

RET RPIRM Model Solutions

Fall 2014

1. Learning Objectives:

1. The candidate will understand how to analyze the issues facing retirement plan sponsors regarding investment of fund assets and make recommendations.

Learning Outcomes:

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

Sources:

Litterman Chapter 27

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Describe the characteristics of hedge funds.

Commentary on Question:

Candidates generally did well on this part of the question. Where they did not do well is when they did not provide a complete listing or did not include enough details in their listings.

- Vehicles that allow investment managers to engage in pure active management
- Not regulated
- Fixed management fee (0%-2%) and performance fee with high water mark (20%-50%)
- Lack of transparency
- Most short lived due to high fees and high water mark
- Illiquid
- Capacity constraints of the strategy since most of the revenue comes from performance fees
- Managers may choose to generate excellent returns on a smaller capital base versus more assets under management

1. Continued

- (b) Describe four hedge fund categories

Commentary on Question:

Candidates generally did not perform well on this section of the question. Candidates either could not provide the categories at all, or where they could provide the categories, they could not give a complete description of each category. Some candidates listed categories of assets in which hedge funds could be invested in and this resulted in no points being awarded.

1. Relative Value

- Managers identify relationships between securities, looking for when current pricing deviates from the manager's expectations. Trades structured that will profit when prices revert to normal relationships.

2. Event Driven

- Managers identify corporate events they expect to affect valuations and construct trades to extract value when event occurs.

3. Equity Long/Short

- Managers develop view on stocks and express those views by going either long or short to reflect the manager's view.

4. Tactical Trading

- Includes macro managers and managed futures.
 - Macro managers develop views on broad economic themes and implement using various instruments
 - Managed futures trader develop views on a variety of market and implement those views with futures contracts and currency forwards

2. Learning Objectives:

2. The candidate will recognize and appropriately reflect the role of plan investments in retirement plan design and valuation.

Learning Outcomes:

- (2b) Evaluate the interaction and relationship between plan investments and valuation assumptions/methods
- (2d) Apply and evaluate strategies and techniques for asset/liability management.

Sources:

RPIRM-112-13

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) List the inputs needed for an asset liability study.

Commentary on Question:

Candidates generally did well on this part of the question.

- (i) Asset assumptions include
 - return level expectations,
 - volatility expectations, and
 - asset class correlations.
- (ii) Liability assumptions include
 - the valuation assumptions used to calculate the most recent valuation (discount rates, salary scales, and other economic variables that are based on economic conditions),
 - the changes in valuation assumptions over the life of the forecast, OR the sensitivity of the liability to changes in valuation assumptions, and
 - experience assumptions for new entrants, decrements, lump sum payments and even plan curtailments or terminations.
- (iii) Financial assumptions include
 - contribution policy (determine the level and timing of future contributions),
 - accounting policy, and
 - investment policy (portfolio mix and rebalancing assumptions).

2. Continued

- (b) List the typical outputs from an asset liability study.

Commentary on Question:

Candidates generally did well on this part of the question.

1. The typical output for an ALM includes distributions of
 - contributions,
 - pension expense,
 - funded levels (based on several liability and asset measures),
 - benefits paid,
 - balance sheet measures,
 - payroll , and
 - portfolio return.
 2. Results should also include a comparison of projected results to the objectives of the plan sponsor.
- (c) Describe the following types of efficient frontiers that can be used in an asset liability study:
- (i) Multi-period;
 - (ii) Downside risk; and
 - (iii) Surplus.

Commentary on Question:

Candidates did not perform well on this part of the question. Candidates did not demonstrate an understanding of efficient frontiers and their application in an asset liability study.

- (i) Multi-period
 - Typically efficient frontiers look at an annual period
 - However, multi-period efficient frontiers can optimize the risk/return at the end of a multi-year period
 - This type of model allows the use of serial correlations and other relationships between years that are not captured in a single period model
- (ii) Downside risk
 - These frontiers require the specification of a target such as a 110% funded ratio and the risk is calculated relative to that target
 - Changes in the target will change the frontier
 - A poorly chosen target will either result in a one portfolio solution or overly aggressive/conservative portfolios

2. Continued

(iii) Surplus

- Optimizes returns relative to specified liabilities
- Can show either funded ratio or surplus
- If liabilities don't vary with future economic conditions than the result will be the same as an asset only frontier

3. Learning Objectives:

1. The candidate will understand how to analyze the issues facing retirement plan sponsors regarding investment of fund assets and make recommendations.

