



# Risk Transfer in Public Pension Plans



Pension Research Council

The Wharton School

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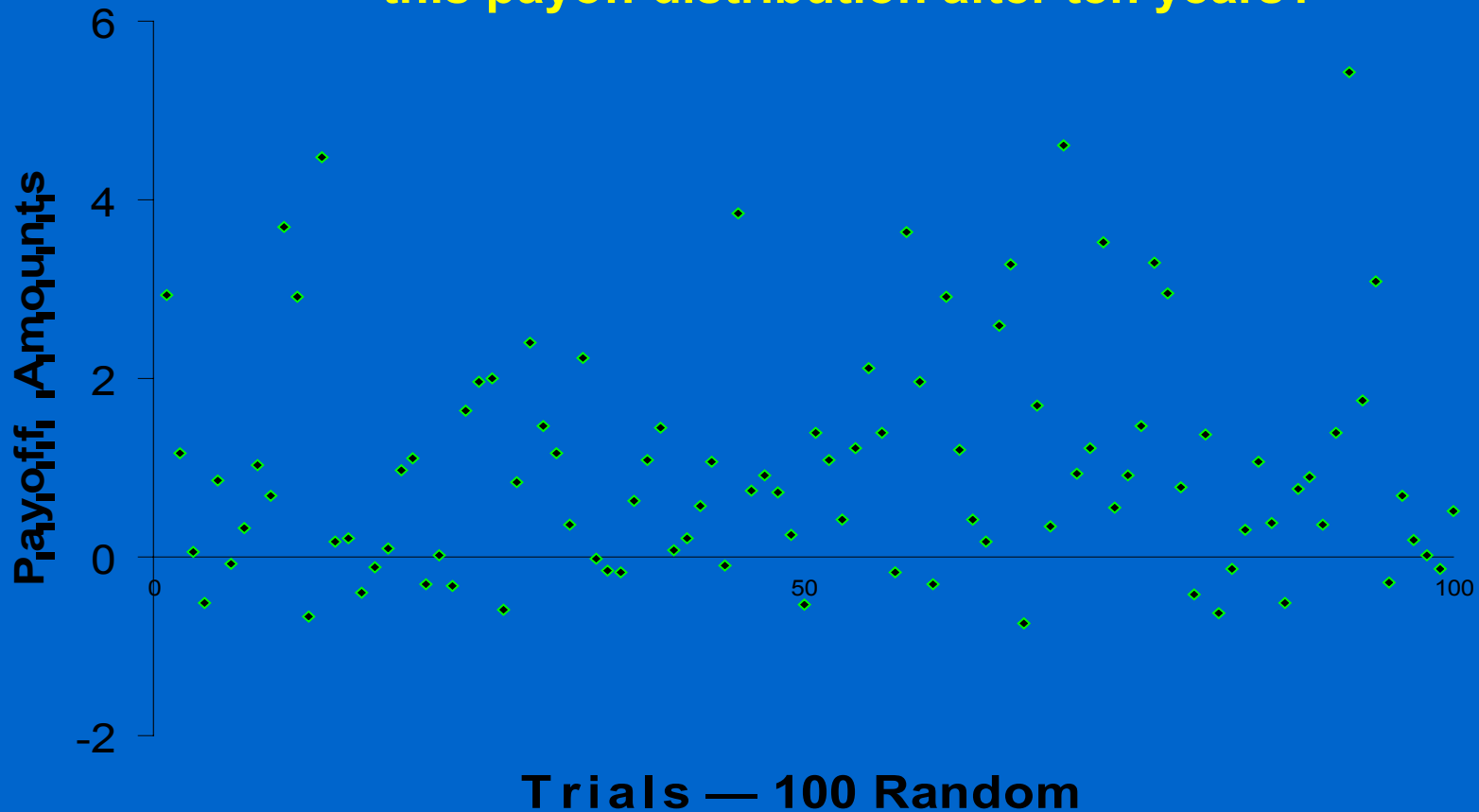


# Outline

- Intuition - “Bader Swap”
- Harvard Mayor Meets Wharton Taxpayer
- Implications
  - Wage/Pension Negotiations
  - Skim Funds
  - Pension Obligation Bonds (POB’s)
- Conclusion

# Intuition

How much will you pay today to receive this payoff distribution after ten years?

