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The Cash Balance Retirement Plan Conversion - A Fully Supported Case

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Abstract

This case deals with a current issue facing many mid-career employees as their companies adopt cash balance plans in lieu of the traditional pension plans. If they have a choice, should they stay in the old plan or enroll in the new plan? If not, how will their retirement be impacted by the change? All employees affected by such a conversion may have similar concerns. Accountants will be asked to resolve these dilemmas because they are generally the best informed about the traditional plans, and they have the skills necessary to weigh the alternatives. Working this case will give students the opportunity to develop their professional skills. The objective is for students to use their knowledge of pensions and time value concepts in an ambiguous context, where the need to make numerous assumptions and to consider their impact on the possible outcomes will demand careful analysis. A second but not secondary objective is to develop spreadsheet skills so that they can not only answer specific questions but also perform sensitivity analysis around their assumptions.

Accompanying Spreadsheets

There are two Excel™ template spreadsheets which accompany the ***Instructor's Notes***: the **Employee Benefits Calculator.xlt** and the **Comprehensive Benefits Analyst.xlt**. The **Employee Benefits Calculator.xlt** calculates the Accumulated Benefit Obligation and the Projected Benefit for a given individual based on input plan variables, employee data, and accounting and actuarial assumptions. The **Comprehensive Benefits Analyst.xlt** provides a comparison of the retirement benefits for the defined benefit and cash balance plans, based on input plan variables, employee data, and accounting and actuarial assumptions, with sensitivity around key assumptions. The spreadsheets are password protected; the password is available on request from the author.

Case Administration

This case could be presented in an Intermediate Financial Accounting course, after the students have studied the accounting for traditional pension plans (SFAS 87, *Employers' Accounting for Pensions*, SFAS 132, *Employers' Disclosures about Pensions and Other Postretirement Benefits*), and SFAS 158, *Employers' Accounting for Defined Benefit Pension and Other Postretirement Plans, an Amendment of FASB Statements No. 87, 88, 106, and 132(R).* It is assumed that they will have facility with time value of money concepts as well. The case could also be used effectively in a personal finance class at the graduate or undergraduate level, or in a quantitative methods class with a focus on spreadsheet skills. If used for the latter, little institutional knowledge of accounting and pensions is actually required to understand the analysis. Instructors may eliminate case questions which do not meet their course objectives.

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Students should be assigned to groups of 3-4 to work on the first part of the case. In both graduate and undergraduate classes, it is best to discuss the first two questions as a class, before students begin work. If the case is used for an Intermediate Accounting class, it is reasonable to ask the students to calculate the ABO and PBO given the information in the case. For other classes, it is better for the instructor to walk students through the calculations using the **Employee Benefits Calculator.xlt** provided.

Issues in comparing the two plans are also best addressed as a preamble to more concrete analysis by the students. Once students understand that the analysis of the case requires assumptions and not just an "it depends" response, they are more willing to commit to assumptions needed to form the basis for the calculations. Alternatively, the instructor can provide a "base case" set of assumptions. Because of the ambiguity inherent in all assumptions, it is important for students to understand that sensitivity analysis is necessary to make their work on the case robust. Students may have additional individual questions as they work on the case. One (or more) of the groups can make a class presentation of their findings after they have prepared the case. If the classroom has a computer, they can review their spreadsheet calculations with the class. It is likely that the groups will have different results, depending on their assumptions, so the presentation is usually a fertile opportunity to discuss the case in detail—the results of various assumptions, the different analytic methods possible.

While the case avoids specifying assumptions for the case analysis, this is an area where students can flounder. As mentioned above, one way to mitigate this, if the instructor is concerned about allowing too much leeway, is to specify assumptions (use the assumptions contained in the Inputs tab of the **Comprehensive Benefits Analyst.xlt**).

If students have proficient spreadsheet skills they should be strongly encouraged to make the assumptions as inputs which can be varied. This would better enable them to perform sensitivity analysis on their results. Setting up a spreadsheet where the assumptions are potentially variable inputs also satisfies those with concerns over building an analysis based on rigid assumptions.

The second part of the case, which requires the development of spreadsheet which can be used to assess multiple scenarios, takes this case beyond a short term assignment. With appropriate introduction, it could be used as a project assignment in an intermediate accounting, personal finance, or quantitative methods class. Instructors may be selective in assigning case questions; they should focus on the requirements they find more useful for their own course objectives.

It is also preferable that the second part of the case be done individually, in order to prevent those with weaker spreadsheet skills from being "free riders" to their own detriment. The school's IT department can be a valuable resource for both students and faculty. Advance consultation with colleagues in IT and QM is strongly recommended, as this case may provide significant integrative opportunities.

Analysis Of Questions

1. **Confirm the calculation of the ABO and also calculate the PBO based on the company's assumptions. What happens to the ABO and the PBO if the company's assumed retirement age decreases from 68 to 65?**

   If this is not an Intermediate Accounting class, students will need further clarification of these terms. This question could also be omitted, but it provides a good exercise in application of time value of money calculations for quantitative methods students. For students in a personal finance class, it illustrates the implications of benefits provided by defined benefit pension plans, which are often not well appreciated.

   The Accumulated Benefit Obligation (ABO) is the present value of the annual pension payments based on the benefit earned to date. Using the benefit formula provided in the case, it is easy to calculate Tom's annual benefit at retirement, based on his current years of service and his most recent five years' annual salary.

annual pension benefit received at retirement	=	1.45%	x	the number of years of employee's service	x	average of five final years' salaries
	=	1.45%	x	21	x	$110,580
	=	$ 33,672				

The ABO is the present value today of this annual payment, over the expected 12 years of retirement (life expectancy of 80 less expected retirement age of 68). This is a two step calculation. First, the present value of the annuity (annual pension benefit payments) *at retirement* should be calculated ($282,298). Retirement at age 68 is 22 years in the future, however. The present value of this annuity *today* requires further discounting, yielding $78,339. The ABO is also the amount "rolled over" into the cash balance plan for employees affected by the conversion. While employees such as Tom may have the option of remaining with the defined benefit plan or electing coverage under the cash balance plan, younger employees generally do not have such a choice.

