

RETIREMENT BENEFITS, ECONOMICS AND ACCOUNTING: MORAL HAZARD AND FRAIL BENEFIT DESIGNS

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ABSTRACT

This paper uses economic principles to analyze alternative recognition schemes for end-of-period retirement plan liabilities; the candidates, using U.S. nomenclature, are the vested benefit obligation (VBO), the accumulated benefit obligation (ABO) and the projected benefit obligation (PBO).

In competitive employment markets with rational contracting we are unable to justify *projected costing* (PBO-based) for typical pay-related defined benefit plans. Projected costing misrepresents the economic obligations incurred by shareholders and invites moral hazard.

Employee exposure to moral hazard may be minimized by *exit costing* (VBO-based) which recognizes only those benefits to which an exiting employee is entitled under the explicit benefit contract. But exit costing may not fully inform shareholders about the obligations that they have incurred under implicit contracts that extend beyond the plan document. *Accrued costing* (represented in the United States by the ABO) may better measure shareholders' economic commitments.

Small differences between the ABO and the VBO may measure a human capital asset incented by delayed vesting and benefit eligibility. Large differences are a marker for frail benefit design and potential moral hazard.

Moral hazard options exercised by employers disappoint employees and may lead to unwelcome ex-post results-oriented repairs imposed by legislators, regulators and courts.

1. INTRODUCTION

This paper uses economic principles to analyze alternative recognition schemes for end-of-period retirement plan liabilities; the candidates, using U.S. nomenclature, are the vested benefit obligation (VBO), the accumulated benefit obligation (ABO) and the projected benefit obligation (PBO). We are concerned only with economics and financial reporting and do not address funding.

Each end-of-period liability recognition scheme implies an allocation of costs over periods of employment. Because the VBO adheres to the explicit "contract" that defines the benefit entitlement of an exiting employee, we may call the VBO-based allocation *exit costing*. *Accrued costing* is based on the ABO, which exceeds the VBO because it assigns probabilities to future service that may meet eligibility requirements for vesting

and for subsidized benefits. The ABO recognizes an implicit contract to continue employment beyond the current reporting date. *Projected costing* is based on the PBO, which adds a second layer of implicit contract, recognizing the benefit impact of estimated future pay increases.

The end-of-period liabilities must properly inform shareholders of economic obligations that they have incurred. The cost allocation method should provide reliable information to support economically rational decisions by managers, employees, investors and regulators.

Fully vested defined contribution (DC) plans provide an example of exit costing. The cost recognized by the employer in each period is identical to the cash it contributes. Defined benefit (DB) and other postemployment benefit plans accrue over an employee's career in ways that make the cost attribution less certain. Difficulties can arise with provisions for vesting and benefit eligibility, and with the treatment of future salary increases under pay-related DB plans. When do

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benefits that are subject to vesting and eligibility rules accrue, over the full crediting period or only when they vest? Do final-pay benefits accrue on the basis of current pay or expected final pay? What about benefits that may be revoked at the company's discretion, such as retiree medical coverage or ancillary pension benefits that are not protected by statute?

We assume competitive markets for labor and capital, and rational contracts. These contracts may be explicit, implicit or both and may include risks. Under these conditions, we argue that there cannot be a rational implicit contract for future pay increases that induces noncompetitive total compensation. This means we can rule out projected costing for common pay-related DB plans. But U.S. and international accounting standards prescribe exactly that approach. This accounting for benefit costs over employees' careers is flawed because it misrepresents the underlying contracts and invites moral hazard.

Some plan designs deliberately delay vesting and eligibility, leading to an ABO that is greater than the VBO. Such designs put employees at risk, raise expected compensation, reduce turnover, enable training investments and enhance productivity. Small differences may mark tradeoffs where productivity gains exceed expected compensation increases; thus the difference represents a human capital asset. Large differences, however, indicate frail contracts where the increased compensation required for employee risks is very likely to exceed any productivity gains; the difference exceeds any human capital asset and reflects an opportunity for moral hazard.

In Section 2, we review principles of employment economics and provide a literature review.

In Section 3, we define and develop the cost method candidates and explore them in spot markets and under explicit and implicit contracts. We see that projected costing requires the support of an enforceable multiperiod contract.

In Section 4, we examine the difference between the ABO and the VBO and the implications for robust rational plan design.

In Section 5, we look at historical cases where the enforcement mechanisms for implicit contracts have broken down and the moral hazard option has been exercised. We then look at how society responds to such action. Regulators, leg-

islators and courts respond in ways that may disappoint employers and employees and threaten the future of otherwise desirable employee benefit schemes. Section 6 summarizes the paper and concludes.

2. SOME PRINCIPLES OF EMPLOYMENT ECONOMICS

We seek an economic basis to inform financial reporting for firms that sponsor postemployment benefit plans. We do so in the context of employment economics and contractual relationships.

2.1 Contract Basics

Contracts constitute an important branch of economic analysis. We are interested in contracts related to employment and the recognition of the liabilities to which they give rise.

Contracts are agreements entered into by willing parties, each for its own perceived benefit. Although some contracts begin and end immediately (e.g., a cash purchase of a newspaper), we are interested here in contracts that may extend over long periods. Because circumstances change subsequent to the original meeting of the minds,¹ contracts must have force even after one party would rather no longer be bound. Thus, contracts must be part of a system that can coerce compliance from a reluctant party. Usually, the reputations or continued interdependence of the parties serve as the enforcement mechanism. Occasionally, courts must intervene and apply legal sanctions.

Contracts may be explicit, implicit or both. Economics teaches us that it is efficient to formalize a contract in writing when the benefits of such formality exceed the preparation costs. When a home is sold, it is efficient to write a contract because the amount of value being transferred is large, the sale occurs at a single point in time, there are only a few pertinent issues, the importance of compliance is high, and both parties want the enforcement potential of the courts to stand behind the transaction. In contrast, when a firm hires a young manager or salaried professional, an explicit contract is not efficient

¹ In many cases, for example, one party performs first, effectively becoming a creditor of the other.

because the employment relationship will encompass changing responsibilities and compensation, evolving relationship-specific investments by each party, and an unpredictable date of severance. Thus the typical nonexecutive employment contract will consist of mutual and tacit understandings, backed by a commonality of interests.

Economists expect contracts to be rational (the welfare of each party is improved) and efficient (no “better” contract exists).²

Contracts may incorporate options (financial or real) that may be absolute or conditional. Examples from the employment world may include the right to terminate a pension plan at any time for any reason, the right to fire an employee for inadequate performance, or the right to choose a lump sum rather than an annuity. The holder of the right (the “long” position) will usually have had to concede some compensation to the “short” party in the contract negotiation.

2.2 Financial Accounting for Contracts

Principle 1: The objective of financial accounting is to report value-relevant information to interested parties. Information that would reduce (increase) the price that a buyer would be willing to pay for a share of the firm signifies a value-relevant liability (asset).

Principle 2: Accounting recognition follows de facto contracts whether implicit, explicit or combined. This is a direct application of Principle 1. Financial accounting reports the value of firm assets and the value of contractual claims against those assets in a fashion that will be credible to suppliers of capital and labor. Although this may seem to be self-evident, we will see that much of the debate about the proper accounting for employee benefits turns on the nature of the contracts and upon the actions and intents of the parties.

2.3 Risks and Incentives in Employment Contracts

We consider the impact of three distinct types of employment-related risks faced by employees: (a) *statistical* (or demographic) *risk*, where individ-

ual employee experiences vary around actuarial expectations in regard to tenure, compensation, mortality etc.; (b) *firm-specific risk*, where employees are exposed to the fortunes of the firm; and (c) *moral hazard*, where employees are vulnerable to exploitation if management fails to adhere faithfully to implicit contracts.

Contracts that impose risk on employees stimulate risk-averse employees to demand higher expected total compensation. Statistical and firm-specific risks may motivate greater productivity:

- Firm-specific risk aligns employee compensation and firm results. This may be accomplished through bonus programs, stock options and grants, and promises without collateral (e.g., unfunded or underfunded benefit programs that make the employee a de facto firm creditor).
- Statistical risk, such as a probability of future vesting instead of immediate vesting, can serve to retain and motivate employees. Employees facing potential forfeiture if they terminate will (a) require greater pay from competitors seeking to hire them away and (b) be disinclined to shirk for fear of being fired.

The amount of compensation demanded per unit of risk increases as a function of the amount of risk employees are asked to bear. An employee who demands a \$1 risk premium for one unit of risk will demand more than a \$2 premium for two units. The incentive effect declines as risk is increased. If the first unit of imposed risk adds \$10 to output, the second unit will add less than another \$10.

Principle 3: Increasing employment contract risk may be efficient, but only up to a limit. At some point, the increasing marginal compensation must exceed the decreasing marginal productivity, and any further imposition of risk must be counterproductive.

Principle 4: Exposing employees to moral hazard is generally inefficient. An employer who wants to retain valuable options against employee interests cannot generally pay employees enough. This is tantamount to asking employees to insure the employer against its own bad acts. Most actuaries will deem this risk “uninsurable.” A more practicable variation on this theme may be constructed with conditions; that is, the option to renege on promised benefits will only be exercised when condition “A” occurs. If A is defined,

² A “better” contract increases at least one party’s welfare at no cost to any other party.

for example, in terms of the employer's financial distress, we may characterize the employee position as "short a customized put on the employer's equity." Such a short position equals a variable long position in the employer equity. Thus, we have a special case of firm-specific risk.

2.4 Competition

Under a simple competitive equilibrium model, firms employ capital and labor, each of which is provided within a context of perfect information, competition and mobility. This model includes spot markets for capital and labor, the existence of which implies that:

- The risk-adjusted expected return on capital is the same in every firm. Lower (higher) returns cause a departure (influx) of capital until this principle is met.
- Each employee will be offered the same total compensation in each period by numerous firms. Lower (higher) total compensation causes a departure (influx) of labor until this principle is met.

