RET RPIRM Model Solutions
Fall 2022

1. **Learning Objectives:**

2. The candidate will recognize and appropriately reflect the role of plan investments in managing plan sponsor risk and make recommendations.

Learning Outcomes:

(2d) Apply and evaluate strategies and techniques for asset/liability management.

(2e) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks.

Sources:

RPIRM-148-17: Key Rate Durations: Measures of Interest Rate Risks

Commentary on Question:

The question was trying to test if the candidate understood the use of key rates and if the candidate could calculate the effect of a yield curve change on liabilities and assets provided the key rates were available. In part c), many candidates described characteristics of bonds with embedded options as opposed to describing the effect of the use of bonds with embedded option in a liability-driven investment strategy.

Solution:

(a) Describe four uses of key rate durations.

- to identify the price sensitivity of a bond to each segment of the yield curve.
- to create a replicating portfolio of a bond with embedded options using zero-coupon bonds
- to quantify interest rate bets for the manager.
- to provide a procedure to control interest rate risk exposure.

(b) Calculate the effect of the following yield curve shifts, provided in basis points (bps), on the plan's financial position:

	D1	D2	D3	D4	D5
Shift 1	+50 bps	+50 bps	+50 bps	+50 bps	+50 bps
Shift 2	0 bps	+5 bps	+10 bps	+15 bps	+25 bps
Shift 3	-25 bps	-10 bps	0 bps	-10 bps	-25 bps

1. Continued

Commentary on Question:
In addition to the answer below, candidates that used exponential interpolation to quantify the effect of the yield curve shifts received full credit. The effect on the plan's financial position could be given in dollars or percentage.

Effect of shift 1: Shift 1 is a parallel shift. Since the assets equal the liabilities, and both have the same effective duration, there is no impact on the financial position.

Effect of shift 2:

The impact on the liability is the sum of the following:

-0.0005 x 1.5 x 66,000,000 =	(49,500)
-0.0010 x 2.5 x 66,000,000 =	(165,000)
-0.0015 x 4.0 x 66,000,000 =	(396,000)
-0.0025 x 7.0 x 66,000,000 =	(1,155,000)
Grand total of	(1,765,500)

The impact on the assets is the sum of the following:

-0.0005 x 2.0 x 66,000,000 =	(66,000)
-0.0010 x 3.0 x 66,000,000 =	(198,000)
-0.0015 x 4.0 x 66,000,000 =	(396,000)
-0.0025 x 5.0 x 66,000,000 =	(825,000)
Grand total of	(1,485,000)

The impact on the financial position was (1,485,000) – (1,765,500) = 280,500

Effect of shift 3:

The impact on the liability is the sum of the following:

-(0.0025) x 1.0 x 66,000,000 =	165,000
-(0.0010) x 1.5 x 66,000,000 =	99,000
-(0.0010) x 4.0 x 66,000,000 =	264,000
-(0.0025) x 7.0 x 66,000,000 =	1,155,000
Grand total of	1,683,000

The impact on the assets is the sum of the following:

-(0.0025) x 2.0 x 66,000,000 =	330,000
-(0.0010) x 2.0 x 66,000,000 =	132,000
-(0.0010) x 4.0 x 66,000,000 =	264,000
-(0.0025) x 5.0 x 66,000,000 =	825,000
Grand total of	1,551,000

The impact on the financial position was 1,551,000 – 1,683,000 = (132,000)

1. Continued

(c) Company XYZ is considering adjustments to its liability-driven investment strategy by investing in bonds with embedded options.

Describe the impact this may have on duration matching.

- Bonds with embedded options can have very different interest rate risk profiles compared to plain-vanilla bonds.
- For instance, a callable bond and plain-vanilla bond with the same term can have significantly different effective durations.
- Even if a bond portfolio with embedded options is selected with effective duration matching that of the liabilities, the duration match should be further analyzed using key rate duration to understand the composition of the risk along the yield curve.
- Key rate duration analysis shows that bonds with embedded options may actually have negative duration at some key rates.