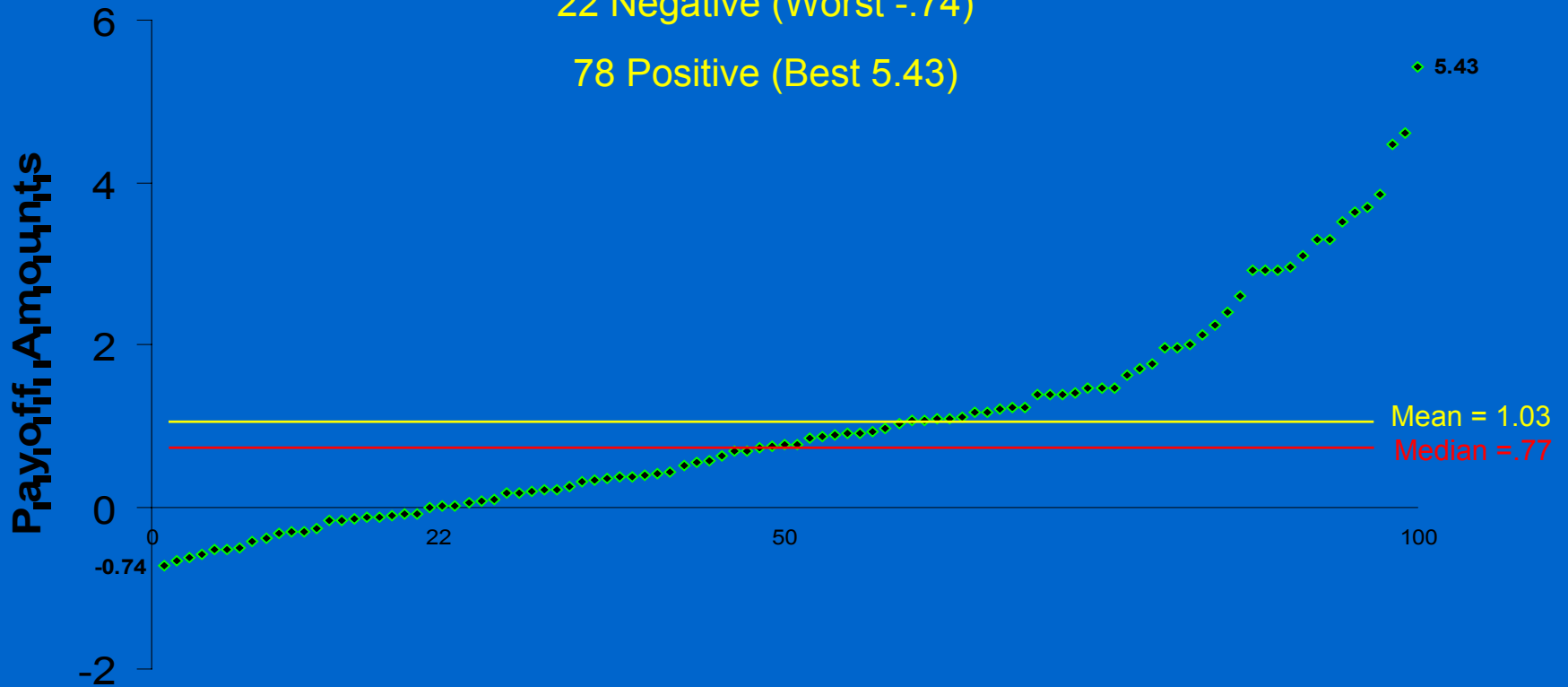


# Intuition

## Rank Ordered

22 Negative (Worst -.74)

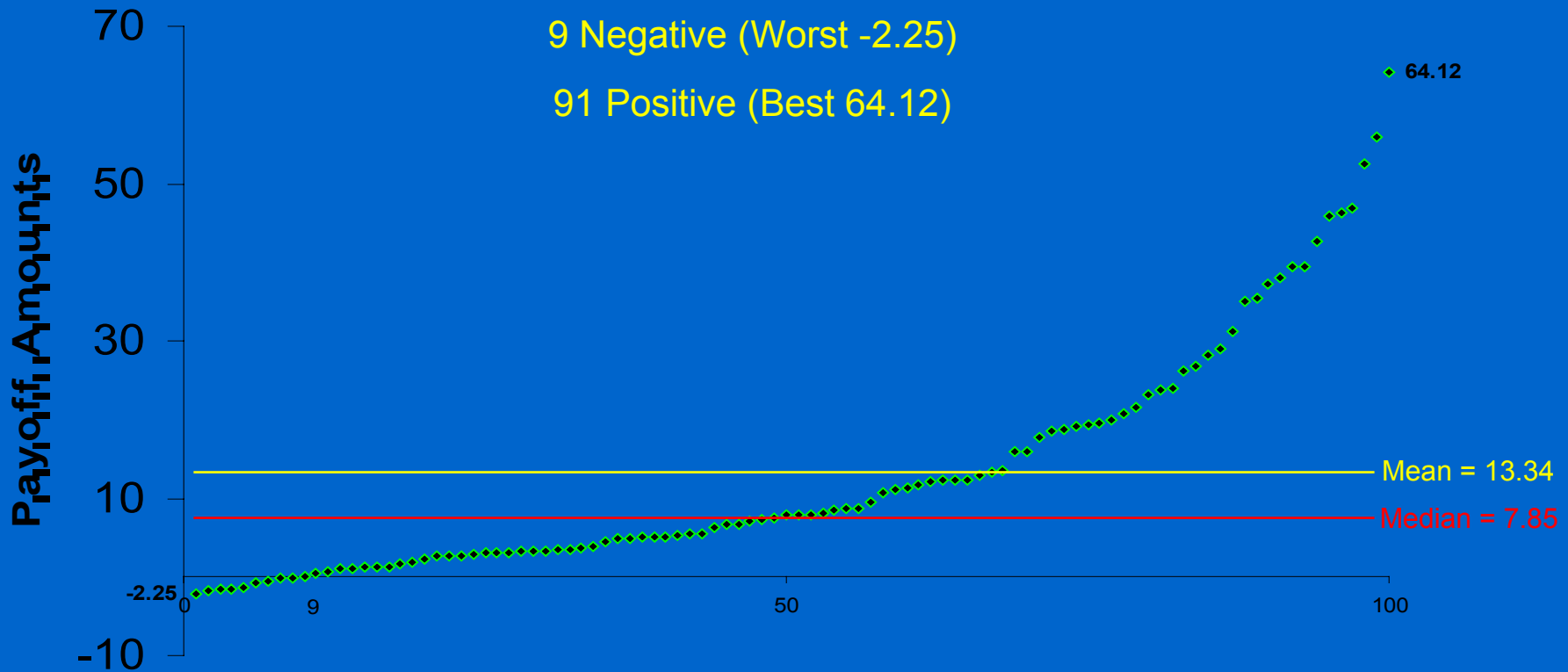
78 Positive (Best 5.43)



