Fixed-Income Portfolio Management

CFA三级培训项目

讲师：TOM

101% Contribution Breeds Professionalism

TOM

- 金程教育资深培训师
- 美国特许金融分析师（CFA）、注册会计师（CPA）、美国注册财务策划师（RFP）、量化金融分析师（AQF）、注册金融风险管理师（CFRM）
- 资深证券分析师、美国注册财务策划师协会特聘资深专家，中国银行、中国建设银行、国家进出口银行、国泰君安等多家大型金融机构特聘培训专家
- 曾就职于全球顶级咨询公司与会计师事务所，并担任某世界500强企业投资总监，主导并参与多个大型企业兼并收购及IPO项目，投资标的及服务的客户包括阿里巴巴、中国中铁、中国南车、TPG Capital、L Capital、野村证券等。
- 在财务分析、估值建模、兼并收购、投资理财、税务筹划、资产证券化等方面拥有丰富的管理与实战经验。先后为数十家国内外银行、保险公司、证券公司、世界500强企业进行专业培训并担任多家金融机构的特聘资深专家。
- 服务客户：中国银行、广发证券、中国建设银行、中国工商银行、交通银行、招商银行、农业银行、上海银行、太平洋保险、平安证券、国泰君安等。

专业·创新·增值

Topic in CFA Level III

Session	Content
Study Session 1	BEHAVIORAL FINANCE
Study Session 2	CAPITAL MARKET EXPECTATIONS
Study Session 3	ASSET ALLOCATION AND RELATED DECISIONS IN PORTFOLIO MANAGEMENT
Study Session 4	DERIVATIVES AND CURRENCY MANAGEMENT
Study Session 5-6	**FIXED-INCOME PORTFOLIO MANAGEMENT (1)&(2)**
Study Session 7-8	EQUITY PORTFOLIO MANAGEMENT (1)&(2)
Study Session 9	ALTERNATIVE INVESTMENTS FOR PORTFOLIO MANAGEMENT
Study Session 10-11	PRIVATE WEALTH MANAGEMENT (1)&(2)
Study Session 12	PORTFOLIO MANAGEMENT FOR INSTITUTIONAL INVESTORS
Study Session 13	TRADING, PERFORMANCE EVALUATION, AND MANAGER SELECTION
Study Session 14	CASES IN PORTFOLIO MANAGEMENT AND RISK MANAGEMENT
Study Session 15-16	ETHICS & PROFESSIONAL STANDARDS (1)&(2)

专业·创新·增值

Framework

Fixed-income Portfolio Management

- **SS5 Fixed-Income Portfolio Management (1)**
  - R11 Overview of Fixed-Income Portfolio Management
  - R12 Liability-Driven and Index-Based Strategies
- **SS6 Fixed-Income Portfolio Management (2)**
  - R13 Yield Curve Strategies
  - R14 Fixed-Income Active Management: Credit strategies

专业 · 创新 · 增值

Overview of Fixed-Income Portfolio Management

专业 · 创新 · 增值

Framework

1. Roles of fixed-Income in Portfolios
2. Fixed-Income Mandates
3. Fixed-Income Portfolio Measures
4. Bond Market Liquidity
5. A model for Fixed-Income Returns
6. Leverage
7. Fixed-Income Portfolio Taxation

专业 · 创新 · 增值

1. Roles of Fixed-Income in Portfolios

- Fixed-income investments can provide ***diversification benefits*** when combined with other asset classes.
  - Correlation coefficient <1, but difficult to find assets much lower than 1.0.
  - Correlation coefficient (ρ) between indexes:
    - ✓ ρ between US bond market's investment grade sub-sector=0.77~0.95 (highly correlated).
    - ✓ ρ between **international investment-grade bonds and US investment-grade bond=0.54** (significant diversification benefits existed for including both US and non-US bonds).

专业 · 创新 · 增值

Roles of Fixed-Income in Portfolios

- Fixed-income investments can provide ***diversification benefits*** when combined with other asset classes.
  - ρ is not constant.
    - ✓ Market stress period
      - → decrease between government and equity
      - → increase between high yield bond and equity
  - Bonds: less volatile than equity
    - ✓ Interest rate volatility increases
      - →near-term volatility>average volatility

专业 · 创新 · 增值

Roles of Fixed-Income in Portfolios

- Fixed-income investments typically produce ***regular cash flows*** to a portfolio.
  - Meet the future obligations:
    - ✓ Tuition payments
    - ✓ Pension obligations
    - ✓ Payout on life insurance policies
  - Approach: **ladder bond portfolio** by staggering the maturity dates of portfolio bonds through investment horizon.
    - ✓ Balance price risk and reinvestment risk

