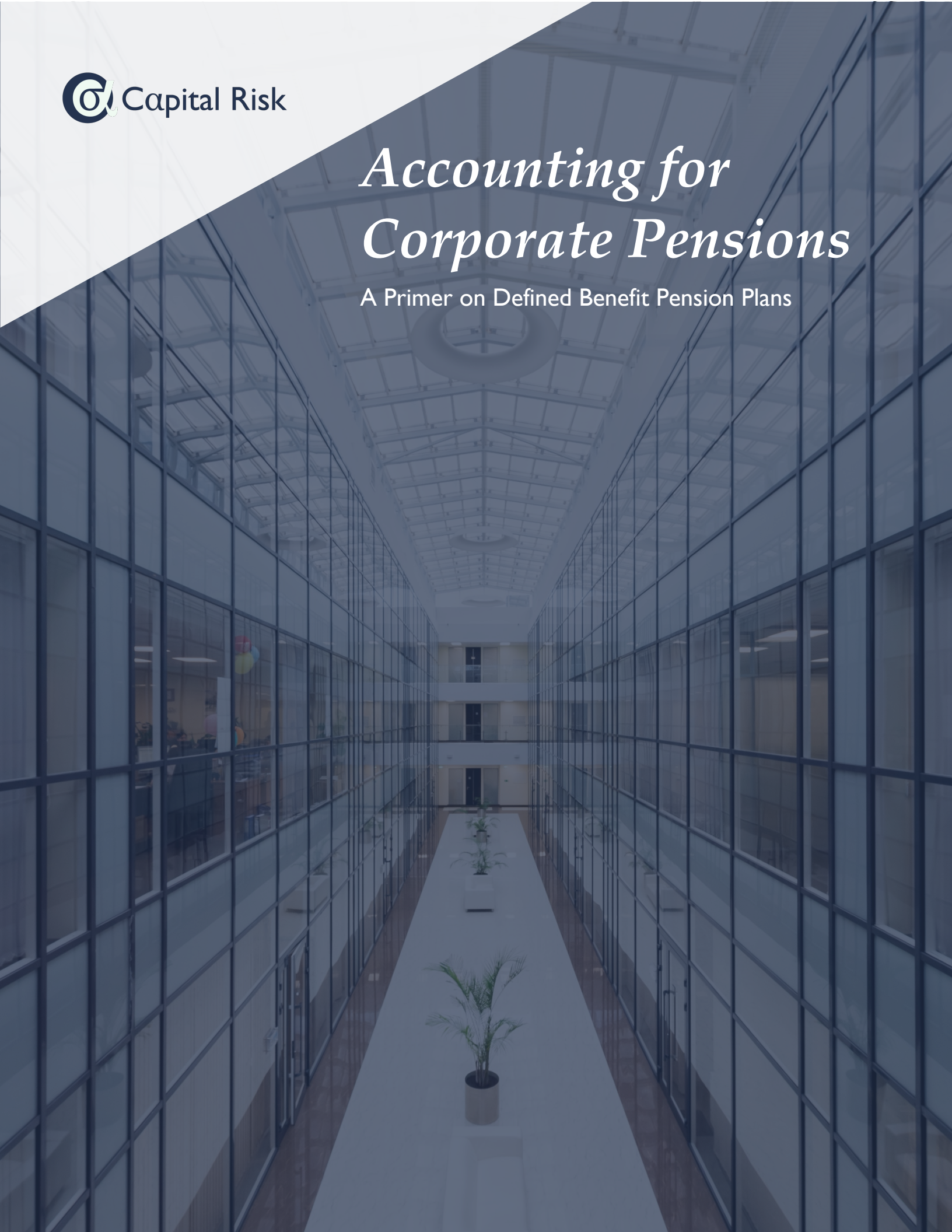
Capital Risk

Accounting for Corporate Pensions

A Primer on Defined Benefit Pension Plans



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A Primer

Accounting for Corporate Pensions

The key to a successful defined benefit pension plan is managing risk.

The pension plan is a significant employee benefit that supports retention and corporate culture in the long-term. The pension plan liability may represent a considerable proportion of the corporation's balance sheet and materially impact the income statement. Accounting for a defined benefit pension plan is notorious for its arcane regulations and the dual regimes of statutory and financial accounting. A few critical elements are crucial to managing the pension.

Asset and liability management are the critical objectives.

- **Accounting regimes are distinct** with materially *different outcomes* with statutory or financial reporting.
- **Valuation changes to the asset or liability** cause *material changes* to the balance sheet and income statement.
- **Equity Markets and Interest Rates** are the primary drivers of valuation changes and are *manageable risks*.
- **The liability grows every year** from the annual accrual of benefits, the normal (i.e., service) cost.
- **Labor force changes** (e.g., terminations and new hires) are the most significant *demographic factor* of the pension liability.
- **Higher interest rates** are favorable for the pension plan as the service cost decline is *greater than* the interest expense increase.

Many factors impact the funded status (e.g., asset minus liabilities). The two critical components are equity risk (i.e., assets) and interest rate risk (i.e., liability). These risks are manageable through careful asset-liability management and a prudent contribution policy. Understanding the accounting impact helps address these risks.

The Strategic Context

There are three strategic rationales for offering a defined benefit pension plan. First, they provide a form of *deferred compensation*. Second, they aid in *employee retention*. Third, they enable the sponsor to turn a cost center into a *profit center*. While other minor rationales exist, these have the most immediate and enduring impacts on the firm.

Pensions are *deferred* compensation and a *liability*.

Deferred compensation reduces current wages for future payments during retirement. The firm's direct benefit is increased *current* cash flows with *obligatory* payments during retirement to the employees. The statutory regulations codify this obligation. It protects the money placed aside for the sole benefit of the beneficiaries and thus out of the firm's discretionary control. Both stakeholders receive a benefit: one current and one deferred.

A pension augments employee retention by providing a rationale for employees to stay with the sponsor and reduce costly employee turnover. This outcome is a function of the pension benefit's extended accrual period (i.e., it vests after many years of service) and the lack of portability. The employee receives a two-fold benefit: financial security during retirement and the prospect of lower asset management costs and better performance from professional investment. As before, benefits exist for both stakeholders.

The third benefit accrues to the sponsor through the management of the assets and liabilities. While the payment into the pension trust is a *direct cost*, achieving an *implicit benefit* to the sponsor is possible. To the extent that the sponsor earns more on the pension's invested assets of the pension than the discount rate used to calculate their present value, it is advantageous for the company to provide the benefit. Historically, the return on a diversified portfolio of equities and bonds returned more than the performance of a similar liability. Thus, the sponsor can turn a cost center into a profit center.

