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CFA Institute

Level III

Overview of Fixed-Income Portfolio Management

2020 Exam

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2 Roles of Fixed-Income Securities in Portfolios

1. Diversification Benefits
2. Benefits of Regular Cash Flows
3. Inflation Hedging Potential

2.1 Diversification Benefits

Diversification benefit because correlation with other asset classes is less than 1

Index	Bloomberg Barclays US Aggregate	Bloomberg Barclays US Treasury 10-Year Term	Bloomberg Barclays US Corporate	Bloomberg Barclays US TIPS	Bloomberg Barclays Global Aggregate	Bloomberg Barclays US Corporate High Yield	JP Morgan GBI-EM Global	S&P 500
Bloomberg Barclays US Aggregate	1.00	0.95	0.92	0.81	0.54	0.03	-0.01	-0.27
Bloomberg Barclays Global Aggregate	0.54	0.50	0.50	0.49	1.00	0.09	0.46	0.04
Bloomberg Barclays US Corporate High Yield	0.03	-0.13	0.16	0.07	0.09	1.00	0.47	0.32

Source: Authors' calculations for the period January 2003 to September 2015, based on data from Barclays Risk Analytics and Index Solutions; J.P. Morgan Index Research; S&P Dow Jones Indices.

Correlations are not constant over time

Bonds are less volatile than equity → helps reduce portfolio risk

Volatility may vary over time

2.2 Benefits of Regular Cash Flows

- Regular and predictable cash flows help investors meet future goals and obligations
 - Example: 10-year coupon paying bond can be used to cover an investor's living expenses over a 10-year horizon
 - Assumes no credit event or market event will occur
- “Ladder” bond portfolios help balance price risk and reinvestment risk

2.3 Inflation Hedging Potential

	Coupon	Principal
Fixed-coupon bonds	Inflation unprotected	Inflation unprotected
Floating-coupon bonds	Inflation protected	Inflation unprotected
Inflation-linked bonds	Inflation protected	Inflation protected

- Return includes real return plus return tied to inflation rate
- Lower return volatility relative to conventional bonds
- Offer returns that differ from other asset classes → superior risk adjusted portfolio returns

Example 1: Adding Fixed-Income Securities to a Portfolio

Mary Baker is anxious about the level of risk in her portfolio based on a recent period of increased equity market volatility. Most of her wealth is invested in a diversified global equities portfolio.

Baker contacts two wealth management firms, Atlantic Investments (AI) and West Coast Capital (WCC), for advice. In conversation with each adviser, she expresses her desire to reduce her portfolio's risk and to have a portfolio that generates a cash flow stream with consistent purchasing power over her 15-year investment horizon.

The correlation coefficient of Baker's diversified global equities portfolio with a diversified fixed-coupon bond portfolio is -0.10 and with a diversified inflation-linked bond portfolio is 0.10 . The correlation coefficient between a diversified fixed-coupon bond portfolio and a diversified inflation-linked bond portfolio is 0.65 .

The adviser from AI suggests diversifying half of her investment assets into nominal fixed-coupon bonds. The adviser from WCC also suggests diversification but recommends that Baker invest 25% of her investment assets into fixed-coupon bonds and 25% into inflation-linked bonds.

Evaluate the advice given to Baker by each adviser based on her stated desires regarding portfolio risk reduction and cash flow stream. Recommend which advice Baker should follow, making sure to discuss the following concepts in your answer:

- a) Diversification benefits
- b) Cash flow benefits
- c) Inflation hedging benefits

3 Fixed-Income Mandates

1. **Liability-Based Mandates:** match or cover expected liability payments with future projected cash flows; also called: structured mandates, asset/liability management or liability-driven investments
2. **Total Return Mandates:** track or outperform a benchmark

Both mandates share some common features (example: achieve highest risk-adjusted returns given certain constraints) but the goals are very different.

Some investors might want environmental, social and governance factors to be considered.

