Risk Based Capital Study

Prepared for ACLI

by Jeffrey D. Fisher, Ph.D.
NCREIF Consultant
Professor Emeritus, Indiana University

Two approaches to calculating potential losses

- Equities (stocks)
  - Use a broad index like the S&P 500
  - Determine losses that occur over different random time intervals
  - Note that this reflects diversification (gains can offset losses) so mainly only captures systematic risk
  - This uses a total return that includes dividends
- Debt (bonds)
  - Track individual bonds
  - Becomes impaired if market value falls below book value (details later)
  - Interest income is not included – except a portion can go into a reserve to offset losses
  - No benefit of diversification – includes idiosyncratic risk
- Real Estate
  - Is it more like stocks or bonds?
  - Elements of both
  - Both approaches being evaluated – NPI used for real estate for equities approach
  - I was responsible for 2nd approach
  - Had to explain why 2nd approach will always show greater losses!

Purpose of this Study

- Determine how the current risk based capital regulatory rules would have impacted investment grade commercial real estate during the past 30 + years including two major recessions.
- Determine if a property would become impaired and calculate the losses for those properties.
- Evaluate for a typical insurance company portfolio.
- Accumulate the losses over a period of time.

Methodology

- Use the actual historical performance of individual property data in the NCREIF database
- Create a simulation model that tracks the performance of each individual property
  - Market value each quarter as reported to NCREIF (current value accounting)
  - Book value set to market value on date assumed to be acquired
  - Book value decreased each quarter based on 5% annual depreciation.
  - Book value increased by any capex and reduced by any partial sales
- Check each quarter to see if the property has become “impaired” based on regulatory requirements
  - Market value has fallen below Book value AND the “CF10” value has falling below book value. CF10 value is an undiscounted present value of cash flows for next 10 years including resale. It is the value that results in a zero IRR.
  - Calculate the loss for any properties that have become impaired
  - Calculate various statistics on the amount of impairment

CF10 Calculations

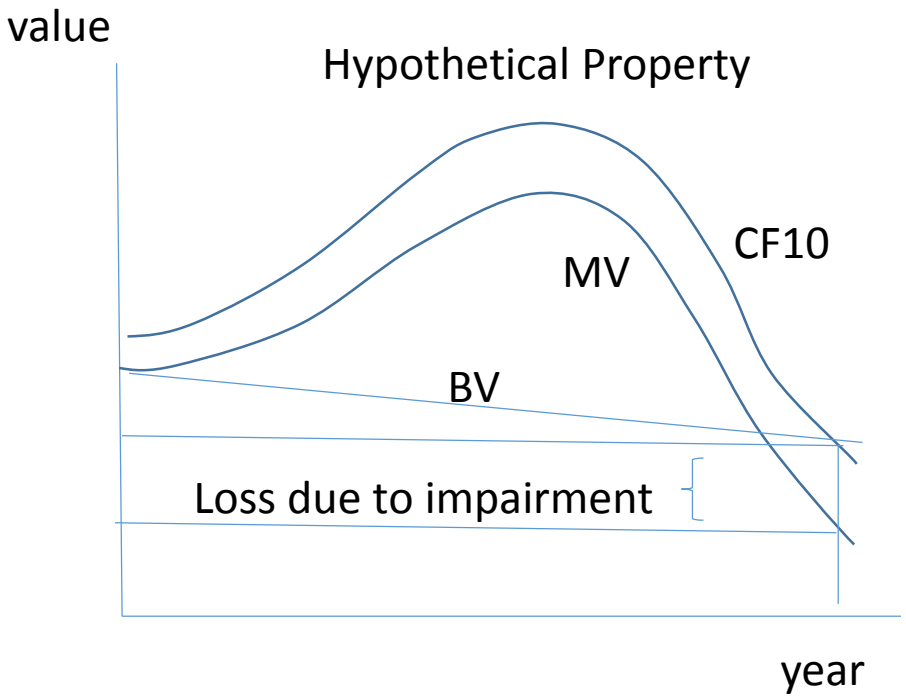
- Use the actual quarterly market value reported to NCREIF
- Use quarterly discount rate and cap rate from Real Estate Research Corporation (RERC) by property type
- Upon assumed acquisition of a property - multiply market value by cap rate to get the initial NOI.
- Use discount rate less cap rate to get implied expected growth rate for NOI
- Calculate what the resale price in ten years would have to be so that the present value of the NOI and resale is equal to the original market value
- Use the NOI and resale to calculate an undiscounted present value (CF10)

Note: could assume a typical capex but this would only change slightly the breakdown between NOI and resale since the model forces the present value to equal the original value reported to NCREIF. So this won't have a material impact on the CF10 value.

Methodology Notes:

- Properties assumed purchased the quarter they enter the NPI
  - Properties can enter the portfolio over time based on actual history of properties being added to the NCREIF database
- Sold properties leave unimpaired unless they became impaired the quarter sold
  - Any gain on sold props doesn't offset losses on impaired props.
- If a property becomes impaired the loss is calculated and property is no longer tracked (i.e., no further losses or recovery considered)