专业 · 创新 · 增值

Roles of Fixed-Income in Portfolios

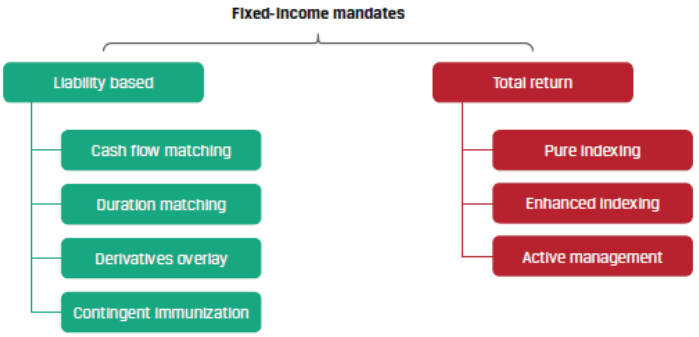
- Some fixed-income securities can provide a ***hedge for inflation***.
  - $R_{nominal} = R_{real}$ + Inflation rate
  - Protection against inflation

	Coupon	Principal
Fixed-coupon bonds	Unprotected	Unprotected
Floating-coupon bonds	Protected	Unprotected
Inflation-linked bonds	Protected	Protected

专业 · 创新 · 增值

2. Classifying Fixed-Income Mandates

- Fixed-income mandates can be broadly classified into ***liability-based mandates*** and ***total return mandates***.



专业 · 创新 · 增值

2.1 Liability-Based Mandates

- Users of liability-based mandates:
  - Individual: funding cash flow & life style needs
  - Institution: bank, insurance company, pension funds
- There are 2 main approaches to liability-based mandates: ***cash flow matching & duration matching.***
- **Duration matching - Immunization:**
  - An ALM approach.
  - To minimize the variance in the realized rate of return over a known time horizon.
  - Reduce or eliminate the risk associated with a change in market interest rates.

专业 · 创新 · 增值

2.1 Liability-Based Mandates

- **Liability-based mandates: key features**

	Duration match	Cash flow match
Yield curve assumption	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
Basic principle	Cash flows come from coupon and principal repayments of the bond portfolio and offset liability cash flows	Cash flow, coupon and principal repayments of the bond portfolio offset liability cash flows
Rebalancing	Frequent rebalancing required	No required but often desirable
Complexity	High	Low

专业·创新·增值

2.1 Liability-Based Mandates

- **Contingent immunization**
  - When "value of asset portfolio" > "present value of liability" →surplus→allowed to actively manage the asset portfolio
  - When actively managed portfolio < specified threshold→active management ceases
- **Derivatives overlay**
  - Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates. The mandates may use futures contracts.

专业·创新·增值

Overview of Classic Immunization

补充

- **Risk when interest rates change**
  - Reinvestment risk;
  - Interest rate or price risk.
- **Assumption**
  - Parallel shift in the yield curve (i.e. all yields rise and fall uniformly).

专业·创新·增值

Classic Immunization

补充

- **Immunization of a single obligation**
  - Select a bond or a bond portfolio with an effective duration equal to the duration of the liability;
  - Set the PV of the bond or the portfolio equal to the PV of the liability.
- **If the duration not equal to**
  - If portfolio duration < liability duration, the portfolio is exposed to reinvestment risk;
  - If portfolio duration > liability duration, the portfolio is exposed to price risk.
- **Immunization cease when**
  - Interest rates fluctuate more than once;
  - Time passes.
- **Immunization risk**
  - Arbitrary (Non-parallel) changes in interest rates.

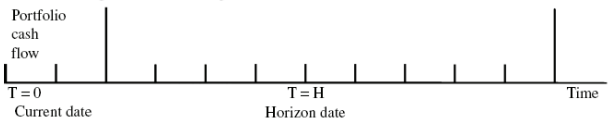
专业 · 创新 · 增值

Immunization Risk

补充

- **Using zero-coupon bond → no immunization risk**

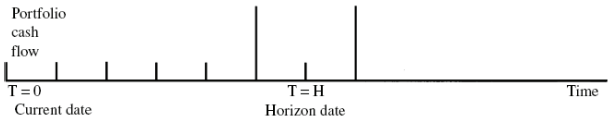
Portfolio A: High-risk immunized portfolio:



Note: Portfolio duration matches horizon length. Portfolio's cash flow dispersed.

Barbell strategy

Portfolio B: Low-risk immunized portfolio:



Portfolio duration matches horizon length. Portfolio's cash flow concentrated around horizon dates.

