Part III

New Strategies for Managing Retirement Risk

Chapter 9

Restructuring the Defined Benefit Pension

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Funded defined benefit (DB) pension plans were a foundational pillar of US private and public retirement security in the twentieth century. Their appeal stemmed, in part, from the perspective that retirement promises should rely on pooling saving, risk, uncertainty, and costs, with assets and liabilities managed at the plan sponsor level. The appeal of company-sponsored DB plans also flowed from the belief that any problems associated with a pooled, centralized approach could be managed and controlled through sufficient regulation. Yet developments in the early twenty-first century have precipitated the traditional DB model into serious decline. Observers cite several reasons for this sea change, including higher worker mobility, the maturing of DB plans in older and highly competitive manufacturing sectors with few new entrants, workers' desire to control their own saving, high rates of labor mobility,[1] and the high costs of DB plan management, along with unexpectedly poor stock market performance and low interest rates (Borzi, this volume).

In our view, the root cause of the decline of the DB model is broader, since we argue that it is the unintended consequence of the risk-management mechanisms adopted to reduce risk, correct agency problems, and address pension administrative concerns. In this chapter, we offer a brief overview of the problems that are tying DB plans into knots, including principal–agent issues, regulation, accounting, and economic fallacies. Next, we outline steps that could be taken to help employers meet the goals and promises originally offered to workers in these plans. These include consideration of economics-based approaches to analyzing funding adequacies, changes in accounting rules, curtailing option and interest-rate arbitrage features, and strengthening the DB system insurer, among other measures. Finally, we turn to the task of creating a new DB structure attractive to employers, workers, and regulators alike—one that might offer a resilient model for the twenty-first century.

The DB Challenge: A Principal–Agent Problem

At the heart of the DB issue is a simple but seemingly intractable conflict arising from the so-called 'agency problem' in economics. This refers to the

fact that multiple actors involved in providing, regulating, supervising, and paying out DB plans may come into conflict, such that their motivations and distinctions may become muddled, driving a wedge between pension participants and those acting on their behalf. This lack of transparency can lead to conflict, introduce new uncertainty, increase risk, and raise costs, even though the intent was quite the opposite. Such problems arise from conflicts between different sets of well-meaning controllers adopted by multiple agents who seek to protect the principals.

This conflict stems from a conflict of interest between the plan sponsor and the employees in a firm offering pension. The economic model of deferred compensation posits that workers will forgo current earnings if they are offered a future pension from the employer. In turn, the employer is responsible for making good on this promise, long into the future. A key problem is that once workers retire, they are of little use to the firm (except in convincing current workers that they will be 'taken care of' when they are old); this raises enforceability questions. Moreover, no one knows how current employer actions might affect the financial security of the sponsoring company and its retirees into the long-distant future. The result is that employers face mixed incentives to protect retirees.

This conundrum gives rise to a justification for pension regulation. Ostensibly, regulation is adopted to protect the covered employee; US examples include the Employee Retirement Income Security Act (ERISA), the establishment of the Pension Benefit Guaranty Corporation (PBGC), and related pension laws (Sass 1997). Nevertheless, the impact of regulation has at times undermined that protection. In particular, regulatory confusion and dysfunction has driven up pension costs due to fragmented and competing regulatory responsibilities, and prompted some plan termination. Many analysts agree that ERISA-compliance costs have had the unintended effect of causing employers to shift away from DB plans; in fact, Perun and Steuerle (2000) point out that one new and far-reaching legal requirement has been added to the Internal Revenue Service (IRS) code regulating pension plans each year since 1974, greatly raising compliance costs.[2]

The sudden increase in DB plan terminations for reversion in the early 1980s also had a major impact on the way DB plan risk was perceived and managed. Initially, DB plans terminated only when their parent firm filed for bankruptcy; in the early 1980s, however, a new tax policy permitted plan sponsors to terminate the plans under circumstances other than financial distress of the plan sponsor. This change introduced substantial new uncertainty into the long-term pension arrangement. Indeed, a wave of terminations was initiated by corporate takeovers, where the acquirer interested in an overfunded DB plan would unilaterally terminate the plan and run the surplus assets through the income statement. Often the

acquirer would immediately create a new DB plan, making the process appear to be a straightforward violation of tax law, since plan sponsors are not permitted to appropriate assets from the plan. Nevertheless, the IRS allowed the transaction (Ippolito 2003). Not long thereafter, the Congress reacted by imposing a reversion tax which eventually reached a confiscatory 50 percent, sharply reducing corporate incentives to maintain excess assets in the plan. This episode also led to sponsors' efforts to substitute cash balance or DC plans in place of traditional DB plans.