Principle 5: Total compensation is independent of the value of benefits earned under the de facto contract. Any increase in benefits recognized in the firm's accounting must be offset dollar-for-dollar by a decrease in direct pay. If a firm chose to commit more (or less) to benefits without adjusting direct pay, the resulting increase (decrease) in total compensation would drive away its suppliers of capital (labor).

Beginning in Section 3, we use the simple model to develop exit-cost recognition of plan liabilities and costs. In subsequent sections, the simple model will be made more complex to account for the real-life features of explicit and implicit contracts of employment.

2.5 Economic Models of Implicit Pension Contracts

Actuaries, accountants and economists have struggled to assign value to financial promises that are wrapped in complicated relationships where not everything is reduced to written contracts. It appears that, while we all may model what we see, we cannot be sure that we have grasped the financial essence of the unwritten promise and its intended effects. Actuaries use

statistical models to predict distributions of outcomes under implicit contracts; accountants concentrate on the timing of transfers of value; economists are concerned about the rationality of contracts.

2.51 Lazear Style Implicit Contracts (LSICs)

Lazear (1979) identifies implicit multiperiod employment contracts that add value for employers and employees. Lazear (1983) asserts that DB pension plans may be viewed as the implementation mechanism for LSICs. According to Lazear, early in their careers, certain employees are paid less than their competitive total compensation. These employees, who tacitly agree to participate in LSICs, commit to a long-term relationship that withholds a portion of their earned total compensation, trains them to enhance their future productivity, motivates them to perform under the risk of losing the value withheld, and ultimately rewards them with career total pay that reflects their enhanced productivity. Usually such employees may be characterized as salaried nonbargaining employees covered by pay-related DB pension plans.

The portion of early-career compensation that is withheld is deemed to act as a "training bond" that allows employers to invest in the employee relationship or as a "performance bond" that discourages employee shirking.³ Return of the withheld compensation late in the career (in the form of vested early retirement subsidies and postemployment benefits) acts as a severance incentive.

Employees who participate in LSICs must believe that, even after considering various risks—including possible renegeing by the firm—they will be adequately rewarded. This belief has been bolstered by the observation that the firm has not renegeed on prior generations of employees. Firms that see the value in LSICs need to protect their access to today's young work force by honoring

³ The performance of such employees can neither be perfectly specified (as in an explicit contract) nor costlessly monitored; thus, incentives that motivate employees are incorporated into an efficient (but second best) contract. Although the same considerations might argue for implicit contracts for senior executives, it appears that the cost-benefit ratio related to the specification of executive contracts is generally more favorable than it is for salaried professionals and middle managers.

the implied promises previously made to their employees with long tenure today.

Can Lazear style implicit contracts justify accounting that recognizes pension liabilities in excess of those in explicit plan documents? How real are the promises and how precisely can they be measured?

2.52 Implicit Contracts and DB Pension Plans

Kotlikoff and Wise (1985) examine the empirical evidence to see whether labor markets follow a spot or a multiperiod contractual model. They focus on cliff vesting and cliff eligibility for subsidized early retirement benefits. Under the spot approach, the presumed smoothness of total compensation must be offset by sharply discontinuous vested values particularly at, and shortly after, age 55; observable direct pay should not proceed smoothly upward in that age range. Kotlikoff and Wise do not find such discontinuity in direct pay and deduce that implicit contracts prevail over the spot market model.

Bodie (1985) in his comment in re Kotlikoff and Wise (1985) questions how much can be deduced about implicit contracts by looking at direct pay patterns without having substantially more information about other forces at work.

Bulow and Landsman (1985) note that the direct pay patterns of individual employees may not reflect the impact of discontinuous benefit entitlements. Because benefit decisions and salary determinations are often made disjointedly within an employer's hierarchy, we often observe employees who earn the same direct pay but take unequal advantage of offered benefits. Nonetheless, because the employer must still determine its total compensation competitively, cohort direct pay plus cohort vested benefit costs must equal cohort total compensation, even if the rule applies imperfectly for individuals.

Bulow (1982) asks the critical question, "How should the firm accrue its pension liability to the worker over time, to keep accounting profits consistent with economic profits?" (p. 438) if an implicit career-long contract exists. Bulow argues that the total compensation should be recognized in each period, regardless of how it is apportioned between direct pay and pension benefits. If the employer recognizes the PBO, the employee's direct pay equals total compensation (TC) less the

service cost (SC). Even though the employee's direct pay plus the value of his incremental vested benefits (VC) does not equal the total compensation earned, the employee does not care because the employer is fully obligated for the PBO under the long-term contract. This relationship is outlined algebraically in Section 3.

Noting the analogy between pensions and life insurance that drives actuarial cost methods, Bulow (1982) reinforces this observation. He states that the whole life policyholder does not object to paying more than the term cost in early years because the insurer is obliged to offer coverage below the term cost in later years. The burden is on those who advocate projected benefit accounting for pensions to show that there exists an implicit contract of sufficient force to assure the employee cohort that it will be made whole.

Finally, Bulow (1982) argues that, even if LSICs exist, there is no reason to assume that "the value of the firm's implicit contract liability is systematically related to the difference between the present values of its pension liabilities, as calculated under the projected benefit and accrued benefit methods" (p. 440). In other words, the pattern of the implicit obligation created by the use of the PBO rather than the VBO would have to be justified. "The point here is that an extraordinary set of implicit contracts is necessary, but not sufficient, for projected benefit methods to be appropriate . . ." (p. 440).

We can see a divide between Bulow (1982) and Lazear (1983) that is not well resolved by empirical work nor by further debate in the years that followed. The FASB (1985) adopted a projected measure for statements of profit and loss and an asymmetric accrued measure for the balance sheet in Financial Accounting Standard (FAS) 87 effective for fiscal years beginning after Dec. 15, 1986.⁴ The debate

⁴ Other standard setters have also used projected costing for profit and loss statements. The Canadian Institute of Chartered Accountants adopted CICA 3460 effective for 1987, and added CICA 3461 in 2000. The Accounting Standards Board of the U.K. replaced Statement of Standard Accounting Practice 24 (SSAP24) with Financial Reporting Standard 17 (FRS 17) which they promulgated in 2000 to be in effect in 2003, postponed to 2005. The IASB's predecessor, the International Accounting Standards Committee, introduced International Accounting Standard 19 (IAS 19) in 1999.

among economists subsided after the flurry of work in the 1980s while practitioners proceeded to implement the FAS 87 methodology.

More recently we have seen dissatisfaction with financial reporting under FAS 87, a continuation of a trend to a more mobile work force (i.e., more of a spot than a career-long contract market for labor), and many conversions of traditional pay-related DB plans to cash balance plans. These factors have contributed to the present revival (and extension) of the 1980s debate.

Balan (2003) argues that workplace changes since the early 1980s have led employers to reduce their interest in implementing LSICs with their entering employees. No longer constrained by the impact on the new entrants, employers have been freed from the need to make good on their existing obligations to their long-tenure employees. Balan's work is tentative but indicative of a declining role for LSICs.

3. ACCOUNTING WITHOUT AND WITH MULTIPERIOD CONTRACTS

In this section we formalize the accounting model for the spot labor market—where there are no implicit contracts and employment agreements are freshly made in each accounting period. In this case, failure to use period-by-period exit costing can injure employees and employers. We then consider the case with multiperiod contracts where the periodic accounting may be relaxed, but injury can still result unless exit costing is applied at the end of the contract.

3.1 Exit Costing for the Spot Market

Consider a simplified model of an economy in competitive equilibrium with full labor mobility:

- Each employee is able to choose each year among several companies, each of which offers the same total compensation. Job changes carry no legal repercussions, reputational costs or economic losses to companies or employees.
 - Total compensation (TC_t) is competitively determined for each employee at the beginning of each year and is due at the end of the year (t). Notation is summarized in Appendix A.
 - Benefit programs vary from employer to employer but offer no tax advantages. Employees have no individual benefit preferences and value an employer-provided benefit dollar equally with a dollar of direct compensation. At least one company, which we will call Company A, has no benefits and pays each employee's total compensation as direct pay.
 - Direct pay (W_t) is defined for each employee as the cash compensation paid. The noncash compensation is the end-of-year value of the employee's incremental vested benefits (VC_t). In accordance with Principle 5, direct pay due at the end of the year is: $W_t = TC_t - VC_t$.
 - Regulation is nonexistent.
- We define the "exit benefit" (V_t) as the benefit to which the employee would be entitled if he left service at year-end. It reflects years of service and pay to date; it excludes nonvested benefits, benefits for which eligibility has not yet been satisfied, and salary scale effects. We define the end-of-year value of V_t as $L_t(V_t)$, or as L_t when the meaning is clear. We designate the increase during the year of the employee's exit benefit as ΔV_t . Under these conditions, the correct benefit cost would be the end-of-year value, $L_t(\Delta V_t)$, which we have already denoted by VC_t . We refer to the use of L_t on the balance sheet and VC_t in the income statement as the "exit-cost" attribution method.
- We count only the exit benefit because any higher or lower cost attribution exposes either the company or the employee to future loss:
- **Advance recognition:** Suppose the company charges more than the exit cost and the employee goes along. The employee would be foregoing wages not for an immediate entitlement, but in the expectation that the company will, in a future year, credit benefits without simultaneously withholding wages. But the company could take the low road, frustrating the employee's expectations either by a prospective change in the plan or by charging fully for the exit benefits when they actually vest.
 - **Delayed recognition:** Alternatively, suppose the company charges less than the full exit cost. Companies often increase vested benefits (e.g., career average updates, past service benefit improvements, negotiated increases in a flat dollar plan, etc.) in the belief that today's employees will render future service in return (Byrne et al.

1983).⁵ This belief may be reflected in the amortization of the instantaneous rise in vested liabilities over forward periods. When the company tries to recoup its undercharge, the employee quits while ahead and joins Company A.

