



Target Benefit Plans Issue Brief #1

Exploring the Simplest Design



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Pension Section

AUTHOR

Barbara Sanders, FSA, FCIA, MSc

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Target Benefit Plans Issue Brief #1: Exploring the Simplest Design

What is a target benefit plan?

Target benefit plans (TBPs) are collective pension arrangements combining certain elements of traditional defined benefit (DB) and defined contribution (DC) plans (see Figure 1). As the name indicates, these plans have a targeted level of retirement income that they aspire to provide, but actual benefits may exceed or fall short of this target. An explicit benefit/funding/investment (BFI) policy lays out, among other things, (1) the sponsor’s funding commitment, (2) how plan assets will be invested, (3) how often, and in what manner, the affordability of the target benefit will be assessed, and (4) the actions that will be taken based on the results of those assessments. Actions may include changing the level of contributions within a predefined range, changing the asset mix, or adjusting members’ benefits in respect of past and/or future accruals.

Figure 1: The hybrid nature of TBPs

Elements of TBPs adopted from	
Traditional DC plans	Traditional DB plans
Predefined contribution levels	Predefined lifetime retirement benefits
Sponsor liability limited to contributions	Collective investment fund without individual accounts
Variable benefit level	Mortality risk pooled among members

Conceptually, TBPs span a wide range between more DC-like designs at one end of the spectrum, with limited risk-sharing among members and frequent adjustments to benefits in response to emerging experience, and more DB-like designs at the other end, with a strong emphasis on benefit security and stability and more risk-sharing.¹

The SOA project in a nutshell

Most Canadian stakeholders to date have focused on DB-like implementations of TBPs, many of which are very complex arrangements with multiple layers of benefit security-enhancing features. In order to help stakeholders understand the contribution of each element to this complex whole, it is instructive to start from a much simpler design and ask:

- What are the fundamental characteristics of a simple TBP?
- How do benefits behave when using simple tools to manage risk?
- What other features could be considered to enhance benefit security and stability, if desired?

To answer these questions, the SOA’s research project investigated several design options under a variety of assumptions. Each permutation had the same sponsor commitment (same starting asset value, plus annual contributions of 10% of pay) and the same general structure for the target benefit (a percentage of career-average-earnings times years of service, without an explicit

indexation provision either before or after retirement) but they each had a different benefit adjustment mechanism and/or investment policy.

Plan membership was assumed to be mature and stationary. Benefits accrued under a predecessor DB plan were assumed to be converted to entitlements under the TBP. The operation of the plan was simulated over a long period using stochastic projections from an economic scenario generator designed for commercial use.

A variety of performance metrics was used to assess the level, stability, and security of benefits over time. With the level of funding being fixed, differences in outcomes were directly attributable to differences in how risks and rewards were allocated among plan members.²

The starting point: a Collective Defined Contribution (CDC) plan

The simplest design considered had a benefit adjustment mechanism that eliminated fully any shortfalls (and distributed fully any excess assets) that arose between valuations by immediately adjusting the accrued benefits of each plan member (including pensioners) by the same proportion, based on the plan’s funded ratio determined under the Traditional Unit Credit (TUC) cost method.³ The methodology is illustrated in Figure 2.

Figure 2 – Examples of benefit adjustments under a simple Collective DC plan

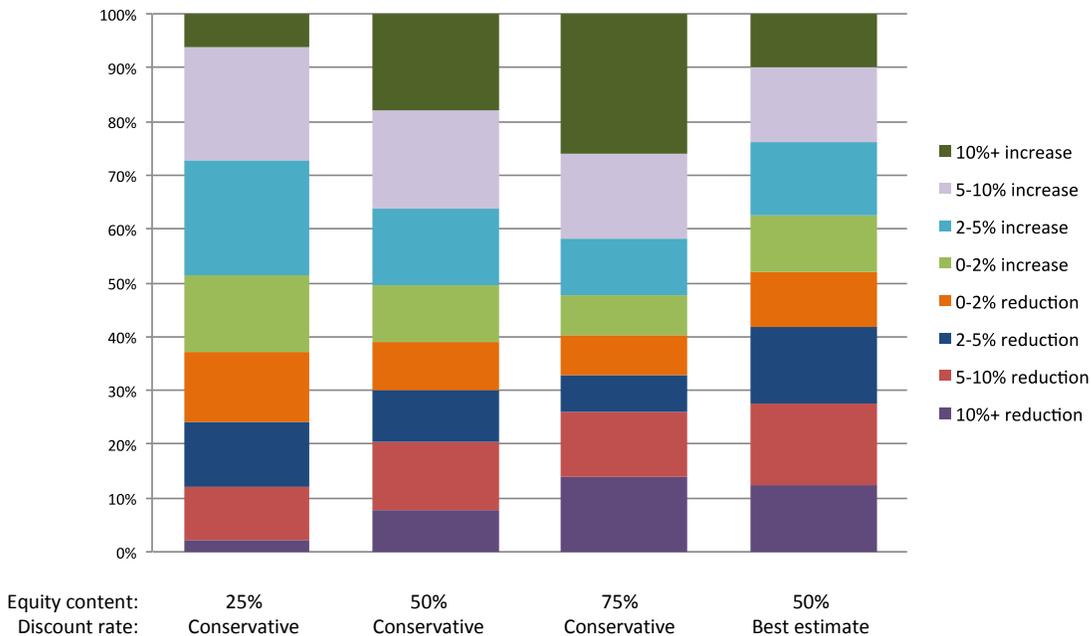
	Member 1	Member 2
Accrued annual pension at last valuation	3,000	18,000
New accruals since last valuation	600	0
Accrued annual pension at current valuation, before adjustment (1)	3,600	18,000
TUC funded ratio in current valuation (2)	103%	
Accrued annual pension at current valuation, after adjustment (1) x (2)	3,708	18,540