2. Learning Objectives:

2. The candidate will recognize and appropriately reflect the role of plan investments in managing plan sponsor risk and make recommendations.

3. The candidate will understand how to evaluate the stakeholders' financial goals and risk management with respect to their plan.

Learning Outcomes:

(2d) Apply and evaluate strategies and techniques for asset/liability management.

(2e) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks.

(3b) Describe how the retirement plan financial and design risks integrate with the sponsor's risk management strategy.

(3f) Provide advice and analysis to plan sponsors and other stakeholders regarding the mitigation of pension plan risks.

Sources:

RPIRM-138-16, RPIRM-149-17 & RPIRM-152-18

Commentary on Question:

Candidates generally did well on this question, however many failed to ***Compare*** *and to* ***Contrast*** *the two strategies in part a); they rather described them.*]

This question was designed to test comprehension of different pension plan risk mitigation strategies.

In part a), the key was to be able to illustrate where the two strategies differed and where they were similar. A few similarities and differences were enough to receive full marks.

In part b), the main thing was to describe three ***key*** *or* ***important*** *considerations of the design phase for the strategy. At least five different considerations were considered as "key" and produced full marks.*

Solution:

(a) Compare and contrast the following strategies for a single employer pension plan:

(i) An immunization investment strategy

(ii) Purchasing buy-in annuities

2. Continued

Compare
For both strategies:

- The plan will be protected against interest rate risk
- The plan administration will remain a responsibility of the plan sponsor
- Settlement accounting will not be triggered

Contrast

- Purchasing buy-in annuities will also protect against market risk and longevity risk, while immunization will not.
- The immunization strategy may create downgrade and default risks, while purchasing buy-in annuities may create counterparty and contractual risks.
- The immunization strategy generally has a high cost (design, implementation, transaction, and strategy management), while purchasing buy-in annuities generally has lower cost (one-time consulting fee for organizing bid).

(b) Describe three key considerations when designing an investment glide path strategy for a single employer pension plan.

Clear determination of the end state:

- should reflect the plan sponsor's strategic objectives
- usually long-term economic sustainability (open plans) or plan termination (closed or frozen plans)
- will typically be associated with a risk profile that best supports the long-term objective

Appropriate trigger points:

- The triggers that will drive the de-risking process should be consistent with end-state objectives.
- The most common triggers are interest rate levels, interest rate spreads, funded status, plan maturity, and time.

Trigger distance and monitoring frequency:

- The distance between triggers and the frequency at which they will be monitored are very important practical considerations.
- If the increments between triggers are too small, the glide path could induce an unnecessarily large number of trades, resulting in excessive transaction costs.
- Conversely, if the increments are too large, good opportunities to capture small gains could be missed.

3. **Learning Objectives:**

1. The candidate will understand the issues facing retirement plan sponsors regarding investment of fund assets.

Learning Outcomes:

(1a) Assess the different types and combinations of investment vehicles for providing retirement benefits given the particulars of the stakeholders' financial circumstances, philosophy, industry, work force and benefit package.

(1b) Distinguish the various strategies, approaches and techniques used to manage retirement fund assets.

Sources:

Ch. 27 & 28 Fundamentals of Private Pensions, McGill, Dan, 9th Edition, 2010

Commentary on Question:

Governance is a critical part of DB and DC plan management. This question was designed to test candidates' understanding of what a good governance structure looks like and how it can be used to enhance the value of these plans to participants and to other stakeholders.

Solution:

(a) Describe how addressing the following elements in a defined benefit governance structure can create value for stakeholders:

(i) Investment beliefs

(ii) Risk management

(iii) Investment time horizon

(iv) Mission

(v) Agency issues

Commentary on Question:

Many candidates struggled with this part of the question. The most common error was a misunderstanding of the difference between "stakeholders" and "stockholders." Candidates who made this error often attempted to answer the question from a financial economics perspective rather than with a governance mindset.

