Accounting and Actuarial Smoothing of Retirement Payouts in Participating Life Annuities

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Motivation

- ✓ Life insurers smooth surpluses over time with:
  - Accounting techniques: historic costs vs. fair market values
  - Actuarial techniques: building reserves

- ✓ Smoothing criticized for:
  - Being nontransparent & hard to assess insurer status *(Jorgensen 2004)*
  - Being an illusion; “no value to policyholders” *(Guillen/Jorgensen/Nielsen 2006)*

- ✓ Accounting literature notes:
  - FMV: better risk assessment *(Bleck/Liu 2007, Beyer et al. 2010)*
  - FMV: misleading, undesirable actions *(Allen/Carletti 2008, Sapra 2008)*

Contribution and Findings

- ✓ We study utility & profitability implications of smoothing techniques for Participating Life Annuity (PLA) in 2 setups:
  - Stylized theoretical 2-period model
  - ➢ Multi-period model of PLA based on realistic insurance company AL-Model;
  - ➢ Inspired by products like TIAA Traditional Annuity / annuities offered in European Market

- ✓ We show:
  - Accounting & actuarial smoothing rules ***strongly influence*** outcomes → smoothing is not an illusion!
  - Pushing insurers more toward FMV may reduce annuitant welfare & insurer profitability and stability.

Participating Life Annuity

✓ Types of life annuity benefits:

- Fixed annuity = guaranteed lifelong (nominal) benefits
- Variable annuity = linked to specific asset portfolio
- ➢ Participating (PLA) = linked to the overall ("collective") experience of annuity provider on mortality & investment.
  - ➢ Possibility to handle systematic longevity risk, capital market risk

✓ Lifelong Benefits Payments of PLA contain:

- Guaranteed benefits + additional surplus
- Guaranteed Benefits: Conservative actuarial assumptions
- Design of Surplus: measurement, distribution to annuitants, profit sharing rule btw. annuitant & insurer

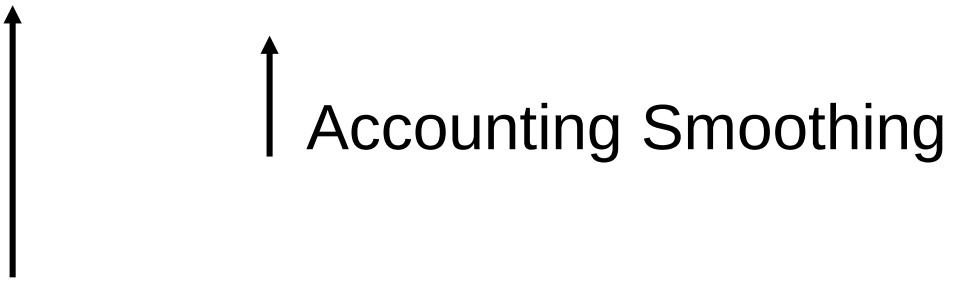
Realistic PLA: Model Setup

- Initial PLA premium:

$$P_t = GB \cdot \sum_{k=0}^{\omega-(x+t)} \frac{{}_k p_{x+t}^{A}}{(1+GIR)^k}.$$

- PLA benefits:

Benefit = GB + f(Asset Surplus, Mortality Surplus)



- Mortality Surplus: Realized mortality versus assumed mortality table

Asset Surplus: Accounting Smoothing

- Asset surplus: Funds Invested * $(i_t^{Total} - GIR)$

→Function of funds invested and difference between reported returns and guaranteed interest rate

- Reported returns depend on asset valuation method

$$i_t^{TOTAL} = (1-\alpha_S)\cdot i_t^{S,FMV} + \alpha_S \cdot i_t^{S,HCV} + (1-\alpha_B)\cdot i_t^{B,FMV} + \alpha_B \cdot i_t^{B,HCV}.$$

Stocks

$$i_t^{S,FMV} = \frac{n_{S,t-1}\cdot(S_t - S_{t-1}) + n_{S,t}\cdot D_t}{(V_t - I_t \cdot L_t)} \qquad i_t^{S,HCV} = \frac{(n_{S,t-1} - n_{S,t})\cdot(S_t - S_0) + n_{S,t}\cdot D_t}{(V_t - I_t \cdot L_t)}$$

Bonds

$$i_t^{B,FMV} = \frac{n_{B,t-1}\cdot(B_t - B_{t-1}) + n_{B,t}\cdot C_t}{(V_t - I_t \cdot L_t)} \qquad i_t^{B,HCV} = \frac{(n_{B,t-1} - n_{B,t})\cdot(B_t - B_0) + n_{B,t}\cdot C_t}{(V_t - I_t \cdot L_t)}$$

Fair Market Value (FMV)
unrealized capital gains & losses

Historical Cost Value (HCV)
realized capital gains & losses

Distribution of Surplus: Actuarial Smoothing

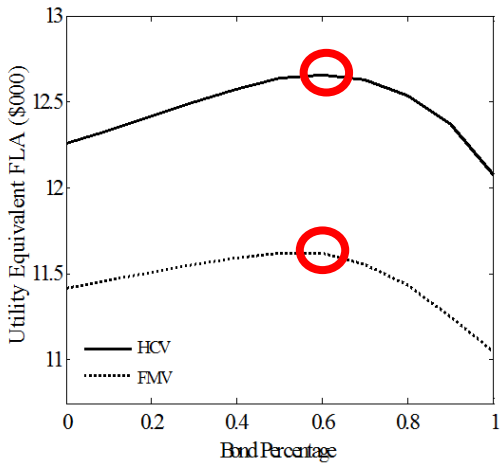
- ✓ Idea: Smooth surplus payouts over time by:
  - Retaining some surplus in “good“ years
  - Building up a buffer fund (“contingency reserve“)
  - Drawing down CR to maintain surplus payouts in “bad” years
- ✓ Mathematical mechanics (actuarial “art”):

