Financial Economics & Actuarial Practice

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IAAust BIENNIAL CONVENTION 2003

Institute of Actuaries of Australia

Chronology

- Modigliani & Miller (1958 & 1961)

- 15 year gap

- Application to DB (Black, Harrison & Sharpe, Tepper)

- Another Gap

- British School (EMS 1997)

- American School (Bader & Gold 2001)

Financial Economics

No Arbitrage

Misconceptions

- Financial Economics does not require

  - CAPM

  - MPT

  - EMH

- No-Arbitrage is not the APT

- Arbitrage can be a fuzzy concept (without loss of power)

Discounted Cash Flow Spec

$$V_a^0 = CF_a^1 (1+i_a^1)^{-1} + CF_a^2 (1+i_a^2)^{-2} + ... + CF_a^t (1+i_a^t)^{-t} + ...$$

$$= \sum_{j=1}^{\infty} CF_a^j (1+i_a^j)^{-j}$$

Bader Swap

- $1 bonds has the same value as $1 equities

- Long $1 equities and Short $1 bonds = 0

$$V_{baderswap}^0 = V_{equities}^0 - V_{bonds}^0$$

$$= \sum_{j=0}^{\infty} CF_{equities}^j (1 + i_{equities})^{-j} - \sum_{j=0}^{n} CF_{bonds}^j (1 + i_{bonds})^{-j}$$

$$= 0$$

Actuarial Practice

- Add up (central) expectations

- Discount

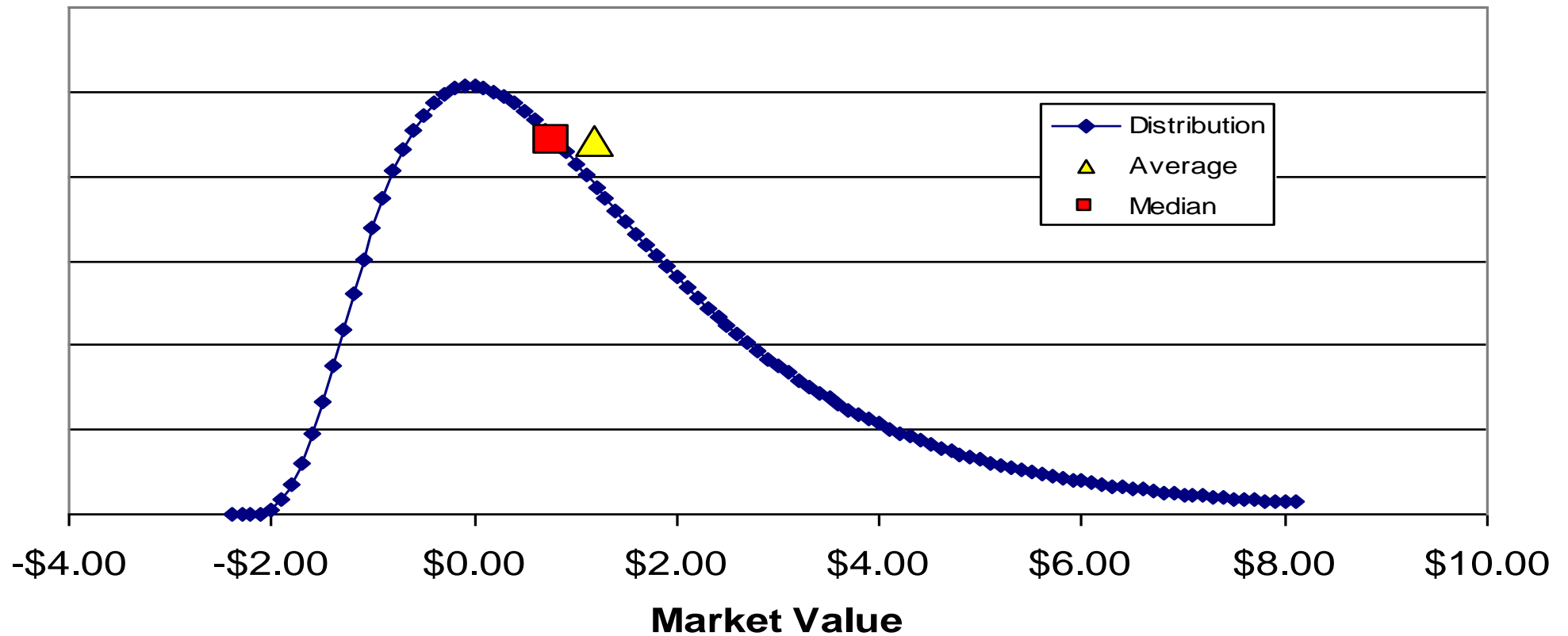$$CF^n_{baderswap} = CF^n_{equities} - CF^n_{bonds}$$

