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Alternatives for Pension Cost Recognition – Issues and Implications

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Presenters & Agenda

- Jerry Mingione, MAAA, EA, FSA, FCA, CERA
  - Member, Pension Committee
    - Overview of the alternative approaches and description of the cost relationships and underlying principles
- Tim Geddes, MAAA, EA, FSA, FCA
  - Member, Pension Committee
    - Description of what one large company implemented, the accounting-related dialogues that have occurred since, and the accounting principles/terminology
- Bruce Cadenhead, MAAA, EA, FSA, FCA
  - Member, Pension Committee
    - Description of the cost implications in more detail and a range of practical/implementation-related issues

Alternatives for Pension Cost Recognition – Issues and Implications

This webinar is based on the American Academy of Actuaries' Pension Committee issue brief, *Alternatives for Pension Cost Recognition – Issues and Implications*
www.actuary.org/files/Pension_Cost_Recognition_08142015.pdf (August 2015)

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Overview of the Alternative Approaches and Description of the Cost Relationships and Underlying Principles

Jerry Mingione

Current “Aggregated” Approach

- Pension accounting calls for a PBO value to be determined based on yields for high quality corporate bonds at appropriate maturities, (typically done through application of a yield curve).
- A single-rate equivalent is developed and disclosed as a proxy for the PBO value developed from the yield curve spot rates.
- This same single rate is used to develop values for service cost and interest cost as needed for determining pension cost.

Rationale for Current Approach

The aggregated approach implies some trade-offs that might not be obvious.

- The service cost can be viewed as overstated because the demographics associated with new accruals are younger (farther from payment) than the existing base of prior year accruals.
- The interest cost can be viewed as being understated because it does not recognize the aging of the PBO base of payments from BOY to EOY.
- The overstatement and understatement would exactly balance out (i.e., no gains/losses at year end) if two conditions are met:
  - the addition of new accruals (service cost) suffices to keep the overall plan demographics (liability duration) unchanged
  - the yield curve at EOY is unchanged from BOY.

  Note: actuarial balance is achieved if the EOY discount rate equates to the BOY discount rate regardless of what causes that outcome.

Alternative “More Granular” Approach(es)

There are a number of alternatives that fall under the general header of “more granular.” Each involves re-determining service cost “more exactly” based on service cost-specific demographics. However, there are three variations on how interest cost would be calculated:

- Apply **individual forward rates** applicable to each future time period to each year’s projected cash flow
- Apply **individual spot rates** applicable to each future time period to each year’s projected cash flow*
- Apply the **first year spot rate** to each year’s projected cash flow.

* Note: there are also options to segment the plan population into separate demographic groups, e.g., active, terminated vested, retired. This achieves some of the same impact as the individual spot rate approach, which can be viewed as the most extreme version of segmentation, i.e., segmenting year by year payment amounts.

Rationale for Various Approaches

A no gain/loss outcome is achieved under each approach if certain capital market scenarios apply (at year end):

	Supporting Capital Market Presumption	Implied EOY Discount Rate
Aggregate	not specified (whatever factors result in no change in discount rate)	no change
Individual forward rates	all yield curve rates remain totally unchanged	typically little change (+/-)
Individual spot rates	spot rates remain attached to individual years and associated cash flows (i.e., spot rates move down maturity scale one year each year)	generally must go up
First year forward rate	forward rates move down maturity scale one year each year	must go up a lot

What's Affected?

- Service cost goes down when re-measured based on interest rates that reflect service cost-specific demographics.
- Interest cost also changes in each case:
  - In the individual forward rate approach it generally goes up (in theory this incorporates the impact of aging demographics associated with PBO cash flows)
  - In the individual spot rate approach it almost always goes down*
  - In the first year forward/spot rate approach it goes down a LOT.

* This may not be intuitive, since the rates applied for each year are the same rates applied to benefit payments to generate the PVs for PBO purposes. But in that case the rates are applied to undiscounted figures. In the case of interest cost they are applied to discounted PV amounts, so the weighting applied to the spot rates is different – much more front-loaded.

Affected by How Much?

- In sample cases tested, the service cost figure drops about 5%. Interest cost drops more, in both percentage and dollar terms.
- The combined impact can be substantial; it's a bit lower with younger demographics and, of course, with a flatter yield curve.

