

# Feedback effects of default insurance for defined benefit schemes

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- Background
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  - Current PPF levy framework
  - New PPF levy framework

## Background

### Motivation

- Scheme insurance first introduced in the United States in 1974 (Pension Benefit Guaranty Corporation, PBGC).
- What influence does scheme insurance have on the decision making of employer-sponsors and trustees?
- What are the feedback effects of this influence on members (specifically the deficit levels faced by schemes)?
- Using the Pension Protection Fund (PPF) in the U.K. as basis for study.

## Current PPF levy framework

- Considering the risk-based levy only.
- For 2011/12 the levy is calculated as:

$$Levy = \min \left[ \begin{array}{l} 0.0075 \times Liability; \\ Underfunding \times Pr(Insolvency) \times Constant \end{array} \right]$$

## Current PPF levy framework (continued)

$$Underfunding = \begin{cases} 1.36 \times L - N & \text{if } N \leq 1.35 \times L \\ 0.0100 \times L & \text{if } 1.35 \times L \leq N < 1.40 \times L \\ 0.0075 \times L & \text{if } 1.40 \times L \leq N < 1.45 \times L \\ 0.0050 \times L & \text{if } 1.45 \times L \leq N < 1.50 \times L \\ 0.0025 \times L & \text{if } 1.50 \times L \leq N < 1.55 \times L \\ 0 & \text{if } 1.55 \times L \leq N \end{cases}$$

Where  $L$  = Liabilities and  $N$  = Assets

## New PPF levy framework

- For 2012/13 the basic levy calculation is the same but the underfunding calculation has changed.

$$\text{Underfunding} = \max \left[ 0, L^{adj} - N^{adj} \right]$$

- $L^{adj}$  and  $N^{adj}$  are adjusted liabilities and assets that have been smoothed (over a period of five years) and stressed (equivalent to a one standard deviation movement) to take into account investment risk.
- Correlations in economic factors are allowed for in the stress adjustment.

## Methodology

### Model scheme

- Model scheme has 8,600 members, pays pensions, is closed to new entrants and is fully funded at the commencement of projections.
- Liabilities for funding and scheme insurance are discounted on a risk-free basis and not capped.
- Valuations performed annually and contributions updated immediately.
- Surplus cannot be retrieved by employer-sponsor.
- Perfect employer sponsor covenant is assumed.

## Simulations & assumptions

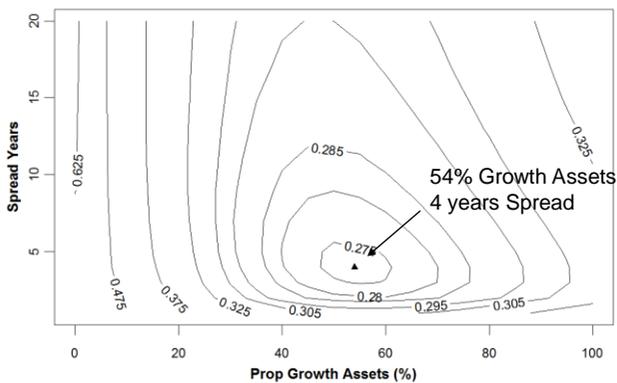
- 1,000 simulations of model scheme performed over a 30 year period.
- Economic model is stochastic and based on the Wilkie (1995) parameterised for Australian index data.
- Demographic models (withdrawal and mortality) are also stochastic.

## Optimisation & decision metrics

- Allocation to equities and spread period (for deficit/surplus) allowed to vary for optimisation.
- Objective function to minimise  $V = \bar{c} + \alpha \times \bar{c}_{exc} + \beta \times \overline{Dfct}$ 
  - $\bar{c}$  is average contribution rate
  - $\bar{c}_{exc}$  is average of excess contributions (above the normal contribution)
  - $\overline{Dfct}$  is the average deficit (treating surpluses as zero deficits)
  - $\alpha$  set to 1 and  $\beta$  set to 10.699

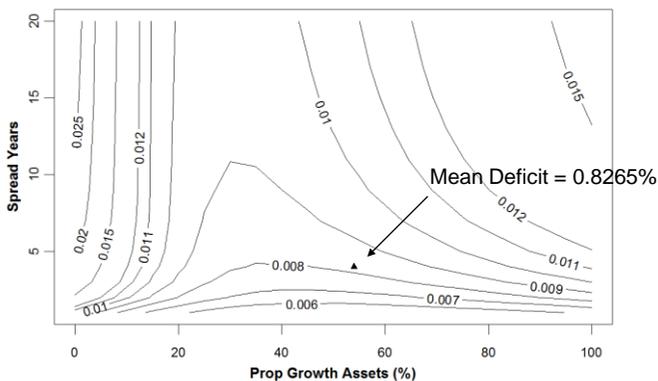
## Results – Base scenario (No insurance)

Objective Function (Base)



## Base scenario (No insurance)

Mean Deficit (Base)



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### Base scenario (Current PPF levy)

This is the base scenario with no insurance      Growth asset allocation steadily increases due to desire to increase funding level to reduce levy payment and then slows down as levy cap applies

P value	0.0000	0.0006	0.0013	0.0021	0.0030	0.0052	0.0078	0.0117	0.0162	0.0199	0.0300
Obj. Func.	0.2735	0.2756	0.2781	0.2809	0.2841	0.2918	0.3010	0.3116	0.3159	0.3174	0.3191
Grth. Asst.%	54	54	55	55	56	57	58	61	62	62	62
Spr. Years	4	4	4	4	4	4	4	4	4	4	4
Mean Def.%	0.8265	0.8273	0.8322	0.8332	0.8384	0.8453	0.8527	0.8705	0.8800	0.8834	0.8885

