



REVIEWING TARGET BENEFIT PENSION PLANS

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Outline

1. What is a Target Benefit Plan?
2. Some Pension Benefit experiments
 - i. The demographics and assumptions
 - ii. Description of Benefit designs
 - iii. Results
3. Future Work

What is a Target Benefit Plan?

A TB pension plan has fixed contributions, a target defined benefit formula and a benefits/funding policy that prescribes the methods for varying benefits based on affordability, with pre-set reserve levels and a pre-determined order of benefit adjustments.

UBC Pension Administration Office Publication

'Under TBPs, benefit levels are "targeted" rather than "defined" or "guaranteed."'

'Employer contributions and employer liability are capped'

'Members and retirees bear the cost of any funding shortfalls in the form of increased contributions or reduced pension benefits, but would also be entitled to any funding surpluses that may arise'

Excerpts from Canadian Federal Govt Consultation paper

What is a Target Benefit Plan?

For the plan sponsor, these will have the characteristics of a DC plan. Once the Defined Contribution is made, the responsibility of the plan sponsor ends.

For the worker/participant, actuarial projections will inform them of an "expected" target benefit. These projections will use mildly conservative assumptions and any positive variance from these assumptions will be used to adjust benefits upward both pre and post retirement. Prior to retirement, this will mean the plans will move toward a final average equivalent ... Post retirement, this will mean some level of indexation of benefits. However, neither is guaranteed.

Rob Brown on JGTBPP "Retirement 20/20 Innovation in Pension Design"

What is a Target Benefit Plan?

- Contributions are fixed (UBC, Aon Hewitt, RLB)
 - Or not fixed but capped (New Brunswick (NB) Shared Risk model)
 - Or employer fixed, employee variable (Canadian government proposal)
- Benefits are adjustable depending on affordability
 - How?
- Surplus is applied to increase benefits (Canadian Govt, RLB)
 - Or perhaps not.(New Brunswick)

Some Target Benefit Experiments

- Assume we have a DB pension plan with 4 options:
 - Remain DB
 - Convert to TB – Type 1
 - Flexible DB
 - Convert to TB – Type 2
 - Collective DC
 - Convert to DC
- We run the plan through 1000 simulations of economic variables to assess risks and benefits.

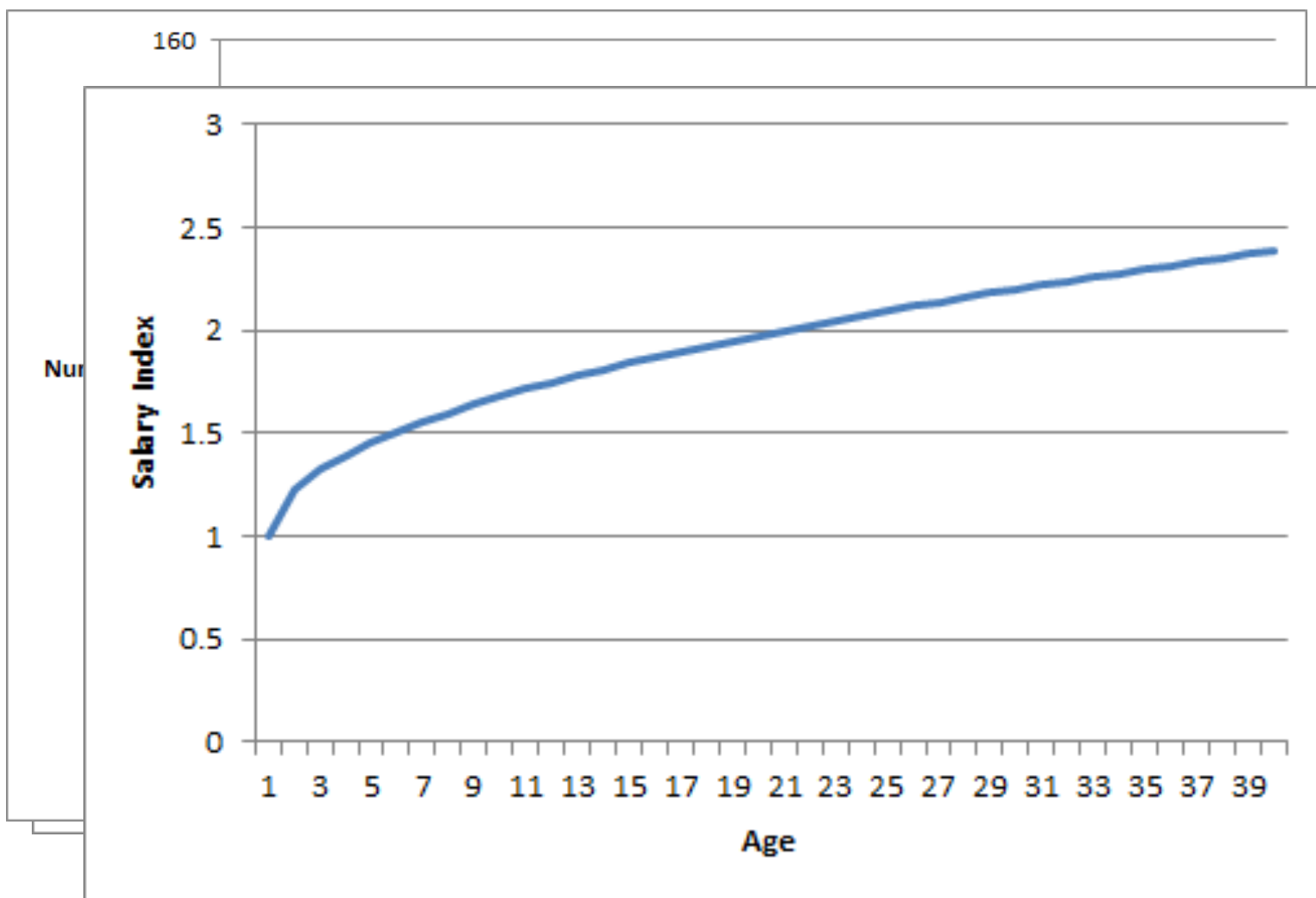
Model Pension Plan

- DB Final 1-year Average plan; accrual rate 0.016667
- Pre-retirement exits:
 - Lump sum = EPV Deferred Pension
- All lives retire at age 65 with whole life annuity
- Average service at retirement: 24.3 years
 - Replacement rate at retirement: 40.5 %
- Normal Contribution Rate: ~ 20%

DB Valuation method/assumptions

- Traditional Unit Credit Valuation
- Valuation rate of interest, i :
 - long term bond yield +100bp
- Valuation salary increase assumption:
 - $i-0.015$, min 2%
- Valuation indexation assumption
 - $i-0.035$, min 1%, max 3%
- Ignore exits in valuation