**Trials — 100 Random**

# Intuition

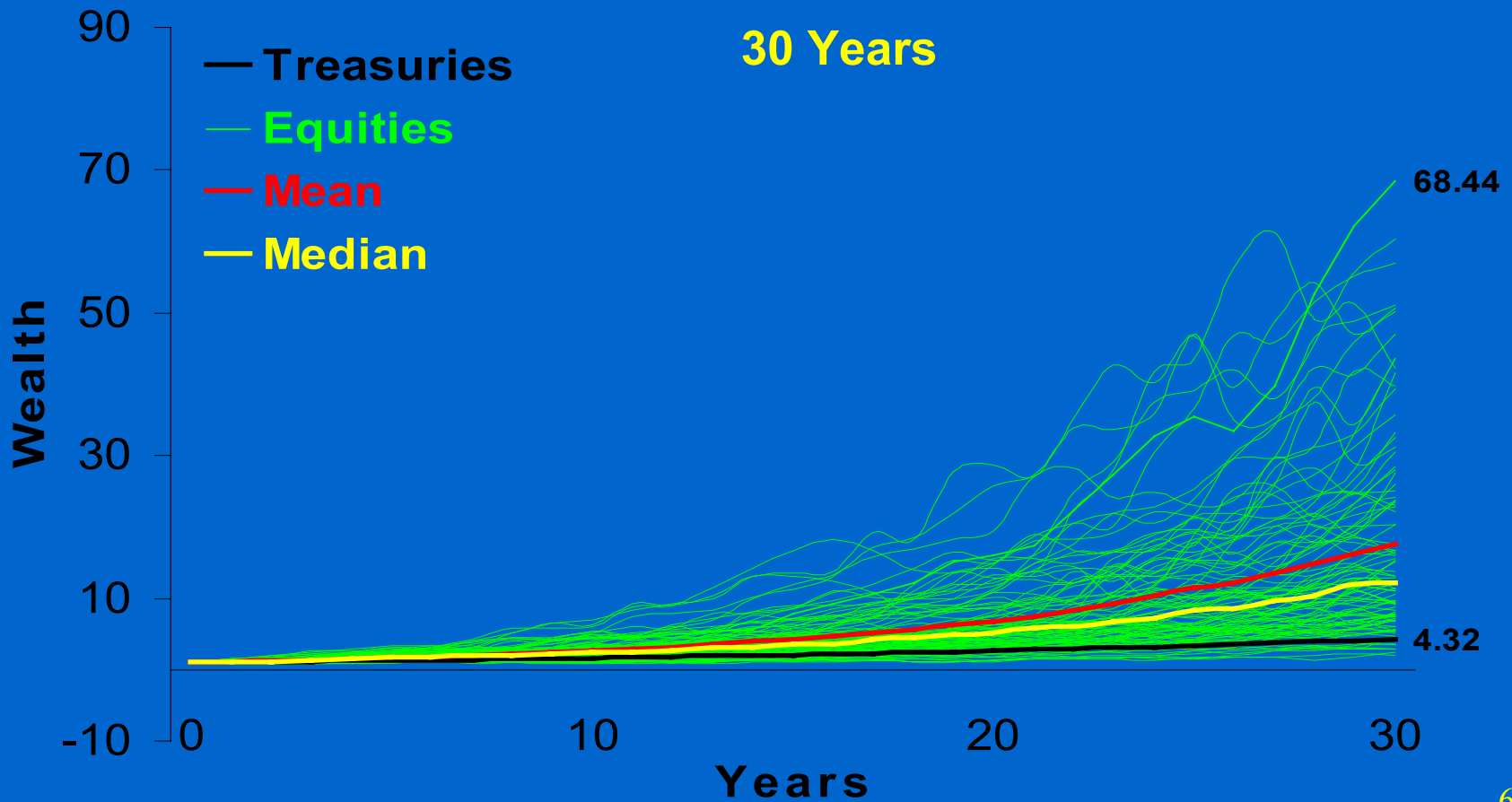
How much will you pay today to receive this payoff distribution after thirty years?