3. **Continued**

(i) There are several primary sources that can be targeted to generate investment return above the LDI portfolio. These sources can include equity risk, credit risk, liquidity risk, and/or manager skill risk. Investment beliefs add value through defining which sources of return are appropriate for the plan and how to allocate the risk budget across the acceptable sources.

(ii) To create long-term value, a plan must allocate appropriate levels of investment risk across both the LDI and value-creating investment segments. A solid governance structure takes the funded status of the plan and strength of the plan sponsor into account when determining the allocation. To aid with effective risk management, tools such as stress-testing and risk-budgeting can be used.

(iii) Pension funds are generally long-term investors, but corporate or IRS requirements may lead to a desire for a shorter-term investment focus. A DB governance structure can help to manage this conflict of time horizons, balancing the long-term growth goals with shorter-term volatility management and/or liquidity constraints.

(iv) Mission is a critical part of governance as it provides clearly defined goals to which all stakeholders are committed and aligned. A strong covenant offers a framework for determining appropriate investment risks and strategies as decisions around these topics arise.

(v) Good governance establishes clear boundaries and controls allowing for management of principal-agent conflicts. It is very common for there to be misalignment of interests between principals (fiduciaries) and agents retained to provide services to the plan, however, the risk can be significantly reduced through governance.

(b) Defined contribution plan governance should address the structural flaws that make these plans less efficient than defined benefit plans at delivering retirement financial security.

Describe three of these flaws.

Commentary on Question:
Most candidates scored well on this section. Those who were able to identify the structural flaws were typically also able to provide sufficient description, leading to full credit for this portion of the question.

3. Continued

There are three primary structural flaws that defined contribution (DC) plans experience relative to their DB counterparts:

1. Many employees lack sufficient time or skill to make the complex investment decisions that can be required to achieve an adequate investment return on a DC portfolio. Even if an employee contributes to the plan at an appropriate level to produce the desired income replacement ratio, if too much (or too little) risk is taken within the portfolio, the replacement ratio may still not be achieved.

2. Many plans offer a sub-optimal investment option lineup. There can be fee structures (such as for actively managed options) that are not in the participants' best interests, incorrectly designed Target Date Funds, or a lineup of options that either provides too many or too few choices for employees to achieve optimal outcomes.

3. As DC plans gradually become the primary source of retirement income for new retirees, there has been increasing concern about the plans' lack of a lifetime income option. Unlike a DB plan, which can nearly eliminate the risk of participants outliving their retirement funds, DC participants are often left to manage their entire retirement based on a single account balance. Many DC plans do not provide an adequate lifetime income option for participants.

4. **Learning Objectives:**

3. The candidate will understand how to evaluate the stakeholders’ financial goals and risk management with respect to their plan.

Sources:
Corporate Pension Risk Management and Corporate Finance: Bridging the Gap between Theory and Practice in Pension Risk Management

Commentary on Question:
Commentary listed underneath question component.

Solution:

(a) Recommend an approach to consolidating pension positions into a balance sheet analysis that is appropriate on an economic basis.

Justify your recommendation.

Commentary on Question:
Candidates generally did well in this part. Those that did not do well generally did not explain why one approach was better than the other.

-Holistic balance sheet approach is appropriate for economic basis.
- Including just the net pension obligation does not reflect the risk of pension plan investment.
- Including just the net pension obligation does not adequately account for the size of the pension plan relative to operating part of business.

(b) Calculate the debt to equity ratios, long-term debt to equity ratios and asset to equity ratios for each Company by filling out the table in Excel.

($ millions)	Total Asset	Total Liability	Equity	Long-term debt	Pension asset	PBO
Company A	50.50	40.60	9.90	20.10	6.57	8.70
Company B	200.30	160.40	39.90	30.20	30.60	27.80
Company C	10.50	9.80	0.70	0.50	0.42	0.29
Company D	800.80	600.90	199.90	150.90	240.24	210.32
Company E	100.70	90.20	10.50	10.70	5.04	5.61

Commentary on Question:
This part tests the holistic corporate balance sheet. The areas where candidates struggled the most were Adjusted Pension Asset and Adjusted Pension Liabilities. They did not adequately account for the buyout liability for all companies, pension buyout for Company B and the hedge against interest rate risk for Company D.