Bullet Strategy

Convexity作用类似于option

$$\text{convexity} = \frac{\text{Mac. Duration}^2 + \text{Mac. Duration} + \text{Dispersion}}{(1 + \text{cash flow yield})^2}$$

专业 · 创新 · 增值

Multiple Liabilities Immunization

补充

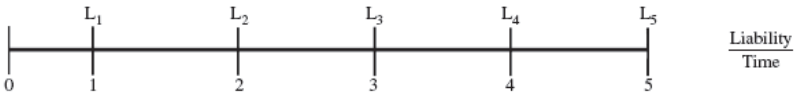
- **The key to immunizing multiple liabilities …**
  - Decompose the portfolio payment streams separately immunize each of the multiple liabilities
- **The following conditions should be satisfied …**
  - Parallel rate shift
  - Asset and liability have the same PV
  - Asset and liability have the same aggregate durations
  - The range of the distribution of durations of individual assets in the portfolio must exceed the distribution of liabilities

专业 · 创新 · 增值

Cash Flow Matching

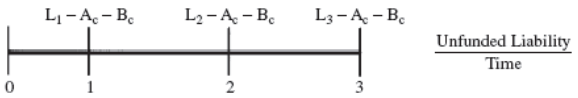
补充

Assume: 5-year liability stream
Cash flow from bonds are annual.



Step 1 Cash flow from Bond A selected to satisfy L_5
Coupons = A_c; Principal = A_p and $A_c + A_p = L_5$
Unfunded liabilities remaining:

Step 2 Cash flow from Bond B selected to satisfy L_4
Unfunded liability = $L_4 - A_c$
Coupons = B_c; Principal = B_p and $B_c + B_p = L_4 - A_c$
Unfunded liabilities remaining:

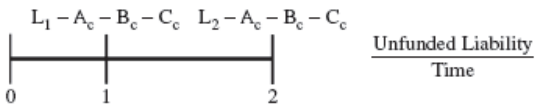


专业 · 创新 · 增值

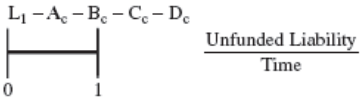
Cash Flow Matching

补充

Step 3 Cash flow from Bond C selected to satisfy L_3
Unfunded liability = $L_3 - A_c - B_c$
Coupons = C_c; Principal = C_p and $C_c + C_p = L_3 - A_c - B_c$
Unfunded liabilities remaining:



Step 4 Cash flow from Bond D selected to satisfy L_2
Unfunded liability = $L_4 - A_c - B_c - C_c$
Coupons = D_c; Principal = D_p and $D_c + D_p = L_2 - A_c - B_c - C_c$
Unfunded liabilities remaining:



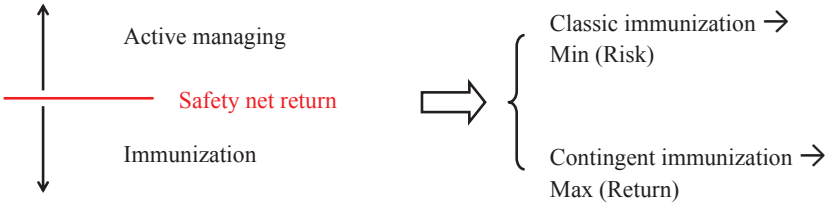
Step 5 Select Bond E with a cash flow of $L_1 - A_c - B_c - C_c - D_c$

专业 · 创新 · 增值

Contingent Immunization

补充

- **Key considerations ...**
  - Establishing well defined immunized initial and ongoing available target returns
  - Identifying a suitable and immunizable safety net return
  - Implementing an effective monitoring procedure to ensure that the safety net return is not violated
- **Understanding the contingent immunization ...**



专业 · 创新 · 增值

Contingent Immunization

补充

- **The frequency of rebalancing ...**
  - The difference between the safety net return and current market interest rate
  - Low safety net return → infrequent rebalance
  - High safety net return → little opportunity for active management
- **Two factors cause effective monitoring fail ...**
  - Adverse movements too quickly
  - The lack of assurance that the immunization rate will be achieved

专业 · 创新 · 增值

Liability-Based Mandates

- An investor is looking to immunize a single liability, but is concerned with the impact from yield curve shifts and twists. When attempting to immunize this liability, which of the following rules should the investor apply?
  - A. The portfolio Macaulay duration should match the due date of the liability.
  - B. The dispersion of asset cash flows around the liability should be maximized.
  - C. The present value of liabilities should exceed the initial portfolio market value.

