Transition from defined benefit
to target benefit

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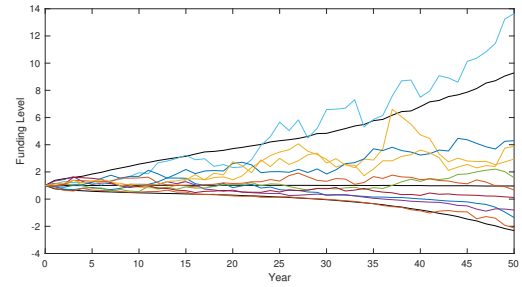Department of Statistics and Actuarial Science, University of Waterloo

Highlights

This article is a summary of the paper by the same authors, titled '*Long and short term optimal transition from a defined benefit to a target benefit pension plan*'.

As Defined Benefit (DB) pension plans in Canada experience funding shortfalls and contribution volatil-ity, Target Benefit (TB) plans have been proposed as potential replacements, with fewer disadvantages for participants than Defined Contribution (DC) plans, and with better opportunities for controlling costs and volatility than traditional DB. In this work, we develop a model TB plan which is designed to provide fair and sustainable benefits over the long term, and we propose a strategy for transition from a traditional DB plan to the TB plan, taking into consideration the different risks for different cohorts.
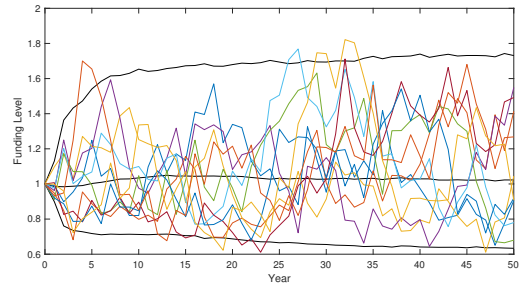
The major findings of the paper are (1) that the TB plan can be designed in a way that is sustainable, with transparent risk sharing between generations, and (2) that a phased age-dependent transition from DB to TB ensures that older retirees are not worse off after transition, with respect to the risk of catastrophic loss of income.

Target benefit and defined benefit plans

Since a TB plan allows the sponsor to adjust both the benefit and the contribution levels according to the actual performance of the fund, it is not surprising that sponsors would favour TB plans over DB plans, as they relieve some or all of their financial risk.

(a) Funding Level of DB

(b) Funding Level of TBP

Figure 1: *Future Funding Level (black line are the 95th, 50th and 5th percentile, colored lines are sample paths).*

On the other hand, the advantages of TB plans to em-ployees are less apparent, particularly if DB plans are seen as offering 100% guarantee of the accrued pen-sion. However, there is increasing awareness of the risk of catastrophic failure of DB benefits, as exam-ples of extensive underfunding of pension plans of defaulting corporations are increasingly reported in the media. When default risk is taken into considera-tion, a TB plan can be demonstrated to offer superior security as well as reasonably stable benefits. Figure 1 presents simulated funding ratios for a DB and a TB plan, under the same economic scenarios, when there exists no external interference or constraints requiring wind-up or reduction of excess assets. Broadly, the advantage of the DB plan for employees and retirees is that, as long as it does not default, the benefits are fixed, predictable and adequate. However, if the plan defaults, there may be catastrophic cuts in accrued benefits. If we assume that a plan with funding level less than around 40% will be forced into default, then it is clear that the sustainability advantage of the TB plan may provide overall better benefit security than the DB plan, even though benefits in the TB plan are subject to adjustment.

The default risk under the DB plan is not the same for different age groups. Retirees have a lower proba-bility of experiencing plan default than younger plan members, as their life expectancy is shorter. So reduc-ing the default risk may not have substantive value for retirees, particularly older retirees. This is one of the reasons that in practice, when a DB plan is termi-nated, older employees often remain in the original

plan while younger members are transferred to the re-placement plan. However, for a severely underfunded DB plan, this transfers the deficit unfairly to future generations.

Transition from DB to TB

There are two major steps in designing any pension reform:

1. Decide on design for the new pension scheme.

2. Establish transitional arrangements for existing members.

Numerous academic studies have examined how to construct an optimal TB plan, which cover the quanti-tative aspects in the first step. The term 'optimal' in-dicates that a design maximizes/minimizes a suitable objective function. In our case, we have minimized the squared difference between the target consumption and the actual consumption across future generations, allowing for employees to pay additional contribu-tions, and retirees to receive smaller benefits when the

asset/liability ratio is below 1.0, and vice versa when the asset/liability ratio is above 1.0.

The parameters of our optimal TB plan are given in Table 1. We started with the DB plan contributions and benefits, that is, setting target contributions of 10% of salary, and a target replacement ratio of 64%, for a retiree with 40 years of service. The parameters in Table 1 indicate the proportion of surplus or deficit that is allocated to decrease or increase contributions for active employees, and the proportion that is allocated to increase or decrease the benefits of retirees. In both cases, adjustments are applied to the target values. The $+$ or $-$ signs indicate an addition or subtraction from the target values.

The DB benefit of 64% of salary comes with a substantial risk of default. The TB benefit, funded with the same target contribution of 10% of pay, is expected to be around 45%. The difference arises because the TB holds funds back to decrease long term insolvency risk. Technical details are given in the full paper.

