

Exam RETRPIRM

Date: Thursday, November 4, 2021

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 7 questions numbered 1 through 7 with a total of 40 points.

The points for each question are indicated at the beginning of the question.

2. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions provided in this document.

Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel file as directed. Graders will only look at work in the indicated file.
 - a) In the Word document, answers should be entered in the box marked ANSWER. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example, β_1 can be typed as beta_1 (and ^ used to indicate a superscript).
 - b) In the Excel document formulas should be entered. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.
2. The answer should be confined to the question as set.
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your five-digit candidate number in the filename.
4. The Word and Excel files that contain your answers must be uploaded before the five-minute upload period expires.

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Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:



1.

(8 points) Company XYZ is considering adding the following alternative asset classes to its defined benefit pension plan assets:

- (i) Private market assets
- (ii) Hedge funds

(a) (3 points) Describe the advantages of investing the assets of a defined benefit pension plan in these alternative asset classes.

ANSWER:

(b) (2 points) Describe the challenges posed by the illiquidity of such alternative investments.

ANSWER:

(c) (3 points) Describe why investment manager selection is important when considering investing in these alternative asset classes.

ANSWER:

2.

(7 points) You are given the following information for Member A's defined contribution pension plan account:

Starting Salary	\$70,000
Bonus target	10% of salary
Bonus payment	At target
Salary increases	3% per year
Withdrawals	None
Contribution timing	End of year

\$100,000 was transferred into the account on the day Member A started working.

2. Continued

You are given the following account balances:

Year	Beginning of Year Balance
0	\$ 100,000
1	\$ 108,840
2	\$ 107,245
3	\$ 116,076
4	\$ 130,997
5	\$ 139,667
6	\$ 145,737
7	\$ 154,119
8	\$ 151,578
9	\$ 159,248
10	\$ 172,197
11	\$ 181,078
12	\$ 190,749
13	\$ 189,050
14	\$ 197,751
15	\$ 187,612
16	\$ 202,823
17	\$ 225,586
18	\$ 252,108
19	\$ 261,502
20	\$ 274,071
21	\$ 305,967
22	\$ 323,234
23	\$ 335,355
24	\$ 364,537
25	\$ 367,252

- (a) (3 points) Calculate the annualized time-weighted and money-weighted returns of Member A's account over the 25-year period.

The response for this part is to be provided in the Excel spreadsheet.

2. Continued

Member B started working on the same day, at the same starting salary, received the same bonus payments, had the same salary increases over his career and also transferred \$100,000 into his account when he started working.

Member B borrowed \$75,000 from his account at the end of year 9. He repaid the loan in 3 equal installments of \$25,000 at the end of years 14, 19 and 24.

You are given the following account balances:

Year	Beginning of Year Balance
0	\$ 100,000
1	\$ 108,840
2	\$ 107,245
3	\$ 116,076
4	\$ 130,997
5	\$ 139,667
6	\$ 145,737
7	\$ 154,119
8	\$ 151,578
9	\$ 159,248
10	\$ 97,197
11	\$ 104,668
12	\$ 112,712
13	\$ 114,158
14	\$ 121,855
15	\$ 143,045
16	\$ 156,197
17	\$ 175,277
18	\$ 197,433
19	\$ 206,340
20	\$ 242,811
21	\$ 271,934
22	\$ 288,150
23	\$ 299,828
24	\$ 326,797
25	\$ 345,252

2. Continued

- (b) (2 points) Calculate the annualized time-weighted and money-weighted returns for Member B's account over the 25-year period.

The response for this part is to be provided in the Excel spreadsheet.

- (c) (2 points) Explain in words why the time-weighted and money-weighted returns are different.

ANSWER:

3.

(6 points) You are given the following excerpt from the Investment Policy Statement (IPS) for the ABC Company Retirement Plan:

Plan Type	Defined benefit with ongoing accruals
Number of participants	Active – 4,000 Retired – 8,000
Composition of liability	Active – 25% of liability Retired – 75% of liability
Funded Percentage	55% using 7.25% discount rate
Trustee	ABC Retirement Board
Investment Manager	ABC Retirement Board
Performance benchmarks	Total fund return
Rebalancing	Asset allocation will be reviewed semi-annually

Asset Allocation

Asset class	Target	Minimum exposure	Maximum exposure
Large Cap public equity	43%	38%	48%
Corporate bonds	26%	20%	30%
Cash	2%	0%	3%
Real estate	9%	5%	12%
Hedge funds and private equity	20%	6%	20%

- (a) (3 points) Critique the above elements of the IPS.

ANSWER:

- (b) (3 points) Recommend changes to the IPS. Confine your recommendations to the elements provided above.

Justify your recommendations.

ANSWER:

4.

(6 points) Assess the features of the accounting standards applicable to the following types of defined benefit pension plans according to the principles of financial economics:

- (a) (3 points) Private sector plans.

ANSWER:

- (b) (3 points) Public sector plans.

ANSWER:

5.