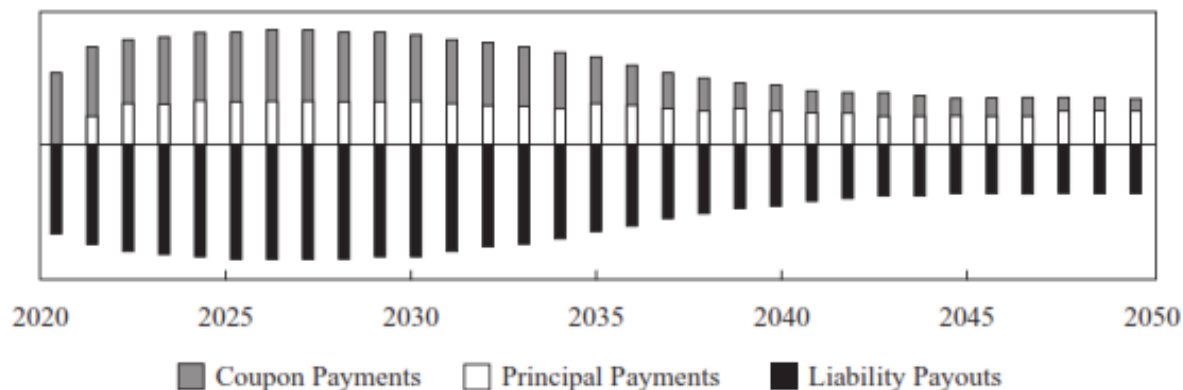
3.1 Liability-Based Mandates (1/3)

Liability-based mandates rely on immunization

Immunization: process of structuring and managing a fixed-income portfolio to minimize the variance in the realized rate of return over a known time horizon → reduce or eliminate the risks associated with a change in market interest rates.

Immunization approaches include: cash flow matching, duration matching, contingent immunization, horizon matching

Cash flow matching: match future liability payouts with cash flows from bonds & fixed income derivatives



Issues associated with cash flow matching:

- Perfect matching is hard to achieve
- High transaction costs
- As market conditions change, lowest cost cash flow matching portfolio may change
- Default risk

3.1 Liability-Based Mandates (2/3)

Duration matching is based on the duration of assets and liabilities.

Bond portfolio's duration = duration of liability portfolio

Bond portfolio's value = present value of liabilities

If interest rates increase or decrease, changes in reinvestment income and changes in bond prices immunize against the effect of interest rate changes

Some points related to duration matching:

- Immunization protects only against a parallel shift in the yield curve
- A portfolio is an immunized portfolio only at a given point in time
- Need to rebalance makes liquidity considerations important; rebalancing and the need to liquidate positions can result in high portfolio turnover
- Immunization assumes that bond issuers do not default
- Immunization can accommodate bonds with embedded options to the extent that a bond's duration is replaced by its effective duration as an input to the methodology

3.1 Liability-Based Mandates (3/3)

	Duration Matching	Cash Flow Matching
Yield curve assumptions	Parallel yield curve shifts	None
Mechanism	Risk of shortfall in cash flows is minimized by matching duration and present value of liability stream	Bond portfolio cash flows match liabilities
Rebalancing	Frequent rebalancing required	Not required but often desirable
Complexity	High	Low

Contingent immunization: combines immunization with an active management approach when asset portfolio value exceeds present value of liabilities.

Horizon matching combines cash flow and duration matching approaches.

- Short-term liabilities are covered using cash-flow matching
- Long-term liabilities are covered using duration matching

Examples 2 and 3: Liability-Based Mandates

Dave Wilson, a fixed-income analyst, has been asked by his manager to analyze different liability-based mandates for a pension fund client. The pension plan currently has a very large surplus of assets over liabilities. Evaluate whether an immunization or contingent immunization approach would be most suitable for the pension fund.

If the yield curve experiences a one-time parallel shift of 1%, what is the likely effect on the match between a portfolio's assets and liabilities for a duration matching approach and a cash flow matching approach?

3.2 Total Return Mandates

	Pure Indexing	Enhanced Indexing	Active Management
Objective	Match benchmark return and risk as closely as possible	Modest outperformance (generally 20 bps to 30 bps) of benchmark while active risk is kept low (typically around 50 bps or lower)	Higher outperformance (generally around 50 bps or more) of benchmark and higher active risk levels
Portfolio weights	Ideally the same as benchmark or only slight mismatches	Small deviations from underlying benchmark	Significant deviations from underlying benchmark
Risk factor matching	Risk factors are matched exactly	Most primary risk factors are closely matched (in particular, duration)	Large risk factor deviations from benchmark (in particular, duration)
Turnover	Similar to underlying benchmark	Slightly higher than underlying benchmark	Considerably higher turnover than the underlying benchmark

Historically, active portfolio performance < index fund performance < benchmark index performance

Example 4: Characteristics of Different Total Return Approaches

Diane Walker is a consultant for a large corporate pension plan. She is looking at three funds (Funds X, Y, and Z) as part of the pension plan's global fixed-income allocation. All three funds use the Bloomberg Barclays Global Aggregate Index as a benchmark. Exhibit 6 provides characteristics of each fund and the index as of February 2016.