Pensions offer the potential for a *profit center*.

The key measure for transforming a plan from a cost center to a profit center is the return on capital (ROC) deployed by the plan sponsor. Suppose the ROC is higher than the discount rate used to value the pension liabilities. In that case, the plan sponsor improves its ROC by the margin between the two. For high growth companies, the diversified portfolio return is usually insufficient to achieve this outcome, thus obviating a defined benefit plan. These companies enable employee retention via equity compensation (e.g., stock & options).

In contrast, those firms with a lower than market ROC may benefit materially from sponsoring a pension plan. The starting potential is apparent. Borrow the higher return on capital of the market to help pay future benefits. Leverage professional and low-cost investment advice that scale delivers to achieve this outcome. Unfortunately, realizing this potential is rare.

Most pension plans endured a deficit position over the last two decades. Whether the result of managerial incentives, behavioral flaws, or poor investment management, the driver is mostly irrelevant to the outcome. This outcome is tragic given the *material benefits* to all the critical stakeholders. The significant insight for the sponsor is that the past is not prelude. A strategic plan sponsor needs to answer only a few key questions to deliver on the promise of defined benefit pension plans.

- Does the market return on capital exceed the sponsor's?
    - If yes, then there is potential to reduce the cost of contributions.
- Are investments fully diversified at low-cost for the target return?
    - Active investment is uncertain, control costs.
- Is the plan underfunded?
    - If yes, commit to contributions or higher funded ratio volatility.

In this context, knowledge of pension plan accounting enables a fuller framing of the pension sponsor's strategic choice.

Accounting for Differences

There are two primary accounting methods for a defined benefit pension plan sponsor. The formal regulations each display are unique and can lead to *different* measures of funding status.

Two methods exist for pension plans: *statutory and financial* accounting.

Statutory Pension Funding – This measures the pension plan's status by the Internal Revenue Code (IRC) and measures the position of the pension's invested assets relative to the actuarial pension liability. The result of this measurement determines the extent to which a plan sponsor may have to contribute to the pension plan, the cost of insurance payments, and the tax deductibility of the pension expense.

Financial Pension Accounting – This reflects the impact of the pension plan in the financial statements. Disclosed in the notes is the status of the pension assets and liabilities. The accounting calculations and notes follow the Financial Accounting Standards Board (FASB), which reflect generally accepted accounting principles (GAAP). THE FASB regulations align with the International Financial Reporting Standards (IFRS) with the *mark-to-market* of the pension's funded status in the financial statements as the principal feature.

The above two points highlight a critical distinction. There are separate rules for the statutory funding status as defined by the Internal Revenue Code (IRC) and the financial accounting implications. The crucial difference that the statutory requirement may be an *actual cash contribution*. At the same time, financial accounting may reflect a non-cash change (e.g., a reduction in the case of a contribution) in the plan sponsor's reported earnings through the mark-to-market of changes in the funded status. While the two regimes are related, the plan sponsor may experience different requirements under each. The divergence is usually from how the liability is *valued*.

Defining the Liability

There are two drivers of the liability's size. First, the forecast of the amount of *cash flows* payable during retirement. Second, the *valuation method* employed for the cash flows at the time of measurement. Both drivers contain variables that involve assumptions about future economic states that may or may not become a reality. Thus, a *measurement error* exists in the liability valuation.

Calculating the obligated cash payments during retirement for the plan participants is the domain of actuaries who follow Actuarial Standards of Practice (ASP). The cash flows are a function of four key components, which includes the following in order of magnitude:

Four variables define the liability.

- the final compensation at retirement,
- the amount of accrued service with the employer,
- the expected life span of the employee after retirement,
- the expected inflation rates (inflation adjustments may not be included).

The former two variables are fixed at retirement, while the latter two features are forecast, which may vary from their experience (e.g., people may live longer than expected or inflation may differ from that forecast). Changes of either compensation or the accrued service will alter the amount of the liability. The changes are all positively related, with increases delivering a higher liability and decreases reducing the liability.

Increased life spans (and increased retirement payments) are called *longevity risk*. Fortunately for people, life spans are increasing, which the projections consider. Thus, the longevity changes are not usually associated with material changes to the liability. The inflation risk was benign for the last few decades as declining inflation brought realized inflation below expectations. While this latter risk may change, it is a manageable risk through plan design (e.g.,

limiting inflation protection) or hedging. Thus, the threat from changes in the underlying liability cash flows is *usually not material*.

The *valuation of the liability* is where the risk resides. The relationship between the liability valuation and interest rates is negatively related. Higher interest rates will lower the present value of the pension liability. In contrast, lower interest rates will increase the liability value. The latter is the outcome of the last four decades, where declining interest rates led to a continuously higher liability valuation. The bull market of the 1990s hid this outcome as asset return swamped the higher liability. Since the 2000, asset portfolio returns lagged the liability valuation gains. Funded status deficits are the result.

One challenge for the liability is that there are different calculations for measuring funded status. This challenge occurs not only between the accounting regime s(i.e., statutory or financial), but within each one. While the names differ within the regime, the three principal measures include some variation of the following:

Three definitions of the liability exist.

Accumulated Benefit Obligation (ABO) – This is the least inclusive measure and includes only the benefits of the *current* employees and retirees earned to date at the *current* salary level.

Projected Benefit Obligation (PBO) – This broader measure includes the benefits of the *current* employees earned to date with their *expected* ending salary included.

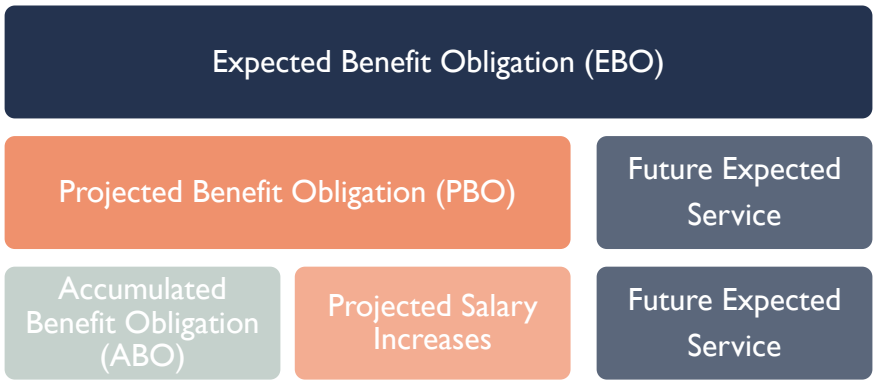
Expected Benefit Obligation (EBO) – This is the most comprehensive measure and includes all the current employees with both *expected benefits earned until retirement* and their *projected final salary*.