Under this design mortality experience is pooled, providing valuable protection to members from longevity risk. However, there is no attempt to spread investment risks over time. As a result, individual members continue to face considerable variability in benefit levels. There are examples of Canadian pension plans that operate on a similar basis, at least during the post-retirement period.⁴

CDC outcomes: security and stability

Stakeholders approaching target benefit plans from a DB framework are usually interested in the security of accrued benefits, and there is considerable focus on the likelihood of benefit reductions.⁵ Predictably, under the simple CDC plan with frequent benefit adjustments, this likelihood is quite high, even when choosing a conservative asset mix and a conservative valuation basis. Figure 3 shows the distribution of annual benefit adjustments by size for four different combinations of asset mix and discount rate.⁶

Figure 3 – Distribution of annual benefit adjustments by size (simple CDC plan)

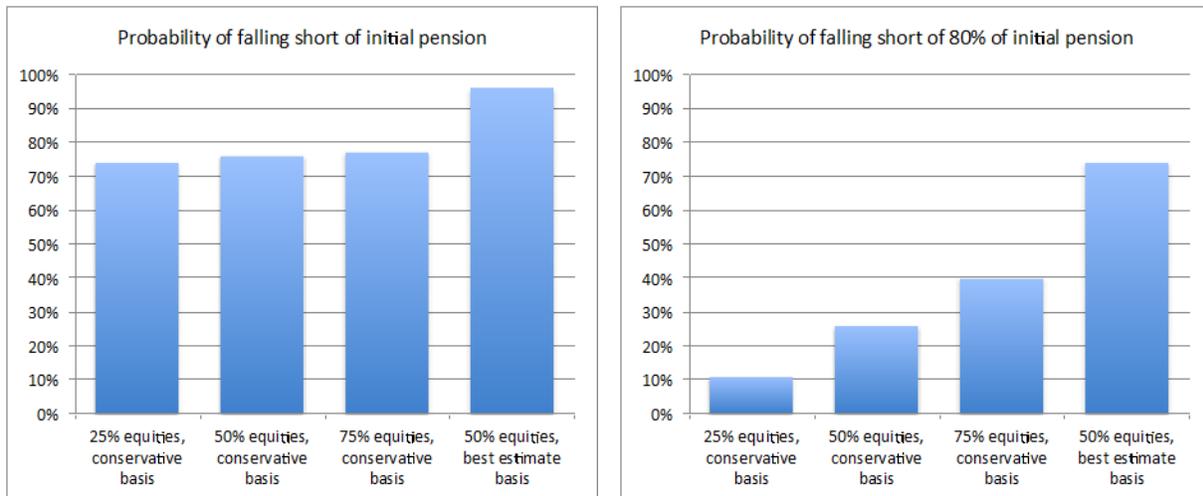


Not surprisingly, when a conservative valuation basis is chosen, upside risk exceeds the downside. Benefit increases are financed by gains that are primarily due to realized equity risk premia and rising bond yields (as predicted by the asset model). Switching to a “best estimate” discount rate changes the plan’s annual risk profile considerably, leading to larger and more frequent benefit reductions and smaller, less frequent benefit increases, all other things being equal. Just like any retirement income plan, a CDC or TBP cannot pay more for benefits than what can be afforded from actual contributions and actual investment income. A higher discount rate allows more spending early on and a higher risk of larger reductions. The discount rate acts more like a spending test than a funding security measure.