The Projected Benefit Obligation (PBO) is the benefit that the employee has earned to date, taking into consideration the effect of projected future salary increases. The benefit is calculated based on the service years provided to date and the expected average annual salary over the final five years' of service. Since the company projects a salary progression rate of 3%, we can forecast Tom's final average pay as $198,846, maintaining the assumption of retirement at age 68. This would provide an annual benefit of $123,980. The present value today of these benefits is $288,448. However, the PBO is $140,870, based on the proportion of benefits earned to date (21/43 of $288,448). The higher the salary progression rate, the greater the difference between the PBO and the ABO.

Keep in mind that this expected retirement age is the company's assumption. Tom's actual retirement age (and indeed his expectations) may differ significantly. However, actuarial techniques, based on stochastic modeling and the application of the law of large numbers, permit companies to make assumptions about employees that are quite robust in computing their overall defined benefit pension obligations. (In determining the initial cash balance, we have calculated the ABO using the assumed 68 year retirement age for all employees analyzed since it is the company's assumption which will dictate measurement of their pension liabilities.)

If the company assumes that the average retirement age is 65 rather than 68, there is no effect on the annual benefit Tom has earned to date. However, his retirement period is now 15 years, rather than 12, and the additional years of retirement increase the ABO to $108,087.

The effect of the change in retirement age on the PBO is more ambiguous. The average final pay will go down, since there are fewer years of salary increases, resulting in a final annual benefit of $105,544. But the longer retirement period results in a PBO of $177,869.

2. How can the defined benefit and cash balance plans effectively be compared?

There is no direct comparison of the benefits from the two plans, since the pension plan promises a specific annual benefit to be paid over the entire retirement and the cash-balance plan yields a single sum at the retirement date. A lump sum payment may always be used to purchase an annuity for a specified number of years and companies may in fact permit this election. By computing an assumed annual payout from the sum received from the cash balance plan, the cash balance plan benefit can be compared to the annual pension benefit.

Defined benefit plans do not typically offer a lump sum distribution at retirement. However, it is also possible to compute an assumed present value of the annual pension benefits at the retirement date—which can then be compared to the cash balance sum.

In either of these ways, a direct numerical comparison of benefits could be made.

3. What assumptions would you have to make in order to show Tom a direct comparison of the retirement benefits provided by the two plans?

The benefits from either plan depend on Tom's salary increases over the years until retirement and how long he works until he decides to retire. In addition, the benefits from the pension plan depend on the company not changing the benefit formula of the plan, specifically the salary upon which the benefit is calculated and the percentage of that salary to be awarded for each service year. The company does have a right to make changes to the plan, which are virtually impossible to incorporate into the analysis. Therefore, we must assume that they will not do so, but at the same time be aware of the tenuousness of this assumption.

The value of the cash balance will also depend on the rate paid on the accumulating balance, specified as the Treasury bill rate plus 1%. Since the Treasury bill rate fluctuates based on macroeconomic conditions, a long-term average must be assumed in order to compute the assumed benefit.

To make a direct comparison of the two plans, additional assumptions must be made. To compute the present value of the assumed pension benefits to compare with the cash balance at the retirement date, we must make an assumption of how many years Tom will receive the benefit during retirement (i.e., years until death). We must then assume a discount rate in order to compute the present value of the benefits. However, this comparison may not be very useful since recipients of traditional defined benefit pensions generally do not have the option of choosing a lump sum payout at retirement.

Comparison of an annual benefit payment may be more relevant. To compute an assumed annual payout from the cash balance, we must use the assumption of the number of years the benefit will be received (years until death), and we must also make an assumption about the average interest rate that Tom will earn on the balance during retirement.

Two types of annuity products are widely available. A term certain annuity provides a guaranteed payment for a period of time specified by the annuitant. A life annuity provides a constant payment over the life of the annuitant. Since the defined benefit pension plan provides lifetime payments, we assume that Tom invests the cash balance accumulation at retirement in a life annuity. For the base case, we further assume that the rate at which Tom could effectively annuitize (for life) his lump sum payout at retirement would be the same as the rate paid on the accumulating balance under the plan.

In comparing the plans using either the single sum valuations at the retirement date or the projected annual benefits over retirement, assumptions must be made about:

a. future salary increases,
b. the number of years until retirement,
c. the number of years of retirement, based on retirement age and longevity,
d. interest rates, specifically,
    the appropriate Treasury bill rate, and
    the earnings on cash balances after retirement, and
e. the appropriate discount rate.

4. How much do the assumptions affect the outcome? Do small changes in one or two assumptions change the results of the comparison?

Base Case Assumptions

Tom's **salary increases** may be in line with the company's average salary progression rate of three percent, or he may only receive one or two percent, as he fears. All three assumptions should be tested. It is probably unnecessary to test higher salary increases, given his age and unwillingness to relocate.

Since Tom is uncertain about his **retirement date**, students should try to develop a spreadsheet that makes it possible to compute the benefits for all possible retirement dates, from age 55 (the earliest possible retirement age) to age 65 or later. Retirement age may also be affected by Social Security eligibility requirements. Average retirement age currently is approximately 68 years.

The retirement date will determine the assumed **number of years of retirement**. The company's actuaries have determined that the number of years of retirement is twelve if retirement occurs at age 68. We infer that the company assumes that Tom will live until he is 80.

Selecting **interest rates** and **discount rates** is more problematic, since they are affected by macroeconomic conditions and are completely out of Tom's control. Using only information from the case, we assume continuation of the 5% Treasury bill rate and the 6% discount rate. However, we might want to consider several alternative interest rates for the cash balance plan retirement in order to assess the effect of the change on the outcome.

Effects of Changes in Assumptions

Salary Progression Rate

The pension benefit can be computed from the company's formula at each of the assumed salary progression rates. The five-year average and current benefit are given by the company, and the remaining years are computed separately at each assumed salary progression.

The effect of the salary progression rate assumption on the pension benefit alone is significant. Comparing benefits for different assumed retirement ages shows that the difference in benefits due to salary progression becomes wider over time. If 3% salary increases are forthcoming, the annual benefit more than doubles if Tom defers retirement until age 68. With lower salary increases, however, there is much less to be gained in benefits from postponing retirement.