Each liability is progressively more inclusive (exhibit 1). Critically, each of these projected cash outflows is valued using the corporate bond rates

applicable at the valuation time. They are then discounted to the present value to derive the aggregate liability value.

Exhibit 1. Constructing the Liability

The liability definition is progressively more inclusive.



There is one fundamental distinction between the statutory and the financial liability. The statutory liability uses the Pension Protection Act (PPA) discount curve, while financial accounting employs market-based yields.[1] The result is a liability with identical cash flows will vary in value depending upon the accounting standard. Further, both regimes must use high-quality bonds (e.g., investment grade of single-A or higher). This definition gives some leeway to the valuation consultant in defining the yield curve. The result is the valuation may differ depending upon *who* does the valuation.

For financial accounting purposes, the Projected Benefit Obligation (PBO) is the primary liability used for reporting. It is a parsimonious trade-off between the more inclusive EBO that contains all expected (but unearned) liabilities, and the ABO that reflects no future service accruals and is the *current* economic liability for the firm. Due to the sponsor's leeway in determining salary levels and the aggregate staffing numbers of the firm, there is some degree of control over the probable payments in the PBO.

Constructing the Liability

[1] See ASC 715 for further details on financial statement disclosure of defined benefit pensions: https://asc.fasb.org/imageRoot/03/64938803.pdf

Actuaries must forecast the future along two dimensions to construct the liability: demographic and economic. The relative stability of the former contrasts starkly with the variability of the second.

Demographic Assumptions – These include measures that impact the rate of participation in the plan. Critically, the plan sponsor knows most of the criteria at inception and as the plan evolves. Thus, there is a little uncertainty in their projections.

Changes in the Labor Force – The number of participants in the pension plan changes with hiring or terminating employees. It is a function of the strategic human resource objectives of the firm.

Retirement Age – The retirement age will impact the plan, with a lower (higher) retirement age increasing (decreasing) the mandatory payments. The plan sponsor mostly fixed these variables at inception. It tends only to change when offering buyouts (e.g., early retirement) to employees.

Life Expectancy – People that live longer will have a higher cost as the benefits paid will increase as the term of retirement increases. The rate of mortality in the employee population defines this measure. There is a hierarchy of life spans based on the nature of work in the US. In increasing order, they are the uninsured general population, blue-collar (e.g., labor), the insured general population, white-collar (e.g., office workers), the most affluent five percent.[2]

Disability (Morbidity) – Employees who become disabled impact the liability by entering the plan sooner than expected or leaving the plan altogether. The rate of morbidity will determine the incidence of disability

[2] Samaras, Thomas Theodore. 2017. *Longevity of Specific Populations*. International Encyclopedia of Public Health (second edition).

in the employee population based on the sponsor's experience or the general population with health access to health care positively related to the measure.

Changes to the labor force are the most impactful and the least variable of these demographic measures. Labor force and retirement age changes tend to occur during combinations or cost reduction initiatives. The other two measures, life expectancy and morbidity, are more stable in the long-run and tend to vary minimally. Companies with sufficient size and time measuring life expectancy and morbidity, may use their projection tables, which are usually more favorable to the liability valuation and may differ from the general population.

Exhibit 2. Impact of Demographic Changes on the Liability Valuation

Demographic Factor	Labor Force	Retirement Age	Life Expectancy	Service Disability
Increases	Higher	Lower	Higher	Higher
Decreases	Lower	Higher	Lower	Lower

The crucial decision point is *offering* the defined benefit pension, which is part of the broader strategic human resource process. Predicating this decision is the sponsor's ability to earn excess returns on the assets above the sponsor's capital cost. The demographic outlook materially influences this election because it determines *future payment timing*. When the employees skew younger (e.g., offer a plan) or skew older (i.e., limit the plan), the decision becomes more apparent.

Economic Assumptions – The valuation of the liability and invested assets incorporate these assumptions and include:

Inflation – It is used to forecast the expected future salary rate increases and reflects the Consumer Price Index (CPI). It is also a key component in constructing future interest rate assumptions and asset returns.

Economic assumptions impact *both* the liability and the asset.

Interest Rates – The discount factor is the critical variable in valuing the liability. Components of the interest rate include inflation, a real interest rate, and a risk factor that reflects the investment strategy of the pension plan. The first two are consistent across all pension plans, while variations in the discount reflect differing risk premium views.

Return on the Invested Assets – This variable reflects the average expected return that the plan's asset allocation strategy will generate. It is composed of the real rate of return, the expected inflation, and the risk premium that will directly scale to the portfolio's risk. Higher returns come with an increased risk in the asset allocation strategy.

Changes in Salary – For plans with final benefits linked to the plan participant's salary, their final pay is a crucial component. This salary growth reflects expected inflation, productivity of the employees (related to the real growth rate), seniority (a linear progression that is parallel to productivity in a production environment), and other tertiary factors.

All the economic factors impact the liability valuation (exhibit 3). The unexpected inflation component has the most *substantial impact on the cash flows* via increases in the beneficiaries' future salary. In a low inflation environment, the expectation is for smaller increases of the future wage for this liability component. Conversely, higher than expected inflation increases the future salary requirement and the liability. This uncertainty contrasts with salary, which the plan sponsor exercises material control. Thus, it delivers little uncertainty because of this control.

Exhibit 3. Impact of Economic Changes on the Liability Valuation

Economic Factor	Inflation	Interest Rates	Asset Return	Salary
Increases	Higher	Lower	Higher	Higher
Decreases	Lower	Higher	Lower	Lower

Inflation is the most uncertain and asset returns the most variable.

Interest rates are where the uncertainty resides for the *liability valuation* with little ability for the plan sponsor to influence control. Lower interest rates drive the valuation higher, with the converse occurring for higher interest rates. While interest rates include an expectation for inflation that could offset the inflation in the salary inflation, they are not usually equal. This inequality leads to a divergent impact of the liability, with the interest rate levels overwhelming the salary inflation component. Thus, their forecast is material to the *long-term* (e.g., decades) liability valuation.

Asset returns display the highest year-to-year variability with convergence to the average over the long-term (e.g., 10-years). The implication is the occurrence of material short-term (e.g., annual) deviations in asset valuation. Managing this variability is a function of the plan's funded status, the contribution strategy of the sponsor, the required return, the asset allocation, and the risk management culture of the plan sponsor.

