

Developing and using risk management models by pension fund supervisors

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Why is DNB interested in ALM analysis?

- **Our own understanding of DB pension funds**
 - essential when designing new regulatory framework
- **Helps in communication (no free lunch)**
 - with politicians (new pension law)
 - with pension funds
- **Creating a benchmark**
- **Might help pension funds**
 - What is the impact of different policies?
 - How to model the term structure?

Questions analysed:

- **What is the impact of market valuation?**
- **What is the impact of new regulatory rules?**
- **What is the optimal investment portfolio?**
- **What is the likelihood of indexation?**
- **How volatile are contributions going to be?**
- **How sensitive are the results?**

New regulatory rules (FTK)

- **Market valuation (also for liabilities)**
- **Full funding guaranteed rights**
 - One year recovery plan
- **Risk-based capital buffers**
 - 15-year recovery plan
- **No need to reserve for conditional rights (indexation)**
 - as long as policy consistent with ambition
- **Premium based on either fixed rate or (smoothed) interest rate/return**

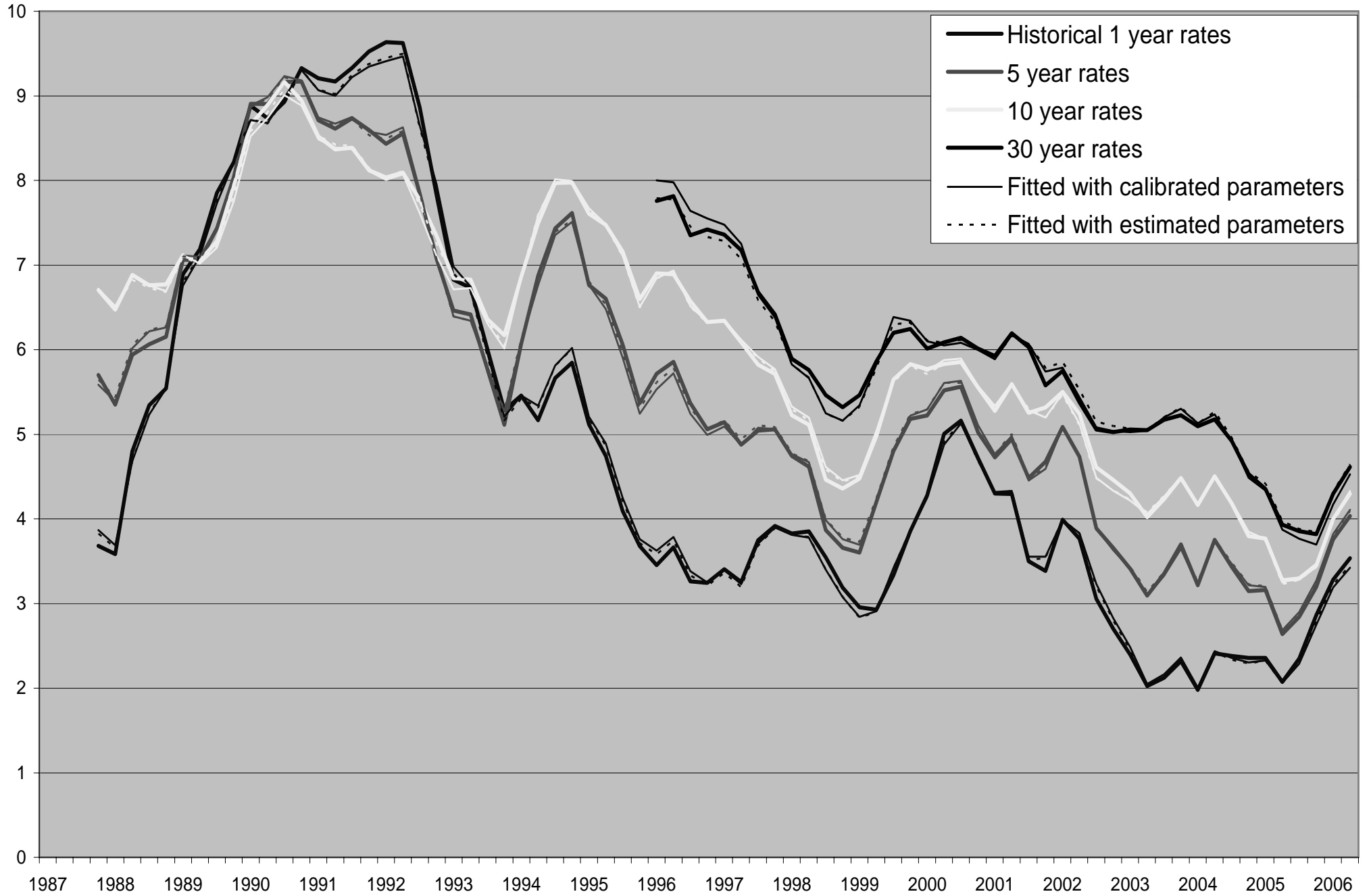
Palmnet characteristics

- **Assumes average earnings pension system**
- **Nominal benefits guaranteed; wage-linked intended**
- **Nominal funding ratio fully market based**
- **Real funding ratio / contributions based on either:**
 - fixed discount rate
 - current market rates (plus risk supplement)
 - smoothed market rates
- **Policy ladders contributions and indexation based on nominal and real funding ratios**

Stochastic inflation, interest rates and stock returns

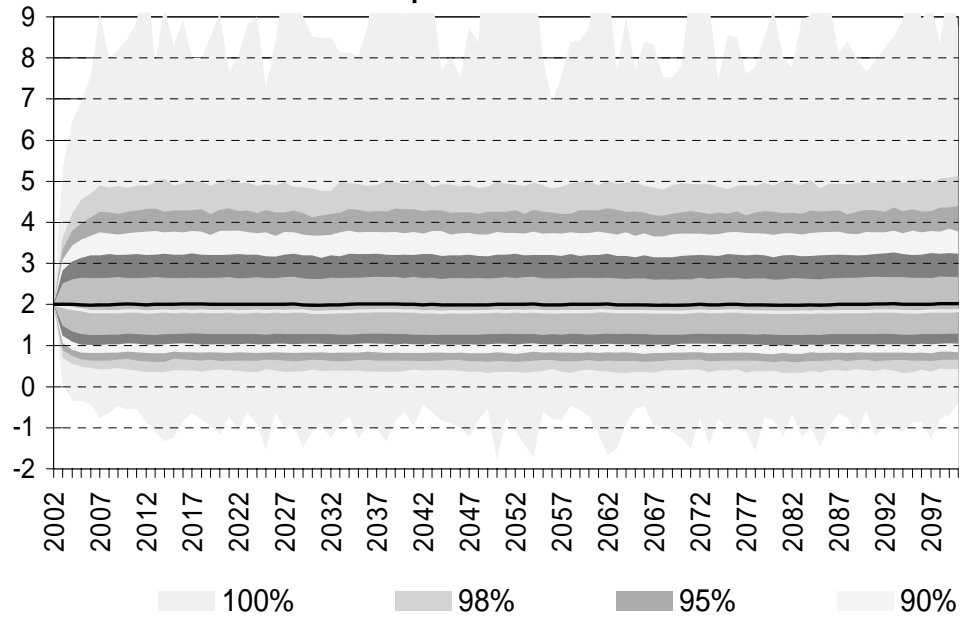
- **New three factor affine term structure model**
 - short rate
 - expected inflation
 - stochastic risk premium
- **Stock market returns: 5-year rate + risk premium**
 - option for mean reversion