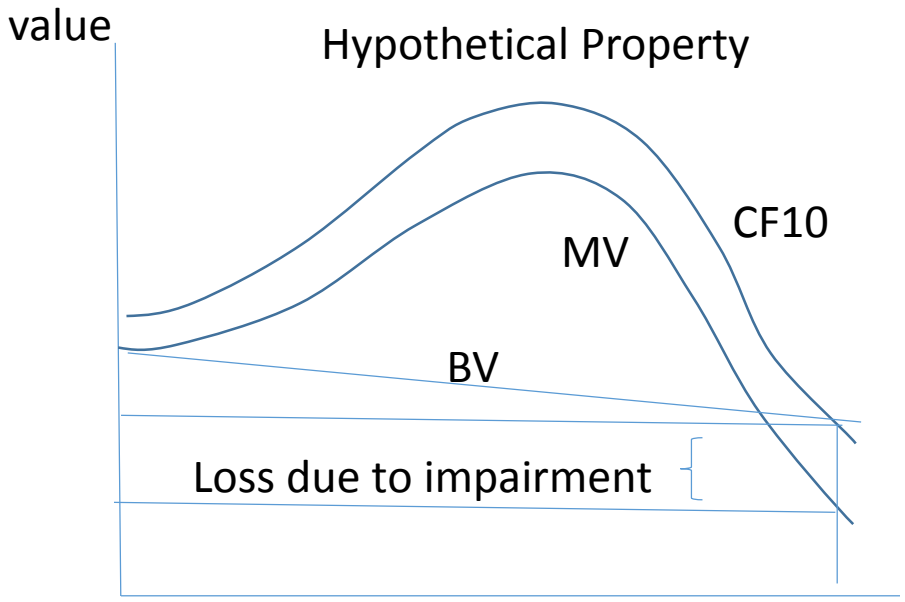
RBC Regulations



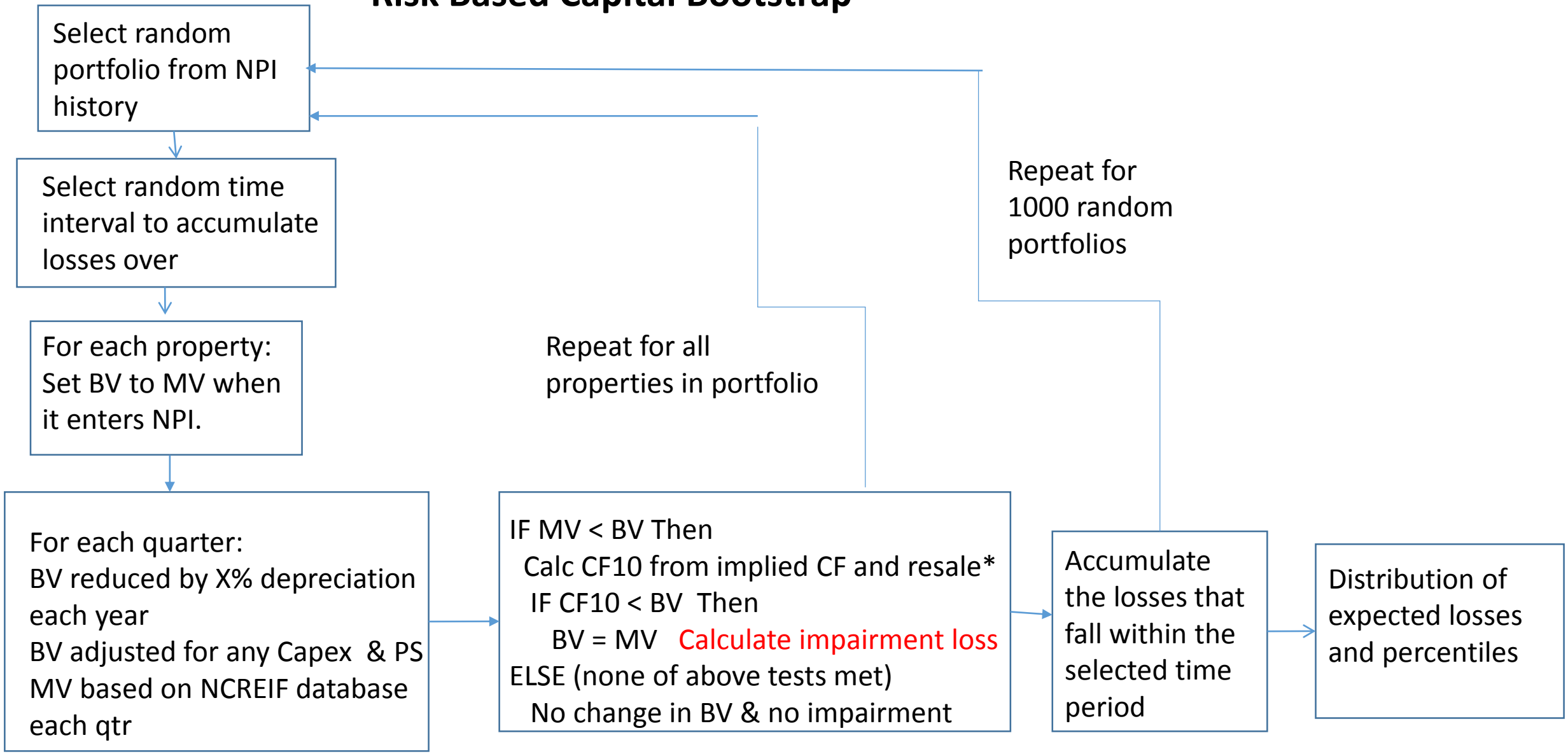
BV = Book Value (assuming no Capex)
MV = Market Value
CF10 = undiscounted 10 year cash flows

RBC Regulations increase loss recognition

- Note that the market value (MV) falls below the book value (BV) before CF10 falls below BV since CF10 is undiscounted and therefore higher.
- Thus if a property has become impaired, it will usually have a greater loss than if it was impaired as soon as MV fell below BV.