The key performance indicators for the plan sponsor are the risk management of short-term asset *returns* and the long-term inflation *level*. Trade-offs between the two diverging objectives impact the variability. The plan sponsor's choice is between higher variability in the short-term or long-term. *Either option is prudent* and contingent upon the sponsor's competitive environment and its strategic objectives.

The Liability Accounting Components

While the specific calculation of the pension liability can take different forms, core principles always apply to the valuation. An individual has a unique benefit stream calculated using numerous inputs. These items include the specific plan provisions, including assumptions on mortality (e.g., how long they live), morbidity (e.g., how sick they may be), length of retirement, and employment changes (e.g., length and salary). The aggregate of all the plan participants yields the beneficiaries' future benefits. The discounted value of these is the *present value of the future benefits (PVFB)*. The PVAB is the liability's critical measure and is very similar to the other reporting measures (exhibit 2). Thus, when discussing the liability, the reporting regime nor the myriad of applicable names are not necessarily meaningful. The relevant insight is that the liability is roughly consistent across regimes.

Exhibit 3. Relationship to the Current Liability

The statutory and accounting liability are mostly equal.

There are several statutory accounting dimensions for unearned future liabilities, which financial accounting parallels. Expenses are not recognized before they occur to ensure alignment with the *recognition principal* of accounting. These costs contain a few elements in their calculation.

Actuarial Liability (AL) – This portion of the liability results from past service and accrues to the beneficiaries. When the plan liability contains a final average salary (FS) as a determinant, then the Actuarial Liability is equivalent to the PBO liability. When the plan does not include a final average salary, the Actuarial Liability parallels the ABO. Both measures

are also called the present value of accumulated benefits (PVAB). For pension funding by the Internal Revenue Code (IRC), the liability is named the current liability (CL) and calculated using the mandated interest rates. Calculation of the liability may use mortality or morbidity tables that are either general population mortality assumptions or plan specific (i.e., if the company has enough employees and has measured them overtime). The result is that all the critical liability measures are roughly equivalent regardless of reporting regime (exhibit 3).

Future Service (FS) – This amount is the expected increase in the liability from employees remaining with the company until retirement and measured at the current salary level. This component measures employees' accruing benefits merely from remaining at the company while excluding salary increases. When the benefit calculation includes a length of service dimension, this is a material component of the liability.

Normal cost is the most important cost item.

Normal Cost (NC) –This cost item reflects the current year of service and is indicative of the deferred compensation for the year. In financial accounting, this is parallel to the service cost (SC). This measure reflects a couple of crucial outcomes during the year. First, employees received salary raises, which the valuation now incorporates. Second, the employee's length of service increased, which usually raises their benefits. The aggregate result is a higher liability.

Present Value of Future Normal Costs (PVFNC) –This is the portion of the PVFB that is attributable to the future years of service. It reflects the projected salary increases (if not already done in the Actuarial Liability), and the future Normal Cost for each year. This measure broadly reflects employees' propensity to receive annual salary increases and not leave the company (and their pension behind) the closer they are to retirement. While the company holds the option not to increase future salaries, the historical experience is that companies provide annual raises. The consequence is the liability incorporates these probable salary increases.

These components are the principal cost drivers when valuing a defined benefit pension liability. The reporting actuary determines the exact calculation method of each cost. The primary requirement is that the approach is consistent across the plan (e.g., all cost calculations use the same method). There are subtle methodological differences for each component (exhibit 4). The vital difference between the components is the calculation for service cost, which uses the current salary basis with a one-year projection. This calculation effectively excludes any future accrual of service. It provides a fair liability valuation if the sponsor were to freeze benefits at that time.

Exhibit 4. Funding and Accounting Measures

Similar components with different names.

	Funding Name	Accounting Name	Salary Basis	Service Basis
Present Value of Future Benefits	Not Defined	Expected Benefit Obligation	Projected	Projected
Actuarial Liability	Actuarial Liability	Projected Benefit Obligation	Projected	Current
Present Value of Accumulated Benefits	Current Liability	Accumulated Benefit Obligation	Current	Current
Normal Cost	Normal Cost	Service Cost	Projected	One Year

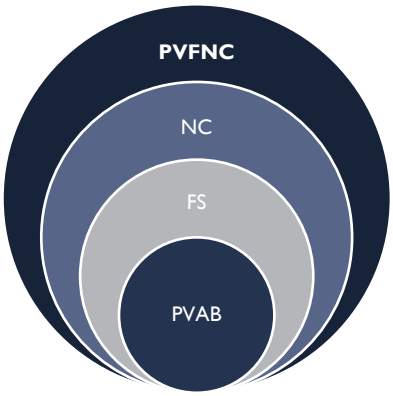
Source: Extracted from the Fundamentals of Current Pension Funding and Accounting for Private Sector Pension Plans, American Academy of Actuaries (2004). http://www.actuary.org/pdf/pension/fundamentals_0704.pdf

The materiality of the liability component differs depending upon the plan's status. In most instances, PVAB is the core component, with the other measures adding incrementally to it (exhibit 5). The pension plan's position

determines the relative magnitudes of these components. A new plan would have little accrued benefits (e.g., PVAB), while a mature plan would have material accrued benefits. A closed plan would most likely not need to include future service costs or salary increases because the accrual of benefits stopped (i.e., "frozen"). Thus, the exact proportions of the measures could vary significantly between plans.

Exhibit 5. The Composition of the Actuarial Liability

Liability components vary in magnitude.



The liability includes many components. Each one can materially impact the liability valuation, which will vary primarily depending upon the plan's age, accrual method, whether the plan is open or close. The collective bargaining agreement or the strategic human resource design mostly fix these factors at plan inception. Thus, while the liability calculation method intricacies are quantitively complex, the reality is that the liability v*aluation* is where the risk manifests itself. This result derives from the variability of the interest rates used for valuation.

Liability Valuation: Interest Rate Curves

The liability's valuation occurs using high-quality (e.g., rated greater than BBB) corporate bond yields. A market-based curve is used for accounting and is the preference for statutory reporting. Lower interest rates and the resulting funded status declines for plan sponsors brought significant legislation to alleviate funding status pressure over the last decade. The result is a divergence between the economic reality of the liability valuation reflected in financial accounting and the funded status for statutory reporting because of the yield curve employed.

The Pension Protection Act (PPA)[3] dictates statutory reporting. It requires discounting the PBO at the prevailing yields in the corporate bond universe of the United States.[4] This valuation process arrives at the current liability value. The ratio of the asset portfolio's current market value to this liability delivers the *funded status* of the pension plan. The funded status is the critical measure for statutory reporting.

The three choices for the liability valuation by the PBGC are:

Three different interest rate curves exist.