Identify the approach (pure indexing, enhanced indexing, or active management) that is most likely used by each fund, and support your choices by referencing the information in Exhibit 6.

Characteristics	Fund X	Fund Y	Fund Z	Index
Average maturity (years)	8.61	8.35	9.45	8.34
Modified duration (years)	6.37	6.35	7.37	6.34
Average yield (%)	1.49	1.42	1.55	1.43
Convexity	0.65	0.60	0.72	0.60
Quality				
AAA	41.10	41.20	40.11	41.24
AA	15.32	15.13	14.15	15.05
A	28.01	28.51	29.32	28.78
BBB	14.53	14.51	15.23	14.55
BB	0.59	0.55	1.02	0.35
Not rated	0.45	0.10	0.17	0.05
Maturity Exposure				
0–3 Years	21.43	21.67	19.20	21.80
3–5 Years	23.01	24.17	22.21	24.23
5–10 Years	32.23	31.55	35.21	31.67
10+ Years	23.33	22.61	23.38	22.30
Country Exposure				
United States	42.55	39.44	35.11	39.56
Japan	11.43	18.33	13.33	18.36
France	7.10	6.11	6.01	6.08
United Kingdom	3.44	5.87	4.33	5.99
Germany	6.70	5.23	4.50	5.30
Italy	4.80	4.01	4.43	4.07
Canada	4.44	3.12	5.32	3.15
Other	19.54	17.89	26.97	17.49

4 Bond Market Liquidity

- High liquidity: easy to buy/sell with little effect on price
- Fixed-income securities are less liquid than equities
- Many issuers have multiple bonds outstanding
- Fixed income markets are typically over-the-counter (OTC) dealer markets and are less transparent relative to equity markets
 - Investors have to locate desired bonds and get quotes from multiple dealers → search cost
- Bond liquidity is highest after issuance
- Less liquid bonds offer a liquidity premium
 - Magnitude of premium depends on issuer, issue size and date of maturity

4.1 Liquidity among Bond Market Sub-Sectors

- Bond market liquidity varies across sub-sectors such as issuer type, credit quality, issue size, and maturity
 - Higher credit quality → higher liquidity
 - Larger issue size → higher liquidity
 - Shorter maturity → higher liquidity
- Sovereign government bonds are more liquid than corporate bonds and non-sovereign government bonds
 - Large issuance size; used as benchmark bonds; accepted as collateral
 - Bonds of countries with high credit quality are more liquid than bonds issued by low credit quality countries

4.2 The Effects of Liquidity on Fixed-Income Portfolio Management

- Pricing
 - Pricing in bond markets is less transparent than in equity markets
 - Infrequent trades → recent txn price does not necessarily reflect value
 - Use matrix pricing
- Portfolio Construction
 - When constructing portfolios consider trade-off between yield and liquidity
 - Dealers often carry an inventory of bonds because buy and sell orders do not arrive simultaneously
 - Bid-ask spreads are influenced by illiquidity, riskiness and complexity
 - Higher bid-ask spread → higher trading costs
- Alternatives to Direct Investment in Bonds
 - Fixed-income derivatives are more liquid than the underlying instruments; interest rate swaps are the most widely used OTC derivative world-wide
 - Exchange traded funds (ETFs) are pooled investment vehicles and are more liquid than underlying individual securities

5 A Model for Fixed-Income Returns

$E(R) \approx \text{Yield income}$

+ Rolldown return

+ $E(\text{Change in price based on investor's views})$

- $E(\text{Credit losses})$

+ $E(\text{Currency gains or losses})$

Example 5: Decomposing Expected Returns

Ann Smith works for a US investment firm in its London office. She manages the firm's British pound–denominated corporate bond portfolio. Her department head in New York has asked Smith to make a presentation on the next year's total expected return of her portfolio in US dollars and the components of this return. Exhibit 7 shows information on the portfolio and Smith's expectations for the next year. Calculate the total expected return of Smith's bond portfolio, assuming no reinvestment income.

