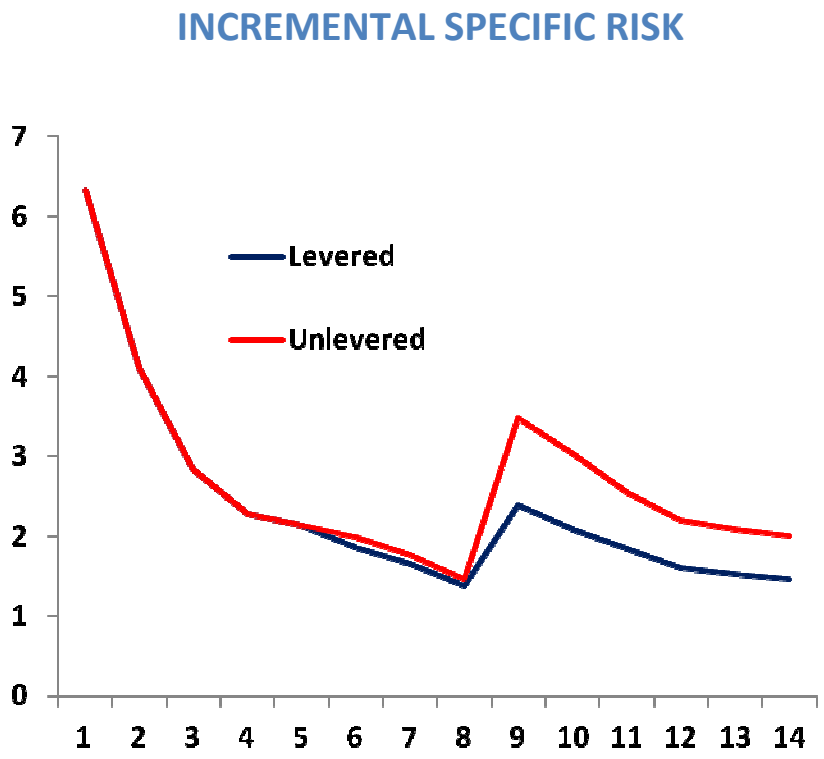
(All Leverage Removed)

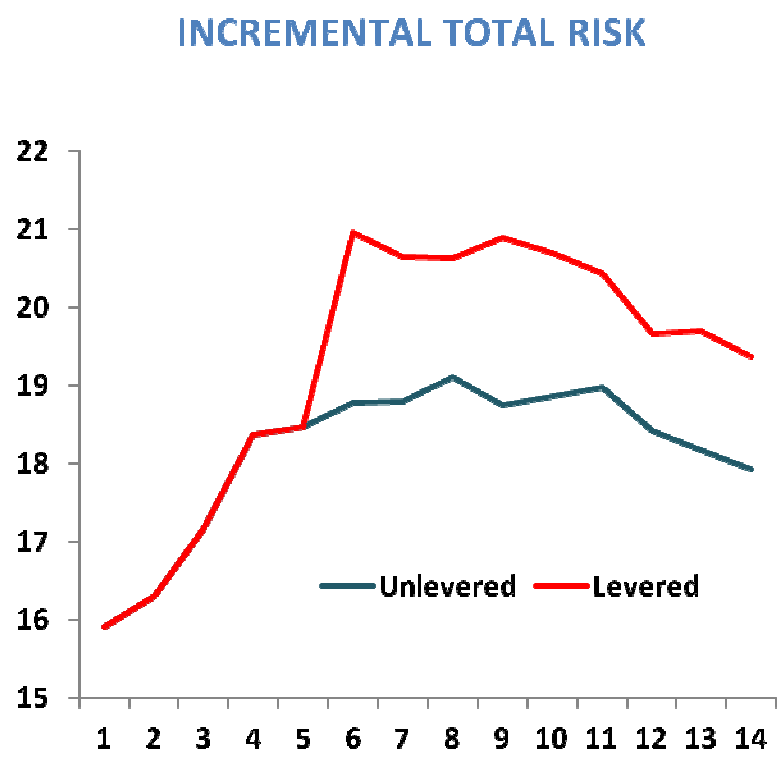
Country	Risk	Property Count	Land Use
Romania	15.9	1	Residential
Sweden	16.4	1	Retail
Germany	17.6	2	Residential, Office
France	19.8	2	Retail, Office
Netherlands	19.9	1	Industrial
U.K.	20.3	4	Office(2), Industrial, Residential
Italy	20.4	2	Industrial(2)
Hungary	20.7	1	Retail