These trends would logically have prompted workers still covered by a DB plan to lose faith that their remaining plans would survive. That is, it would be rational for workers to become leery of deferring further compensation unless it appeared to offer an extraordinary rate of return, particularly young workers likely to discount heavily the probability of accruing full pension rights in an unchanged plan. This would have also been true for longer-tenured workers caught up in the waves of downsizing and plan conversions of the past twenty years.

The cumulative effect of reversions, defunding, and conversions has eroded the trust that is the basis for deferred compensation—the basis for the DB pension contract. As a result, a kind of 'lemons market' has developed: many of the agents charged with protecting pension participants have faced increasingly conflictive incentives and mixed mandates. While this problem crept into the system over time, it took on much greater salience recently, given the coincidence of historically low interest rates and negative equity returns. These were compounded by problems in the government's pension insurance system, and changes in accounting rules. To these we turn next.

Problems in Pension Insurance

Regulatory efforts to control the most important risks faced by individuals and employers in the DB environment have often had counterproductive impacts, which ignore the underlying economics and further undermine the system. One striking manifestation of this problem concerns the national DB plan insurance program, the PBGC.

The PBGC was initially established under ERISA to protect workers with DB plans against employer pension defaults. Nonetheless, it is widely perceived today that the agency itself has become part of the problem: the aggregate funding deficit for private sector DB plans has been in the hundreds of billions of dollars for several years and it is expected to grow further (Credit Suisse First Boston 2005; Morgan Stanley 2003). As an involuntary unsecured creditor, the PBGC has swung from an asset–liability surplus of $7 billion in 2001 to a deficit of $23 billion in its reported 2004 results—a swing of $30 billion in just three years (PBGC 2004). In addition,

the insurer reports exposure of $100 billion to firms rated below investment grade (BIG) by the rating agencies; the latter estimate total underfunding in the DB system to be $450 billion. Finally, the PBGC's deficit is expected to grow in the near term as a number of large plans concentrated in troubled legacy industries experiencing global competition are expected to have further plan terminations.

Many observers of the system do not believe that, under current law, the PBGC can return to surplus (CFFI 2004). Even the US Government Accountability Office (USGAO 2005) has concluded that current funding rules create a potentially large financial risk to the PBGC and consequently to retirement income security. Interestingly, the PBGC is not subject to the reserve and capital standards of the privately regulated insurance industry, which allows it to continue operating under conditions that would result in insolvency if the agency were a private insurer.

Several factors make it administratively difficult for the PBGC to oversee individual DB plans. One is that funding rules permitting plan sponsors to follow the 'letter of the law' while avoiding fully funding their plans. Another is the use of a current liability minimum funding standard that ignores significant changes in payout assumptions that are triggered if a plan terminates. Other factors include credits from past overfunding, waivers from required contributions, and the inability to enforce funding rules (see Chapter 11) leading to poor funding when plans are taken over by the PBGC.

Also important is the role of outdated information. By the time an underfunded terminated plan arrives at the PBGC, the plan's informational report filed with the government (the 5500 Form) is approximately two years old. In other words, firms can often report their plans as financially healthy on the Form 5500, but at termination shortly, they can be in much worse shape. For instance, Bethlehem Steel and United Airlines reported their plans as over 80 percent funded on an ongoing basis, but when they handed the terminated plans over to the PBGC, the plans has less than 50 percent of the assets required to cover promised benefits.

Another structural problem is that pension insurance premiums have been insufficient to pay for past losses and expected future claims; indeed, many have argued there should be closer links between premiums charged and the actuarially fair value of the insurance. Traditionally, premiums have not varied across firms despite widely varying expected risk of sponsor failure. A recent examination of the credit history of 27 of the largest PBGC claims found that none had been rated investment grade within 3 years of plan termination, and nearly 90 percent were rated below investment grade up to 10 years prior to plan termination. Recent proposals suggest raising premiums and adjusting future premiums according to the sponsor's credit rating (Warshawsky et al., this volume). Whether these are actuarially fair prices for PBGC insurance remains to be determined.

Accounting Regulation and Pension Valuation

Another manifestation of principal–agent problems in the DB pension arena is due to the complicated nexus of accounting rules. Appropriately, the theoretical goal in this area is to limit discretion, enhance transparency, and engender consistency for the benefit of shareholders, workers, managers, and regulators. In the DB context, the reality is that plans have very long time horizons, both with regard to the accumulation and to the payout phases. Employers sponsoring DB plans are responsible not only for providing sufficient cash flows to meet current service and interest contributions, but also obligations at far distant points in time. As a consequence, actuarial projections for funding purposes must be made over long time horizons involving such factors as future mortality experience and assumptions regarding asset returns.