Learning Outcomes:

- (1b) Distinguish the various strategies, approaches and techniques used to manage retirement fund assets.
- (1g) Solve for a measure of investment performance relevant to a given benchmark.

Sources:

104-13 (Chapter 12 of Managing Investment Portfolios, 3rd Edition, by Maginn, Tuttle, Pinto, and McLeavey, through Section 5 only)

Commentary on Question:

This question was intended to gauge candidates' understanding of benchmarks and of a manager's value added return relative to a benchmark. The syllabus covers through section 5 of 104-13, and this question builds on the content of these earlier sections to guide candidates through this expression.

Candidates performed best on part (c) [worth the most points], and most understood measuring a manager's value added return over a benchmark. The strongest candidates used parts (b) and (d) to demonstrate an understanding of the value added return as it relates to choosing an investment sector and choosing individual securities within a sector.

Solution:

- (a) Describe four of the properties of a valid benchmark for investment performance measurement.

Commentary on Question:

Many candidates simply listed properties with very basic definitions that did not show understanding of the underlying concept. In many cases it appeared that candidates memorized a list of properties that they attempted to define themselves based on the name. We awarded full points for correctly naming four properties and providing a substantial definition or an example. The sample solution offers examples that suggest that pension liabilities may be treated as a benchmark.

3. Continued

Choose any four:

- **Unambiguous:** The identities and weights of risk exposures are known and are clearly defined.
 - A pension liability calculation is based on a participant census as of a particular date that defines benefit amounts, payment dates, and payment forms, along with service and pay history. Additionally, the actuary performs calculations on these data using prescribed or elected economic and demographic assumptions that are listed in the actuarial report.
- **Investable:** It is possible to invest directly in the securities underlying the benchmark (i.e. forgo active management).
 - A pension liability can be considered as a stream of cash flows held short, and it is theoretically possible to create a custom short bond portfolio to match cash flows exactly.
- **Measurable:** The benchmark's return may be calculated on a particular valuation date and/or on a reasonably frequent basis.
 - At each valuation date, it is possible to measure the change in present value of liabilities over the valuation period.
- **Appropriate:** The benchmark is consistent with the manager's area of expertise or investment style.
 - Pension actuaries are expected to be skilled in analyzing the liability cash flows and sensitivities of a plan sponsor's pension plan.

Additional correct properties that received credit:

- **Reflective of current investment opinions:** The manager has current investment knowledge (positive, negative, or neutral) of securities or of factor exposures within a benchmark.
- **Specified in advance:** The benchmark is specified prior to the start of an evaluation period and the makeup of the benchmark is known to all interested parties.
- **Owned:** The investment manager should be aware of and accept responsibility for the constituents and performance of the benchmark.

- (b) (2 Points) Describe how the following formula is used to measure a fund manager's value-added return.

$$r_v = \left[\sum_{j=1}^S (w_{pj} - w_{Bj})(r_{Bj} - r_B) \right] + \left[\sum_{j=1}^S (w_{pj} - w_{Bj})(r_{pj} - r_{Bj}) \right] + \left[\sum_{j=1}^S w_{Bj}(r_{pj} - r_{Bj}) \right]$$

3. Continued

Commentary on Question:

The strongest candidates described each bracketed component in real-world terms (e.g. first component highlights manager's sector choosing decisions, last component reflects manager's security selections within a particular sector) and asserted or showed that the formula simplifies down to the difference between the portfolio return and the benchmark return. Candidates who simply translated symbols to words with no discussion or analysis received few points.

The first component (Sector Choice or Pure Sector Allocation) assumes that within each sector the fund manager held the same securities as the benchmark and in the same proportion. Hence, this component represents the relative impact of sector weighting decisions.

The second component (Interaction or Allocation/Selection Interaction) captures the interaction between sector-weights and within-sector equity-weights relative to the benchmark. This measures the joint effect (or interaction) of a portfolio manager's sector and security weighting decisions.

The last component (Security Within-Sector or Within Sector Selection) assumes that the manager weights every sector in the portfolio the same as its weight in the benchmark. Therefore, this component measures the value added by the particular security selections of the manager within a sector.

The sum of all three components is the value added return, or the return of the portfolio in excess of the benchmark. This metric (and its component breakdown) can be used to measure a manager's effectiveness.

- (c) Calculate the components of the fund manager's total value-added return.

Show all work.