- The IRS's currently monthly rates for each of the applicable points along the time horizon.

- The prior rates averaged over the preceding 24 months for each of these points, divided into three segments along the time horizon. These segments are 5-years or less, greater than 5-years but less than or equal to 20-years, and greater than 20-years. Each segment uses the same value for all points within it for discounting the liability.

[3] IRS Section 412(b)(5)(B)(ii)(II) defines the methodology for calculating the discount curve for the valuation of the liabilities.
[4] A complete discussion of the universe is in Appendix A.

- The 25-year average of the segments and is subject to a minimum and maximum corridor. The average includes the three prior segments used in the 24-month average.[5]

While the current legislation prefers the market-based rates, it permits legacy pension plans to elect the second or third valuation method. The third method contains materially higher interest rates than the current market levels, which results in a material reduction in the liability *valuation*.

There are benefits and drawbacks to each of the methods (exhibit 6). The PBGC prefers current market-based interest rates. The principal drawback is that it adds short-term volatility to the valuation methodology, which does not accurately reflect the long-term nature of the liability. The moving average curves address this deficiency by slowing-down the interest rate movement through the averaging process.

Exhibit 6. Attributes of the Different PPA Yield Curves

The interest rate curves possess different attributes

Factor	Monthly Spot	2-Year Average	25-Year Average
Valuation	Highest	Lower	**Lowest**
Volatility	Highest	Lower	**Lowest**
Market Pricing	Current	Lagged	**Lagged**
Accounting Variability	Highest	Lower	**Lowest**
Accounting Persistence	Lowest	Higher	**Highest**
Matches Liability Horizon	No	No	**Yes**

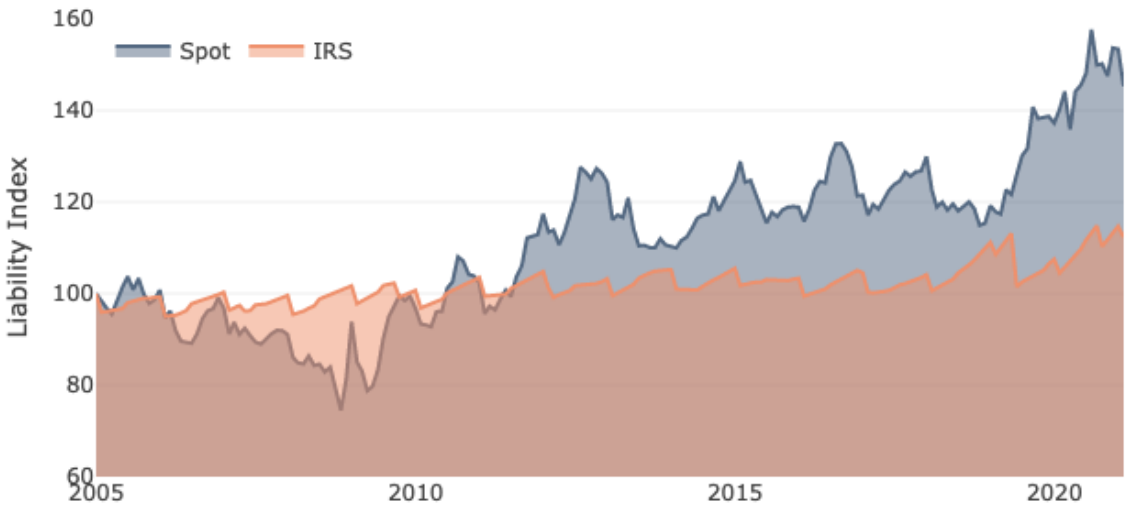
[5] These rates were defined in Section 430(h)(2) of the IRC, as amended by the Moving Ahead for Progress in the 21st Century Act (MAP-21), the Highway and Transportation Funding Act of 2014 (HATFA), and the Bipartisan Budget Act of 2015 (BBA).

The moving average methods' principal problem is that it results in a timing mismatch between the assets and liability that can *increase* funded ratio volatility. The desynchronized movement of the assets and liabilities may introduce the impact of events that occurred two (or 25) years in the past. These asynchronous movements pose a challenge for matching the assets even when their averaging prices. This result occurs because the allocation to equities that *diversify* the portfolio move differently than the bond portfolio, even before the averaging process.

The timing mismatch is apparent when valuing a liability using the different methods (exhibit 7). The IRS's 2-year moving average method saw little movement in the liability during the financial crisis in 2008 while the market-based liability fell over *20 percent*. In contrast, lower market rates resulted in a *30 percent* higher liability since 2018, while the moving average method resulted in a liability only *ten percent* higher. Indeed, the 2-year average method results in little variation of the liability for over fifteen years. While this is an enviable result when minimizing liability variability, it causes significant issues for the asset and liability *management process*.

Liability valuations can differ materially.

Exhibit 7. Liability Valuation with a Spot and PPA Yield Curve (2-year average)



Source: Society of Actuaries, IRS, CRM calculations. Pension liability duration is 15 years.

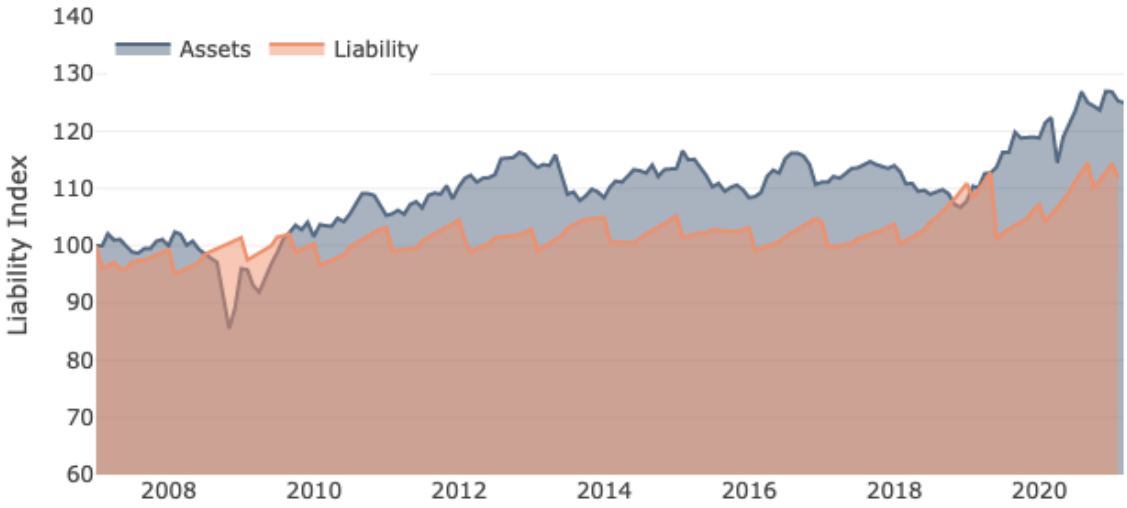
Three key points derive from the differing liability valuation methods:

- Volatility is higher with the spot rates than average rates.
- The average method lags the spot rates and *assets*.
- Interest rate sensitivities (e.g., duration) of the two methodologies will vary modestly through time but are approximately equal on average.