4. Continued

Pension deficit	Adjusted pension asset	Adjust pension liabilities	Adjusted pension deficit	Adjusted total asset	Adjusted total liabilties	Adjusted long term debt	Debt to equity ratio	Long term debt to equity ratio	Asset to equity ratio
-2.14	6.57	9.57	-3.01	57.07	52.31	29.67	5.28	3.00	5.76
2.80	0.00	0.00	0.00	200.30	157.60	30.20	3.95	0.76	5.02
0.13	0.42	0.32	0.10	10.92	10.00	0.82	14.28	1.18	15.60
29.93	48.05	46.27	1.78	848.85	617.24	197.17	3.09	0.99	4.25
-0.58	5.04	6.18	-1.14	105.74	96.95	16.88	9.23	1.61	10.07

(c) Recommend the acquisition of either Company B or Company E, taking into account the risk involved for Company MNO.

Justify your recommendation.

Commentary on Question:
Candidates generally did well in this section. Those that did not do well generally did not correctly explain why they were recommending one company over the other, or recommended the wrong Company.

-Recommend acquiring Company B.
-The debt to equity and long term debt to equity ratios for company B are lower than that for company E, which means company B is not as leveraged and is considered less risky.

(d) Calculate the change in equity capital and debt-to-equity ratio for Company XYZ if the pension plan's equity allocation were changed to 30%, 15% or 0%, by filling out the table in Excel.

Commentary on Question:
Participants generally did not do well in this section, particularly in calculating the Pension asset beta, Equity, and Change in equity capital.

Pension asset beta	Change in pension asset beta	Equity	Change in equity capital	Debt to equity ratio
0.45	n/a	17.1	n/a	2.05
0.3	-0.15	14.4	-2.74	2.44
0.15	-0.3	11.6	-5.47	3.01
0	-0.45	8.9	-8.21	3.94

5. **Learning Objectives:**

3. The candidate will understand how to evaluate the stakeholders' financial goals and risk management with respect to their plan.

Learning Outcomes:

(3b) Describe how the retirement plan financial and design risks integrate with the sponsor's risk management strategy.

(3f) Provide advice and analysis to plan sponsors and other stakeholders regarding the mitigation of pension plan risks.

Sources:

Pension Risk Transfer – evaluating impact and barriers for de-risking strategies, pages 33-38

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Describe potential barriers associated with de-risking through the purchase of a group annuity buy-out.

Commentary on Question:

Successful candidates both listed potential barriers and described how/why they are barriers to de-risking. No credit was given for answers which outlined how buy-out annuities are constructed or the selection process. Successful candidates provided examples of barriers suited to the number of exam points. Credit was given where warranted for additional examples.

5. Continued

Demographics	Pricing for actives and deferred vested members are generally more expensive due to elevated longevity and investment risk
Anti-selection	Plans which offer lump sums at or during retirement can be subject to anti-selection risk from insurers as uncertainty in future cash flows will increase pricing
Optionality	Uncertainty regarding date of retirement and early retirement subsidies also increased risk for insurers making the cost of a group annuity buy-out more expensive for plans with these provisions
Asset Portfolio	For very large annuity purchases where the payment of premium is done via a transfer in kind of existing assets, the asset portfolio would need to look attractive to an insurer
Plan Size	The size of monthly retiree payments per member effect the willingness of an insurer to take on the liabilities. Very large monthly payments may be too much of a risk to take on A very small plan or liability base may not be profitable enough to attract attention from insurers
Reputational Impact / Employee Relations	Transferring pensions to an insurer can draw negative attention and even legal action from retirees who feel that the plan sponsor is abandoning their responsibility or if the chosen insurer fails
Liquidity	If a plan is in a deficit on a funding basis the plan sponsor may not have the additional cash liquidity necessary to cover the insurer premium or the cash is needed elsewhere in the business
Capacity Constraints	The number of insurers and personnel capable of transacting on group annuity buy-outs is limited so in periods of high volume the market may experience short-term strains in available of backing assets
Labor Unions	For plans that have collective bargaining a group annuity buy-out may need to be negotiated with the union which can be very contentious and can lead avoidance of the topic altogether
Financial Statements	Potential for significant accounting impact if there are large differences between annuity pricing and liabilities being held on the balance sheet