$$= (1 + i_{equities})^n - (1 + i_{bonds})$$

$$AV^0_{baderswap} = CF_{baderswap} * (1 + i_{baderswap})^{-15}$$

What is the value?

**Bader Swap
Distribution at t=15**

Legend: Distribution, Average, Median

X-axis: Market Value (-$4.00, -$2.00, $0.00, $2.00, $4.00, $6.00, $8.00, $10.00)

Law of One Price

- Law of One Price states that:

  if x has the same cash flows as y then the value of x equals the value of y.

- Fuzzy Version

  if x has similar cash flows as y then the value of x should be similar to the value of y.

Matching

- ## Financial Economics says

  Apply Law of One Price to value (known and certain) liabilities – find a matching asset

  => Use Bond-like discount rates

- ## Actuarial Practice says

  Use Asset-like discount rates

  => Functionally equivalent to deducting the Bader swap value from liability value

Irrelevance Principle

- ## Applied to DB Funds

  The first-order effects of Asset Allocation are irrelevant eg Equity exposure does not add value to a shareholder

  Instead, focus on second-order effects

  - Tax

  - Surplus Usage

  - Agency Issues

Scheme or Stakeholders?

- What is a DB Scheme and does it have a risk preference?

- Stakeholder List
  Members
  Shareholders/Tax payers
  Trustees
  Consultants
  Fund Managers
  Corporate Management
  Tax man

Actuarial Asset Allocation

- Equities will probably outperform bonds in the long run;

- Defined benefit schemes should then hold mostly equities in order to lower the costs of funding liabilities;

- This lowering of cost should be taken into account (e.g. for determining and monitoring funding requirements); and

- All this is assisted by valuing liabilities using the asset discount rate.

Value

- Current Value and Future Value are not the same concepts - but nobody talks about it.

- FEers focuses on current value and diss future value (as being unobservable)

- Actuaries focus on future value and diss current value (as being unimportant)

- Where does this lead?

Actuarial Judgement

- Actuaries are human too!

    Hubris

    Agency pressures (Moral hazard)