专业 · 创新 · 增值

Liability-Based Mandates

- **Correct Answer: A.**
  - Rules for immunizing a single liability include the following:
    - ✓ Initial portfolio market value (PVA) equals (or exceeds) PVL.
    - ✓ Portfolio Macaulay duration matches the due date of the liability ($D_A = D_L$).
    - ✓ Minimize portfolio convexityi(to minimize dispersion of asset cash flows around the liability and reduce risk to curve reshaping).

专业 · 创新 · 增值

Liability-Based Mandates

➢ Which of the following statements correctly describes contingent immunization?

A. It uses Treasury futures contracts to adjust the portfolio and maintain duration matching.

B. It constructs a portfolio of zero-coupon bonds that provide enough cash inflows to meet liabilities.

C. It uses active bond portfolio management, as long as the present value of assets exceeds the present value of liabilities.

专业 · 创新 · 增值

Liability-Based Mandates

➢ **Correct Answer: C.**

- Contingent immunization is a hybrid active/passive strategy. It requires initially overfunding the portfolio with more assets than needed to immunize and meet the future liability.
- As long as that surplus is of sufficient size, the portfolio can be actively managed. A derivatives overlay uses Treasury futures contracts to adjust the portfolio. Cash flow matching creates a portfolio of zero-coupon bonds to match cash inflows with cash outflows.

专业 · 创新 · 增值

2.2 Total Return Mandates

➢ **Total return approach: key features**

	Pure indexing	Enhanced indexing	Active management
Objective	Match benchmark return and risk as closely as possible	Modest performance (20-30bp) of benchmark while active risk is kept low (around 50bp or lower)	Higher outperformance (50bp or more) of benchmark and higher active risk levels
Portfolio weights	Same as benchmark or only slight mismatches	Small deviations from underlying benchmark	Significant deviations from underlying benchmark
Risk	Risk factors are matched exactly	Most primary risk factors are closely matched (duration)	Deviations from benchmark (duration)
Turnover	Similar to underlying benchmark	Slightly higher than underlying benchmark	Considerably higher turnover than the underlying benchmark

专业 · 创新 · 增值

Total Return Mandates

- A fixed-income portfolio manager is seeking to outperform the Barclays Capital Aggregate Bond Index. Which of the following statements most accurately describes a pure indexing strategy for achieving the total-return mandate? Pure bond indexing:
  - A. allows large deviations from the risk factors of the index and seeks a high active return.
  - B. matches duration to the index, but some risk mismatches of sectors and quality are allowed.
  - C. seeks to exactly match all the risk factors of the index while allowing the manager some leeway on the individual bonds selected.

专业 · 创新 · 增值

Total Return Mandates

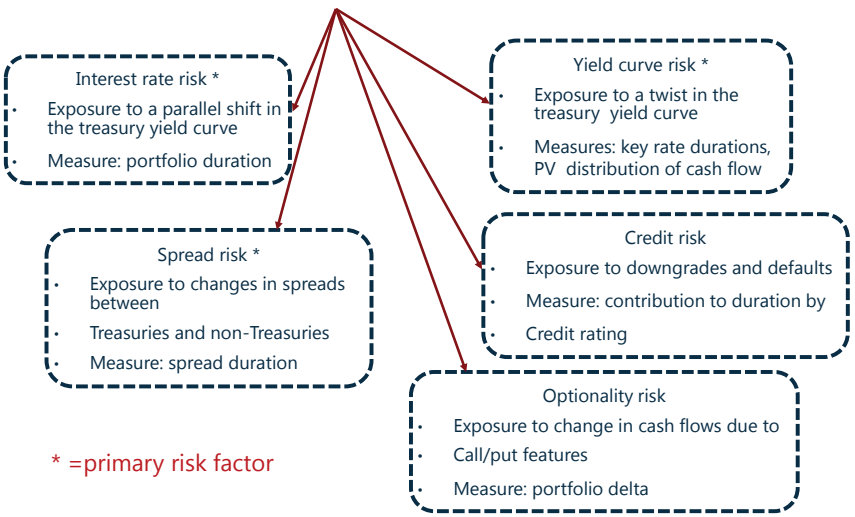
- **Correct Answer: C.**
  - Pure indexing attempts to replicate the performance of a bond index. It seeks to exactly match all of the risk factors of the index while still allowing the manager some leeway on the individual bonds selected.
  - Enhanced indexing allows some additional flexibility in constructing the portfolio and seeks to add some modest active return. Active management allows much larger deviations from the risk factors of the index and seeks greater active return.

专业 · 创新 · 增值

Bond Portfolio Risk

补充

- **Fixed-Income Portfolio Risks**



专业 · 创新 · 增值

Total Return Mandates

➢ 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.