Comparison of Annual Benefits Under Different Assumptions Defined Benefit Pension Plan

Retirement Age	3% Salary Increase	2% Salary Increase	1% Salary Increase
55	$58,901	$54,986	$51,307
60	$79,663	$70,827	$62,911
65	$105,544	$89,370	$75,566
68	$123,980	$101,954	$83,695

The accumulated cash balance can also be computed based on the same three salary progression assumptions. If the Treasury bill rate is assumed to be stable at 5%, the interest credits will be calculated at 6%. It is preferable to make simplifying assumptions about the timing of the credits to the cash balance account because computing monthly increments is too unwieldy. The annual computations assume that (1) the annual pay credit (and transition credit for the first nine years) is based on a previous year end salary, (2) account deposits and withdrawals are made evenly during the year, and (3) interest is computed annually on the average cash balance during the year.

Comparison of Annual Benefits Under Different Assumptions Cash Balance Conversion Plan			
Retirement Age	**3% Salary Increase**	**2% Salary Increase**	**1% Salary Increase**
55	$20,736	$20,311	$19,906
60	$34,829	$33,783	$32,808
65	$60,385	$57,941	$55,720
68	$87,256	$83,170	$79,516

Retirement Date and Length of Retirement

The annuity under the cash balance plan is more significantly affected by the retirement date than by the different projected salary levels. The annuity almost triples if Tom defers retirement from age 55 until age 65, but the balance is only 8% higher at age 65 if he achieves a 3% salary increase compared with a 1% increase.

The previous calculations maintained the assumption that Tom's life expectancy is 80 years. Under the traditional defined benefit plan, no matter what his life span, the company is obligated to continue to make benefit payments. Under the cash balance plan, outcomes are less certain and Tom runs the risk of outliving his savings if he purchases a term certain annuity or actively manages the investments from the lump sum distribution himself.

The benefits can also be directly compared at the retirement date by computing the present value of the annual pension plan benefits under various assumptions and comparing it to the assumed cash balance at the retirement date. The company has disclosed that its assumed discount rate is 6%. Note that we have assumed that the pension benefit occurs annually as an ordinary annuity; this simplifies the calculation but also minimizes the projected benefit (in comparison with a monthly payment).

Present Value of Benefits at Retirement				
Retirement Age	**Retirement Plan**	**3% Salary Increase**	**2% Salary Increase**	**1% Salary Increase**
55	Pension	$752,951	$702,908	$655,873
	Cash Balance	$265,075	$259,644	$254,466
60	Pension	$913,724	$812,384	$721,587
	Cash Balance	$399,482	$387,489	$376,301
65	Pension	$1,025,068	$867,988	$733,917
	Cash Balance	$586,478	$562,740	$541,168
68	Pension	$1,039,432	$854,764	$701,686
	Cash Balance	$731,538	$697,282	$666,648

It is interesting to observe that the present value of the pension benefits actually decreases after age 65 when a lower salary increase is anticipated; the effect of the increment in annual benefits from continued employment is less than the reduction in number of years benefits will be received due to retirement age.

For Tom, the present value at retirement of the pension plan benefits always exceeds the cash balance, but this difference becomes less pronounced as the retirement age is pushed forward, and as the estimated progression rate decreases. These parameters will become more critical for younger employees.

Interest Rate Assumption

Tom's benefits under the cash balance plan depend on the interest rate applied before retirement and the annuitization rate used to convert the lump sum at retirement to an annual benefit payment. Expectations about Treasury bill rates underlie the assumption of the rate of return on the accumulated cash balance prior to retirement. A 5% annual rate is consistent with the past twenty year average market yield on U.S. Treasury securities at 1-year constant maturity, making the 6% return a reasonable assumption.

Nevertheless, since the cash balance plan's interest credits are pegged to a variable rate, the long term average may differ from the rate assumed here. Holding other assumptions constant, we can compare the effects of different interest rate assumptions at different retirement ages, assuming that the same rate is applied both before and after retirement.

Comparison of the present value of the benefits at retirement does not depend on any assumption about annuitization rates. It is a somewhat artificial comparison, however, since defined benefit pension plan beneficiaries rarely if ever have the chance to elect a lump sum distribution. But obviously, a higher interest rate assumption will produce a higher forecast cash balance accumulation.

Present Value of Benefits at Retirement					
Retirement Age	**Defined Benefit Plan**	**Cash Balance Plan Under Different Interest Rate Assumptions (Same Rate Before and After Retirement Rate)**			
		4%	**5%**	**6%**	**7%**
55	$752,951	$232,997	$248,502	$265,075	$282,784
60	$913,724	$326,106	$360,837	$399,482	$442,470
65	$1,025,068	$446,178	$511,166	$586,478	$673,741
68	$1,039,432	$533,977	$624,296	$731,538	$858,875

Continuing to hold other assumptions constant and maintaining the assumption that the same rate is applied both before and after retirement, we can compare the effects of different interest rate assumptions at different retirement ages on the annual benefits to be received at retirement.

Annual Benefits at Retirement					
Retirement Age	**Defined Benefit Plan**	**Cash Balance Plan Under Different Interest Rate Assumptions (Same Rate Before and After Retirement Rate)**			
		4%	**5%**	**6%**	**7%**
55	$58,901	$14,915	$17,632	$20,736	$24,266
60	$79,663	$23,995	$28,955	$34,829	$41,766
65	$105,544	$40,130	$49,247	$60,385	$73,973
68	$123,980	$56,896	$70,436	$87,256	$108,134

Under the cash balance plan, a higher interest rate assumption will result in higher forecast annuity payments. But there is downside risk as well; if rates decline the projections become less favorable.

Here the underlying assumption was the rate at which Tom could effectively annuitize his lump sum payout at retirement would be the same as the rate paid on the accumulating balance under the plan. However, if he takes the balance and invests and manages it himself, he may be able to attain a higher interest rate than that paid during the accumulation period. This could potentially increase his annual benefits. But if there are adverse market conditions or he does poorly as an investment manager, his annual benefit could decline. Typically sponsoring companies set the interest rate on cash balance plans very conservatively, critics contend unreasonably so. (In fact, the expected rate of return on plan assets disclosed by Tom's company for its defined benefit plans was 8% compared to the 6% rate on cash balances at the time of conversion.) It is easy to argue that a younger investor with a sufficiently long investment time horizon could exceed the company's benchmark. At the same time, during retirement most individuals cannot tolerate much risk so the assumption of equivalent rates may be reasonable, regardless of one's opinion on the company's interest credit rate.