Results developed based on Citigroup yield curve rates @ EOY 2014	% Effect on SC		% Effect on IC		Sum of SC + IC	
	Mature Plan	Young Plan	Mature Plan	Young Plan	Mature Plan	Young Plan
Individual forward rate	-5%	-6%	+10%	+10%	**+4%**	**--**
Individual spot rate	-5%	-6%	-15%	-13%	**-11%**	**-8%**
First year forward rate	-5%	-6%	-83%	-83%	**-51%**	**-32%**

The Dec-14 curve had a fairly typical upward slope. Steeper curves imply greater % differences; flatter curves imply lesser differences.

It is very difficult to find a past curve so flat (or inverted) that there is no cost reduction.

Affected by How Much?

The potential reduction in recognized pension cost adds up to significant $ amounts.

$ billions amounts for all Fortune 1000 companies	SC	IC	SC + IC
Total	$35	$95	**$130**
Estimated reduction	-1.8	-14.2	**-16**
% of Net Pension Cost			**-27%**
% of Operating Income			**-1%**

Issue: will analysts make adjustments to offset for the methodology change or will stock prices increase +1% with operating earnings?

Implications for Year End

Whenever less $ cost is recognized for the year, there is a commensurate implication for either:

(1) the experience loss that should be expected at year end, or

(2) changes in capital market conditions necessary to avoid that implied loss.

- Under the individual forward rate approach there is no experience loss if all BOY spot rates remain exactly unchanged at EOY (i.e., by year of maturity)
- Under the individual spot rate approach there is no experience loss if each BOY spot rate remains attached to the same calendar year and projected cash flow figure; this implies that the aggregated discount rate has gone up.
- Under the first year spot/forward rate approach there is no experience loss if each BOY forward rate remains attached to the same calendar year; this implies that the aggregated discount rate has gone up (a lot).

Implications for Year End

What changes in aggregate PBO discount rate would be necessary to avoid an experience loss outcome?

The answer of course varies based on which granular approach is used. Obviously the lower the cost recognized the bigger the required discount rate increase.

	Discount Rate Increase	
	Mature Plan	Young Plan
Individual forward rate	-1 bp	+1 bp
Individual spot rate	+5 bps	+6 bps
First year forward rate	+24 bps	+24 bps

Pros and Cons

Benefits of changing:

- Service cost calculation is more exact
- Reduced or no reliance on stable demographics being achieved
- Cost components are the same whether liabilities are contained in one plan or valuation group or split into several sub-groupings

Negative implications:

- Calculation of pension cost components is more complex
- Cost calculation is less transparent, since it relies on multiple rates rather than just one rate; thus disclosure will probably involve presenting 3 or 4 rates
- Recognized costs are expected to be more variable (since both the single yield curve equivalent rate AND the yield curve slope have an impact)
- An increase in the year-end discount rate is typically necessary to offset the impact of reduced cost recognition during the year (in order to avoid an experience loss)

Pros and Cons

	Aggregated	Granular
Calculation methodology	simple	complex
Technical precision	less	more
Understandability/ transparency	more	less
Requirement to achieve actuarial balance	no change in discount rate	discount rate needs to change
Reliance on stable plan demographics	some	none
Impact if liabilities are segmented	results vary	results don't vary

Description of What One Large Company Implemented, the Accounting-related Dialogues that have Occurred Since, and the Accounting Principles/Terminology

Tim Geddes

In Practice: The AT&T Example

Situation:

- Beginning Q4 2014, AT&T began to account for service cost / interest cost using an alternative approach
- AT&T uses a mark-to-market approach already, so the impact is only in the allocation of cost amongst the quarters and in the classification of the cost

Specific Disclosure:

In the fourth quarter of 2014, we changed the method we use to estimate the service and interest components of net periodic benefit cost for pension and other postretirement benefits. This change compared to the previous method resulted in a decrease in the service and interest components for pension cost in the fourth quarter. Historically, we estimated these service and interest cost components utilizing a single weighted-average discount rate derived from the yield curve used to measure the benefit obligation at the beginning of the period. We have elected to utilize a full yield curve approach in the estimation of these components by applying the specific spot rates along the yield curve used in the determination of the benefit obligation to the relevant projected cash flows. We have made this change to provide a more precise measurement of service and interest costs by improving the correlation between projected benefit cash flows to the corresponding spot yield curve rates. This change does not affect the measurement of our total benefit obligations or our annual net periodic benefit cost as the change in the service and interest costs is completely offset in the actuarial (gain) loss reported. We have accounted for this change as a change in accounting estimate that is inseparable from a change in accounting principle and accordingly have accounted for it prospectively.