Figure 4 shows the cumulative impact of these benefit adjustments over time. It charts, for the same four combinations of asset mix and discount rate, the probability that the actual pension of a member who retires shortly after inception falls below his initial pension (determined at age 65) at *least once during his/her retirement*. It also shows the corresponding probabilities that this member’s pension falls below 80% of his initial pension – a significant cumulative loss of benefits.

Under all variants, there is a significant probability of at least one “shortfall event” during the member’s retirement period, simply because the period in question is very long (30-40 years) and adjustments are frequent. Note that, due to the path-dependent nature of the adjustments, the probability of a shortfall over a single valuation period (as reflected in Figure 3) cannot be used to infer the probability of shortfall over longer horizons. Hence, focusing exclusively on short-term outcomes may not provide adequate insights into outcomes over the long term.

Figure 4 – Shortfall probabilities over entire retirement period (simple CDC plan)



Some stakeholders may also be interested in the year-to-year variability of pensions, with particular concern over the prospect of needing to reduce benefits immediately on the heels of a benefit increase (we refer to this as a “benefit reversal”). Since the simple CDC design makes no attempt to smooth out experience, such benefit reversals are experienced routinely. Behavioural economics suggests that this may be difficult for members to accept⁷, so clear communication regarding the volatility of benefits is of paramount importance.

CDC outcomes: benefit levels and income replacement

While the use of a less conservative valuation basis under a simple CDC plan tends to reduce the security of benefits, it can improve benefit levels (at least for some cohorts) as illustrated in Figures 5 and 6.

Figure 5 shows the distribution of modified replacement ratios⁸ for three different cohorts of retirees under a simple CDC plan with 50% equity content, using a conservative valuation basis. The blue boxes indicate the middle 50% of outcomes (25th to 75th percentiles) with the bar in the middle marking the median. The “whiskers” above and below the box extend to the 10th and 90th percentiles. Benefits are clearly back-loaded with significant differences between the distribution of outcomes for different cohorts: the median replacement ratio is only 28% for those retiring at inception, compared to 37% for those retiring 25 years later.

Figure 5 (conservative basis)

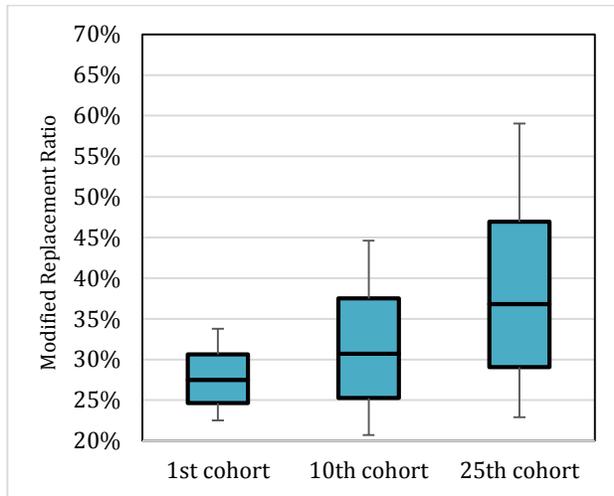


Figure 6 (best estimate basis)

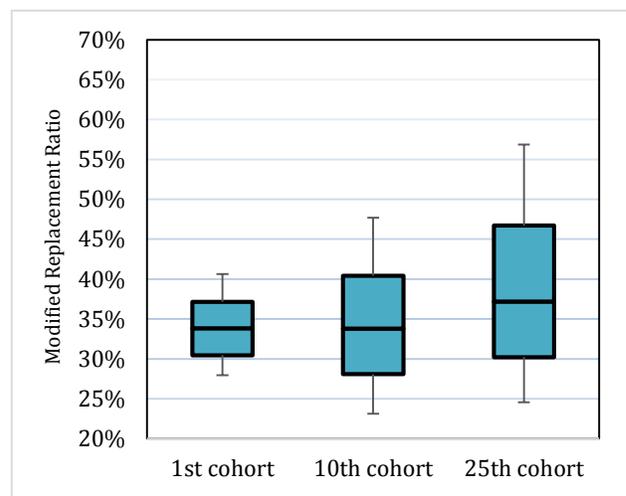


Figure 6 shows the corresponding distributions under the same simple CDC plan using best-estimate assumptions. Benefits start out significantly higher, as expected. Differences between the median outcomes of the various cohorts are tempered, as more is paid out earlier.