(b) Describe the advantages and disadvantages of group annuity buy-outs for:

(i) Plan members; and

(ii) Plan sponsors

Commentary on Question:
Successful candidates provided at least one advantage and disadvantage for both plan members and sponsor. Successful candidates also provided clear answers which separated advantages and disadvantages between member and sponsor. Credit was given where warranted for additional examples.

5. Continued

Plan Members	
Advantages	Insurers have additional protections through a guaranty association protection which provides some backstop for member benefits should the insurer fail Group annuity buy-outs are fully funded at the time of purchase which can be beneficial if the plan was in a deficit prior to purchase The chosen insurer may have a higher credit rating than the plan sponsor
Disadvantages	Benefits and provisions are locked-in at the time of contracting so there is no potential for any improvements to be granted The chosen insurer may have a lower credit rating than the plan sponsor Can cause relationship / administration issues with members having to deal with unfamiliar third party
Plan Sponsor	
Advantages	Group annuity buy-outs eliminate funded status volatility and therefore the likelihood of falling into deficits and requiring additional cash commitments Pension de-risking activities are looked at favorably by analysts and transferring volatile liabilities to an insurer can may improve credit ratings Sponsor would no longer have to make insurance premiums (PBGC in the U.S., PBGF in Ontario) or administer the benefits associated with the liabilities purchased Can be favourable in terms of costs if there are deals to be had in the group annuity marketplace
Disadvantages	Can be very expensive depending on the types of provisions offered in the pension plan and result in large one-time contributions Can have significant financial statement impacts from different liability valuation bases and actual purchase premium Lose the ability to invest assets to generate higher returns / yield and help pay for remaining benefits / deficits

6. Learning Objectives:

1. The candidate will understand the issues facing retirement plan sponsors regarding investment of fund assets.

2. The candidate will recognize and appropriately reflect the role of plan investments in managing plan sponsor risk and make recommendations.

3. The candidate will understand how to evaluate the stakeholders’ financial goals and risk management with respect to their plan.

Learning Outcomes:

(1a) Assess the different types and combinations of investment vehicles for providing retirement benefits given the particulars of the stakeholders’ financial circumstances, philosophy, industry, work force and benefit package.

(1b) Distinguish the various strategies, approaches and techniques used to manage retirement fund assets.

(1c) Given a context, analyze a Statement of Investment Policy.

(1d) Assess the potential effects of various investments and investment policies on all of the stakeholders, including tax implications.

(1f) Identify and assess the sources of investment risk applicable to retirement fund assets.

(2c) Evaluate how factors including cash flow requirements, various plan designs and various economic environments affect setting investment strategy.

(2d) Apply and evaluate strategies and techniques for asset/liability management.

(2e) Provide advice and analysis to plan sponsors regarding the mitigation of investment risks.

(3b) Describe how the retirement plan financial and design risks integrate with the sponsor’s risk management strategy.

(3f) Provide advice and analysis to plan sponsors and other stakeholders regarding the mitigation of pension plan risks.

Sources:

RPIRM-132-14: CAPSA, Guideline No. 6, Pension Plan Prudent Investment Practices

RPIRM-103-15: Fiduciary Liability Issues for Selection of Investments

6. Continued

Commentary on Question:
Generally, candidates did very well on part (a) and not well on part (b).

