Financial Economics and Actuarial Science

Jeremy Gold

Pension Roundtable

Public Policy & Professional Standards

NYU — November 18, 2004

Outline

- Introduction — financial economics concepts 2
- Investment 12
- Accounting 39
- Funding 47
- Design 58

Introduction

- Crossroads for DB plans
- Science/professionalism today
- Client issues at Spring meeting
- Impact
  - Public policy
  - Professional standards
- Revitalization

Concepts

- Efficiency
- Frictions
  - lack of transparency
  - transactions costs
  - taxes
  - regulatory barriers
  - costly bankruptcy
- Transparency
- Arbitrage

Concepts

- No-Arbitrage Pricing – law of one price
- With frictions – an arbitrage-free range of prices
- Modigliani-Miller (1958)
  - No-arbitrage argument – frictionless environment.
  - The mix of debt and equity used to finance a business (its capital structure) has no effect on the firm's value.
  - More interesting results occur when frictions are considered – tax arbitrage, costly bankruptcy, costly information.

Concepts

- Modern Corporate Finance – (theory of the firm) – one of two main branches of financial economics –includes:
  - Capital structure – securities issued by the firm – its "liability" side
  - Pension Finance (our area today) which carries implications for
    - Investing pension assets
    - Pension accounting
    - Funding rules and the role of the PBGC
    - Benefit design
  - Agency Theory (Jensen and Meckling, 1976)

Concepts

- Agency Theory
  - *Agents* make decisions that affect *principals*
  - Agents have their own preferences
  - Lack of transparency (asymmetric information)
    - Costly monitoring
    - Costly transparency
    - Agents help themselves
    - Incentives

Concepts

- Other main branch – Portfolio Selection and Asset Pricing:
  - Efficient Frontier – Markowitz (1952)
  - Capital Asset Pricing Model – Sharpe (1964)
  - Option Pricing Model – Black-Scholes (1973)
  - Arbitrage Pricing Theory – Ross (1976)
  - Term structure models – e.g., Cox-Ingersoll-Ross (1985)
  - Three-Factor Asset Pricing – Fama-French (1992+)

Concepts

- Actuaries generally need to learn about asset pricing not in order to price assets but rather in order to value liabilities.

- When insurance actuaries talk about financial economics they usually refer to:
  - Option models to value product guarantees
  - Term structure models to measure and manage interest rate risks

Concepts

- Pension actuaries espousing “financial economics” get many of their concepts from Modern Corporate Finance:
  - Arbitrage
  - Transparency
  - The single price of market risk
  - Agency theory
  - Bankruptcy
  - Tax arbitrage

Concepts

- Questions
- Discussion

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Investment

- Equity bias in actuarial methods and assumptions

- Modigliani-Miller + taxes => all bonds

Bodie-Gold-Kra (2001) - SOA Session 37, Dallas Spring Meeting

Bader (2003) , Gold-Hudson (2003) - Pre-roundtable Papers

Investment

Equity Bias

- Framework
- Sole Shareholder Owns
- Shareholder Indifference
- Base Case
- Swap
- Mis-Measurement
- Review

Investment
Equity Bias

Framework

- Modigliani-Miller
- Transparency
- Sole shareholder alternative
- Ignoring taxes
- Generalizes to public companies
- Generalizes to government pension plans

Investment
Equity Bias

Sole Shareholder Owns

Large diversified portfolio

+

Company assets - company debts

+

Pension assets - pension liabilities

Investment
Equity Bias

Shareholder Indifference

Pension assets +/- publicly traded assets

+

Diversified portfolio -/+ publicly traded assets

=

Pension assets + diversified portfolio

=>

S/H ability to offset

=>

S/H indifference to pension allocation

Investment
Equity Bias

Base Case

Pension assets ($1 million)

=

Bonds

=

Liability cash flow

Investment
Equity Bias

Swap

Pension assets - bonds + S&P

+

Diversified portfolio + bonds - S&P

=

Pension assets + diversified portfolio (unchanged)

Investment

Equity Bias

- Framework
- Sole Shareholder Owns
- Shareholder Indifference
- Base Case
- Swap
- Mis-Measurement
- Review