Source: Note 12 to AT&T 10-K Financial statements available at:
http://www.att.com/Investor/ATT_Annual/2014/downloads/att_ar2014_annualreport.pdf

In Practice: AT&T Specific Method Employed

Description:

- Utilizing a “full yield curve” approach in the estimate of interest cost / service cost
- Applying the “specific spot rates along the yield curve”
- Provides a “more precise measurement of service cost and interest costs”

Conclusion:

- Based on the above excerpts, it is believed that AT&T is applying the individual spot rate approach described earlier
- Each of the annual cash flows is discounted to today’s value at the relevant spot rate
- Interest cost is determined using that same individual spot rate for each given year
- Service cost is calculated using its own set of expected cash flows and the individual spot rates applicable to those cash flows

In Practice: AT&T Description of Impact

Description:

- Produced a “decrease in the service and interest” costs
- No change in the “measurement of our total benefit obligations”

Conclusion:

- The impact of applying the individual spot rates to the cash flows includes a reflection of the longer duration of the service cost producing a lower service component.
- The change in the weighing component for interest cost calculation leads to a lower interest cost as well – because of the use of the individual spot rate approach.

In Practice: AT&T Other Information

Description:

- AT&T had previously adopted a mark-to-market approach for pension recognition
- As a result, the new approach does not change the “annual net periodic benefit cost as the change in the service and interest costs is completely offset in the actuarial (gain) loss reported.”

Conclusion:

- The result of “no change in expense” in a given year is a function of the mark-to-market approach; individual components of expense would change.
- Other companies, who do not recognize gains / losses immediately, will see a change in their expense recognition pattern with lower expense recognized early on followed by higher expenses due to recognition of greater actuarial losses (or lower actuarial gains)

In Practice: AT&T Accounting Approach

Description:

- AT&T treated the change as a “change in accounting estimate that is inseparable from a change in accounting principle.”
- The impact of such a classification is that the change “accounted for … prospectively.”

Transition Questions:

- Three typical accounting treatments were possible:
  - Change in method
  - Change in estimate
  - Change in estimate that is inseparable from a change in accounting principle
- Method changes require retrospective application while the other two treatments allow only prospective implementation

In Practice: AT&T Disclosures

Description:

- Continues to disclose a single, weighted average discount rate
- No change in the disclosure of the year-end PBO
- Substantially lower discount rate disclosed for "Determining Net Cost"
  - Traditional 5% for 9 months
  - New method of 3.5% for 3 months
  - Disclosed rate for 2014 of 4.6%

Assumptions

In determining the projected benefit obligation and the net pension and postemployment benefit cost, we used the following significant weighted-average assumptions:

	Pension Benefits			Postretirement Benefits		
	2014	2013	2012	**2014**	2013	2012
Weighted-average discount rate for determining projected benefit obligation at December 31	**4.30%**	5.00%	4.30%	**4.20%**	5.00%	4.30%
Discount rate in effect for determining net cost[1]	**4.60%**	4.30%	5.30%	**5.00%**	4.30%	5.30%
Long-term rate of return on plan assets	**7.75%**	7.75%	8.25%	**7.75%**	7.75%	8.25%
Composite rate of compensation increase for determining projected benefit obligation	**3.00%**	3.00%	3.00%	**3.00%**	3.00%	3.00%
Composite rate of compensation increase for determining net pension cost (benefit)	**3.00%**	3.00%	4.00%	**3.00%**	3.00%	4.00%

[1] Weighted-average discount rate of 5.00% in effect from January 1, 2014 through September 30, 2014. Discount rate of 3.50% in effect from October 1, 2014 through December 31, 2014.

In Practice: Possibly Relevant Accounting Literature

ASC715-30-20:

Actuarial Present Value – "The value, as of a specified date, of an amount or series of amounts payable … with each amount adjusted for the time value of money (through discounts for interest)…"

Discount Rate – "A rate or rates used to reflect the time value of money …"

Gain / Loss – "A change in the value of either the benefit obligation … or the plan assets resulting from experience different from that assumed or from a change in the actuarial assumption…"

ASC715-30-35-6: Service Cost – "…the actuarial present value of benefits attributed by the plan's benefit formula to services rendered by employees during the period."

