

# SOLUTIONS MANUAL

TENTH  
EDITION

## RETIREMENT PLANS



401(k)s, IRAs, and Other  
Deferred Compensation  
Approaches

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## CHAPTER 3:

# DEFINED CONTRIBUTION VERSUS DEFINED BENEFIT PLANS

### Questions for Review

1. Describe the factors that will determine an employee's retirement benefit under the defined contribution approach.  
Under the defined contribution approach, the employer's contribution is fixed and an employee's benefit becomes the variable. The employee's retirement benefit will depend upon factors such as:
  - a. Age at entry
  - b. Retirement age
  - c. Investment earnings or losses
  - d. The level of the employer's contribution
2. Explain the primary advantages of a defined benefit plan.  
The primary advantages of a defined benefit plan are:
  - a. A defined benefit plan can be structured to achieve specific income replacement objectives
  - b. A defined benefit plan can be integrated more easily with Social Security benefits; defined contribution plans are forced to adjust contribution levels if integration is desired
  - c. Unlike a defined contribution plan that frequently pays the entire account balance in the event of death or disability, a defined benefit plan uses available funds more efficiently by avoiding these lump-sum distributions
  - d. A defined benefit plan may result in an equitable allocation of employer contributions since the employee's age, past service and pay all may be taken into account implicitly
  - e. The risk of preretirement inflation may be transferred from the employee to the employer by relating the benefit to the employee's final pay
  - f. The investment risk will be borne by the employer, not the employee, in a defined benefit plan.
  - g. Termination benefits tend to be less costly under a defined benefit plan.
3. Explain the primary advantages of a defined contribution plan.  
The primary advantages of a defined contribution plan are:
  - a. Deferred profit sharing plans offer employers maximum flexibility in terms of cost commitment as well as opportunities to increase employee productivity
  - b. Through the use of employer securities as a plan investment, greater employee identification with the company and its goals can be achieved
  - c. If the employee group covered is relatively young, the defined contribution plan is apt to have greater employee relations value than a defined benefit plan.
4. Explain the ways in which the federal government has encouraged the defined contribution approach.  
The federal government has encouraged the defined contribution approach in several ways. For example:

- a. Provisions of the Internal Revenue Code encourage the use of defined contribution plans for employees of educational and other nonprofit organizations
- b. The individual retirement arrangement concept is totally a defined contribution approach.
- c. The defined contribution approach is mandatory for SEPs, SIMPLEs, ESOPs, and Section 401(k) cash/deferred profit sharing or savings plans.

5. Explain how the 1983 Social Security amendments might affect use of the defined benefit approach.

The 1983 Social Security amendments gradually change the normal retirement age for Social Security benefits from 65 to 67. These changes will further erode the idea that age 65 is a typical retirement age. If retirement becomes spread over a wider range of ages, it will become increasingly difficult to maintain a plan design structure that is predicated on the majority of employees retiring at age 65 and the coordination of two income sources at this point.

## Questions for Discussion

1. The text states that in the view of some, a more equitable allocation of employer contributions occurs under a defined benefit plan than under a defined contribution plan. Assume that a participant in a defined benefit pension plan, age 25, is currently paid \$15,000 per year and he or she will retire at age 65. At that time, he or she will receive a pension benefit equal to 1 percent of his or her average salary in the last five years, times years of service. Compute the present value of the pension benefit accrued from working an additional year, as a percentage of the participant's compensation, at ages 30, 35, 40, 45, 50, 55, 60, and 64. Perform the calculations under two sets of assumptions: (a) the participant has no wage growth and the discount rate is 3 percent; and (b) the participant's wage growth is 7 percent and the discount rate is 10 percent. Graph the change in the present value of accrued benefits from an additional year's work (expressed as a percentage of compensation) against the participant's age under both scenarios. What conclusions can you draw about the allocation of employer contributions under defined benefit plans? (Notice that the discount rate exceeds the wage growth by 3 percent under both scenarios.)

The first thing that an observant student will notice is that there is a need to convert the annual benefits from a defined benefit pension plan into a present value at retirement age. This concept is explored in more detail later in this text, and since the objective of the current chapter is to explore the inherent differences between defined benefit and defined contribution plans, there is no attempt to complicate the calculations with a technically accurate calculation. The assumption in the calculations provided below is that all participants will survive to age 65 and live exactly 10 more years. Moreover, the pension benefits will be paid at the beginning of each year. The present value of each dollar of annual benefit at retirement age for discount rates of 3 and 10 percent, respectively, can be calculated as shown in Table 3-1. Under these assumptions, \$1 of annual retirement benefits beginning at 65 would be worth \$8.79 when discounted at 3 percent and \$6.76 at 10 percent.