Whether Tom chooses to manage the cash balance accumulation himself or purchases an annuity, it is possible that interest rates at retirement will differ from those assumed to be in effect during the accumulation period. The effect of different post-retirement interest rates on the annual benefits at retirement is summarized below.

Annual Benefits Provided by Cash Balance Plan							
Assumed 6% Accumulation Rate Prior to Retirement							
Under Different Post-Retirement Rates of Return							
Retirement Age	**4%**	**5%**	**6%**	**7%**	**8%**	**9%**	**10%**
55	$16,968	$18,808	$20,736	$22,746	$24,832	$26,986	$29,203
60	$29,395	$32,056	$34,829	$37,708	$40,688	$43,762	$46,923
65	$52,748	$56,503	$60,385	$64,392	$68,518	$72,758	$77,106
68	$77,947	$82,536	$87,256	$92,102	$97,071	$102,160	$107,363

Discount Rate Assumption

When comparing the present value of benefits at retirement, it is important to remember that the benefits in the cash balance plan accumulate to the value at retirement. The determination of a comparable number for the defined benefit pension plan benefits is very dependent upon the discount rate. To make the above comparison under differing salary increase assumptions, the discount rate must be held constant. Keep in mind that the present value of the pension benefits would be considerably less if the discount rate were higher. A lower assumed discount rate and deferred retirement interact to produce a significant increase in benefits measured at the retirement date.

Present Value of Benefits at Retirement				
Retirement Age	**Cash Balance Plan**	**Defined Benefit Plan Under Different Discount Rate Assumptions**		
		5%	**6%**	**7%**
55	$265,075	$830,146	$752,951	$686,406
60	$399,482	$992,773	$913,724	$843,947
65	$586,478	$1,095,509	$1,025,068	$961,284
68	$731,538	$1,098,869	$1,039,432	$984,737

The effect of different discount rate assumptions primarily affects the measurement of the pension liability for the sponsoring company and is of less concern to the plan beneficiary. But in making comparisons of different types of benefits, the effects of all assumptions must be clearly understood.

5. What other assumptions—financial or non-financial—might affect Tom's choice of plans?

The benefits of the two plans appear to converge over time under any set of assumptions, so Tom's decision on when to retire is significant in the choice of plans. It appears that the sooner the retirement, the more benefits to be derived from the pension plan.

A major consideration is the amount of risk that Tom is willing to accept. The pension plan is in some ways less risky, in that it delivers a set amount annually for life after retirement. However, the employer may change the benefit formula; if the company goes bankrupt, employees may end up with far less than anticipated if the plan is (as is often the case) underfunded.

The cash balance plan, on the other hand, delivers a sum at retirement which must then provide an annual payout for life after retirement. There is a risk of having insufficient funds for life. The potential reward associated with the increased risk is that Tom might be able to invest the sum at a higher return and achieve a higher annual payout. However, there might be additional management and decision-making to achieve the higher goal, which is not required with the pension plan. The accumulated cash balance also belongs to the employee at any point in time prior to retirement as well, should their employment be severed.

Tom should consider all of his retirement options in making the decision. His other assets may reduce the risk of the cash balance plan. Or he may have plans that require a large initial sum and lower maintenance over the years, which would make the lump sum distribution available under the cash balance plan more attractive.

Estate planning may also be a consideration. The two types of plans have different implications for Tom's heirs and dependents and we have not considered these effects.

6. How would you advise Tom?

Tom should be aware of the impact of various assumptions, in particular retirement age, on possible outcomes. His tolerance for risk and ability to assume investment responsibilities need to be carefully evaluated. Absent concerns about the company's survival, it appears clearly evident that the most prudent and financially rewarding option is to continue coverage under the traditional pension plan.

Which employees quality for transition credits and at what percentage?

The following table provides a summary of eligibility for transition credits. Note that some employees whose age plus years of service exceed 50 do not qualify as they are over 55 years of age, the maximum for receiving transition credits.

Analysis of Employee Eligibility for Transition Credits					
Employee Name	**Age**	**Years of Service**	**Age plus Years of Service**	**Eligible?**	**Transition Credit**
Marcus Anderson	27	6	33	N	0%
Matt Bradford	23	2	25	N	0%
Liu Wen Chen	36	8	44	N	0%
John Daurio	44	18	62	Y	3%
James Finn	62	43	105	N	0%
Keisha Gibson	32	7	39	N	0%
Tanya Monson	24	1	25	N	0%
Sonia Nieves	53	27	80	Y	4%
Jennifer Palmer	30	5	35	N	0%
Luis Rodriguez	42	10	52	Y	1%
Davon Smith	58	30	88	N	0%
Han Su	54	17	71	Y	4%
Susan Toussaint	29	10	39	N	0%
Jared Wilson	21	1	22	N	0%
Madeline Winston	47	9	56	Y	2%

7. **Set up a spreadsheet that enables you to calculate the ABO for any employee of Tom's firm. The ABO should be calculated using the company's assumptions about retirement age (65) and discount rate (6%). The individual's specific estimated mortality and salary progression rates should be used for comparability with the analysis which follows.**

Employee Benefits Calculator.xlt is an Excel™ template spreadsheet that calculates both the ABO and the PBO given the requisite inputs. After developing a generic spreadsheet to solve a specific set of calculations, it is good practice to save that spreadsheet and rename subsequent versions with specific data inputs under different names. The template format forces that practice by making it difficult to save changes to the original spreadsheet. Once data is entered, the save function forces renaming of the file. These calculations measure the pension obligation under the defined benefit plan from the company's perspective. The ABO calculation also provides the roll-over amount for the cash balance conversion.

8. **Develop a spreadsheet that enables you to make comparisons for any employee of Tom's firm who comes to you for assistance in the understanding the impact of the company's proposal. Make a table for these employees showing their annual benefit at retirement under the existing plan and under the cash balance conversion plan. Assume that they will continue to work for the company until retirement.**

Comprehensive Benefits Analyst.xlt is another Excel™ template spreadsheet which can be used to calculate benefits under a full range of assumptions, using data input on any individual. It provides comparisons between annual benefits under both plans as well as comparisons between the present values of benefits at retirement. It

can also be used to perform sensitivity analysis on the full range of assumptions. As can be seen from the summary below, only three individuals are made better off by the cash balance conversion.