Scenario	Additional Contribution	Additional Benefit
Surplus	-8.0%	$+4.3\%$
Deficit	$+3.7\%$	-1.98%

Table 1: *The Sample Target Benefit Plan.*

Moving from a DB to a TB plan gives substantial benefits overall in terms of long run security, but is not necessarily optimal for each individual cohort. The goal for our second step is to ensure that all individuals benefit from the transition, at least in respect of protection from catastrophic loss, which is deemed to occur when assets/liabilities falls below 40%. At this level, we assume that the fund (DB or TB) is subject to mandatory wind-up, with a heavy expense burden, and a one-time pro-rata cut to accrued benefits. Our approach is to allow partial participation into the new TB plan, based on individual's age. The key idea is that retirees may reduce their future income risk through partial enrollment. Older retirees may still

share part of any deficit, but the exposure is decreasing with age. This smooth transition strategy can be effective in terms of enhancing the sustainability of the pension fund. Retirees share funding risks, as appropriate for a TB plan, but their exposure is decreasing as a function of age at transition. The overall security of the plan is enhanced, as retirees share the risk, but retiree income is also largely protected, as their participation in the TB plan is less than 100%.

In Figure 2 we show the optimal benefit adjustments on deficit, by age at transition. The horizontal line is the optimal β^l obtained from long-term problem, which is not affected by the initial funding level. For the cohorts at transition, if β^l_x is at the long term value of 1.98% (as given in Table 1). then members age x at transition should optimally transfer fully to the TB plan. If β^l_x is close to zero, then members age x at transition should optimally stay in the DB plan. In between, members should be partially enrolled in the TB plan. We see that members of a highly under-funded DB plan will have more incentive to participate in the TB plan, as the risk of catastrophic default is reduced. Hence, full participation in the TB plan is optimal for all cohorts except the very oldest. When the DB plan is fully funded at transition, a partial participation in the TB plan is recommended for retirees age 80 and above, with full transition indicated for all retirees below age 80.

The values for each age are determined by optimizing with respect to an objective function based on minimizing the retirees' downside income risk.

Is a phased transition necessary?

Perhaps the simplest transition would be to transfer assets and liabilities for active members to the new plan, and leave retirees in the old plan. This is an age-based transition, albeit a crude one. However, this "cut-off" strategy has disadvantages over the phased strategy described above. First, it transfers deficits from the retired population to current and future workers. Sec-
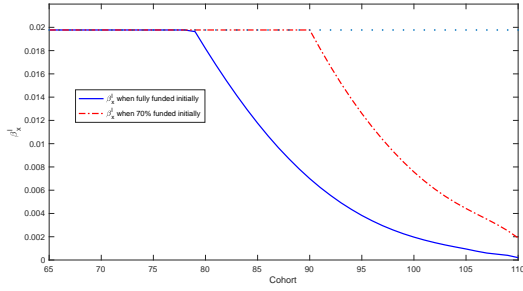
Figure 2: *Transition benefit adjustment factors on deficit; 100% and 70% initial funding*

(a) Sustainability: Smooth Transition to TBP v.s. DB

(b) Sustainability: Smooth Transition to TBP v.s. Cut-off

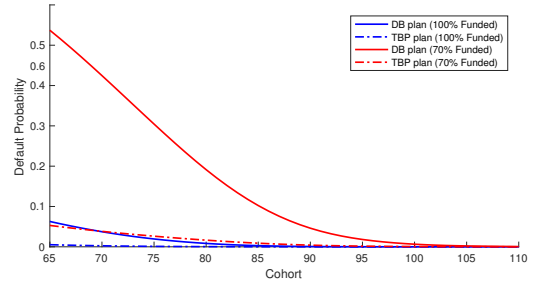**Figure 3:** *The expected probability that pension fund becomes insolvent during each cohort's lifetime.*

ondly, if retirees form a major component of the membership, this arrangement may not sufficiently relieve the financial burden of the old DB plan, especially if the plan is already in deficit at transition.

In Figure 3 the sustainability of the TB plan is illustrated; we assume a pension fund is considered "insolvent" when assets fall below 40% of the liabilities.
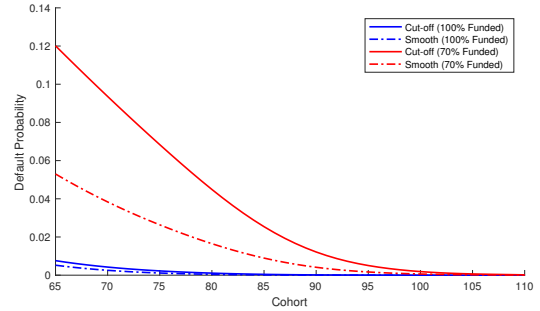
The *x*-axis represents the different cohorts, and the *y*-axis is the probability of fund insolvency during their remaining lifetime. The TB curve shows the probability of fund insolvency, by age, assuming a smooth transition. The DB curve in the top diagram compares the insolvency risk of the TB fund (with smooth transition) with a DB plan. In the lower diagram, the TB insolvency curve, assuming smooth transition, is compared with the insolvency risk for the TB plan, assuming all retirees retain their full DB benefits, while all active members are transferred to the TB plan. These graphs show that the sustainability issue remains significant using the "cut-off" strategy, especially when the DB plan is under-funded initially.

Summary

Pension reform will remain a global issue for the coming decades. Target Benefit plans which emphasize sustainability and adequacy will play an important role in future retirement systems. Designing transition strategies will be an important part of the reform process. Our procedure reduces intergenerational conflicts while preserving the optimal long run structure. Importantly, the method is simple and flexible, allowing it to be adopted by different sponsors with different objectives.

About the Authors

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