The change in the present value of accrued benefits from an additional year's work is calculated for both the no wage growth (columns 2-6) and the 7 percent wage growth (columns 7-12) scenarios in Table 3-2.<sup>1</sup> The values are graphed at five-year intervals in Figure 3-1.

It is obvious from the results that the defined benefit pension plan allocates a larger portion of employer contributions to older employees when expressed as a percentage of compensation and that this phenomenon becomes more pronounced when the inflation rate increases.

2. Prepare a graph similar to the ones created in the preceding question for an employee participating in a defined contribution plan providing a contribution of 6 percent of compensation, and compare your results with the previous graphs. What conclusions can you draw about the allocation of employer contributions under a defined contribution plan vis-a'-vis those of a defined benefit plan? What implications do these conclusions present for the retention of older employees?

The results for this question are superimposed on Figure 3-1. It is obvious that the defined contribution plan in this question would be preferred by younger employees. The cross-over point for an employee starting at age 25 occurs between ages 51 and 54, depending on the rate of wage growth. After that point the defined benefit plan is more advantageous for the employee and hence more costly for the employer. *Cet. par.*, this would imply that older employees would be more costly to retain for employers sponsoring defined benefit pension plans.

3. Assume that you are an employee, age 25, and you are given your choice of participating either in the defined benefit plan described in Question 1 or the defined contribution plan described in Question 2. Which one would you prefer? Describe how you made the evaluation and any assumptions required.

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<sup>1</sup>The marginal change in the present value from working an additional year (columns 5 and 11) in year  $t$  is defined as the present value in year  $t+1$  minus the present value in year  $t$  accumulated at the discount rate for one year.

For simplicity, the assumptions used in Question 1 will be retained for this question. The student should realize that even though cross-over points exist for the marginal change in value when defined benefit and defined contribution plans were compared in the previous question, the appropriate comparison for this analysis is the present value of the defined benefit plan at a particular age with the accumulated value of the defined contribution account balance. It was assumed that the defined contribution pension plan assets would accumulate at the same rate used to discount the defined benefit present values. Figures 3-2 and 3-3 show the results for the two wage growth scenarios. It is obvious under the assumptions used in this analysis that the employee would always have a larger value under the defined contribution plan. Therefore, the employee should prefer the defined contribution plan with a 6 percent contribution rate over a five-year final-average plan providing an annual benefit of 1 percent of average salary per year of service.

Table 3-1

Table 3-1

	AGE	PRESENT VALUE	
		3%	10%
	65	1	1
	66	0.970873	0.909090
	67	0.942595	0.826446
	68	0.915141	0.751314
	69	0.888487	0.683013
	70	0.862608	0.620921
	71	0.837484	0.564473
	72	0.813091	0.513158
	73	0.789409	0.466507
	74	0.766416	0.424097
<b>SUM</b>		8.786108	6.759023

