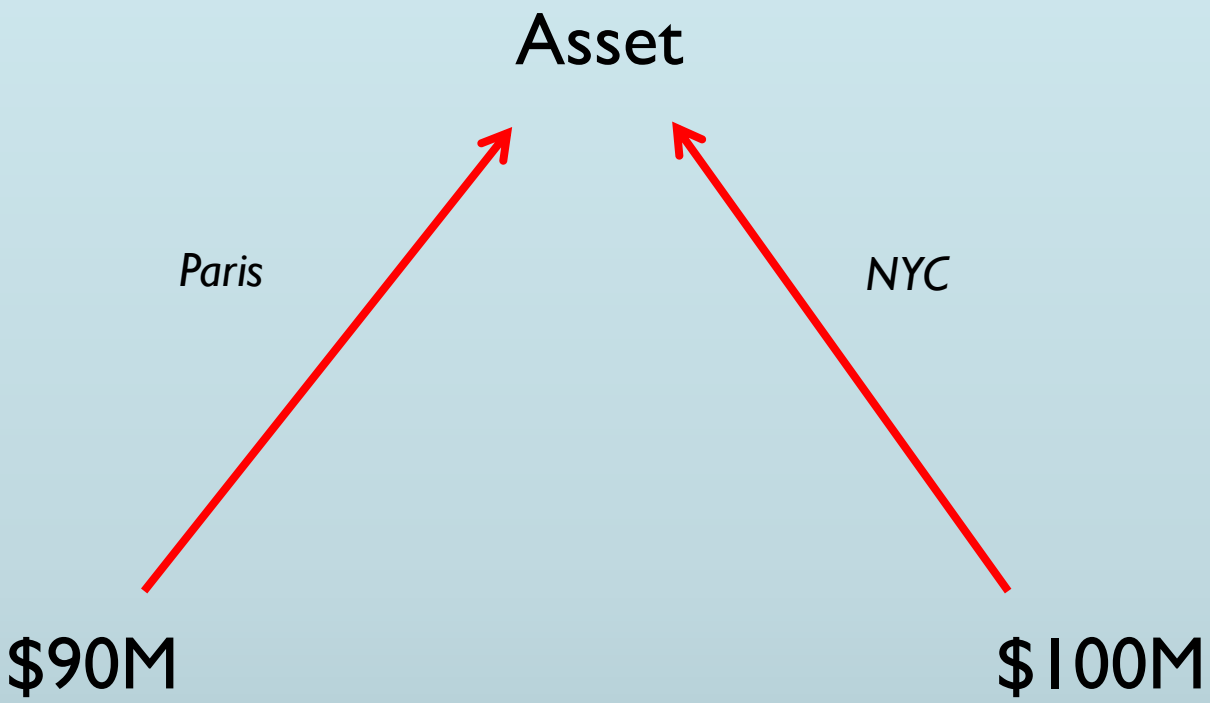
Preliminaries

Real estate finance

The question

- How should one price real estate assets?
- Asset: store of value with well defined property rights
- A title to a string of cash flows (or payoffs) to be received over time, and subject to some uncertainty
- Two basic tasks:
  1. Describe the distribution of payoffs (i.e. *forecast*)
  2. Price that distribution
- Arbitrage principle: "similar" assets should be priced in such a way that they earn similar returns
- Otherwise…

Arbitrage opportunities



Opportunity cost of capital

- Investing in a given asset is foregoing the opportunity to invest in other assets with similar properties
- Investor should be compensated for foregoing that opportunity
- Asset under consideration, therefore, should yield at least the same return as other similar assets

IRRs

- The IRR is the discount rate that makes the present value of expected cash flows equal to the initial investment cost

- There is only one correct way to compute an IRR:
  1. Compute expected cash flows
  2. Find the discount rate that makes the investment's net present value zero

- Reversing these steps is a typical and massive mistake

IRRs: warm-up example

- An asset pays $500 in year 1, and a random cash-flow in year 2
- Year 2 CF is $500 with probability p, 0 otherwise
- *Expected* second year CF is 500 p + 0 (1-p)= 500p
- Bond's IRR solves $900=500/(1+r) +500p/(1+r)^2$

A deeper example: waterfall structures

- Often, real estate projects include several equity holders
- Some simply fund the project, others have a hand in running it
- Equity can be split simply according to initial stake
- Split can also be conditional on performance to give the right incentives to managing stake-holders

The IRR look-back model

- Initial equity injection: $1M, 10% managing owner, 90% pension fund
- Equity flows are 10% of initial injection in year 1, grow by 10% every year after that. In year five, reversion flow to equity is 10 times year 6 projected cash flow.
- Managing owners gets:
  1. 10% of net equity flows until 10% "hurdle" IRR is reached by the pension fund (Tier 1)
  2. 20% of remaining cash flows until 15% IRR is reached by the pension fund (Tier 2)
  3. 50% thereafter (Tier 3 cash flows a.k.a the gravy train)
- What are cash flows to both equity holders? What is the IRR of both equity holders? Who benefits the most from higher growth rates?

Main asset pricing recipes

1. Discounted cash flow approach
   a. Write asset as a string of expected cash flows
   b. Find return similar assets earn
   c. Discount cash flows using that rate

2. Ratio/Peer Group/Multiple approach
   a. Find a set of similar assets, with known value
   b. Find average value/key statistic ratio
   c. Apply that ratio to asset under consideration

The multiple approach in real estate

- Find a group of comparable properties ('Comps') with known value
- Comparable: similar location, purpose, vintage…
- Compute average ratio of value to gross rental income (**G**ross **R**ent **M**ultiplier approach)
- Compute average ratio of Net Operating Income (NOI) to value, a key ratio known as the **Capitalization Rate**
- Get an estimate of the current Gross Rent and NOI for your target property, and apply ratio

Example

- A target property has a NOI of $400,000
- You have obtained the following two recent sales data:

	NOI	Selling price
Property 1	$424,200	$4,200,000
Property 2	$387,200	$3,400,000

- What is the estimated value of your target using the cap rate approach (assign equal weights to the two sales)?

Solid comp case in Real Estate

1. Quality of the comparables
2. Consistency of calculations
3. Good treatment of outliers

Sources for real estate comps/multiples

1. Databases of recent transactions: RCA analytics, Costar…
2. Survey data: PwC, RERC, CBRE, Costar…
3. "Fundamentals"

NOI vs. EBITDA

- NOI = operating income - operating expenses
- Like EBITDA, a fuzzy notion
- My preference is to figure cash operating expenses only, making my NOI equivalent to "Normalized EBITDA"
- But not everybody agrees…

NOI vs. PBTCF

- NOI = operating income – operating expenses
- BT bottom line = NOI – Capital Expenses
  = **P**roperty **B**efore **T**ax **C**ash **F**low
  = PBTCF
- Before-tax IRR is the discount rate that makes the PV of all future PBTCF equal to the property's price

The holy trinity of real estate

- Consider a property with current PBTCF cap rate y%
- Assume that PBTCF is expected to grow by g% for ever
- Then the before-tax IRR associated with buying this property is:

$$r = y + g$$

Cap rate "fundamentals"

- NOI yield ≈ required return (r)
  - expected income growth (g)
  + investment rate (CAPEX/V)

- Required return = real risk-free rate
  + expected inflation
  + risk premium
  + liquidity premium

Example: Is Manhattan office overvalued?

- Cap rates on Manhattan office have fallen back to pre-crisis levels
- Could spell trouble, but…
- …PwC survey (Q2-2014) is consistent with current valuations:

Required return (r)		7.44%
- Cap rate *(PBTCF or NOI?)*	-	5.25%
- Rent growth (g)	-	3.67%
	<	0

- … and spreads over treasuries have actually risen
- … though not as much as in other markets

Is Manhattan office overvalued?

- **Point #1**: Since 10-year rates have fallen, there is nothing surprising about cap rates falling as well
- **Point #2**: Spreads (Cap rates – 10 year) are actually rising. If you are going to argue that Manhattan is priced for a fall, you need to come up with a deeper argument
- Recall: Spread = Liquidity premium
  + Risk premium
  - g
  +CAPEX/V
- What's the story?

The class of real estate assets

- Bedrock: real estate properties (land + structures affixed to it)
- Residential (deliver housing services) or Commercial (held for a business purpose)
- Real estate properties are strings of cash flows
- Real estate *assets* are all assets whose payoffs derive -- however remotely -- from some underlying property

Some language

- Debt: financial contract that gives specific claims to asset's payoff, but no ownership rights
- Equity: financial contract that gives only a residual (or subordinated) claim to asset's payoff, but carries ownership rights
- Public Markets: Markets with many buyers and sellers, observable transaction prices and sizes, and stringent disclosure rules
- Private Markets: Markets where transactions involve limited numbers of buyers and sellers, and where transaction information and financials need not be disclosed

Real estate assets

	Public Markets	Private Markets
Equity Assets	**REITs** **Mutual funds**	**Real Properties** **Private investment firms**
Debt Assets	**Mortgage-backed securities**	**Whole mortgages** **Venture debt**

Mortgages

- Mortgage: debt contract secured by a real estate property
- Characteristics:
  1. Initial balance or principal (b_0)
  2. Maturity (T)
  3. Yield (or contract rate) structure (r_t, for all periods t)
  4. Payment structure (m_t, for all periods t)
- Mechanics:
  1. At a given date, interest due is $b_{t-1}\ r_t$
  2. $b_t = b_{t-1} + b_{t-1}\ r_t - m_t$
  3. If $b_T > 0$, balance is due in one *balloon payment*