ASC715-30-35-8: Interest Cost – "Measuring the PBO as a present value requires accrual of an Interest Cost at rates equal to the assumed discount rates."

In Practice: More Possibly Relevant Literature…

ASC715-30-35-45: "…The disclosures required by subtopic 715-20 regarding components of the benefit obligation will be more representationally faithful if individual discount rates applicable to various benefit deferral periods are selected. A properly weighted average **can** be used for aggregate computations such as the interest cost component…"

ASC715-30-55-24: "The assumed discount rates used to discount the vested, accumulated and projected benefit obligations **may be different** if the employer can justify such differences in terms of … the requirement to make the best estimate of the assumed discount rates. For example, different rates should be used to measure the pension obligation for active and retired employees if necessary to reflect differences in the maturity and duration…"

ASC715-30-55-26: "A change in the basis for estimating discount rates …is not a change in method."

In Practice: SEC Discussion

Description:

- Following AT&T's implementation of an alternative approach at year-end 2014 and others' consideration of similar approaches, the large accounting firms engaged in conversation with SEC Staff
- The various approaches discussed in the issue brief were explained to staff along with a review of the other accounting implications

SEC Staff Comments:

- The SEC staff would not object to continued use of the single discount rate approach
- The SEC staff would not object to the individual spot rate approach
- The SEC staff would not object to treating the change as a change in estimate
- The SEC staff was silent on the other approaches
- Disclosure was suggested as a topic of discussion with a firm's auditors

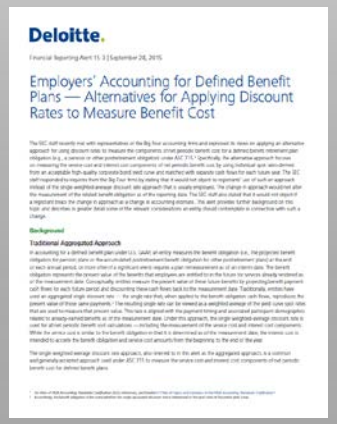
In Practice: Published Discussions

The large accounting firms and actuarial firms have discussion papers on the topic of disaggregation.

Deloitte: http://www2.deloitte.com/us/en/pages/audit/articles/fra-employers-accounting-for-defined-benefit-plans-alternatives-for-applying-discount-rates-to-measure-benefit-cost.html

PWC: http://www.pwc.com/us/en/tax-services/publications/insights/using-multiple-discount-rates-develop-benefit-plan-cost.html

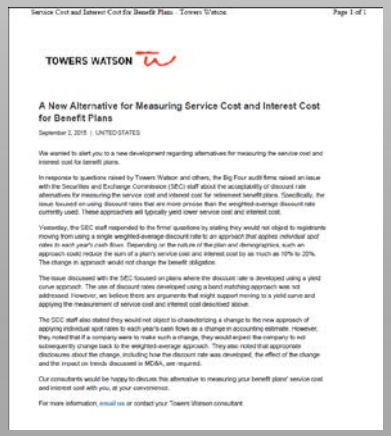
TW: https://www.towerswatson.com/en-US/Insights/IC-Types/Ad-hoc-Point-of-View/2015/09/a-new-alternative-for-measuring-service-cost-and-interest-cost-for-benefit-plans


Deloitte.

Employers' Accounting for Defined Benefit Plans — Alternatives for Applying Discount Rates to Measure Benefit Cost


Using multiple discount rates to develop benefit plan cost

pwc


TOWERS WATSON

A New Alternative for Measuring Service Cost and Interest Cost for Benefit Plans

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In Practice: Going Global? IAS 19 Definitions

Current Service Cost: "…The increase in present value of the defined benefit obligation resulting from employee service in the current period."

Net Interest on the Net Defined Benefit Liability: "Net interest on the net defined benefit liability (asset) is the change during the period in the net defined benefit liability (asset) that arises from the passage of time"

In Practice: IFRS Additional References

IAS19.85: "…The discount rate reflects the estimated timing of benefit payments. In practice an entity often achieves this by applying a single, weighted-average discount rate that reflects the estimated timing and amount of benefit payments and the currency in which the benefits are to be paid."

IAS19.123: "Net interest on the net defined benefit liability (asset) shall be determined by multiplying the net defined benefit liability (asset) by the discount rate…"

IAS19.124: "Net interest on the net defined benefit liability (asset) can be viewed as comprising interest income on plan assets, interest cost on the defined benefit obligation and interest on the effect of the asset ceiling mentioned in paragraph 64."