Risk & Return Characteristics	Fund X	Fund Y	Fund Z	Bloomberg Barclays Global Aggregate 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

专业 · 创新 · 增值

Total Return Mandates

Risk & Return Characteristics	Fund X	Fund Y	Fund Z	Bloomberg Barclays Global Aggregate Index
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

专业 · 创新 · 增值

Total Return Mandates

➢ **Correct Answer:**

- **Fund Y most likely uses a pure indexing approach** because it provides the closest match to the Bloomberg Barclays Global Aggregate Index. ***The risk and return characteristics are almost identical*** between Fund Y and the benchmark. Furthermore, quality, maturity exposure, and country exposure deviations from the benchmark are very minor.

专业 · 创新 · 增值

Total Return Mandates

- **Correct Answer:**
  - **Fund X most likely uses an enhanced indexing approach**. Fund X's ***modified duration and convexity are very close to those of the benchmark but still differ slightly***. The ***average maturity*** of Fund X is ***slightly longer*** than that of the benchmark, whereas Fund X's ***average yield is slightly higher*** than that of the benchmark. Fund X also has ***deviations in quality, maturity exposure, and country exposures*** from the benchmark, providing further evidence of an enhanced indexing approach. Some of these deviations are meaningful; for example, Fund X has a relatively strong underweight in Japan.

专业 · 创新 · 增值

Total Return Mandates

- **Correct Answer:**
  - **Fund Z most likely uses an active management approach** because ***risk and return characteristics, quality, maturity exposure, and country exposure differ markedly from the index***. The difference can be seen most notably with the ***mismatch in modified duration*** (7.37 for Fund Z versus 6.34 for the benchmark). Other differences exist between Fund Z and the index, but a sizable duration mismatch provides the strongest evidence of an active management approach.

专业 · 创新 · 增值

2.3 Fixed-Income Mandates with ESG Considerations

- Some fixed-income mandates include a requirement that ESG factors be considered during the investment process.
- When considering these factors, an analyst or portfolio manager may look for evidence of whether the portfolio contains companies whose operations are favorable or unfavorable in the context of ESG and whether such companies' actions and resource management practices reflect a sustainable business model.
- For companies that do not fare favorably in an ESG analysis, investors may assume that these companies are more likely to encounter future ESG-related incidents that could cause serious reputational and financial damage to the company.
- Such incidents could impair a company's credit quality and result in a decline in both the price of the company's bonds and the performance of a portfolio containing those bonds.

专业 · 创新 · 增值

3. Fixed-Income Portfolio Measures

- **Macaulay duration (MacDur)**

Macaulay duration is a weighted average of the time to receipt of the bond's promised payments, where the weights are the shares of the full price that correspond to each of the bond's promised future payments.

- **Modified duration (ModDur)**

The Macaulay duration statistic divided by one plus the yield per period, which estimates the percentage price change (including accrued interest) for a bond given a change in its yield to maturity.

- **Effective duration (EffDur)**

The sensitivity of the bond's price to a change in a benchmark yield curve (i.e., using a parallel shift in the benchmark yield curve (ΔCurve). Effective duration is essential to the measurement of the interest rate risk of a complex bond where future cash flows are uncertain.

专业 · 创新 · 增值

3.1 Bond Risk and Return Measures

- **Key rate duration (KeyRatDur, also called partial duration)**

A measure of a bond's sensitivity to a change in the benchmark yield curve at a specific maturity point or segment. Key rate durations help identify "shaping risk" for a bond or a portfolio—that is, its sensitivity to changes in the shape of the benchmark yield curve.

- **Empirical duration**

A measure of interest rate sensitivity that is determined from market data—that is, run a regression of bond price returns on changes in a benchmark interest rate.

- **Spread duration**

a useful measure for determining a portfolio's sensitivity to changes in credit spreads.

- **Duration times spread (DTS)**

a modification of the spread duration definition to incorporate the empirical observation that spread changes across the credit spectrum tend to occur on a proportional percentage basis rather than being based on absolute basis point changes.

专业 · 创新 · 增值

Bond Risk and Return Measures

- **Money duration**

A measure of the price change in units of the currency in which the bond is denominated. Money duration can be stated per 100 of par value or in terms of the bond's actual position size in the portfolio. Commonly called "dollar duration" in the United States.

- **Price value of a basis point (PVBP, DV01, BPV)**

An estimate of the change in a bond's price given a 1 bp change in yield to maturity. PVBP "scales" money duration so that it can be interpreted as money gained or lost for each basis point change in the reference interest rate.