Some language, and notes

- Mortgage whose balance is zero after T periods ($b_T=0$) are called *fully amortizing*
- Contract rate can be fixed, vary on a fixed schedule, or according to some other market rate
- Amortization can be negative -- balance can grow -- from one period to the next (if $m_t<b_{t-1}\ r_t$)
- *Interest-only mortgages* (IOMs) have payments equal interest due ($m_t=b_{t-1}\ r_t$) for part of the contract

FRMs: fixed-rate, fully amortizing mortgages

- For all t:
  1. $r_t = r$
  2. $m_t = m$
- Fully amortizing: $b_T = 0$
- What must m be? (Fixed annuity formulae)
- $m = b_0 \, r \, / (1-(1+r)^{-T})$

The lender's perspective

- Full amortization means:

$$b_T = 0, \quad \text{or, equivalently,} \quad b_0 = \sum_{t=1,..T} m_t / (1+r)^t$$

- More generally:

$$b_0 = \sum_{t=1,..T} m_t / (1+r)^t + b_T / (1+r)^T$$

- Absent points and whether or not amortization is full, r is the loan's IRR <u>if all payments are made</u>, i.e. the APR or YTM

Fixed payment example

- 100K, monthly payments, 10 years, r=7%

1. With full amortization: m=$1,161.08
2. With 30K balloon: m=$ 987.76

Yield vs. return

- Yield (APR) is the lender's IRR if **and only if** all payments are made as planned
- In practice, borrowers default, fail to make payments on time, refinance or prepay when interest rates are low,…
- Causes transaction costs, and capital losses
- IRR<APR
- Riskier borrowers should pay more
- But paying more makes default more likely…
- Fixed point problem, which may or may not have a solution: market exclusion

GPMs: graduated payment mortgages

- Can we design a fully-amortizing mortgage with contract rate r whose payments grow by g% each period?
- Easy:
  1. Guess that the first payment is $1
  2. Calculate the corresponding payment schedule, and its PV at discount rate r, call it F
  3. First payment must be $m_1 = b_0/F$
  4. Rest follows trivially
- Logic: all payments are proportional to m_1, so is PV

Midterm-style question

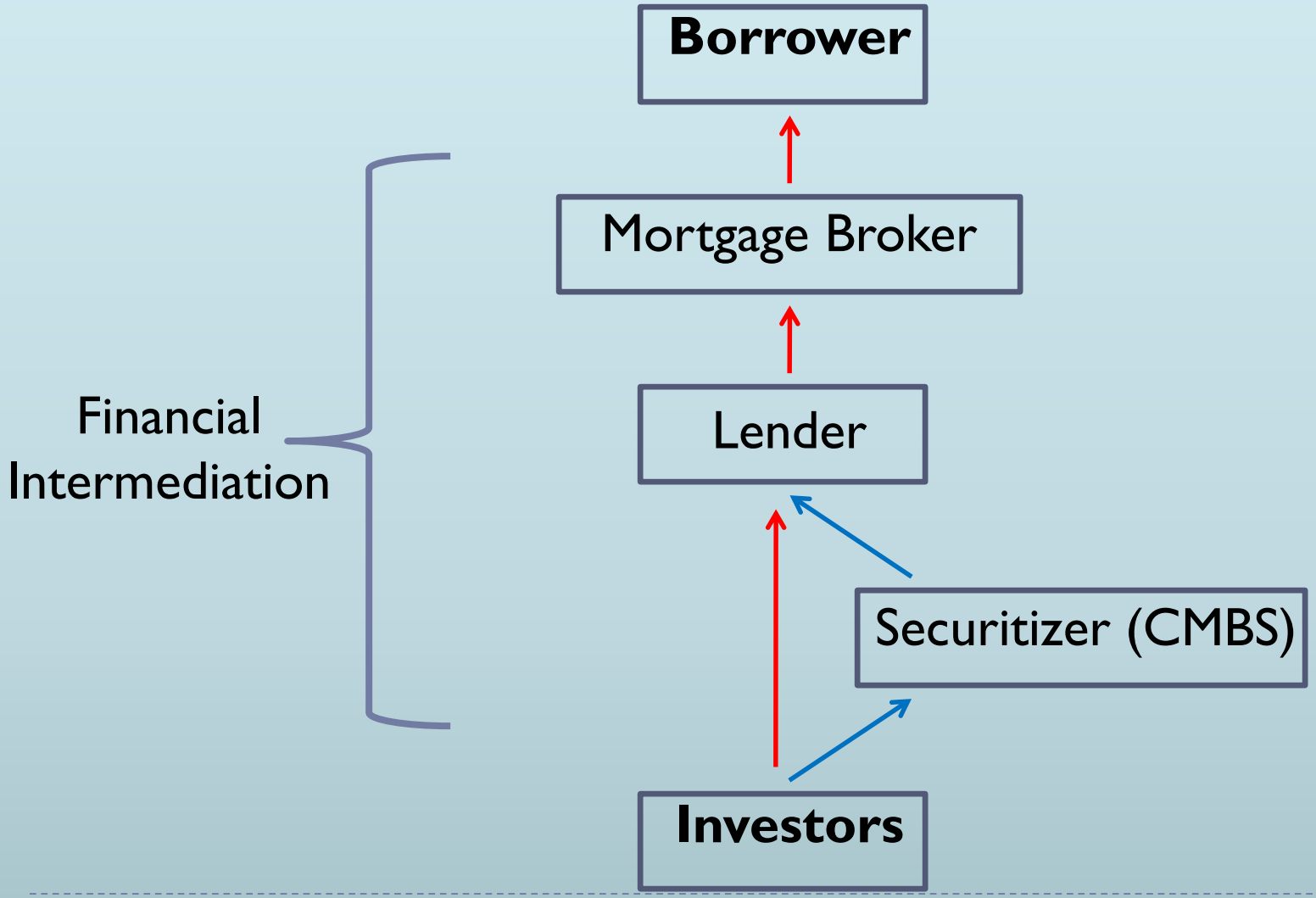
- A borrower obtained a 100K mortgage with 2 yearly payments (T=2), a 30K balloon, a rate of 7%, and payments that increase by 50% in year 2. What are the two payments?

- One unknown: m_1
- Indeed, $m_2 = 1.5\ m_1$
- One equation:

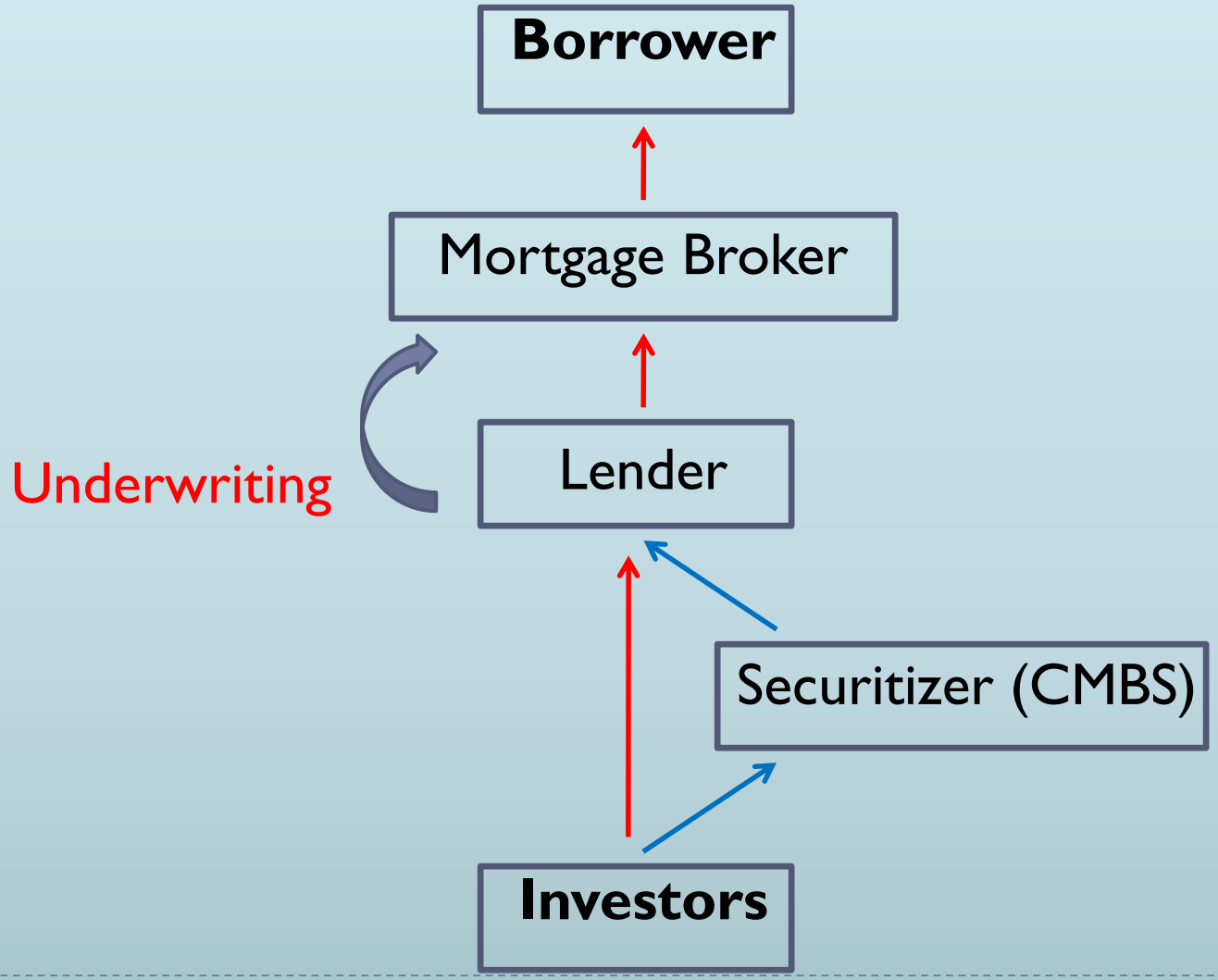
$$100K = m_1/1.07 + 1.5m_1/1.07^2 + 30K/1.07^2$$