The divergence between the asset and liabilities is material when using the two-year averaging method (exhibit 8). A falling liability did not match falling assets during the financial crisis in 2008. This outcome occurred because widening credit spreads offset lower treasury interest rates. Even though credit spreads and equities are positively related there, no offsetting change occurred. The time series gap is significant and reflects the asynchronous pricing of the liability and the asset portfolio.

Exhibit 8. Performance of the Liability (Average Method) and Assets (Bonds)

Moving average yield curves do not follow the assets.

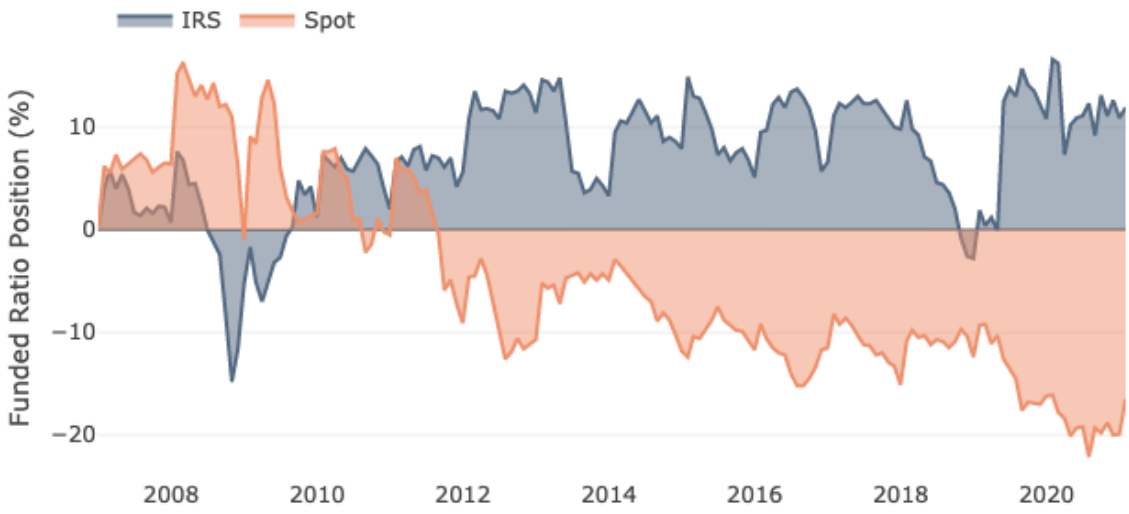


Source: CRM calculations. Pension liability duration is 15 years. Assets are the US Corporate Bond Index price return. The exclusion of coupon payments (e.g., total returns) implies that the bond coupons paid each year's service cost. Starting assets and liabilities are equal.

The decision to reduce the volatility of the liability via an averaging method for interest rates results in a counterintuitive outcome. The funded ratio volatility *increases* due to the mismatch with the asset portfolio. Minimization of the mismatch occurs at a balanced allocation (e.g., an equal proportion of bonds and equities) between bonds and equities. The current higher funded status using the averaging process comes with another drawback (exhibit 9). Lower current rates will eventually arrive (e.g., 2019) to increase the liability valuation and reduce the funded status unless a material movement upwards in rates occurs *immediately*.

Exhibit 9. Funded Status with Spot and Average Interest Rate Liability Valuation

Moving average yield curves display *higher* funded ratio volatility.



Source: CRM calculations. Pension liability duration is 15 years.

The averaging process alters the efficient asset-liability allocation. The increased volatility is a direct result of not having an asset portfolio that moves with the liability. The averaging process turns the liability into a series of Asian interest rate options with *no matching asset portfolio*.[6] While the premise to reduce the liability volatility is sound, *increased* funded ratio volatility may result.

[6] Asian interest rate options have their strike prices averaged over a trailing period (e.g., 24-months). There is no natural counterparty to this position in the marketplace.

Pension Contribution Strategy

The funded status is objective number one.

The pension plan's funding status is the critical determinant for meeting the requirements of both statutory and financial reporting. The funding status determines the degree to which a plan sponsor will have to make compulsory contributions to a plan, impacting the sponsor's cash flow and balance sheet. While demographics and economic variables play a large part in determining the funded status level and variability, the plan sponsor's *contribution strategy* is the crucial ingredient to a well-managed plan. The decision is valuable because the plan sponsor *explicitly* controls it.

A contribution may be mandatory or elective when the plan sponsor pre-funds future contributions. The election of pre-funding contributions is a valuable option for the plan sponsor with benefits under statutory and financial accounting. Critically, it is a *strategic option* that the plan sponsor can exploit to offset the certainty of demographics and the economic variables' uncertainty. All US tax-qualified pension plans must meet the Employment Retirement Income Security Act (ERISA) funding requirements. These statutes provide certain benefits to pre-funding, which include:

- Allocation of costs to the year of realization (i.e., cost deferral)
- Additional security for beneficiaries with increased funding
- Tax-free growth of pension plan assets
- Tax deduction of contributions up to the maximum amount
- Deferral of tax on the compensation until benefits are received

The vital distinction for a plan sponsor is whether contributions are mandatory or elective. Mandatory contributions may occur at an inconvenient time for the sponsor that compromises their operating cash flow. Elective contributions can *reduce* future mandatory contributions while enabling *strategic* management of the plan.

Contributions: Statutory Tax Deductions

Statutory accounting limits contribution amounts. Fortunately, recent regulatory changes permit plans to contribute excess amounts to the plan. These changes enable plan sponsors more discretion in the timing of contributions that may reduce the plan's overall strategic risk.

Limited tax advantages exist for excess contributions.

The tax deduction for the contribution is subject to a minimum requirement and a maximum limit per tax year under the IRC. The minimum contribution per year includes:

Normal Cost – The additional year of benefits accrued for the current year.

Amortization of the Unfunded Actuarial Liability (UAL) - The AL minus the actuarial value of the assets (AVA).[7] The UAL has two major components:

Prior Service Liability – Increases in benefits for service already earned, which is amortized over the plan's life not to exceed 15 years.