Model Results –Risk by Property Type

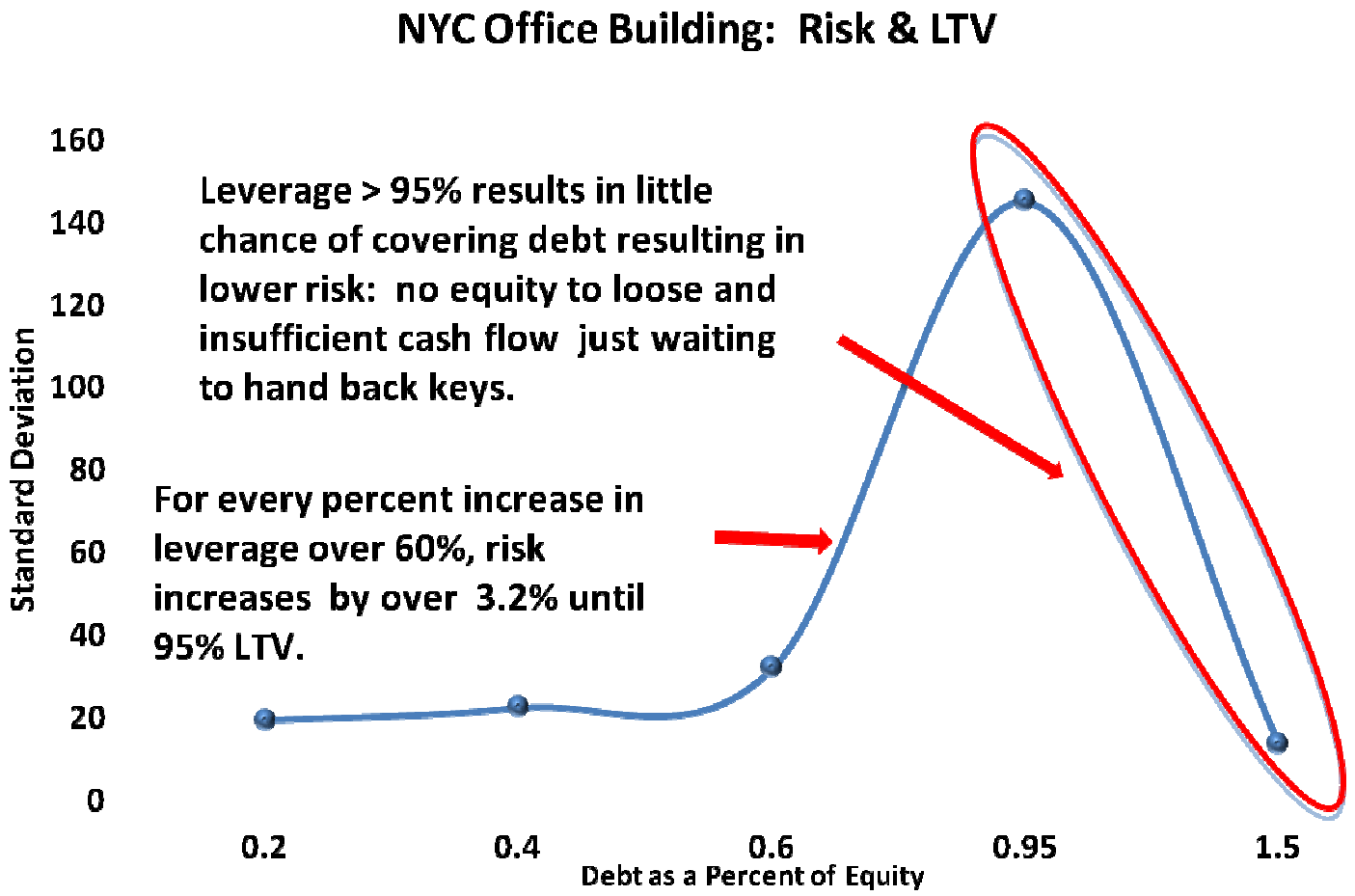


Model Results: Incremental Risk with Additional Acquisitions





Effects of Leverage on Equity Risk – Single Property



Reality Check

How to perform a check on the reasonableness of results when there is not objective way to measure individual property risk results any time between buy and sell points, which is a long time:

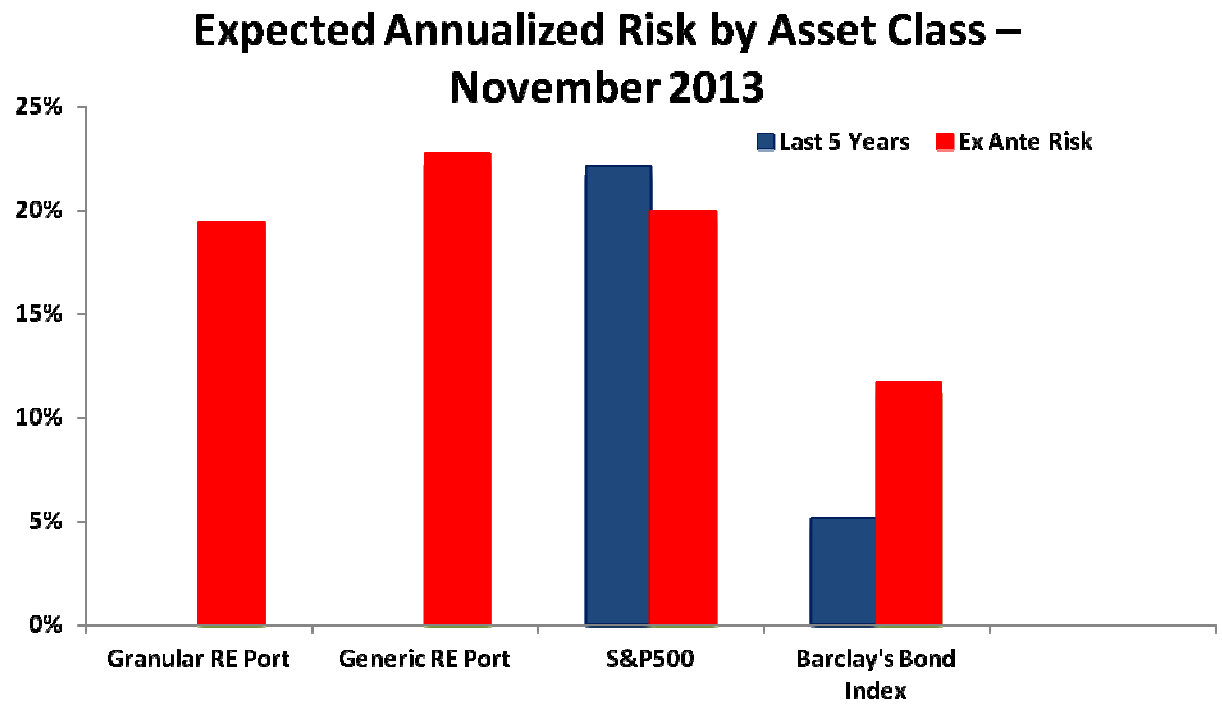
•One general way is to compare with other asset classes and see if the ranking corresponds to our intuition.

•Another way is to de-smooth real estate appraisal-based indexes using a time horizon of a typical property holding period and compare standard deviations

•A third way is to use real estate expert qualitative risk rankings and compare to model predicted risk rankings

•The acid test: does the methodology appeal to economic intuition?

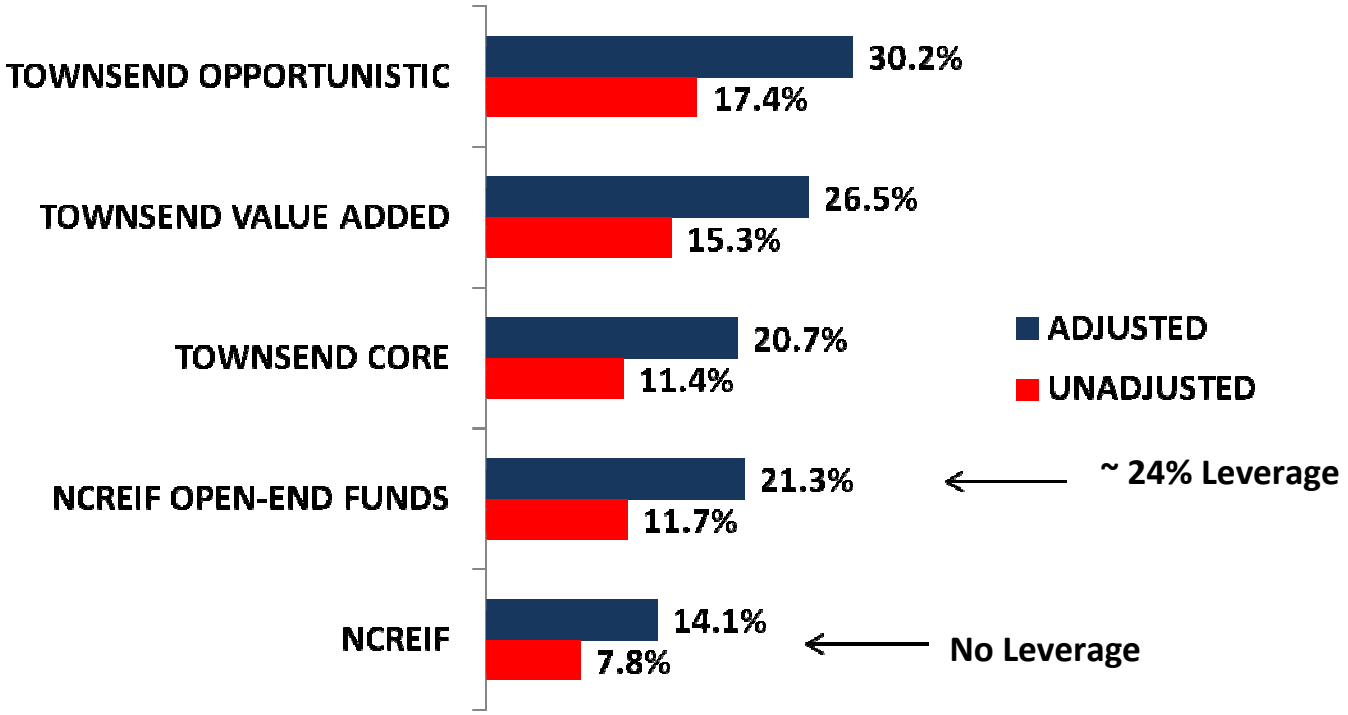
Reality Check (con't):