- m_1=\$32,875.49, m_2=\$49,313.24

The mortgage process



Underwriting criteria



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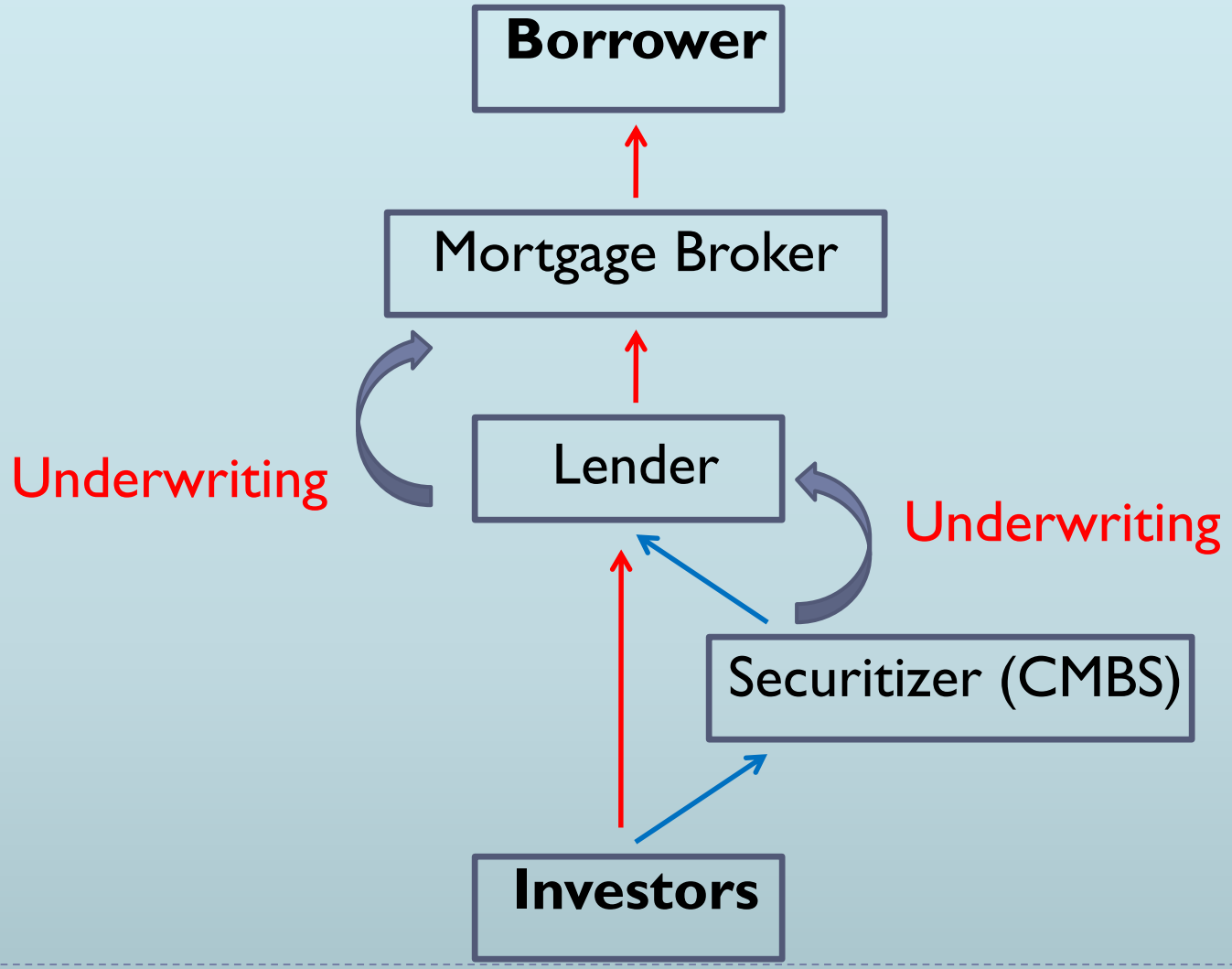

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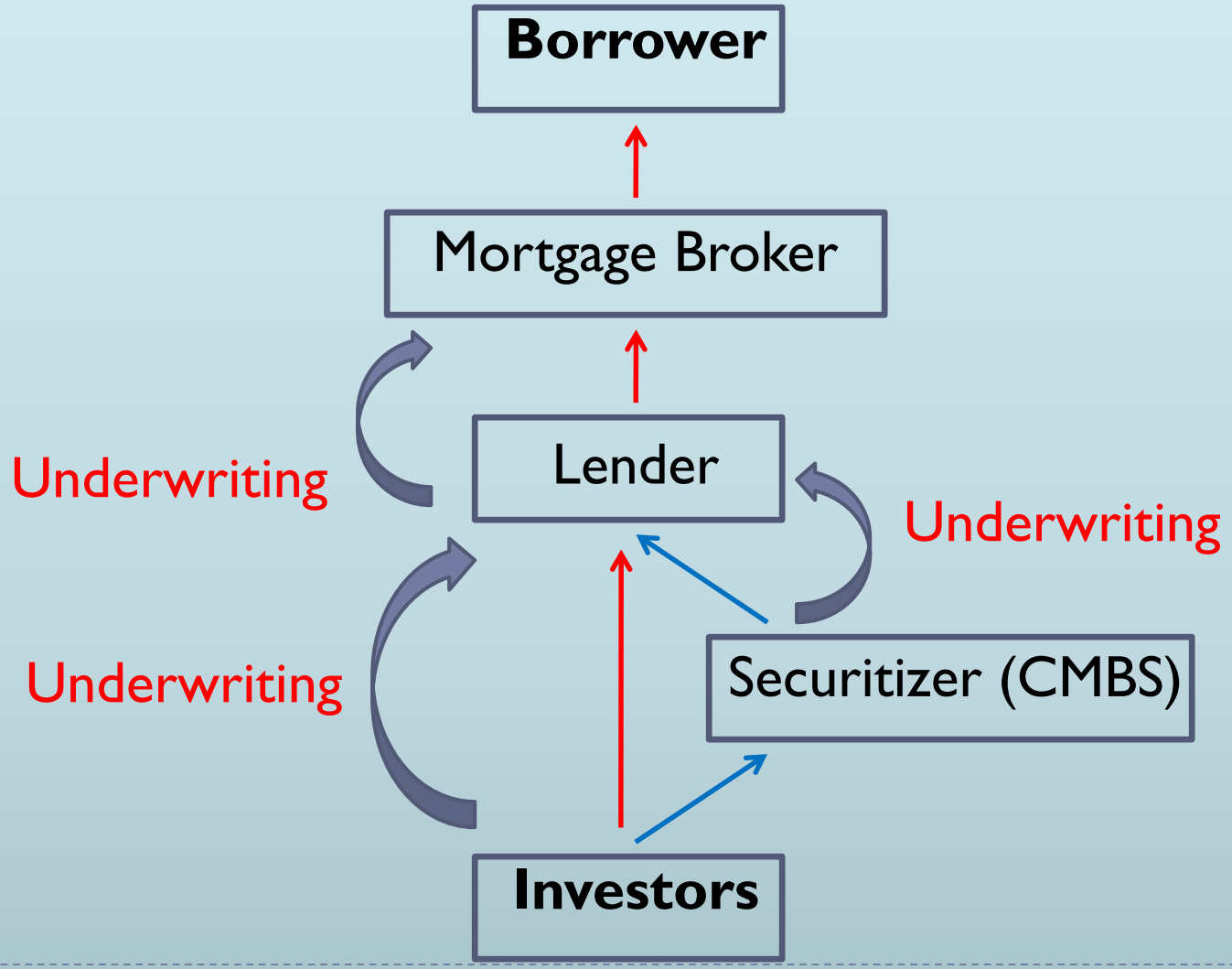


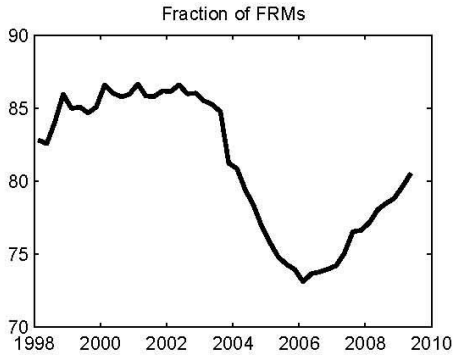
Underwriting criteria

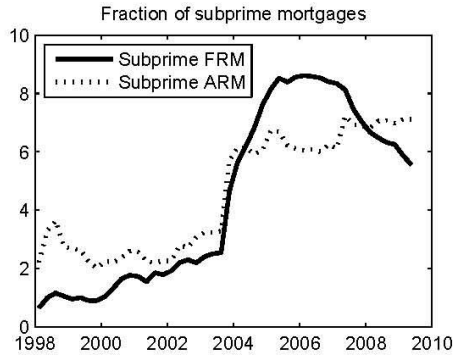
- Lenders tell brokers what they'll fund:
  1. Leverage (loan-to-value ratio)
  2. Credit worthiness of borrowers
  3. Proper documentation
  4. Ratio of projected cash-flows to debt-service
  5. …
- Likewise, securitizers tell lenders what they'll buy
- When secondary markets are involved, lenders pass underwriting standards on to brokers