The reality of pension accounting, however, is that the accounting rules themselves have been a source of DB dysfunction; both alone and in combination with other forms of regulation. Specifically, problems arise in conjunction with accounting rules that call for the use of single summary numbers for liabilities, assets, returns, and discount rates. This issue goes a long way to explaining why the equity share in pension portfolios has remained high over several decades, despite changes that should arguably have encouraged a shift to fixed income investment to better match changes in the liability structure (particularly demographic aging). These rules produced a situation where pension returns were decoupled from pension risks.

Liability Accounting. From 1986 through 2005, the prevailing US standard for pension accounting was the Financial Accounting Standards Board (FASB) rule known as SFAS 87, which embodied a smoothing methodology to dampen fluctuations in pension assets and liabilities from one year to the next. Under this rule, pension liabilities were treated as fixed-income instruments and discounted at a specified long-term interest rate. Many rules govern permissible actuarial assumptions when measuring a plan's accumulated liabilities; however, the discount rate used to measure plan liabilities never depended on the plan's actual demographic structure. Thus the rules insisted that the proper discount rate was invariant to expected cash flows actually payable by DB plan sponsors. For example, in the case of an old-line industrial firm with many workers nearing retirement age, the DB plan would face the prospect of having to pay out large sums to these workers as they began to retire in large numbers. Finance experts would have recommended that plan liabilities in this case be discounted with a yield curve of interest rates matching the timing of required cash flows (US Treasury Department 2005). Nevertheless, SFAS 87 required a single interest rate unrelated to

the place on the yield curve that a plan sponsor might need to discount benefit payments using finance methodology.

When assessing changes in liabilities, SFAS 87 also required the use of a standardized measurement approach including the projected unit credit method (PUC), the accumulated benefit obligation (ABO), and the projected benefit obligation (PBO).[3] The main problem with this approach is that it produces deterministic values to set the pension obligation, depending on the regulatory goal. However, in addition to the many technical choices that can limit measurement reliability, none of these measures envisions variability of liabilities. In other words, choosing any of these numbers is like buying a bond without knowing its duration. Just as a bond's duration affects its behavior (and hence its price), so too can the duration of the liabilities affect behavior and valuation.

In 2003, the FASB released Exposure Draft Statement 132, which included draft requirements helpful in formulating duration-like assessments of a firm's liability structure and the magnitude of cash flows payable over time. These and other duration-related disclosures could help those seeking to conduct sensitivity analysis and test key assumptions about the firm's asset management strategies and stress-test the firm's liability immunization strategy. Unfortunately, FASB rejected these potentially helpful requirements.

Asset Accounting. Similar concerns may be raised regarding asset accounting: thus under previous versions of SFAS 87 and 132 (in effect from 1986 to 2003), a single rate of return assumption was used for accounting for plan assets, and returns were smoothed over a period of years. This had the very powerful effect of making actual volatility virtually unrelated to the rate of return assumption selected by the plan sponsor. Further, during that period, plan sponsors were not required to disclose volatility assumptions for asset returns. As a result, the accounting rules embedded a strong proequity bias; some argue that pension assets were managed with such a 'tilt' that it appeared as if they had a beta of zero in financial terms (Gold 2001).

Instead of requiring disclosure of the expected rate of return by individual asset category, the revised SFAS 132 requires only a narrative description of the investment strategies employed by the DB plans and the basis used to determine the overall expected rate of return. The FASB did require that the disclosure explain the general approach taken, which data were used in forming the long-term rate of return assumption, or whether or not adjustments were made to historical data. These disclosures still allow assumptions to vary significantly from one plan sponsor to the next. Also, anticipated returns can be booked on the income statement today, but the risks can be smoothed on the balance sheet over a period of several years (Gold 2001). This has led some plans to raise anticipated

return assumptions and further boost the share of the portfolio devoted to equities. Such behavior may be reinforced by internal company dynamics that provide incentives for a CFO to avoid reallocating out of equities (Fore 2005). In the post-2000 period, as the equity bubble burst and analysts undertook more detailed examinations of balance sheets (Coronado and Sharpe 2003), this smoothing strategy was recognized as problematic. In particular, the smoothing strategy was found to have a built-in negative reinforcement mechanism, so that DB plans which appeared comfortably overfunded in 1999, became dramatically underfunded by 2002. These continue to be underfunded in 2005, and they now face the prospect of many years of deficit-reduction contributions.

The principal–agent problem for DB pensions has resulted in a less-than-full embrace of some key economic and statistical lessons that, when ignored, can lead to some of the pathologies outlined earlier. The most important of these is the inability of pension regulation to promote or even acknowledge the benefit of dynamic, stochastic, and shortfall analysis rather than deterministic and point estimates. The effect is to create incentives for companies and regulators alike to ignore factors that can severely undermine the DB pension and have led to the tenuous situation it is in today.