Fit of term structure model

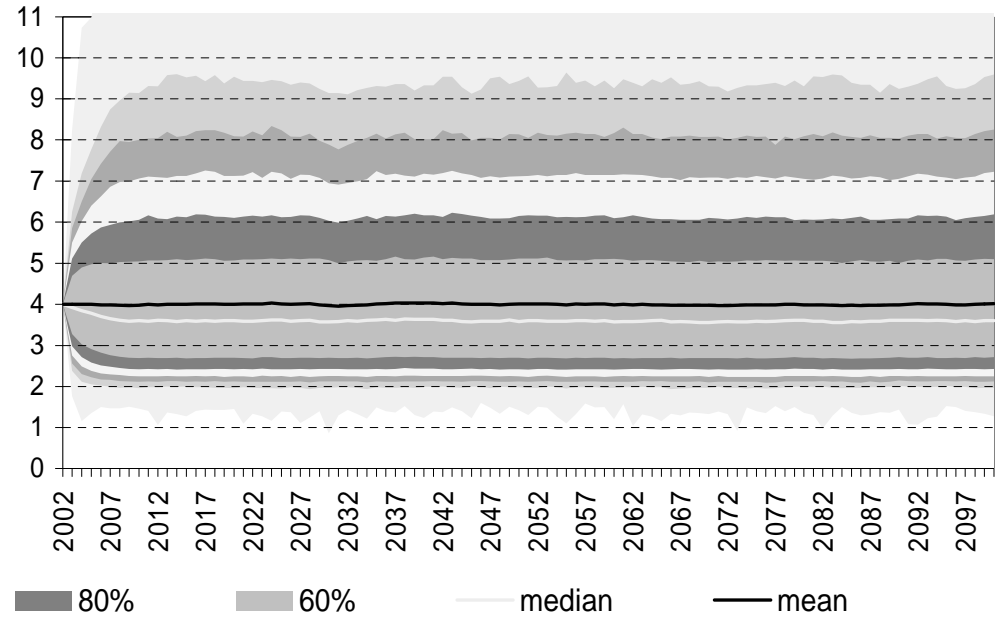


Simulations with calibrated parameters

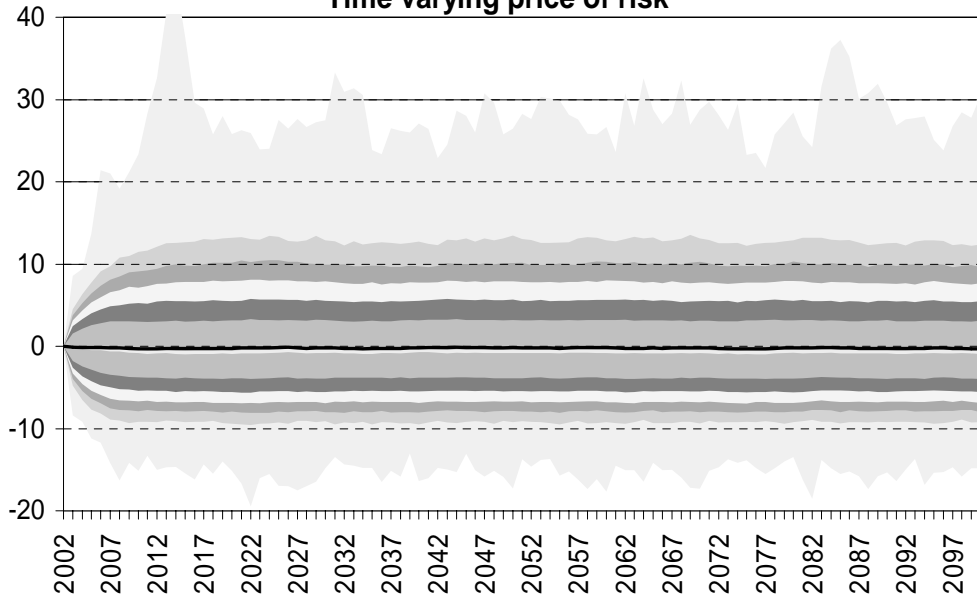
Expected inflation



