Next Generation Defined Benefit Scheme[1]

Although the Dutch Pension System is considered to be an efficient and high quality system various threats are undermining the future of this system. This paper explores an alternative form of pension set up retaining the benefits of the current system and using financial engineering to counter threats. The proposed system is essentially a collectively executed Defined Contribution system, but is designed to align the needs of the various stakeholders in a pension plan. It uses a high allocation to return - seeking assets for young participants and it applies financial engineering in order to synthetically replicate a Defined Benefit scheme for the elderly participants.

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Efficient system, but facing threats

The quality of the Dutch system is expressed through the high level of post retirement replacement income at moderate costs, for a large part of the population (OECD, 2009). The thriving force behind the success is generally considered to be the solidarity principle; sharing risks, benefits and costs amongst the various stakeholders (Boender et al. 2000).

However, the Dutch pension system is facing several threats. The first threat is the enhanced awareness of the negative aspects of the intergenerational solidarity, mainly between young participants and elderly participants. The latter is especially relevant when a flat rate contribution is applied to an aged population or if recovery contributions are paid on top of normal contributions, combined with a generous indexation policy. This intergenerational solidarity is only sustainable on the long run if it is perceived as fair for all participants. In many cases, there exists unfair ('perverse') solidarity in the Dutch pension system (cf. Kuné, 2006). This might induce one or more stakeholders to end the contract.

The second threat comes from financial sustainability. Due to the ageing population of many pension funds, the relation between the total sum of salary of the affiliated corporations and the total fair value of the pension liabilities has changed in the sense that the liabilities are much larger than the sum of salary. This means that a small increase in the contribution is no longer sufficient to restore the financial position for a typical pension fund. It is not unlikely that the total sum of salary should be doubled to restore the financial position of the pension fund. It is not likely that a sponsor company is willing or able to pay this amount of cash. As we have witnessed during the current economic crisis a deteriorated financial position of the pension fund generally coincides with challenging times for the corporation.

The third threat comes from the International Accounting Standards (IFRS). IFRS require corporations to account for their pension obligations. If a pension plan is indicated as Defined Benefit this means that the corporation needs to account for the pension plan in both the balance sheet and the profit and loss sheet[3]. This means that the performance of the pension plan impacts the corporation and it is therefore a risk to the corporation. Although accounting rules have revealed (and not caused) the inherent risks, they have contributed to a higher awareness of pension risk for companies. Since pension management is not a core business to most companies, they have an incentive to reduce their pension risks. One way to do this is to move away from regular Defined Benefit in order to improve their own risk management.

The good, the bad and the ugly

Given the severe threats to the system, we need to identify the components that make the current system so successful, the components that are prone to or even accelerate the threats and consider the available alternatives. After all, the Next