(5 points) Company XYZ sponsors a defined benefit pension plan that provides cost-of-living adjustments (COLA) based on inflation. You are given the current spot rates and projected benefit payments below:

Year	Spot Rates	
	Inflation	Nominal Rates
0	2.00%	2.00%
1	2.00%	2.50%
2	2.00%	2.70%
3	2.00%	2.90%
4	2.00%	2.97%
5	2.00%	3.03%
6	2.00%	3.10%
7	2.00%	3.17%
8	2.00%	3.23%
9	2.00%	3.30%
10	2.00%	3.33%
11	2.00%	3.37%
12	2.00%	3.40%
13	2.00%	3.43%
14	2.00%	3.47%
15	2.00%	3.50%
16	2.00%	3.53%
17	2.00%	3.57%
18	2.00%	3.60%
19	2.00%	3.60%
20	2.00%	3.61%
21	2.00%	3.61%
22	2.00%	3.62%
23	2.00%	3.62%
24	2.00%	3.63%
25	2.00%	3.63%
26	2.00%	3.64%
27	2.00%	3.64%
28	2.00%	3.65%
29	2.00%	3.66%
30	2.00%	3.66%

Plan Cash Flows		
Inflation	Inflation	Inflation
-100bps	2.00%	+100bps
759,992	759,992	759,992
799,452	811,626	825,829
857,628	870,688	885,925
901,560	915,289	931,307
943,298	957,663	974,422
992,757	1,007,875	1,025,513
1,029,821	1,045,504	1,063,800
1,084,301	1,100,813	1,120,077
1,116,390	1,133,391	1,153,225
1,141,927	1,159,317	1,179,605
1,173,979	1,191,857	1,212,714
1,205,481	1,223,839	1,245,256
1,237,127	1,255,967	1,277,946
1,262,633	1,281,861	1,304,294
1,297,493	1,317,252	1,340,304
1,327,589	1,347,806	1,371,393
1,347,973	1,368,500	1,392,449
1,375,980	1,396,934	1,421,380
1,396,943	1,418,216	1,443,035
1,402,336	1,423,691	1,448,606
1,407,796	1,429,235	1,454,247
1,427,531	1,449,270	1,474,632
1,423,129	1,444,801	1,470,085
1,409,436	1,430,899	1,455,940
1,386,979	1,408,101	1,432,743
1,366,758	1,387,572	1,411,855
1,346,350	1,366,853	1,390,773
1,321,711	1,341,839	1,365,321
1,279,040	1,298,518	1,321,242
1,232,551	1,251,321	1,273,219
1,185,048	1,203,094	1,224,148

5. Continued

Year	Spot Rates	
	Inflation	Nominal Rates
31	2.00%	3.67%
32	2.00%	3.67%
33	2.00%	3.68%
34	2.00%	3.68%
35	2.00%	3.69%
36	2.00%	3.69%
37	2.00%	3.70%
38	2.00%	3.71%
39	2.00%	3.70%
40	2.00%	3.70%
41	2.00%	3.70%
42	2.00%	3.70%
43	2.00%	3.70%
44	2.00%	3.70%
45	2.00%	3.70%
46	2.00%	3.70%
47	2.00%	3.70%
48	2.00%	3.70%
49	2.00%	3.70%

Plan Cash Flows		
Inflation	Inflation	Inflation
-100bps	2.00%	+100bps
1,133,931	1,151,199	1,171,345
1,078,922	1,095,352	1,114,521
1,022,386	1,037,955	1,056,119
963,429	978,100	995,217
903,784	917,547	933,604
843,190	856,030	871,011
781,845	793,751	807,642
721,542	732,530	745,349
662,160	672,244	684,008
604,115	613,315	624,048
547,792	556,134	565,866
493,541	501,057	509,825
441,590	448,315	456,161
392,131	398,103	405,070
345,374	350,634	356,770
301,539	306,131	311,488
260,786	264,757	269,390
223,246	226,646	230,612
189,043	191,922	195,281

- (a) (3 points) Calculate the effective duration of the plan under the following scenarios:
- (i) 100 basis point change in inflation and real interest rates remain constant.
 - (ii) 100 basis point change in real rates and inflation remains constant.

The response for this part is to be provided in the Excel spreadsheet.

5. Continued

- (b) (2 points) Describe the assets that can be used to hedge inflation-linked pension liabilities.

ANSWER:

6.

(4 points)

- (a) *(2 points)* Describe the advantages of pension guarantee schemes for the following:
- (i) Sponsors of defined benefit pension plans; and
 - (ii) Members of defined benefit pension plans.

ANSWER:

- (b) *(2 points)* Describe the challenges that pension guarantee schemes face.

ANSWER:

7.

(4 points) Describe the following responsible investment strategies:

- (i) Positive and negative screenings;
- (ii) Economically targeted investments;
- (iii) Shareholder advocacy; and
- (iv) Environmental, social and governance (ESG) investments.

ANSWER:

****END OF EXAMINATION****