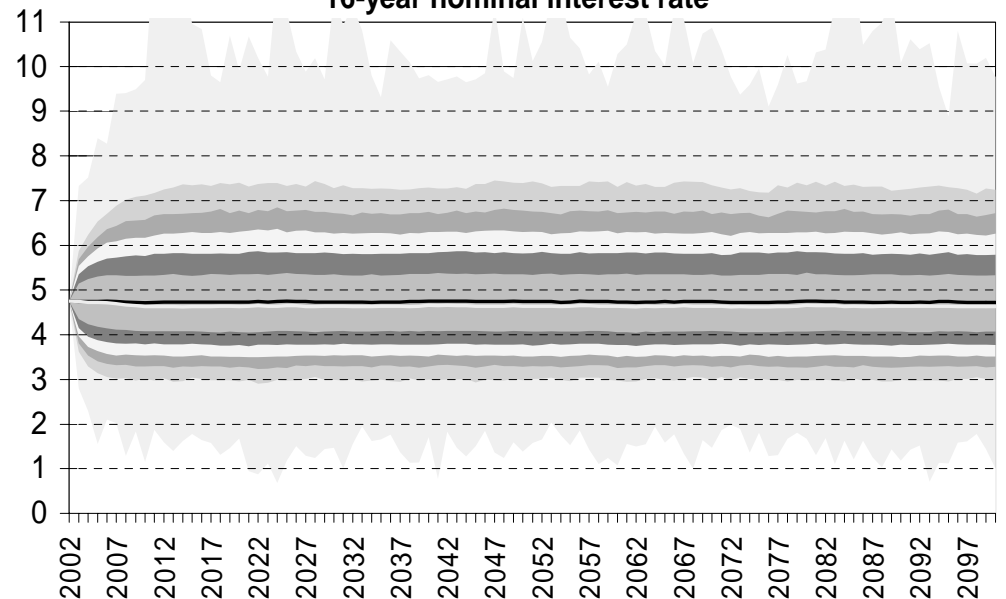
3-month nominal interest rate



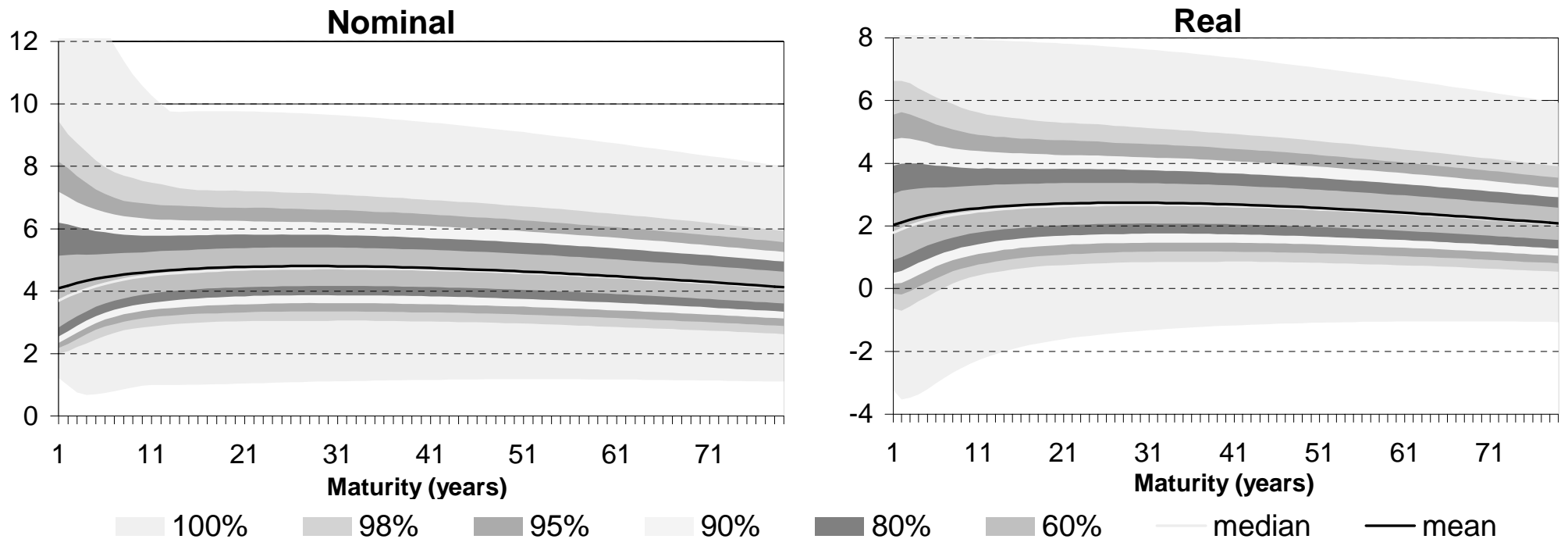
Time varying price of risk