Note that under both conservative and “best estimate” assumptions, the cohorts retiring far in the future see higher replacement ratios than earlier cohorts. This is due (at least to some extent) to the rigidity of the target accrual rate, which is set at plan inception to be in line with the sponsor’s contribution commitment but is never changed under this design. Given the rising interest rate environment projected by the asset model, the cost of future benefits becomes much lower over time than the fixed contribution rate. Consequently, the contribution rate effectively includes a margin relative to the normal cost of the target accruals in later years. This tends to generate gains, which translate into higher replacement ratios for later cohorts.

Creating more security and stability

In certain circumstances plan members may be willing to accept the significant benefit variability associated with the simple CDC design outlined here. However, there are many situations where stakeholders may wish to have a higher level of benefit security and stability, particularly where benefits are being converted from an existing DB arrangement. The report of the Canadian Institute of Actuaries’ Task Force on Target Benefit Plans lists a number of design tools available for this purpose. Key questions to answer are then (1) how effective are these tools in creating stability and security relative to the baseline CDC design, and (2) how does the introduction of these tools affect the distribution of risks and rewards among different cohorts of members.

The next *Issue Brief* in the target benefit plan series explores these topics.

References:

- Canadian Institute of Actuaries, Task Force on Target Benefit Plans. (2015, June) *Report of the Task Force on Target Benefit Plans*. Retrieved from <http://www.cia-ica.ca/publications/publication-details/215043>.
- Kahneman, D. and Tversky, A. (1979) "An Analysis of Decision under Risk." *Econometrica* 47(2): 263-292. <http://dx.doi.org/10.2307/1914185>
- Society of Actuaries, Pension Section. (2016, February) *Analysis of Target Benefit Plan Design Options*. Available at <https://www.soa.org/Research/Research-Projects/Pension/2016-target-benefit-plans.aspx>.

Notes:

- ¹ The TBP design spectrum is described in detail in the Report of the Task Force on Target Benefit Plans issued by the Canadian Institute of Actuaries.
- ² Details of the various inputs and assumptions, the methodology used, and a summary of the outputs and observations can be found in the project report titled "Analysis of Target Benefit Plan Design Options".
- ³ The adjustment mechanism employed in the simple CDC plan is similar to that in US variable pension plans, where members' benefits are adjusted annually by the difference between the actual rate of return on plan assets and some fixed hurdle rate. The primary difference is that under the CDC plan all plan experience is considered when making adjustments to members' benefits, including the impact of any changes in valuation assumptions. The sponsor does not underwrite any of the risks. In US variable benefit plans, active and retired members carry investment risk but the sponsor typically retains all other risks.
- ⁴ The Variable Payment Life Annuity (VPLA) option offered by the UBC Faculty Pension Plan is one example. During members' active service, the UBC Faculty Pension Plan operates as a traditional DC plan with individual accounts. At retirement, members can elect to use some or all of their account value to purchase a VPLA from the plan. For more information about the VPLA option, refer to the Faculty Plan's website (http://www.pensions.ubc.ca/faculty/purchase_vpla_ubc.html).
- ⁵ Numerous other ways of measuring benefit security are available, including the likelihood of falling short of the target *at retirement*, or the likelihood of falling short of the target at some point *during* retirement.
- ⁶ Asset mixes were kept simple for modeling purposes, with allocations to traditional equities and bonds only. Equity holdings were split equally between Canadian and US issues. Bond holdings were split equally between Canadian long bonds (duration 16.2 years) and Canadian corporate bonds (duration 7.3 years). The conservative discount rate was based on the yield on 30-year Government of Canada bonds. The best estimate discount rate was based on the methodology prescribed for the Benchmark Discount Rate under the Alberta TBP regulations. See the project report for more details.
- ⁷ Prospect theory, developed by Kahneman and Tversky (1979) and supported by experimental evidence, posits that people experience financial outcomes in terms of gains or losses relative to a reference point, and that this reference point shifts as people become accustomed to their position after a gain/loss. In the context of a target benefit plan, receiving a benefit increase would shift a plan member's reference point so that a

benefit reduction in the following year would be experienced as a loss even if the resulting pension were higher than the pension the member had prior to the benefit increase.

⁸ The modified replacement ratio is the ratio of (1) the average annual pension payable to a member each year after retirement, weighted in proportion to the member's probability of survival from age 65 to the year in question, divided by (2) the member's salary during their last year of employment. Unlike the traditional replacement ratio, which is based on the annual pension payable at retirement, the modified replacement ratio also takes into account the impact of benefit adjustments *after* retirement. However, the modified replacement ratio does not make any adjustment for inflation after retirement.