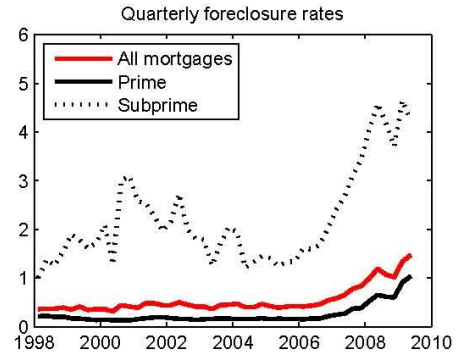
The foreclosure crisis

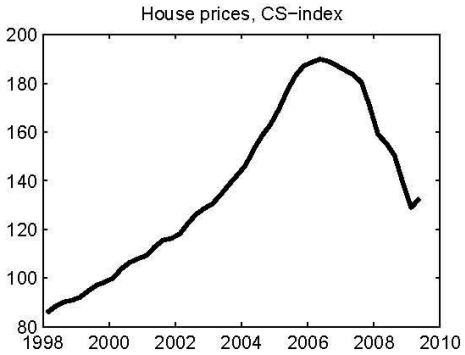
- Between 2004 and 2006, underwriting standards were greatly loosened in the residential market
- Low-down payment, delayed amortization products gained ground
- High-risk borrowers entered market, and products with slow build-up of equity proliferated
- When house prices collapsed in mid-2006, foreclosure rates skyrocketed like never before

Recent trends in US housing









Source: National Delinquency Survey, Mortgage Bankers Association

Solving the foreclosure crisis

- Almost all foreclosures involve negative equity…
- … but most households with negative equity do NOT foreclose absent something else
- Second trigger: income difficulties (e.g. job loss)
- Obama plan subsidizes loan modification. It won't help much.
- Instead, plan should offer mortgage payment vouchers to households with verifiable income difficulties
- This is the Wi-Fur/Boston Fed plan

REITs

- Real Estate Investment Trusts
  1. buy, sell and hold real estate assets on behalf of a diffuse shareholder base
  2. manage these and other assets
  3. **are not taxed at the corporate level**

- Three basic types: equity, mortgage, hybrid

- Can be public or private

- UPREITs (U for "umbrella") hold positions in corporations that invest in real estate, including other REITs

Brief history

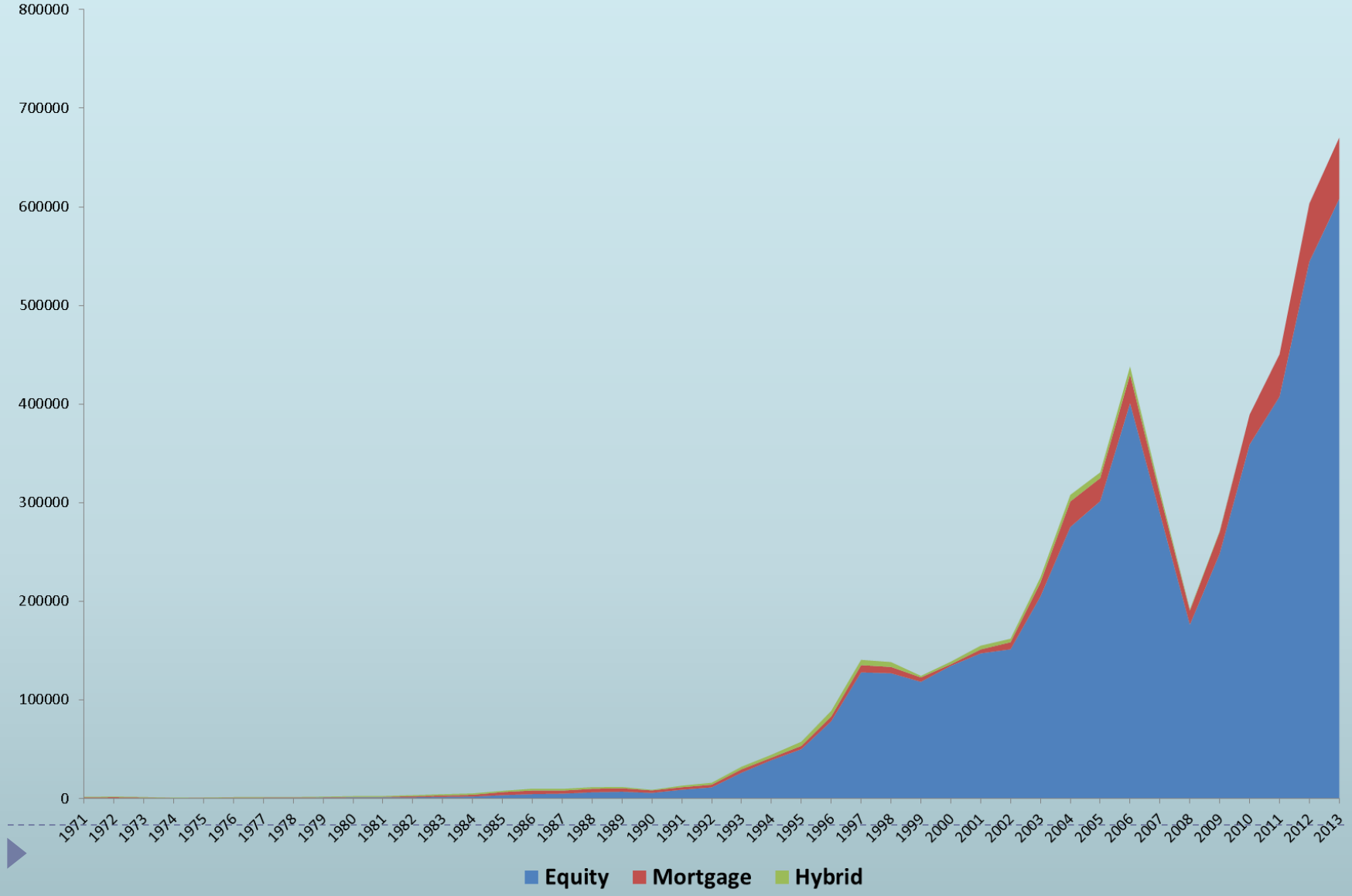
- REIT act, 1960: REITs may be treated as untaxed, pass-through entities provided they satisfy a number of requirements

- Current requirements include:
  1. 75% of holdings in RE, cash, or US paper
  2. 75% of income must come from rents, dividends, mortgage interest, gains from the sale of qualifying assets or holdings in other REITs
  3. **90% of taxable income must be distributed to shareholders***
  4. At least 100 shareholders
  5. Top 5 holders cannot hold more than 50% of shares

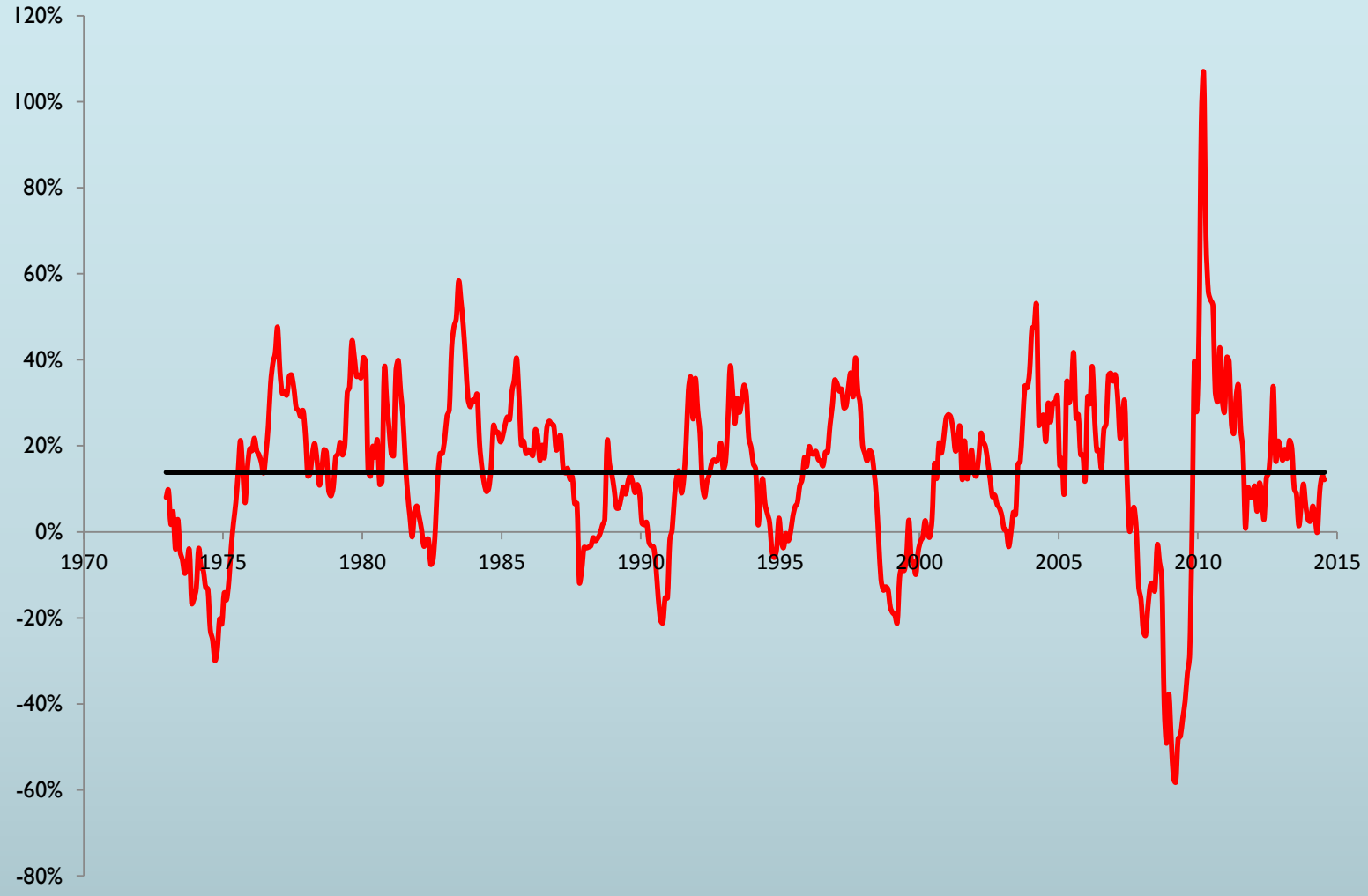
- 1986 tax reform removed two big downsides of REIT structure:
  1. Management activities were severely restricted
  2. Other forms of incorporations (LPs, especially) enjoyed preferential depreciation rules