Commentary on Question:

Candidates did very well on this question. Those who calculated the right final answer with a reasonably clear process that relied on the three bracketed formula components were awarded full points. Those who calculated the right answer but lacked clarity received substantial credit (unless there was evidence that the calculation was accidental). Those who calculated the wrong final answer got partial credit for any correct elements that are substantive to the calculation.

3. Continued

Economic Sector	Equity Portfolio Weight (%)	Sector Benchmark Weight (%)	Last Month's Portfolio Return (%)	Last Month's Sector Benchmark Return (%)	Sector Choice Component (%)	Interaction Component (%)	Security Within-Sector Component (%)	Total Value-Added (%)
Financial	50	60	3.600	3.500	-0.07750	-0.01000	.06000	-.02750
Technology	20	15	2.400	2.500	-.01125	-.00500	-.01500	-.03125
Utilities	30	25	1.000	1.000	-.08625	.00000	.00000	-.08625
Total	100	100	2.580	2.725	-.17500	-.01500	.04500	-.14500

Total Last Month's Portfolio Return = 2.580% = .036*.50+.024*.2+.01*.3
 Total Last Month's Sector Benchmark Return = 2.725% = .035*.6+.025*.15+.01*.25

Total Value-Added = -0.145% = 2.580% - 2.725% = -0.175% -0.015% +0.045%

Total Sector Choice Component = -0.175%

Total Interaction Component = -0.015%

Total Security Within-Sector Component = 0.045%

Example: Sector Choice Component for Financial = -.0775% = (.5-.6)*(.035-.02725)

Example: Total Sector Choice Component = -.175% = -.07750% + -.01125% + -.08625%

Example: Interaction Component for Technology = -.005% = (.2-.15)*(.024-.025)

Example: Security Within-Sector Component for Utilities = 0% = (.25)*(.01-.01)

- (d) Evaluate the fund manager's performance based on the results from (c).

Commentary on Question:

Results of this question were fair/good, with most candidates losing points for not utilizing the three bracketed components of the given formula in their answers. The strongest candidates tied together examples from the part (c) for each of the formula components (in magnitude or in sign), an observation that the result of the formula in (c) matches the difference between the simple weighted average returns of the portfolio and the benchmark, and next steps for evaluating, monitoring, or assisting the fund manager.

Over the prior month, the manager's Financial sector stock picks actually performed better than the benchmark's financial stocks. But, the manager was lightly weighted in Financial stocks relative to the benchmark, so he did not take advantage of his superior stock picking (and the high returns of the financial sector relative to the other sectors). As an illustration, observe the .06000% Security Within-Sector Component impact for the Financial sector compared to the -0.07750% Sector Choice Component impact in the same sector.

3. Continued

Additionally, the Sector Choice Component return for Utilities is negative because the manager invested more heavily than the benchmark in a sector with returns well below the overall benchmark return.

The net result is a very negative Sector Choice Component return in total combined with a smaller magnitude but positive Within Sector Allocation return that yields a negative total manager value added. This – by design – matches the difference between the portfolio and benchmark returns over the period, and it illustrates that the fund did not benefit from active management over this period. Evidence may warrant a re-evaluation of the manager’s job responsibilities.

4. Learning Objectives:

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

Learning Outcomes:

- (3a) Compare the interests of plan sponsors, employees, shareholders, taxpayers and other stakeholders related to the financial management of a retirement plan.

Sources:

RPIRM-125-13

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Describe the risks from the perspectives of the following stakeholders:
 - (i) Plan participants
 - (ii) The Government
 - (iii) Taxpayers

Commentary on Question:

Candidates generally did well on this part of the question. There were points given for risks not addressed in the source materials, but still applicable. Some candidates missed the general theme of "risk"; what does each group stand to lose? The well written response included stepping back and answering the question holistically instead of thinking of a list.

- (i)
 - Active employees could have current benefit reduced
 - Examples: Annual accrual, increase ERFs, increase retirement age, increased employee contributions
 - Active employees could have current benefit frozen
 - Inactive benefits could be reduced
 - Including retiree medical
 - COLAs could be eliminated or reduced
 - There are no PBGC guarantees for public plans.
 - Wage risk – Salaries reduced or raises cut back to fund pension plans
- (ii)
 - Negative perception if plans were forced to acknowledge the underfunding on market basis
 - Higher borrowing costs since underfunded plan may increase riskiness perception

4. Continued

- May have to increase funding from current tax revenue
- May have to cut other programs
 - Residents may move away due to perceived financial shortcomings in the public entity – thus decreasing public entity's tax base.
- Negative public opinion if funding deficit grows
 - Re-election concerns
- Rich benefits may be highlighted to public and put pressure on government
- Fiduciary risk

(iii)

- Taxes could be increased to pay for benefits
- Other Gov't sponsored programs may be cut
- Negative opinion on government if rich benefits aren't properly funded for
 - Inter-generational inequality is not well received

(b) Describe possible solutions to address the risks identified in (a).