Spread period not impacted      Mean deficit consequently increases – feedback effect due to growth asset allocation increase

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### Base scenario (New PPF levy)

Growth asset allocation decreases due to allowance for investment risk in levy calculation      Growth asset allocation increases due to levy cap being applied

P value	0.0000	0.0018	0.0028	0.0044	0.0069	0.0110	0.0160	0.0201	0.0260	0.0306	0.0400
Obj. Func.	0.2735	0.2760	0.2775	0.2797	0.2835	0.2885	0.2936	0.2969	0.3004	0.3015	0.3029
Grth. Asst.%	54	54	54	53	52	52	52	53	55	56	56
Spr. Years	4	4	4	4	4	4	4	4	4	4	4
Mean Def.%	0.8265	0.8271	0.8274	0.8241	0.8210	0.8221	0.8234	0.8281	0.8369	0.8415	0.8422

A corresponding reduction in mean deficit – feedback effect      Consequent increase in mean deficit      Objective function not as high due to trend towards surplus

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## Cash flow matched defensive investment

- Instead of defensive assets being invested as per standard indexes they are proportionately cash flow matched to liabilities.
- Stress test is assumed to affect liabilities and cash flow matched assets equally.

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## Cash flow matched (Current PPF levy)

Initial objective function, growth asset allocation and mean deficit lower

<b>P value</b>	<b>0.0000</b>	<b>0.0006</b>	<b>0.0013</b>	<b>0.0021</b>	<b>0.0030</b>	<b>0.0052</b>	<b>0.0078</b>	<b>0.0117</b>	<b>0.0162</b>	<b>0.0199</b>	<b>0.0300</b>
Obj. Func.	0.2338	0.2362	0.2390	0.2423	0.2459	0.2549	0.2654	0.2793	0.2852	0.2868	0.2882
Grth. Asst.%	34	35	35	36	36	38	40	43	44	45	45
Spr. Years	4	4	4	4	4	4	4	4	4	4	4
Mean Def.%	0.5090	0.5186	0.5194	0.5292	0.5303	0.5506	0.5711	0.6015	0.6147	0.6264	0.6299

Effect of scheme insurance largely the same

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## Cash flow matched (New PPF levy)

Increase in growth asset allocation at higher  $P$  values does not occur due to reduction in effect of stress test

$P$ value	0.0000	0.0018	0.0028	0.0044	0.0069	0.0110	0.0169	0.0201	0.0260	0.0306	0.0400
Obj. Func.	0.2338	0.2353	0.2361	0.2384	0.2394	0.2428	0.2465	0.2492	0.2526	0.2549	0.2586
Grth. Asst.%	34	34	34	34	33	32	32	32	32	32	32
Spr. Years	4	4	4	4	4	4	4	4	4	4	4
Mean Def.%	0.5090	0.5091	0.5091	0.5092	0.5004	0.4917	0.4918	0.4919	0.4921	0.4921	0.4923

Hence mean deficit continues to decrease

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## Dynamic asset allocation

- Allocation to growth assets reduced by 1% for every 1% the funding level exceeds 100%.
- Defensive assets maintained as being cash flow matched.

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## Dynamic asset allocation (Current PPF levy)

Slight reduction in objective function from cash flow matched – initial growth asset allocation and mean deficit has increased

<b>P value</b>	<b>0.0000</b>	<b>0.0006</b>	<b>0.0013</b>	<b>0.0021</b>	<b>0.0030</b>	<b>0.0052</b>	<b>0.0078</b>	<b>0.0117</b>	<b>0.0162</b>	<b>0.0199</b>	<b>0.0300</b>
Obj. Func.	0.2316	0.2338	0.2365	0.2395	0.2428	0.2510	0.2606	0.2726	0.2779	0.2798	0.2818
Grth. Asst.%	43	44	44	45	46	48	51	55	57	57	58
Spr. Years	4	4	4	4	4	4	4	4	4	4	4
Mean Def.%	0.5648	0.5729	0.5740	0.5823	0.5908	0.6081	0.6323	0.6643	0.6830	0.6868	0.6992

Effect of scheme insurance largely the same – although increase in growth asset allocation faster

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## Dynamic asset allocation (New PPF levy)

Growth asset allocation does reduce at highest P value due to impact of levy cap

<b>P value</b>	<b>0.0000</b>	<b>0.0018</b>	<b>0.0028</b>	<b>0.0044</b>	<b>0.0069</b>	<b>0.0110</b>	<b>0.0169</b>	<b>0.0201</b>	<b>0.0260</b>	<b>0.0306</b>	<b>0.0400</b>
Obj. Func.	0.2316	0.2332	0.2341	0.2356	0.2379	0.2415	0.2452	0.2478	0.2509	0.2529	0.2560
Grth. Asst.%	43	43	43	42	42	41	41	41	41	41	44
Spr. Years	4	4	4	4	4	4	4	4	4	4	4
Mean Def.%	0.5648	0.5649	0.5649	0.5578	0.5579	0.5508	0.5509	0.5509	0.5510	0.5510	0.5726

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## Conclusions

- New PPF levy framework far better at reducing deficit feedback effects for members.
- Levy cap can lead to increase in optimal allocation to risky assets depending on investment strategy.
- Not really realistic to remove levy cap as this will increase levies for those schemes most at risk.

**Questions / Comments?**

**Thank You!**