Prospects for Reform

Next we evaluate whether some relatively simple regulatory and legislative changes could enhance the DB plan regulatory environment, so as to prevent further erosion of DB plans to improve future funding. Our analysis of potential remedies appears in Table 9-1, which arrays these along two

Table 9-1 Opportunities for Pension Reform

	Easy	*Difficult*
Incremental	Credits	Discount rates Remove pension call option
Reform	Exp. rate of return on plan assets Form 5500 timing/ transparency	Reversion tax reform
Fundamental reform	Interest rate arbitrage	Smoothing new income statement Fair market valuation of assets and liabilities Agree on transition period to new paradigm

Source: Authors' elaboration.

dimensions: the degree of reform proposed (from incremental to fundamental) and the ease of realizing the reform (from 'easy' to 'difficult'). Many of these reforms would be true improvements, in our view.

The DB pension problem has attracted comparisons to the US savings and loan debacle of the late 1980s, although the scale of pension write-downs is unlikely to be as large in real terms. Under the *status quo*, the reality is that DB pension beneficiaries will suffer in the form of reduced benefit checks. Going forward, different options would address the pension funding gap through regulatory reorientation; for instance, measures might involve adopting economic and statistical methods to valuing pension funding, boosting PBGC premiums, restricting lump-sum payments, better capitalizing the PBGC, and reforming its premium structure. As we shall show, some of these measures would have long-term impacts, while others would have more immediate effects. Whether these would be sufficient to save the DB pension system is not clear.

Insights from Financial Economics. To better understand the pension funding problem, the first step would be to properly value a DB plan's liabilities, by treating them as future cash flows. That is, the financial view of a DB plan's liability is the expected present value of all cash flows the plan commits to pay, inclusive of benefits associated with past and future service of current and future employees, accrued to their expected retirement dates. Furthermore, these cash flows would be discounted using a rate consistent with the market-related risk of the liabilities, rather than the more traditional expected return on the assets used to defease them.

A financial assessment of actual DB plan liabilities would view the liabilities as representing a bundle of exposures to various market risk factors, plus an idiosyncratic stochastic risk term unrelated to market factors (Scott 2002). Accordingly, the appropriate discount rates would be based on a permanent set of standard 'benchmark' securities matched to the date on the yield curve of the cash flows payable.[4] A financial economics perspective would also propose more transparency in measuring DB plan assets. Currently, DB plan assets must be (mostly) marked to market as of the plan's reporting date, but Form 5500 documents still allow substantial time lags.[5] Further, DB plans are permitted to 'smooth' the value of their assets over several years. The financial economics approach would prefer frequent market-updating of asset values, and little or no smoothing.

Adopting a financial economics perspective would likely prompt the adoption of many new tools in the DB environment. These could include dynamic asset allocation, shortfall risk, stochastic valuation, and the use of nontraditional financial instruments (such as inflation bonds and options). Dynamic asset allocation involves a class of models introduced to alleviate the funding and opacity problems traditionally associated with DB pensions (Guillen et al. 2004). The approach has been used in Denmark, where

returns-smoothing functions solely as an accounting device, and the pension contract, in finance terms, is modeled as a path-dependent contingent claim combining elements of both DB plans and DC plans. Recently, dynamic portfolio optimization models of asset–liability management have been proposed which incorporate options to minimize the probability of funding shortfalls. Results by Boender et al. (1997) suggest that pension funds can achieve significant risk-neutral reductions in contribution rates by implementing a liability-driven path-dependent put strategy. Nevertheless, few US DB plan sponsors or consultants have used this tactic as yet.

The use of shortfall risk (cf. Leibowitz et al. 1994) and stochastic models (Boulier et al. 1995; Haberman and Owadally 2001) for analyzing and managing DB pensions are well known but not particularly widely adopted. One interesting fact is that stochastic control models imply nonlinear contribution rates and asset allocation patterns. Thus when a plan's funding ratio is low, contributions should be maximized and the asset allocation tilted in favor of riskier assets. As the funding ratio improves, the models predict that contribution rates and the allocation to risky assets be dialed back. Finally, if the plan's funding ratio exceeds 100 percent, contributions can be suspended and gains locked in.

