

October 2011, Issue No. 75



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NEEDS RETHINKING*By Theo Kocken*

Editor's note: This article was originally published in Volume 4 – Issue 1 of the Rotman International Journal of Pension Management. It is reprinted here with permission.

This article explains why and how maturing defined benefit pension plans become increasingly unstable if they maintain asset mix policies that embody material mismatch risk between plan assets and liabilities. An important feature of maturing defined benefit plans is that net positive cash flows (i.e. contributions exceed benefit payments) eventually turn negative as more money flows out of the plan to pay benefits to a rising number of retirees. Examples in the article demonstrate the implications of this new reality for funding ratio instability in defined benefit plans. A consequence is that the design of defined benefit plans needs rethinking. On the one hand, traditional features such as benefit security and inflation protection remain important plan features. On the other, new elements such as pension contract fairness and completeness, as well as fair-value valuation disciplines for plan assets and liabilities must also become part of plan design.

THE EVOLUTION OF THE DUTCH PENSION SYSTEM

In the 1980s and 1990s the Dutch pension system operated as a typical defined benefit system based on final pay, with annual indexation during retirement.^[1] Plan sponsors absorbed almost all risks and pension contributions were used as the main control mechanism. In many cases, the sponsors providing the guarantee also benefitted from contribution holidays. In the early years of the 2000s after the tech bubble burst, the Netherlands decided to weaken the defined part of the pension benefits from fully inflation indexed to more conditional promises. Specifically, the system made indexation conditional on the funding health of the plan. As a result, some of the pension risks began to be absorbed by plan

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beneficiaries.

In some cases, corporate pension plans consisting largely of entitlements to retirees have grown larger than the corporations funding them in the past. As a result, corporate employers as full guarantors of these large liabilities gradually became less attractive and less viable propositions. This receding riskabsorption capacity of employers has occurred around the western world, but was recognized early in the Netherlands after the first crisis of the new century in 2001–2003. If the employer is not fully guaranteeing the pensions, what remains is effectively a mutual insurance company, with beneficiaries sharing risk among themselves.

The conditional indexation feature also avoided unfair riskabsorption by younger generations. This problem now seems unavoidable for many closed defined benefit plans around the world, and also for still-open pension plans such as the pension plans for public employees in the United States, many of which are heading towards asset depletion in the next 10–20 years (Rauh 2009, 2010). The Dutch modifications received much praise from the rest of the world for the intergenerational fairness resulting from their adjustments. However, persistent longevity increases, two financial crises, and continued interest rate declines, have resulted in deterioration of the funding status of even the Dutch plans. Although still hovering around a 100% funded status in nominal terms, it has become clear that the conditionality of the benefits may have to go well beyond indexation.

A NEW THREAT: PLAN MATURATION

If two financial crises in one decade and a material increase in life expectancy were not enough of a threat to defined benefit pension plans, most plans are now also entering the net outflow phase, with benefit payments exceeding new contributions. This has serious implications for the current defined benefit pension contracts in force in western countries such as the United States, Canada, the United Kingdom, Switzerland, and the Netherlands. For decades, pension funds received more money from new contributions than they needed to spend on benefit payments. But in the upcoming decade this process will be reversing itself, if this has not already occurred.

Each pension fund will inevitably enter the second phase – the net outflow or decumulation phase. This happens when the membership of the plan matures and the number of retirees is high in comparison with the number of active employees. In the net outflow phase under most current defined benefit contracts pensioners still receive 100% of their benefits, even if the fund is in deficit. After continued full payment of these benefits, the funding ratio sinks a little deeper and a decreasing amount of capital is left for the remaining stakeholders (Kocken, 2010). Indeed, even if a plan is currently

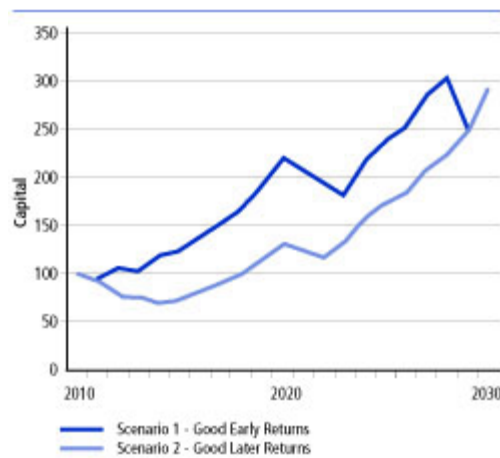
100% funded and is about to earn high average but volatile returns on investments over the next 20 years, it still runs a substantial risk of getting into trouble.