In Force Demographics



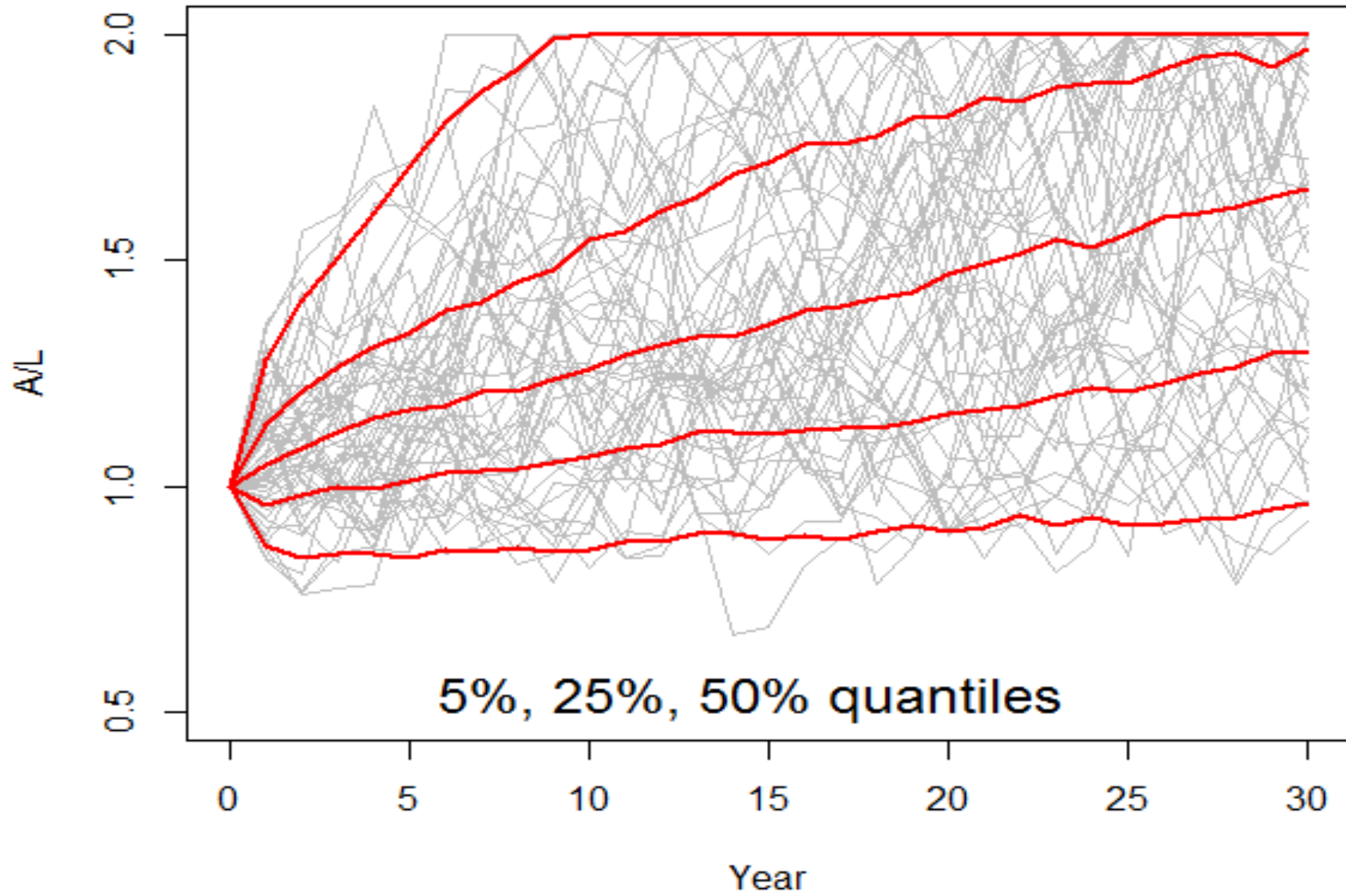
Simulation assumptions etc

- No demographic/ longevity risk
- Open group projections
- Q&D ESG, fitted to Canadian data, annual frequency
 - Lognormal equity returns, $\mu = 0.08$, $\sigma = 0.18$
 - AR(1) long bond rates, $Y(t) \sim (0.05, 0.9, 0.1)$
 - Inflation: $X(t) * Y(t)$, $X(t) \sim \text{AR}(1) (0.4, 0.2, 0.15)$
 - Salary growth = inflation
- Investments: 60% equity, 40% long bonds

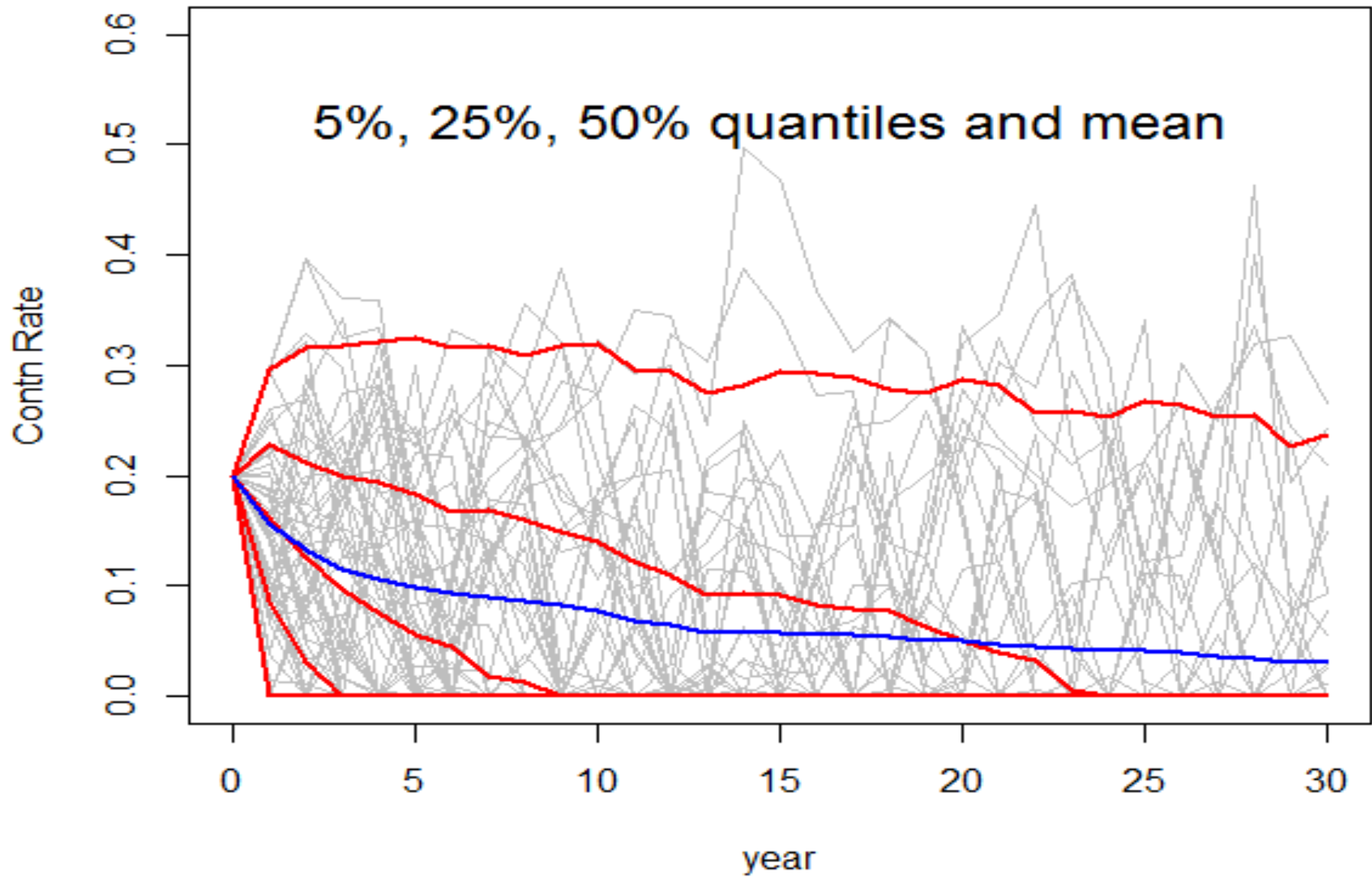
Simulation assumptions etc

- Fund is 100% funded (TUC basis) at $t=0$
- Surplus/Deficit spread over 5-years (no interest)
- Minimum total contribution: 0% -- but...
 - $A/L > 200\%$  excess returned to sponsor (or tax)

DB A/L



DB Total Contribution Rates



DB - Summary

- Replacement rate 40.50% for 23.9 year service is guaranteed
- Potential spikes in contributions
 - Prob [contribution rate >30%] ~ 0.04-0.07 per year
- Potential contribution holidays
 - For $t > 10$, prob of 0% contribution ~ 0.6 – 0.8
- Potential for longer periods of low A/L, high contributions