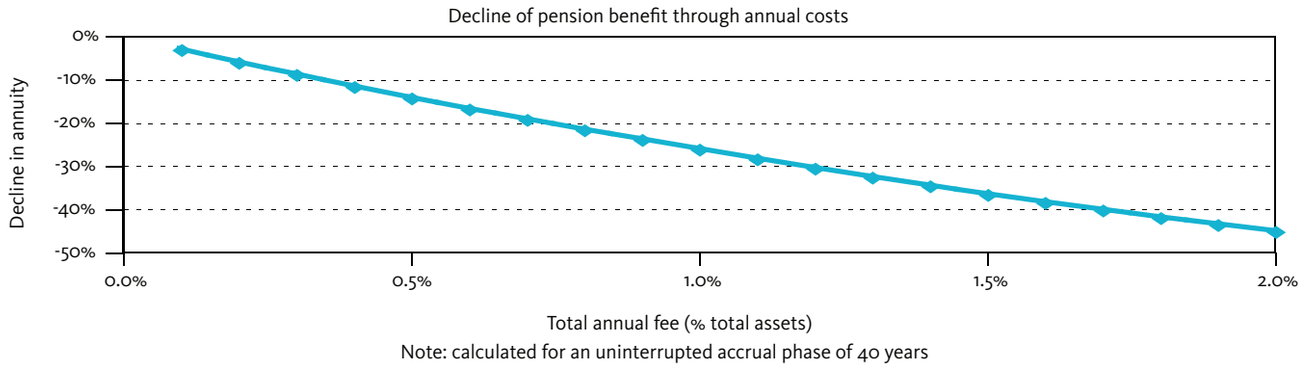


Figure 1: Decline of pension benefits through annual costs

Generation Defined Benefit scheme will ideally retain the good, remove the bad and circumvent the ugly.

Good

The current Dutch pension system is a collective system. A collective system means that the costs can be lowered through economies of scale. Although costs may seem marginal, their impact become material over time and therefore very relevant when saving for pension. The graph below estimates the effect of annual cost on the total level of pension. A 1% lower return equals almost 30% lower annual pension benefit (Figure 1).

Collective saving introduces economies of scale. Bikker and De Dreu (2006) analysed the impact of the number of participants on the average administration cost per participant[4]. Using an analytical model they demonstrate a convex relationship, with improving economies of scale, yet marginally declining (see graph 2[5]).

The argument of economies of scale should not be taken to its extreme consequence as a plea for one national pension fund (or a few big funds), as this may lead to elimination of competition and increasing the risk of systemic failure on a large scale.

Next to collectivity, the intergenerational risk sharing increases wealth caused by the possibility to share the benefits and the burdens over multiple generations. Through the use of a buffer, positive and negative shocks in the asset level can be dampened and shared over multiple generations, theoretically even over generations that are yet to be born (see Ewijk et al. (2009) for an illustration).

The Next Generation Defined Benefit scheme will ideally retain the good, remove the bad and circumvent the ugly

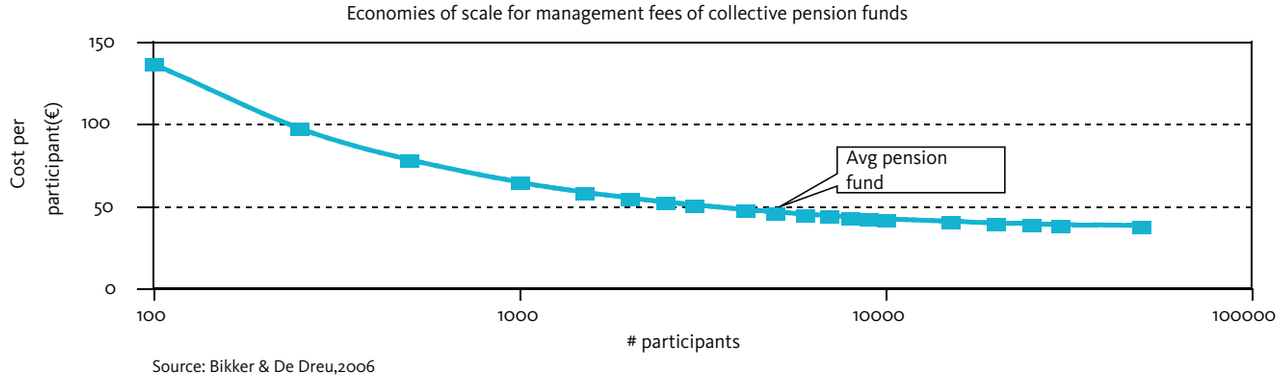
Bad

Solidarity takes different shapes, also negative ones. Fair solidarity (e.g. probability solidarity) is the kind of solidarity where ex-ante each participant pays a fair premium. A well known example is a fire insurance. Participants wish to be compensated in the unfortunate case that their house is destroyed by a fire. All participants pay a fair premium (based on the value of the house, and some intrinsic properties of the house). The total contribution is collectively saved.