ILLUSTRATIONS WITH TWO RETURN SCENARIOS

In order to show how fragile mature funds really are, consider the following illustrations. We start with two similar scenarios of 20-year returns that we apply to a pension plan with a starting nominal funding ratio of 100%. In both return scenarios, the expected arithmetic return on risky investments is 8%. The risky investments make up 50% of the pension fund and the other half is in bonds yielding 4% that match the liabilities. The two risky return series are relatively straight-forward and quite similar.

Specifically, the returns as well as the volatility over the 20-year period are identical, and are based on the actual MSCI global equity index. [2] However, while the first series represents exactly what happened during the period 1990–2009, in the second series four returns have been swapped around. Specifically, the order of the 1991 and 2008 returns were swapped, as were those of 1993 and 2002. In [Figure 1](#), the actual return series is called Scenario 1 – Good Early Returns; the series with the swapped returns is Scenario 2 – Good Later Returns. Figure 1 simply plots the path a \$100 fund takes with the two return series. Ultimately, the two different return paths have no effect on the final result as in both scenarios the investment nearly triples over 20 years.

Figure 1: Capital Values in the Two 20-Year Investment Scenarios



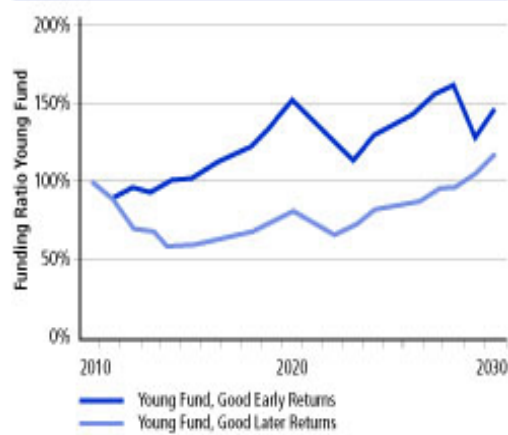
Source: Cardano (2010)

However, the story changes dramatically when we study the financial impact of the two return series on a young plan (i.e. with demographics typical for the years 1960–1980) and on a more mature plan (i.e. with demographics typical for the years 2010–2030).

FINANCIAL IMPACTS ON THE YOUNG AND MATURE PLANS

Figure 2 tracks the funding ratio of the young plan. This plan has a liability-duration of 28 years with its peak in payments 39 years from now, and with 33% of the value of the liabilities paid in the first 20 years. Note that the funding ratio pattern tracks the pattern of the asset-only indexes displayed in Figure 1, but with lower growth since the liabilities also rise in line with the discount rate. Although the plan is overfunded at the end of the period in both return scenarios, differences do arise after 20 years because this young plan also makes payments during these 20 years. For simplicity, no inflow of contributions is modeled in this example. Inflow of contributions would have stabilized the funding ratio even more and revealed two more converging paths.

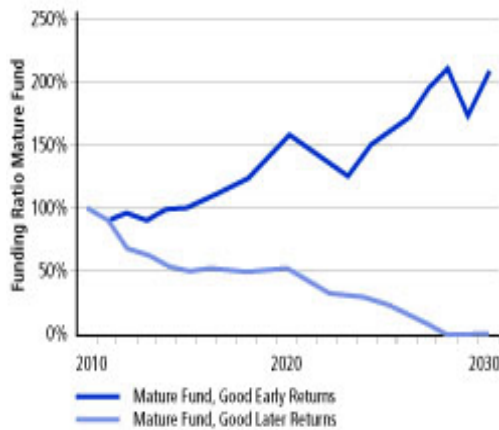
Figure 2: Young Plan Funding Ratios in the Two 20-Year Investment Scenarios



Source: Cardano (2010)

Figure 3 tracks the funding ratio of the mature plan. This plan has a liability-duration of 13 years with its peak in payments 8 years from now and with 78% of the value of the liabilities paid in the first 20 years. These cash flow projections are realistic for many mature funds that exist today. Even taking into account new contributions, the net outflow is representative for money defined benefit plans between now and 10 years from now. Note that the mature plan picture is radically different, with a growing divergence between Scenarios 1 and 2.