Realistic PLA: Simulation Study Setup

- ✓ Life Insurance Company: 5K paths of PLAs sold to cohort of 10,000 men age 65 for various asset allocations and accounting regimes (run off scenario); solvency restrictions; surplus sharing mechanism
- ✓ PLA-Pricing: GIR = 3%, Annuity 2000 table
- ✓ Asset model: Bonds 10y duration driven by 3-factor CIR model; Stocks: short rate from CIR + stochastic risk premium + fixed dividend yield (1-10y US treasury yields 1988-2012, S&P500 Price+Dividend yield 1981-2012)
- ✓ Mortality: Individual Bernoulli experiments based on population mortality following CBD (2006) stochastic mortality model (HMD US male mortality 1933-2010).
- ✓ Annuitant‘s perspective: Life time utility of benefits (CRRA)
- ✓ Insurer‘s perspective: Distribution of IRR for each path

Realistic PLA: Annuitant's Perspective

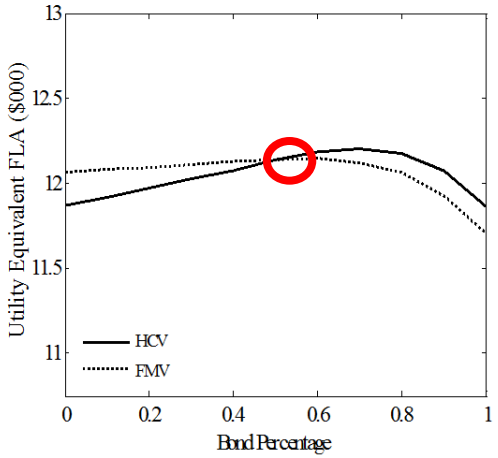
Accounting Smoothing



Implications:

- HCV superior to FMV
- Mixed portfolios better than single assets, independent of accounting method.

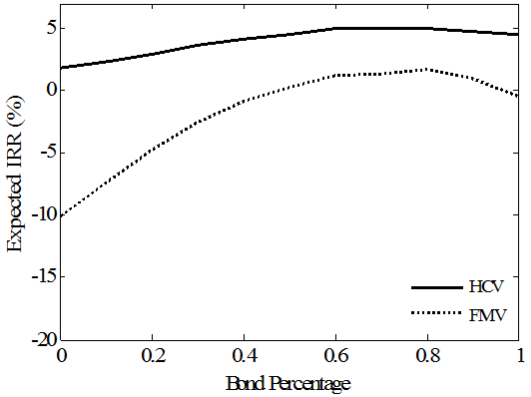
Accounting & Actuarial Smoothing



- Higher utility under FMV, due to volatility reduction
- Decreases utility under HCV, due to delayed benefit payment
- No dominance of either accounting method

Realistic PLA: Insurer's Perspective

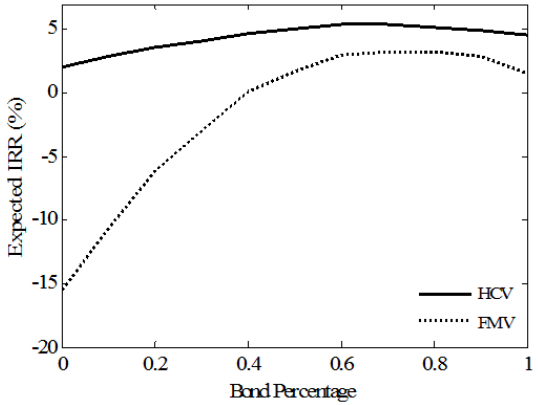
Accounting Smoothing



Implications:

- IRR low under FMV due to benefit guarantee (short put)
- HCV reduces guarantee value → higher IRR

Accounting & Actuarial Smoothing



- Residual claim to CR generally increases IRR
- Delayed benefit reduction under high volatility due to actuarial smoothing reduces IRR

Conclusions

- ✓ PLAs attractive way to give retirees a guaranteed benefit while handling systematic mortality and capital market risks.

- ✓ Our stylized & more realistic model of PLAs permits us to study utility and profitability implications of smoothing through accounting and actuarial methods.

- ✓ Accounting and actuarial rules for smoothing strongly influence benefit payouts → Smoothing is not an illusion!

- ✓ Statement for further discussion: Pushing insurers more toward FMV may reduce both annuitants' welfare AND insurer profitability/ stability.

Backup

Distribution of Surplus: Actuarial Smoothing

- ✓ Idea: Smooth surplus payouts over time by:
  - Retaining some surplus in “good“ years
  - Building up a buffer fund (“contingency reserve“)
  - Drawing down CR to maintain surplus payouts in “bad” years
- ✓ Mechanics (actuarial “art”):

$$\max_{PS_t} f(PS_t) + g(CR_t)$$

$$f(PS_t) = -\left(\frac{PS_t}{PS_{t-1}^{adj}} - \frac{DS_t - PS_{t-1}^{adj}}{PS_{t-1}^{adj}}\right)^2 + 2\left(\frac{PS_t}{PS_{t-1}^{adj}} - \frac{DS_t - PS_{t-1}^{adj}}{PS_{t-1}^{adj}}\right)$$

$$g(CR_t) = -\left(\frac{CR_t}{CR_t^{aim}}\right)^4 + 4 \cdot \left(\frac{CR_t}{CR_t^{aim}}\right) - 2$$