Perhaps the central insight offered by stochastic control models is that spreading volatile gains and losses over shorter periods and recognizing them faster leads to better funding (Dufresne 1989; Haberman and Owadally 2001). Contribution rate stability and fund security cannot be traded off over longer spreading periods. Further, these models imply that there may be a minimum funding level (higher than some may suspect), below which the plans cannot return to stable equilibrium.[6] One limitation to implementing stochastic models has to do with 'transition effects'—that is, a sponsor adopting this approach might face substantial up-front costs. For example, the expected present value of benefits using the stochastic framework can rise by one-third, as compared to traditional valuation methods (Sherris 1995).[7]

Along with better statistical tools for pension valuation, moving to a financial economics-based perspective on DB pensions could also spur investments in new assets. Most retirees default into joint and survivor annuities, so that plan sponsors and asset managers must begin thinking about how to design an immunization strategy matched against both nominal wage growth and beneficiary demographics.[8] Currently, no sovereign or high-grade private entity issues securities that match expected wage trajectories of employees in a corporate or public sector DB plan. Accordingly, Bodie (1995) has championed inflation-indexed treasury bonds, arguing that these can be an essential component of the DB plan portfolio. Of course if this asset were to constitute the entire DB plan portfolio, it would imply high contribution rates and lower earnings for the plan sponsor.

Improving Accounting Rules. Earlier we have argued that the fundamental principal–agent problem facing DB plans has been exacerbated by accounting rules. Accordingly, several specific accounting changes could help promote fairer valuation and immunization, while helping US and international accounting standards converge. They would also curtail sponsors' opportunities to smooth/arbitrage pension assets and liabilities, and take advantage of the pension 'call option'.

The ultimate arbiter of accounting practice in the USA is the Securities and Exchange Commission (SEC). This entity could, for instance, announce that it would not allow the filing of financial statements with pension assumptions that allow for arbitraging of assets and liabilities. This would put a stop to cases such as at General Motors, where debt was issued to the DB plan, but simultaneously a higher rate of return was reported on plan assets.

Accounting standards could also be revised to prohibit credits from past asset returns as a means of cutting current contributions, unless the plan sponsor could demonstrate to a fiduciary that the credits represented real assets. Indeed, the use of such credits is not currently seen with favor by regulators (US Department of Treasury 2005). In addition, plan funding could be treated in a more symmetrical fashion so that asset gains would not automatically reduce the need for contributions, nor would asset losses produce reversions or terminations. This would remove the firm's pension plan 'call option' while reconsidering the IRS rule on reversion taxes. The intended consequence would be to place full responsibility for the current plan firmly on the firm's shoulders.[9] In addition, if the call option could be removed and the reversion tax problem solved, convergence could perhaps lead to the Dutch approach to plan funding. In the Netherlands, DB plans typically target funding levels between 115 and 135 percent of full funding; as a consequence, there is no widespread DB funding problem in that country. In our view, the most urgent change in accounting rules would be to move to fair valuation of pensions. This trend is well under way in Europe, launched by the UK Accounting Standards Board (ASB) issuance of Financial Reporting Standard (FRS) 17 in the year 2000. In a nutshell, this approach moves toward the use of market prices to value assets and liabilities, in lieu of smoothing techniques. It should be noted that adopting of fair value accounting forced sponsors to recognize the stochastic nature of asset returns; that is, plan sponsors could no longer act as if returns and risks were unrelated. To put it another way, plan sponsors could no longer assume that equities had a financial beta of zero, and pension gains and losses had to be immediately recognized. (By contrast, in the USA, plan asset values can still be smoothed over a period of up to five years.)[10] Some argue that this introduces excessive volatility into sponsors' financial statements, and that it has made accounting regulations drive economic and financial decision-making. In response, the UK ASB noted

that recognizing year-to-year fluctuations in asset values in the financial statements was similar to recognizing revaluation gains and losses on fixed corporate assets (ASB 2000: 71).

In addition to fair valuation, convergence of other pension accounting rules in the international context would also be beneficial. For instance, the US FASB has promised to the International Accounting Standards Board (IASB) that it will work on convergence for retirement plan benefit accounting. This project has proposed that actuarial gains and losses must be recognized immediately, outside the income statement, in a statement of total recognized income and expenses, and also included immediately in retained earnings. In addition, indexation agreements and future salary increases must now be taken into account when valuing liabilities (IAS 2004); plan sponsors and fund managers must also describe the assumptions and logic used to determine the overall expected rate of return on assets as well as the expected rate of return for each major asset class.

Proponents of these new standards believe that moving to the more transparent world of fair value accounting, and away from actuarial smoothing of gains and losses, will prevent periodic funding crises by highlighting small problems before they can grow into large problems. Opponents of the new standards argue, conversely, that introducing fair value accounting into a system of long-dated commitments introduces excessive volatility for too little gain. Clearly an immediate move to fair value accounting standards in the USA would have serious consequences, given the large number of underfunded plans. On the other hand, having the data to obtain a clear reading of troubled firms' financial situation would make clear that many intend to terminate their plans in the near future.