Description of the Cost Implications in More Detail and a Range of Practical/Implementation-related Issues

Bruce Cadenhead

Implications of Change to Spot Rate Approach

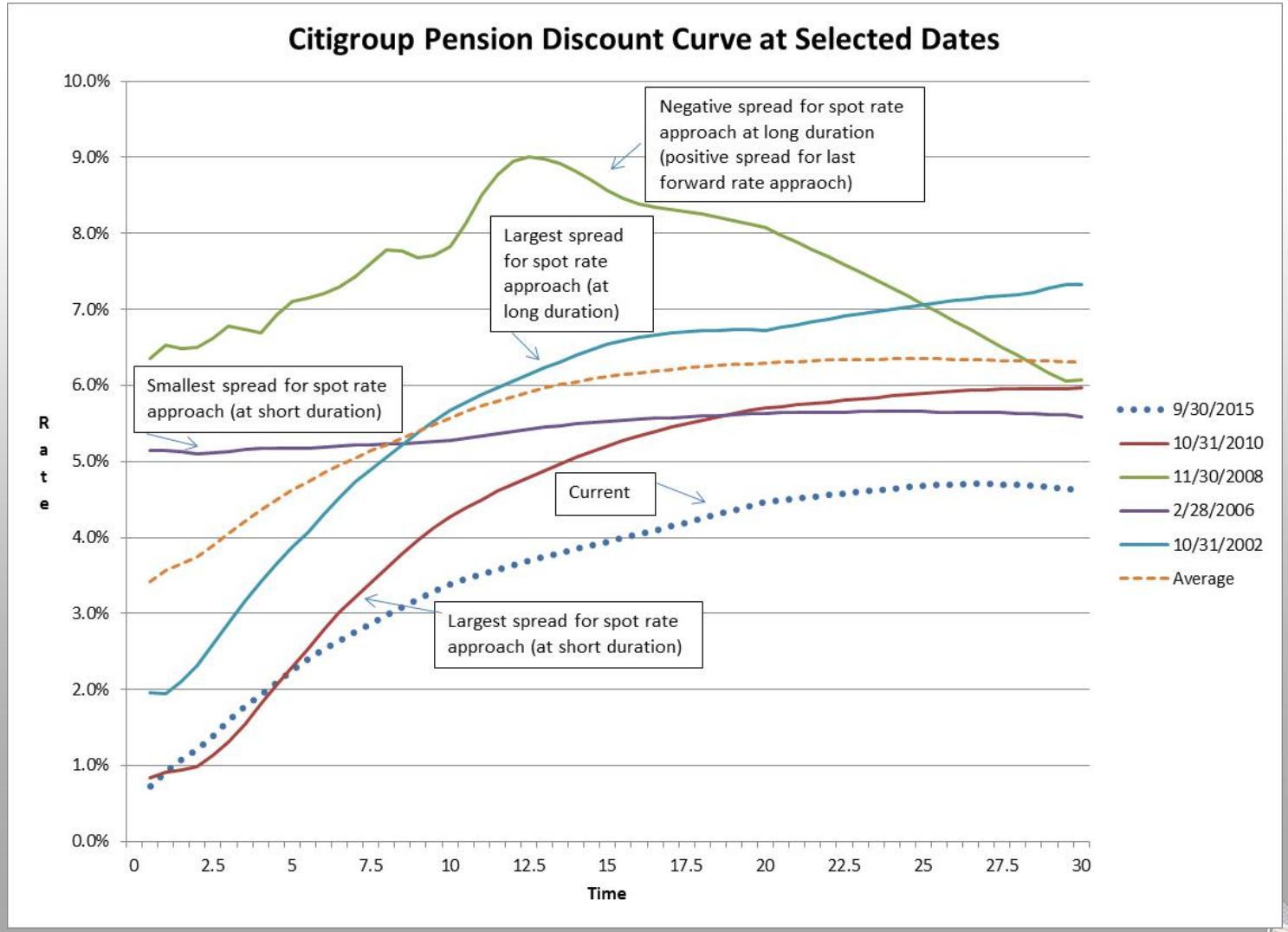
- Moving to the spot rate approach almost always affects interest cost more than service cost
  - Increases volatility of interest cost component of expense
- Will affect gain/loss recognition in the future
  - Effect emerges more slowly for frozen plan amortizing over average future lifetime
  - Potential for increase in future settlement charges
- Factors that come into play
  - Shape of yield curve – largest effect when yield curve is steep
  - Pattern of cash flows / duration
    - Larger effect for shorter-duration plans