Ex-ante it is not known which participants if any will receive a benefit from this collective saving. Mathematically there is no transfer of economic value so this kind of insurance is fair. Within the context of pension funds the collective sharing of actuarial risks can be viewed as forms of fair solidarity.

Perverse solidarity is the opposite of fair solidarity. This implies that some participants ex ante expect a larger benefit

Figure 2: Economies of scale for management fees of collective pension funds



Source: Bikker & De Dreu,2006

than other participants, or pay less for the same expected benefit than others. Given the fact that pension is basically a form of delayed income, perverse solidarity is a form of income transfer. As an example, consider a pension plan that uses a flat rate contribution level and offers a spouse pension to its participants. This means that a member without a partner pays for the spouse pension of the member that does have a partner (cf. Kuné, 2005).

In recent years, the public awareness of this 'bad' solidarity has increased, which might lead to a collapse of the pension contract, including all the positive effects.

Another negative element of the current pension system lies in the complexity of many pension plans. Due to many years of changing regulations and changing corporate circumstances, many pension plans appear like a complex piece of patchwork. The more complex the plan rules are the higher the administrative burden and the higher the costs are.

Ugly

In recent years, there has been a trend from Defined Benefit schemes towards Defined Contribution, or Collective Defined Contribution systems. Both systems have significant downsides and offer a solution to the aforementioned threats at severe cost.

In a Defined Contribution system there is no sharing of risk, with the investment cost generally significantly higher than in a DB scheme. Furthermore, literature shows that individuals make suboptimal choices and have demonstrated to underperform (cf. Van Rooij, Kool, Prast, 2004 or Munnel, Soto, Libby, Prinzivalli, 2006).

A Collective Defined Contribution is simply a defined benefit plan, with explicit rules on discounting of rights in case of under-funding. When making cuts across the board (Dutch law prescribes every member to be treated equally) this means that every participant takes the same discount, no matter how long their personal recovery period lasts. This is a form of perverse solidarity.
Finally, a pension can be bought with an insurance company. Although this offers security, it comes at a cost. Bikker and De Dreu (2006) conclude that the cost of saving for pension through of an insurance company is approximately five times higher than when saved through a pension fund, although results can vary depending on the relative size fo

the pension fund versus the insurance company.

Proposed solution: The Hybrid DB/DC scheme

A possible solution would be to retain the benefits of the current system and remove the elements that cause the threats. This means that we need a collective approach within a non-profit pension fund, using fair solidarity and with lesser impact on corporate balance sheets and P&Ls. The proposed solution is therefore a Hybrid DB/DC scheme.

The Hybrid DB/DC scheme uses the normative concept of optimal lifecycle pension investment. Optimal lifecycle investment means that a participant invests a constant part of his total capital in return seeking assets. Since the total capital consists of financial capital (which increases with age) and human capital (which decreases with age) and in reality, we can only observe the financial capital, this means that young people invest highly in return seeking assets and reduce this investment the closer to retirement he/she gets.

An essential success factor for a pension system is to align the outset with the needs and desires of the various stakeholders within the pension deal. The pension deal is graphically represented in Figure 3. From a stakeholder perspective, the interest of a retiree is a safe, real pension benefit. The interest of an active participant is to have a good pension level, adjusted with income increases.

The interest of the sponsor is to have a pension level that is suitable for the corporate from a remuneration perspective, but more importantly to have a low and predictable level of contribution. Finally, governments and regulators have an interest in a stable financial system where the pension funds can deliver upon their promises and where the future generations can still benefit from the pension system.

This leads to a Hybrid DB/DC scheme. For each individual we construct a combination of a return-seeking portfolio and a risk-free portfolio. The risk-free portfolio amounts to a synthetic DB portfolio, combining (forward starting) interest rate swaps, inflation swaps and longevity swaps to synthetically create a inflation guaranteed Defined Benefit disbursement. For each individual we allocate an age dependent asset allocation consisting of an allocation to the synthetic DB portfolio and to a return seeking portfolio.