Closing the Funding Gap. Restoring solvency to the DB system requires closing the PBGC's funding gap. One approach would boost premiums paid by insured firms. One proposal would raise premiums by more than half, index them to the growth in nominal earnings, and charge an additional premium to firms rated BIG (McCall et al., this volume). This approach would also give the PBGC's Board, composed of the cabinet secretaries from the departments of Commerce, Labor and Treasury, the authority to adjust premiums in the future so that the PBGC could charge actuarially fair prices for its insurance. This would be a revolutionary development for the PBGC because it would significantly improve the odds that future premium revenue could cover future expected losses.

Yet even if this occurs, it would not solve the so-called 'legacy costs' driving a wedge between PBGC assets and liabilities. These are attributable, in part, to the fact that Bethlehem Steel, United Airlines, and many other plan sponsors never paid for the full value of the pension insurance they received and 'put' to the PBGC. Of course boosting premiums on healthy

plan sponsors to cover past losses would likely produce more plan terminations and, in the extreme, a collapse of the DB system. The reality, of course, is that the PBGC is an undercapitalized insurance company with a single line of business; its revenues consist of writing naked put options. Reforms that would raise revenues in the same manner as previously does not change the business model. Rather, the PBGC needs a new approach to raising capital and bringing in new revenue. Another option might be to 'socialize' the PBGC's past losses, by raising taxes on the current taxpayers, or passing costs onto future generations by selling bonds. These choices may not appeal to taxpayers who view with alarm increasing federal deficits and social security shortfalls.

Reinventing the DB Plan

Up to this point, we have argued that critiques of the DB pension fall prey to two problems. One is conceptual: well-meaning policymakers have too often proposed piecemeal changes in the DB system, without taking the big picture into account. The second problem is practical: while solutions may be available, they are often expensive. For instance, financial economics suggests that employers hold more fixed income in their DB portfolios and contribute more. Reforms might also decouple the pension from the income statement and balance sheet, which regulators might find difficult. And reform might require an infusion of cash to capitalize the PBGC, which again will be expensive. The odds against a comeback of traditional DB plans are very long indeed.

Accordingly, in this section, we ask whether individuals, households and employers might find appealing a new class of DB plan, one which would hold onto the essential elements of DB retirement programs, while moving away from other aspects. To make headway, we posit that the main goal of a DB pension is to be a consumption-smoothing device,[11] and we turn to the consumption-based asset pricing literature (Cochrane 2005) to show that forward-thinking individuals will seek assets that pay off well when times are bad and hence most needed.[12]

Let us next consider the position of an individual DB plan participant. The younger employee, recently vested in the plan, has accrued only a small future benefit; as he is likely to exit the firm and the plan for employment elsewhere, the DB promise is akin to BIG bonds in default. In other words, the young employee will eventually receive, at retirement, a small benefit comparable to a defaulted bond paying in recovery settlement cents on the dollar. By contrast, the older and longer-tenured employee intending to remain with the firm until retirement has a DB promise akin to an investment-grade corporate bond; he is likely to receive the full face value of the bond in retirement, but there remains some chance of a default (due either to employee or employer actions). Only at retirement

will the full-career employee value the DB promise as akin to Treasury bonds, as long as the plan is fully funded (and abstracting from PBGC insurance ceilings and other problems).

The question, then, is how one might replicate the DB pension from the point of view of the participant. One way would be to replicate the 'pseudo portfolio' held by the participant with fixed-income instruments having the same characteristics as the plan accrual pattern, embodying its separation rates and eventual benefit levels. Rather than doing this with bonds directly, we propose treating the promises as a series of credit option derivatives, one for each year of potential employment. In the worker's first year, the probability of leaving employment would set the option value or price, other elements of the design being equal. The second year's pension option value would be similar, except that it would be conditional on remaining employed after the first year and the probability of leaving employment might change. Each succeeding year would follow in like fashion. This would be akin to a life insurance product where the payout is unknown (the convexity of the benefit structure over time would also be a factor).

A related approach would be consistent with Valdés-Prieto's proposal (this volume) to have companies (or governments) offer securitized Covered Wage Bill (CWB) bonds. He argues that in particular CWB bonds would be good inflation hedges, as the wage bill should be highly correlated with inflation at least in the medium term. He further argues for the place of CWB bonds in a pension portfolio as a means to match the participants' human capital. Another technique would replicate the portfolio by investing in a riskless asset and then in a second portfolio consisting of risky assets; portfolio shares would vary within specified bands.