- **Convexity**

A second-order effect that describes a bond's price behavior for larger yield movements. It captures the extent to which the yield/ price relationship deviates from a linear relationship.

- **Effective convexity (EffCon)**

A curve convexity statistic that measures the secondary effect of a change in a benchmark yield curve.

专业 · 创新 · 增值

3.2 Correlations between Fixed-Income Sectors

- Correlation characteristics refer to the interplay between benchmark rates, spreads, and such factors as currencies.
- Correlations between fixed-income sectors within a market are likely to be higher than those across markets given country-specific factors, such as central bank policy, economic growth, and inflation.
- In developed economies, investment-grade securities with a low probability of default are highly correlated with interest rate changes in the sovereign yield curve.
- Below-investment- grade securities are affected more by changes in spread than by changes in general interest rates and often exhibit stronger correlations with equity markets.

专业 · 创新 · 增值

3.3 Use of Measures of Risk and Return in Portfolio Management

- **3.3.1 Portfolio Duration in Total Return Mandates**
- Total return mandates that are actively managed often use a top-down approach to establish the large risk factors in a portfolio combined with a bottom-up approach of individual security selection.
- The analytics can be used to measure and manage the macroeconomic risk factors in the portfolio.
- Portfolio managers develop or use a forecast of the direction of the economy and an assessment of the current business, political, and regulatory environment to develop themes that can be reflected in the portfolio.
- On the basis of expectations for changes in interest rates and the shape of the yield curve, portfolio managers can adjust the duration of a portfolio to reflect their view.

专业 · 创新 · 增值

3.3.2 Managing Credit Exposure Using Spread Duration

- Portfolio managers often use the spread duration to gauge the portfolio's sensitivity to changes in credit spreads.
- A portfolio manager expecting credit spreads to narrow may wish to increase the spread duration in an actively managed portfolio.
- The manager may face constraints, such as a target duration, rating-based restrictions, or limits to derivatives use, as part of the investment mandate.
- A second way to increase the portfolio credit exposure is to reduce the average credit rating of the portfolio.
- The portfolio manager will select securities as part of the portfolio construction process to achieve a targeted level of tracking error or active risk relative to a benchmark.

专业 · 创新 · 增值

3.3.3 Relative Value Concept

- ***Relative value*** is a key concept in the active management of fixed-income portfolios that describes the selection of the most attractive individual securities to populate the portfolio with, using ranking and comparing.
- Portfolio managers analyze and rank securities on the basis of such considerations as valuation, issuer fundamentals, and market technical conditions (supply and demand).
- This analysis is carried out across sectors, issuers, and individual securities to select securities with the most attractive risk and return profiles.
- The portfolio manager will establish a time horizon over which the relative value analysis is applied.
- The single bond characteristics can be used to express an active position relative to the benchmark.

专业 · 创新 · 增值

4. Bond Market Liquidity

- **Fixed-income securities vary greatly in their liquidity**
  - Vs equity markets: less liquid & less transparent;
  - On-the-run liquidity > off-the-run liquidity;
  - Liquidity decreases→yield increases.
- **Liquidity among bond market sub-sectors**

	More liquidity	Less liquidity	Reason
Issuers	Sovereign government bond	Corporate and non-sovereign government bond	• Issuance size • Use as benchmark bond • Acceptance as collateral in repo market • Well-recognized issuers
Credit quality	High credit quality	Lower credit quality	Find a counterparty dealer

专业 · 创新 · 增值

Bond Market Liquidity

- **Liquidity among bond market sub-sectors**

	More liquidity	Less liquidity	Reason
Issue frequency	Outstanding issues	Infrequent issuers	Familiarity
Issue size	Larger issues	Smaller issues	Include or excluded in/from bond index with minimum issue size requirements
Maturity	Nearer-term bonds	Longer maturities bonds	Intent to hold them until maturity

专业 · 创新 · 增值

Bond Market Liquidity

- **Effect of liquidity on fixed-income portfolio management**
  - **Pricing**
    - ✓ Electronic systems help to increase transparency;
    - ✓ **Matrix pricing**: use recent transaction prices of comparable bonds to estimate the market discount rate or required rate of return.
      - ◆Advantage: not require sophisticated financial modeling;
      - ◆Disadvantage: ignore some value-relevant features between different bonds.