Constructing a separate synthetic DB portfolio for each individual is impossible, due to implementation constraints. For instance, it is impossible to enter the interest rate swap market for a purchase worth only a fraction of a monthly salary. However, this can be circumvented, by managing the system collectively, building a synthetic DB portfolio based on the expected cumulative cash flows of the collective portfolio. By pooling the assets and the future DB benefit cash flow stream, we can access complex derivative markets (which require both a high notional as well as high level of expertise), the alternative investment world (eg. Private equity and hedge funds), but also internally hedge idiosyncratic risks and use the collective purchasing power to negotiate a fair reinsurance premium.

Remarks

The proposed system is essentially a Defined Contribution system, but one where for elderly participants the Benefits are guaranteed. The system does not use traditional measures to calculate the final benefit (accrual rate, offset, pensionable salary, etc.), but the accrued benefit is a function of investment returns. In that sense, it aligns with the "Pensioenakkoord" (Stichting van de Arbeid, 2010) which introduces the term 'soft pension benefits'.

The system does not use a funding ratio, as the pension fund itself has hedged its guarantees in the capital market and any shock in financial and economic markets is explicitly allocated to the participant's pension capital, relative to their allocation in the return seeking portfolio. In effect, if we were to use a funding ratio, it would be constant at 100%.

Design

To determine the optimal lifecycle allocation I use an ALM approach, taking the perspective of a participant of 25 year old, who will stay employed until his retirement date. Although this may not be a realistic assumption for most people, this methodology will give insight in the dynamics of the pension plan. For this analysis, I assumed that the total level of cash contribution is the same for all alternatives. Figure 4 shows the total level of real pension at retirement as a percentage of the pensionable salary just before retirement. This data excludes the state pension, which would be the same for all variants. The graphs show the median outcome (vertical axis) of 1,000 economic scenarios and the 5% percentile (5% pension at risk, horizontal axis). These measures represent a range of expectations for a 25 year old. Nearing retirement, a participant will change his perception of risk, focusing more on stability when you need to know your future level of income with increasing certainty to allow for a robust financial planning of the last years of your life. Therefore, I added a risk measure that denotes the amount of absolute year to year deviation three years before retirement (size of sphere). In these dimensions, you want to choose the variant that is situated the highest (highest expected pension level), the most to the right (minimum loss in a bad economic environment) and with the smallest sphere (minimum risk towards retirement).

These outcomes show that the Defined Benefit plan can be improved by using a hybrid DB/DC construction. This leads to a higher expected return and a higher 5% 'pension at risk' level, i.e.