- 1991 Kimco Realty IPO ushered in a new era for REITs

Market capitalization of Public REITs



Historical 12-month returns (e-REITs)



Mortgage-backed securities

- Basic idea:
  1. Pool a large number of mortgages
  2. Sell the pool as a security, or use the pool as collateral for one or more debt instruments (bonds)
- Purpose:
  1. Allow more investors to invest in real estate debt instruments
  2. Make that investment more liquid
  3. Pool/fine-tune risk

A machine to generate AAA paper

- Why did securitization take off after 2000?
- Among other things because AAA paper became scarce largely due to the global saving glut (US paper hogs)
- AAA paper lubricates many key markets, the repo market in particular
- Where to find it? There is, after all, only so many blue chip issuers
- Answer: CMOs
- Housing boom created endless supply of mortgages, only trick is to somehow issue safe bonds backed by unsafe assets
- Sounds crazy, but it "works": no AAA tranche of any CMO deal has defaulted to date (many have been downgraded, but none have formally defaulted)

The subordination theorem(s)

Theorem I: Risk-free debt can be written against a pool *if and only if* the worst-case scenario CF realization from the pool is strictly positive

Proof: Let A be the lowest possible CF realization associated with the pool. Make the quantity of debt small enough that the promise is A or less.

Theorem II: Debt with less than a probability p of default can be written against a pool *if and only if* the CF realization is strictly positive with probability 1-p

Proof: Let A be such that P(CF>A) > 1-p. Make the quantity of debt small enough that the promise is A or less.

How about them CDOs and CDO^{2}s?

- Junior tranches of MBS are often pooled into new deals, often out of necessity (*investors won't pay much for stand-alone B tranches*)
- If combining these tranches raises the lower bounds on overall cash-flows, more AAA paper can be produced with the right level of credit support
- The problem: getting the level of credit support right
- Top tranches of many CDO deals defaulted, which means that people overestimated the ability of pooling to dissipate risk

The game investment banks play

- If you get the following trivial point, you understand securitization better than most people who say they understand securitization

- Given a pool of assets, investment banks choose a feasible security scheme E to write against a given pool of assets to solve:

$$\text{Max } MV(E) - C(E)$$

where MV(E) is the market value of scheme E given investors' willingness to pay for various type of assets while C(E) is the cost of issuing that combination of securities and funding the assets

- After 2000, the scope of securitization widened markedly to include riskier pools of assets because the willingness to pay for top tranches made deals profitable that weren't before

Mortgage securitization: a short history

- The US government wanted liquid secondary markets for mortgages after the great depression: FNMA (1938), GNMA (1968), FHLMC (1970)
- Ginnie issues first pass-through in 1968
- Bank of America issues first private label pass-through in 1977
- Solomon Brothers and First Boston create the CMO concept in 1983

Securitization process

1. Mortgages are originated
2. Sold to and pooled by investment banker
3. Pool is used to create one or several securities:
    i. Mortgage-backed bonds (MBBs)
    ii. Mortgage pass-through securities (MPTSs)
    iii. Mortgage pay-through bonds (MPTBs)
    iv. Collateralized Mortgage Obligations (CMOs)

What is the fuss about securitization?

- Can reduce incentives for originators to do their homework
- Obfuscates risk
- Securitizers dictate what products are offered, for better or for worse
- Not particularly compelling, if you ask me…
- Much more compelling (heck, undeniable): higher demand for AAA made deals profitable that were not profitable before

Derivatives

- Derivatives are assets whose payoffs derive from some other asset or set of assets
- Example: swaps
- A swap contract stipulates an exchange of payoffs between two assets

Real estate swap

- Two parties exchange (risky) return from some real estate asset for a fixed return
- At origination, fixed rate is set so that the value of the swap is zero
- As time goes by, swap value rises or falls (symmetrically for the two counterparties)
- Swaps are traded in secondary markets, where investors can buy or sell exposure to real estate payoffs…
- …without the underlying asset being much involved

Real estate swap (continued)

- In practice, RE swaps involve returns on large indices such as NCREIF, for various subtypes of institutional properties
- Institutional Properties: large, safe, premium quality properties in which institutional investors invest
- Say you own lots of properties; to offset the risk associated with your investment, you sell the NCREIF return to Credit Suisse for a safe return
- Hedge vs. systematic real estate risk

Market has yet to take off

- Four possible explanations:
  1. No NCREIF forwards
  2. A redundant asset
  3. "Liquidity begets liquidity"
  4. Tough to price

- More success in Europe with IPD instruments

SWAP question example

Credit Suisse has agreed to write a swap for a client who wants to sell (short) the total NCREIF yearly return over the next 2 years in exchange for a fixed return. Credit Suisse expects the relevant NCREIF return to be 6% in the first year and 13% in the second year. Payments are made at the end of each of the two years. Credit Suisse decides that the appropriate discount rate for this contract is 10% a year.

What fixed return will Credit Suisse offer to the swap buyer?

Credit-default swap (CDS)

- Protection buyer owns asset subject to default (a MBS, say)
- Pays protection seller (AIG, say) fixed premia
- Seller covers default risk
- Perfect way to eliminate diversifiable risk
- Systematic risk remains, however
- Real-estate related CDS played a big role in the recent financial mess

CDS question example

AIG wants to sell a CDS on a Bond with two periods to expiration and notional=face value=100K. Default occurs in period 2 with probability 10% and would cause a loss of 20% of the face value for AIG.

What rate must AIG charge to generate an IRR of 5% on this deal?

Real estate returns

1. Indices
2. Surveys
3. Holy trinity
4. Asset pricing models

Real estate returns: indices

- *NCREIF property index* (NPI): "quarterly … total rate of return measure … of a very large pool of individual commercial real estate properties. …acquired, at least in part, on behalf of tax-exempt institutional investors"
- Return ≈ (NOI + capital gains)/(Initial market value)
- "Class A", premium, institutional quality properties

Two big issues with NPI

- *Coverage:* institutional properties (owned directly or via JVs by untaxed institutional investors), large MSAs

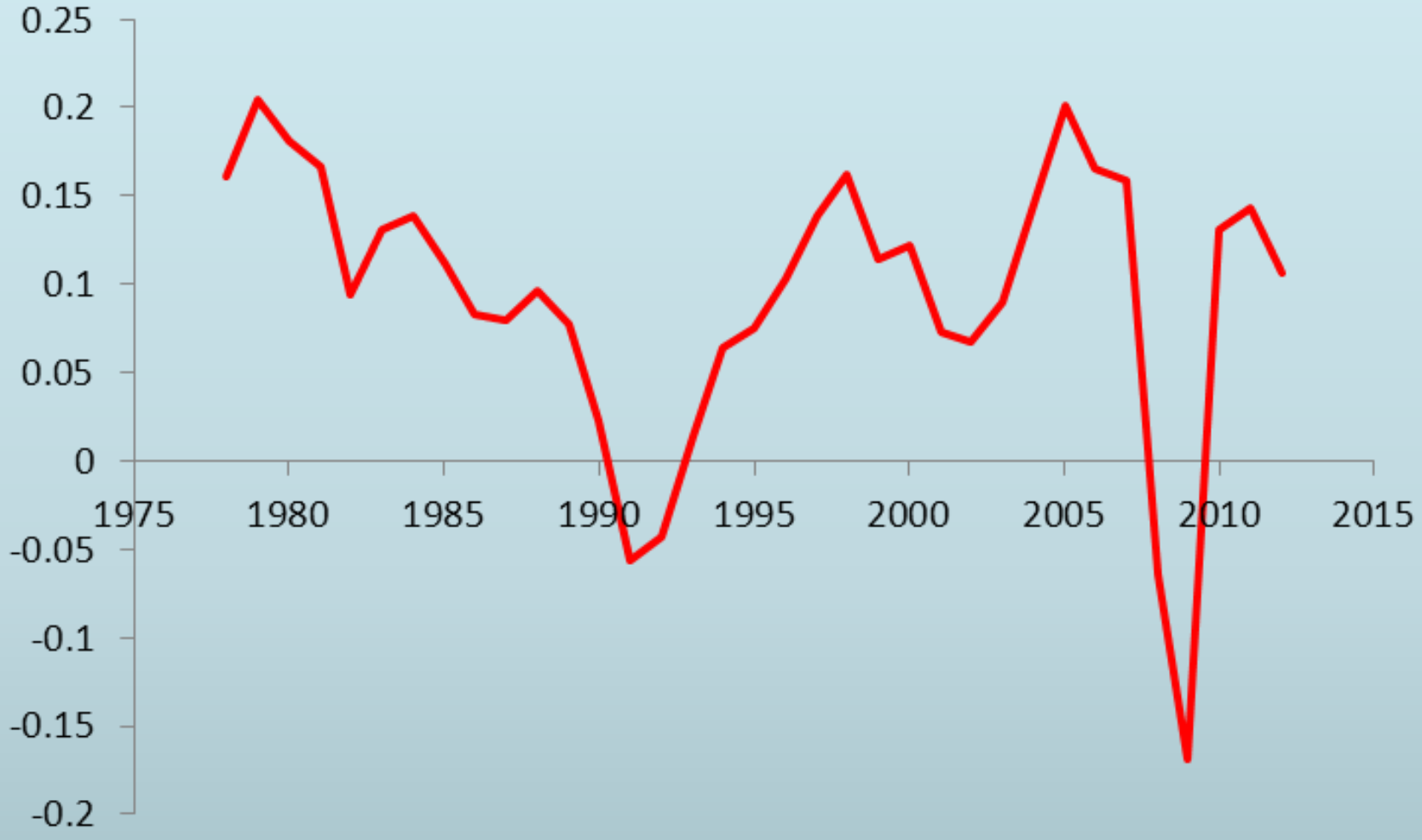
- *Market values*: value is based on transactions when possible, but on appraisals or estimates in most cases