Expected Magnitude of Change to Spot Rate Approach

- Effect of change varies by plan
  - Lower duration plans see larger effect
- Average spread (discount rate less effective rate for interest cost) for sample plans based on Citigroup Pension Discount Curve rates going back to 1995
  - Range from min to max is an indication of potential volatility in interest cost

	Last Year Forward Rate / Constant Yield Curve			Spot Rate			First Year Forward Rate		
Sample Plan Duration	Duration 9	Duration 14	Duration 19	Duration 9	Duration 14	Duration 19	Duration 9	Duration 14	Duration 19
Average Spread	-0.17%	-0.14%	-0.16%	0.68%	0.58%	0.43%	2.19%	2.47%	2.60%
Current Spread (9/30/2015)	-0.29%	-0.27%	-0.30%	0.84%	0.74%	0.54%	2.83%	3.26%	3.46%
Minimum Spread	-0.37%	-0.35%	-0.42%	0.13%	0.00%	-0.20%	0.12%	0.25%	0.32%
Date	3/31/2013	12/31/2012	5/31/2012	2/28/2006	11/30/2008	11/30/2008	11/30/2000	11/30/2000	11/30/2000
Maximum Spread	0.11%	0.41%	0.60%	1.28%	1.17%	0.95%	4.28%	4.73%	4.95%
Date	10/31/2008	11/30/2008	11/30/2008	10/31/2010	10/31/2002	10/31/2002	3/31/2010	3/31/2010	3/31/2010
Size of range	0.48%	0.76%	1.02%	1.14%	1.17%	1.15%	4.16%	4.48%	4.63%

Selected Yield Curve Rates



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Practical Issues

- Adjusting interest cost for payments during first year
- Roll-forward
- What happens to the concept of discount rate?
  - Implications for rounding, aggregating plans
- What might disclosures look like?
- Interest-sensitive lump sums
- Bond model / bond matching techniques

Adjusting Interest Cost for Payments During First Year

- Traditional formula charges interest on full PBO and then subtracts off partial year interest for amount paid out
  - Partial year adjustment at weighted average discount rate
- Granular approaches apply interest separately to PV of each cash flow
  - First year cash flow would be charged interest only to assumed payment date (at the first year rate)
  - Introduces concept of separate effective rate for interest cost
    - Single rate that produces the same result
    - Approximately equal to interest cost / (PBO – yr 1 cash flow weighted for timing)

Roll Forward

- Liabilities are often rolled forward from a beginning of year calculation date to a year-end measurement date
- Traditional roll-forward formula: $(PBO_0 + SC_0) \times (1+DR) - BP_0 \times (1+DR)^{.5*} = PBO_1$
  - PBO and SC each consist of a stream of discounted cash flows
  - Applying this formula is equivalent to dropping the first year cash flow, adding together PBO and SC cash flows, and discounting as of the year-end measurement date…
    - As long as benefit payment term subtracted in formula above is equal to the expected first year cash flow that we are dropping
    - Otherwise need to consider how to adjust for the difference between actual and expected payments

*or other partial year adjustment

Roll Forward – Adjusting for ΔBP

- Differences between actual and expected cashflows (ΔBP) represent one or both of the following:
  - An acceleration (or deceleration) in the release of liability
  - Gains and losses due to higher or lower benefits

Examples	
Change in timing of liability release	Gain / loss
Actuarially equivalent forms of payment	Change in utilization of subsidized benefits (e.g., early retirement)
Actuarially equivalent changes in timing (early / late retirement)	Payment of lump sums at a conversion interest rate that differs from assumption
	Accelerated early retirement in a traditional PRM plan

Roll Forward – Adjusting for ΔBP

- The traditional rollforward method implicitly assumes that ΔBP represents an adjustment to liability.
- Making no adjustment to cash flows for ΔBP is consistent with the gain/loss view.
- Reality is often somewhere in between
  - Expect to pay closer attention to this adjustment in the future