12 Month *Ex Ante* as of November 2013 per Northfield's Everything Everywhere Model

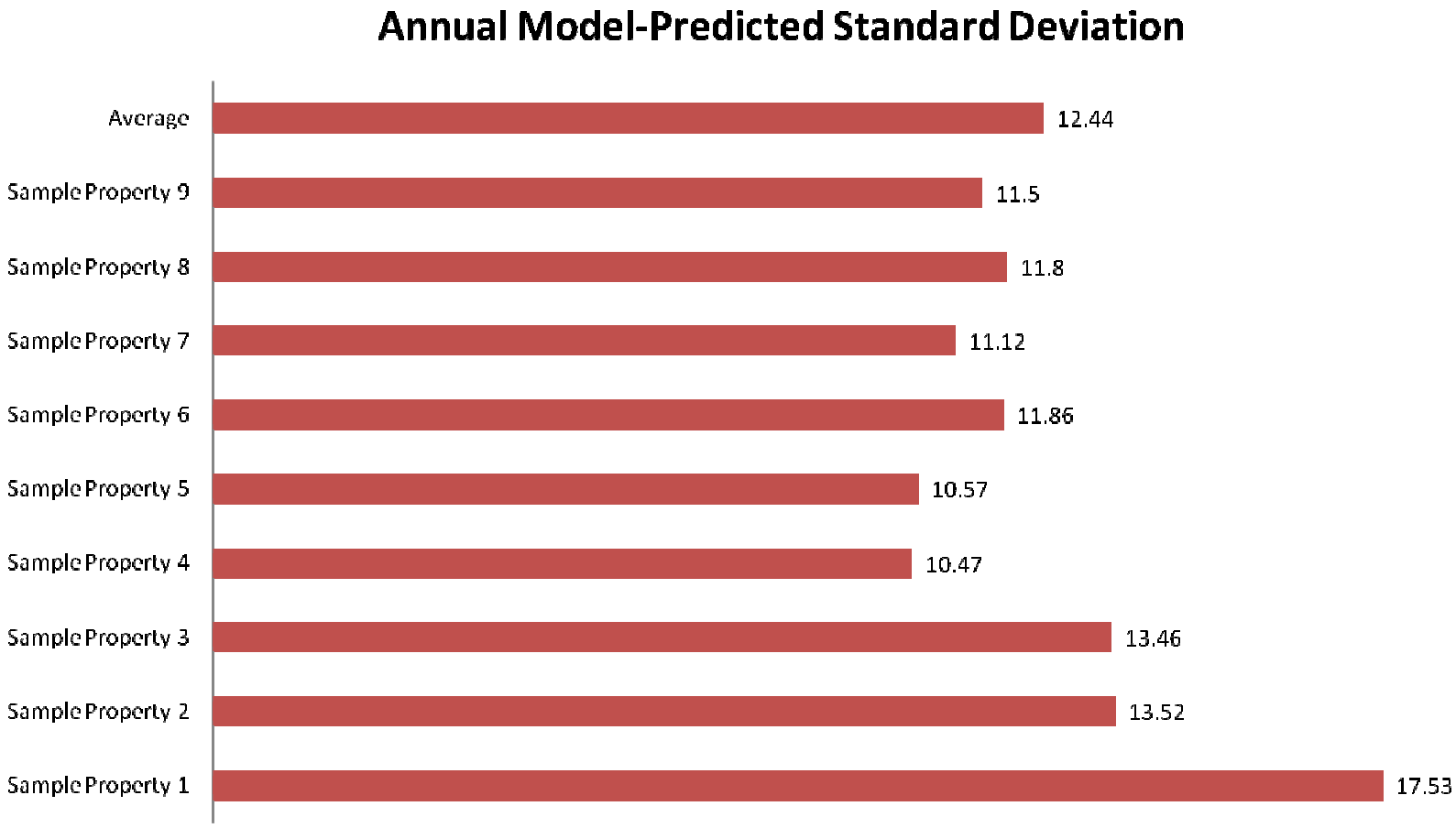
Reality Check (con't)