Toward a Portable DB Pension. One commonly cited drawback to DB plans is the fact that workers lack portability. In most cases DB plans evolved as distinct entities because sponsoring firms offered benefit features suited to their business and to their workforces; sometimes sponsors negotiated benefits with unions; and early retirement subsidies were used to influence the age distribution of the staff at some firms. Plans differ in their retirement ages, generosity factors, special disability rules, and funding, all of which tend to make DB promises nonportable.

Yet lack of portability is not a necessary element of DB plans: for instance, Blake (2000) notes that in the Netherlands DB plans are portable because all plans share critical common features, including the use of the same actuarial assumptions to value liabilities and accrued benefits. This means that workers can transfer service credits when changing jobs and pension plans. In our view, several plan design features would benefit from standardization, which would in turn foster portability, lower regulatory needs, and cut compliance costs. Specifically, actuarial assumptions would be

made uniform across plans, as well as a common benefit accrual formula. Of course any particular benefit accrual rate could be set, though a relatively low accrual rate could be more attractive since the plan becomes more expensive to fund as the accrual rate rises. At the same time a plan design where participants could purchase additional years of service credits would presumably be a desirable feature. This is a not-uncommon feature of state and local government DB plans, and is reportedly popular with plan participants. Of course, as the accrual rate is ratcheted up, it would become progressively more difficult for individuals to buy service credits. Conversely, if the accrual rate were set too low, plan participants would only receive adequate incomes in retirement if they purchased additional credits. From a practical viewpoint, the only early retirement feature of the plan would be to permit purchase of additional service credits, to maintain actuarial and labor market neutrality.

In this type of portable DB plan, two workers having similar earnings trajectories over their careers but different numbers of jobs would arrive at retirement with identical retirement benefits. By contrast, in a traditional DB plan, at retirement, job changers have much reduced benefits. A portable DB plan therefore resembles the US social security system (abstracting from social security's spousal benefit and disability features; disability insurance could be covered under separate insurance arrangements and the plan could be neutral with regard to family status).

Standardizing assumptions generates a standardized DB plan, portable across firms, industries, and occupations. If assumptions were suitably standardized, different workers earning similar annual amounts participating in this plan with different employers (plan sponsors) would originate similar liabilities in the plan and accrue the right to similar benefits from the plan. If they were to terminate employment for whatever reason, their accrued benefits would stay the same, as would the flow of liabilities their participation in the plan had caused. It would also be necessary to standardize mortality assumptions. A standard population table with cohort adjustments for expected improvements in longevity would likely be the appropriate choice. Standardization of actuarial assumptions might not necessarily extend to the full annuitization period, if some plan sponsors wanted to offer pure life annuities while others would offer participating provisions. One option would be to target a standard floor or base benefit which could then be enhanced by plan sponsors as they saw fit.

While asset allocation patterns could be standardized via regulation, a better approach might be to anticipate that reformed accounting rules would produce certain common practice along with a healthy respect for duration with regard to plan liabilities. An asset allocation approach we find interesting would have an accumulation structure with two pillars. One pillar would provide a guaranteed rate of return to participants plus the possibility of additional accumulations, and while the second pillar would

offer risky returns with no guarantee. The portion of the portfolio containing the riskless asset would have a variety of restrictions concerning the investments that could be held, ensuring that the guaranteed rate of return could be met or surpassed, and that other desirable features such as immunization could be followed as investment strategy. The portfolio share containing the risky asset would function as a percentage of the overall DB plan and would be invested in equities. Each year, the plan sponsor would be expected to contribute an amount equal to the plan service cost in a predetermined ratio to the guaranteed asset percentage of the plan and the risky asset percentage of the plan. These ratios could change over time as a result of market performance, as could plan contributions.

Possible Critiques. A potential criticism of the portable DB idea is that benefit portability implies much higher eventual benefit payouts and consequently much higher total plan liabilities. This, in turn, could imply an unacceptably high plan sponsor contribution rate. There are several ways to respond to such a criticism. First, benefit levels and plan liabilities can be adjusted by offering a lower accrual rate. Second, young workers who turn over subsidize higher-paid longer-tenure employees in the traditional DB plan. It is difficult to justify this if policymakers are concerned about security for all retirees. Third, it may be possible to reduce costs by using better asset-management and asset–liability matching models.[13] Finally, this portable DB plan would be expected to have much lower regulatory and compliance costs compared to traditional DB plans. Separate portable DB plans for different groups could be sponsored by professional associations, unions, insurance companies, or other financial services companies.[14]

Conclusion

The traditional DB plan suffers from many problems, including well-intended but misguided disciplinary and regulatory regimes. Here we argue that a stochastic, more financially based approach to asset/liability matching would enable DB plan sponsors to improve their ability to consider expected risks in both liabilities and asset returns. Incentives can be instituted to make plan funding more robust to changes in asset returns and other vital economic and financial variables. With this, governments will be asked to provide increased support for the needs of the pension community. That is why we propose a new approach to the DB plan, an approach preferable to piecemeal reform. It is a portable DB pension plan, most likely to appeal to firms seeking to attract younger and more mobile workers concerned with lifelong retirement security. It combines the best of what DB and DC plans have to offer and in so doing, incorporates the

key roles of pensions in retirement security. We anticipate that this model can prove practical and attractive to interest a wide range of sponsors.