# Intuition - “Bader Swap”

## Equity vs. Treasury

30 Years



# Intuition - “Bader Swap”

This Favorable Looking  
Distribution  
is Worthless



## Intuition - Public Plan Bader Swap

- A Big City (ABC) pension plan has:
  - Sole obligation to be paid in 30 years of \$4.32
  - \$1 30-year Treasury zero will pay \$4.32
- Perfect Match
- Actuary assumes same 5% rate offered by 30-year zero because ASOP 27 requires use of expected return on plan assets.
- Actuarial liability value is \$1.



## Intuition - Public Plan Bader Swap

- Mayor (HBS MBA) learns about ASOP 27
- He directs plan to sell T-zero and buy S&P index with 10% expected return.
- Actuary assumes 10%
- Actuarial liability value is \$.25.
- Mayor cuts taxes by \$.75.
- Actuary says plan is fully funded with \$.25.

## Intuition - Public Plan Bader Swap

- Mayor directs a “Bader Swap”
- Actuary reduces liabilities by \$.75
- \$.25 in equity has same actuarial power as \$1 in Treasuries
- An apparent money machine

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# Harvard Mayor Meets Wharton Taxpayer

- More formal model:
  - Now: Gen1 working, Gen2 is in school
  - Next: G1 retired, G2 at work, G3 at school
  - Then: G1 dead, G2 retired, etc.
- M members of each Gen, G of whom work for ABC
- Gen1 designs DB plan,  $\$M/G$  paid each retiree, equals \$1 per taxpayer.

# Harvard Mayor Meets Wharton Taxpayer

- Per ASOP 27 depending on expected returns:
  - Treasury with  $i = 5.2632\%$   $\Rightarrow$  \$.95
  - S&P with  $i = 9.8901\%$   $\Rightarrow$  \$.91
- In each case, we expect \$1 at period end.
- With Treasuries, all Gens pay certain \$.95
- With S&P, Gen1 pays certain \$.91 towards Gen1 retirees; Gen2 wins or loses Gen1 bet (expectation = 0) and pays certain \$.91 for Gen2 retirees; later Gens just like Gen2.