Roll Forward – Adjusting for ΔBP

- If ΔBP represents a liability release, adjust it from original expected payment date to adjusted expected payment date
  - Adjustment from original date to measurement date at reasonable interest
    - Discount rate used to make this adjustment in traditional rollforward formula
    - Could also consider using the rate at which the payment is expected to grow (plan actuarial equivalence rate, lump sum conversion rate, cash balance interest credit rate)
    - As this is just a partial year adjustment, probably no need to be too refined
    - Resulting amount is adjustment to PBO as of measurement date
  - Adjustment from measurement date to new assumed payment date at yield curve rate to preserve effect on PBO
    - If the adjustment to PBO is small relative to first year cash flows, may be easiest simply to adjust the first year cash flow
    - Another alternative is to adjust each cash flow by the ratio of ΔBP/PBO
      - For this purpose PBO calculated before cash flow adjustment
      - Implicitly adjusts ΔBP to each future payment date

Discount Rate

- Traditional approach
  - Determine single rate that reproduces PBO cash flows discounted using a yield curve
  - Apply this rate in all subsequent calculations (potentially including calculation of “actual” PBO)
  - Amenable to adjustments, such as rounding, or calculating a single rate based on aggregated cash flows for multiple plans

Discount Rate

- Granular approaches
  - Discount rate is not actually used in any calculation, but is simply a disclosure item
  - Actual calculations (PBO, Interest Cost, Service Cost) are all done using the yield curve
  - Rounding or aggregating no longer have any practical effect
  - When rolled forward cash flows are used for disclosure, but updated cash flows (based on updated census) are used for expense, the PBO discount rate may change
    - Does not represent a change in assumption as the “real” assumption (the underlying yield curve) does not change

Discount Rate – and Other Disclosures

- What additional disclosures might be needed under granular approaches?
- Probably makes sense to disclose the effective rate applied wherever the discount rate previously applied
  - PBO discount rate
  - Effective rate of interest (on PBO)
  - SC discount rate
  - Effective rate of interest on SC (less significant than the other items and may not merit disclosure)

Interest-Sensitive Lump Sums

- The value of an interest-sensitive lump sum generally varies directly with the value of the underlying annuity
  - Values are equal if the assumptions used to calculate the lump sum are those used to value the annuity
  - Supports the use of an "annuity substitution" approach
    - Differences between lump sum and valuation assumptions can be adjusted for positive or negative subsidies relative to accounting valuation basis:
      - 417(e) vs. valuation mortality
      - Discount curves that are based on a different subset of high quality bonds than those used to set lump sum rates
        - » Above mean / median curves typically result in rates that are higher than 417(e)
  - Lump sum-based approaches can produce the same result
    - Reflect implied forward rates in setting lump sum rates at projected future payout dates
    - Combination of implied forward rate and discounting the resulting lump sum at the spot rate in effect on payment date results in equality in value between lump sum and annuity

Interest-Sensitive Lump Sums

- Interest-sensitive lump sums raise new issues with regard to the consistency of interest crediting between otherwise equivalent approaches
  - Annuity substitution results in similar cost recognition as would apply to the underlying annuity
    - Might consider modifying this approach to reflect lump sums for periods for which the lump sum rate is already known (generally through the year beginning on the measurement date)
  - Under a lump sum-based approach one might expect to use the spot rate in effect on the lump sum payment date, resulting in lower interest cost than would apply to annuity valuation
    - Can result in greater losses when liabilities are reameasured at year-end
    - One option would be to credit interest on lump sums using spot rate for payment date + post-termination duration (results in roughly the same effective average crediting rate as for the underlying annuity)

Interest-Sensitive Lump Sums

- Another approach in use is to set an expected lump sum rate independent of the theoretical settlement cost
  - Zero-coupon bond maturing at lump sum date will match lump sum payment if lump sum rate assumption is met; otherwise it will be off
  - In this case it seems consistent with the spot rate method to credit interest based on the spot yield for the lump sum payment date

Lump Sum Example

- Lump sum payable in two years equivalent to annuity of $10,000 per year for 5 years
- Two common approaches to preserving inherent equality in value between lump sum and underlying annuity are:
  - Annuity substitution – value the underlying annuity payments instead of the lump sum
  - Reflect implied forward rates in determining the lump sum