Investment
Equity Bias

Mis-Measurement

- Actuaries misvalue a worthless swap
- FAS87/CICA3641/IAS19 use expected return (e.g., S&P = Bonds + 6%)
- Earnings increase by $60,000 (6%)
- With 15:1 P/E, Capitalized swap = $900,000

Investment
Equity Bias

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See Vancouver – June 2003 – Coronado and Sharpe

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Equity Bias

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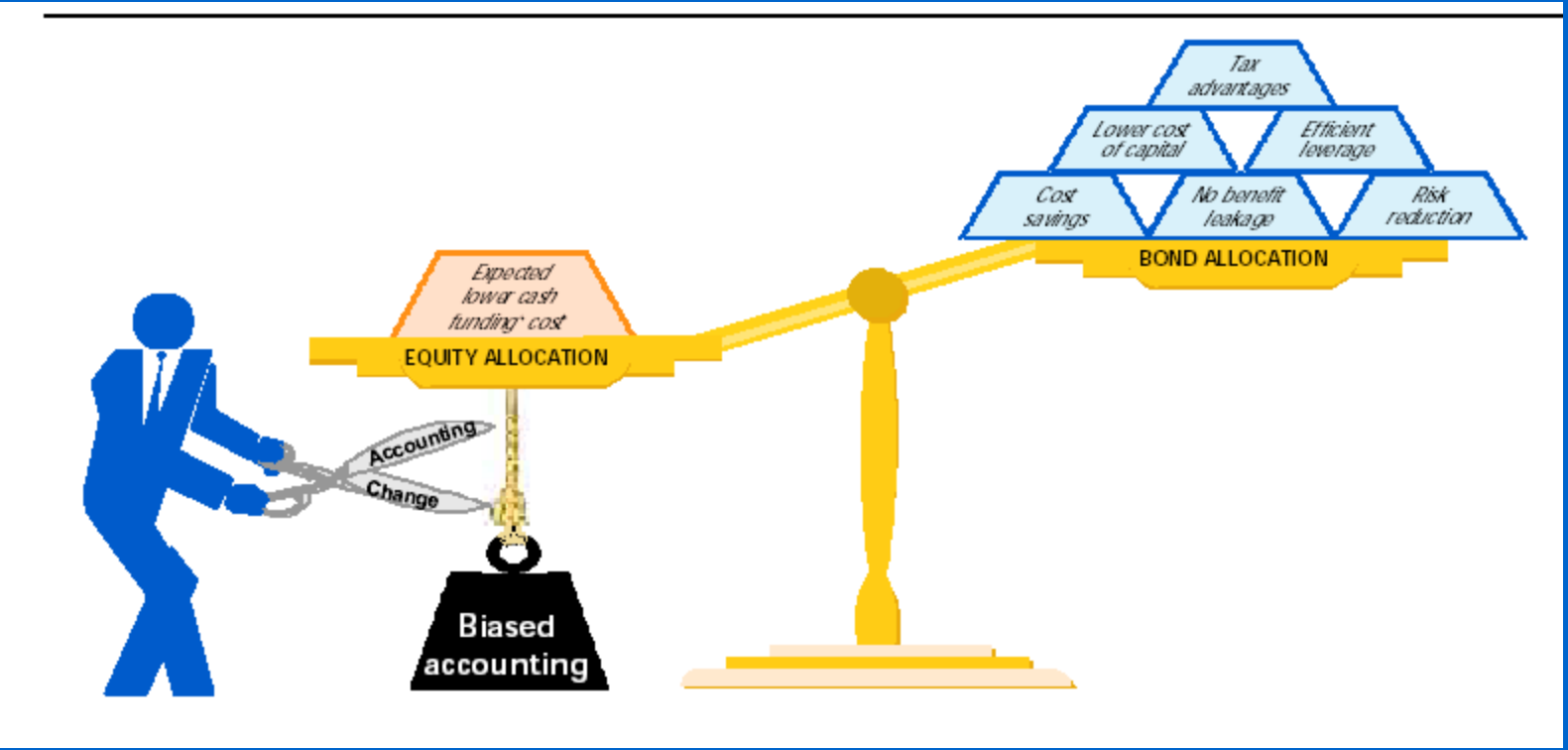
Investment
Equity Bias