Comparison of Traditional Defined Benefit and Cash Balance Conversion Plans									
								Annual Benefits at Retirement	
Employee	**Age**	**Years of Service**	**Current Base Salary**	**Average Salary Over Last Five Years**	**Anticipated Retirement Age**	**Expected Mortality**	**Expected Rate of Salary Increase**	**Defined Benefit Plan**	**Cash Balance Plan 5% Salary Credit**
Anderson	27	6	45,000	40,129	68	77	3%	$97,210	$92,079
Bradford	23	2	25,000	N/A	70	77	1%	$27,798	$65,754
Chen	36	8	57,000	50,830	68	82	3%	$80,315	$49,356
Daurio	44	18	128,000	114,146	68	79	3%	$149,495	$117,435
Finn	62	43	53,000	47,263	65	82	3%	$35,693	$30,335
Gibson	32	7	42,000	37,450	68	82	3%	$71,603	$46,429
Monson	24	1	28,000	N/A	71	82	2%	$47,528	$60,455
Nieves	53	27	82,000	73,100	68	83	3%	$73,400	$51,910
Palmer	30	5	57,000	50,830	68	82	5%	$206,329	$94,575
Rodriguez	42	10	97,000	86,500	68	78	3%	$103,018	$79,424
Smith	58	30	76,000	67,774	65	81	3%	$47,310	$33,069
Su	54	17	165,000	147,140	60	80	5%	$67,046	$29,718
Toussaint	29	10	34,000	30,320	62	82	3%	$53,046	$25,004
Wilson	21	1	32,000	N/A	68	77	2%	$54,317	$79,784
Winston	47	9	102,000	90,960	65	83	3%	$64,137	$34,624

9. What is the impact of a change in the pay credit percentage? What if it rises to 7%? What happens if it is 3%?

Comparison of Traditional Defined Benefit and Cash Balance Conversion Plans								
					Annual Benefits at Retirement			
Employee Name	Age	Current Base Salary	Anticipated Retirement Age	Expected Rate of Salary Increase	Defined Benefit Plan	Cash Balance Plan 5% Salary Credit	Cash Balance Plan 3% Salary Credit	Cash Balance Plan 7% Salary Credit
Marcus Anderson	27	45,000	68	3%	$97,210	$92,079	$57,297	$126,860
Matt Bradford	23	25,000	70	1%	$27,798	$65,754	$40,035	$91,473
Liu Wen Chen	36	57,000	68	3%	$80,315	$49,356	$32,780	$65,932
John Daurio	44	128,000	68	3%	$149,495	$117,435	$94,630	$140,241
James Finn	62	53,000	65	3%	$35,693	$30,335	$29,988	$30,681
Keisha Gibson	32	42,000	68	3%	$71,603	$46,429	$29,899	$62,960
Tanya Monson	24	28,000	71	2%	$47,528	$60,455	$36,579	$84,332
Sonia Nieves	53	82,000	68	3%	$73,400	$51,910	$46,976	$56,845
Jennifer Palmer	30	57,000	68	5%	$206,329	$94,575	$58,724	$130,427
Luis Rodriguez	42	97,000	68	3%	$103,018	$79,424	$57,445	$101,402
Davon Smith	58	76,000	65	3%	$47,310	$33,069	$31,634	$34,504
Han Su	54	165,000	60	5%	$67,046	$29,718	$27,336	$32,100
Susan Toussaint	29	34,000	62	3%	$53,046	$25,004	$16,351	$33,657
Jared Wilson	21	32,000	68	2%	$54,317	$79,784	$48,143	$111,425
Madeline Winston	47	102,000	65	3%	$64,137	$34,624	$27,061	$42,187

Predictably, increasing the pay credit percentage increases the annual benefits under the cash balance plan. But the 7% salary credit only tips the balance in favor of the cash balance plan for one additional employee. The effects of change in the pay credit are more pronounced, the younger the employee. Under the lowest salary credit assumption, only one employee remains better off under the cash balance plan.

10. Which employees should accept the conversion? What are the factors which make an employee better or worse off in choosing the cash balance plan? Can you create an employee profile which characterizes the employee who is better off with the conversion? What risks do they face associated with their choice?

11. Which employees should continue with the defined benefit plan? What are the factors which make an employee better or worse off in choosing the cash balance plan? Can you create an employee profile which characterizes the employee who is better off with the existing plan? What risks do they face associated with their choice?

Generally, the younger the employee and the higher the retirement age, the more likely the employee is to be better off with the cash balance conversion. A young employee who plans to work a long time is the ideal candidate for the cash balance plan. It is worth noting that younger employees (and students) frequently have greater illusions about how early they can plan to retire. The portability of cash balance plans is also likely to appeal to younger employees. Note that here we have assumed that employees will continue to work for this firm until retirement.

Lower expectations about salary increases tend to favor the cash balance plan. The back-loading feature of traditional defined benefit plans produces the greatest increase in benefits as pay levels rise during the final

years of service. While both the defined benefit formula and the cash balance plan are based in part on pay, the effect of pay increases is stronger for the pension plan. Employees with higher expected salary increases tend to amass greater benefits over time under the pension plan.

Generally the older the employee and the closer to retirement, the better off they would be staying with the pension plan. However, benefits may virtually converge if the employee is very close to retirement and does not project a long retirement period. This is in part because the amount rolled over into the cash balance plan approaches the PBO as the employee approaches retirement age.

Under the cash balance plan, the employee bears the risk if the amounts set aside are not sufficient to fund their retirement. Market conditions at the time of retirement may be very hard to predict and could impact their investment options significantly. However, the money in the cash balance plan is the employee's: it cannot be taken away if the firm goes bankrupt and it can be passed on to heirs. The lump sum payment may be very attractive to retirees who wish to pay off their mortgage or purchase a retirement home.

On the other hand, the pension plan beneficiary has greater certainty about their retirement income and need not worry about outliving their cash balance accumulation. But this certainty may be illusory. The pension plan beneficiary bears the risk of changes in the plan which could reduce benefits and could find benefits greatly reduced or wiped out if the firm goes bankrupt. The nearer to retirement, however, the greater the protection under ERISA for those covered by traditional defined benefit plans.

The detailed discussion concerning the impact of various assumptions on Tom Brown will help clarify these questions. Sensitivity analysis on a case by case basis will also help clarify which types of risk are of more significant importance for particular employees.