Figure 3: Mature Plan Funding Ratios in the Two 20-Year Investment Scenarios



Source: Cardano (2010)

Under Scenario 1 with good returns in the initial phase and shocks somewhat later, the funding ratio rises and this effect is reinforced by liability–reducing benefit payments. The result is that an increasing amount of capital remains, to the delight of the declining group of beneficiaries left in the pension fund. Under Scenario 2 there are serious setbacks at the start and the funding ratio rapidly plummets to a level from which it can no longer recover. Even prolonged periods of very high returns as seen in the 1990s are not enough to save the fund from depletion. By 2027 the plan's coffers are completely empty, despite having had a funding ratio of 100% in 2010. The boxed text provides an intuitive numerical example to illustrate how a plan's maturity and investment policy can combine to deplete plan assets.

A NUMERICAL EXAMPLE OF THE SINKING EFFECT OF OUTFLOW

When a pension fund with a funding ratio of $F(\%)$ makes a positive payment p (net outflow of money), its new funding ratio is $(F - p)/(100 - p)$. If $F < 100$, the new funding ratio will be lower than the initial one. When $F > 100$ and p is positive, the funding ratio will actually grow because the payment being made extinguishes an equal amount of liability. If p is negative (positive net inflow), the system stabilizes around 100. A funding ratio exceeding 100 will decrease due to a negative p , a situation with a deficit will increase the ratio in the direction of 100. Assume a fund starts in an underfunded situation and makes a benefit payment. In order to revert to the initial funding ratio F , either the assets have to grow or the entitlements have to be cut. The size of the liability cut depends on the size of the payment and the initial funding ratio. The absolute cut in liabilities required is $p \times (1 - 100 / F)$.

EXAMPLE

When the assets are worth 60% of the liabilities, a payment of 5% of the liabilities causes both sides of the balance sheet to drop. This has a lowering effect on the funding ratio. It sinks to $55/95 = 57.9\%$. In order to return to a funding ratio of 60%, the liabilities would have to be cut with $5 \times (1 - 100 / 60) = 3.3\%$, from 95 to 91.7. In the alternative, an excess return on top of the discount rate of $60\%/57.9\% - 1 = 3.6\%$ is required. This is the excess return on the total assets needed not to sink further. And with a 50% risky asset mix, this requires 7.2% expected risk premium on the risky assets. This is much higher than historical risk premiums and even then, recovery is not there.

FROM AD HOC ADJUSTMENTS TO SUSTAINABLE REDESIGN

The prior illustration demonstrated that two defined benefit plans with the same returns over 20 years and nominal guarantees for retired members can produce radically different outcomes. The implication is that asset depletion is a risk that mature plans should take very seriously. This means redesign should be a priority for pension plans facing this risk.

The unsustainable situation of a maturing defined benefit pension fund structure was recognized long before the credit crisis (e.g., Ambachtsheer, 2006; Kocken, 2006; Teulings and De Vries, 2006; Broeders, 2008). However, the crisis did add to the perception of immediacy and emergency in the Netherlands.^[3] Early in 2010, two committees – the Goudswaard Committee and the Frijns Committee – evaluated the impact of the crisis on Dutch pension funds and advised how to change pension contracts to cope with future challenges such as net outflow, longevity shocks and persistently low funding ratios.^[4]

The consensus in the Netherlands is that collective risk-sharing should continue in some form and not be replaced by an individual saving system. The perception is that pension design with a collective risk-sharing element produces not only a pension system with low operating costs but also provides opportunities to share inter-generational risk that smoothes shocks (e.g. longevity and inflation risks) to retirees' pension income. Such risk-sharing products are not available in the financial markets.

Below are five criteria that should be integrated into any serious pension redesign project:

- The degree of completeness of a contract.
- The future fairness of contributions in the short- and long-term.

- A certain minimum level of security for pension income.
- Risk-sharing.
- Inflation-indexed pension during retirement.
- All five are examined in turn below.

CONTRACT COMPLETENESS

Contract completeness can be defined as the extent to which the entitlements to beneficiaries under all situations of asset growth, interest rate development and longevity development are allocated explicitly to individuals. In its most extreme form, the sum of the individual entitlements equals the wealth available in the system. This is also called a closed contract since the complete allocation of wealth ensures no deficit allocation to stakeholders outside the current pension plan. A high degree of completeness avoids uncertainty. Completeness can also go hand-in-hand with risk-sharing solidarity, provided that at each point in time it is clear what the end result of risk sharing is for a person's individual position.

Current defined benefit plans suffer from contract incompleteness regarding plan surpluses and deficits. A deficit implies the losses incurred are not fully assumed by the current generation. The plan incorporates the possibility of carrying the losses forward to future generations. New members could start off with a debt burden as soon as they enter the pension fund. This is not insurance solidarity; instead, it resembles implicit taxation in a non-governmental vehicle. Although this system can work in the case of a stable or growing perpetual inflow of new participants, this inflow is actually very unpredictable and in fact declining for mature plans. As illustrated in Figure 3, in maturing pension plans incompleteness can easily lead to complete asset depletion.