专业 · 创新 · 增值

Bond Market Liquidity

- **Effect of liquidity on fixed-income portfolio management**
  - **Portfolio construction**
    - ✓ Trade-off between yield and liquidity
    - ✓ 2 types of investors
      - ◆Buy-and-hold: prefer less liquid bonds for higher yields;
      - ◆Investors that emphasize liquidity, give up some yield.
    - ✓ Dealer market: often carry an inventory of bonds because buy and sell orders do not arrive simultaneously.
      - ◆Liquidity comparison: Bid-ask spreads comparison

Lower bid-ask spread (Higher liquidity)	Higher bid-ask spread (Lower liquidity)
Government bonds	Corporate bonds, structured financial instruments
Conventional bonds/plain vanilla bonds	Corporate bond with embedded options
Bonds of large, high-credit-quality corporations	Smaller, less creditworthy companies

专业 · 创新 · 增值

Bond Market Liquidity

- **Alternatives to Direct Investment in Bonds**
  - Because transacting in fixed-income securities may present challenges resulting from ***low liquidity*** in many segments of the fixed-income market, fund managers may ***use alternative methods*** to establish bond market exposures. The methods we outline are applicable across different fixed-income mandates.
  - ***ETFs and mutual funds***. These products provide an alternative to transacting in individual bonds. They are more liquid than the underlying securities.
  - ***Exchange traded derivatives***. Futures and options on futures provide exposure to underlying bonds.
  - ***OTC derivatives***. Interest rate swaps are the most widely used OTC derivative worldwide and entail customized arrangements between two counterparties that reference an underlying market price or index.

专业 · 创新 · 增值

5. A Model for Fixed-Income Returns

- Examining these components leads to a better understanding of the driving forces behind expected returns.
- **Expected returns [E(R)] can be decomposed**
  - $E(R) \approx Yield\ income + rolldown\ return$

    $+E\left(change\ in\ price\ based\ on\ investor's\ view\ yields\ and\ yield\ spreads\right)$

    $-E(credit\ losses)$

    $+E(currency\ gains\ or\ losses)$

    ✓ Only approximately;

    ✓ Better understand their own investment positions;

    ✓ Applied to an annual period;

    ✓ Not reflect taxes.

专业 · 创新 · 增值

Yield Income

- **Yield income** is the income that an investor receives from coupon payments relative to the bond's price as well as interest on reinvestment income.
  - $\text{Yield income} = \frac{\text{annual coupon payment}}{\text{current bond price}}$

    ✓ ***Annual coupon payment*** **= coupon + reinvestment income**

    ✓ When reinvestment income=0, yield income = current yield

专业 · 创新 · 增值

Rolldown Return

- **Rolldown return:** return results from the bond "rolling down" the yield curve as the time to maturity decrease, assuming zero interest rate volatility.
  - Equals the bond's percentage price change ***assuming an unchanged yield curve*** over the strategy horizon.
  - $\text{Rolldown return} = \frac{\text{Bond price}_{end} - \text{Bond price}_{beginning}}{\text{Bond price}_{beginning}}$
- ***Roll yield*** **= yield income + rolldown return**

专业 · 创新 · 增值

Expected Change in Price Based on Yields

- The ***expected change in price based on*** investor's views of yields and yield spreads reflects an investor's expectation of ***changes in yields and yield spreads*** over the investment horizon.
  - E(Δprice based on investor's view of yields and yield spreads)
    $=-\text{modified duration}\times\Delta\text{yield}+\frac{1}{2}\times\text{convexity}\times(\Delta\text{yield})^2$
  - Expected change=0 if expected yield curves and yield spreads to remain unchanged
  - Convexity estimates the effect of the non-linearity of the yield curve
  - Embedded option: effective duration, effective convexity
  - Floating rate notes have modified duration near zero

专业 · 创新 · 增值

Expected Credit Loss & Currency Gain/Loss

- **Expected credit loss** represent the expected percentage of par value lost to default for a bond.
  - Expected credit losses
    =Probability(default)×expected loss severity(loss given default)
- **Currency gain or loss**
  - Any expected fluctuations in the currency exchange rate or expected currency gains or losses over the investment horizon.
  - Can be locked in over the investment horizon using currency forwards.

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$$

专业 · 创新 · 增值

Estimation of The Inputs

- **Easiest component:** yield income.
- **Relatively straightforward:** rolldown return.
- **Most uncertain**
  - Investor's views of changes in yields and yield spreads;
  - Expected credit loss;
  - Expected currency movements.

专业 · 创新 · 增值

A Model for Fixed-Income Returns

- Ann manages a British pound-denominated corporate bond portfolio. Her department head in New York has asked Ann to make a presentation on **the next year's total expected return** of her portfolio in US dollars and the components of this return. The following shows information on the portfolio and Ann's expectations for the next year.
- Calculate the total expected return of the bond portfolio, assuming no reinvestment income.