3.11 Base Case—Defined Contribution Plan

Consider how existing accounting practice treats the following situations:

- Company A pays a certain employee \$50,000 in direct pay with no benefits.
- Company B pays \$48,000 of wages plus \$2,000 immediately vested in a DC plan.
- Company C, a start-up, puts in a DC plan that credits and immediately vests \$1,000 for an employee with less than five years of service and \$3,000 for one with five years or more.

Under existing practice, which is identical to what we have defined as exit costing, Company C recognizes \$1,000 of benefit cost and pays \$49,000 of wages. After five years, Company C recognizes benefit cost of \$3,000 and pays wages of \$47,000.

Consider how Company C might apply projected costing. The company recognizes a uniform cost of \$2,000, based on a projection of its average contribution over employees' careers; accordingly, it offers \$48,000 of wages and reports total compensation expense of \$50,000. This departs from current DC accounting rules, but is there any substantive problem with it?

An employee who expects to stay with the same company for his entire career decides that this basis will be favorable and joins Company C. For five years the employee collects total compensation of \$49,000, \$48,000 as wages and \$1,000 as defined contributions. In the fifth year, Company

C is acquired by Company D. At first, the employee worries that the plan will be changed. He is reassured to learn that Company D, which has the same DC plan as Company C, will maintain the plan.

Then the employee learns that Company D uses standard exit costing. His direct wages will be calculated as \$50,000 minus the defined contribution. Over the past five years, the employee has received the same wages but \$5,000 less in defined contributions than his Company B counterparts. He had expected to recoup this shortfall by continuing to receive the same wages as Company B employees but getting \$1,000 more in annual defined contributions. Now he realizes that his \$5,000 sacrifice was fruitless. Going forward, he will receive the same total compensation as they, although differently allocated between wages and defined contributions. In no real sense did Company C have any liability to meet his expectations of receiving above-market compensation after five years of service; the "liability" has vanished *without a change in the benefit plan*.

This illustrates why the standard accounting in this case, *in which it coincides with exit costing*, is correct. Company C's spreading method creates a phantom liability and can produce incorrect and abusive compensation decisions.

3.12 Salary Scale—Another Case of Advance Recognition

We next show that the standard accounting for defined benefit (DB) plans is as flawed as the smoothed DC example above, *exactly because it does not follow exit costing*. A case that closely parallels the earlier example can be built using the PBO defined by FAS 87 as applied to a simplified final-pay DB plan.

Unlike the ABO and the VBO,⁶ the PBO assumes future pay increases. Consider a plan with immediate vesting that provides a lump sum benefit equal to 2% of final year's total compensation⁷

⁵ See, especially, Byrne's remark defending the practice of spreading the cost of immediate increases in accrued promises over substantial future periods (i.e., delayed recognition):

"There is no basis for the view that an employer adopts a pension plan primarily as a reward for services rendered prior to the adoption of the plan. . . . Pension funds represent reward for future service and productivity.

The same conclusion can be reached for amendments to a pension plan. That a plan may use preadoption service or pay . . . does not detract from the conclusion that the plan is an exchange for future service" (Byrne et al. 1983, p. 985).

We return to this subject in Section 4.43.

⁶ Recall that the VBO, as opposed to the ABO, ignores nonvested benefits and benefits for which eligibility rules have not yet been satisfied. In the example at hand, the VBO equals the ABO.

⁷ Final-pay plans are invariably based on some measure of direct pay. The use of total compensation in our example simplifies the illustration without significant distortion.

multiplied by years of service. We look at a newly hired employee who might be expected to work for 30 years. Her initial total compensation is \$50,000 and is expected to compound at 4.9% annually to \$200,000 in her 30th year.

The benefit payable after 30 years can be computed as 2 percent of \$200,000 (\$4,000) times 30, or \$120,000. Because the VBO and PBO calculations each discount for the time value of money and for termination probabilities in the same way, we ignore these discounts⁸ and focus on the different ways in which they assign benefit accruals to reporting periods. The standard accounting model assigns a service benefit (ΔP_t) of \$4,000 to each period. The VBO approach, following the exit-costing theme, computes the first year benefit (V_1) as 2 percent of \$50,000, or \$1,000. The two-year vested benefit (V_2) is \$2,098⁹ and, thus, the second year accrual (ΔV_2) equals \$1,098. In the 30th year, when ΔP_{30} is again \$4,000, ΔV_{30} is \$9,415. Each method assigns a total of \$120,000 over 30 years.

The effect of the standard accounting is, parallel to the earlier smoothed DC example, to substitute an average cost that exceeds the actual cost in the early years. In this example, the crossover point occurs after 17 years, at which time the projected P_{17} is \$68,000 while the vested V_{17} is only \$36,528. Following our earlier example, the employee who has worked for one year will receive a \$46,000 paycheck under standard accounting despite having earned a vested benefit of only \$1,000. Under exit-cost accounting that paycheck is \$49,000. As earlier, advance-recognition accounting invites exploitation. If the employer chooses to exploit the situation after 17 years, the employee loses \$31,472.

3.13 Nonvested and Revocable Benefits

A similar problem arises under current accounting for nonvested benefits. Suppose the company withholds wages to pay for nonvested benefits (of any kind); the employee accepts this withholding in the expectation of future vesting. When the

vesting year arrives, even if the company cannot legally change the vesting provision, it can frustrate the employee's expectation by changing the ground rules and charging the employee's direct pay for the full value of the newly vested pension. The employee would have no recourse. Whether she stays or leaves, she has received no value for the previous years of pension charges against her pay.

This reasoning applies to all benefits that increase in value as the employee ages: for normal or ancillary benefits that vest at later ages, for the impact of future pay increases on prior service, for other postemployment benefits, such as retiree medical plans that vest at an early retirement age (e.g., 55), or for benefits that can be revoked by the company. Only exit costing creates a compensation environment that minimizes opportunities for gaming the system.

3.2 Multiperiod Contracting

When a multiperiod contract exists, the year-by-year precision of the exit-cost model may be relaxed without introducing moral hazard. Reduction of total compensation early in employees' careers is in fact standard in certain businesses where the possibility of future rewards is part of a conditional implicit contract. Law firms and investment banking firms may underpay associates by offering the prospect of eventual partnership rewards for the most successful. The pay pattern is built into the industry structure, and firms intending to stay in business cannot cheat on the eventual rewards.

This example illustrates that a contract may allow the exit-cost attribution method to be postponed during the contract period. It does not free us from the need to strike an economically motivated deal at contract inception nor does it free us from the need to true up at contract expiry. Our new partners must now be paid commensurately with competitive partnership standards and our new nonpartners must receive future compensation competitive with their now well-defined status.

This illustration suggests conditions that could permit a company to attribute costs and withhold wages on a basis other than exit costing. Such conditions would reflect restricted labor mobility, because of constraints on the company or the employees. These constraints can take the form

⁸ This is equivalent to zero percent discount rate and service survival probability of unity.

⁹ Two percent of \$52,448 times two years. The entire tabulation appears in Appendix B.

of company-employee contracts, explicit or implicit; enforced on the company by the high costs of recruiting, training, and potential reputational injury and lawsuits; enforced on the employee by high transaction costs associated with job search, job change, and the abandonment of employer-specific skills.

When a T -year contract exists, the employer and the employee can agree to recognize an accumulated obligation, R_t , in addition to the vested benefit obligation, L_t . Use of R_t as a *contract reserve* (and ΔR_t as the periodic addition to or subtraction from the contract reserve) allows the direct pay to be overcharged in some years and undercharged in other years, as long as the accumulated value is zero at the end of the contract:

Liability at the end of year t : $L_t + R_t$

Year t direct pay: $W_t = TC_t - VC_t - \Delta R_t$

End of contract: $R_T = 0$,

where $\Delta R_t = R_t - (1 + i)R_{t-1}$ and i represents a fair employer-employee rate of interest.

3.3 Projected vs. Accrued Costing for DB Plans

FAS 87 assumes a multiperiod contract in the definition of the PBO that, for pay-related plans, credits a percentage of future earnings in each year's pension cost. Setting $R_t = PBO_t - L_t$ to reflect the FASB-hypothesized contract in excess of the plan document contract:

Liability at the end of year t :

$$L_t + R_t = PBO_t$$

Year t direct pay:

$$W_t = TC_t - VC_t - \Delta R_t = TC_t - SC_t$$

End of contract:

$$VBO_T = PBO_T \Rightarrow R_T = 0,$$

where

$$\begin{aligned} VC_t + \Delta R_t &= L_t - (1+i)L_{t-1} + R_t - (1+i)R_{t-1} \\ &= PBO_t - (1+i)PBO_{t-1} \\ &= SC_t \end{aligned}$$

is the FAS 87 service cost.

L_t represents the exit liability (the VBO_t in FAS 87) under the explicit contract defined by the plan. Thus R_t represents the advance recognition inherent in the implicit contract that FAS 87 recognizes. It is appropriate, therefore, to refer to this use of R_t as the FAS 87 *implicit contract reserve*.

Is this multiyear implicit contract sufficient to justify the FAS 87 accounting treatment rather than the exit-cost method? Note that we have had to assume a promise to pay competitive total compensation over the life of the contract. Further, although this contract does not contemplate exit, if we wished to let employees go early without penalizing them, we would have to pay them the implicit contract reserve when they leave. Similarly, the contract does not anticipate plan termination or amendment but, if we wished to let the plan be amended or terminated at the will of the employer, we would have to agree to settle up based on the PBO at that time.