Incompleteness has the potential to create tension between generations and social unrest in cases of real problems and serious disputes. This actually happened in the Netherlands in 2010, with much unrest about who absorbs what part (and when, in what form) of deficits. Retirees fear large and acute cuts in their current income. Active workers fear there will be no assets left for them when a plan is in serious deficit and continues to pay full benefits to retirees. During the net outflow phase, plan instability grows and the leverage between young and old will create more uncertainty about the allocation of asset shortfalls. In general, the higher the degree of net outflow the contract should aim to be more complete.

Finally, lack of contract completeness could obstruct labor mobility. For

example, a plan participant may not want to give up on the long-term benefits of a large pension plan surplus that cannot be taken to a new employer at departure.

CONTRACT FAIRNESS

Ex-ante fair contracts imply that all contributions have an expectation of pay-out equal to the amount of contribution plus the expected return.^[5] In more formal terms, the risk-neutral market value of future entitlements including all embedded risk-sharing options at the moment of paying contributions equals the value of those contributions. Many defined benefit plans fail this fairness test today as young workers pay full contributions while at the same time retirees will receive full benefits in an underfunded situation. This is not insurance-related mutual solidarity that is based on ex-post wealth distribution due to risk-sharing. Instead, it is ex-ante wealth distribution.^[6] In the long run, this erodes sustainability when the ratio of retirees to actives increases and the unfairness gets leveraged to unprecedented levels. Fair contracts strongly support market mobility and avoid age discrimination.^[7]

Some observers believe unfair contributions are sustainable on a single period basis, as long as the intention is to make them fair over a lifetime horizon. One such example is the average contribution (doorsnee premie in Dutch) that implies a fixed percentage of salary every year provides a fixed amount of salary-related pension entitlement, ignoring the time value of money. A plan member pays too much in his early career and too little during the years before retirement. However, contributions are fair over a career at a single employer that stretches from ages 25 to 65. However, in view of the increasing number of job changes over a lifetime and switches between working for an employer and self employment that most people experience, the concept of lifetime fair prices may become less and less relevant.

PENSION SECURITY

People place a high value on certainty, particularly as applied to their retirement income. The fact is that we cannot continue to offer generous, fully-guaranteed pensions costing 30%-40% of pay. However, some minimum pension guarantee with an uncertain soft amount on top raises comfort levels significantly. Recent polls in the Netherlands (www.pensioenkiijker.nl, November 2010) reveal that three times more people prefer a lower pension with high certainty than those who prefer a higher expected pension with a lot of uncertainty.

The results of the De Nederlandsche Bank Household Survey (DNB, 2010) strongly supported the preference for certainty. A majority of employees want to pay 2% to 5% additional contribution themselves on top of what

they already pay, if this money provides higher certainty. A higher pension or retaining the retirement date at 65 years of age was of less importance to the respondents. These responses are consistent with behavioral finance studies on risk-tolerance that reveal people are more risk-averse and less reluctant to gamble when it comes to their lifetime income or retirement income than when smaller amounts are involved (Pan & Statman, 2009).^[8]

Securing a certain part in pension entitlements fits this need for a minimum life income security. However, a substantial unsecured part of the pension could be considered in a pension fund system because risk-taking in investments with an expected risk premium allows for a higher expected pension that can be used to index the secured part. Based on this argument, some claim no guarantees are needed at all, despite the indicated strong desire from survey respondents. Admittedly, some risk taking is needed to provide adequate inflation protection. The implication is that combining unsecured soft, and secured hard nominal pension entitlements can serve both criteria (see Potters, 2011).

TARGET INCOME REPLACEMENT, RISK-SHARING AND INFLATION-INDEXATION

People get used to their salary level over their working life and adjust their consumption to this level, so-called habit formation. After they retire, their level of required monthly income usually falls but some relationship to salary during their working life is still desired. This used to be a link to final salary in the past, but in the last decade this link switched to career average salary in the Netherlands. This link between salary and pension income provides a more robust outcome at retirement age, as there is an implicit correlation between how fluctuations in inflation will impact both average career income and average contributions.