Actuarial Gains/Losses – These deviations occur because the experience is different from forecast's assumptions. For the liability, it can be because of differences in mortality, morbidity, salary, or inflation. The plan assets can change if the actual plan returns are different from the plan assumption. The plan amortizes these changes over a period of seven years.

Other minor variables impact the contribution requirements. When the pension plan's actuarial asset value is below 90% of the current liability, then

[7] Per the Pension Plan Protection Act of 2006, the AVA is the value of plan assets calculated at fair market value (FMV) or a smoothing process not to exceed two years. If smoothed, the AVA must be between 90-110% of the FMV.

the plan sponsor must pay an additional charge that places the pension plan on a path towards the 90% threshold. Usually, this amount is minor. During periods of significant change in the economic variables (e.g., interest rates or asset values), the funded status change may result in *material contribution requirements*.

The maximum tax-deductible contribution per year into a pension plan is equal to the normal cost plus the current amortization expense of the unfunded actuarial liability. Recent legislation increased the amount by fifty percent, enabling more discretion for the plan sponsor in the time of contribution. The full funding limitation constrains this amount, which reduces the amount materially. In practice, companies tend not to contribute any amount more than the maximum tax-deductible amount. The motivating factors are the absence of a *further tax shield* and the possibility of an *excise tax* on the excess amount.

While plan sponsors bear the burden of deficit in the plan, they do not reap positive funding status rewards. Removing excess assets from the plan is prohibited, and contributions cannot exceed the full funding limitation, which may require zero contribution. This regulation provides a material incentive to *manage* the contribution strategy.

Contributions reduce risk and provide tax benefits.

Credit balances occur when contributions are more than the minimum required amount. In future years, it is possible to offset a funding shortfall with the credit balance. This ability is critical to the pension plan's strategic management. The contributions, more than the minimum and up to limit, enjoy considerable benefits. In the strategic context, this is an enviable choice. When a plan sponsor experiences a good *business operating year*, the ability to prefund contributions helps *reduce* plan risk and provides *immediate* tax benefits. This contribution strategy provides both an *enterprise risk* reduction strategy and a *tax minimization* strategy.

Contributions: Financial Accounting Deductions

Defined benefit pension plans are liabilities of the sponsor with direct and indirect costs that eventually enter the accounting statements.[8] Seven primary input assumptions drive the cost of a pension plan. In aggregate, they are called the Net Periodic Pension Costs (NPPC). The NPPC includes:

Interest rates changes impact many cost items.

Service Cost – This item is the most direct cost associated with a pension plan. It reflects the accrued benefits that occurred during the year. This item is primarily driven by two factors: the years of service and the salary level. Ending benefits are a combination of years of service and the employee's final salary level at retirement and then discounted to present value at the prevailing interest rate.

Salary Level – Impacts the service cost by the expected growth in employees' salary during the year. To the extent that salary growth reflects the change in inflation level, the liability will grow at a similar rate. In instances where salaries increase on a percentage basis greater than the prevailing inflation rate, the liability will grow at an increasing rate in dollar terms and result in a mismatch between inflation and the liability.

Years of Service – Years of service for each employee impacts the final benefits and grows with time. It acts as a linear function of the time of service. It provides a constant growth rate in the PBO when changes to the underlying population do not occur.

[8] For further insight, refer to the Financial Accounting Statement No. 87 from FASB that states the specific method for pension accounting for those in the US that follow GAAP. The mark-to-market of asset and liabilities is the preferred method and parallels the International Financial Reporting Standards (IFRS). GAAP permits more leeway in the valuation of asset and liabilities than does IFRS.

Interest Cost – This reflects the cost of the deferred liability embedded in the pension plan. The calculation is as follows:

Beginning-of-year (BoY) liability
Multiplied by the end-of-year interest rate.

Amortization of gains & losses impact funding status.

Expected Returns on Pension Plan Assets – The expected rate of return on the pension plan's invested assets and derived from the investment return assumptions embedded in the asset allocation. This measure counterbalances the expenses, primarily service cost and interest expense. Notably, sponsors may elect a smoothing method to account for asset gains, which results in the deferral of their recognition. This election usually occurs when the sponsor elects to use average interest rates to value the liability. The calculation of the change is as follows:

End-of-Year (EoY)	Assets
Minus	BoY Assets
Plus	Benefits Paid During the Year
Minus	Contributions During the Year

Amortization of Gains/(Losses) – These items account for changes in actuarial assumptions and enter the pension expense over time as a smoothed value. The usual method is straight-line over the average remaining service life of the employees. The unrecognized portion of this pension item accumulates in a separate account, *unrecognized net gain or loss.* Components of this account include:

- Deviations in the invested asset's expected and realized returns
- Changes to the assumptions in the PBO liability (e.g., mortality)

Amortization of Prior Service Cost – Changes in the benefits to the plan beneficiaries increase or decrease service costs. These are likely from a renegotiation of plan benefits. The preference is to amortize the cost over a pre-defined period rather than impact the financial statements immediately.

Curtailments – The result of the reduction in the expected future years of service for plan participants. Usually, this results from events related to labor force reductions or *freezing* of the pension plan (i.e., no longer offering the plan to new employees). The immediate impact is a reduction in the PBO liability.

Curtailments & settlements are at the sponsor's discretion.

Settlement – This action reduces the future liability of the plan irrevocably. This action includes a buyout of the current plan members with a lump-sum payment or an annuity for the employee. This decision's economic benefit is limited and depends upon the current interest rate level and the pricing power in the market for buyouts. In general, this item *reduces* the balance sheet liability while incurring a higher cost that *reduces* current income. The strategic rationale for settlements is sparse. It *locks-in* the cost of the liability while *removing* the strategic benefits of the pension plan to the sponsor.

In general, these items result in an expense for a given year. Their summation may result in a *negative* expense in some circumstances. When the total is negative, these items flow through to the income statement.

The items highlight the many moving parts that impact the annual cost of the pension plan. While the plan sponsor exercises limited control over the items, they can influence the cost through the plan design (e.g., curtailments and settlements). These items are part of the broader strategic human resource policy. They can impact the *viability* of the plan, and the *retention policy* of the plan sponsor.

Interest Rate Impacts

Interest rates impact three important accounting items using statutory and financial accounting.

Service cost – Interest rates are used to discount accrued future service costs. A negative relationship exists between the interest rate and service cost, with higher interest rates decreasing the service cost.

Interest rates impact three cost items.

Interest Cost – Interest rates influence interest cost expense and have a direct positive relationship. Increasing rates lead to higher interest expense costs.