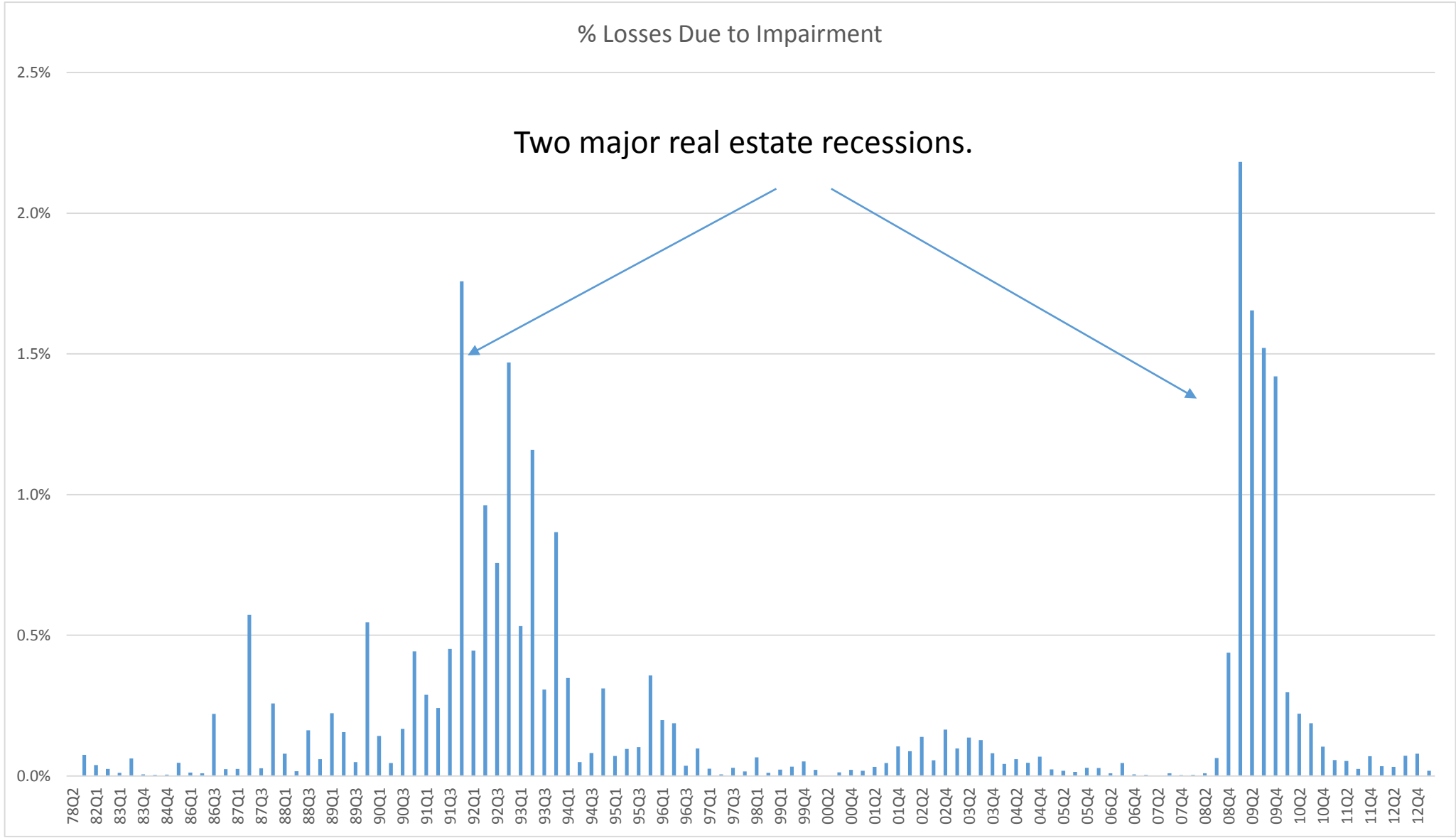


Risk Based Capital Bootstrap

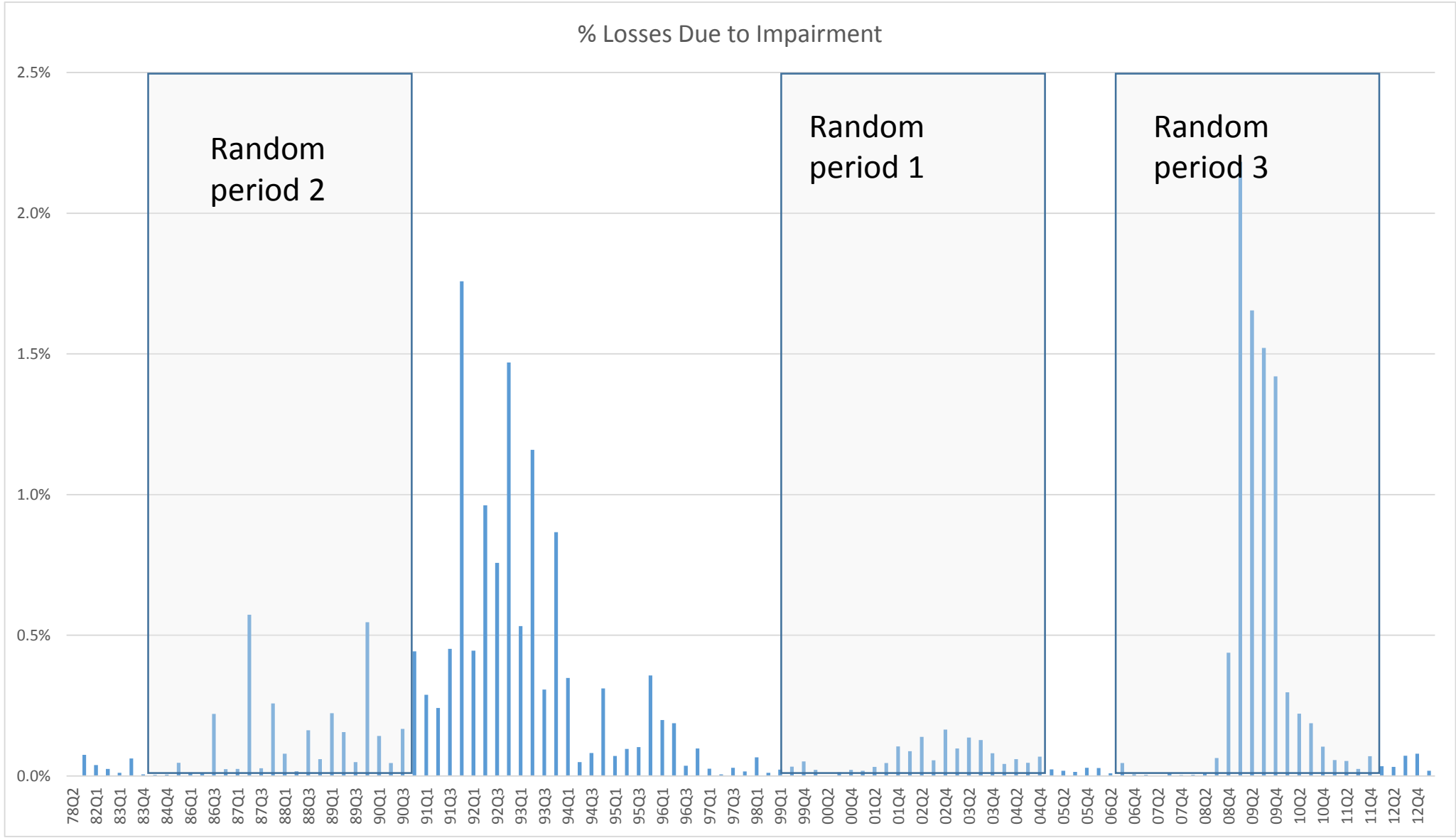


*CF10 is undiscounted sum of projected cash flows and resale for next 10 years. We can use information about the cap rate each quarter to "reverse engineer" the market value (MV) reported to NCREIF to get the original cash flows that would have been discounted in order to calculate CF10 that is used for impairment calcs.

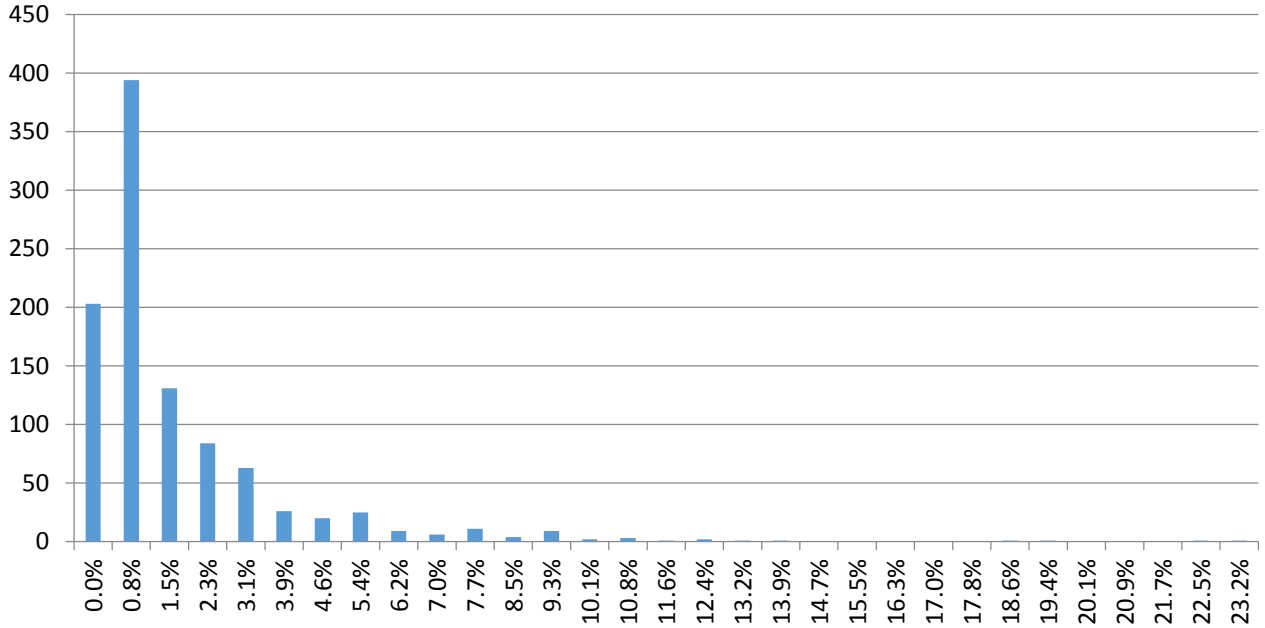
Losses over Time for Portfolio of All Properties in NPI



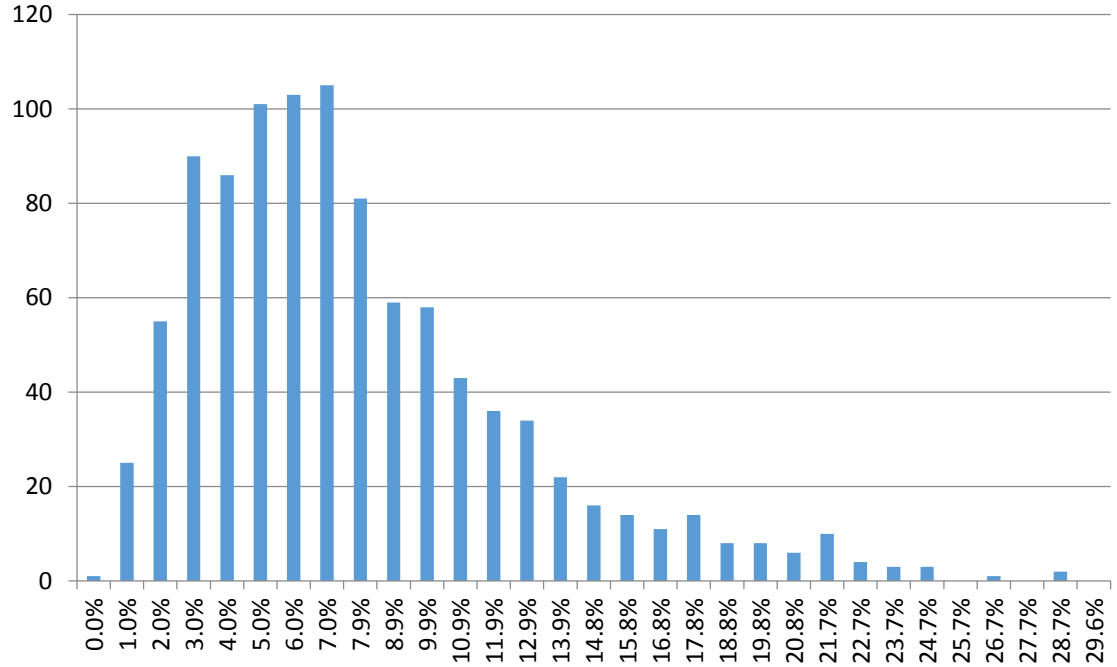
Accumulate Losses over the Random Fixed-Length Time Periods



Cumulative Losses
2 year random time intervals



Cumulative Losses
10 year random time intervals



	Cumulative Consecutive Losses			
	2 yr periods	3 yr periods	5 yr periods	10 yr periods
90th percentile	3.78%	5.20%	7.46%	13,95%
95th percentile	5.69%	7.28%	10.17%	17.46%
90 CTE	7.18%	7.81%	12.15%	18.29%
50th percentile	0.42%	1.12%	2.67%	6.30%

Conclusion

- Losses due to impairment is only significant during the two major real estate recessions that have occurred
- Max worst quarter is 2.25%% of portfolio MV during great recession
- This can be extended to measure downside risk due to different financing alternatives
- The NCREIF database a great way to examine historical risk that includes two major recessions (and recoveries).