One approach could be to divide the class into groups once the individual students have completed the spreadsheet assignment and assign each group an employee to examine in depth. In performing any kind of sensitivity analysis, it is hard to analyze the impact of varying multiple assumptions simultaneously. Care must be taken to keep track of which assumption is being analyzed and permitted to vary and which are being held constant. It may be helpful to ask how much a certain assumption would have to change to make an employee just as well off under the cash balance conversion as they would have been under the traditional pension plan (or vice versa, though that is less frequently the case).

The summaries below provide some insight into this question for three employees from the group above who are most significantly affected by the cash balance conversion.

Susan Toussaint				
Current Assumptions				
	Fixed Parameters			
		Current age	29	
		Current salary	$34,000	
		Years of service	10	
		Opening Cash Balance	$5,654	
		Estimated life expectancy	82	
	Assumptions			
		Anticipated retirement age	62	
		Anticipated salary increases	3%	
		Rate of return earned on accumulating cash balance	6%	
		Annual pay credit to cash balance (% of salary)	5%	
		Post-retirement rate of return	6%	
	Projected Annual Benefits Under Pension Plan		$53,046	
	Projected Annual Benefits Under Cash Balance Conversion		$25,004	
	Projected Loss of Benefits Under Cash Balance Conversion		53%	
What would it take for the Cash Balance benefit to equal the Pension Benefit?				
	Note: All other assumptions are held constant!			
			Revised Assumption	***Cash Balance Benefit***
		Anticipated retirement age	69	$53,572
		Anticipated salary increases	8.5%	$53,807
		Rate of return earned on accumulating cash balance	9.6%	$53,011
		Annual pay credit to cash balance (% of salary)	11.5%	$53,126
		Post-retirement rate of return	17.8%	$53,054

As can be seen, it would be difficult for this employee to achieve parity between the two plans without increasing rates of return, salary increases, or the pay credit to levels which are hardly reasonable. Alternatively, she could defer retirement by 7 years, which may not seem like a terribly long time until we note that this reduces her expected retirement period by 35%, from 20 years to 13 years.

Jared Wilson			
Current Assumptions			
Fixed Parameters			
	Current age	21	
	Current salary	$32,000	
	Years of service	1	
	Opening Cash Balance	$300	
	Estimated life expectancy	77	
Assumptions			
	Anticipated retirement age	68	
	Anticipated salary increases	2%	
	Rate of return earned on accumulating cash balance	6%	
	Annual pay credit to cash balance (% of salary)	5%	
	Post-retirement rate of return	6%	
Projected Annual Benefits Under Pension Plan		$54,317	
Projected Annual Benefits Under Cash Balance Conversion		$79,784	
Projected Gain in Benefits Under Cash Balance Conversion		47%	
Note: All other assumptions are held constant!			
		Revised Assumption	***Cash Balance Benefit***
	Anticipated retirement age	65	$53,054
	Anticipated salary increases	0.0%	$59,099
	Rate of return earned on accumulating cash balance	4.6%	$54,051
	Annual pay credit to cash balance (% of salary)	3.4%	$54,471
	Post-retirement rate of return	0.0%	$60,296

This employee is one of the few made better off through the cash balance conversion and it is hard to change the parameters enough to reverse that. Note that his low expectations on salary increases reduce his projected benefits under the defined benefit plan and if these expectations were to change it would be worth recalculating benefits under both plans and using that as the point of departure for sensitivity analysis. As it stands, though, he could sustain a drop in salary increase, or reduced pay credits, or a lowered rate return on his accumulating cash balance, or retire early, or put his money under the mattress at retirement and be as well off as he would have been as under the forecast pension coverage. Once again, it is critical to note that here we are only varying the assumptions on the cash balance plan and changing some assumptions (salary increases, retirement age) would impact the pension benefit as well.

Tanya Monson				
Current Assumptions				
	Fixed Parameters			
		Current age	24	
		Current salary	$28,000	
		Years of service	1	
		Opening Cash Balance	$390	
		Estimated life expectancy	82	
	Assumptions			
		Anticipated retirement age	71	
		Anticipated salary increases	2%	
		Rate of return earned on accumulating cash balance	6%	
		Annual pay credit to cash balance (% of salary)	5%	
		Post-retirement rate of return	6%	
	Projected Annual Benefits Under Pension Plan		$47,528	
	Projected Annual Benefits Under Cash Balance Conversion		$60,455	
	Projected Gain in Benefits Under Cash Balance Conversion		27%	
What would it take for the Cash Balance benefit to equal the Pension Benefit?				
	Note: All other assumptions are held constant!			
			Revised Assumption	***Cash Balance Benefit***
		Anticipated retirement age	69	$47,193
		Anticipated salary increases	0.4%	$47,414
		Rate of return earned on accumulating cash balance	5.15%	$47,562
		Annual pay credit to cash balance (% of salary)	3.9%	$47,323
		Post-retirement rate of return	1.5%	$47,344

This employee is also better off under the cash balance conversion. One of the interesting outcomes of this analysis is how little her expected retirement age would have to drop to reduce her benefits by 27%. Looking at time value of money functions graphically helps students understand why this is the case. There is not much leeway in the assumption regarding the rate of return on her accumulating cash balance or her annual pay credit. Her expectations appear more robust to changes in salary increase or postretirement age (this latter perhaps because of her high expected retirement age).