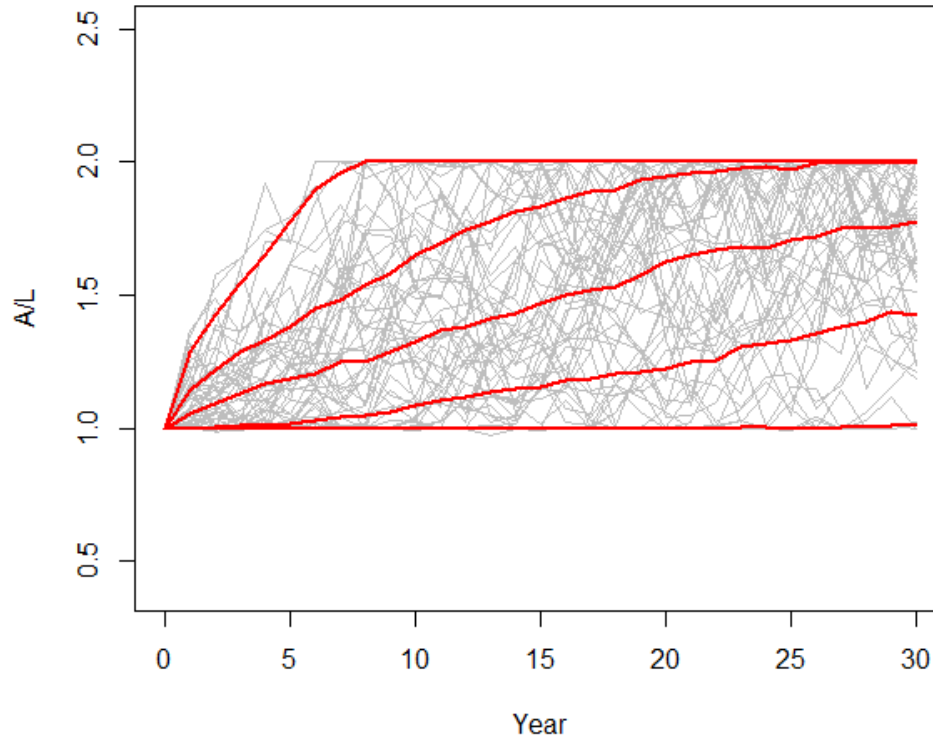
Option 2: Flexible DB

- Target benefit (actives) – as DB
- Base benefit (actives) – as DB but no (future) COLA
- Target Benefits (in Payment)
 - Base at retirement + all plan COLA
- Base Benefits (in Payment)
 - $\max(\text{Base at retirement, previous years benefit})$
- Maximum contribution rate: 21.5%
- Minimum contribution rate: 7%
- Additional Contribution Rate: 1.5%

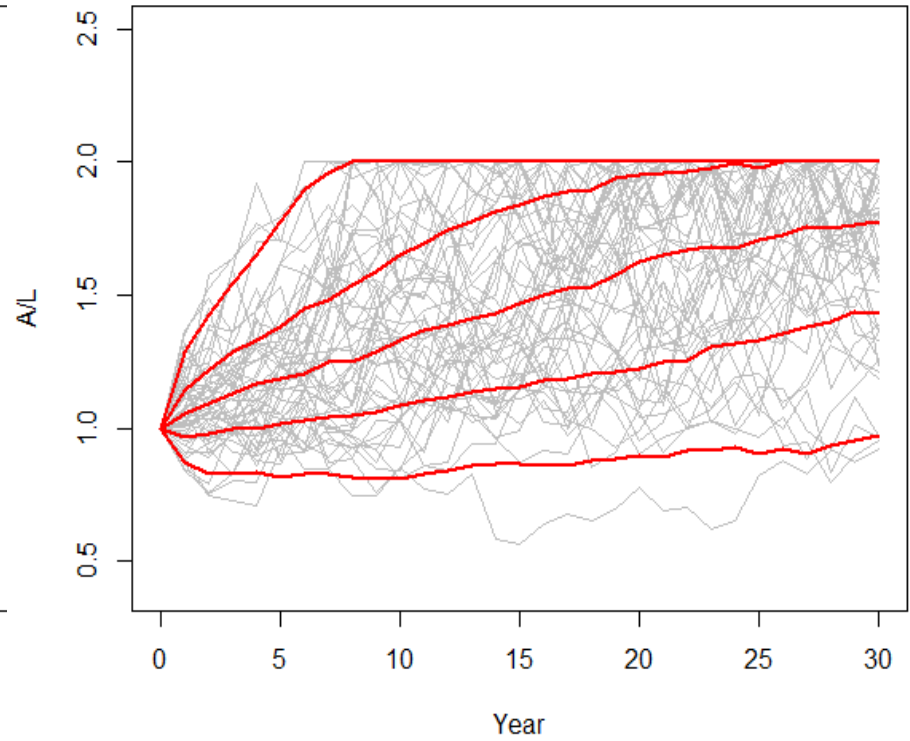
Flexible DB Benefit Adjustments

- $A/L^T > 1.0$
 - Use excess to increase COLA up to inflation
 - Surplus returned if $A/L^T > 2.0$
- $A/L^T < 1.0$ and $A/L^B > 0.97$
 - Reduce COLA payments and valuation rates
 - No reduction in Base Benefits
- $A/L^B < 0.97$
 - Reduce all accrued benefits by reduction factor A/L^B