16-year nominal interest rate

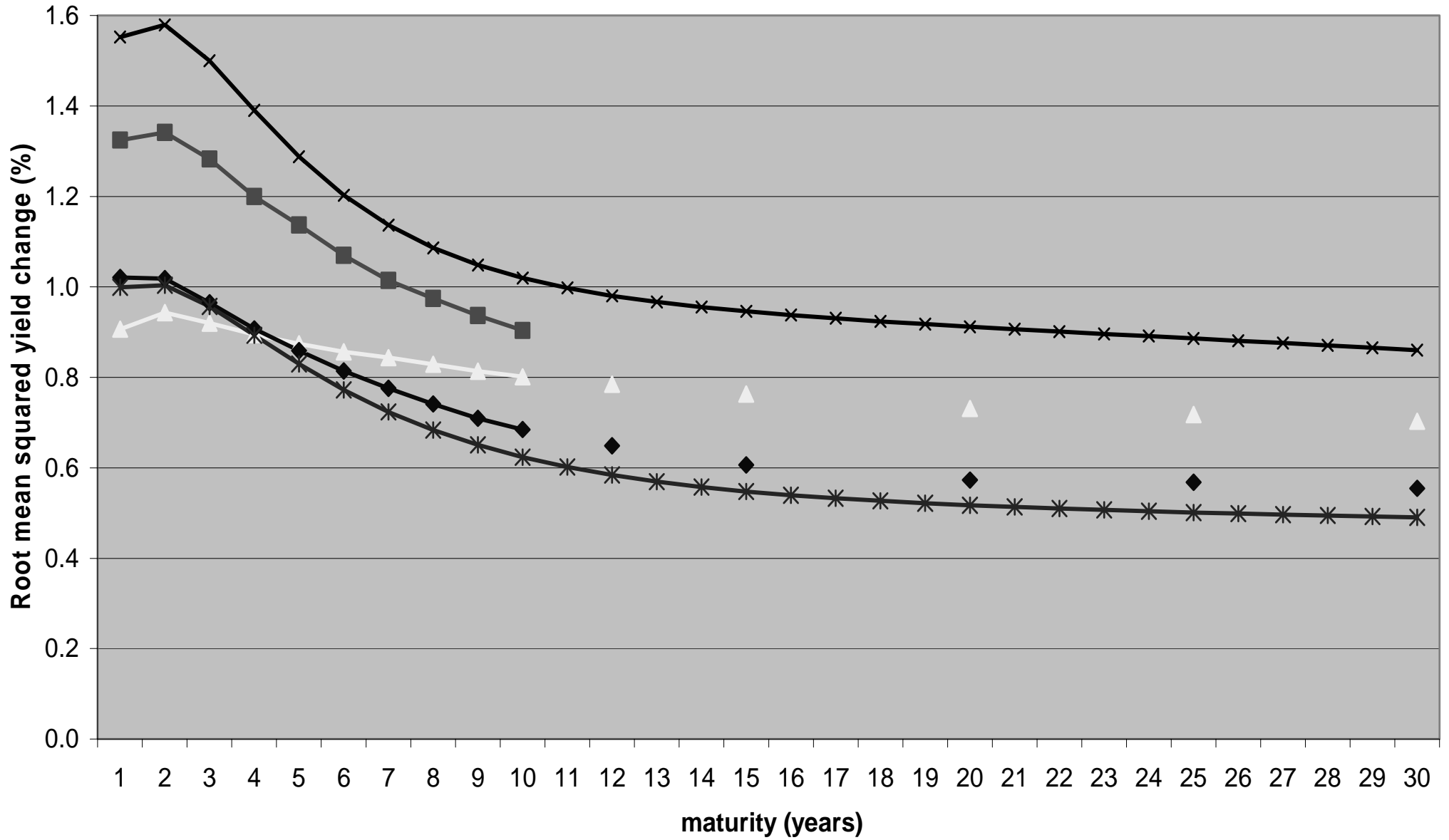


Unconditional distribution term structure



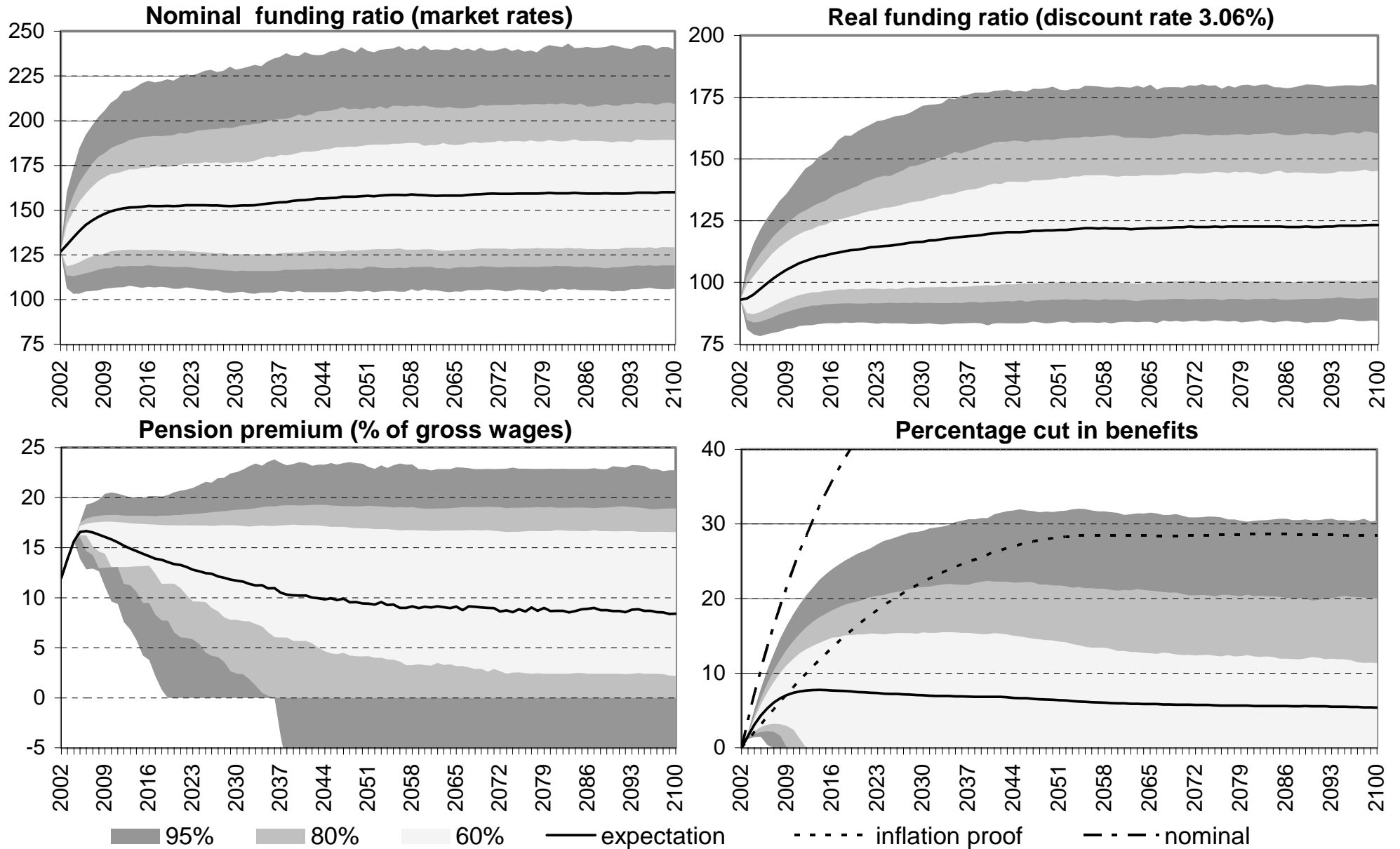
- First upward, then downward sloping (as in reality)
- No problems with lower bound
- Reasonable range of outcomes (even out of sample)
- Real rates are as volatile as nominal ones