Commentary on Question:

Some candidates went into a lot of detail regarding one particular solution instead of outlining several possible solutions. For example, great detail was provided on asset/liability matching or other methods of funding benefits.

- Fund benefits on a market basis when promised
 - Another way of saying this is funding pension promises using assets with maturities that match the promised benefit payments, i.e., asset-liability management. Do not use expected rate of return on assets for discounting liabilities.
- Could pay benefits from current revenues
 - Would make it difficult/impossible to provide essential service and service other debts
- Could raise taxes
 - Effectively having borrowed in past from future taxpayers
- Change benefits for current active employees
 - Reduce future benefits (or) increase retirement age
- Cut benefits to current pensioners
 - Such as DROPs
 - Reduce/eliminate cost of living adjustments

4. Continued

- Freeze promises at current levels and shift to a defined contribution plan
 - By definition defined contribution plans create no new unfunded liability
 - However, employees now face risks they did not have previously
 - Therefore, all public employees should be brought into Social Security system
 - Could mean increase to entity's current contribution levels
- Could raise money by selling long-term bonds
 - May be difficult to convince investors to buy
- Federal government could provide incentives for public-sector pension reform
 - Portion of aid should be contingent upon getting liabilities under control
 - Will cost federal government money
 - But may prevent crisis from overwhelming the country

5. Learning Objectives:

1. The candidate will understand how to analyze the issues facing retirement plan sponsors regarding investment of fund assets and make recommendations.

Learning Outcomes:

- (1b) Distinguish the various strategies, approaches and techniques used to manage retirement fund assets.
- (1f) Identify and assess the sources of investment risk applicable to retirement fund assets.

Sources:

RPIRM-131-14

Commentary on Question:

Commentary listed underneath question component.

Solution:

Describe the key challenges and considerations in selecting and evaluating target date funds from a defined contribution plan sponsor's perspective.

Commentary on Question:

Successful candidates were the ones that described challenges and considerations in selecting target date funds for the investment line-up on a defined contribution plan. Note that while certain considerations and challenges may be related to selection of any funds to offer in a defined contribution plan, candidates who fared better were able to describe in addition issues that are specific to the selection of target date funds.

In addition, candidates who listed challenges and considerations, but failed to describe the items listed did not receive full credit for their response.

Challenges:

- Non static asset allocation and wide range of glide paths even for funds with the same "target date". The data illustrate a wide range of target-date glide paths, demonstrating that target date funds can be far from interchangeable with one another. For instance, longer-dated 2055 funds, intended for younger investors with many years to go before retirement, have almost a 20-percentage-point difference between the most and least aggressive options.
- Very long investing horizon. Evaluating a glide path isn't a straightforward exercise, though, especially considering the 60-plus-year investing horizon that some funds on the marketplace imply.

5. Continued

- Less historical data available for target date funds. The industry's oldest series, BlackRock LifePath (formerly Barclays LifePath), is less than 20 years old. There are also fewer than 90 years of market data by which to analyze these asset-allocation plans; even using annually rolling 60-year periods, that results in fewer than 30 observations.
- Monte Carlo analysis can simulate thousands of possible allocations that a glide path could take to calculate the probability of success (and failure) for investors. However, these models require many assumptions and inputs, so it is nearly impossible to compare one provider's output with another's (assuming that they even release the results, which is rare).