A/L-Adjusted

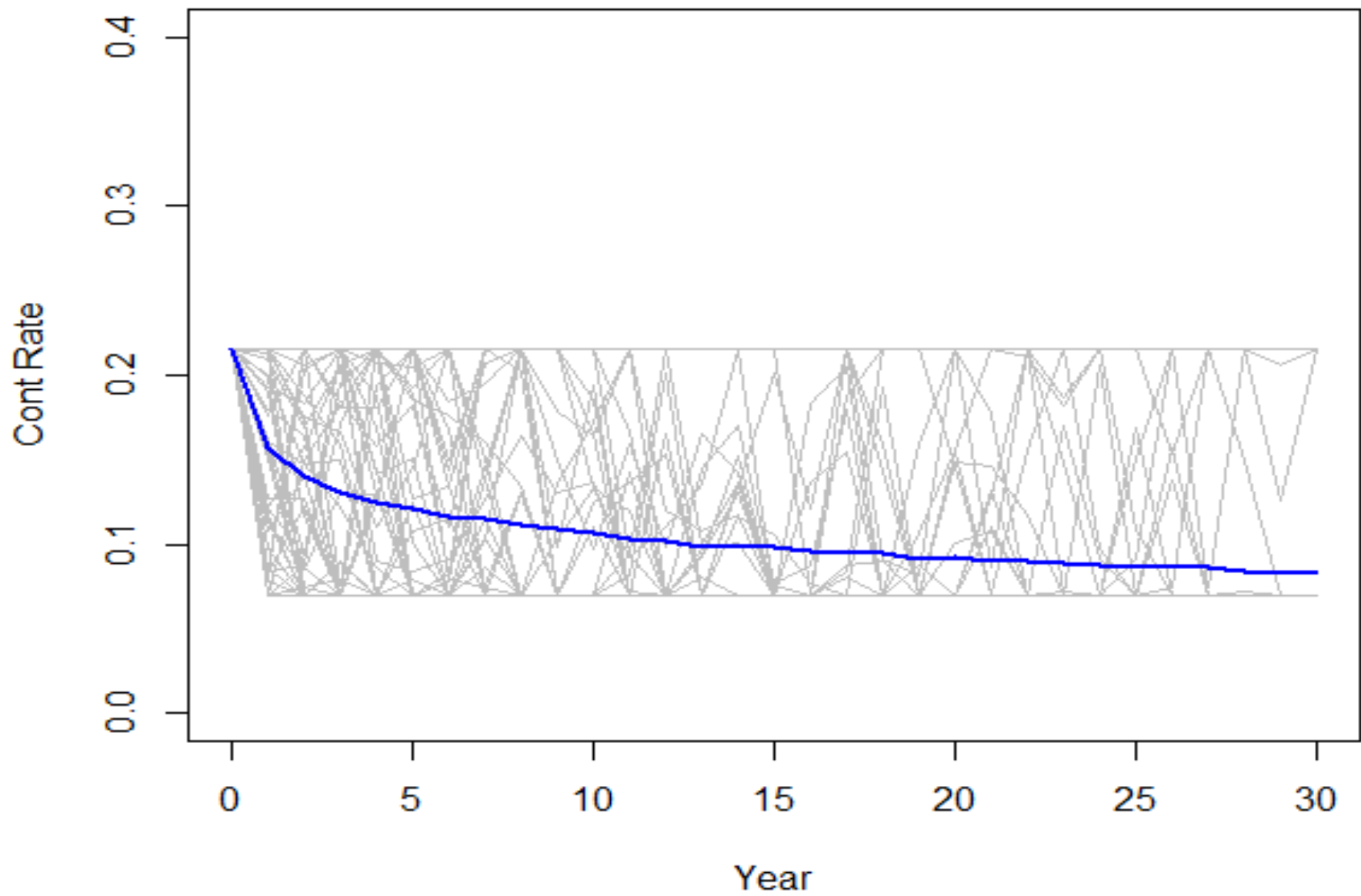


A/L-Target

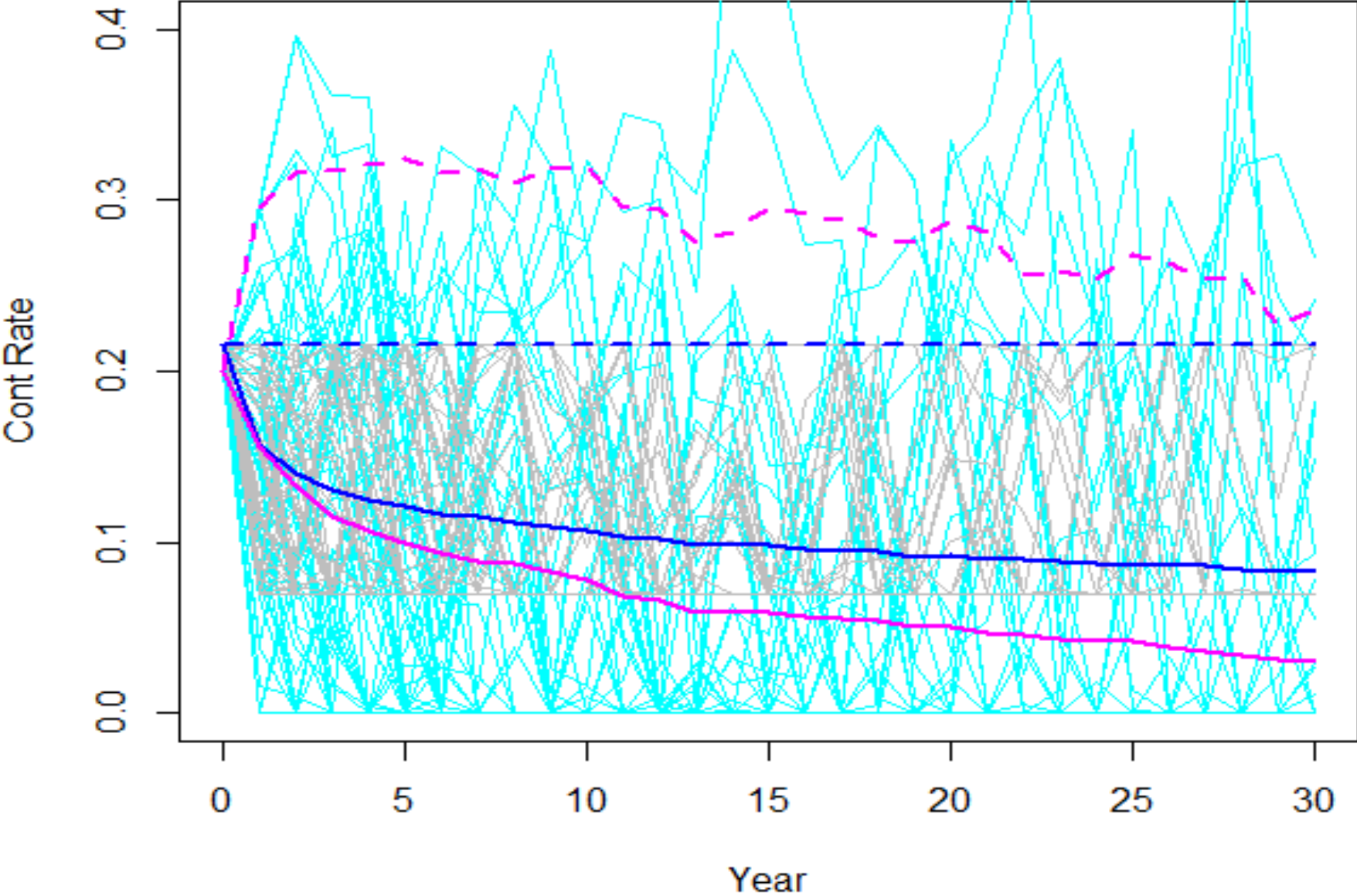


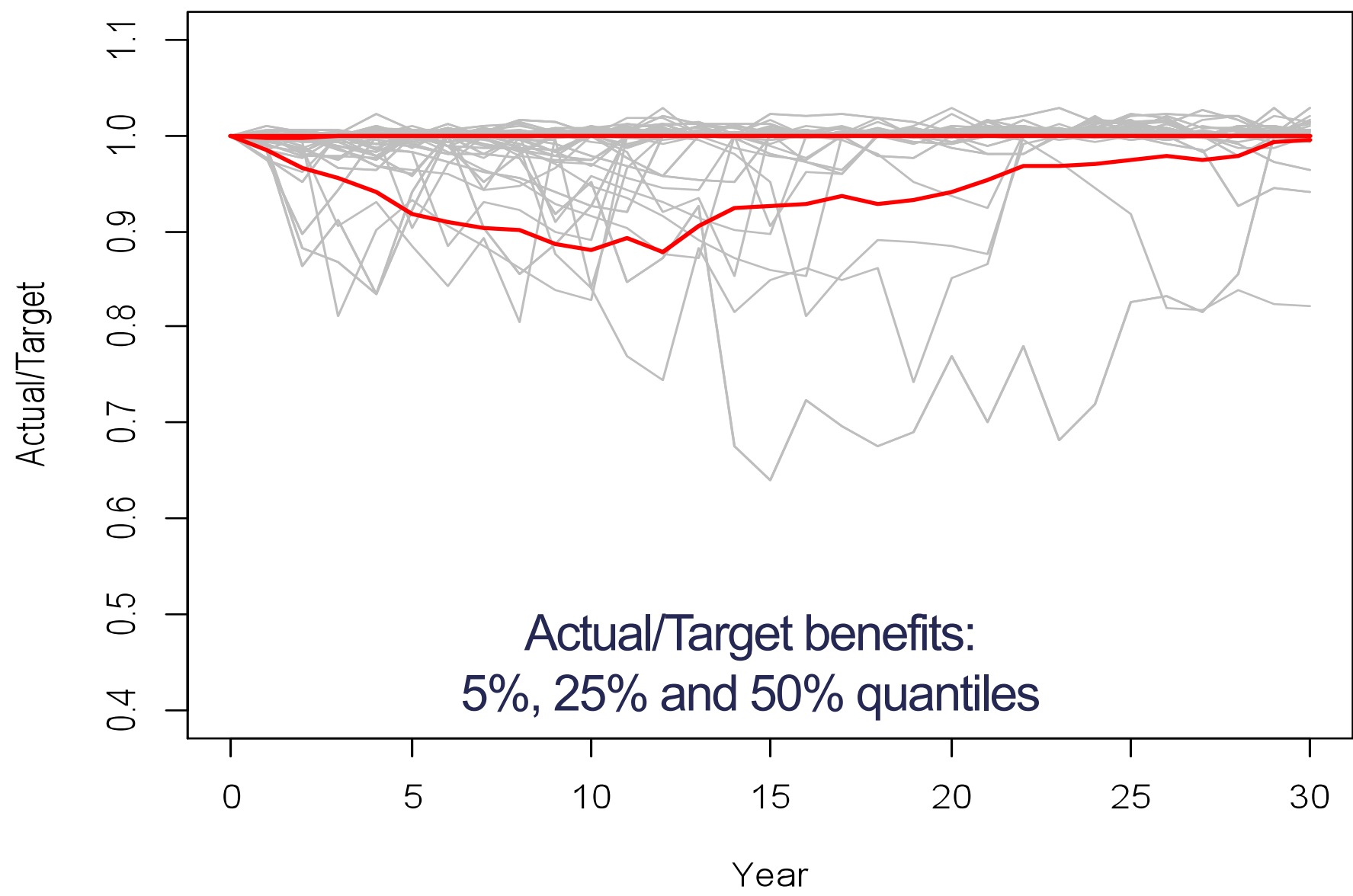
Flex-DB A/L
5%, 25% and 50% quantiles

Flex-DB Total Contribution

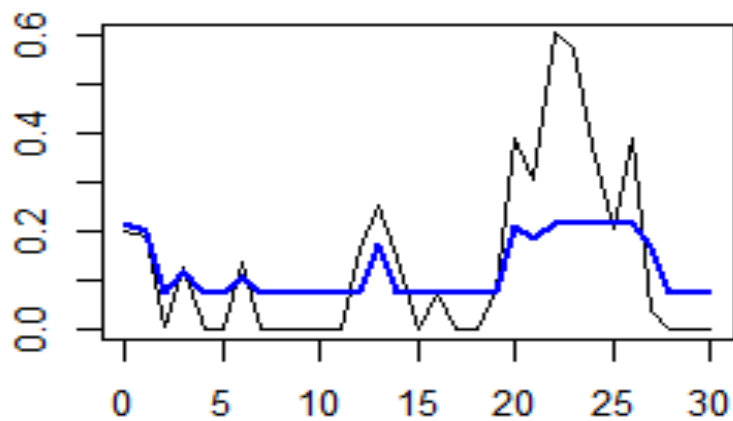


Flex-DB Total Contribution

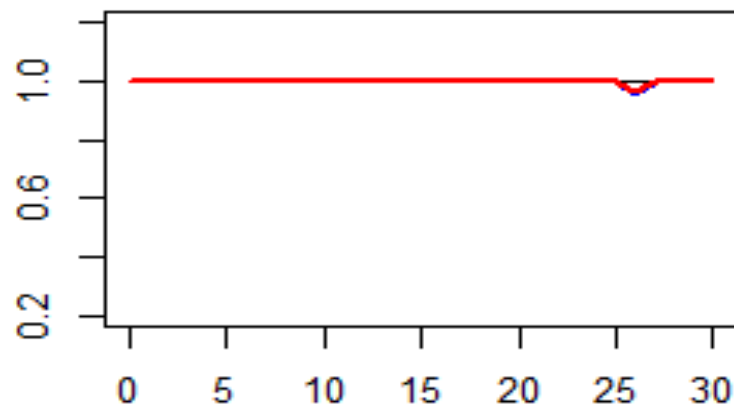




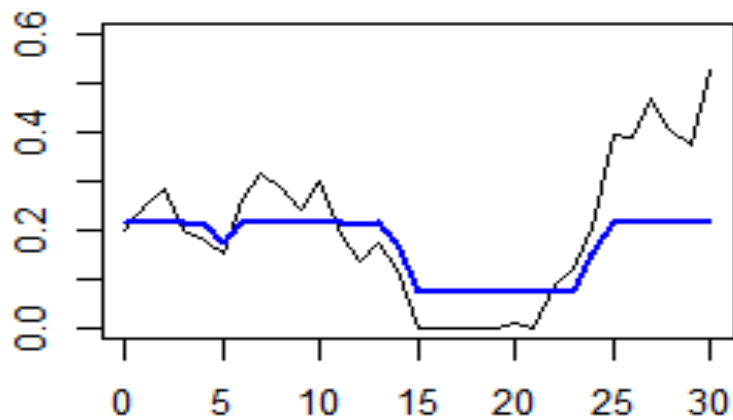
Total Contribution Rates