Liability Valuation – Interest rates directly impact liability valuation. The relationship is negative, with increasing interest rates lowering the present value of the liability and vice versa.

The varying impact of interest rates on the cost items is material (exhibit 10). In general, since the service cost is lower than the expected total liability, higher interest rates will lower the liability at a higher rate than the service cost. Thus, all else equal, higher rates result in a lower pension expense.

Exhibit 10. Impact of Interest Rate Changes on Accounting Measures

Interest Rate	Service Cost	Interest Cost	Liability Value
Increases	Lower	Higher	Lower
Decreases	Higher	Lower	Higher

In an active pension plan, the annual service cost accounts for a material (e.g., two to three percent) increase in the liability as new benefits accrue in the pension plan. Changes in the liability valuation dominate the other cost items on the income statement (exhibit 11). This result is a material consideration for the sponsor on whether to adopt spot or average interest rates when valuing the liability.

Exhibit 11. Impact of Interest Rate Increase on Accounting Expense

Liability Duration = 15	Service Cost	Interest Cost	Net Cost	Liability Value
Interest Rate = 5%				
Current Liability	1.9	5.00	6.9	100.00
Interest Rate = 4%				
Scenario Liability	1.92	3.38	5.3	84.5
Change	0.02	(1.62)	(1.6)	(15.5)

Higher interest rates are generally beneficial.

The impact of a 100-basis point increase of interest rates delivers a modestly higher service cost, offset by a lower interest rate cost. The net effect in aggregate is lower cost items (e.g., service and interest). Notably, the drop in liability value is nearly about 16%. Thus, a general rule is that i*nterest rate increases are favorable for both the income and balance sheet.*[9] The strategic implication is that when historically low interest rates occur, reducing a plan is irrational because the *cost is already incurred* while future benefits exist.

[9] While this outcome generally applies, a pension plan that contains a high proportion of retirees and older participants will reverse this conclusion. The expectation is for an increased frequency of this example as demographics shift over the next decade, and the transition from defined benefit to defined contributions pension plans continues.

Other Pension Plan Accounting Items

Accrued or Prepaid Pension Costs - A balance sheet asset can appear in the financial statements when there is an accrued or prepaid pension cost. This item is the accumulated amount of company contributions that exceed the net periodic pension cost (NPPC). In the case when the fair market value (FMV) of assets is less than the accumulated benefit obligation (ABO), there may be additional amounts required on the sponsor's balance sheet. It is not necessary to reflect these items in the income statement.

Additional Minimum Liability (AML) – When the liability (the accumulated benefit obligation) is higher than the plan's assets, then the deficiency is reflected on the balance sheet as an unfunded liability (the additional minimum liability). The prepaid pension cost can be applied to any gap to reduce the additional minimum liability (AML) on the balance sheet. When there is no deficiency, recording a liability is not required.

Intangible Asset – When recording an additional minimum liability (AML), an offset can occur with an asset equal to the total of the unrecognized prior service costs and the transition obligations. This action captures the employees' future goodwill, who have deferred benefits (e.g., compensation) into the future.

Deficient funding flows through OCI and impact the income statement.

Reduction in Other Comprehensive Income (OCI) – When the additional minimum liability (AML) is higher than the intangible asset, than the difference results in a decrease to other comprehensive income (OCI). It is a means to reflect the reduction in company value from the unfunded pension liability.

Accounting for Corporate Pensions

There are three key strategic rationales for offering a defined benefit pension plan. First, they provide a form of *deferred compensation*. Second, they aid in *employee retention*. Third, they enable the sponsor to turn a cost center into a *profit center*. While other minor rationales exist, these are the ones with the most immediate and enduring impacts on the firm.

There are two primary accounting methods for a defined benefit pension plan sponsor. They are *statutory* pension funding as defined by Internal Revenue Code and financial accounting, as defined by US (GAAP) and international accounting (IFRS) standards. The formal regulations each display is unique and can lead to *different* measures of funding status.

There are two drivers of the size of the liability. First, the forecast of the amount of *cash flows* payable during retirement. Second, the *valuation method* employed for the cash flows at the time of measurement. Both drivers contain variables that involve assumptions about future economic states that may or may not become a reality. Thus, *measurement error* enters the liability valuation.

Contributions are part of the *strategic human resource* objectives.

The pension plan's funding status is the critical determinant for meeting the requirements of both statutory and financial reporting. While the plan sponsor exercises limited control over many of the cost items, they can influence the funded status through the plan design (e.g., curtailments and settlements). The *contribution strategy* of the plan sponsor is the crucial ingredient to a well-managed plan. The contribution strategy is valuable because the plan sponsor *explicitly* controls it. Thus, the sponsor impacts the funded status through their strategic choice. These items are part of the broader strategic human resource policy. They can influence the *viability* of the plan and the *retention policy* of the plan sponsor.

Appendix A: Pension Protection Act Discount Curve

The daily yield curve for a given day is constructed under methods and assumptions described in this section. The description applies to the current methodology in use. An IRS notice will announce any significant changes in this methodology.

Credit rating is the key attribute.

The following criteria identify those bonds included in the database used to construct the yield curve. The universe of possible bonds consists of a set of bonds that are designated as corporate, have high-quality ratings (AAA, AA, or A) from nationally recognized statistical rating organizations, and have at least $250 million in par amount outstanding on at least one day during the reporting period. The database is extended for maturities below 1-year by using AA financial and AA nonfinancial commercial paper rates, as reported by the Federal Reserve Board. The bonds selected pay fixed nominal semiannual coupons and the principal amount at maturity. Bonds with different or additional characteristics are generally excluded. The main exclusions are:

1. bonds not denominated in U.S. dollars;
2. bonds not issued by U.S. corporations;
3. bonds which are capital securities (hybrid preferred stock);
4. bonds having variable coupon rates;
5. convertible bonds;
6. "Agency" bonds, such as FNMA bonds;
7. asset-backed bonds;
8. callable bonds unless the call feature is make-whole;
9. putable bonds; and
10. bonds with sinking funds.

In addition, a bond is excluded from use with respect to a given day if the bond has for that day:

1. a par amount outstanding below $250 million;
2. a maturity greater than 30 years; or
3. a rating below A.

These criteria leave about 1,400 bonds in each daily set. For each day, the database information for each bond includes the bid price (for commercial paper, it is the ask price), coupon rate, maturity, par amount outstanding, and ratings.[10]

[10] Additional information regarding the daily corporate bond yield curve is found at: http://www.ustreas.gov/offices/economic-policy/reports/corporate_yield_curve_2007.pdf

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