Solution:
(a) Critique the following elements of the investment policy statement provided below:

Plan Type	Closed and frozen defined benefit pension plan for a law firm
Plan Liability	30% actives 70% retirees
Plan Administrator	ABC Plan Administrators
Investment Consultant	Plan sponsor
Investment Managers	Different manager for each asset class
Monitoring	Quarterly reporting
Asset Allocation Policy Objectives	- Diversify within asset classes - Generate long-term investment returns - Pursue above-market returns in down markets
Performance Measurement	Measured in aggregate for the whole portfolio
Rebalancing	Rebalanced to target on a daily basis

Asset Allocation:

Asset Class	Target	Minimum	Maximum
Core fixed income	25%	20%	30%
Domestic Public Equity	35%	30%	40%
Private Equity	15%	10%	15%
Real Estate	15%	10%	15%
Cash	10%	5%	10%

Commentary on Question:
Most candidates performed very well on this question, and were able to identify 4-6 main concerns (or positives) from the investment policy statement.

- **Plan Type:** It is helpful to know plan specific items, including whether the plan is closed and frozen, however it would be helpful to know the specific type of benefits being accrued (e.g. final average or flat dollar), if there are any COLAs, etc.
- **Plan Liability**: The IPS should provide more information on the plan liability, including the size of the liability and the funded status, including an estimated market value of assets.

6. Continued

- **Investment consultant:** The plan sponsor is a law firm and therefore their expertise is likely not in investments. Therefore, they should consider their responsibility to delegate and consider delegating the investment consulting and managing of the plan if they cannot carryout with the best skill, care and knowledge.
- **Investment managers:** The provided information about the managers is that they use a multimanager approach, which reduces concentration risk ~~on~~ from any single manager and is likely the most appropriate approach given the wide array of asset classes. Depending on the size of the assets, it may be appropriate to have multiple managers within each asset class as well (e.g. within domestic public equity, both a growth and a value manager).
- **Asset allocation policy objectives:** given the plan is closed, frozen, and mostly retirees, the plan may want to revisit these objectives to be less return focused. Generating long-term investment returns is likely not appropriate given the demographics of the plan. Generating above-market returns in down markets neglects the liabilities and is not an appropriate objective for this plan.
- **Performance management:** Given the multi manager approach each individual manager should be monitored as well in addition to total portfolio management. The IPS should also specify how each manager will be evaluated and should provide a benchmark for comparison.
- **Monitoring:** Quarterly monitoring is appropriate and typical of pension plans. More frequent monitoring may be required if there are performance issues for any particular manager, or if the plan is on a strict derisking path.
- **Rebalancing**: Daily rebalancing is not reasonable, and would lead to excessive fees.
- **Asset Allocation**: Given the plan is mostly retirees, the cash allocation seems reasonable to ensure the plan has enough money to pay for benefit payments on an ongoing basis. However, 10% may be a large portion and should be evaluated as the target since the assets should be made productive and cash is not often productive. The overall allocation seems to fit the defined objectives, however as stated above, the objectives may need to be revisited. The ranges for private equity, real estate and cash are inappropriate as the maximum equals.

(b) Describe the fiduciary obligations when delegating pension investment services.

Commentary on Question:
Candidates generally did not perform well on this question. Most candidates just listed fiduciary obligations, but did not elaborate to answer the question.

6. Continued

Investment related tasks need to be delegated to parties with sufficient skills, knowledge, and expertise.

Written governance documents of the plan should clearly set out the authority to delegate, the requirements of the delegate to report back to the plan administrator, and the obligations of the plan administrator to monitor the delegate.
Delegation itself should set out the terms of the delegation, including what functions are being delegated, obligation to report back to the plan administrator, and whether the delegate has the authority to subdelegate.
The plan administrator remains responsible for the delegated activities and should monitor and review the delegated activities to ensure they have been appropriate and prudently carried out. This includes monitoring and reviewing service provider activities based on established policies and performance procedures.