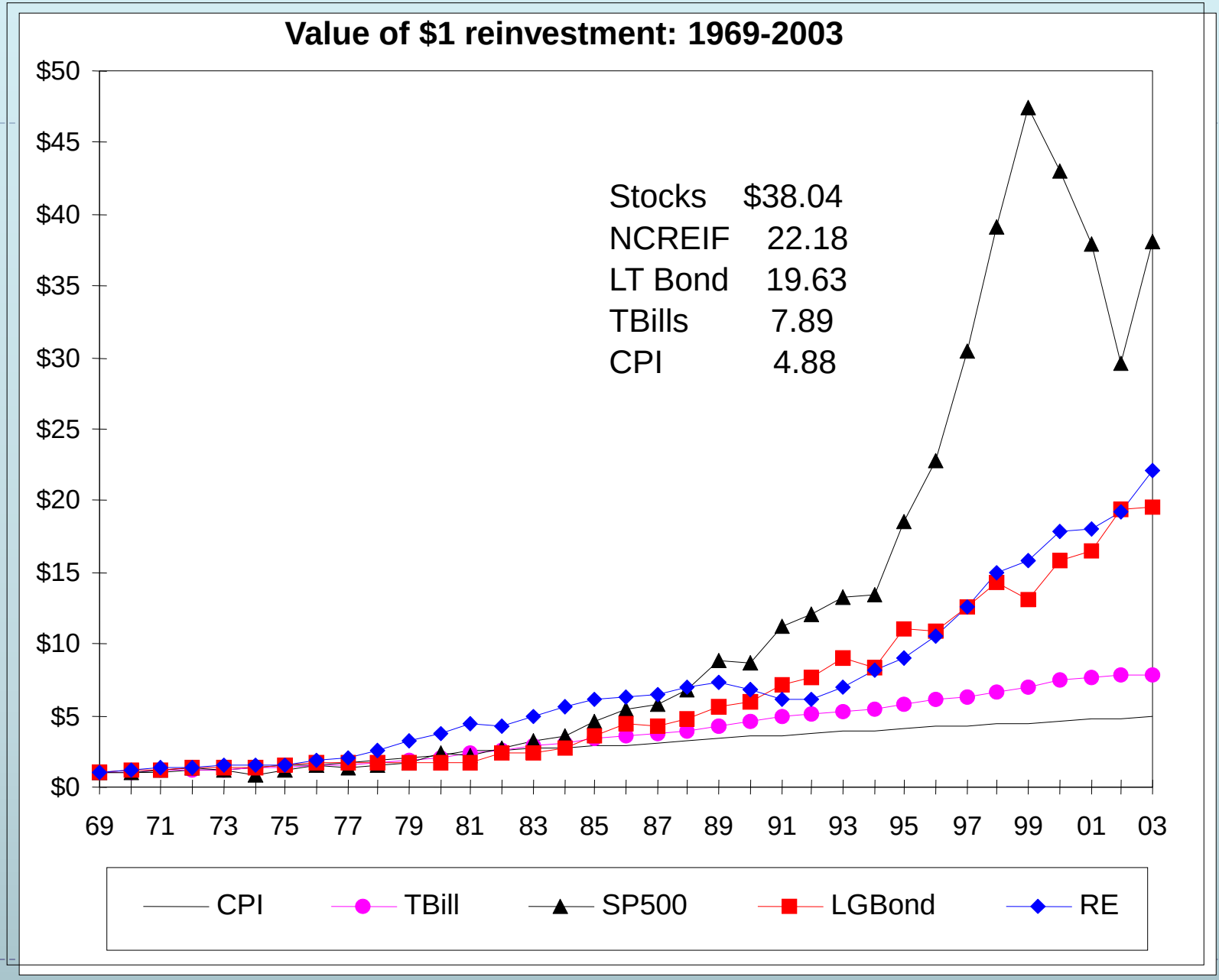
Historical evidence, 1970-2003

	Total Return	Volatility	Risk Premium
T Bills	6.30%	2.83%	NA
G Bonds	9.74%	11.76%	3.44%
Real Estate*	9.91%	9.02%	3.61%
Stocks	12.72%	17.48%	6.42%

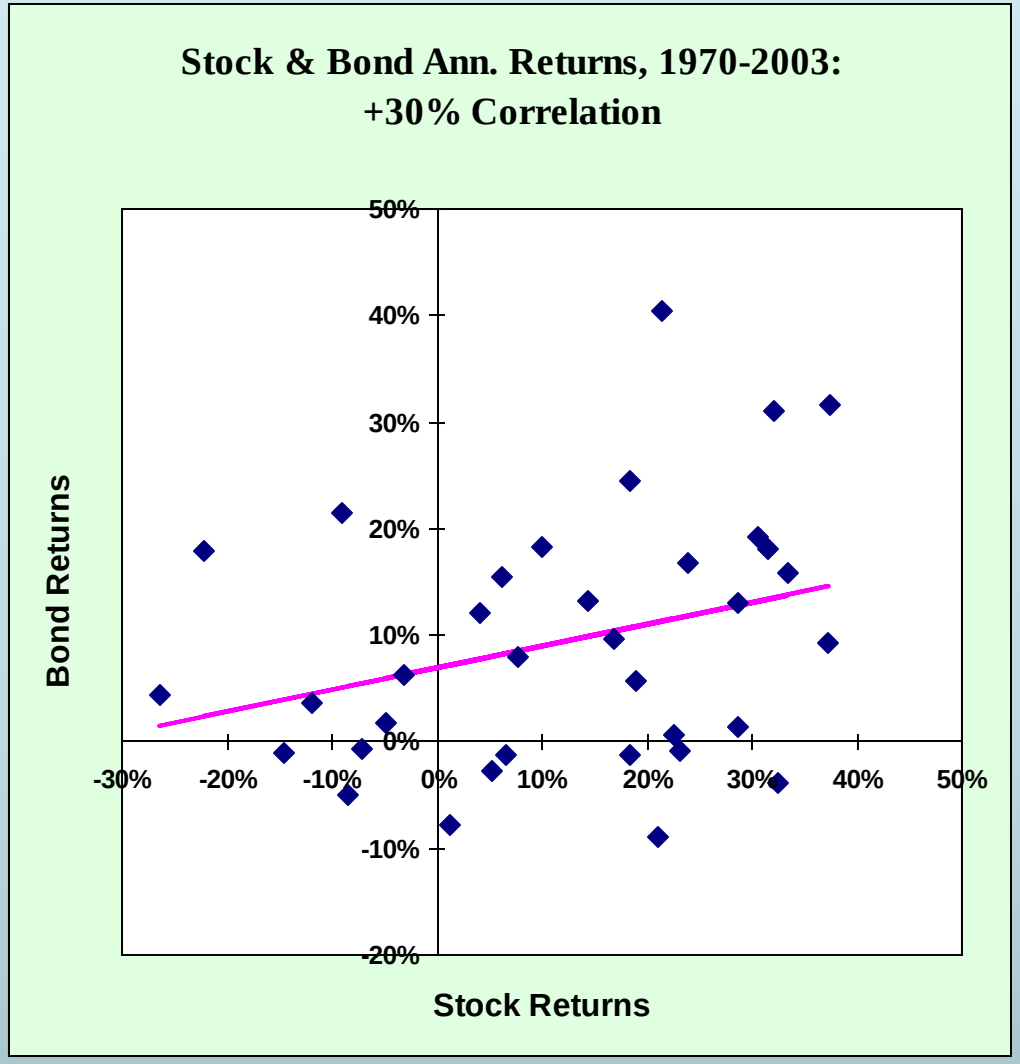
*NCREIF: large, institutional quality commercial properties