Mis-Measurement



Investment
Equity Bias

Mis-Measurement

Investment

All Bonds

- Pension Equity => Shareholder Tax Loss
- Magnitude and Source of value
- New Equilibrium - What if Everybody Did It?
- First Mover Advantage
- Review

Investment - All Bonds
Pension Equity => Shareholder Tax Loss

Swap (35% Corporate Tax)

Pension assets - bonds + S&P

+

Diversified portfolio + .65*bonds - .65*S&P

=

No change in after-tax s/h equity exposure

Investment - All Bonds
Pension Equity => Shareholder Tax Loss

Base Case and Assumptions

- Assets ($1mm) = bonds = liabilities
- Personal tax on bond income: 40%
- Personal tax on equity returns: 15%*
- Risk-free return: 5%

* Equivalent annual rate of tax

Investment - All Bonds
Pension Equity => Shareholder Tax Loss

Tax Effects of Swaps

- Pension swap: $1mm bonds –> S&P
- Diversified swap: $650k S&P –> bonds
- S/H tax increase:

(650k)(.05)(.4-.15)=(.05)162.5k

Investment - All Bonds
Pension Equity => Shareholder Tax Loss

Present Value of S/H Tax Loss

PV = (.05)162.5k/(.05)(1-.40) = 270.8k

In reverse, when a U.S. plan adopts an All-Bond allocation, s/h gain =

$270.8k per $1mm

Investment - All Bonds
Magnitude & Source of Value

$2 in Bonds : $3 in Equity

- Reallocate $1mm => s/h +270.8k
- S/H value of $1mm pension asset:
  (650k)(1-.15) = 552.5k
- Equity-Bond swap adds 50% to s/h after-tax value of plan assets

Investment - All Bonds
Magnitude & Source of Value

Arbitrage not Statistical Model

- Boots' swap adds 50% to s/h after-tax value of plan assets
- Not based on statistical model or estimates
- Based on risk-free arbitrage

Investment - All Bonds
Magnitude & Source of Value

Shareholder Action Not Necessary

- Value arises from plan swap alone (with transparency)
- Reduced risk should cause s/h's to increase personal leverage
- Risk may be partly recaptured via balance sheet leverage

New Equilibrium - What if Everybody Did It?

- Firm leverage on balance sheets
- No pension leverage
- Less notional equity
- More notional debt
- Less cross-ownership

Investment
All Bonds

First Mover Advantage

- How do we get to new equilibrium
- Not immediately, over time
- Poor equity returns during transition
- Transition demand for more bonds
- First movers win

Investment Review

- Ignoring taxes => shareholder indifference
- Actuarial mis-measure => equity investments

  "Value" might look like 90% of assets

- Taxes + transparency => bonds

  Value IS 50% of assets

- First mover advantage

Investment

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Accounting

- Post-FRS 17 Accounting
- PBO versus ABO

Accounting
Post-FRS17

- CICA 3461 ~ FAS 87 ~ IAS 19
- FRS 17 Closer to Financial Economics
  - No smoothing, no amortizations
  - Separation of operating versus financing
- Post-FRS 17
  - No anticipation of equity returns
  - ABO not PBO

Accounting
Post-FRS 17

FRS 17 Closer to Financial Economics

- No more smoothing
  - assets at market
  - liabilities at market
- No more amortizations
  - immediate recognition (through STRGL) of gain & loss
  - immediate recognition of vested benefit improvements
- Separation of:
  - operating expense (service cost)
  - financing results (surplus/deficit increase/decrease)

See Contingencies – September/October 2002 – Valuing Companies

Accounting

Post FRS 17

- No anticipation of equity returns
- ABO/VBO not PBO
- Liability discount (*Reinventing*: Principle 4)
  - default-risk-adjusted yield curve
  - yield curve => hedge-able