    Selection issues

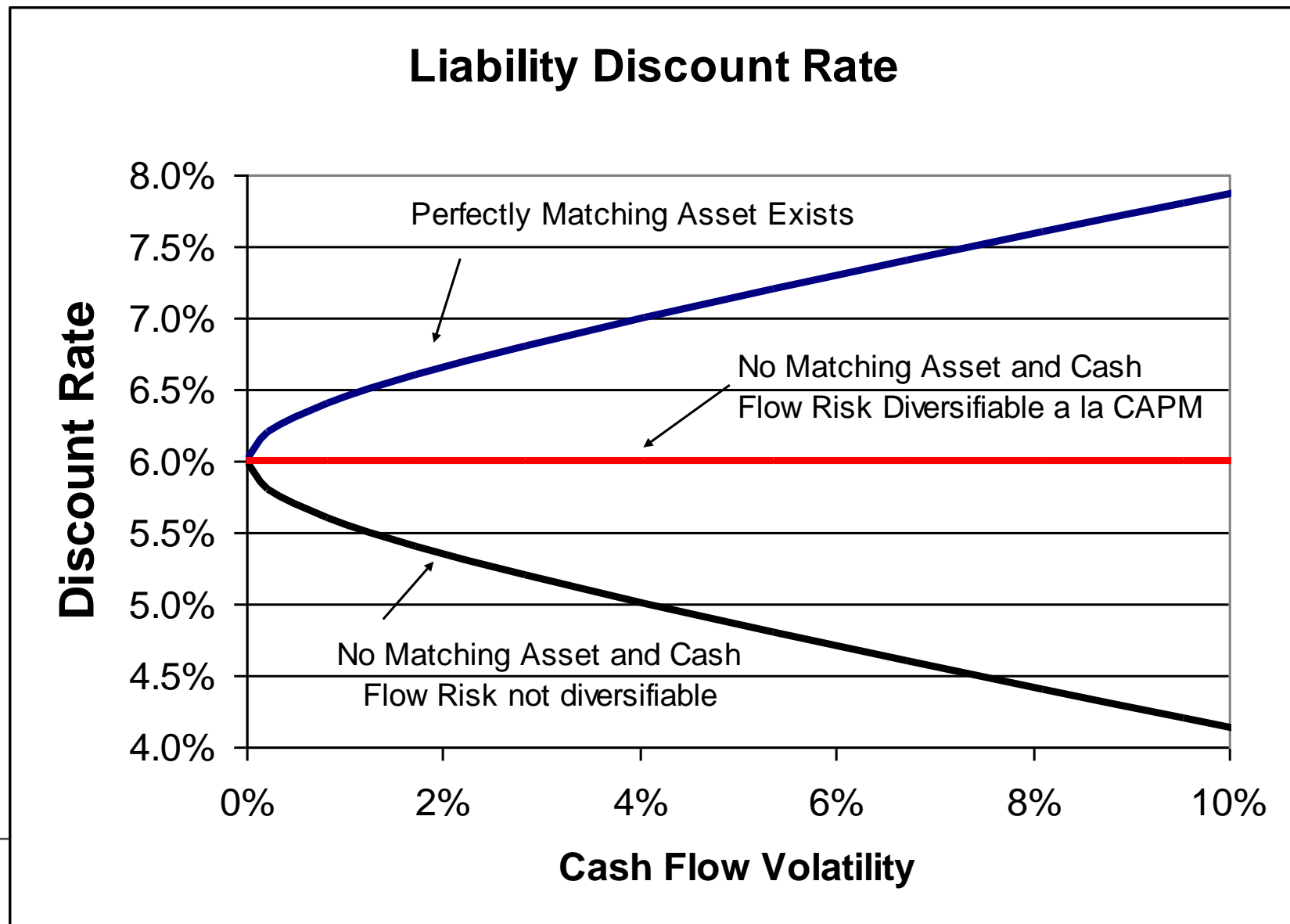   Obfuscation

- Transparency is a solution

The Big Uglies

- Incomplete Matching

- Choosing Static Models

- Using Return Statistics as a Proxy for Risk

- Overemphasis on Current Values

Incomplete Matching

Liability Discount Rate

Perfectly Matching Asset Exists

No Matching Asset and Cash Flow Risk Diversifiable a la CAPM

No Matching Asset and Cash Flow Risk not diversifiable

Discount Rate — Cash Flow Volatility

Choosing Static Models

- Static versus Dynamic modelling

$$r_{bonds} = \left(\prod_{j=1}^{9} (1 + i_{bonds}^{j})^{-1} - \prod_{j=1}^{10} (1 + i_{bonds}^{j})^{-1} \right) / \left(\prod_{j=1}^{10} (1 + i_{bonds}^{j})^{-1} \right) = i_{bonds}^{10}$$

Return and Risk

- Arithmetic or Geometric?