Key considerations

- Longevity risk or market risk (Glide paths)
 - Plan sponsors should keep their workforces' demographics and overall pattern and level of savings in mind when choosing target-date funds.
 - Companies with more-generous retirement-contribution plans, for instance, have greater leeway to choose more-conservative options.
 - As the results demonstrate, though, workers in other firms may need the long-term boost provided by more-aggressive options.
- Passive or Active
 - Target-date assets are shifting to passive. Not only have organic growth rates of index-based target-date series been outpacing actively managed series for the past several years, but 2012 marked the first calendar year in which dollar flows into passive series surpassed those going into active target-date funds.
 - Passively managed target-date series - In addition to offering the benefits of low fees and broad diversification, are potentially easier than actively managed series for plan sponsors and investors to understand and monitor
 - Few managers have improved performance with the selections they've made beyond the funds' asset allocation and expenses.
- Price (Expense Ratio) / Fee
 - Fees continue to fall at target-date series. The asset-weighted average expense ratio was 0.91% in 2012, down from 0.99% in 2011 and 1.04% in 2008.
 - Series with lower asset-weighted expense ratios also tend to have better fee level rankings.
 - Higher fees did not help most of series' competitive positions.
- Fund Managers' Performance
 - When evaluating the merit of these various managers, tenure can be a helpful quantitative measure.
 - The average tenure of target-date managers trails the broader mutual fund industry average, and manager investment in target-date shares remains relatively rare.

5. Continued

- Fiduciary Considerations
 - In general when selecting funds, the sponsor has fiduciary obligations to the plan, which include ensuring that participants have the opportunity to diversify appropriately, ensuring that the funds offered are in themselves sufficiently well diversified and that the funds offered are prudent
- Education and communication
 - In general for funds that will be available under a self-directed savings plan, it is necessary to provide participants with sufficient information and education to allow them to make informed investment choices.

6. Learning Objectives:

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

Learning Outcomes:

- (3d) Compare the financial economics perspective to the traditional perspective on funding and accounting for retirement plans

Sources:

RPIRM 129-13 Pension Actuary's Guide to Financial Economics

Commentary on Question:

In this question, candidates were asked to demonstrate their understanding of the Augmented Balance Sheet approach. A well prepared candidate was expected to correctly compute the shareholders' after-tax income using the proposed policy and then evaluate the result in terms of the Treasurer's objective.

Solution:

- (a) Calculate the shareholders' after-tax income under the proposed policy using the Augmented Balance Sheet approach.

Show all work.

Commentary on Question:

Credit was given for either Method 1 (long version) or Method 2 (short version). Many candidates used Method 1 and correctly computed the shareholders' after-tax income. Some candidates omitted part of the calculation, e.g. not applying the 35% tax rate to the initial pension equity and pension bonds. Candidates who calculated the wrong answer for a certain step (due to a prior miscalculation) but used the correct formula still received credit for that step.

6. Continued

Item	Explanation	Answer (\$m)
Method 1 (long version)		
Pension Equity under Proposed Allocation	$50 * (1 - 35\%)$	32.5
Pension Bonds under Proposed Allocation	$150 * (1 - 35\%)$	97.5
Indirect Equity under Proposed Allocation	$500 - 32.5$	467.5
Indirect Bonds under Proposed Allocation	$500 - 97.5$	402.5
Pretax Pension Income	$(32.5 * 9\%) + (97.5 * 4\%)$	6.825
Pretax Income from Indirect Equity	$467.5 * 9\%$	42.1
Pretax Income from Indirect Bonds	$402.5 * 4\%$	16.1
Personal Tax on Pension Assets	$6.825 * 10\%$	0.683
Personal Tax on Indirect Equity	$42.1 * 10\%$	4.2
Personal Tax on Indirect Bonds	$16.1 * 40\%$	6.4
After-tax Pension Income	$6.825 - 0.683$	6.1
After-tax Pension Income from Indirect Equities	$42.1 - 4.2$	37.9
After-tax Pension Income from Indirect Bonds	$16.1 - 6.4$	9.7
Total After-tax Income	$6.1 + 37.9 + 9.7$	53.7
After-tax Income under Current Allocation	Given	52.9
Change in After-tax income	$53.7 - 52.9$	0.78
Method 2 (short version)		
Arbitrage shortcut formula	$200 * 4\% * (40\% - 10\%) * (1 - 35\%) * (75\% - 25\%)$	0.78

- (b) Evaluate whether the proposed allocation meets the Treasurer's objective to maximize shareholder value.

Commentary on Question:

Many candidates observed that the proposed allocation increased shareholder value. Fewer candidates concluded that the Treasurer's objective was not met since a higher bond allocation was needed to maximize shareholder value.

The proposed allocation increases shareholder value since after tax income increases.

The Treasurer's objective of maximizing shareholder value is not met as this would require an even higher bond allocation.

The conclusion is consistent with pension financial economics theory. Investing in bonds for pension plans increases shareholder value.