Figure 3: The Pension deal

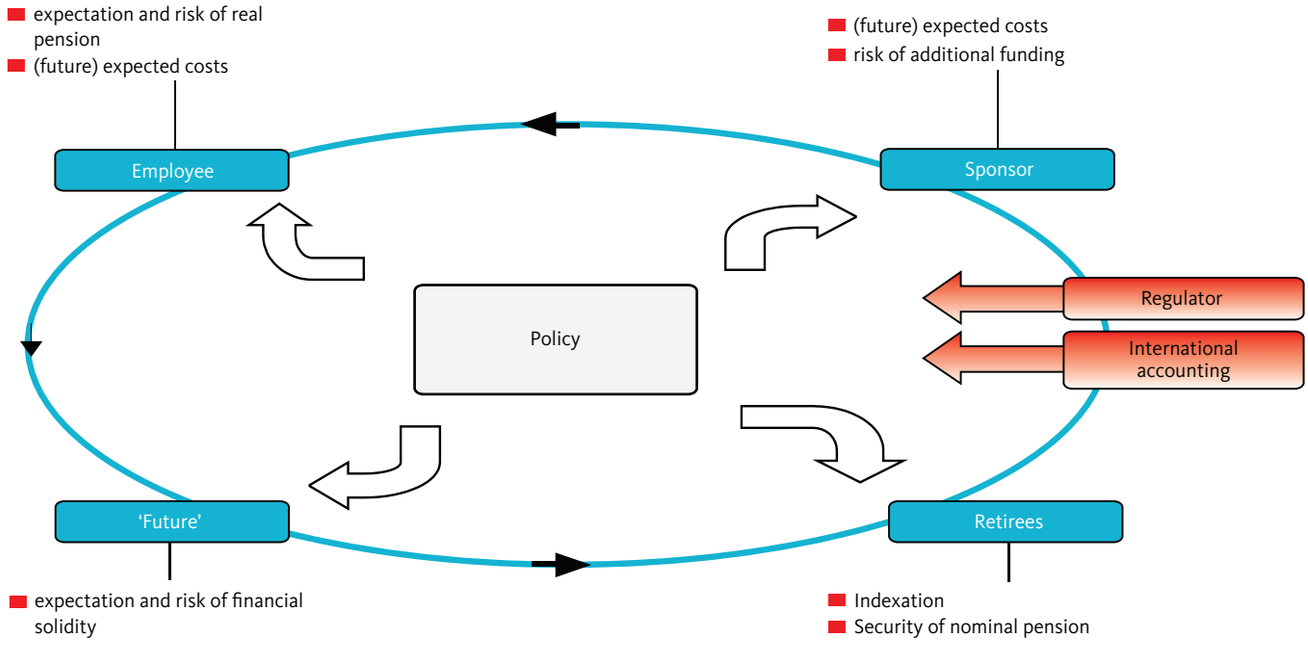


Figure 4: Median percentage pension base for annuity at retirement

Note: the letters A and B in Hybrid_A_..” represent different return seeking portfolios. The final numbers in “Hybrid_.._..” represents the age at which a synthetic DB portfolio has been launched. The size of the sphere represents the relative risk towards retirement

the pension level that will be reached at retirement with 95% probability. This analysis does not incorporate all possible forms of pension execution. For instance, forms of horizontal DB/DC (DB for salaries below a threshold, DC for the part of the salary that is above the threshold) or insurance solutions are not included.

Furthermore, it illustrates the case against CDC, at least without adding additional funding (either an upfront lump sum payment or a structural increase in contribution). The risk of underfunding is transferred from the sponsor (DB) to the participants (CDC), which results in a lower pension at risk for the participants in CDC.

Table 1: Key Economic Parameters. For more details see Hulshoff (2010)

Economic key parameters			
Category	Average annual return (arithmetic average)	Average cumulative annualized return (geometric return)	Standard deviation
Price inflation	1.7%	1.7%	1.2%
Wage inflation	2.2%	2.1%	1.5%
Long term spot (government rate)	4.5%	4.5%	1.0%
Euro cash	2.3%	2.3%	1.1%
Fixed Income (Government bonds, normal duration)	4.3%	4.1%	6.4%
Fixed Income (Credits, A-rated)	4.8%	4.4%	8.5%
High Yield	5.6%	4.5%	15.1%
Emerging Market Debt	5.7%	4.5%	16.2%
Equity mature markets	9.5%	7.1%	22.2%
Equity small caps	11.0%	8.0%	26.0%
Equity emerging markets	11.6%	8.2%	27.5%
Real Estate (non listed, indirect)	6.3%	5.9%	9.1%
Real Estate (listed, indirect)	6.3%	5.6%	12.6%
Commodities	6.6%	5.5%	14.9%
Hedge fund (fund of fund)	7.0%	5.2%	19.5%
Private Equity	12.0%	8.0%	30.2%

Although the utility function of the participants is unknown, we can still draw meaningful conclusions on the optimal design of the portfolio, when considered from the participant perspective. The Hybrid A portfolio is inefficient compared to DB. The Hybrid “B” portfolio however is more efficient then DB, as it generates a higher expected level of pension, and a higher pension at risk value. Furthermore, a case can be made to start building a synthetic DB portfolio at age 40 as this generates a risk measure (volatility, size of sphere) roughly equal to the DB system, and less risky than the variant where the synthetic DB portfolio is started to accrue from age 50 onwards. From this perspective, the proposed alternative is economically more efficient than the alternatives of continuing Defined Benefit, moving to a Collective Defined Contribution scheme or moving to a Defined Contribution scheme.