IRRs from the NCREIF Database

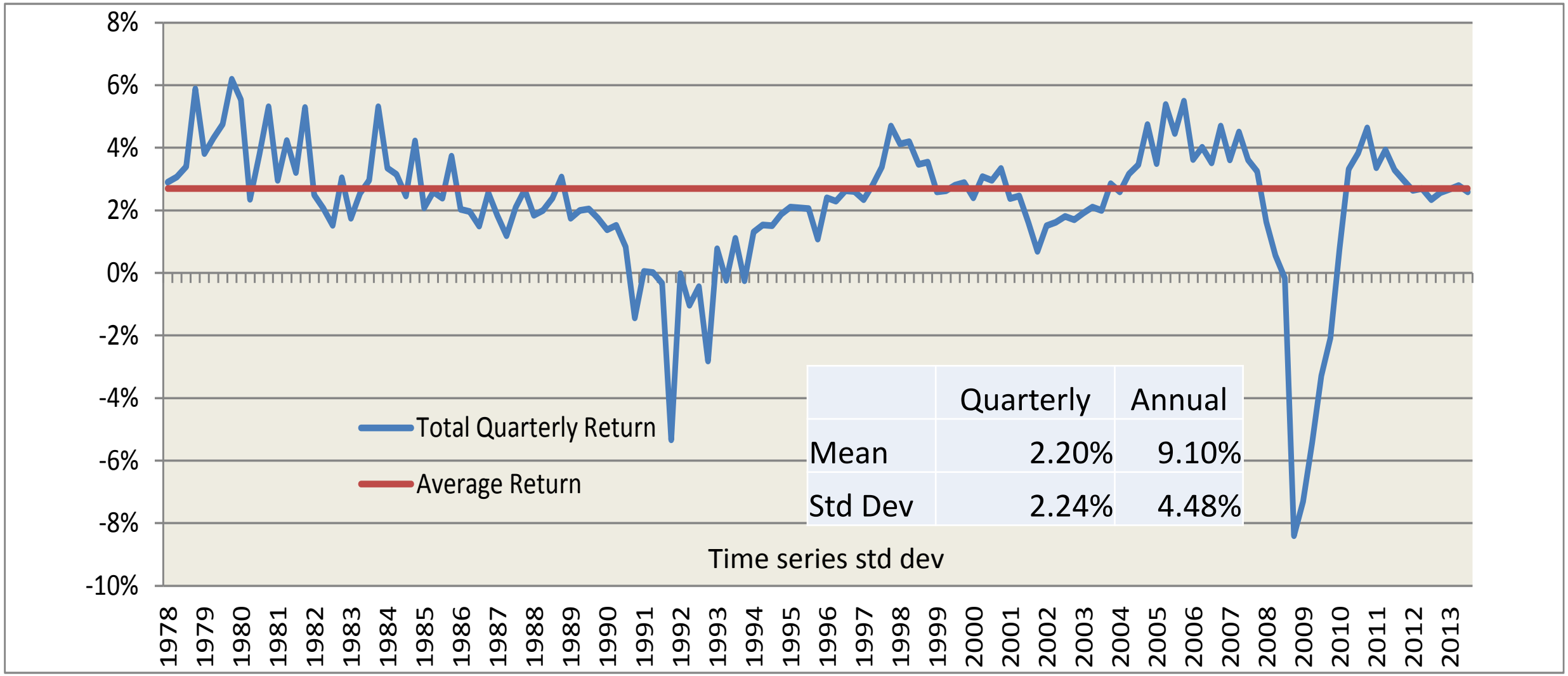
Jeffrey D. Fisher, Ph.D.
NCREIF Consultant
Professor Emeritus, Indiana University

DRAFT 12/6/13

Calculating IRRs with the NCREIF Database

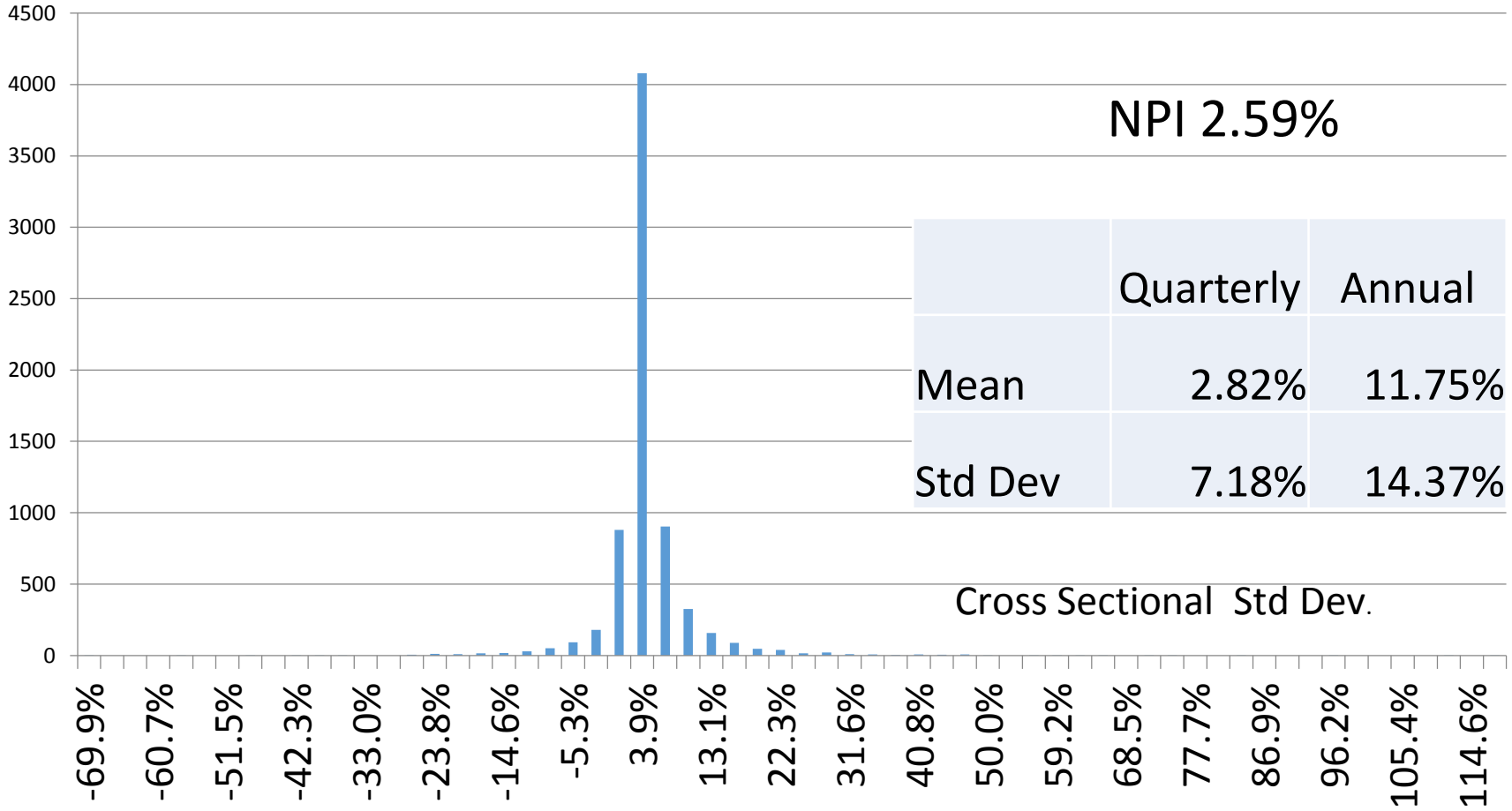
- Quick Review of IRR vs. TWR
  - NPI is based on Time Weighted Returns (TWR)
  - Each quarter a return is calculated as if the property was purchased at the beginning of the quarter and sold at the end of the quarter.
  - This is like an IRR for the quarter assuming NOI is monthly and CapEx mid quarter (hence the infamous denominator to approximate a quarterly IRR)
  - Relies on having a value each quarter
  - Quarterly returns chain linked giving equal weight to each quarterly return (regardless of dollar amount invested).
  - An IRR uses a beginning investment amount, cash flows each quarter, and a value at the end of a holding period (sale price or market value)
  - The amount of cash flow each quarter impacts the IRR (dollar weighted).