- i.i.d. and extreme finance

- Time diversification, Mean reversion of equity prices and all that
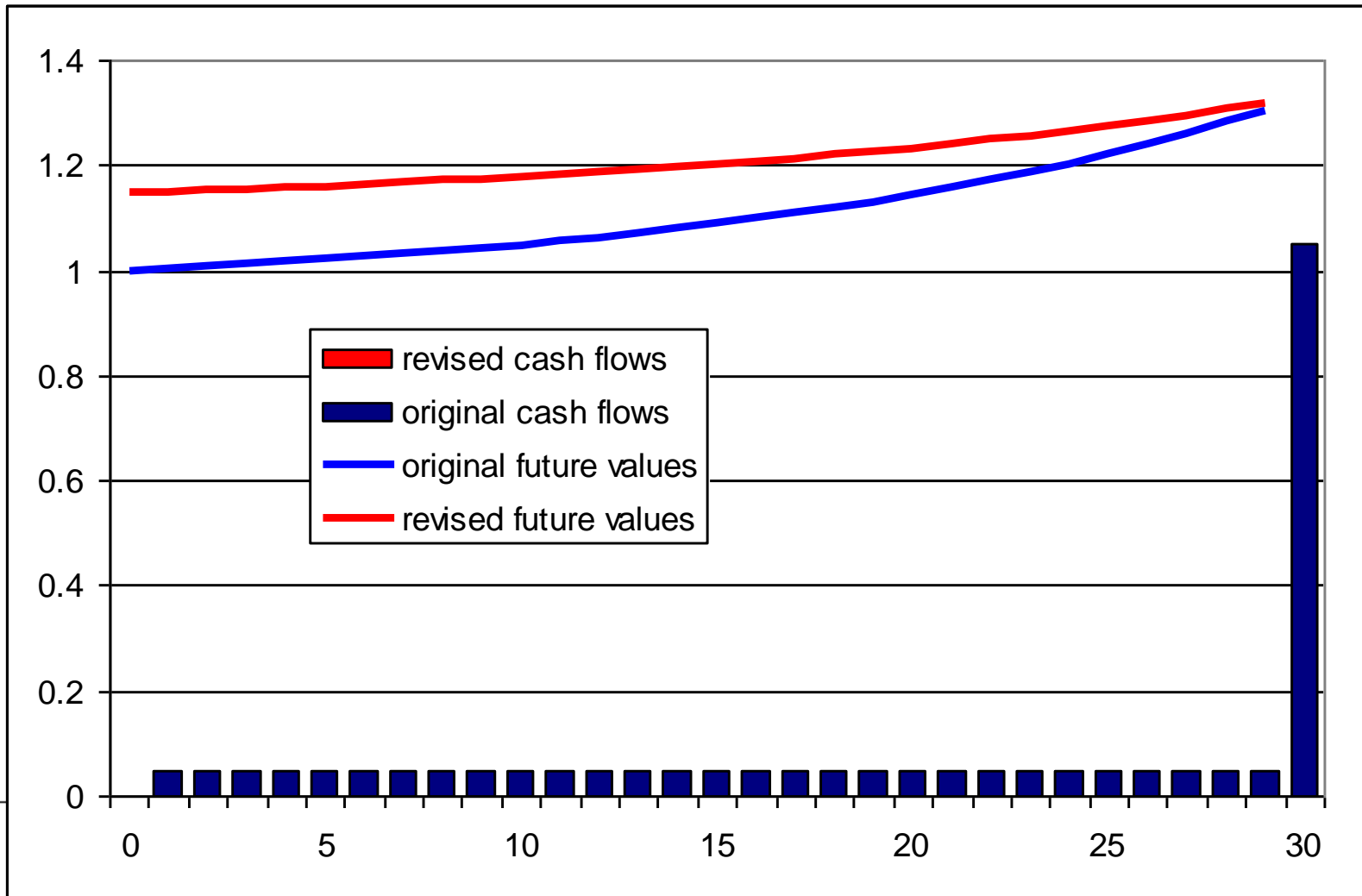
- DCF to the rescue!