Lifecycle defined contribution contracts based on individual accounts are complete and ex-ante fair, but lack risk-sharing between participants.^[9] Risk-sharing products can be bought by individuals in financial markets. However, in the absence of relevant markets factoring in domestic price or wage inflation or longevity hedging possibilities, risk-sharing within the plan may be a better solution by providing retirees with smoothed pension payments over their decumulation stage in a reasonably predictable manner.^[10] This risk-sharing between actives and retired beneficiaries only works if enough active workers are available in the pension fund with sufficient soft entitlements compared to the risk in the retirement contracts that has to be absorbed. In many mature pension funds, this capacity will be limited.

Ideally, pensions are inflation-indexed. Nominal pensions invite money illusion. Especially during persevering inflation spikes, the purchasing

power of nominal pensions is materially eroded. However there is a lack of capital market instruments offering protection against country-specific price or wage inflation.

Other pension plan design factors could be considered. Pension adequacy and cost are considered in the design process, but they act more as constraints framed by the past cost levels and pension promises. The need for transparency speaks for itself. ^[11] Transparency is likely to correlate well with the completeness criteria, as does the facilitation of labor mobility.

TOWARDS A NEW GENERATION OF PENSION PLANS

An important message of this article is that as defined benefit plans continue to mature in the decades ahead, contract completeness becomes increasingly significant. However, fairness, a minimum level of security, risk-sharing and inflation-indexation are important design criteria too. All five criteria should be considered in the pension redesign processes currently underway in the Netherlands and elsewhere. The question now is in what mix and in what form.

Pension contracts can take many forms, but two structural trade-offs are critical: individual versus collective entitlements, and hard guarantees versus soft benefit targets. Collective entitlements can be either positive-only, related to an unallocated buffer of money on top of allocated individual pension entitlements; or, they can also take on negative values where the sum of all individual entitlements is higher than the assets available. Similarly, individual entitlements can be either hard guarantees, soft targets based on normal economic scenarios, or some mix of the two. So the distinguishing design blocks are hard individual entitlements, soft individual entitlements, soft positive collective entitlements and soft negative collective entitlements.

These four building blocks can create multiple pension system design variants. The challenge is to choose the mix of the four blocks that best balances pension plan participant needs and economic realities.

ENDNOTES

1. The author would like to thank David Blake, Malcolm Hamilton, David Knox, Theo Nijman, Joeri Potters and Bart Oldenkamp for their useful comments.
2. In the two scenarios, a return on the risk-free bonds of 4% is assumed for simplicity, although due to the same discounting in liabilities as in the (maturity matching) bonds, only the risk premium on the risky assets (in this case equity) and not the yield on the

bonds is relevant for the development of the funding ratio.

3. Other countries are also contemplating improvements in the pension system e.g. Independent Public Service Pensions Commission UK (2010).
4. This paper concentrates on adjustments in the pension contract. Of course, other solutions to reduce risks in the defined benefit contracts could come from improvements in hedge products, such as domestic inflation products or longevity-linked products. There is a logical role for the governments in defined benefit countries to issue these kinds of products linked to their own debt programme – see Blake (2010) and Bodie (2009). This is outside the scope of this paper.
5. Expected pay-out includes all embedded options i.e. payments conditional to health of the fund, life expectation etc.
6. Further thoughts on the relationship between completeness and fair conditions: Complete contracts are not necessarily fair contracts. Fair contracts are always complete. Complete contracts need not be ex-ante fair. Every proprietary claim under all scenarios can be well described, but the end result may be shifting money – in market value terms – from one group to the other. However, if contracts are fair they need to be complete. If parts are incomplete, it is not known who gets what amount in the incomplete situations. It is therefore impossible to say if the contract has an ex-ante fair price.
7. The concept of age discrimination is very unclear in Dutch law. Economic unfair, off-market pricing in defined benefit regimes (not in defined contribution regimes) both in terms of contributions and embedded options are from a legal perspective perceived as age-fair. See Nijman et al. (2006).
8. The author's research found for example, that a 50-50 chance of an increase in lifetime income of 50% is only acceptable if the downside of the bet is 12.5%.
9. The risk-sharing contracts in this paper can also be defined contribution contracts, if they are collective risk-sharing defined contribution programs with accumulating and decumulating generations sharing risks between them.
10. Risk absorption can be achieved in many ways, e.g. via reduction of soft entitlements, change in retirement age, change in contributions, etc. The latter two only apply risk absorption to

actives. The exact form of risk-sharing is not further elaborated in this paper.

11. To some, transparency is not considered an evident merit and creates unnecessary panic. Although lack of transparency certainly delays the panic, it may actually escalate the ultimate consequences of not being transparent in the first place, as is already apparent in the form of reduced trust in the defined benefit pension system around the western world.

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