Table 3-2

Table 3-2

1	0% inflation, 3% discount						7% inflation, 10% discount					
	2	3	4	5	6	7	8	9	10	11	12	
age	wage	annual benefit	present value	marginal change	pctg of wage	wage	5-year average	annual benefit	present value	marginal change	pctg of wage	
25	15,000.00	0.00	0.00	416.14	0.028	15,000.00	NA	0.00				
26	15,000.00	150.00	416.14	428.62	0.029	16,050.00	NA	150.00				
27	15,000.00	300.00	857.24	441.48	0.029	17,173.50	NA	300.00				
28	15,000.00	450.00	1,324.44	454.73	0.030	18,375.65	NA	450.00				
29	15,000.00	600.00	1,818.90	468.37	0.031	19,661.94	NA	600.00				
30	15,000.00	750.00	2,341.83	482.42	0.032	21,038.28	17,252.22	862.61	207.47	64.81	0.003	
31	15,000.00	900.00	2,894.50	496.89	0.033	22,510.96	18,459.87	1,107.59	293.03	80.05	0.004	
32	15,000.00	1,050.00	3,478.22	511.80	0.034	24,086.72	19,752.08	1,382.64	402.38	98.64	0.004	
33	15,000.00	1,200.00	4,094.37	527.15	0.035	25,772.79	21,134.71	1,690.78	541.26	121.31	0.005	
34	15,000.00	1,350.00	4,744.35	542.97	0.036	27,576.89	22,614.14	2,035.27	716.69	148.91	0.005	
35	15,000.00	1,500.00	5,429.64	559.26	0.037	29,507.27	24,197.13	2,419.71	937.28	182.49	0.006	
36	15,000.00	1,650.00	6,151.78	576.04	0.038	31,572.78	25,890.93	2,848.00	1,213.49	223.28	0.007	
37	15,000.00	1,800.00	6,912.37	593.32	0.040	33,782.87	27,703.29	3,324.39	1,558.12	272.80	0.008	
38	15,000.00	1,950.00	7,713.05	611.12	0.041	36,147.68	29,642.52	3,853.53	1,986.74	332.85	0.009	
39	15,000.00	2,100.00	8,555.55	629.45	0.042	38,678.01	31,717.50	4,440.45	2,518.26	405.62	0.010	
40	15,000.00	2,250.00	9,441.66	648.33	0.043	41,385.47	33,937.72	5,090.66	3,175.71	493.72	0.012	
41	15,000.00	2,400.00	10,373.24	667.78	0.045	44,282.46	36,313.36	5,810.14	3,987.00	600.29	0.014	
42	15,000.00	2,550.00	11,352.21	687.82	0.046	47,382.23	38,855.30	6,605.40	4,965.99	729.13	0.015	
43	15,000.00	2,700.00	12,380.59	708.45	0.047	50,698.98	41,575.17	7,483.53	6,213.72	884.76	0.017	
44	15,000.00	2,850.00	13,460.45	729.70	0.049	54,247.91	44,485.43	8,452.23	7,719.85	1,072.65	0.020	
45	15,000.00	3,000.00	14,593.97	751.60	0.050	58,045.27	47,599.41	9,519.88	9,564.49	1,299.34	0.022	
46	15,000.00	3,150.00	15,783.37	774.14	0.052	62,108.44	50,931.37	10,695.59	11,820.28	1,572.66	0.025	
47	15,000.00	3,300.00	17,031.01	797.37	0.053	66,456.03	54,486.57	11,989.24	14,574.96	1,902.03	0.029	
48	15,000.00	3,450.00	18,339.30	821.29	0.055	71,107.95	58,311.33	13,411.60	17,934.49	2,298.73	0.032	
49	15,000.00	3,600.00	19,710.77	845.93	0.056	76,085.50	62,393.12	14,974.35	22,026.68	2,776.28	0.036	
50	15,000.00	3,750.00	21,148.01	871.30	0.058	81,411.49	66,760.64	16,690.16	27,005.62	3,350.86	0.041	
51	15,000.00	3,900.00	22,653.75	897.44	0.060	87,110.29	71,433.88	18,572.81	33,057.04	4,041.86	0.046	
52	15,000.00	4,050.00	24,230.80	924.37	0.062	93,208.01	76,434.25	20,637.25	40,404.60	4,872.50	0.052	
53	15,000.00	4,200.00	25,882.08	952.10	0.063	99,732.58	81,784.65	22,899.70	49,317.58	5,870.55	0.059	
54	15,000.00	4,350.00	27,610.63	980.66	0.065	106,713.86	87,509.58	25,377.78	60,119.87	7,069.27	0.066	
55	15,000.00	4,500.00	29,419.61	1,010.08	0.067	114,183.83	93,635.25	28,090.57	73,201.12	8,508.41	0.075	
56	15,000.00	4,650.00	31,312.27	1,040.38	0.069	122,176.69	100,189.71	31,058.81	89,029.64	10,235.54	0.084	
57	15,000.00	4,800.00	33,292.01	1,071.59	0.071	130,729.06	107,202.99	34,304.96	108,168.15	12,307.51	0.084	
58	15,000.00	4,950.00	35,362.36	1,103.74	0.074	139,890.10	114,707.20	37,853.38	131,292.47	14,792.28	0.106	
59	15,000.00	5,100.00	37,526.96	1,136.86	0.076	149,671.70	122,736.71	41,730.48	159,214.00	17,771.09	0.119	
60	15,000.00	5,250.00	39,789.62	1,170.96	0.078	160,148.72	131,328.28	45,964.90	182,906.49	21,340.97	0.133	
61	15,000.00	5,400.00	42,154.26	1,206.09	0.080	171,359.13	140,521.26	50,587.65	233,538.11	25,617.83	0.149	
62	15,000.00	5,550.00	44,624.97	1,242.27	0.083	183,354.27	150,357.74	55,632.37	282,509.75	30,740.12	0.168	
63	15,000.00	5,700.00	47,205.98	1,279.54	0.085	196,189.07	160,882.79	61,135.46	341,500.84	36,873.10	0.188	
64	15,000.00	5,850.00	49,901.89	1,317.93	0.088	209,922.31	172,146.58	67,146.39	412,524.03	44,214.11	0.211	
65	15,000.00	6,000.00	52,716.65			224,616.87	184,194.70	73,677.88	497,990.55			