i.i.d at the extreme
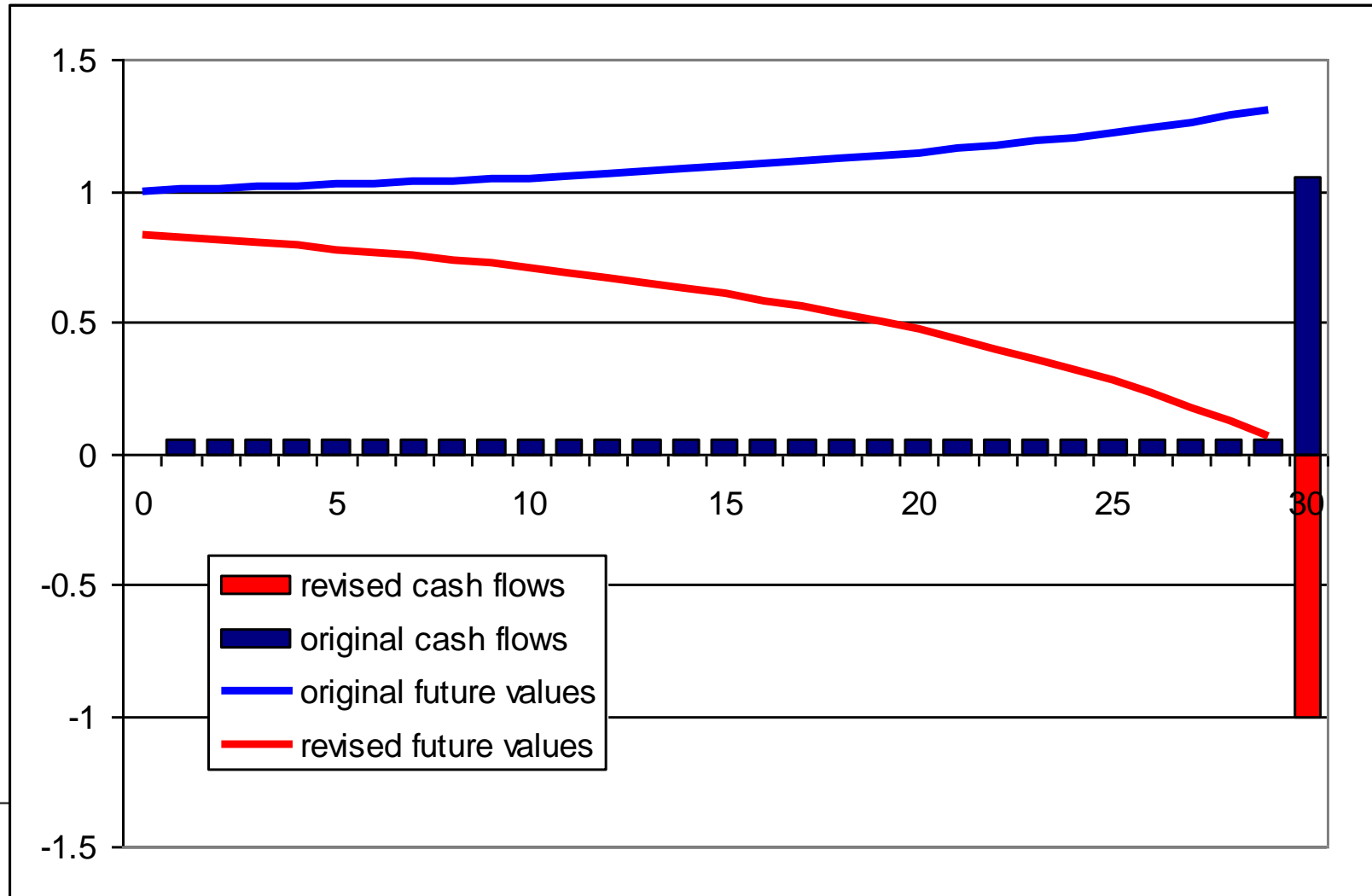

Distribution of Equity Value at t = 50

Market Value

Legend:
- Equity Distribution
- Equity Value Average
- Equity Value Median
- Bond Value