Endnotes

1. The decline of job tenure and the apparent changing nature of the employee–employer relationship partly explains the shift away from DB pensions, since securing long job tenure is less valuable than previously. There is little evidence that employers offering DC plans value long-tenured employees (Friedberg and Owyang 2004).
2. Of course, an additional consequence of ERISA and related regulations might be a loss of innovation potential by the various actors involved in DB plan design and management, as they have become increasingly bound in a regulatory and compliance straitjacket.
3. Details and uses of these measures are widely known, as are specific issues with each; see McGill et al. (2004).
4. Financially appropriate yield curve discounting raises plan liabilities for mature plans with a large fraction of annuitants, as compared to current actuarial practice. Yield curve discounting could also improve incentives for pension immunization.
5. Along these lines it should be noted that private equity poses a particular valuation problem, as it typically has a 7–10-year time horizon over which it is not marked to market. Private equity is a rising share of pension plan portfolios.
6. Other uses of stochastic control include modeling the option value of early retirement benefits (Chen 2002), and a spread method of funding assuming changes in plan liabilities are random (Josa-Fombellida and Rincon-Zapatero 2004).
7. A stochastic differential equation seems to improve the accuracy of such accruals, but at a current cost for the sponsor (Bacinello 2000). Similarly, using a partial differential equation, Taylor (2002) shows that a funding or solvency level below 80 percent represented an unstable equilibrium, and funding tends to fall even further.
8. At the individual level, workers who invest their annual retirement contributions in a series of five-year insured products, perhaps based on inflation bonds, could have a higher probability of meeting their retirement income targets than if they were to invest the same amount in the S&P 500 index (Bodie and Crane 1999). A participant would buy a series of these during the accumulation phase, and these retirement income contracts could guarantee a monthly income for life in retirement. In theory, these contracts could be designed to provide the best features of both DC and DB plans, but in practice their transaction costs might make them less attractive.
9. To avoid unintended consequences, however, such policies might require FASB movement and action on a statement of comprehensive income so that firms also face incentives to preserve pension over funding when asset totals are larger than anticipated (i.e. so there will be assets held in a kind of reserve for when returns are lower than anticipated). We are aware that FASB action on a new income statement is a major reform and no simple task.

10. Fair valuation of liabilities represents a challenge because of the pattern of salary increases and recognition that the 'true' liability horizon is a worker's life expectancy. Acknowledging the lack of an active market in long pension liabilities, the UK ASB considered alternative actuarial methods to unlink the discount rate on liabilities from the expected return on plan assets. These included the use of inflation bonds as the liability benchmark or a weighted portfolio of equities and bonds. In the end, the ASB settled on a single discount rate, the AA corporate bond, noting that part of the rationale for this decision was to bring about convergence in standards.
11. The traditional DB pension also fulfilled labor market objectives such as encouraging employee loyalty in firms where the development and retention of firm-specific human capital was a valuable management objective; these are usually thought of as secondary objectives in the USA.
12. Most 401(k) plans do not do a good job of smoothing lifetime consumption for their participants. For instance, 401(k) plans tend not to provide financial planning guidance nor payout annuities, though most offer a wide menu of investment fund choices, especially in the equity area.
13. Alternative asset allocation models could be constructed using contingent-claims pricing techniques to replicate the benefit accrual paths of a standardized, portable DB plan. The plan could be modeled using contingent-claims techniques where the payoff function is a discrete event with a known maturity date. For a large enough pool of participants, path-dependence in the contingent claim can be handled via a sufficiently conservative investment strategy. Termination from the plan can be expressed as a surrender option. In practice, individuals will exit the plan due to death, disability, and withdrawal. Practical actuarial work realizes this and constructs what are called multiple decrement tables to model survival rates. Decrement models exist to handle mortality rates at various ages, disability rates, and turnover; they also vary according to how they model key variables.
14. Alternatively, such plans could be organized along loose lines of affiliation, such as wage earners versus salary earners; the main supplemental public pension schemes in France are structured in this way.

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