See The Actuary (U.K.) – April 2002 – The Trouble with FRS 17

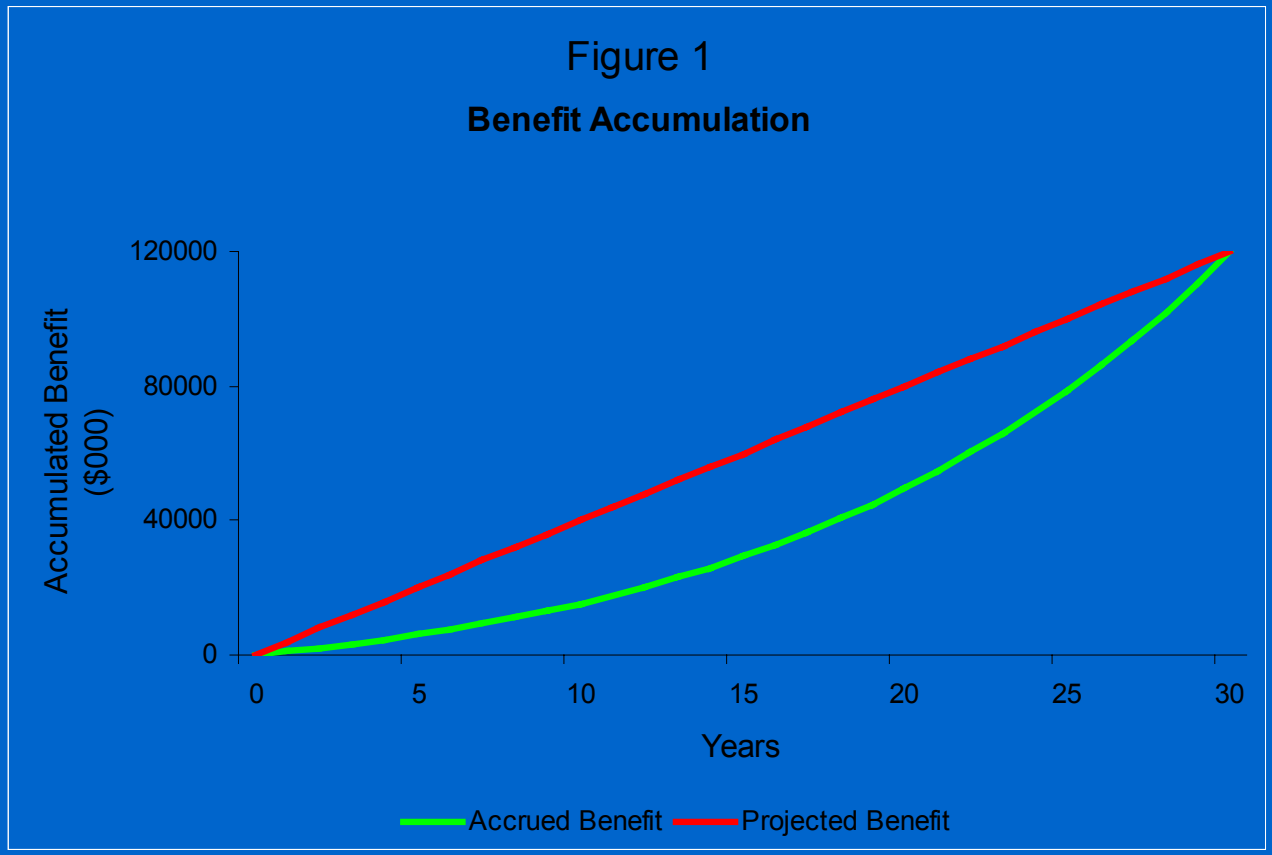
See Vancouver – June 2003 – Periodic Cost of Employee Benefits