Guide to Accompanying Spreadsheets		
	These workbooks are password protected Excel templates (.xlt). The password is available on request from the case author. Changes cannot be saved to the template itself, but spreadsheet versions (.xls) can be saved. This is to protect the integrity of the spreadsheet calculations and prevent accidental overwriting of cells containing formulas. Cells requiring data input are clearly indicated. Both workbooks are currently populated with data for the employee who is the subject of the case. Details are provided for each tab in the workbooks.	
Employee Benefits Calculator.xlt		
	Benefits Calculator	
		This worksheet provides step-by-step calculation of the ABO and the PBO for a given employee. It requires inputs concerning the employee's age, salary history, anticipated retirement age, plan benefit formula, the assumed discount and salary progression rates, and estimated life expectancy. It provides the beginning balance for the cash balance plan under the assumption that it is equivalent to the ABO.
Comprehensive Benefits Anayst.xlt		
		This workbook calculates a base case scenario for a specific employee and then allows the user to do sensitivity analysis by changing one variable at a time in order to see what effect this would have on the values of the cash balance and defined benefit pension plan.
	Instructions and Notes	
		Provides an overview of the workbook and basic instructions.
	Inputs	
		This worksheet is populated with the data for the employee who is the subject of the case. Data can be entered in the white cells to supply information about any employee (age, years of service, etc.) and about the accounting and actuarial assumptions made by the company. Enter the data only in the white cells. These data is used to populate the Master Table with values for the pension plan and cash balance plan at various retirement ages.
	Base Case Scenario	
		Illustrates results of the initial set of assumptions and compares annual benefits and present value of benefits for the cash balance and defined benefit pension plans.
	Retirement Ages	
		Compares annual benefits and present value of benefits under the cash balance and pension plans at different retirement ages.
	Salary Progression Rate	
		Compares different assumptions for the rate of increase in salary to see the effect on annual pension benefits and on annual cash balance benefits, and on the present value of benefits.
	Different Rates of Return	
		Shows how the benefits under the cash balance plan are affected by different assumptions concerning rates of return before and after retirement, and compares these to the pension benefit at different ages.
	Discount Rates	
		Shows how the pension benefit varies when the discount rate assumption changes.
	Master Tables	
		Provides details of calculations underlying the Base Case Scenario and subsequent worksheet tabs providing results of sensitivity analysis on input assumptions.
		Table 1. Benefits Calculated with Beginning Input Data and Assumptions
		Tables 2 and 3. Variable: Salary
		Tables 4 and 5. Variable: Rate of Return on Accumulating Balance
		Tables 6 and 7. Variable: Discount Rate
		Table 8, 9, 10, and 11. Variable: Post-Retirement Rate of Return
	Basic Formulas	
		Shows the basic formulas behind the calculations in the Master Tables.

Appendix: The Case

The Cash Balance Retirement Plan Conversion

INTRODUCTION

Tom Brown, a family friend, comes to you with a problem.

"I know you're studying accounting, so maybe you can help me out with this pension question. My company has just changed our plan from a traditional defined benefit pension plan to a cash balance plan. Everybody has to change to the new plan, unless you are over 40 and the sum of your age and your years of service exceeds 50—like mine. Then you can choose between the old and new plans. But truthfully, I can't figure out which plan is most beneficial to me. I just don't see how to compare them. I have to give the company my decision by December 31. Can you help?" Tom asks.

"Well," you reply, "I should be able to figure it out if you give me the details of the plans. We also need to make some assumptions about your future. Are you planning to stay with the company? When do you intend to retire?"

"I'm not planning on leaving the company, but I'm not really sure about when I'll retire. I'm not eligible to retire for nine years, when I will be 55 years old. I guess I'll retire either when I'm 65 or when I'm 68. It's just another thing that I can't figure out," Tom points out.

Tom tells you that he had just turned 46 years old when the cash balance plan was adopted by the company on 9/1/06. He has worked for the company since 8/25/85—essentially 21 years.

As you look through the package of materials Tom's company provided, you summarize the important elements of the conversion and the existing plan. You also briefly research cash balance plans and conversions from defined benefit to cash balance plans.

BACKGROUND

Cash balance plans first gained momentum in the United States in the 1980s. Often referred to as hybrid plans, they combine elements of traditional defined benefit and defined contribution plans. Hundred of companies, including a number of Fortune 100 firms, converted from traditional defined benefit version to cash balance pension plans. Court challenges put a temporary stop to conversions; the IRS suspended its issuance of determination letters in September 1999. (Cash balance plans continued to be adopted; it was only the approval of conversions which was put into hiatus.) Recent legislative reforms have cleared the way for resumption of conversions. Tom's firm was one of the first to act after the legislation was signed into law and there is a widespread sense that many more firms will do so as well.

Employers prefer cash balance pensions because they are less risky and may be less costly. In addition, they do not provide incentives for workers to stay on the job longer than they otherwise would just to increase their pensions, which is considered to be a drawback to defined benefit pension plans. Employers contend that cash balance plans are also more attractive to younger workers and an increasingly mobile workforce, making the firm's compensation portfolio more competitive.

Traditional Defined Benefit Pension Plans

Under defined benefits plans, the annual payment to be received after retirement is a function of the employee's salary history and years of service to the company. Frequently, the formula grants a percentage of salary for each year of service to the company. A typical formula for the benefit is

annual pension benefit received at retirement	=	a percentage set by the firm	x	the number of years of employee's service	x	salary-based-measure

The salary-based-measure is frequently an average of the employee's pay over the final or highest three or five years of service.

In most cases, employees must work for the company for some minimum number of years (the "vesting" period) to be entitled to receive the benefits which they have earned. Once the employee is vested, the benefit earned to that date is locked in whether the employee continues employment with the company or not; this benefit is then paid when the employee does retire. The amount of the employer's obligation at any time is the present value of the benefits that have accumulated for its employees (the Accumulated Benefit Obligation or ABO). Note that as the employee continues working for the same firm, the benefit grows dramatically. This is partly because of salary increases but more importantly because of the nature of the benefit formula. The Projected Benefit Obligation (PBO) is the present value of benefits that have been earned to date, incorporating the effects of future salary increases.

At Tom's company, the defined benefit at the time of the conversion was:

annual pension benefit received at retirement	=	1.45%	x	the number of years of employee's service	x	average of five final years' salaries

The company is legally entitled to change the provisions of the defined benefit plan at its own discretion. Changes were instituted by the company in 2001 that significantly reduced benefits from the previous level. While benefits that have already been earned in prior periods generally cannot be reduced, plan amendments can have significant effects on benefits earned in future periods.

Cash Balance Pension Plans

For cash balance plans, a defined percentage of the employee's salary is contributed to the plan assets account each year. These assets, designated as the employee's balance, accumulate and earn interest until the retirement date. The earnings on the balance are specified in the plan; the rate may be fixed or variable and is usually based on short-term interest rates. These earnings are credited to the employee's balance, regardless of the actual earnings when the company invests the pool of assets. Any difference accrues to (or must be made up by) the company.

As with traditional plans, there is usually a vesting period. At retirement the employee can take the benefit in the form of a lump sum. The lump sum proceeds may be used to purchase an annuity or invested by the beneficiary.