As with any ALM-like analysis, the outcomes are subject to the choices on economic parameters. The parameters in this analysis are constructed using a macro-economic building blocks. The methodology is based on Van Alphen (2005). The main parameters are summarized in Table 1.

Implementation issues

From an implementation perspective, there are various challenges. The most challenging problem is the proposed use of the longevity swaps, which is unlikely at the time of writing, since the market depth is very shallow, with the first Dutch deal still to be awaited.

Furthermore, the inflation swap market is liquid, but not as liquid to facilitate the entire Dutch pension market, and only the Euro inflation can be bought (not Dutch inflation). Furthermore, the range of available maturities for interest rate and inflation is limited to around 30 years, with longer maturities being very illiquid. Finally, the use of these financial derivatives requires expert knowledge, governance and asset size to be able to trade.

One possible workaround for the longevity problem would be to keep the longevity risks on the books, and define a way to transfer the manifestation of the risk to the stakeholders. One can imagine that an increase in the longevity will be translated into a higher retirement age or a lower pension. Investigation is left for future research. Furthermore, there are several risks left, such as base risk (EURO HICP versus Dutch Inflation), market risk, operational risk, macro risk and counterparty risk.

The Hybrid DB/DC scheme: Does it solve the problems?

The proposed construction solves many of the aforementioned issues, yet is not a perfect solution. The proposed solution:

- Reduces the level of unfair solidarity
- Is financially sustainable and ready for the increasingly ageing population
- Reduces the incentives to reduce Defined Benefit schemes that the International Accounting rules imply (after all, the Hybrid DB/DC scheme will classify as a DC scheme, independent of the investment strategy that attains a defined benefit like scheme for retirees)
- It retains the benefits of collectivity (see Table 2)
- Robust and flexible design
- It is in line with theoretical lifecycle investment theory
- Is by no means riskless (implementation imperfections)
- High funding requirements for fair transfer (given full indexation ambition)

The biggest downturn of the system is that the costs of transferring from traditional DB to synthetic DB are large, if the aim is to purchase a full real, longevity proof pension (which aligns with an indexation ambition of 100%). From an analysis with a pension fund that represents the average Dutch fund, it is estimated that per primo 2010 a funding ratio of approximately 165% was needed[6]. Naturally, this depends on the market prices at the time of transfer, and should ideally incorporate the funds indexation ambition. At that point in time, the funding ratio of the average Dutch pension was 110%.

Table 2: Strengths and weaknesses of individual and collective saving for pension

Strengths and weaknesses of individual and collective saving for pension		
	Strong	Weak
Individual pension saving	* Facilitates tailor made choices	* Suboptimal choices, due to low pension awareness
	* Competition between providors	* Suboptimal choices, due to behavioral effects
		* Adverse selection
		* Higher cost
		* Incomplete market, not all financial instruments are accessible
Collective pension saving	* Completes financial markets by creating otherwise unavailable financial products	* Ineffecitve use of policy steering instruments
	* Facilitates young people in taking on high risk	* Does not facilitate heteregeneous members
	* Low cost	* Pension contract is inexplicit (ownership of funds assets is not determined)
	* Higher wealth due to intergenerational risk sharing	* Continuity of solidarity is not guaranteed
	* Professional investment knowledge	* Stakeholder "Future Generations" is not part of governance
Hybrid DB/DC	* Completes financial markets by creating otherwise unavailable financial products	* Does not facilitate heteregeneous members
	* Facilitates young people in taking on high risk	* High initial cost
	* Low cost	
	* Higher wealth due to intergenerational risk sharing	
	* Professional investment knowledge	
	* Continuity of solidarity is likely	
	* Pension contract is explicit	
	* Stakeholder Future Generation is served	
	* Effective use of steering instruments	

For which types of funds is Hybrid DB/DC an option to consider?