Australia
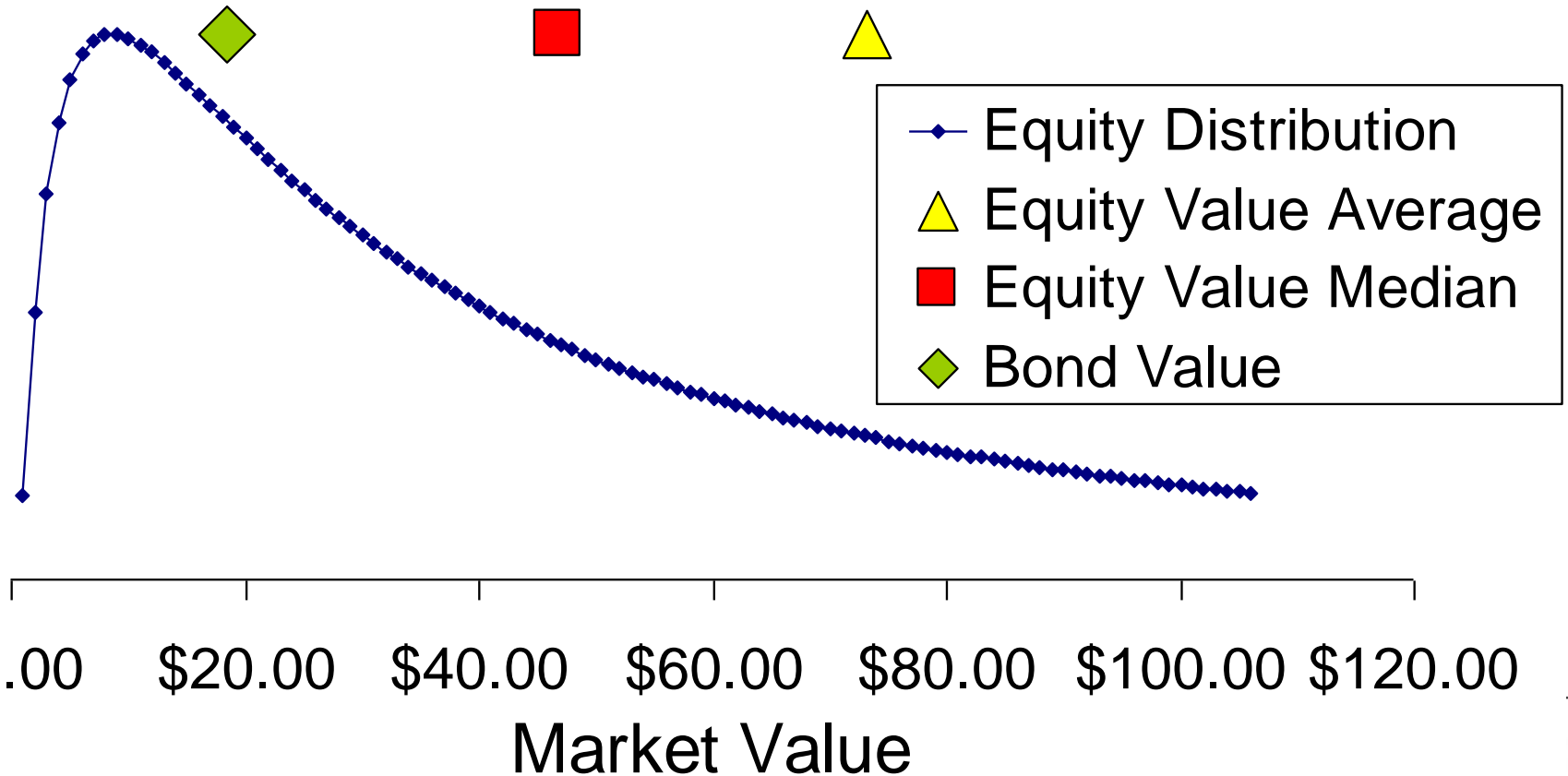