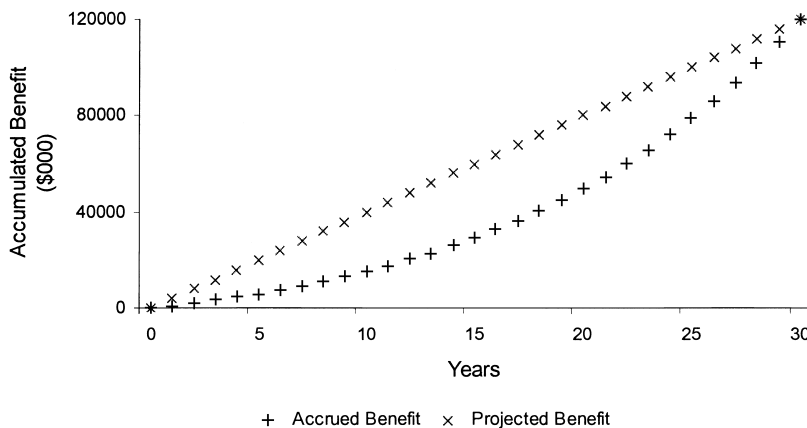
Note that moral hazard is avoided whenever the accounting matches the contract; current explicit contracts (plan documents) are VBO-like and imply exit costing; an enforceable PBO contract would be consistent with FAS 87.

3.4 Eliminating Projected Costing as a Candidate

Figure 1 (based on Appendix B) illustrates the difference between exit costing and projected costing when the entire difference is attributable to anticipation of future pay increases (i.e., exit costing equals accrued costing in this instance). The area between the accrued and projected benefit curves represents the difference in recognized benefits that gives rise to the FAS 87 implicit contract reserve. As we have just seen, we need to assume that an effective multiperiod contract exists in order to avoid exposing employees to the potential moral hazard measured by this area.

But the potential for moral hazard may not be sufficient cause to eliminate projected costing as a viable candidate. We must also show that the projected benefit information provided is not required to inform shareholders with respect to economic liabilities they have incurred. Can we argue that the PBO contains economically relevant information? We know that future pay increases will occur and that we can make reason-

Figure 1
Benefit Accumulation



able estimates of such increases for employee cohorts. We suspect that shareholders might find such estimates “interesting.” Nonetheless, nowhere other than in DB accounting do we find any liabilities or costs associated with future pay increases. Why?

Recall that accounting liabilities must be value-relevant and that we expect liabilities on today’s books to reflect economic obligations incurred to date by shareholders. If shareholders were committed to provide pay increases under a multiyear contract in such a way as to provide future total compensation that was in excess of competitive rates, we might well agree that an economic obligation has already been incurred and that it is appropriate to recognize it. But, if the only obligation that shareholders have made to their employees is to continue to pay them competitively, no such economic liability has been incurred. Thus future pay increases do not appear in financial statements.

Consider how a final-pay DB plan might create a current obligation related to future pay increases. On its face, the plan provides benefits equal to a percentage of final pay for each year of current service, suggesting that future pay increases should be recognized in current service cost. But the plan does not commit the employer to the pay increases themselves. The employer who offers employees a final-pay plan has not agreed to make itself competitively nonviable compared to the employer who offers another form of compensation. Principle 5 indicates that

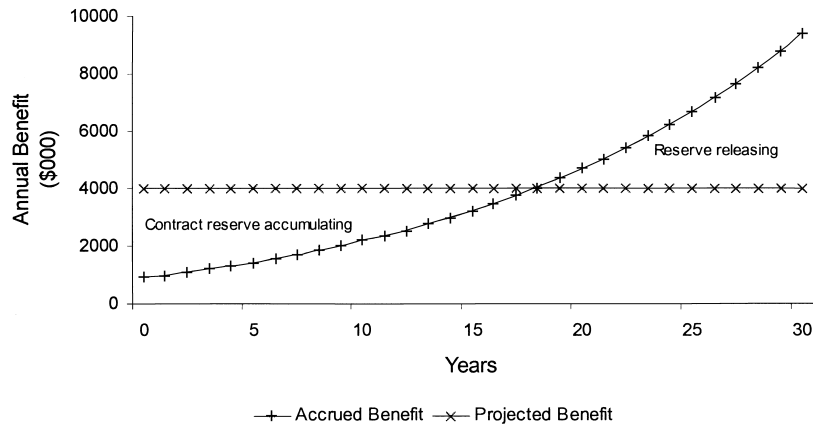
differential benefit costs between competing firms will be offset in direct pay. Employees covered by a final-pay plan must expect smaller increases in direct pay than those covered by less expensive plans. Employers who have committed to pay competitive total compensation have not incurred current economic obligations for their shareholders merely because they offer some compensation in the form of a DB plan. The current recognition of an obligation for benefits based on future pay increases is no more justified than the current recognition of future pay increases themselves.

3.41 How Did Projected Costing Become the Standard?

Actuaries developed two cost methods in order to help employers budget their cash contributions to pension plans. The accrued cost method, analogous to the term insurance policy referred to by Bulow (1982), recognizes the increase in pension wealth held by a fully vested employee in each year. As the employee ages, the annual cost rises, as it does for term insurance. Just as many individual insurance buyers preferred to purchase whole-life insurance in order to make their insurance outlays more level over their lives, many employers preferred a more level budget even if early outlays were thereby greater.

At a time when pension benefits were considered “fringes” and costs and liabilities were less significant to the enterprise than they are today, accountants found it convenient to look to the cash con-

Figure 2
Annual Benefit Recognized



tributions made as sufficiently reflective of the cost of the plan. FAS 87 was being developed during the 1980s, the FASB was anxious to create more rigor and comparability between firms and this led them to choose one method. They chose a variation of an actuarial method known as “projected unit credit” which reflected future pay increases, vesting and eligibilities.

FAS 87 was a hybrid that did not quite follow any of the existing actuarial cost methods. It moved from the actuarial budgeting methods towards (but not to) a market-based approach. It was controversial, compromised, and immediately criticized from numerous directions. In the intervening years, the accounting profession has been informed by financial economics and by market forces and is in the process of shifting from an historical cost paradigm to one based on fair value. It may be said that FAS 87 and its international sisters are artifacts that reflect neither modern economics nor the accounting trend towards modern economics.

3.42 One More Nail

In addition to imposing potential moral hazard and misinforming shareholders, projected costing threatens the existence of defined benefit plans. The difference between the projected and accrued benefits (Figure 1) may be thought of as an employee-shareholder wedge to the extent that employee pension wealth tracks the accrued benefit line while shareholder obligations seem to track the projected benefit line. This wedge represents “suspended eco-

nomomic value” not yet realized by employees and seemingly beyond the reach of shareholders—an asset without an owner.

Figure 2 illustrates the annual benefits for which employees are charged (projected) and to which they become entitled (accrued) as cohorts of employees age. This picture implies that older employees will try to hang on to the projected-cost model and the implicit contract that it represents. Younger employees are likely not to appreciate the DB plan promises when they see their compensation being PBO-charged and their wealth being ABO-incremented. It has been suggested that “one reason some firms may perceive DB plans to be increasingly expensive is that employees who place little value on the PBO promise are not in fact accepting reduced pay.”¹⁰ Employers who observe the relative preferences of their younger and older employees may conclude that DB plans are encouraging older employees to linger past their most productive years while discouraging younger recruits.

4. JUSTIFYING BENEFIT DESIGN— ABO:VBO DISCREPANCIES POINT TO FRAIL DESIGNS

In this section, we examine benefit designs where the ABO is substantially greater than the VBO. These designs may or may not be justified eco-

¹⁰ Source: an anonymous reviewer of this paper.

nomically. We identify a need to inform shareholders about implicit benefit obligations. This shareholder need for information conflicts with the protection employees need against being charged for promises that they cannot take with them. Certain designs are shown to be frail; more robust replacements are outlined.

Section 3 demonstrated that employees whose pay is charged for projected benefits are vulnerable because the “liabilities” can disappear. Employers can offer smaller pay increases to employees with longer service in a final-pay plan and employees cannot use competitive offers to recoup the contract reserve. (The employer can charge an employee for the projected cost prior to the crossover point in Figure 2 and for the accrued cost thereafter.) It is not so easy, however, for an employer to take advantage of vesting and eligibility provisions where the employee can recover the accrued-contract reserve (the ABO minus the VBO) simply by staying on the job. We can address the pay issue simply by abandoning the PBO measure in favor of the VBO or the ABO. But is it perfectly clear which of the latter two is always most appropriate?

The difference between the ABO and the VBO exists because not all benefits accrued by an employee may be taken on exit. The discussion leading to Principle 3 makes it clear that such designs are meant to put employee compensation at risk in ways that increase net productivity. Principle 3, however, also cautions us that such incentives have limits. When accrued liabilities are much larger than vested liabilities, we should ask whether the risk built into the benefit design will cost more than it returns.

4.1 Explicit and Implicit Benefit Plans

Benefit plan documents expressly deny tenure, for example, “This *Summary Plan Description* does not constitute a contract of employment.” Nonvested accrued liabilities come from implicit contracts and the need to inform shareholders about all value-affecting obligations whether or not explicit. Strict VBO reporting protects employees. Does it properly inform shareholders? Under VBO reporting, it appears that the promise to vest a valuable benefit soon is indistinguishable from no promise at all. Is this a faithful representation of firm value?

In a strict sense, yes, because employees have not been charged for the promise and because they will be fully charged when the promise vests. Can this be applied in practice? If VBO reporting is used to account for a postemployment medical plan with cliff vesting, the paycheck for a newly vested employee must be debited for the entire lump-sum benefit value, an untenable amount. Without some form of multiperiod contracting, VBO reporting and cliff vesting cannot be reconciled. Employees at some point in their careers—say, 10 years prior to the cliff vesting point—must understand that the employer will vest a substantial fraction of their cohort. Rather than pay for this valuable benefit in the vesting year, these employees tacitly agree to allow the employer, in exchange for the benefit, to pay them less than their market competitive salaries for the period of years that extends until, and perhaps even after, vesting. Thus, an implicit pay-smoothing contract exists. If strict VBO reporting were used in this instance, shareholders would be unaware that liabilities loom for soon-to-be-vested benefits.

This example shows that financial reports must include the value of obligations under a multiperiod contract, albeit conditional and statistical (i.e., only employees who actually remain in service will earn any part of the benefit). Competitive total compensation must be reported in each period and money withheld under an implicit multiperiod contract must be reserved. This presumes, of course, that the employer will honor the implicit contract.