Annual returns on NPI index

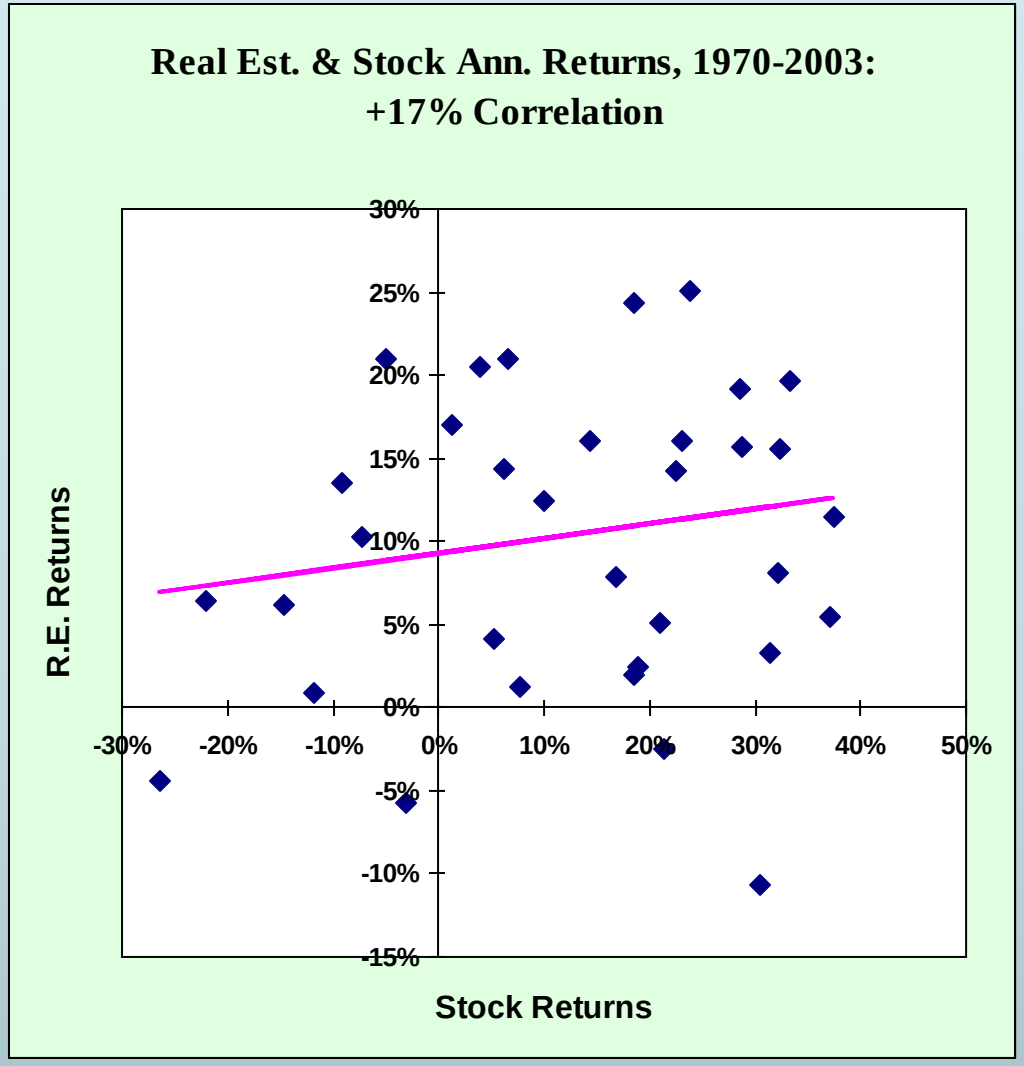



Value of $1 reinvestment: 1969-2003
$50
$45
$40
$35
$30
$25
$20
$15
$10
$5
$0
69
71
73
75
77
79
81
83
85
87
89
91
93
95
97
99
01
03
Stocks $38.04
NCREIF 22.18
LT Bond 19.63
TBills 7.89
CPI 4.88
CPI
TBill
SP500
LGBond
RE