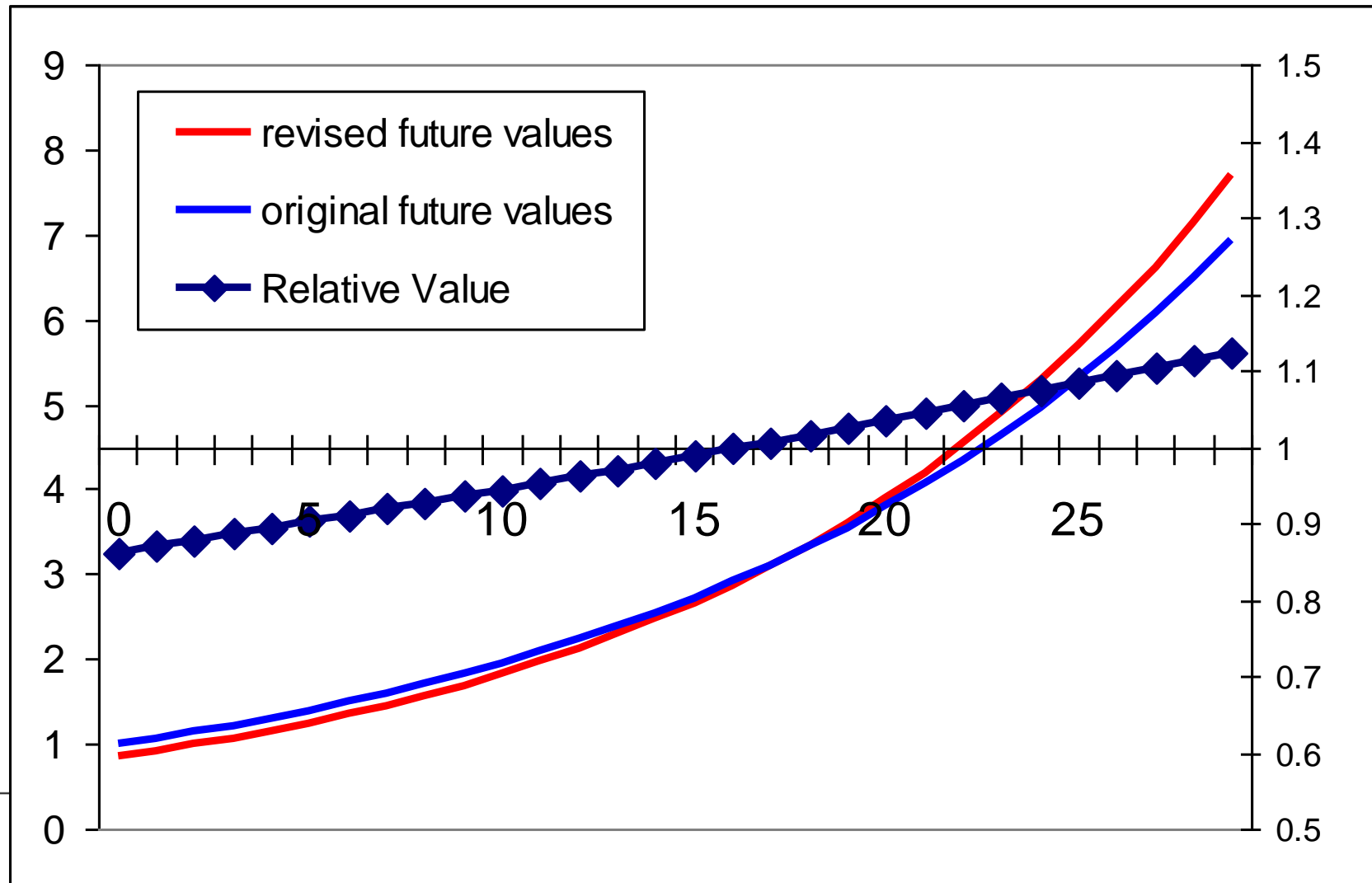# Bonds