4.2 Frail Benefit Designs

But what are the terms of the implicit contract? When, if ever, may the employer curtail promised benefits (or otherwise appropriate the contract reserves)? When the firm is in financial distress? When managers are in danger of failing to meet their own goals? The contract, because it does not vest the benefit as it is recognized, creates a valuable employer option. Section 2.3 makes it clear that employees will demand higher pay because they are placed at risk. But when is this transaction fair and when is it exploitive? At a minimum, a fair contract must be perceived identically and accurately by the parties. The employees cannot be led to believe that the employer will renege only under condition “A”, later to learn—to

their misfortune and misery—that the employer reneges under condition “B”.

Either details of the contract must be made explicit or employees must have reason to trust that the employer will be fair. Such a degree of trust applies only in situations where the value of the employer’s option is de minimis or where the employer is constrained and very likely to remain so. When the benefit option is valuable and the period over which advance recognition occurs is long, trust cannot provide sufficient motivation for employees’ acquiescence.

Benefit designs with substantial conditionality (long cliff vesting, revocable benefits, shutdown benefits) may endanger employees (using accrued cost) or misinform shareholders (using exit cost). This suggests that there may not be genuine agreement on terms. The explicit contract often clearly retains rights for the employer while the implicit contract limits the exercise of these rights.

If the implicit agreements are genuine, it should be possible to explain to employees and shareholders alike why the contracts take the form that they do and how the existence of such contracts is beneficial to the parties. Because these contracts create risk and raise expected labor costs, proponents should be able to identify expected productivity gains and their source. Arguments with respect to training, performance and severance, along the lines of Lazear, do just that.

Principle 3, however, limits the productivity gains that may be expected. It is reasonable to argue that five-year cliff vesting in DB and DC plans can protect training investments. It is less reasonable to argue that promising nonvested postemployment medical benefits to 25-year-old employees adds more in retention incentives than it costs in risk, reputation and dissatisfaction.

In situations where, over extended periods, the exit promise is nonexistent and the looming liability should be reported to shareholders, we must look critically at the benefit design. Implicit contracts are inherently frail; the degree may be measured by the magnitude of the ABO:VBO disparity. Designs that reduce the disparity are likely to be more robust and more efficient.

4.3 More Robust Benefit Designs

Let us consider several redesigns of postemployment medical benefits that reduce the ABO:VBO disparity, reduce contract risks and the associated costs, and may still provide efficient incentives:

- Individual accounts for postemployment medical benefits may be implemented on a DC or cash balance basis. Retention incentives may be fostered through modest class-year vesting. At a specified age, where retention is no longer an employer goal, full vesting is granted.
- DB postemployment medical may be accrued (and vested) ratably over some portion of the employee’s career; for example, 10% of the ultimate medical coverage may be earned in each of the 10 years preceding early retirement eligibility. Such accrual (with de facto pay debiting) may begin when the employee is old enough to value such benefits.
- As discussed in Section 3, projected accounting creates implicit reserves owed to employees whose pay has been debited in excess of their exit benefits. Plans could be designed where that reserve is partially vested, along the lines of the PBO settle-up discussed in Section 3.3.

The ABO:VBO conflict may be seen as a marker or symptom of frail benefit design. When the marker is noted, economic justification for the design should be sought. The search for justification may validate the design as robust, challenge it as frail, or result in valuable redesign.

4.4 Other Frail Designs

The very long cliff vesting typically associated with postemployment medical benefits makes it a poster child for dubious design. We next review some other cases where the mix of explicit and implicit provisions may be marked frail because neither the VBO nor the ABO tells the whole story.

4.41 Subsidized Early Retirement with Cliff Eligibility

How shall we analyze the implicit contracts surrounding eligibility for subsidized early retirement? The traditional actuarial anticipation of entitlement that leads to a positive contract reserve (R_t) in the years approaching eligibility

“bonds” the employee to remain until eligible. At the moment of eligibility, the increased vested benefit value will be large and may extinguish the contract reserve; that is, the bond is released. Under the traditionally smooth cost methods, it is likely that subsequent ΔR_t 's are slightly positive. The combined effect is to hold the employee in the years approaching eligibility for subsidized early retirement benefits and to encourage an early exit thereafter (note how the positive preeligibility contract reserve encourages employees to remain in anticipation of its release, while positive posteligibility ΔR_t 's encourage retirement).

To the extent that traditional final-pay plan designs (without subsidized early retirement) created too much incentive for employees to linger past their peak years of productivity, the early retirement subsidy may be seen as a “bribe” to encourage departure. The invention of the “open window plan” circa 1980 represents a more efficient form of bribe that has made the early retirement subsidy obsolete. Some of the movement towards cash balance plans that began in 1985 has been attributed to their lack of embedded early retirement subsidies.¹¹

As in the case of cliff vesting, it is likely that benefit design and traditional cost methods have incited the behavior of employers and employees in the years approaching early retirement eligibility. The invention of window and cash balance plans indicates that more efficient and transparent tools may be used to accomplish similar purposes. If cash balance plans eliminate subsidies, the issue is moot—there is no cliff. When window plans are used to create an explicit cliff, exit costing recognizes the cost of the bribe immediately, improving transparency and timing relative to the current treatment.¹²

¹¹ “The study found that when companies reduced costs in the conversion it was largely due to the prospective elimination of subsidies for early retirement, which typically augment benefits at around age 55. The effect on normal retirement benefits was much more muted” (see Watson Wyatt 2003). “Some companies may feel that these subsidies have become cumbersome, expensive or unfair.

Where that is the case, the introduction of a cash balance plan may present an opportunity to eliminate or rethink these subsidies” (see Kwasha Lipton 1985, p. 6, original emphasis).

¹² Some might argue that the spreading of window costs over future periods to match anticipated cost savings from the elimination of unproductive workers is good accounting. It is more likely true that the losses that arise from continuing to employ these workers (under

For the traditional plan, the use of exit costing would lead to higher direct pay prior to eligibility and would fully charge for the benefit subsidy in the year that it occurs. This would make the personal and pension wealth accumulation of the employee smoother, in a fashion somewhat along the lines of that achieved by cash balance plans. Because the traditional pension incentives apply to age cohorts, they are blunt instruments when used to discourage employment as worker productivity declines. With exit costing and/or the removal of early retirement subsidies, employers may find it necessary to evaluate productivity more precisely for each aging employee. Window plans may still be used to motivate groups.

4.42 Revocable Benefit Promises

Another difficulty with cost attribution for retiree medical benefits is their revocability. Companies almost always retain the right to modify or terminate these plans. We observe that, under exit costing, eliminating coverage for employees who have not reached their dates of first eligibility has no direct financial impact on either the employees or the company, simply because there is no VBO and no charge against employee compensation. Under FAS 106, however, the service cost that has accumulated to the APBO¹³ has been charged, and employer revocation appropriates employee wealth.

Terminating benefits for retired or active employees who have become eligible breaches an implied contract, with potential legal exposure, employee-relations problems and reputational cost. Petertil (2005) tells us the cost of terminable benefits cannot be measured by methods that ignore the likelihood of benefit reduction or elimination. Clearly the company's right to reduce or terminate such benefits is a valuable option. *Valuable options remain unexercised indefi-*

a contract theory that makes employers reluctant to terminate them) have already been incurred because the “contract” assures that the losses will soon be realized. The window plan write-off recognizes that cost immediately. If any spreading were really appropriate, it would be backward not forward.

¹³ Because postemployment medical benefits are not pay-related, the accumulated postretirement benefit obligation (APBO) under FAS 106 (FASB 1990) parallels both the ABO and the PBO under FAS 87. The APBO accumulates uniformly from the employee's date of hire until his first eligibility date (e.g., at age 55). Throughout that period, the exit benefit is certainly zero and may remain so forever because the firm maintains the right to revoke it.

nitely only if their consequences for the optionholder exceed the gains from exercise.

Exit costing for revocable benefits protects employees because it does not recognize benefits until they are paid (pay-as-you-go was the common approach prior to FAS 106). Of course it does not inform shareholders that any obligation exists until it is paid, at which point it is too late to charge against the pay of the now-retired recipient. How should shareholders understand payment of a benefit that was neither promised nor charged against the employee's wages? One possibility is that the payment constitutes a gratuity. A purely gratuitous payment by a company violates its fiduciary responsibility to shareholders.

Suppose instead that the payment is designed to develop good will among present employees. Perhaps that satisfies shareholders if they are getting equal or greater value from existing employees. But is the company charging the current employees or getting better service from them? If so, is it because today's employees expect that they will get future benefits even though no irrevocable promise is made? Shall we charge current employees for benefits paid to the retirees and then also charge them because they have been lured into believing that future benefits await them?

Whether a gratuity, or a goodwill builder, or a lure, revocable promises seem to be fraught with opportunities for misunderstanding, mispricing and abuse. But it still may be possible for us to interpret the revocable contract as genuine, but conditional. Perhaps it is just such a contract that allows some companies to continue to pay revocable benefits today while others choose to renege.

Perhaps the true contract is a conditional promise to pay as long as all is well: as long as medical costs do not soar, as long as the company prospers, as long as the company values its goodwill with current employees more highly than it values the marginal dollar needed to meet other needs. If such promises exist, it is possible to design an appropriate accrual system. Option theory offers us some techniques to value a promise to pay up to \$X of benefits as long as the company stock is priced at \$Y or higher.¹⁴ This suggests that rational, explicit and transparent contracts

might be made along these lines. It does not, however, imply that this is a very good idea.

4.43 Past Service Benefits

In Section 3 we identified so-called past service benefits as an example of a delayed-recognition scheme that invited opportunistic behavior by employees. We also cited Byrne's (1983) observation that such benefits are always awarded in exchange for future service despite their "past service" appellation.