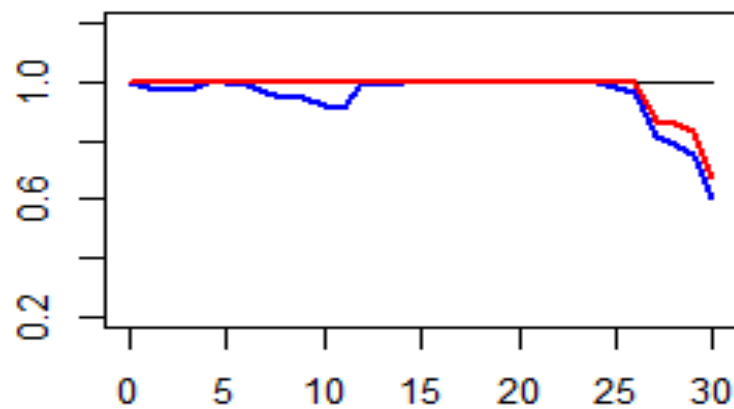
Actual/Target, Base



Total Contribution Rates




Actual/Target, Base



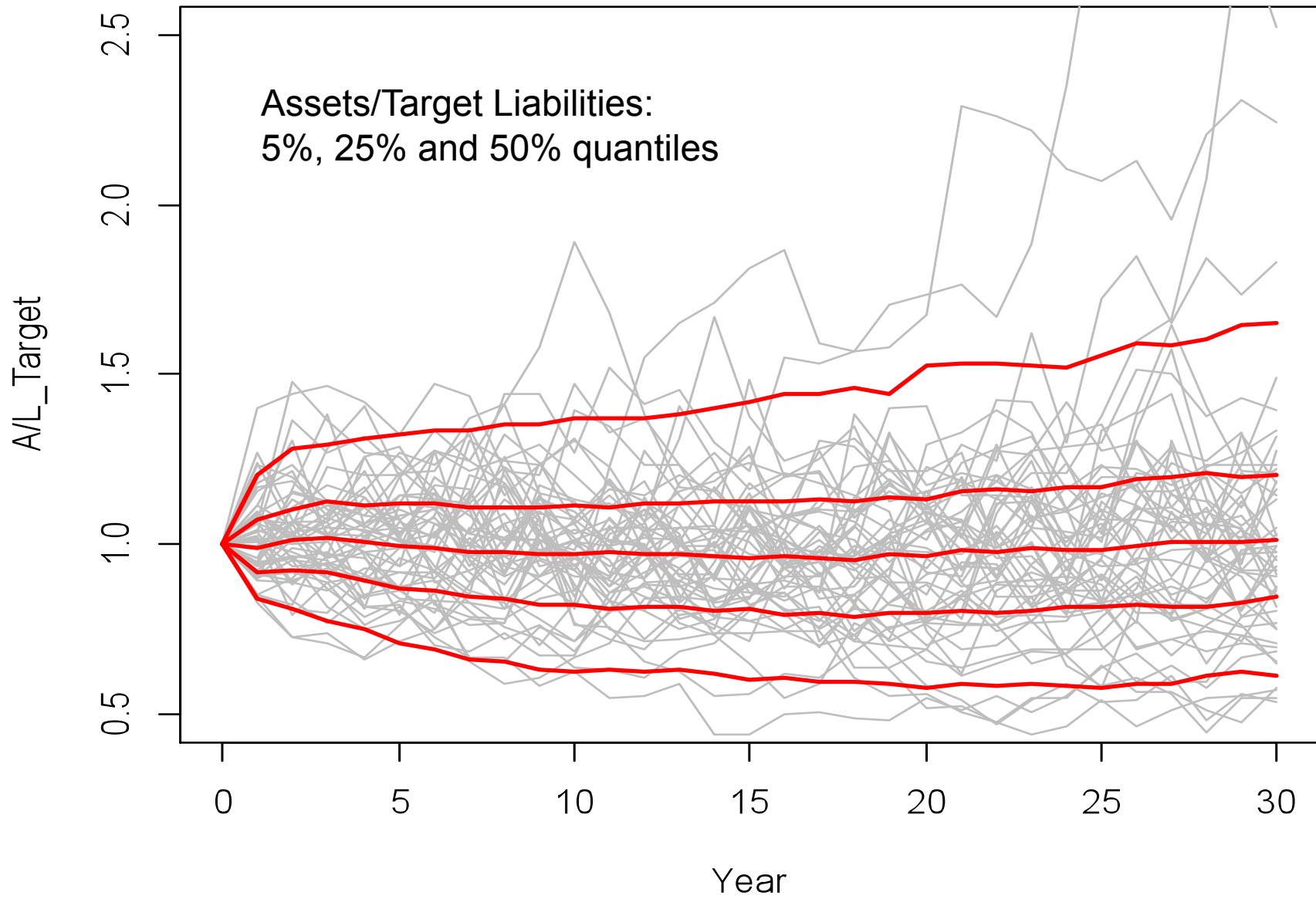
Flex-DB Summary

- A/L is constructed to be ≈ 1.0 (approx)
- Total Contributions are bounded
- Benefits are variable:
 - Probability of no base benefit reduction in a 30-year projection: ~ 80%
 - Probability of single year reduction: ~ 10%
- Probability of no COLA reduction ~ 45%