Figure 3-1

Chapter 4: Discussion Questions 1 and 2  
Value of an additional year's work

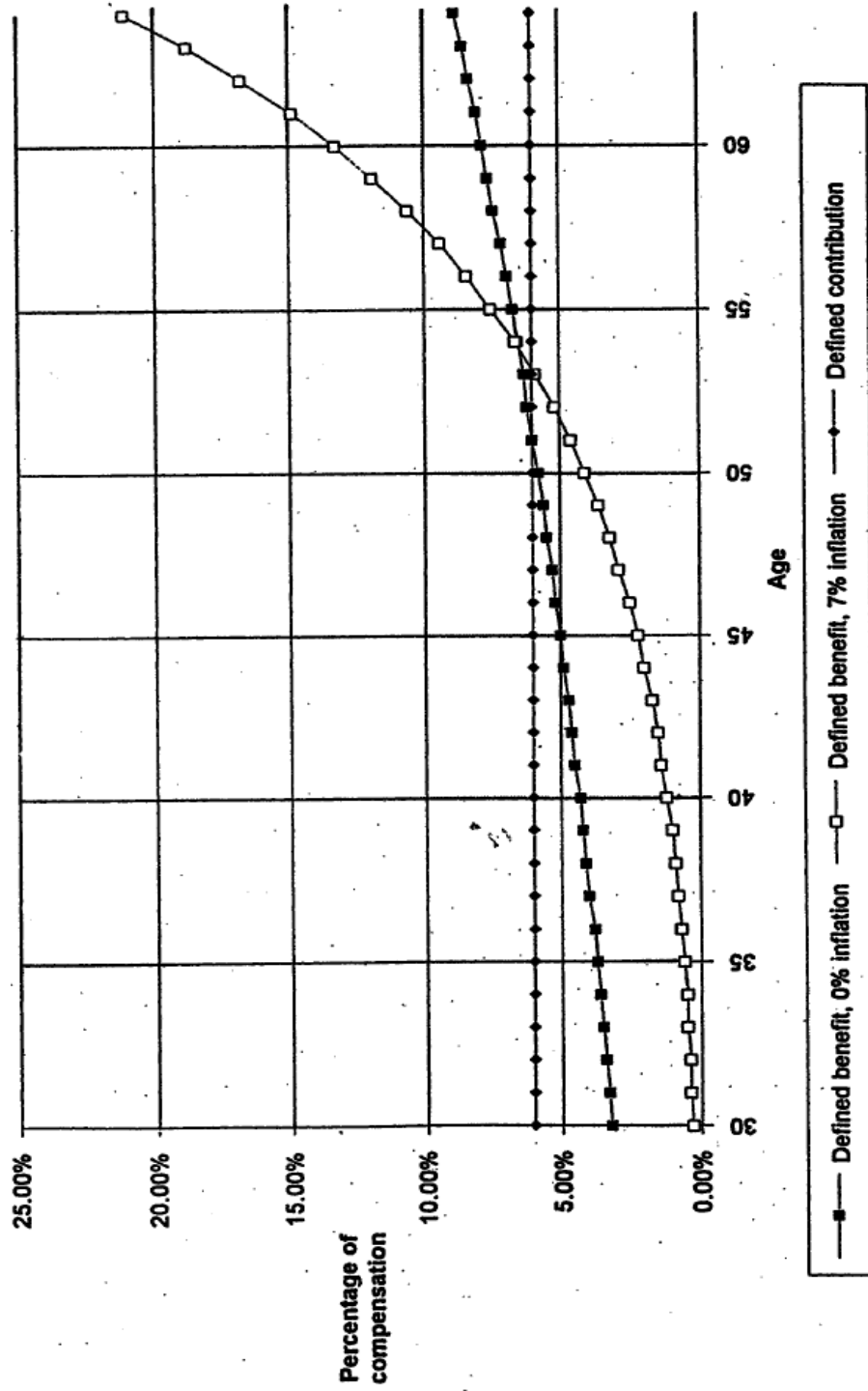


Figure 3-2

Chapter 3: Discussion Question 3  
Defined benefit vs. defined contribution: no growth