NPI – Time Weighted Quarterly Returns



	Quarterly	Annual
Mean	2.20%	9.10%
Std Dev	2.24%	4.48%

Return Distribution for 2013-3



We can calculate IRRs using the NCREIF database

- We know the beginning value (initial market value when a property enters the index)
- We know the cash flows each quarter (NOI, Capex, Partial Sales)
- We have the sale price or an ending market value if not sold.
- But still several ways of calculating

Alternative ways of calculating an IRR

1. Pooled Cash Flows

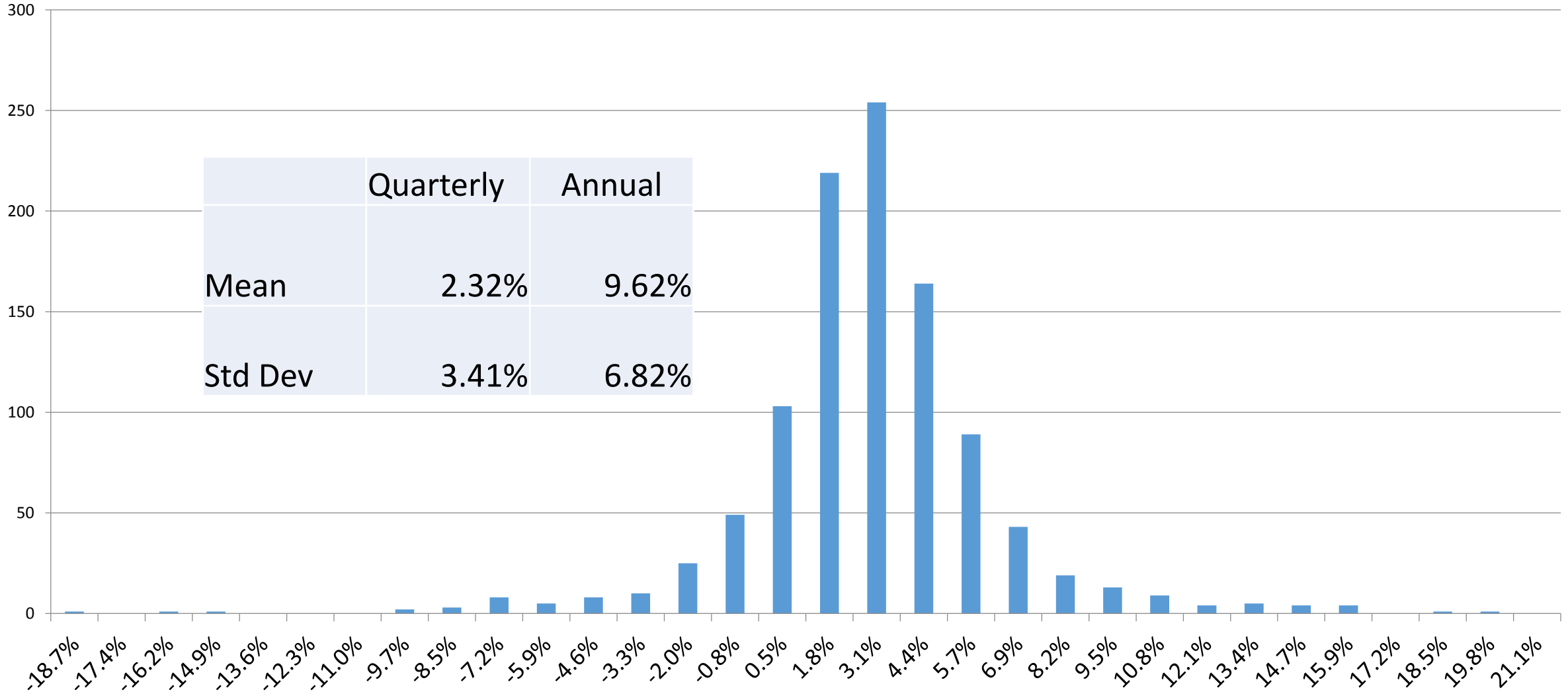
- Add all the actual cash flows for each property in the portfolio
- May have different starting and ending periods for each property.
- Calculate an IRR on the total cash flows.
- Often used for venture capital funds
- This would reflect the IRR for the entire portfolio and reflect the dollar amount invested each quarter

2. Calculate IRR on each individual property

- Use actual cash flows from each individual property.
- Initial value can be when it first enters database or a value at a later point in time.
- Ending value can be sale price or market value at the end of a holding period if not sold yet.
- Calculate the IRR on the above cash flows.
- Can then calculate the average, standard deviation and other distributional characteristics of these IRRs. Good for risk analysis.
- The rest of this presentation deals with this approach