Historical Standard Deviation - Last 20 Quarters Ending November, 2013



Source: NCREIF

Reality Check (con't)



Applications in Risk Management

Lessons learned from the experience of major North American pension fund using this type of model approach:

–The results were immediately useful to top level management by identifying economic exposure to interest rates, inflation, sectors, resources, geographies, and credit

–The riskiness rankings produced by this technique were reinforced by a blind study of internal expert property risk rankings where such opinions existed. Where no such opinions existed the model became the de factor “expert” providing insight to regions, markets, and properties where such expert opinions could not be formed on a qualitative basis alone.

Applications in Risk Management (con't)

- The good news is that the risk management flexibility provided by Northfield's granular private equity property model and its factor model methodologies provides users with unprecedented flexibility in designing tailored risk analysis.
- The bad news is that you will have to wait until tomorrow's Webinar to hear the details.

Summary

The Methodology:

- Provides integrated and consistent risk measurement and management capability, comparable to other asset classes
- Poses manageable data requirements, but yet does not cut corners with respect to granularity, locality, and other difficult aspects of the analysis
- Features a fundamental, bottom-up approach which integrates intuitively the economic forces that drives returns for private equity real estate
- Uses broad risk drivers that allow identification of the types of risks that can be hedged using liquid market instruments (e.g. discount rate risk = interest rate risk)
- Is fully flexible with regards to risk platform use

The Ugly, the Bad, & the Good

The Ugly:

- Traditional appraisal-based indices fail as risk metrics significantly underreporting volatility due to serial correlation

The Bad:

- Index-based approaches with minimal appetite for fundamental property-level data at first glance appear to be a solution
- The statistical confidence of the aggregate model declines dramatically when correcting for serial correlation. It does not diversity away!
- When you have only real estate factors such as regions and property types you have limited options. Not integrated with other asset classes and therefore operate in silos.

The Good:

- Treat a property as a composite asset with “steady state” cash flows, rent changes, and financing risks.
- Fully integrated, bottom-up approach using a global factor model using a parsimonious set of risk factors.

References

- DiBartolomeo, D., Gold, R., Baldwin, K., Belev, E. "A New Approach to Real Estate Risk." Northfield Working Papers . http://www.northinfo.com/documents/191.pdf. 2005
- Belev, E., Gold, R.. "The Pitfalls of an Index-Based Approach to Managing Real Estate Investment Risk". Northfield Working Papers . http://www.northinfo.com/Documents/589.pdf. 2014
- Geltner, D. and B. Kluger, "REIT-Based Pure-Play Portfolios: The Case of Property Types", Real Estate Economics, 1998, 26:4, pp. 581-612.
- Giliberto, S. M., " Measuring Real Estate Returns: The Hedged REIT Index", Journal of Portfolio Management", 1993.
- Giliberto, S. Michael "Equity Real Estate Investment Trusts and Real Estate Returns", Journal of Real Estate Research", 1990, 5, pp. 259-264.
- Kim, E., "REIT-Based Pure-Pure Play Portfolios: The Case of Property Types and Geographic Locations", MIT Master of Science in Real Estate Development Thesis, 2004.
- Horrigan Holly, Case Brad, Geltner, David, and Pollakowski, Henry, "REIT-Based Property Return Indices: A New Way to Track and Trade Commercial Real Estate", The Journal of Portfolio Management, 2009.
- Lee, Stephen, "Is There a 'Case for Property' All the Time?", Presented at the 9th Annual European Real Estate Society (ERES) Meeting, June 2002.
- Ross, Stephen A., "The Arbitrage Theory of Capital Asset Pricing", Journal of Economic Theory, 1976, 13, pp. 341-360.
- Sharpe, W., "Capital asset prices: A theory of market equilibrium under conditions of risk", Journal of Finance, September 1964.