Term structure of annual yield volatility

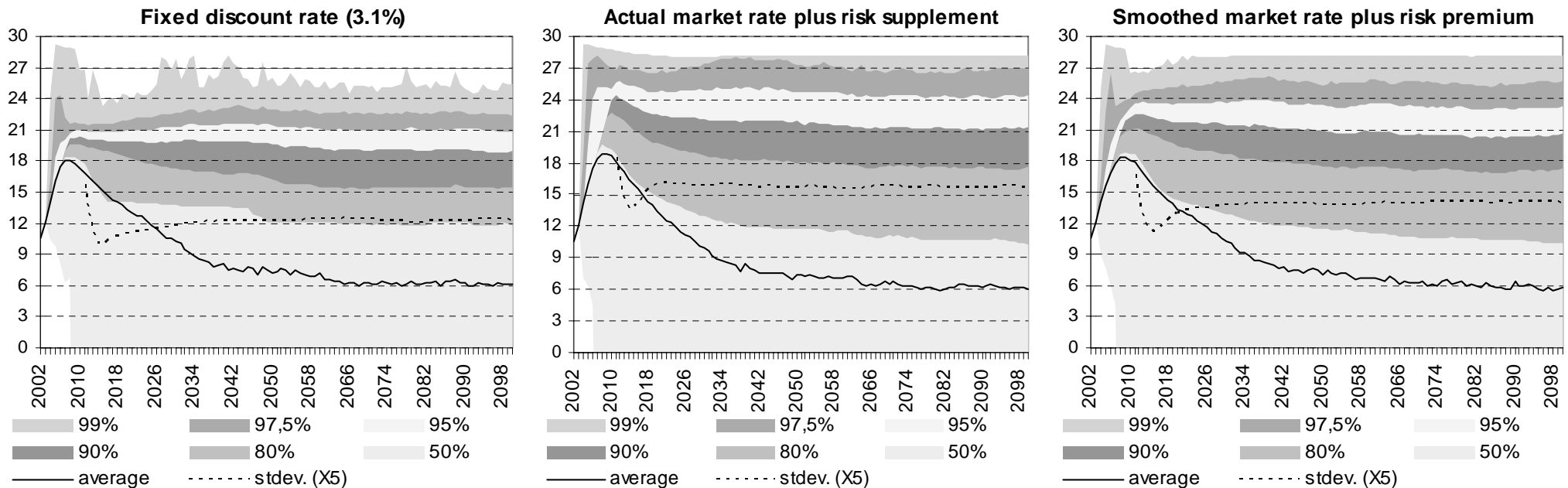


■ Data 1988-2006 ▲ Data 1997-2006 ◆ Data 2000-2006 × Simulated estimated par. * Simulated calibrated par.

Conditional wage indexation, with provisioning

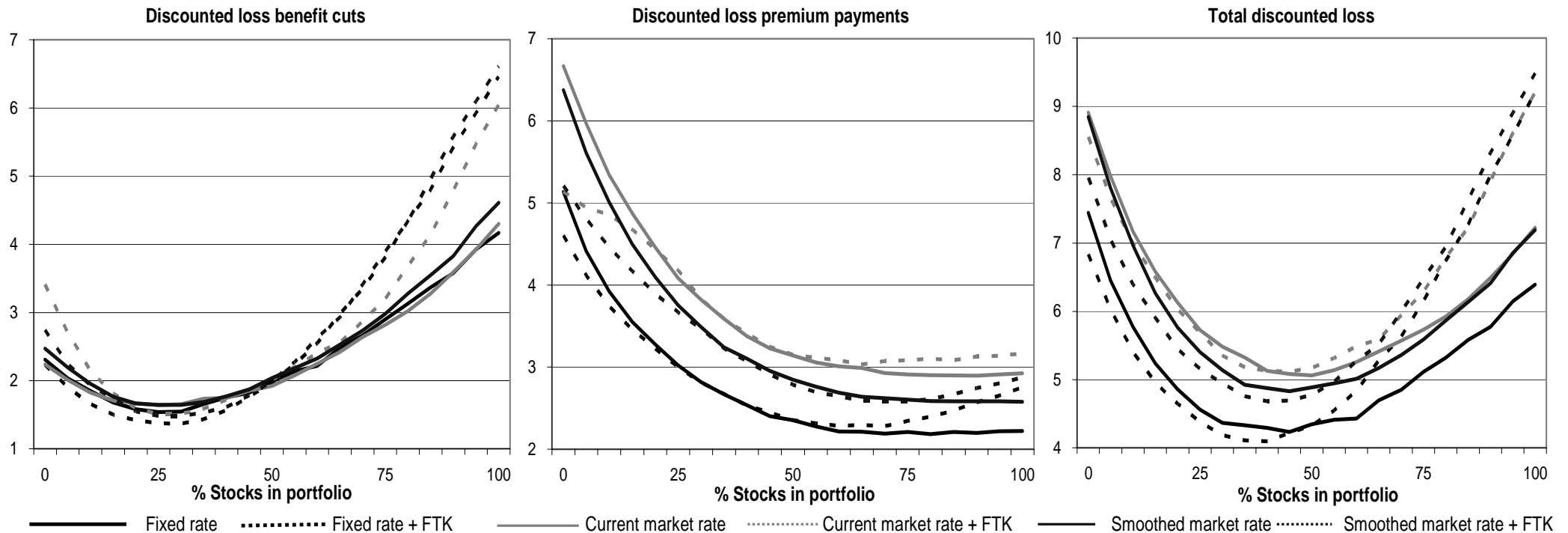


Impact discounting method on contributions, Standard pension fund, FTK - compatible