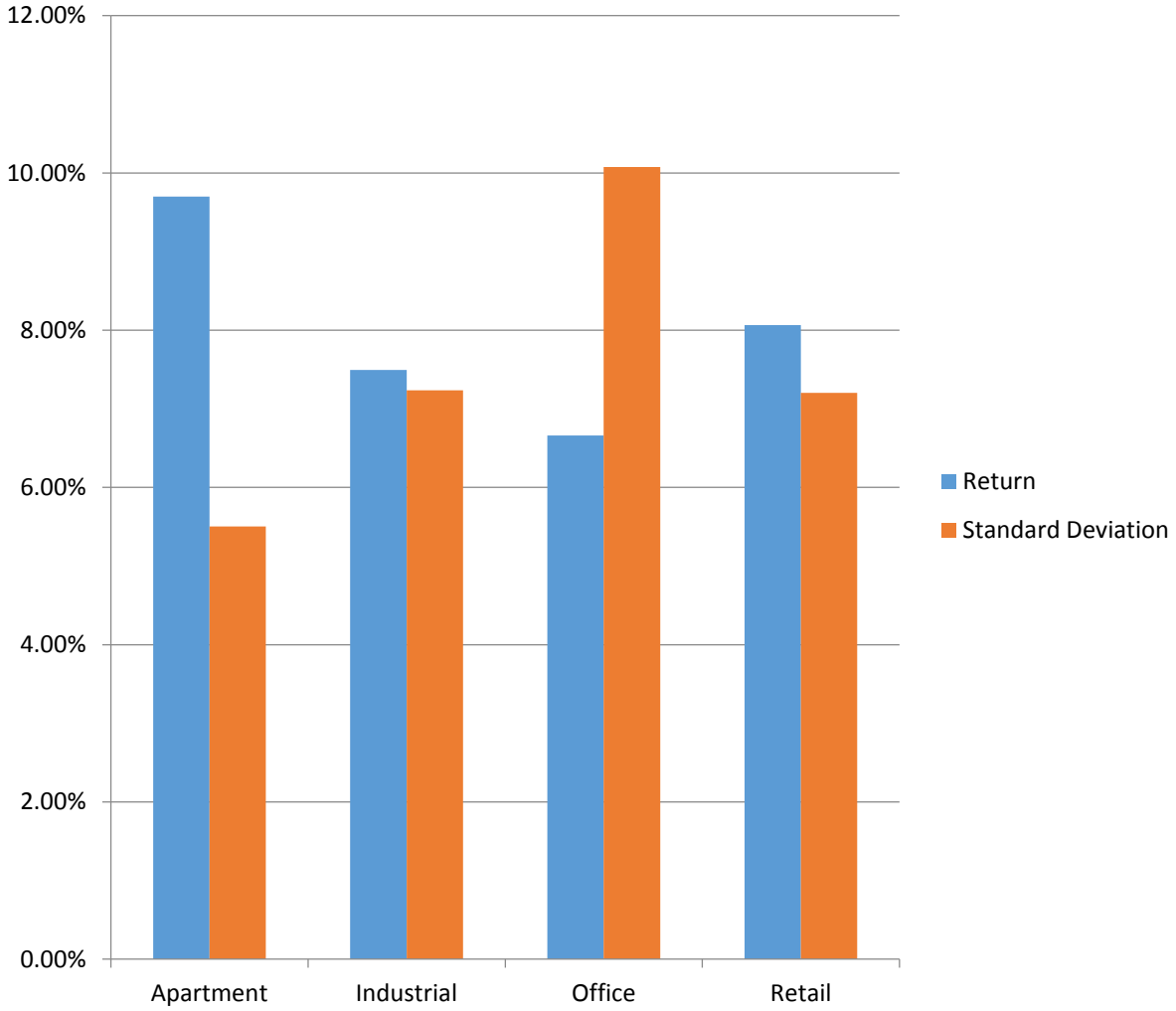
Sold Properties from NPI

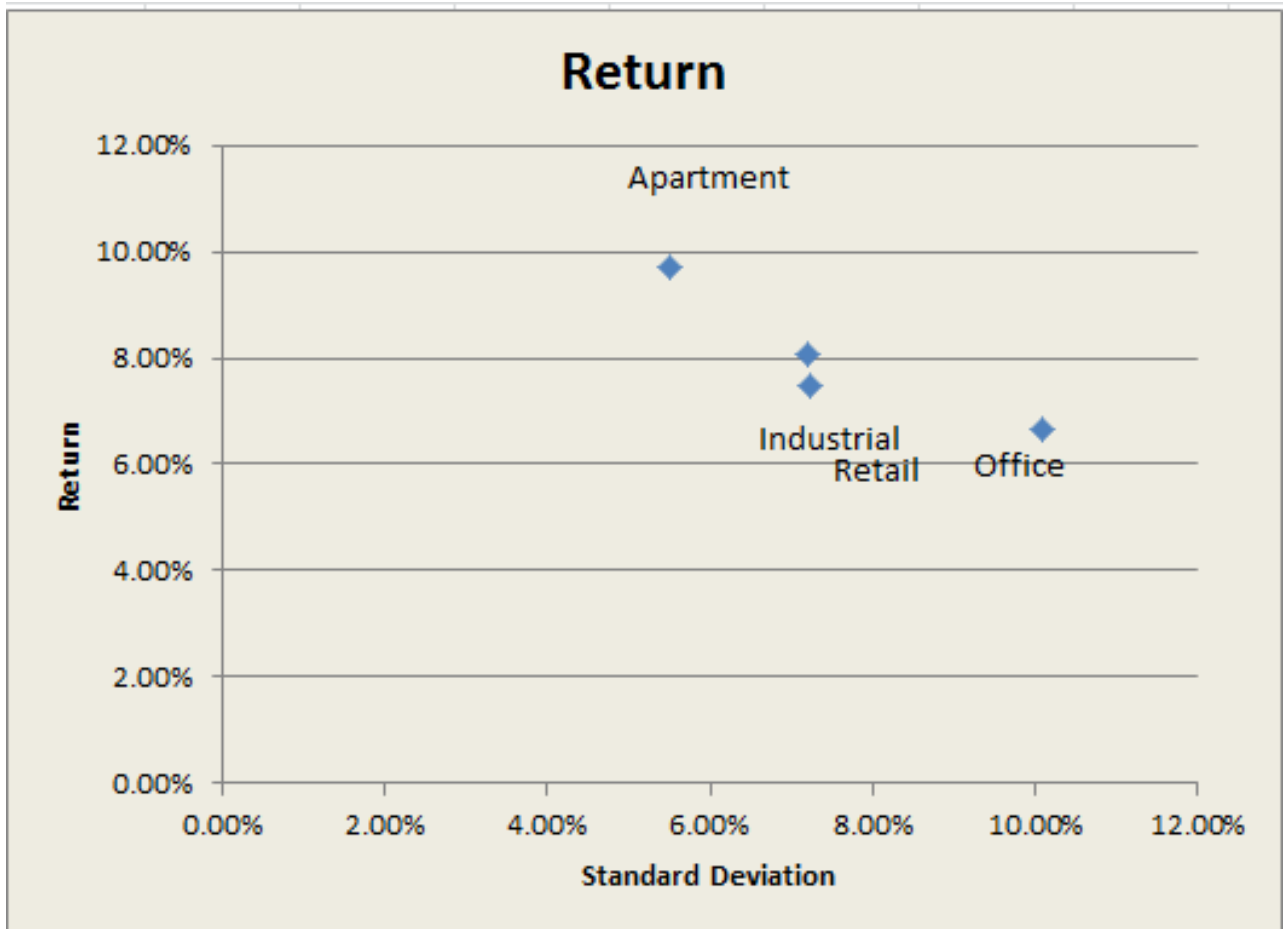
Frequency of Quarterly IRR



	Quarterly	Annual
Mean	2.32%	9.62%
Std Dev	3.41%	6.82%

Property Type	Return	Standard Deviation
Apartment	9.70%	5.50%
Industrial	7.49%	7.24%
Office	6.66%	10.07%
Retail	8.06%	7.20%

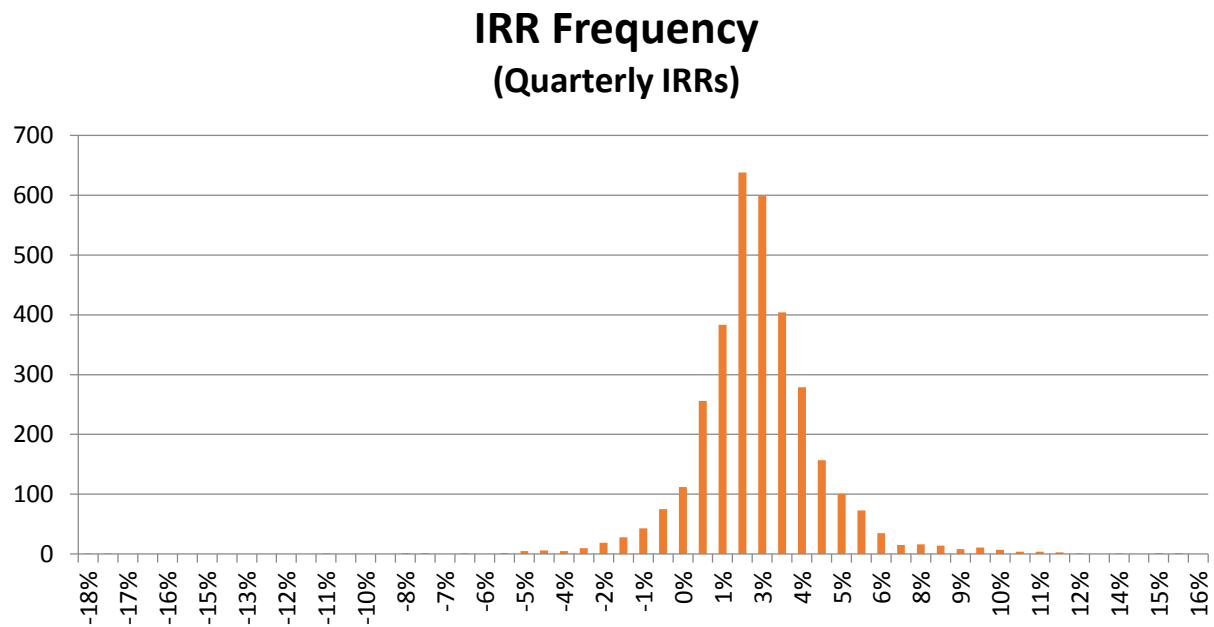

12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
Apartment
Industrial
Office
Retail
Return
Standard Deviation


Return
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
Return
Apartment
Industrial
Retail
Office
0.00%
2.00%
4.00%
6.00%
8.00%
10.00%
12.00%
Standard Deviation

Requested exercise from the Risk Management Officer of a NCREIF Member

- Assume all properties in the NPI as of the first quarter of 1990 are purchased on that date
- Properties that enter the NPI after that come in at initial market value
- Sold properties leave when sold
- Any properties unsold as of the 2nd quarter of 2013 are sold at their market value
- Exclude properties held less than a year (flips)
- Calculate the IRR on these properties
- Provide distributions for the IRR

Apartments

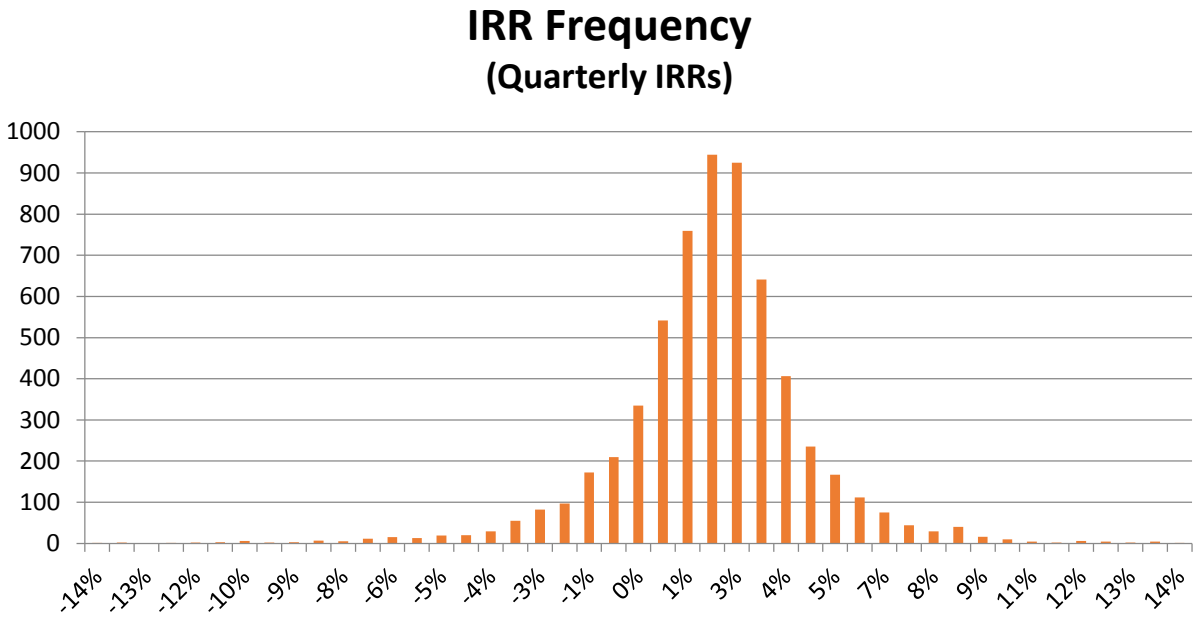


Sample size	3,328

	Quarterly	Annual
Mean	2.20%	9.09%
Std Dev	2.09%	4.18%
1st percentile	-3.09%	-11.78%
3rd percentile	-1.39%	-5.44%
5th percentile	-0.71%	-2.81%
25th percentile	1.25%	5.08%
50th percentile	2.08%	8.58%
75th percentile	3.07%	12.85%
95tth percentile	5.31%	23.02%

Note: Standard Deviation is a mixture of different property holding periods and different unique properties.