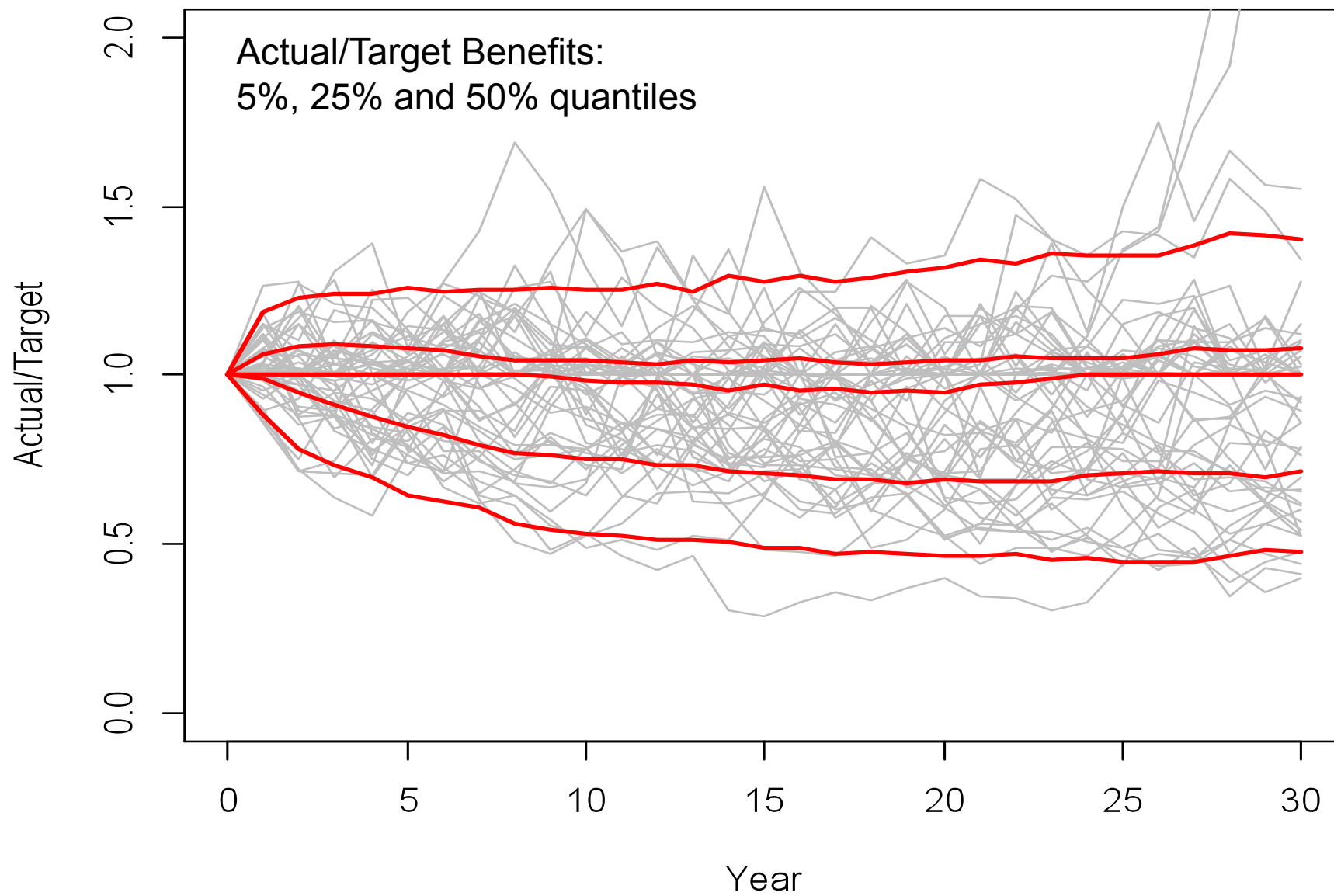
TB -- Collective DC Model

- Assume starting employee fund
 - $F_x =$ value of DB benefit V_x
- Fixed 10% contribution rate
 - + 15% at $t=0$ to *Equalization Reserve (ER)*
- Subsequently:
 - If $F_x > V_x$ then 20% of excess paid to ER
 - If $F_x < V_x$ then shortfall is made up from ER (afap)
 - No payment to ER if ER is large ($> 50\%$  V_x)
- All benefits paid as lump sum
- Target is static