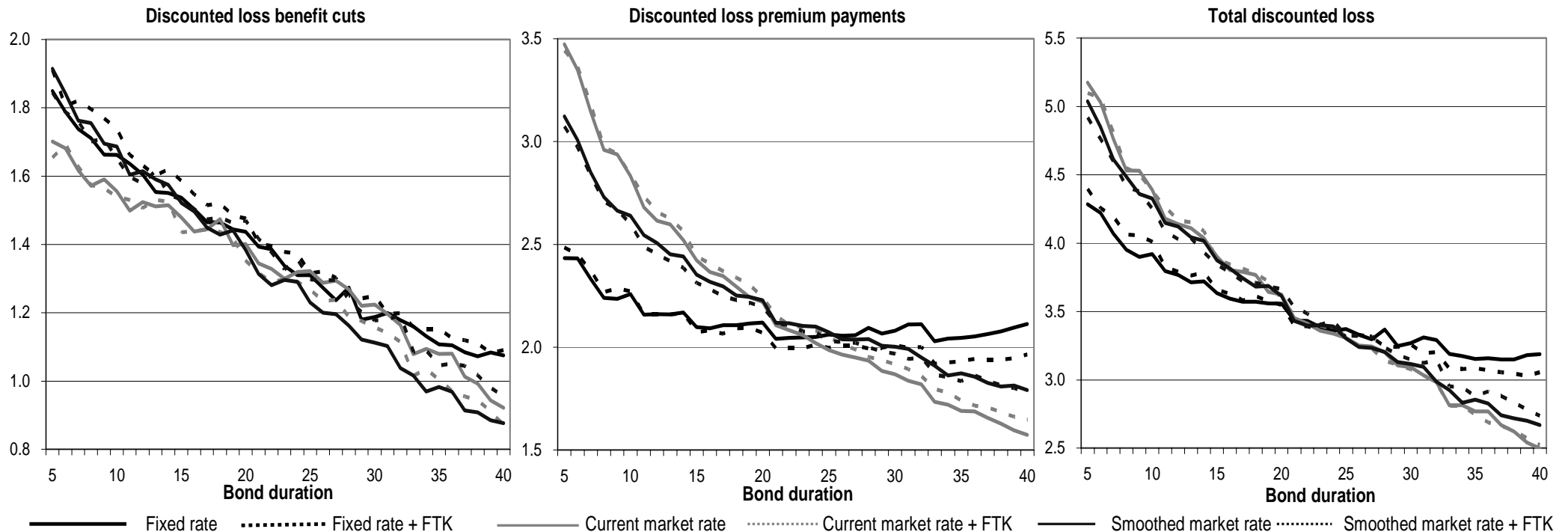
- Market valuation leads to much more volatility and higher extremes
 - More aggressive adjustment policy
 - Worse timing: Higher premium if expected returns are lower
- Smoothing (40 quarters) hardly helps

Utility loss as function of % equity, duration bonds = 5 years



- 40% stocks optimal, but low equity premium (3%) and no mean reversion
- Loss higher under market valuation → More volatile
→ Worse timing
- Stocks slightly less attractive under FTK

Impact duration bonds, starting from equilibrium term structure, 50% equity



- Optimal duration assets $>$ duration liabilities \rightarrow due to mean reversion
- Loss still higher under market valuation for reasonable durations
- FTK does not make big difference

Conclusions

- **ALM analysis essential for supervisor:**
 - improve understanding consequences regulation
 - creates benchmark
- **Uncertainty is the central theme in pension economics:**
 - proper modelling of interest rate risk essential
 - markets are not complete
 - for conditional pension rights old-fashioned actuarial accounting works better than sophisticated finance