Notional principal of portfolio (in millions)	£100
Average bond coupon payment (per £100)	£2.75
Coupon frequency	Annual
Investment horizon	1 year
Current average bond price	£97.11
Expected average bond price in one year (assuming an unchanged yield curve)	£97.27
Average bond convexity	0.18
Average bond modified duration	3.70
Expected average yield and yield spread change	0.26%
Expected credit losses	0.10%
Expected currency losses (£ depreciation versus US\$)	0.50%

5.2 Estimation of the Inputs

- Yield income is easy to estimate
- Rolldown return is relatively easy to estimate but depends on the curve-fitting technique used
- Investor's views of changes in yields and yield spreads, expected credit losses, and expected currency movements are not easy to estimate.
 - Estimation exercise is can be based on purely qualitative (subjective) criteria, on survey information, or on a quantitative model

5.3 Limitations of the Expected Return Decomposition

- Only duration and convexity are used to summarize the price–yield relationship
- Model implicitly assumes that all intermediate cash flows of the bond are reinvested at the yield to maturity
- Model ignores local richness/cheapness effects
- Model ignores potential financing advantages

Example 6: Components of Expected Return

Kevin Tucker manages a global bond portfolio. At a recent investment committee meeting, Tucker discussed his portfolio's domestic (very high credit quality) government bond allocation with another committee member. The other committee member argued that if the yield curve is expected to remain unchanged, the only determinants of a domestic government bond's expected return are its coupon payment and its price.

Explain why the other committee member is incorrect, including a description of the additional expected return components that need to be included.

6 Leverage

Leverage is the use of borrowed capital to increase the magnitude of portfolio positions.

1. Using Leverage
2. Methods for Leveraging Fixed-Income Portfolios
3. Risks of Leverage

6.1 Using Leverage

Leverage increases returns if returns on invested funds > cost of borrowing

$$\begin{aligned} r_P &= \frac{[r_I \times (V_E + V_B) - (V_B \times r_B)]}{V_E} \\ &= \frac{(r_I \times V_E) + [V_B \times (r_I - r_B)]}{V_E} \\ &= r_I + \frac{V_B}{V_E}(r_I - r_B) \end{aligned}$$

6.2 Methods for Leveraging Fixed-Income Portfolios

1. Futures Contracts

$$\text{Leverage}_{\text{Futures}} = \frac{\text{Notional value} - \text{Margin}}{\text{Margin}}$$

2. Swap Agreements

3. Structured Financial Instruments

4. Repurchase Agreements

5. Securities Lending

6.3 Risks of Leverage

- Leverage alters risk-return properties of an investment portfolio
- Gains and losses are magnified
- If portfolio value decreases, leverage increases
- Increased leverage might lead to forced liquidation at prices which are below fair value
- In a financial crisis, counter parties to short-term financing arrangements may withdraw their financing

7 Fixed-Income Portfolio Taxation

Taxable investors are concerned with after-tax returns rather than pre-tax returns

Taxes vary across countries, investor types and income source

1. Principles of Fixed-Income Taxation
2. Investment Vehicles and Taxes

7.1 Principles of Fixed-Income Taxation

- Primary sources of investment income: coupon payments and capital gains/losses.
- In general, tax is payable only on capital gains and interest income that have actually been received.
- Capital gains are frequently taxed at a lower effective tax rate than interest income.
- Capital losses generally cannot be used to reduce sources of income other than capital gains.
- In some countries, short-term capital gains tax > long-term capital gains tax.

Key points for managing taxable fixed-income portfolios :

- Selectively offset capital gains and losses for tax purposes.
- If short-term capital gains tax rates are higher than long-term capital gains tax rates, then be judicious when realizing short term gains.
- Realize losses taking into account tax consequences. They may be used to offset current or future capital gains for tax purposes.
- Control turnover in the fund. In general, the lower the turnover, the longer capital gains tax payments can be deferred.
- Consider the trade-off between capital gains and income for tax purposes.

7.2 Investment Vehicles and Taxes

- Choice of investment vehicle often affects how investments are taxed at the final investor level
- Pooled investment vehicles: interest income taxed a final investor level even if reinvested
- Some countries use pass-through treatment of capital gains
- Separately managed account: investor typically pays tax on realized gains in the underlying securities at the time they occur
- Tax loss harvesting: defer realization of gains and realize capital losses early → accumulate gains on a pre-tax basis → increase present value of investments

Example 7: Managing Taxable and Tax-Exempt Portfolios

A bond portfolio manager needs to raise €10,000,000 in cash to cover outflows in the portfolio she manages. To satisfy her cash demands, she considers one of two corporate bond positions for potential liquidation: Position A and Position B. For tax purposes, capital gains receive pass-through treatment; realized net capital gains in the underlying securities of a fund are treated as if distributed to investors in the year that they arise. Assume that the capital gains tax rate is 28% and the income tax rate for interest is 45%. Exhibit 9 provides relevant data for the two bond positions.