Past service benefits are often created at the inception of a DB plan, when career-average and flat-dollar plan benefits are updated and, less frequently, in response to plan amendments due to plan mergers, statutory and regulatory changes, etc. Under current accounting and funding rules, even though new liabilities are often created in an instant, recognition is delayed over extended future periods.

A weakness of this approach has already been noted: shareholder liabilities are increased immediately while compensation reductions extend over time.¹⁵ Unless many employees leave en masse,¹⁶ however, this seems to be little cause for concern and not much of a demonstration that this is an untenable approach to benefit design.

But here is where exit costing can illuminate an alternative design that is demonstrably more favorable to shareholders. The apparent disadvantage of exit costing when past service benefits are created is that it creates an abrupt loss to shareholders. Using delayed-recognition (amortization of the past service liability over future years) recognizes that future compensation will be reduced for employees who remain, in a fashion consistent with Byrne's analysis of the exchange of past service benefits for future employee-generated value.

Now consider an alternative design that effects the "Byrne exchange" and, using exit costing, produces the desired cost spreading. Instead of increasing the vested benefit immediately while delaying the cost recognition, simply phase in the benefit improvement over the desired period. Thus, the accounting accruals are smoothed be-

¹⁴ Petertil (2005) characterizes these conditional promises as employee "equity interests." Here they are characterized as equity options.

¹⁵ A negative implicit contract reserve is created and amortized.

¹⁶ This situation may be created quite deliberately under a window plan.

cause the benefit accrual is smoothed. Employees who remain in service receive the same ultimate benefits as under the existing approach. Employees who leave receive less. The future costs have really been matched to the future productive service of today's employees. The employee incentives have been more sharply defined and the employer is able to retain greater control and flexibility with respect to future employment levels and compensation.

4.44 Plant Shutdown Benefits

Plant shutdown benefits include extra pension payments made to old long-service employees when a plant is shut down. These have been negotiated between unions seeking job security for their members and rust-belt employers who cannot agree to keep unprofitable plants running to the detriment of their shareholders. In theory, such benefits align the interests of employees and shareholders; older employees earn "sweat equity" in the plant in which they work and are rewarded when shareholder interests dictate that plant operations shall cease.

Once negotiated, these benefits become part of the business calculations made by employers. The decision whether or not to shutdown and when to do so is influenced by the existence of shutdown benefits and by their eligibility provisions.¹⁷ Plan actuaries frequently choose not to include shutdown benefits in the course of ongoing funding valuations because the shutdown event is binary—it occurs or not, and funding for a probability of shutdown will always provide too much funding right up to the moment of shutdown, when it is then shown to have provided too little.

Although shutdown benefits may have some economic justification and contractual force, they present very real problems to actuaries and accountants attempting to provide useful information to shareholders. These benefit designs incorporate some of the same mechanisms—long cliff eligibility, employer volition, equity characteristics—that challenge the viability of revocable postretirement medical plans.

¹⁷ Because the benefits were designed to protect old long-service employees, the eligibility cliffs occur only with substantial age and service.

5. MORAL HAZARD: HISTORICAL EXAMPLES AND SOCIETAL REACTION

We look at examples where moral hazard options have been exercised and at society's reaction.

5.1 Historic Examples

The explicit DB contract under ERISA is VBO-like. PBO-based recognition—which reflects an implicit contract reserve—must be justified by the existence of implicit contracts. As postulated by Lazear, such implicit contracts rely on reputational costs to deter employers who might be tempted to exploit advance-recognition accounting. Such exploitation can diminish employee morale, increase turnover and cause recruiting difficulties. Occasionally, exploitation leads to lawsuits.

These costs are likely to inhibit all companies in good times and most companies even in less favorable times. From time to time, however, companies will find that reneging gains exceed reputational costs and will act accordingly. It is at just such times that employees will find that they have surrendered real compensation for "a pocketful of mumbles, such are promises."¹⁸ We look at three cases where employers have exercised their explicit rights, disappointing employees whose expectations were implicitly formed.

- **Cash Balance Conversions.** During the 1990s, sponsors of traditional pay-related DB plans faced aging tenured populations, a need to attract young mobile workers, rising liabilities under their traditional back-loaded DB plans and competition from younger firms around the world. While some of these employers terminated their DB plans and started—or strengthened—their DC plans, many were trapped by potential excise taxes (Section 5.222 below) and elected to convert to cash balance plans. Both DC replacements and cash balance conversions honor the explicit ABO liabilities but disavow some or all of the FAS 87 implicit contract reserve.

Consistent with Balan (2003), employers who convert to cash balance plans appear to have concluded that the workforce they need today

¹⁸ Paul Simon (1969) "The Boxer."

is not interested in LSICs nor in how long-tenure employees are treated. Naturally, the long-tenure employees are often furious and ready to exert themselves fully to recover the final-pay benefits and early retirement subsidies they feel they have earned. Most prominent among the companies that have faced the backlash from their older employees is IBM, whose cash balance conversion in 1999 led to loud protests, much bad press, and congressional scrutiny. Having already grandfathered those employees within five years of earliest retirement eligibility, IBM responded to this political and public relations furor by agreeing to grandfather employees aged 40 and over who had at least 10 years of service.

- **Cutbacks and Rescission of Postemployment Medical Benefits.** Most employers have been cautious about making medical benefit promises and have reserved the right to amend or terminate such plans unilaterally for nonunion employees. Prior to the application of FAS 106 in 1993, these plans were often accounted for on a pay-as-you-go basis.¹⁹ The adoption of FAS 106, rising medical costs, and some of the same factors driving DB plan terminations and cash balance conversions (aging populations, mobile young workers, worldwide competition) have led employers to cut back postemployment medical plans. Companies that have been most burdened have had the greatest incentive to cut back or rescind. According to the Employee Benefit Research Institute (2001):

“As a result of FAS 106, some employers placed caps on what they were willing to spend on retiree health benefits. Some added age and service requirements, while others moved to some type of ‘defined contribution’ health benefit. Some completely dropped retiree health benefits for future retirees, while others dropped benefits for current retirees, although this has happened less frequently than the other changes.”

Such cutbacks reduce the APBO and may generate income for plan sponsors. Even though the accrual of the APBO has been charged

against employee pay in accordance with implicit contract theory, there is usually no legal limit on the degree of cutback. Reputational concerns are likely to have mitigated the extent of cutbacks. Singh (2001) says:

“... critics have renewed charges that some companies are using FAS 106—the standard that since 1993 has governed accounting for postretirement health-care benefits—as part of a strategy to reduce retiree medical coverage, then reflect the lower reserve amounts in operating earnings” (p. 1).

- **Layoffs of Employees Approaching Eligibility for Shutdown Benefits.** In 1977, the Continental Can Company and the United Steelworkers negotiated supplemental pension benefits that would be paid to eligible employees in the event of plant shutdown or long-term layoff (Section 4.44 above). The eligibility requirements were expressed in terms of age and service, for example, age plus service of at least 65 and 20 years of service.²⁰

Several lawsuits (for example, *Gavalik v. Continental Can Co.*, 812 F.2d 834, 851-853 [3d Cir. 1987]) alleged that the company subsequently initiated and maintained a computer-based system to identify employees who were approaching eligibility. Many targeted employees were then laid off and the computer system acted as a line of defense to prevent their recall. These lawsuits were consolidated in the Newark Federal District Court (*McLendon v. Continental Can Co.*, 908 F.2d 1171 [3d Cir. 1990]), which ruled in May 1989 that the layoff program violated Section 510 of ERISA. In January 1991, under orders from the court, the parties agreed to a \$415 million settlement in favor of the employees.

5.2. Societal Reaction: Bad Contracts/Accounting Invite Legislation, Regulation and Lawsuits

Society reacts when bad outcomes befall innocent people—political institutions act to redress perceived injustices. Legislators legislate, regulators regulate, and courts decide. Each of these actions affects employers and employees in ways

¹⁹ Because revocable benefits never vest, pay-as-you-go is exit costing.

²⁰ At some plants, age plus service had to total 70 or 75.

that cannot be predicted accurately. Unintended consequences are almost certain.

Because the legislators, regulators and judges (collectively, rule makers) are motivated to repair damage, they are inherently results-oriented. It is almost never their self-perceived function to do science. Manning and Segal (2002) describe the unintended consequences that have arisen in the DB pension funding area in the post-ERISA era.²¹ No U.S. pension actuary would argue that the multiple overlapping rules made in this era represent the best that actuarial science has to offer. We may conclude that the best way for us to reduce the frequency of bad outcomes and the unwelcome bad rules that follow is to do our best science beforehand.

5.21 Here Comes the Judge

When an employer reneges on what employees understand to be benefit promises, particularly where pay debits have preceded vesting, the parties may meet in court. Once in court, at most one party can win and sometimes both lose.

In the Continental Can case, the Court found substantial evidence that the company had acted in bad faith and had deliberately misled the employees. Continental had run afoul of ERISA Section 510. Although Section 510 permits a company to make economically motivated business decisions with respect to such issues as layoffs and plant closings, it may not take actions that are motivated by the emerging value of pension benefits. Continental attorney and former U.S. Attorney General Nicholas deB. Katzenbach said, "I don't know anything about Continental. . . . Maybe they do all kinds of bad things. I don't know. . . . But you cannot run a company if you can't take these [pension] costs into account" (Beck 1991, p. 66).

One of the lessons of the Continental Can case is that calculated exploitation of contractual opportunities may be offensive and can be redressed. In particular, reasonably formed expectations of the aggrieved parties are likely to be respected. When contract particulars and the commonsense understanding of the parties are

sharply at odds, courts may feel compelled to rewrite the contract.

Although courts are a common venue for testing society's attitude towards contractual exploitation, regulators and legislators often take action too. This is particularly true when the perceived exploitation is widely repeated. The cash balance brouhaha that led to congressional hearings in and after 1999 is a case in point. Cash balance plan conversions credit employees with an opening balance that is usually computed to be equal to the accrued benefit value. Mid-career employees who expected to ride up the sharply accelerating accrued benefit curve until it caught up with the PBO were disappointed. Although they would express the issue very differently, they wanted to know what had happened to the implicit contract reserve.