This leaves us with the question: For which types of pension funds is the Hybrid DB/DC scheme a feasible solution?

A first requirement is that the fund is of sufficient size (rough estimate: >€500 million) since the design uses complex instruments that need careful risk management and a high degree of specialized knowledge. On top of that, the instruments that are used are only economically feasible if the notional is sufficiently high. Apart from the size, there are three distinct types of funds that might opt for the Hybrid DB/DC solution. The first one, is a well funded pension fund with a weak sponsor, and a relatively old population (which implies little steering power of contribution). Such a fund might opt for a de-risking strategy, thereby securing the current expected pension rights and maintaining upward potential for the younger population, while removing the need for excessive strain on the sponsor or future possible discounting of accrued pension rights.

The second group is a pension fund with a low funding ratio (either under funded, i.e. less than 100% or in reserve shortfall, i.e. funding ratio less than the required solvency level), and a strong sponsor, with a high commitment. In this case the sponsor might opt to inject additional cash in the pension fund to replace the current options in

Categorisation of pension funds that might be interested in Hybrid DB/DC			
	De-Risking	Economic profit	Risk seeking (alternative to discounting rights)
Funding	Well funded	Under funded (or reserve shortfall)	Under funded
Sponsor	Weak sponsor	Strong sponsor	Weak sponsor
Population	Old population	Old population	High representation of young people
Risk appetite	–	–	Risk appetite from participants

Table 3: Pension funds that might be interested in Hybrid DB/DC

the pension fund financial agreement (making an economic profit). My analysis suggests that a funding ratio of less than around 115% might be an economically reasonable candidate.

The third and final group is an underfunded pension fund, with a weak sponsor, but a relative young population. Such a pension fund is likely to end up having to discount their accrued pension rights, since the sponsor won't be able to cough up additional contribution. The law prescribes that a discount of pension rights should be incorporated for all participants (the 'cheese slicer' approach). Using a switch to the Hybrid DB/DC scheme allows the stakeholders to negotiate a more tailor-made approach, which in broad lines will mean that the active participants take a bigger cut on their pension rights, but also gain a share in the upward potential in the asset return. Given this construction, it is clear that it is required that the participants have a high degree of risk appetite.

Conclusion

Although the proposed Hybrid DB/DC scheme has some implementation issues that need to be addressed, the proposed construction succeeds in reducing some major disadvantages of the current system (perverse solidarity, financial insustainability), yet retaining the benefits (collectivity). Given the current funding ratios the biggest downside of the construction is the need for additional cash funding. However, under certain circumstances a poorly funded pension fund might also be a feasible candidate.

Future research could focus on removing the implementation issues through, for instance, the pension deal itself or through investment strategies that might mitigate part of the risk. Furthermore, the optimality of the Hybrid DB/DC portfolio should be investigated further to challenge against other variants and for sensitivity on the main assumptions.

The proposed solution opens the door to Next Generation Defined Benefit schemes. Perhaps the current funding does not allow for an immediate transfer, but it is essential to plan ahead, creating a more stable and sustainable pension benefit system by which the next generation can happily retire too.

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Notes

1 The article is a summary of the FBA thesis of October 2010, by the same author.
2 The author would like to thank Gaston Siegelaer and the anonymous reviewer of the VBA Journal for their comments on this article.
3 The details of the accounting standards are outside the scope of this article.
4 These results do not involve the cost of asset management. Intuitively, a similar relationship between asset management fees and the total size of assets can be assumed. Ambachtsheer 2009) statistically demonstrates this relationship using a large database of US and Canadian pension funds.
5 The average pension fund in the graph denotes a corporate pension fund, not a industry pension fund. The author thanks Gaston Siegelaer for providing this graph.
6 Given full indexation ambition and including an estimated risk premium for longevity and for inflation.