	Position A	Position B
Current market value	€10,000,000	€10,000,000
Capital gain/loss	€1,000,000	-€1,000,000
Coupon rate	5.00%	5.00%
Remaining maturity	10 years	10 years
Income tax rate		45%
Capital gains tax rate		28%

The portfolio manager considers Position A to be slightly overvalued and Position B to be slightly undervalued. Assume that the two bond positions are identical with regard to all other relevant characteristics. How should the portfolio manager optimally liquidate bond positions if she manages a portfolio for:

1. tax-exempt investors?
2. taxable investors?

Summary 1/2

Diversification Benefits

- Correlation with other asset classes is less than 1
- Fixed income volatility is less than equity volatility

Benefits of Regular Cash Flows

- Regular and predictable cash flows help investors meet future goals and obligations
- Assumes no credit event or market event will occur

Inflation Hedging Potential

- Inflation linked bonds provide a hedge against inflation
- Return includes real return plus return tied to inflation rate
- Lower return volatility relative to conventional bonds
- Offer returns that differ from other asset classes, leading to superior risk adjusted portfolio returns

Two types of mandates:

1. **Liability-Based:** match or cover expected liability payments with future projected cash flows.

Immunization: process of structuring and managing a fixed-income portfolio to minimize the variance in the realized rate of return over a known time horizon

- Cash flow matching
- Duration matching
- Contingent immunization
- Horizon matching

	Duration Matching	Cash Flow Matching
Yield curve assumptions	Parallel yield curve shifts	None
Rebalancing	Frequent rebalancing required	Not required but often desirable
Complexity	High	Low

2. **Total Return Based:** Generally structured to either track or outperform a benchmark. They can be classified into different approaches based on their target active return and active risk levels.

Pure Indexing	Enhanced Indexing	Active Management
Match benchmark return and risk as closely as possible	Modest outperformance (generally 20 bps to 30 bps) of benchmark while active risk is kept low (typically around 50 bps or lower)	Higher outperformance (generally around 50 bps or more) of benchmark and higher active risk levels
Ideally the same as benchmark or only slight mismatches	Small deviations from underlying benchmark	Significant deviations from underlying benchmark
Risk factors are matched exactly	Most primary risk factors are closely matched (in particular, duration)	Large risk factor deviations from benchmark (in particular, duration)
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Bond market liquidity varies across sub-sectors such as issuer type, credit quality, issue size, and maturity.

- Higher credit quality → higher liquidity
- Larger issue size → higher liquidity
- Shorter maturity → higher liquidity
- **Pricing in bond markets is less transparent than in equity markets**
 - Infrequent trades → recent transaction price does not necessarily reflect value
 - Use matrix pricing
- **When constructing portfolios consider trade-off between yield and liquidity**
 - Dealers often carry an inventory of bonds because buy and sell orders do not arrive simultaneously
 - Bid-ask spreads are influenced by illiquidity, riskiness and complexity
 - Higher bid-ask spread → higher trading costs
- **To overcome liquidity issues use fixed income derivatives and ETFs**

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Summary 2/2

$E(R) \approx \text{Yield income} + \text{Rolldown return} + E(\text{Change in price based on investor's views})$
- $E(\text{Credit losses}) + E(\text{Currency gains or losses})$

- Leverage increases returns if returns on invested funds > cost of borrowing.

$$r_P = \frac{r_I \times (V_E + V_B) - (V_B \times r_B)}{V_E} = r_I + \frac{V_B}{V_E}(r_I - r_B)$$

Methods for Leveraging

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Swap Agreements

Structured Financial Instruments

Repurchase Agreements

Securities Lending

Risks of Leverage

- Leverage alters the risk-return properties of an investment portfolio
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- Increased leverage might lead to forced liquidation at prices which are below fair value
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Key points for managing taxable fixed-income portfolios:

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- b. Selectively offset capital gains and losses for tax purposes.
- c. If short-term capital gains tax rates are higher than long-term capital gains tax rates, then be judicious when realizing short term gains.
- d. Realize losses taking into account tax consequences.
- e. Control turnover in the fund.

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- Pooled investment vehicles: interest income taxed at final investor level even if reinvested
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Tax loss harvesting: defer realization of gains and realize capital losses early → accumulate gains on a pre-tax basis → increase present value of investments.