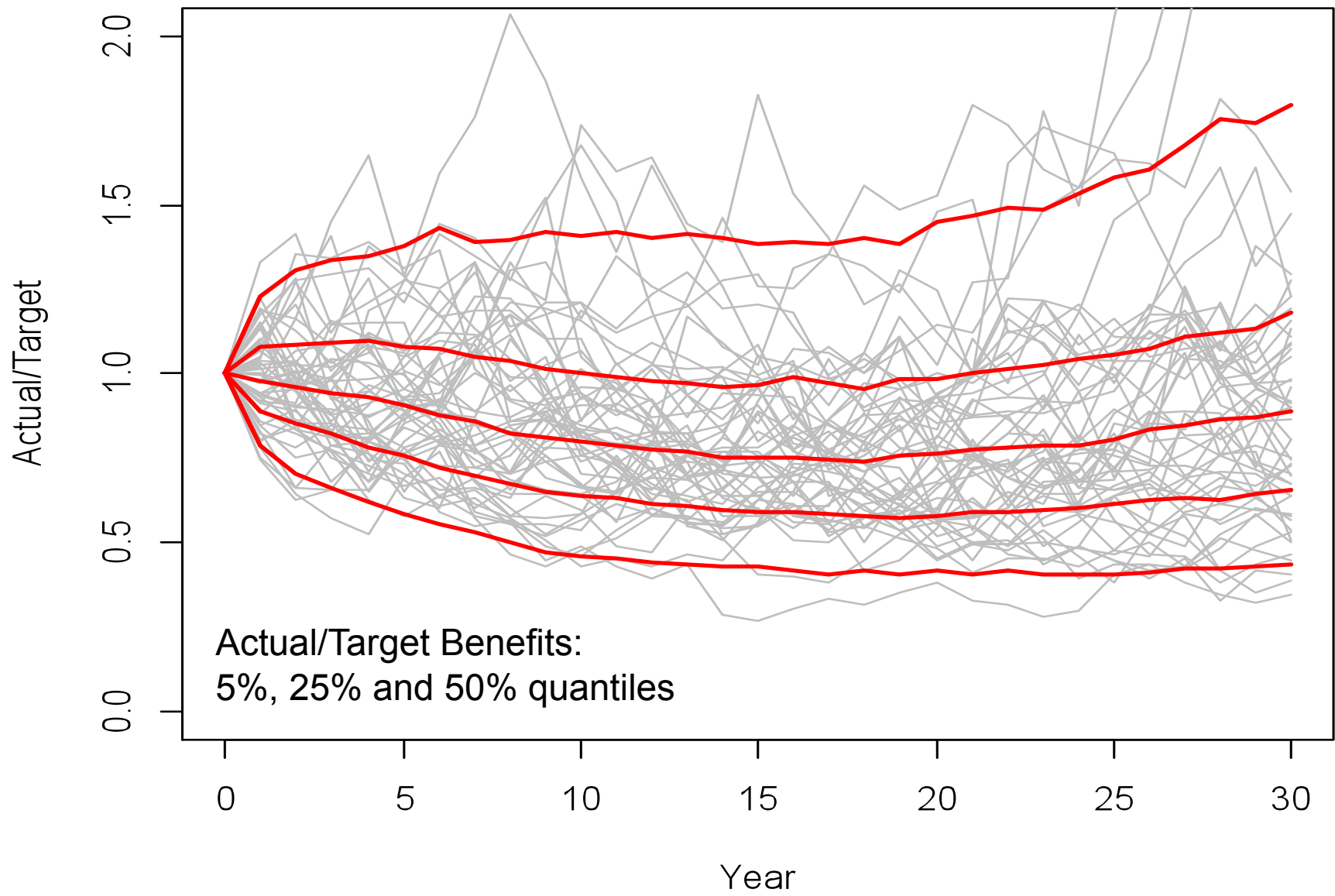
Collective DC



Collective DC



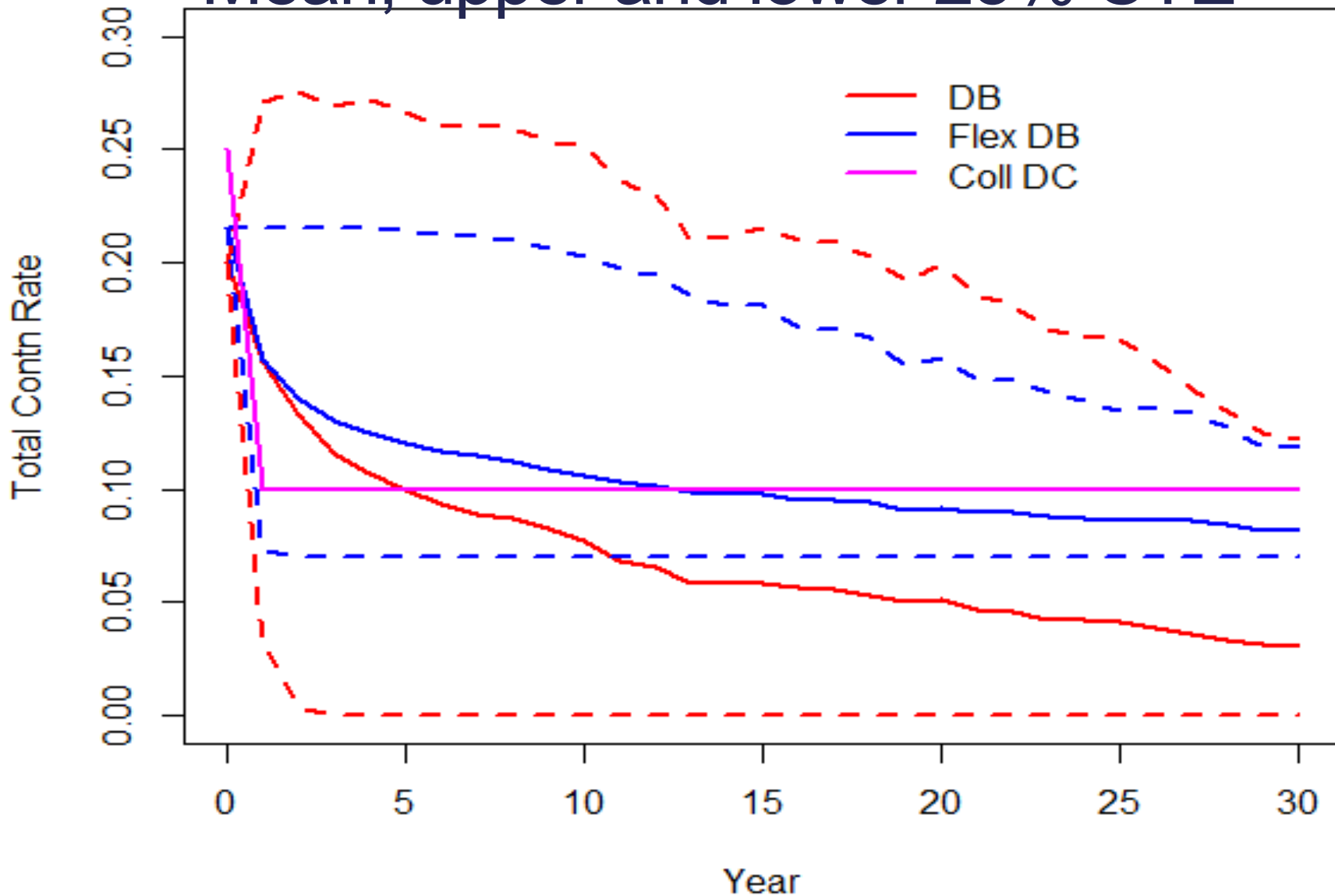
DC



Comparisons: Contributions

- DB highly variable
 - Mean trending to ~ 6%
- Flex-DB constrained
 - Mean trending to ~ 9%
- Collective DC
 - Fixed at 10%, + 15% initial payment to ER
- DC
 - Fixed at 10%