When an employee's retirement plan is converted from a traditional defined benefit plan to a cash balance plan, the employee does not start with a zero cash balance. The employee's cash balance is initially credited with the present value of the retirement benefits that have been earned to date under the traditional plan. Generally, this is equivalent to the Accumulated Benefit Obligation (ABO), since plan changes cannot reduce benefits that have already been earned.

Under the new plan established at Tom's company, each employee has a Personal Pension Account, which is to be initially credited with the present value of the employee's accumulated benefit under the old defined benefit plan.

As the employee continues working for the firm, the account is then credited annually with the company's contributions, which consist of:

(1) pay credits, equal to 5% of pay,

(2) transition credits, an addition ranging from one to four percent of pay, given to certain employees over age 40 or for whom the sum of their age and years of service exceeds 50, and

(3) interest credits, at the Treasury bill rate plus 1%.

At Tom's company, transition credits are an added benefit awarded to employees over 40 whose age and length of service combined total more than 50. They are optional and are usually used as an incentive for employees with longer tenure to elect the cash balance conversion.

Total of Age Plus Years of Service	Transition Credit
> 50	1%
> 55	2%
> 60	3%
> 65	4%

Because of the high sum of his age and years of service (67), Tom qualified for transition credits equal to four percent of his salary. However, the transition credits are paid only until the employee reaches the retirement eligibility age of 55—which is nine years for Tom.

The Personal Profile issued to Tom by the company specified that Tom's beginning balance for the cash balance plan (which in this case is equal to the ABO under the defined benefit plan) would be $78,339.

The Personal Profile indicates that the annual benefit that Tom had accrued at 9/1/06 (based on his twenty-one years of service and a five-year average salary of $110,580) was $33,672 per year. From these facts, you calculate that the company is projecting a twelve-year annuity, given the 6% discount rate disclosed in the company's annual report. Actuarial tables available from the government give Tom's expected mortality at age 80. From this you conclude that the company assumes that Tom will retire at age 68.

Other Factors

The company provides employees with information about the defined benefit formula, the accumulated benefit under the defined benefit plan, and the parameters which determine benefits under the cash balance conversion. The company does not offer employees a direct comparison of the two plans. Hence, the difference in benefits is not very clear to employees. You explain to Tom that, because both plans rely on numerous actuarial presumptions and unknown future rates, it will be necessary to make a number of assumptions so that you can compare his expected benefits under the two plans. In addition, you cannot easily factor into the comparison any potential changes in benefits that the employer might make.

Tom's annual salary is $110,000. In its annual report, the company discloses an average salary progression rate of three percent. Tom is not sure whether he will attain this level of increase. He is worried that he may only receive one or two percent because of his age and unwillingness to relocate.

REQUIRED

1. Confirm the calculation of the ABO and also calculate the PBO based on the company's assumptions. What happens to the ABO and the PBO if the company's assumed retirement age decreases from 68 to 65?

2. How can the defined benefit and cash balance plans effectively be compared?

3. What assumptions would you have to make in order to show Tom a direct comparison of the retirement benefits provided by the two plans?

4. How much do the assumptions affect the outcome? Do small changes in one or two assumptions change the results of the comparison? Which assumptions are most critical?

5. What other assumptions—financial or non-financial—might affect Tom's choice of plans?

6. How would you advise Tom?

SUBSEQUENTLY

After meeting with Tom to discuss your analysis, you are approached by a number of his colleagues who are seeking help in understanding the implications of this change in their retirement benefits. Some, like Tom, must respond one way or the other to the company's offer. Others are trying to see what the new plan means for their retirement income. Their pertinent salary and other information are contained in the table below.

Employee Name	Age	Years of Service	Current Base Salary	Average Salary Over Last Five Years	Anticipated Retirement Age	Expected Mortality	Expected Rate of Salary Increase
Marcus Anderson	27	6	45,000	40,129	68	77	3%
Matt Bradford	23	2	25,000	N/A	70	77	1%
Liu Wen Chen	36	8	57,000	50,830	68	82	3%
John Daurio	44	18	128,000	114,146	68	79	3%
James Finn	62	43	53,000	47,263	65	82	3%
Keisha Gibson	32	7	42,000	37,450	68	82	3%
Tanya Monson	24	1	28,000	N/A	71	82	2%
Sonia Nieves	53	27	82,000	73,100	68	83	3%
Jennifer Palmer	30	5	57,000	50,830	68	82	5%
Luis Rodriguez	42	10	97,000	86,500	68	78	3%
Davon Smith	58	30	76,000	67,774	65	81	3%
Han Su	54	17	165,000	147,140	60	80	5%
Susan Toussaint	29	10	34,000	30,320	62	82	3%
Jared Wilson	21	1	32,000	N/A	68	77	2%
Madeline Winston	47	9	102,000	90,960	65	83	3%

REQUIRED

7. Which employees qualify for transition credits and at what percentage?

8. Set up a spreadsheet that enables you to calculate the ABO for any employee of Tom's firm. The ABO should be calculated using the company's assumptions about retirement age for this group of employees (65) and discount rate (6%). The individual's specific estimated mortality should be used.

9. Develop a spreadsheet that enables you to make comparisons for any employee of Tom's firm who comes to you for assistance in the understanding the impact of the company's proposal. Make a table for these employees showing their annual benefit at retirement under the existing plan and under the cash balance conversion plan. Assume that they will continue to work for the company until retirement.

10. What is the impact of a change in the pay credit percentage? What if it rises to 7%? What happens if it is 3%?

11. Which employees should accept the conversion? What are the factors which make an employee better or worse off in choosing the cash balance plan? Can you create an employee profile which characterizes the employee who is better off with the conversion? What risks do they face associated with their choice?

12. Which employees should continue with the defined benefit plan? What are the factors which make an employee better or worse off in choosing the cash balance plan? Can you create an employee profile which characterizes the employee who is better off with the existing plan? What risks do they face associated with their choice?

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Other Resources

For information on Treasury bill rates, see
http://www.federalreserve.gov/datadownload/Choose.aspx?rel=H.15

For information on retirement ages, see
Social Security Online – Find Your Retirement Age
http://www.ssa.gov/retirechartred.htm

For information on mortality rates, see
United States Department on Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics National Vital Statistics System , National Vital Statistics Reports Volume 54 Number 14 United States Life Tables, 2003
http://www.cdc.gov/nchs/data/nvsr/nvsr54/nvsr54_14.pdf