Accounting

- Questions
- Discussion

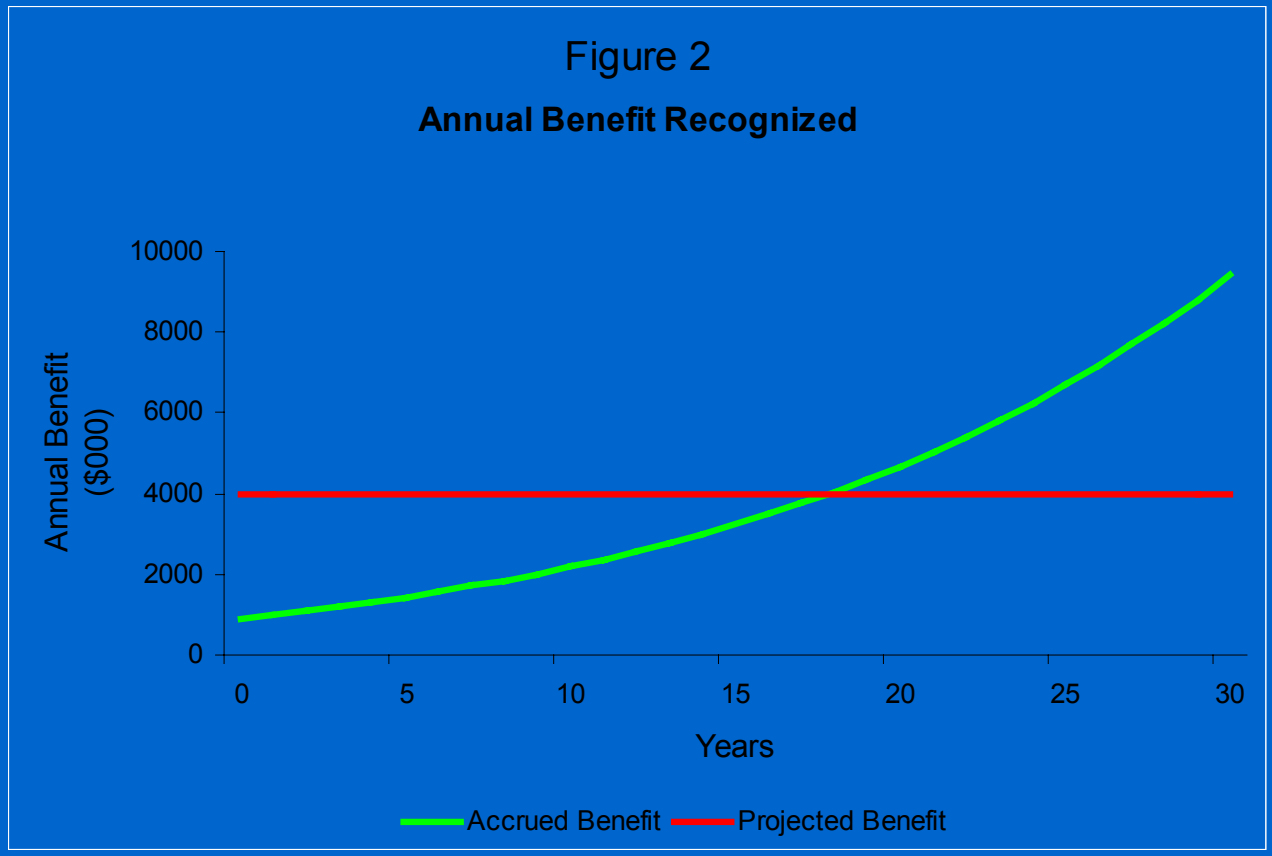
Accounting
Post-FRS 17

PBO versus ABO



Accounting
Post-FRS 17

PBO versus ABO



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Minimum Funding Rules & PBGC Guarantees

- Rational Funding with Transparency w/o Guarantees
- Society's Rational Interest when Employees Aren't Informed and Rational
- Role of the PBGC

Rational Funding with Transparency

- Benefits = promises in lieu of pay
- Unfunded = borrowing from employees
  - undiversified
  - expensive lenders
- Funding = collateral
  - raises benefit value
  - lowers benefit risk

Rational Funding with Transparency

- Borrow from diversified lenders to fund
  - lower compensation cost
  - tax-efficient debt refinancing
- With rationality and transparency – fund fully

Minimum Funding Rules & PBGC Guarantees

Society's Rational Interest

- Employees ignorant, make bad loans
  - Good for shareholders
  - But bad for society which has capacity to impose transparency and rationality
- Society has an interest in full funding, not as a moral matter, but rather as a matter of efficiency