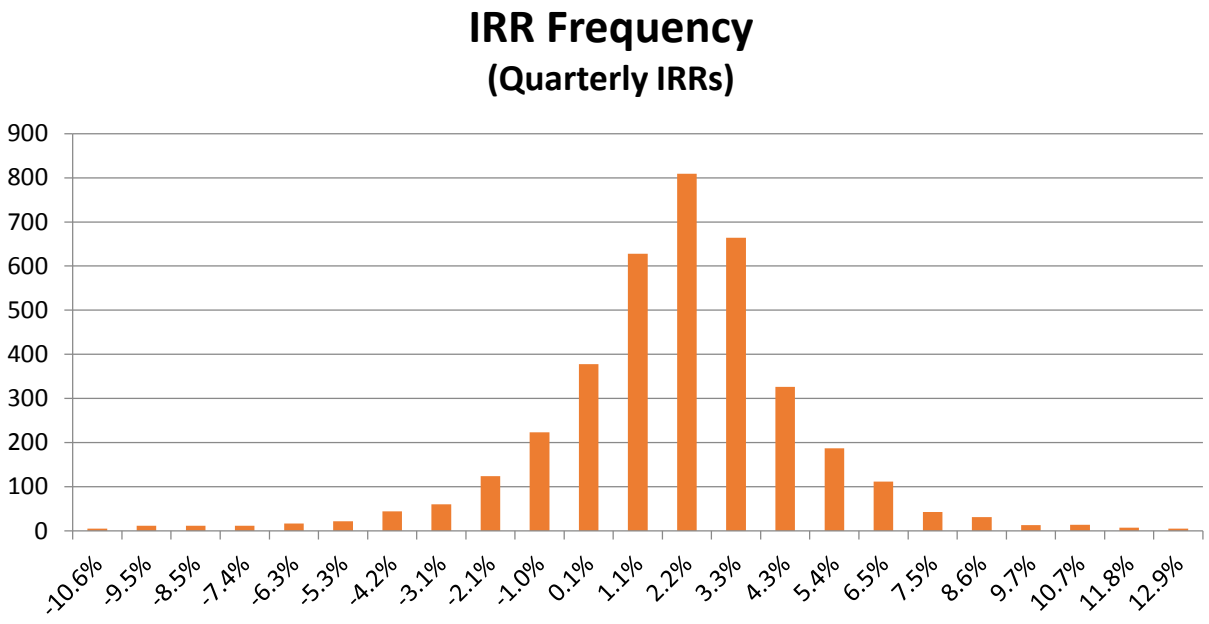
Industrial



Sample size	6,069

	Quarterly	Annual
Mean	1.79%	7.37%
Std Dev	2.65%	5.30%
1st percentile	-6.51%	-23.60%
3rd percentile	-3.32%	-12.62%
5th percentile	-2.32%	-8.95%
25th percentile	0.60%	2.43%
50th percentile	1.85%	7.61%
75th percentile	2.96%	12.38%
95tth percentile	5.55%	24.13%

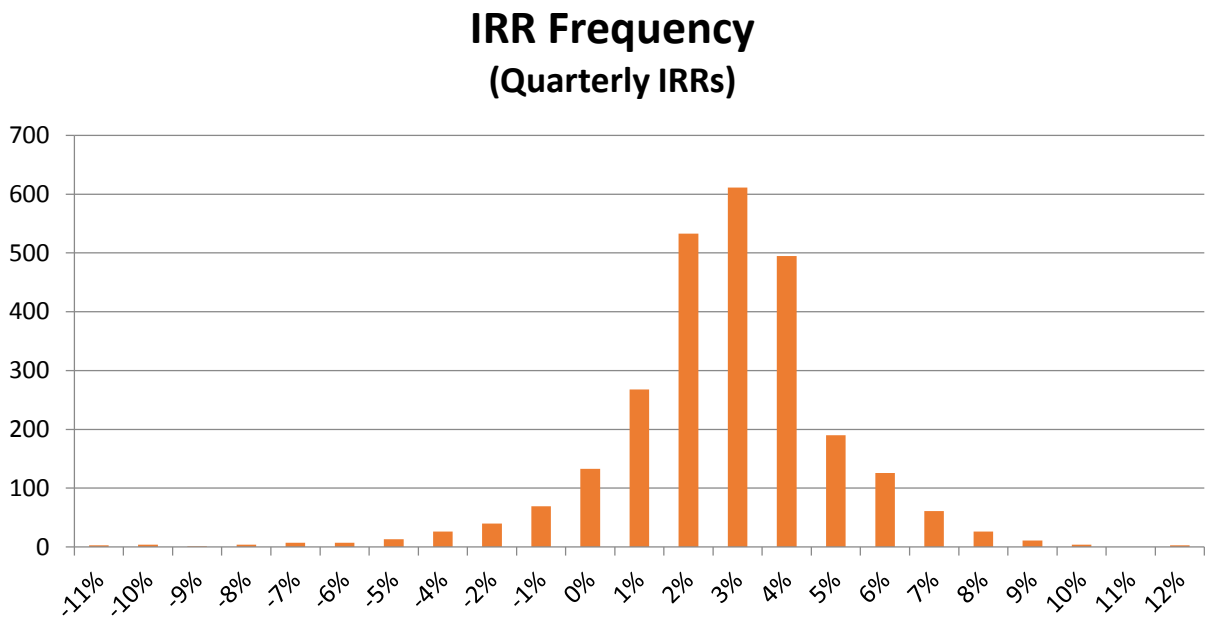
Office



Sample size	3,773

	Quarterly	Annual
Mean	1.46%	5.98%
Std Dev	3.15%	6.30%
1st percentile	-8.61%	-30.25%
3rd percentile	-4.72%	-17.58%
5th percentile	-3.24%	-12.34%
25th percentile	0.14%	0.54%
50th percentile	1.62%	6.63%
75th percentile	2.88%	12.04%
95tth percentile	5.77%	25.15%