Bond and stock returns



Real estate and stock returns



Real estate and bond returns

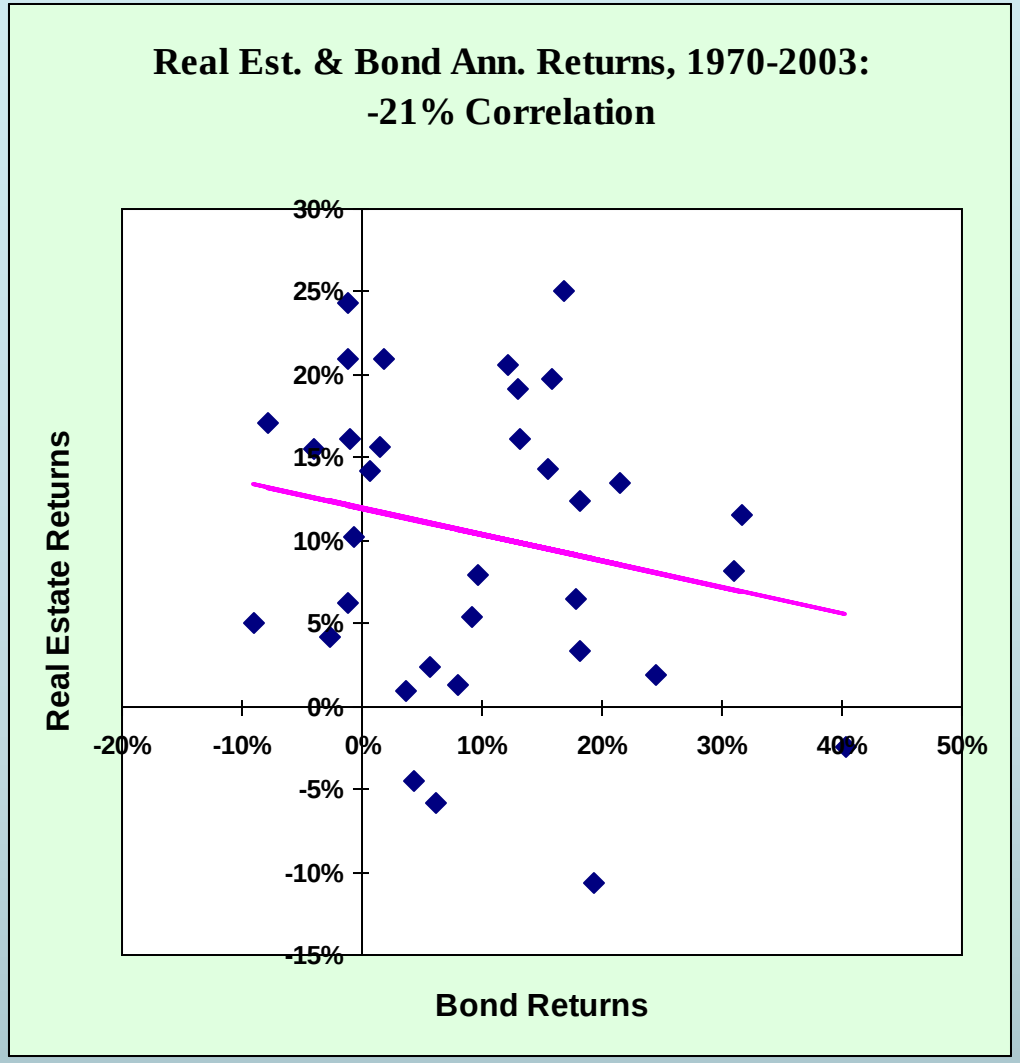


EXHIBIT 3: NCREIF APPRAISAL AND TRANSACTION CAP RATES

Source: NCREIF

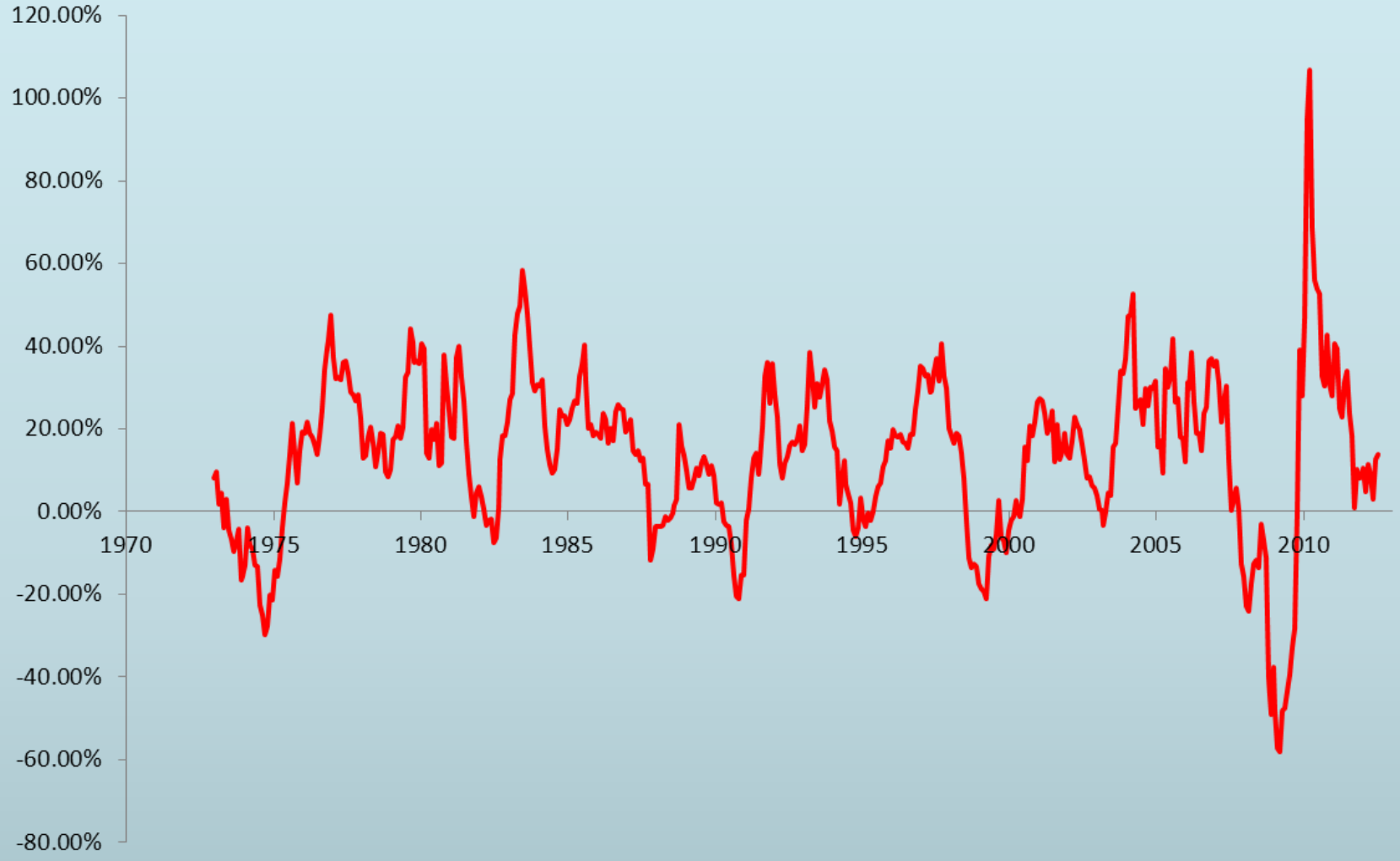
Cap rate sensitivity

	6% cap rate	7% cap rate	8% cap rate
Potential gross income	$1,000,000	$1,000,000	$1,000,000
Less vacancy loss (5%)	$50,000	$50,000	$50,000
Effective gross income	$950,000	$950,000	$950,000
Less expenses (50%)	$475,000	$475,000	$475,000
Net operating income	$475,000	$475,000	$475,000
Divided by cap rate	6%	7%	8%
Value conclusion	**$7,916,667**	**$6,785,714**	**$5,937,500**

Return to public equity investments

- *NAREIT indices*: indices that track the performance of various synthetic portfolios of investments in publicly traded REITs
- Capitalization-weighted, total return indices
- Broken down – conveniently -- by area and asset type

Historical 12-month returns (e-REITs)



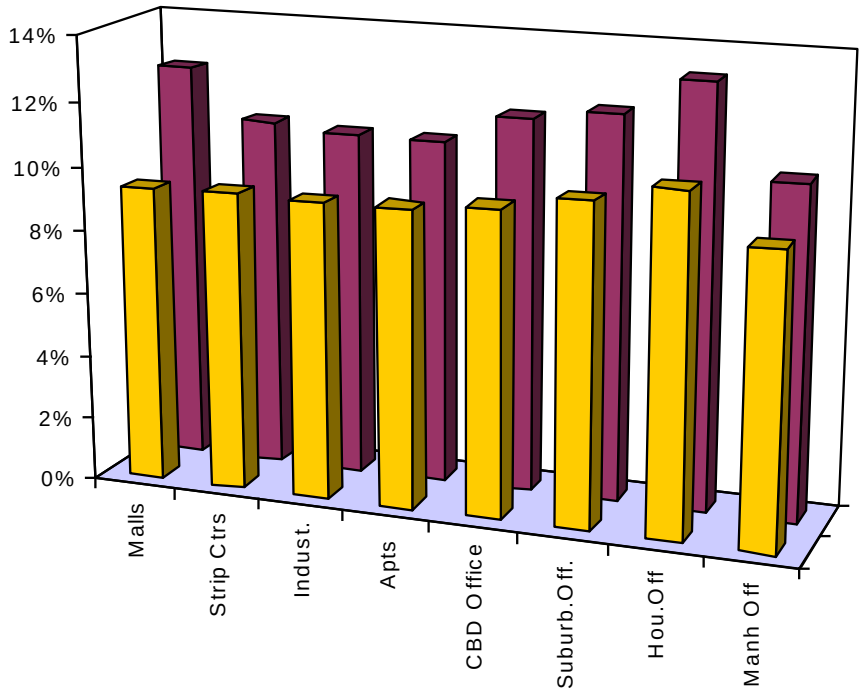
Issues with NAREIT returns

- Comparability:
  1. REIT investments are highly liquid, returns reflect that
  2. REITs tend to invest in class A properties
  3. Levered equity returns: must de-lever before use

- A volatile history:
  1. REIT Regulations have changed a lot since 1961
  2. Boom-bust cycles

Survey evidence

Exh.11-6a: Investor Total Return Expectations (IRR) for Various Property Types*

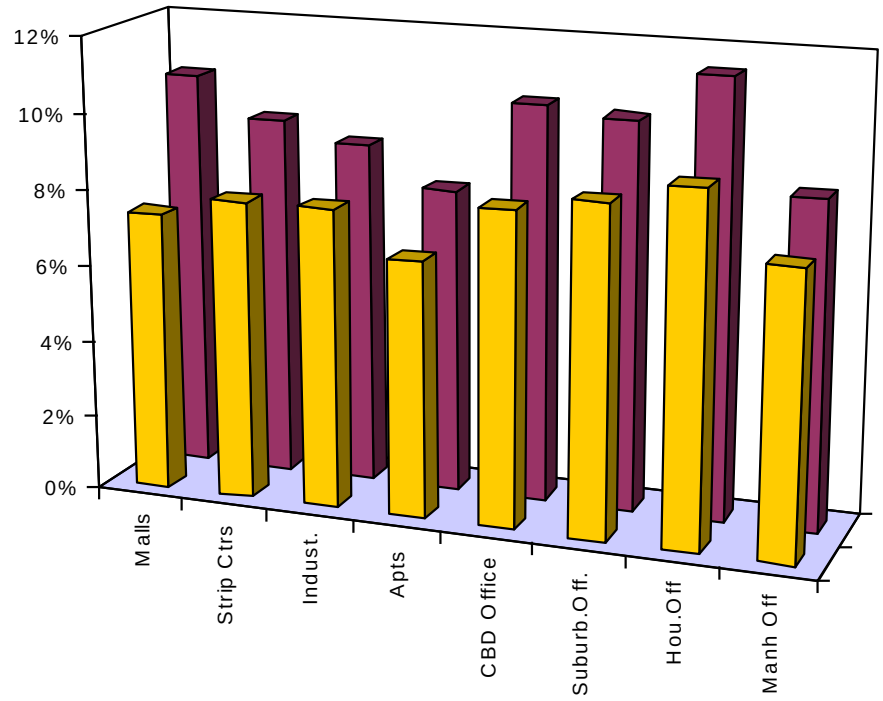


***Source: Korpacz Investor Survey, 1st quarter 2005**

	Malls	Strip Ctrs	Indust.	Apts	CBD Office	Suburb. Off.	Hou.Off	Manh Off
Institutional	9.27%	9.35%	9.28%	9.31%	9.56%	10.03%	10.58%	9.11%
Non-institutional	12.53%	11.00%	10.81%	10.80%	11.68%	12.05%	13.19%	10.38%

Survey evidence *(!! on NOI cap rates !!)*

Exh.11-6b: Investor Cap Rate Expectations for Various Property Types*



***Source: Korpacz Investor Survey, 1st quarter 2005**

	Malls	Strip Ctrs	Indust.	Apts	CBD Office	Suburb. Off.	Hou.Off	Manh Off
Institutional	7.33%	7.86%	7.88%	6.74%	8.26%	8.63%	9.19%	7.45%
Non-institutional	10.51%	9.50%	9.02%	8.00%	10.38%	10.18%	11.44%	8.59%

Issues

- Survey data, enough said

“Practice?
You wanna talk about practice?”

(Allen Iverson, a.k.a “The Answer”)

We wanna talk about practice

- Sometimes, practice meshes well with theory
- Sometimes, it does not
- Common sense based approach dominate practice
- We want to discuss these methods because:
  1. they are time-tested
  2. they are the industry standard
  3. we all need jobs

Cash-on-cash returns

- CoC return = Cash flow in year 1 / Initial cash investment
- Total cash return = (CF in year 1+ Loan reduction + …)
  / Initial cash investment
- Rule: invest provided cash return exceeds some threshold

Required cap rates/Band of investment

- Required cap rate = LTV x mortgage constant
  + (1-LTV) x required return on equity

- Rule: invest if actual cap rate > required cap rate

Front-door/Back-door analysis

- Front-door criterion: What rent must the property earn **to cover acquisition and development costs**?
- Rule: invest if the property is expected to produce that rent
- Back-door criterion: Given market rent, what is the maximum **supportable acquisition and development cost**?
- Rule: invest if the cost is below that upper-bound

A word about the global property market

- The largest global investors are institutional (pension funds, sovereign funds, insurance companies…)
- Institutionally investable RE is estimated around $16trn (**1.15** x US GDP)
- Institutions are loath to invest RE directly because it is illiquid, lumpy, requires careful monitoring…
- Instead, they invest via listed (reits) and unlisted (funds) vehicles
- Funds can be open-ended (allow new investment and redemption) or closed-ended (funds are raised once and for all and deployed for a fixed period of time)
- Funds are classified as core, core-plus, value-added and opportunistic
- The fund model worked well until 2008, but has been under pressure since then
- Investors are asking for more control and more manager investment
- What will the new fund model look like?
- Read Baum and Hartzell (2011) for more

Summary

- The arbitrage principle
- Two basic asset pricing methods: multiple, DCF
- Real estate multiples: GRM, Cap rates
- Holy trinity of real estate finance: $r \approx y + g$
- Real estate assets: properties, and beyond
- Debt/Equity, Private/Public
- REITs, CMBS', derivatives
- The "capital stack"
- Basic mortgage algebra, YTM, **APR**