Pareto Efficiency – See the Actuary – October 2003

Minimum Funding Rules & PBGC Guarantees

Society's Rational Interest

- Path independence - where you are; not how you got there
  - Funding ratio
  - Asset liability mismatch
- Overfunding - allow more funding in good times?
  - If a weak company had funded more in 1998-2000, they would have lost more
  - Weak don't overfund, strong do, tax leakage

See Contingencies – September/October 2003 – Stopping the Insanity

Minimum Funding Rules & PBGC Guarantees

Role of PBGC guarantees

- Society commits to promises being kept thru:
  - Monitoring
  - Funding rules
  - Insurance
- Monitoring is typically annually and delayed
- Funding protects
  - Employees without insurance
  - Insurer with insurance
  - Other companies and /or taxpayers

See Pension Section News – September 2003 - p. 7

Role of PBGC guarantees

- Insurance can be efficient for pure accidents
  - All insurance invites anti-selection and moral hazard
    - default game – prisoners' dilemma – loan guarantees
  - Full funding and matching mitigates both
  - Perfect premiums – second best
    - Intrusive monitoring
    - Must be coercive – i.e., overpriced

See Pension Section News – September 2003 - p. 22

Role of PBGC guarantees

- Full funding measured by riskless defeasance
  - Aa insufficient, even if matched
- Monitoring not continuous =>
  - including accruals to next monitoring date
  - mismatch cushion

See SOA Record, San Francisco 2002, Session 118

Role of PBGC guarantees

- Yield curve => hedge-ability
  - better than actuarial (AAA) plea for predictability
    - predictability => knowable mis(measure) of risk
    - hedge-ability => accept, dispose of, or manage, risk
  - no averaging over time – e.g., 4-year or 90-day
    - with matched portfolio on every day,
      I do not match the measure

See Senate Testimony – March 2003 –
http://users.erols.com/jeremygold/usingtreasury.pdf

Funding

- Questions
- Discussion

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Design

- Plan design: how may DB plans be revitalized in a transparent world?
- Consider new designs for:
  - DB plans themselves AND
  - The regulatory environment
- Both informed by the lessons of pension finance
- Tested by the search for economic value added (EVA)

The Actuary, October 2003, Jeremy Gold, What's Next?

Design

- Plans are contracts made between shareholders and employees
- Contracts can create or destroy value
- Pro-sound-funding, anti-value-destroying regulation, e.g.:
  - some vesting rules
  - front and back loading restrictions
  - age discrimination limitations
  - whipsaw
  - etc.

Design

- Value destroying plans and actuarial techniques – STOP IT
- Value added plan designs – GO TO IT
- Value destroying rules – CHANGE THEM

Design – Value Destroyers

- Lump sums
- Long cliff eligibilities
  - Subsidized early
  - Shutdown benefits
- Inefficient transfers of risk
- Things that increase costs of labor and/or capital
  - Implicit contracts
  - Off-market CB crediting rates – e.g. current coupon on 10-year bond
  - PBO service cost
  - Smoothing/amortizing
  - Unhedge-able
    - Benefit promises
    - Benefit valuations
    - Funding rules
  - Uncompensated A/L mismatches

Design – Value Destroyers

- Agency costs
  - Moral hazard
  - Principals missing from the table
    - Future taxpayers
    - PBGC
  - Valuing $100 benefit at $70
  - Robbing Peter to pay Paul

NAAJ, January 2005, Jeremy Gold, Retirement Benefits, Economics ...

Design – Value Creators

- Annuities
- Transparency/Communication/Explicit contracts
- Attract, retain, motivate and exit
  - Principal/agent at the employer/employee level
  - Pay administration – focus on total compensation
  - Attract – ABO service cost allows competition for young workers
  - Retain and Motivate – New vesting schedules – ERISA change
    - Encourages investment in training
    - Creates "training" bond
    - Creates "performance" bond
  - Exit – DB superior to DC

Design – Rules Changes

- A paradigm shift? – already under way?
- Be careful what we ask for
- As we cooperatively manage the paradigm shift, should we continue "business as usual" commentary to policymakers?
- ASOP 27?

Pension Forum, December 2004, Bader-Gold, What's Wrong with ASOP27?

Design

- Questions
- Discussion

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