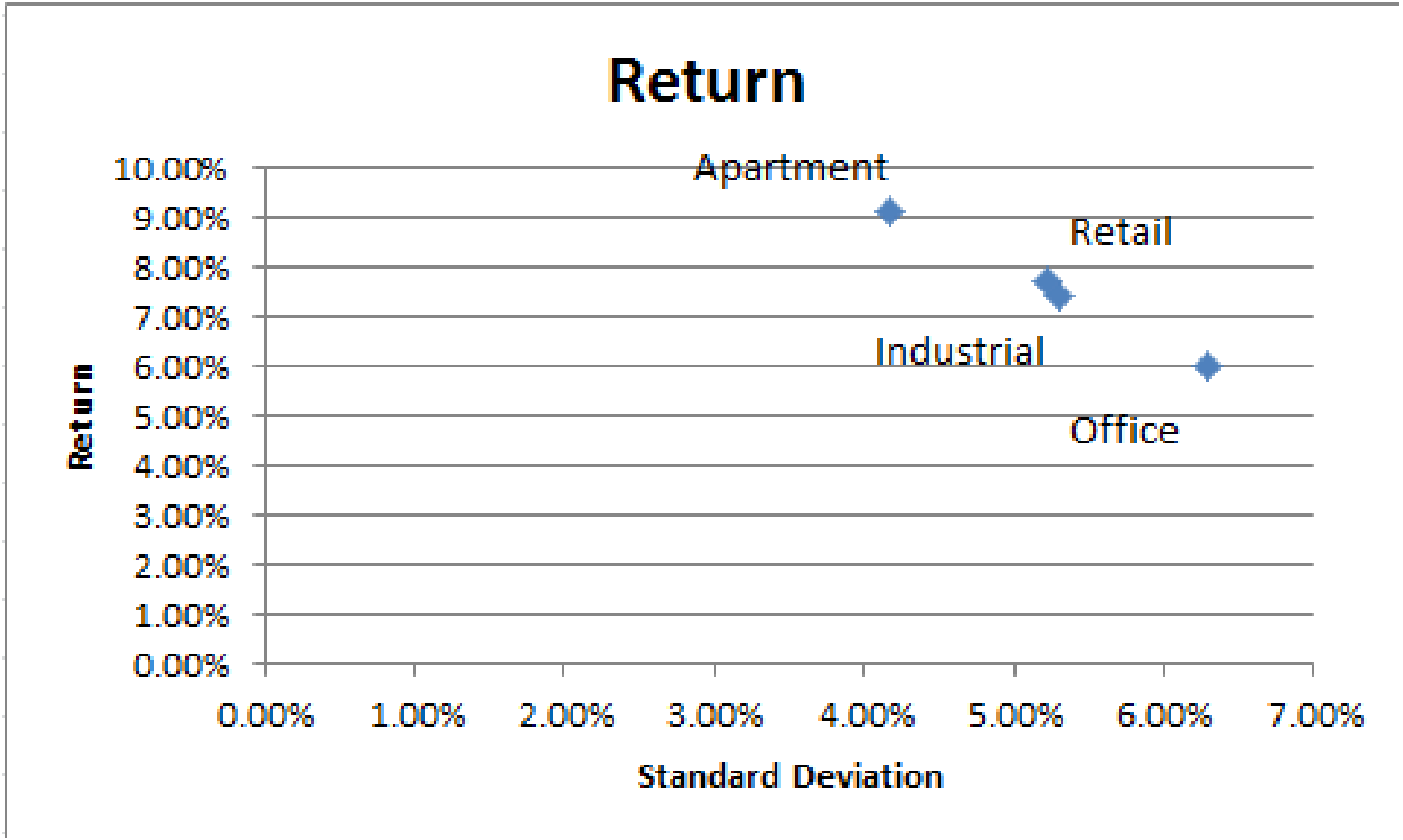
Retail



Sample size	2,646

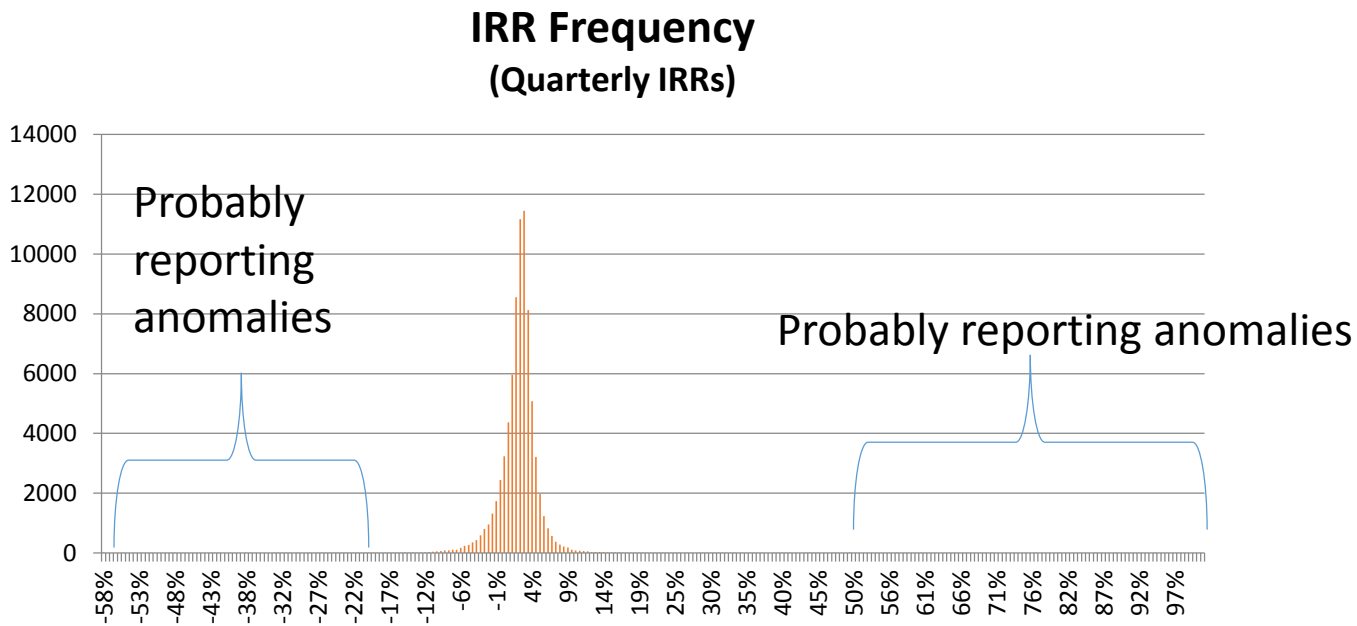
	Quarterly	Annual
Mean	1.86%	7.66%
Std Dev	2.61%	5.22%
1st percentile	-6.37%	-23.14%
3rd percentile	-3.23%	-12.32%
5th percentile	-2.19%	-8.48%
25th percentile	0.77%	3.12%
50th percentile	1.99%	8.20%
75th percentile	2.91%	12.17%
95tth percentile	5.56%	24.15%

Higher Risk, Lower Return?!



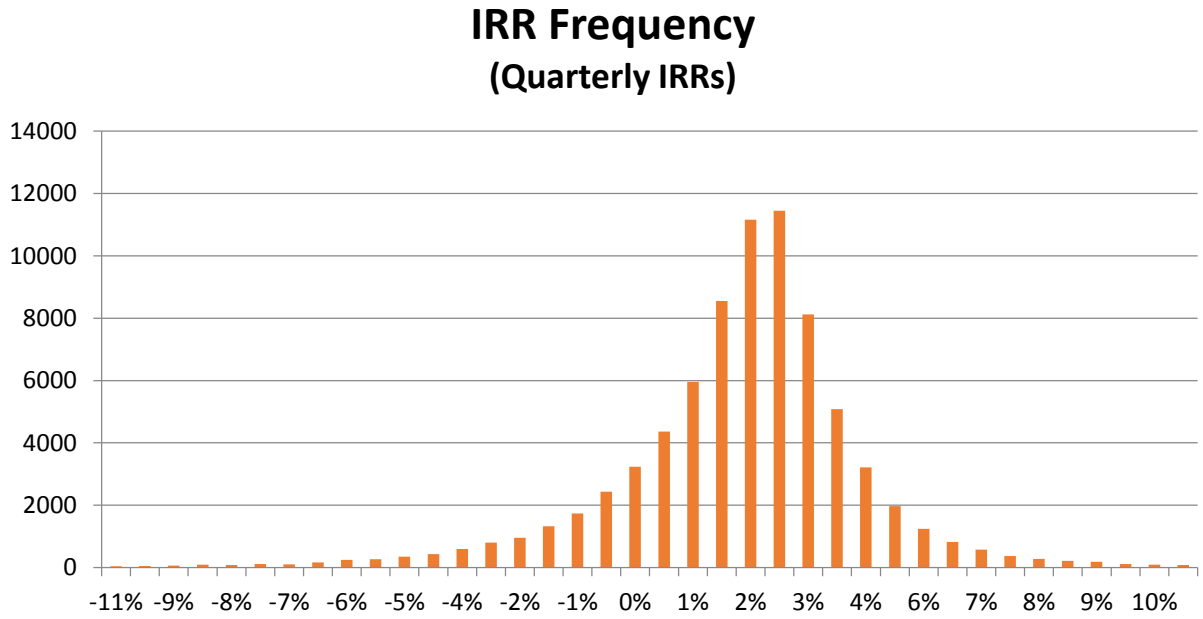
Variation – extend sample of holding periods

- Still assume purchase in 1990
- Assume sale after one year, after two years, after three years, etc. until actually sold or sell at market value 2nd quarter of 2013
- This generates 77,832 IRRs
- Better dispersion of holding periods in the sample



	Quarterly	Annual
Mean	1.67%	6.86%
Std Dev	3.21%	6.43%
5th percentile	-2.94%	-11.23%
10th percentile	-1.30%	-5.09%
25th percentile	0.60%	2.42%
50th percentile	1.93%	7.95%
75th percentile	2.94%	12.31%
95tth percentile	5.27%	22.82%

Same IRRs – just omitted the extremes



Possible Next Steps

- For each property, allow purchase and sale in any combination of start and end dates
- Calculate IRRs for cohorts, e.g., start in 1995 and end in 2000
- Again break down by property type and also region etc.
- Use TBI to adjust when appraised value used for terminal value rather than actual sale price?