PBO Calculation

Time	(A) Annuity Payments (boy)	(B) Citigroup 9/30/2015 Yield	(C) Compounded	(D) = (A) x (C) Discounted Value of Annuity	(E) Implied Rate as of Lump Sum Pmt Date	(F) Compounded	(G) = (A) x (F) PV at Lump Sum Date	(H) Payment Stream Reflecting Lump Sum	(I) = (H) x (C) Discounted Value of Lump Sum
0	-	0.73%	1.0000	-		-	-	-	-
1	-	0.92%	0.9909	-		-	-	-	-
2	10,000	1.21%	0.9762	9,762		1.0000	10,000	47,245	46,123
3	10,000	1.59%	0.9538	9,538	2.36%	0.9770	9,770	-	-
4	10,000	1.92%	0.9266	9,266	2.64%	0.9491	9,491	-	-
5	10,000	2.25%	0.8949	8,949	2.94%	0.9166	9,166	-	-
6	10,000	2.53%	0.8608	8,608	3.20%	0.8817	8,817	-	-
Total				46,123			47,245		46,123

Both approaches give the same present value

Lump Sum Example (cont'd)

- The lump sum is paid sooner than the underlying annuity. As a result it is charged interest at a lower rate
- As a result the projected year-end PBO is smaller using the lump sum method
- To preserve the equality between annuity and lump sum a higher rate of interest would have to be charged on the lump sum
  - Can be approximated by moving up the spot rate curve by the average duration (at commencement date) of the annuity underlying the lump sum (2 years in this example)

Interest Cost Calculation	Underlying Annuity		Lump Sum		Lump Sum - Alt: Duration Shift (2 Years)	
Time	(J) = (B) x (D) Interest on PBO	(K) = (D) + (J) Expected PV at Year-end	(L) = (B) x (I) Interest on Payments	(M) = (I)+(L) Expected PV at Year-end	(N) = (B) [2 years later] x (I) Interest on Payments	(O) = (I) + (N) Expected PV at Year-end
0	-	-	-	-	-	-
1	-	-	-	-	-	-
2	118	9,881	558	46,680	887	47,010
3	152	9,689	-	-	-	-
4	178	9,444	-	-	-	-
5	201	9,150	-	-	-	-
6	218	8,826	-	-	-	-
Total	867	46,990	558	46,680	887	47,010
	Effective int credit rate = (J) / (D)		Effective int credit rate = (L) / (I)		Effective int credit rate = (Q) / (I)	
		1.88%		1.21%		1.92%

Lump Sum Example (cont'd)

- Redoing the calculation at year-end based on the projected (shifted) yield curve implied by the spot rate method confirms that the annuity substitution approach avoids gains or losses

Projected results based on "no gain/loss" yield curve at year-end

	Underlying Annuity								
Time	(A) Annuity Payments (boy)	(B) Expected Yield	(C) Compounded	(D) = (A) x (C) Discounted Value of Annuity	(E) Implied Rate as of Lump Sum Pmt Date	(F) Compounded	(G) = (A) x (F) PV at Lump Sum Date	(H) Payment Stream Reflecting Lump Sum	(I) = (H) x (C) Discounted Value of Lump Sum
0	-	0.92%	1.0000	-		-	-	-	-
1	10,000	1.21%	0.9881	9,881		1.0000	10,000	47,558	46,990
2	10,000	1.59%	0.9689	9,689	1.97%	0.9806	9,806	-	-
3	10,000	1.92%	0.9444	9,444	2.28%	0.9558	9,558	-	-
4	10,000	2.25%	0.9150	9,150	2.59%	0.9260	9,260	-	-
5	10,000	2.53%	0.8826	8,826	2.86%	0.8932	8,932	-	-
6	-	3.22%	0.8269	-	3.63%	0.8369	-	-	-
Total				46,990			47,558		46,990

Matches prior page

Differs from prior year as implied forward rates change with the shift in the yield curve

Bond Matching Approaches

- Bond matching approaches / bond models derive a portfolio of high quality bonds that reasonably match the plan's cash flows
  - Yield on the resulting portfolio is the discount rate
- Granular approaches require a yield curve
- It would be mathematically quite simple to derive a curve that produces the same discount rate for a given set of cash flows
  - Shape of curve could be patterned after existing yield curves
  - Result is a purely hypothetical curve that is likely not fully supportable based on a portfolio of actual bonds
- It may also be possible to derive a curve from the selected bonds
  - May be gaps due to relatively small number of bonds and lack of maturities at certain duration
  - Cash flow mismatches could be more of a concern
  - May result in additional constraints being added to the model
- No endorsement yet from SEC or auditors of any of these approaches

Questions?

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