## Harvard Mayor Meets Wharton Taxpayer

- Actuary says every generation expects to pay \$.91 => fair and unbiased system.
- Mayor is satisfied.
- A Gen2 Wharton student notes that Gen1 pays a certain \$.91 while she faces uncertain cost expected to equal \$.91.
- She develops balance sheets for Gen1 and Gen2:

# Harvard Mayor Meets Wharton Taxpayer

## Gen1 Balance Sheet, Period 1

Assets	Liabilities
Personal portfolio	\$.91 payable now

## Gen2 Balance Sheet, Period 1

Assets	Liabilities (due Period 2)
Personal portfolio:	\$.91 expected
\$X S&P	
\$Y T-bills	Risk of Gen1's S&P investment

# Harvard Mayor Meets Wharton Taxpayer

- She reformulates the plan risk in terms of S&P exposure:

**Gen2 Balance Sheet, Period 1, Analyzed**

Assets	Liabilities (due Period 2)
Personal portfolio:	\$.91 for Gen2 employees
\$X S&P	1.00 for Gen1 retirees
\$Y T-bills	-(.91 S&P in plan as of Period 1)



# Harvard Mayor Meets Wharton Taxpayer

- She:
  - has studied hedging and arbitrage
  - can tolerate  $\$X$  of S&P risk.
  - sells  $\$.91$  of S&P in personal portfolio
  - buys  $\$.91$  of Treasuries.

## Gen2 Balance Sheet, Period 1, Hedged

Assets	Liabilities (due Period 2)
Personal portfolio:	$\$.91$ for Gen2 employees
$\$(X-.91)$ S&P	1.00 for Gen1 retirees
$\$(Y+.91)$ T-bills	$-\$.91$ S&P in plan a/o Period 1

# Harvard Mayor Meets Wharton Taxpayer

She projects her balance sheet forward:

## Gen2 Balance Sheet, Period 1, Hedged

Assets	Liabilities (due Period 2)
Personal portfolio:	\$.91 for Gen2 employees
\$(X-.91) S&P	1.00 for Gen1 retirees
\$(Y+.91) T-bills	-\$\$.91 S&P in plan a/o Period 1

## Gen2 Balance Sheet, Period 2, Projected

Assets	Liabilities
Personal portfolio	\$.91 for Gen2 employees
\$X* S&P	\$.042105 for Gen1 retirees
\$Y* T-bills	

\* Plus one period returns

# Harvard Mayor Meets Wharton Taxpayer

To compare to Gen1 in Period 1:

Gen2 Balance Sheet, Period 2, Projected

Assets	Liabilities
Personal portfolio	\$.91 for Gen2 employees
	<b>\$.042105 for Gen1 retirees</b>

Gen1 Balance Sheet, Period 1

Assets	Liabilities
Personal portfolio	\$.91 payable now

# Harvard Mayor Meets Wharton Taxpayer

- Gen1 pays: \$ .91
- civil servants get: \$ .95
- bargain: \$ .04
- Gen2 pays \$ .952105
- civil servants get: \$ .95
- loss: \$ .002105
- Final GenN loses: \$ .042105
- Gen1 “borrows” .04
- Gen2 etc. pay interest
- GenN pays off loan

# Harvard Mayor Meets Wharton Taxpayer

- Equities not problem
- ASOP 27 is the problem
- ASOP 27 may motivate Mayor
- ASOP 27 => Equity, not vice versa
- “Damages” of \$.002105 seem very small, but
- $.95^{30} = .21$
- $.91^{30} = .06$
- Gen1 pays .06 with no risk
- Gen2 pays .78
- GenN pays .94

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# Implications

- Intergenerational wealth/risk transfers
- And bad decisions in re:
  - Wage/Pension Negotiations
  - Skim Funds
  - Pension Obligation Bonds (POB's)

## Implications - Wage/Pension Negotiations

- Fair liability value .21
- ASOP 27 value .06
- Any wage concession less than .21 is a real gain for employees.
- Any wage concession above .06 is an apparent gain for taxpayers.



# Implications - Skim Funds

- DB contract
  - Employees own the plan liabilities not the assets
- Public plans go to equities over time
- Skim funds are call options on assets
- Adopted skim funds  $\Rightarrow$  0 equities

# Implications - POB's

- Bader-Swap application
- City borrows at taxable rate  $c > t$
- Proceeds  $\rightarrow$  plan, expect equity  $r > c$
- Plan costs  $\downarrow$  more than debt service  $\uparrow$
- Parse
  - Borrow at  $c$ , invest at  $t$       LOSER
  - Borrow at  $t$ , invest at  $r$       BADER-SWAP

# Implications

- Fundamental actuarial bias anticipates risky returns before the risk is taken.
- Misvaluation lead to multiple schemes allowing current taxpayers, employees, politicians and investment bankers to exploit future taxpayers.
- Actuaries invite arbitrage, injure constituents.

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# Conclusion

- Bader Swap shifts value between taxpayer generations.
- Ignoring the price of risk invites arbitrage and exploitation.
- Financial engineers, mba's, cfa's and investment actuaries know this; the "fair value" paradigm is reforming accounting.
- Pension actuaries (and ASOP 27) need reformation as well.



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