Total Contributions: Mean, upper and lower 25% CTE



Comparisons: Benefits, Paid:Target

- DB

- Paid : Target = 1

- Flex-DB

- Median ~ 1.0, 25% quantile ~ 1.0, 5% quantile ~ 0.95

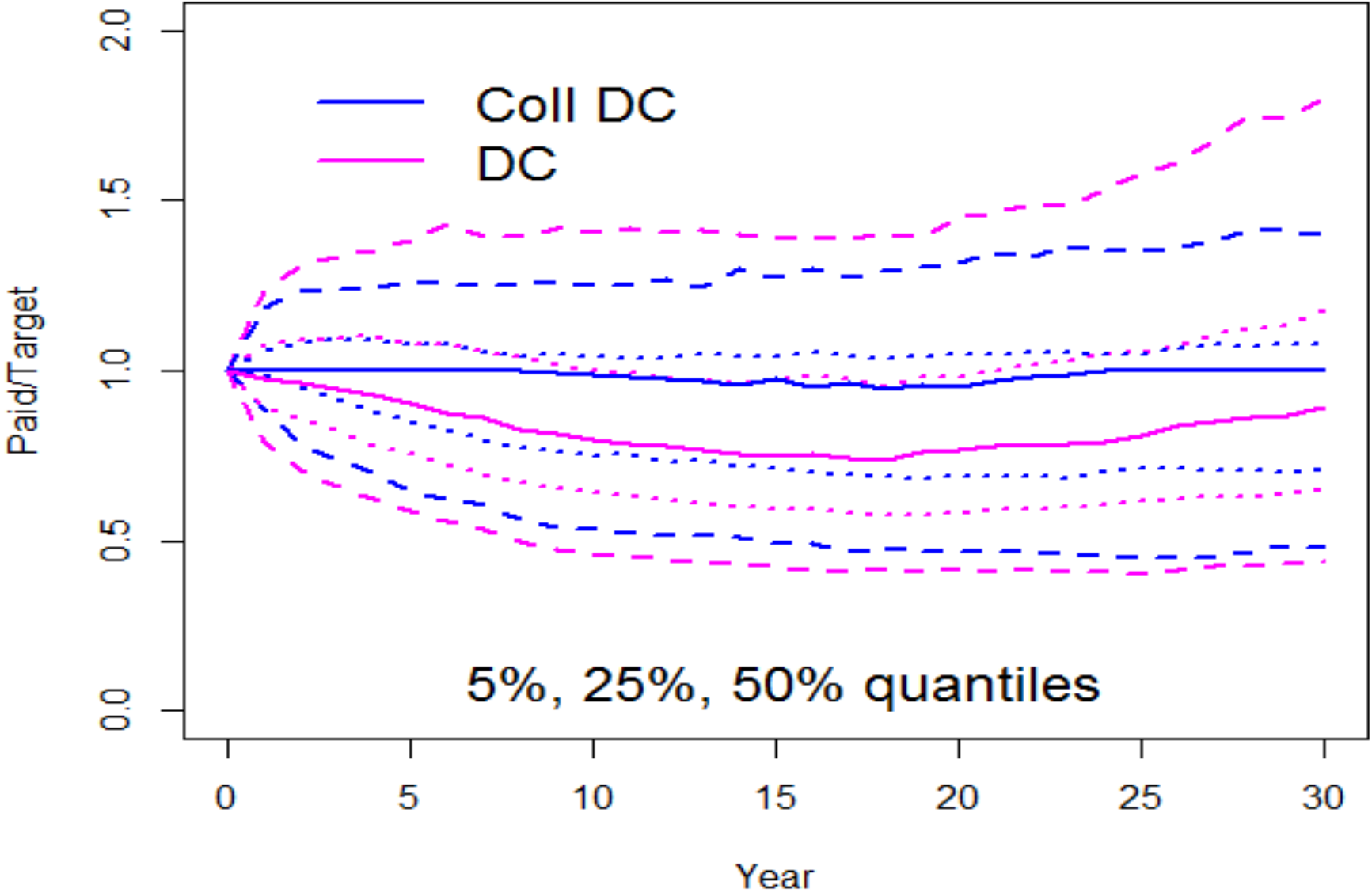
- Collective DC

- Median ~ 1.0, 25% quantile ~ 0.7, 5% quantile ~ 0.5

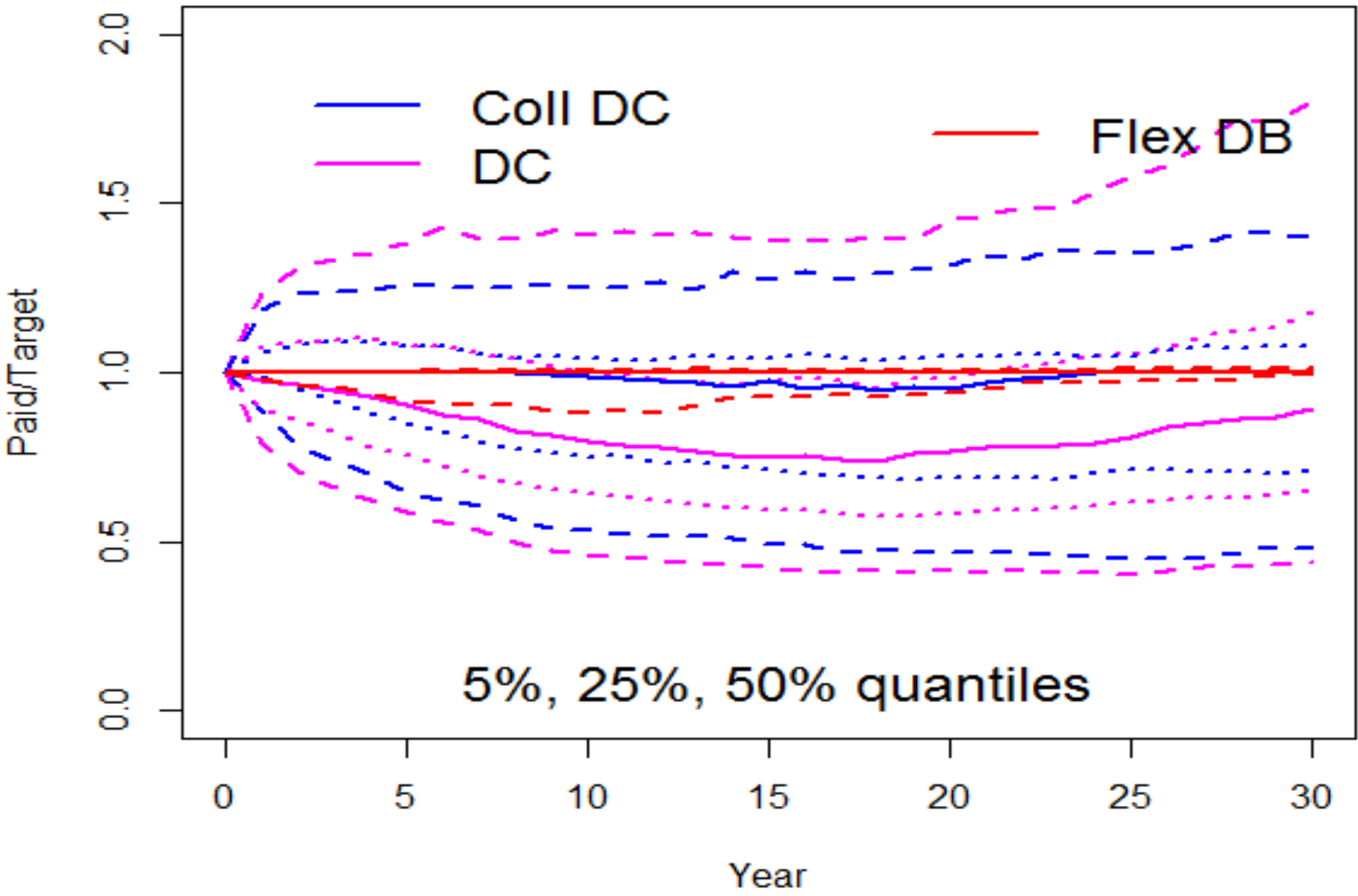
- DC

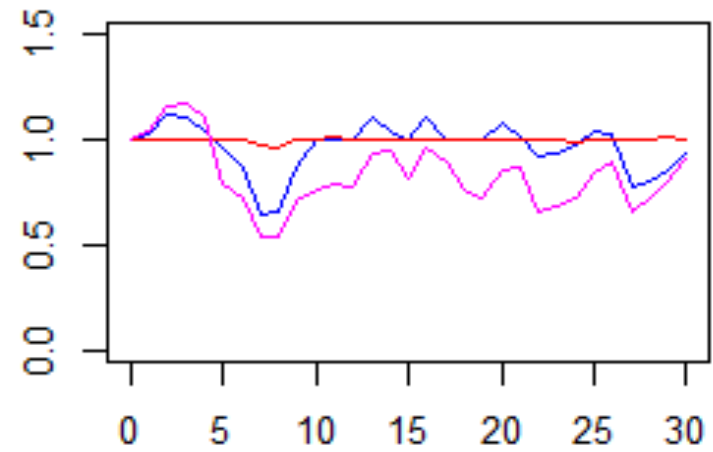
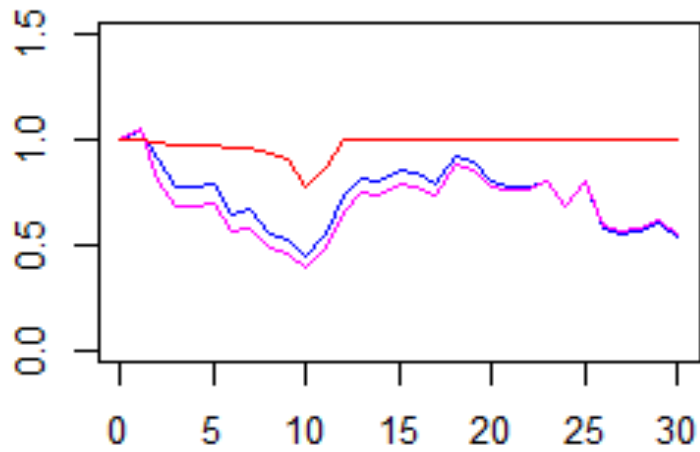
- Median ~ 0.75, 25% quantile ~ 0.6, 5% quantile ~ 0.4

Paid/Target quantiles



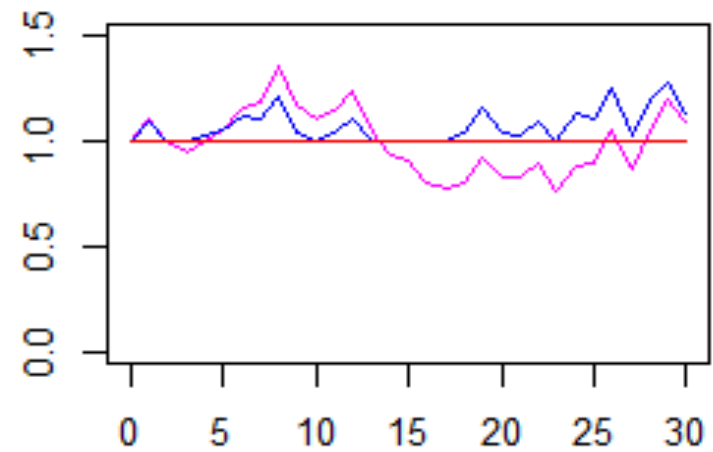
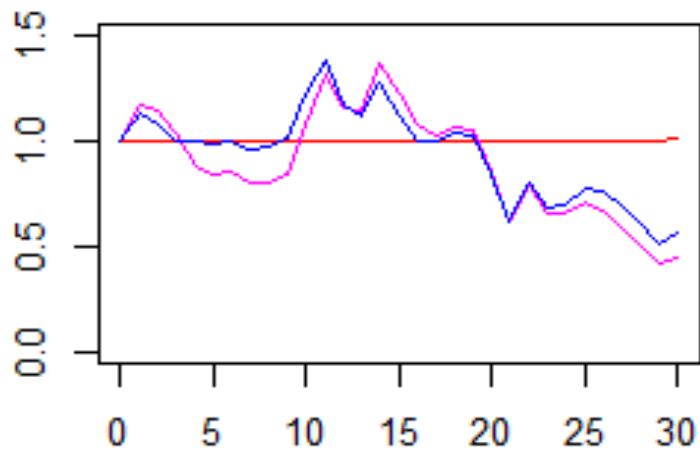
Paid/Target quantiles





Paid/Target, individual projections:

— Flex DB — Coll DC — DC



Comments and Questions

- Collective DC improves on DC wrt low benefit risk
 - but not by much
 - Also, lump sum benefits are risk-inefficient
- Flex DB offsets downside risk
 - With additional contributions
 - And no upside potential
 - Is this a reasonable trade-off?
 - Why is upside potential important?
 - What about early leavers?
- Trend is to Collective DC