- A 1% increase in discount rates

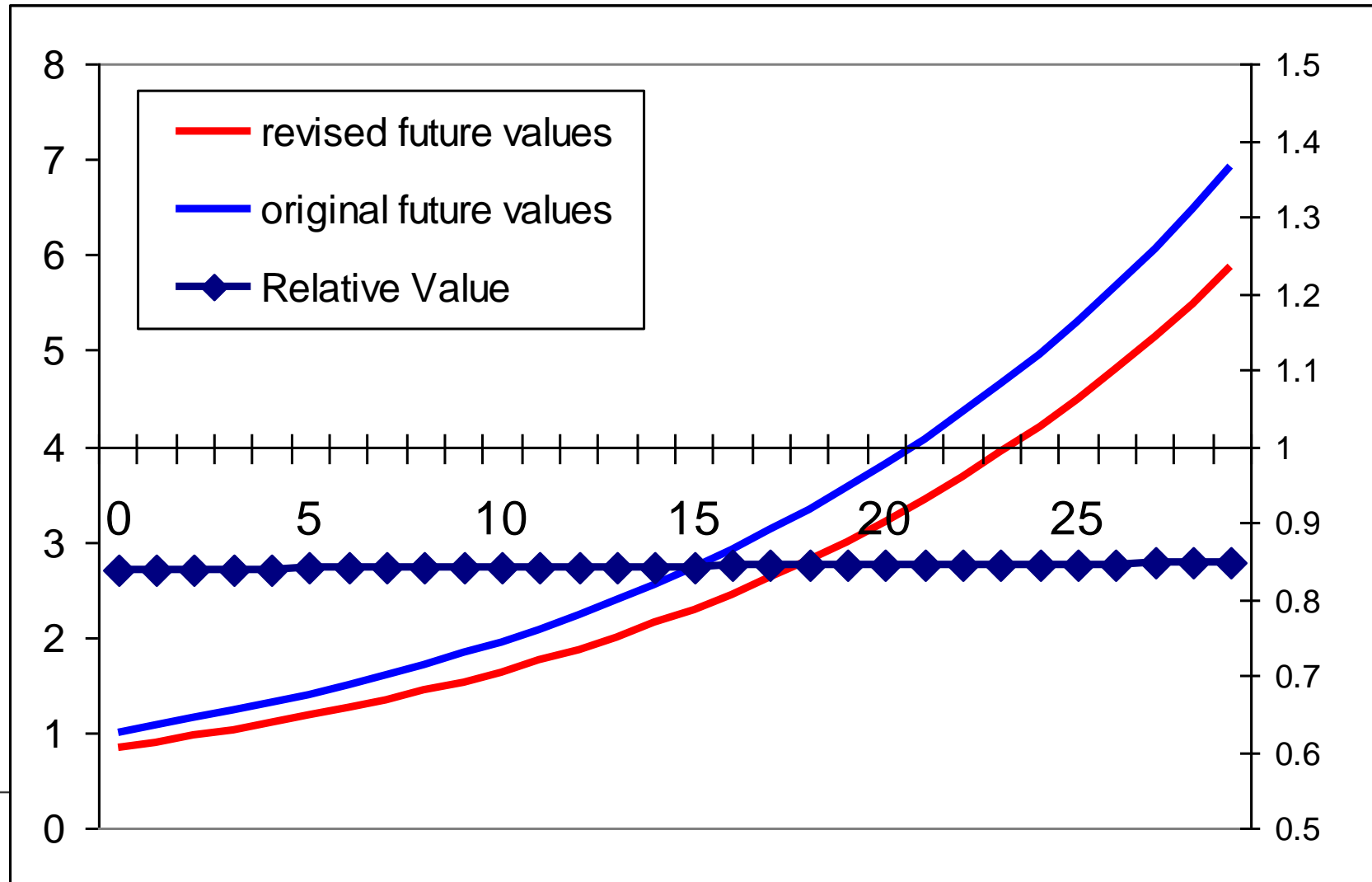# Bonds

- ## Terminal Default Risk

Equities

- A 1% increase in equity discount rates

Equities

- A 1% decrease in growth rates

What should we do?

- stop creating arbitrage opportunities

- respect current values

- acknowledge stakeholders

- be explicit and transparent

- solve the liability discount rate anomaly

- champion the dcf