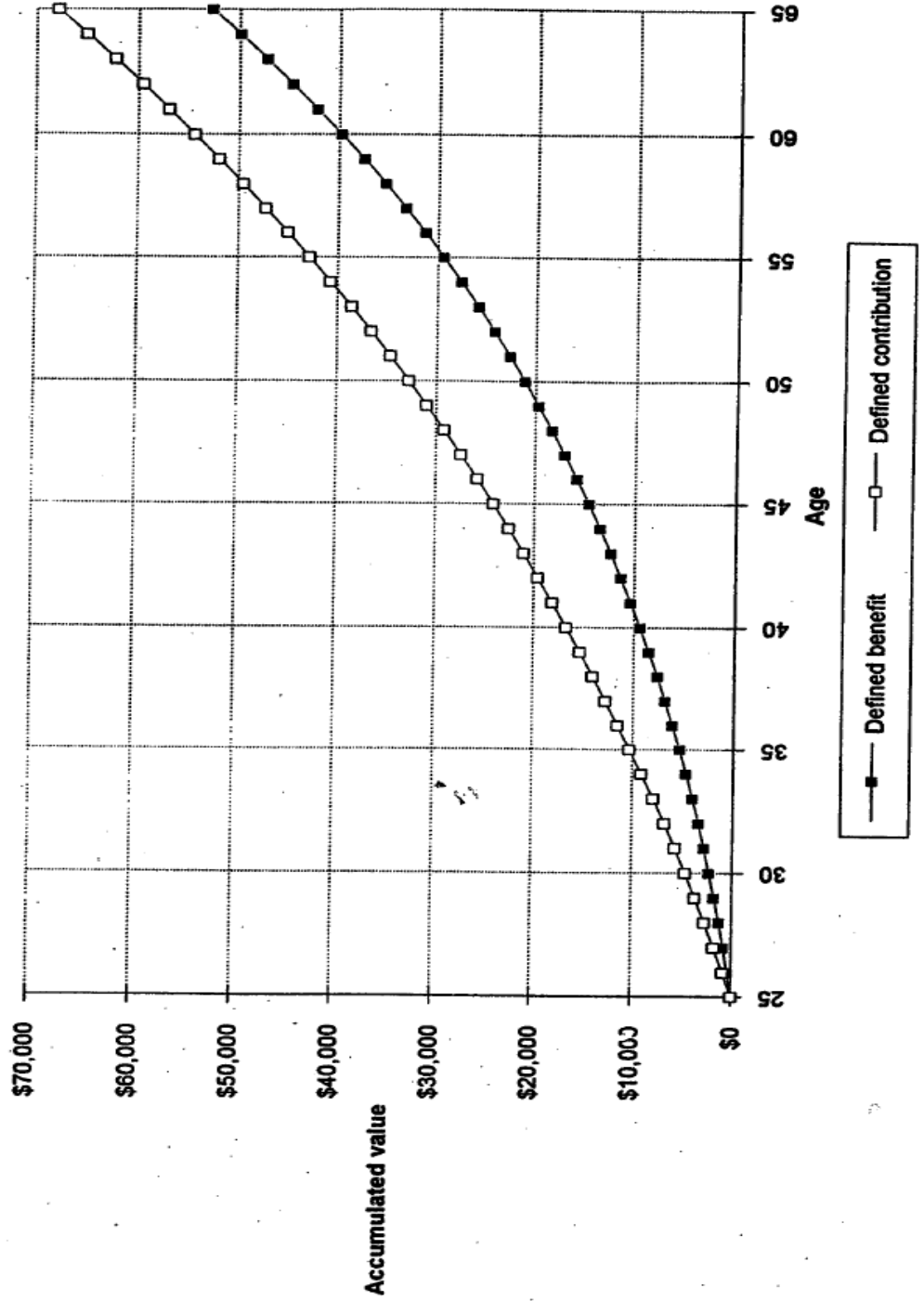




Figure 3-3

Chapter 3: Discussion Question 3  
Defined benefit vs. defined contribution: 7% wage growth