Companies were applying the terms of the explicit contract. Many companies believed that they were being more generous. By grandfathering mid-to-late-career employees, they were meeting the expectations of the implicit contract. Even those that did not grandfather such employees were able to argue that any plan going forward offered more than they were explicitly required to offer. The right to terminate the DB plan at any time had been retained by virtually every company with respect to nonbargaining employees.

Employee advocates argued vigorously in favor of the implied projected benefit contract. Karen Ferguson, executive director of the Pension Rights Center, testified:

"What is particularly shocking about this practice²² is that these benefits were fully funded and the employers fully intended to pay them—until they were advised by their consultants that they could take advantage of a technical maneuver that could save them millions of dollars in benefit payments, while also boosting their companies' bottom lines" (Ferguson 2001, p. 4).

Without judging the intentions of the employers ourselves, we observe that Ferguson's argument is made more plausible by projected funding and expensing methods. Where she uses the phrase "fully funded" in support of her argument

²¹ Also see Gold (2003) for a brief follow-up to Manning and Segal (2002).

²² ". . . reducing the *expected* pension benefits of older employees" (emphasis added).

regarding employer intent, she might have said “that these benefits have been fully paid for.” To the extent that the PBO (and comparable ERISA measures of liability) anticipates future salaries, subsidies and eligibilities, this argument might be persuasive regardless of market vagaries.

“We also think there is a way that the *reasonable benefit expectations* of the employees can be reconciled with employers’ interests in having the flexibility to make prospective changes in their plans” (Ferguson 2001, p. 5, emphasis added).

In a competitive economy with voluntary private pension plans, is it reasonable to hold companies responsible for employees’ expectations with respect to future pay raises? Certainly we do not “vest” their future compensation increases or potential service. Nor do we account for such future compensation and service, but we do account for their impact on future pension and medical benefits. Actuarial methods and assumptions include expectations of future pay increases, future service, future eligibility and, as noted elsewhere (Bader and Gold 2003), future equity risk premiums. Should we be surprised that employee advocates imply that actuarial expectations bolster employee expectations?

In December 2002, after lengthy study of the controversial practice of converting DB plans to cash balance plans, the IRS proposed regulations affirming that employers could convert as long as the successor cash balance plan protected the value of accrued benefits—valued at reasonable interest rates.

The IRS proposal is noteworthy because the IRS proposal amounted to a determination that—despite the outrage of employees who felt they had been mistreated (Section 6.1 below)—the terms of the explicit DB contract prevailed and there was no obligation to provide anything more than the benefit accrued to date. Although the IRS proposal reinforces arguments in favor of exit costing, the unsettled judicial state with respect to cash balance conversions should also serve as a warning: Courts, legislators and regulators will not always reject implicit contract theories.²³ *Actuaries and accountants should be cautious*

about financial recognition of contracts that clients do not recognize as legally binding.

The dissonance between PBO accounting and VBO contracting may be settled by exit-cost accounting or by lawsuits, legislation and regulation that will intermittently enforce PBO-like contracts.

5.22 Results-Oriented “Fixes”

Legislatures, regulators and courts have used a results-oriented approach to “fix” perceived weaknesses in the U.S. pension system over the past 30 years. Let us look at the contrast between our free-market folklore and our regulator reality, followed by the “ERISA Game” and two ham-handed fixes thereunder, concluding with a grandfathering lesson we have learned.

5.221 Free-Market Folklore, Regulatory Reality

Although the free-market ethos highly values the freedom for parties to enter into contracts of their own design, the American sense of fair play is offended by contracts that invite exploitation, even if such exploitation is occasional and incidental. The postwar employee benefit history of the United States, reflecting the tension between free markets and fair play, includes strictly voluntary employee benefit plans that are strictly regulated.

As long as promises made become promises kept, the free market and fair play forces are both satisfied. When promises are broken, however, we find that there can be substantial debate about what went wrong and how to fix it. Shall we (society, through government) strengthen the enforcement of promises? How shall we deal with ambiguous promises? Should we intervene in the promise making as well as in the promise keeping? What incentives are created? How much pertinent information is available to each of the contracting parties at inception and subsequently?

Because these simple questions do not have simple answers in a complex society, society provides a complex regulatory environment teeming with societal agents and quasi agents, including: courts; legislatures; official regulators such as the Department of Labor, the IRS and the SEC; quasi-official regulators such as the FASB, the Actuarial Standards Board and the Actuarial Board

²³ The IRS proposed rule has been promulgated during an administration generally deemed to be corporate-friendly.

for Counseling and Discipline; and professionals in public practice including CPAs and EAs.

5.222 The ERISA Game

Bader and Gold (2003) say ERISA froze the developing pension actuarial science and began an iterative game between sponsors and consulting actuaries on the one hand and rule makers on the other. This is an unfortunate history for all parties because actuarial science had accomplished much prior to ERISA and was still flexible and creative. The ERISA Game stifled the advancement of pension science; all sides appeared to need results more than greater insight.

Actuaries are scientifically trained businesspeople and, thus, capable of both deep understanding and the pursuit of favorable results—but not always simultaneously. We describe ourselves as problem solvers, and this fits our ability to do science and our ability to get results—but the ERISA Game made us choose, and our clients' needs made us choose, and the political nature of the regulatory establishment made us choose. It appears that duty to our clients led us to choose results as the first priority and science as the second. To rationalize the ERISA Game and “Stop the Insanity,” we must return to the strength of our root science, enriched by developments in financial economics over the last 30 years.

For now, we look at two examples where the results orientation of the rule makers played off of actuaries' needs for results and led to two ERISA disasters: (1) the definition of *current liability* [Internal Revenue Code Section 412(l)] and (2) the Metzenbaum reversion excise tax [IRC Section 4980].

- **Current Liability.** When Congress enacted ERISA, it adopted actuarial funding techniques that had been designed to budget employer contributions and adapted these in order to create its own minimum funding requirements. Because minimum funding is society's way of defining the collateral necessary to back up benefit promises, the science to apply is that outlined by Bodie and Merton (1992) rather than the budget technology of Trowbridge (1952). When, after nearly a decade of ERISA minimum funding, an Allis Chalmers plan terminated with seven-digit assets and nine-digit liabilities, it highlighted the lack of science in

minimum funding rules. The PBGC, which bore the brunt of such failures, lobbied successfully for funding rules based on plan assets and the current liability.

Results-oriented legislators understood that IRC Section 412(l) would increase employee security—Congress was not especially interested in the associated actuarial mechanics. Results-oriented consulting actuaries knew that their clients did not want funding standards that would produce volatile contributions, nor were the clients inclined to give up expected equity returns and reduce volatility via asset/liability matching. The resulting measure of the current liability is a miserable compromise all but devoid of scientific basis. IRC Section 412(l) contributes to the Manning-Segal “Insanity.”

- **Metzenbaum Reversion Excise Tax.** ERISA protects the accrued benefits defined by the explicit pension contract (plan). Funding and accounting rules recognize the projected benefits of the implicit contract. The results of this “split-personality” are tested frequently by employers, their consultants, the courts, the regulators and the Congress. In the 1980s, after projected benefit funding combined with other factors to produce assets often far in excess of the accrued benefit liability, many employers chose to terminate their plans in order to capture the surplus assets. Some of these transactions occurred in connection with corporate takeovers and restructurings that often included employee layoffs.

Senator Howard Metzenbaum and his constituents in the highly unionized state of Ohio were upset. The result was IRC Section 4980,²⁴ which combined with the continued bull market to “trap” surplus assets in many plans. This, in turn, contributed to the 1990s test of accrued versus projected liabilities, for example, cash

²⁴ Ten percent excise tax on asset reversions, IRC Section 4980, added by Pub. L. 99-514, title XI, Sec. 1132(a), for reversions after Dec. 31, 1985. Increased to 15 percent by Pub. L. 100-647, title VI, Sec. 6069(a), for reversions after Dec. 31, 1988. Increased to 20 percent by Pub. L. 101-508, title XII, Sec. 12001, which further provided a rate of 50 percent unless the employer used at least 20 percent of the otherwise revertible assets to fund immediate benefit increases or at least 25 percent to fund a qualified replacement plan, for reversions after Sept. 30, 1990.

balance plan conversions, angering still more plan participants. IRC Section 4980 contributes to the Manning-Segal “Insanity.”

5.23 Grandfather Lessons

Consider how one full cycle of the ERISA Game is played. An employer, party to an implicit contract that it finds onerous, concludes that the renegeing gains are high enough and the reputational costs are low enough for it to capture a net gain.²⁵ It reneges, thereby riling its employees and, in turn, rule makers. Rule makers, in response to public expressions of dissatisfaction, act to prohibit future occurrences of this kind. But rule makers are constrained by ex post facto considerations that limit the extent to which the original action can be overturned; thus, corrective rule making usually applies only prospectively. Therefore, the originator, and in all likelihood some early copycats, enjoy the benefits of renegeing on unfavorable implicit contracts while those who might have hesitated or deferred have missed their opportunity.

- Lesson one: If it appears that violating an implicit contract will produce a net gain, act early. Carpe diem.
- Lesson two: Each implicit deferred compensation contract—in conjunction with advance-recognition accounting—should have to justify itself in light of the costs inflicted upon society from time to time. Lessened reliance on implicit contracts in the employment arena is likely to be a public good.

6. CONCLUSION

This paper started out to answer the question, “What method should be used to compute the periodic cost of employee benefit programs that accumulate value over long periods of employee service?” In particular, should the method anticipate future pay raises and benefit eligibilities under plans/contracts that do not guarantee future employment, future compensation, or plan continuance? Broadly characterizing recognition methods that *do* anticipate as projected benefit cost methods (e.g., FAS 87) and those methods

that *do not* as exit-cost methods, we conclude that exit-cost methods are more accurate, more transparent and less fraught with opportunities for manipulation.

In the course of researching the attribution issue, we discovered that the dissonance between explicit accrued benefit rights on the one hand, and implicit projected benefit contracts embedded in accounting and funding rules on the other, defines much of the battleground upon which society fights its pension and OPEB wars. Along the way, we concluded that certain plan designs, herein characterized as “frail,” were apt to be economically inefficient. These designs were particularly prone to create misunderstandings between employers and employees, thus serving to widen society’s battleground.

Some of the societal discord—and much of the actuarial angst associated with it—might be alleviated by a better pension actuarial model, one more rooted in the science of financial economics than in the day-to-day results-oriented efforts of pension actuaries to meet client objectives while navigating regulatory minefields.

As prior literature has shown, projected methods applied to pay-related plans overcharge the pay of younger shorter-service employees in exchange for sometimes dubious promises of future overpayment. We argue that advance recognition of future benefit entitlements in excess of those actually promised is dangerous. Absent coercive mechanisms, implicit contracts have insufficient force to justify financial recognition. Nonetheless, real-life complications require financial reports to inform shareholders of obligations that might reflect less-than-perfectly formed contracts.

Yet we should be aware, as financial reporters and as benefit designers, that implicit contracts and financial reports based on them may add dead-weight costs. We can aim at a more efficient system by making explicit as much of the employment relationship as is practicable and by avoiding the creation of valuable options that only go unexercised because they are held in check by frail mechanisms. When these mechanisms fail, courts, legislators, and regulators will often fill the breach.

DB pension plans define an explicit accrual pattern whose financial value is precisely measured by exit costing. Every other recognition method deviates from this pattern, relying economically on an implicit contract to explain the

²⁵ Balan (2003) describes this in the context of a firm that no longer needs to recruit young employees into LSICs.

difference ($R_t \neq 0$). All of the projected cost methods reflect positive implicit contracts ($R_t > 0$) that raise employee expectations. Enforcing these dubious contracts adds systemwide cost in several ways:

- The cost of regulation and the threat thereof, including the patchwork of regulation that derives from imperfections in prior regulatory layers. When creative consulting actuaries exploit these imperfections in order to help their clients win the ERISA Game, regulators respond with a new layer of “Insanity.”
- Capital costs associated with opaque financial reporting. When lenders and shareholders fear pension plan surprises, corporations must offer higher rates of return to acquire external capital.
- Additional capital costs arise when investors suspect that managers may be building up slush funds inside well-funded plans.
- Because employees cannot be sure that their expectations will always be met, in a competitive economy, their compensation must include a renegeing-risk premium. Companies that wish to avoid this premium may choose not to sponsor DB plans.
- Whether or not their compensation has included such a premium, employees who feel

victimized when renegeed upon will sue. Win or lose, this is costly.

- Because the implicit contract raises employee expectations, management must anticipate negative reaction whenever they contemplate plan cutbacks. Thus, the apparently flexible implicit contract becomes an impediment to real flexibility in the future.

In contrast, exit costing substantially immunizes employees so they do not bear the brunt of plan design changes. This clarifies the employment contract, reducing dependency on ambiguous implicit contracts, reduces the threat and cost of regulation, provides transparency to investors, and allows management greater flexibility to design plans that best serve the *future* interests of all constituents.

If we wish to stop the regulatory insanity, employers must make explicit and rational pension contracts with their employees. Exit costing follows a rational entitlement contract, diminishes employee expectations and reduces the judgmental actuarial “art” that many of us have enjoyed practicing. It represents something of a return to the “science” in pension actuarial science. It encourages us to direct our creative talents to the development of explicit benefit contracts incorporating transparent incentives.

APPENDIX A

NOTATION TABLE

Notation	Definition
t	Career year.
$L_t(\)$	Liability valuation function, discounts, annuitizes and decrements as necessary.
A_t	Accrued benefit, end-of-year t .
ABO_t	$= L_t(A_t)$
AC_t	$= L_t(\Delta A_t)$, accrued-benefit-based service cost (traditional unit credit normal cost).
P_t	Projected benefit, end-of-year t .
PBO_t	$= L_t(P_t)$
SC_t	$= L_t(\Delta P_t)$, FAS 87 Service Cost (projected unit credit normal cost).
V_t	Vested benefit, end-of-year t .
VBO_t	$= L_t(V_t)$
VC_t	$= L_t(\Delta V_t)$, Exit Cost (service cost under exit-cost model).
TC_t	Total compensation, end-of-year t .
W_t	Direct compensation, end-of-year t . $W_t = TC_t - XC_t$, where XC_t is recognized cost. $W_t = TC_t - VC_t$ under exit-cost method.
R_t	An “implicit contract” reserve. Employer owes employee, $R_t > 0$, or vice versa, $R_t < 0$.
ΔR_t	One year change in implicit reserve. Special case, FAS 87 vs. Exit Cost: $\Delta R_t = SC_t - VC_t$
W'_t	Special case, used in Appendix B. $W'_t = TC_t - SC_t = W_t + VC_t - SC_t = W_t - \Delta R_t$
TC'_t	Special case, effective total compensation: $TC'_t = W'_t + VC_t = TC_t - \Delta R_t$
x	Employee age at hire.
${}_{T-t} \ddot{a}_{x+t}$	\$1 deferred annuity, employee age $x + t$, commences at age $x + T$.

APPENDIX B

A defined lump sum payable on exit (V_t) is equal to 2 percent of final year's notional total compensation (what Company A pays, TC_t) for each year of service. Direct pay (W_t) is determined by subtracting recognized exit benefit cost, VC_t . When SC_t is recognized (per FAS 87), alternate direct pay (W'_t) is determined accordingly, and vested total compensation (TC'_t) is computed by adding back VC_t . The equivalences $\Delta V_t = VC_t$ and $\Delta P_t = SC_t$ are special cases due to assumed zero percent discount, service survival certainty and the lump-sum benefit definition.

t	TC_t	W_t	V_t	$\frac{\Delta V_t}{VC_t} =$	P_t	$\frac{\Delta P_t}{SC_t} =$	W'_t	TC'_t	R_t	ΔR_t	$\frac{V_t}{TC_t}$	$\frac{VC_t}{TC_t}$
1	\$ 50,000	\$ 49,000	\$ 1,000	\$ 1,000	\$ 4,000	\$ 4,000	\$ 46,000	\$ 47,000	\$ 3,000	\$ 3,000	2%	2.00%
2	52,448	51,350	2,098	1,098	8,000	4,000	48,448	49,546	5,902	2,902	4	2.09
3	55,016	53,813	3,301	1,203	12,000	4,000	51,016	52,219	8,699	2,797	6	2.19
4	57,710	56,394	4,617	1,316	16,000	4,000	53,710	55,026	11,383	2,684	8	2.28
5	60,536	59,099	6,054	1,437	20,000	4,000	56,536	57,973	13,946	2,563	10	2.37
6	63,500	61,934	7,620	1,566	24,000	4,000	59,500	61,066	16,380	2,434	12	2.47
7	66,609	64,904	9,325	1,705	28,000	4,000	62,609	64,314	18,675	2,295	14	2.56
8	69,871	68,017	11,179	1,854	32,000	4,000	65,871	67,725	20,821	2,146	16	2.65
9	73,292	71,279	13,193	2,013	36,000	4,000	69,292	71,305	22,807	1,987	18	2.75
10	76,881	74,697	15,376	2,184	40,000	4,000	72,881	75,064	24,624	1,816	20	2.84
11	80,645	78,279	17,742	2,366	44,000	4,000	76,645	79,011	26,258	1,634	22	2.93
12	84,594	82,033	20,302	2,561	48,000	4,000	80,594	83,154	27,698	1,439	24	3.03
13	88,736	85,967	23,071	2,769	52,000	4,000	84,736	87,504	28,929	1,231	26	3.12
14	93,081	90,089	26,063	2,991	56,000	4,000	89,081	92,072	29,937	1,009	28	3.21
15	97,638	94,409	29,291	3,229	60,000	4,000	93,638	96,867	30,709	771	30	3.31
16	102,419	98,936	32,774	3,483	64,000	4,000	98,419	101,902	31,226	517	32	3.40
17	107,434	103,680	36,528	3,753	68,000	4,000	103,434	107,187	31,472	247	34	3.49
18	112,694	108,652	40,570	4,042	72,000	4,000	108,694	112,737	31,430	-42	36	3.59
19	118,212	113,862	44,921	4,351	76,000	4,000	114,212	118,563	31,079	-351	38	3.68
20	124,000	119,321	49,600	4,680	80,000	4,000	120,000	124,680	30,400	-680	40	3.77
21	130,072	125,042	54,630	5,030	84,000	4,000	126,072	131,102	29,370	-1,030	42	3.87
22	136,441	131,037	60,034	5,404	88,000	4,000	132,441	137,845	27,966	-1,404	44	3.96
23	143,122	137,320	65,836	5,802	92,000	4,000	139,122	144,924	26,164	-1,802	46	4.05
24	150,129	143,903	72,062	6,226	96,000	4,000	146,129	152,356	23,938	-2,226	48	4.15
25	157,480	150,802	78,740	6,678	100,000	4,000	153,480	160,158	21,260	-2,678	50	4.24
26	165,191	158,032	85,899	7,159	104,000	4,000	161,191	168,351	18,101	-3,159	52	4.33
27	173,280	165,608	93,571	7,672	108,000	4,000	169,280	176,951	14,429	-3,672	54	4.43
28	181,764	173,547	101,788	8,217	112,000	4,000	177,764	185,981	10,212	-4,217	56	4.52
29	190,664	181,867	110,585	8,797	116,000	4,000	186,664	195,462	5,415	-4,797	58	4.61
30	200,000	190,585	120,000	9,415	120,000	4,000	196,000	205,415	0	-5,415	60	4.71
Σ	3,263,459	3,143,459		120,000		120,000	3,143,459	3,263,459		0		

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