专业 · 创新 · 增值

A Model for Fixed-Income Returns

Notional principal of portfolio (in million)	£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%

专业 · 创新 · 增值

A Model for Fixed-Income Returns

- **Correct Answer:**
  - **Yield income** over a one year horizon=2.75/97.11= 2.83%.
  - **Rolldown return**=(97.27-97.11)/97.11=016%.
  - **Roll yield**=yield income + rolldown return=2.83%+0.16%=2.99%.
  - **The expected change in price** based on Ann's views of **yields and yield spreads**=$(-3.70*0.0026)+[1/2*0.18*(0.0026)^2]=-0.96\%$.
  - **Expected credit losses**=0.1%.
  - **Expected currency losses** (£ depreciation versus US$)=0.5%.
  - **Total expected return**=1.43%.

专业 · 创新 · 增值

6. Leverage

- **Leverage** is the use of borrowed capital to increase the magnitude of portfolio positions, and it is an important tool for fixed-income portfolio managers.
- **Leveraged portfolio return (r_p)**

$$r_p = \frac{Portfolio\ return}{Portfolio\ equity} = \frac{r_I \times (V_E + V_B) - (V_B \times r_B)}{V_E}$$

  - ✓ Including: V_E=value of portfolio equity
    V_B=borrowed funds
    r_B=borrowing rate (cost of borrowing)
    r_I=return on the invested funds (investment return)
    r_P=return on the levered portfolio
  - ✓ If $r_I > r_B$, leverage increase the portfolio's return
  - ✓ If $r_I < r_B$, leverage decrease the portfolio's return
- **Leverage effect on duration**

$$D_p = D_i + \frac{V_B}{V_E}(D_i - D_B)$$

专业 · 创新 · 增值

Methods for Leveraging Fixed-Income Portfolio

- Derivatives or borrowing are explicit forms of leverage. Other forms of leverage, such as the use of structured financial instruments, are more implicit.
  - **Futures contracts**
    - ✓ Futures contract's notional value
      =current value of underlying asset × multiplier
    - ✓ $Leverage_{futures} = \frac{notional\ value - margin}{margin}$
  - **Swap agreement**
    - ✓ Fixed-rate payer: short a fixed-rate bond + long a floating-rate bond→i↗ →value↗
    - ✓ Fixed-rate receiver: long a fixed-rate bond + short a floating-rate bond→i↘ →value↗
    - ✓ Equivalent to a long-short bond portfolio: provide leveraged exposure to bonds

专业 · 创新 · 增值

Methods for Leveraging Fixed-Income Portfolio

- **Structured financial instruments (structured products)**
  - ✓ **Inverse floating-rate note (inverse floater)**
    - ◆Coupon rate = C – L x R
    - ◆Strong view that interest rates will remain low or possibly
- **Repurchase agreements (repos)**
  - ✓ Important source of short-term financing
  - ✓ Repos are effectively collateralized loans
  - ✓ Repo rate: interest rate on a repurchase agreement
  - ✓ $Dollar\ interest = principal\ amount \times repo\ rate \times \frac{term\ of\ repo\ in\ days}{360}$

专业 · 创新 · 增值

Methods for Leveraging Fixed-Income Portfolio

- **Securities lending**
  - ✓ Short sales: sale of securities the seller does not own
  - ✓ Financing-motivated security loan: a bond owner lends the bond to another investor in exchange for cash
  - ✓ Unlike repos, securities lending transactions are typically open-ended. Lender may recall the securities at any time, forcing the borrower to deliver the bonds by buying them back or borrowing from another lender.
  - ✓ Rebate rate = Collateral earnings rate – Security lending rate

专业 · 创新 · 增值

Risk of Leverage

- Leverage alters the risk-return properties of an investment portfolio. A heavily leveraged portfolio may incur ***significant losses*** even when portfolio assets suffer only moderate valuation declines.
  - Leverage can lead to ***forced liquidations***. If the value of the portfolio decreases, the portfolio's equity relative to borrowing levels is reduced and the portfolio's leverage increases. Portfolio assets may be sold in order to pay off borrowing and reduce leverage.
  - If portfolio assets are not liquidated, then the overall leverage increases, corresponding to ***higher levels of risk***.
  - Decreases in portfolio value can lead to forced liquidations even if market conditions are unfavorable for selling-for example, during crisis periods. The term "***fire sale***" refers to forced liquidations at prices that are below fair value as a result of the seller's need for immediate liquidation.

专业 · 创新 · 增值

7. Fixed-Income Portfolio Taxation

- **Principles of fixed-income taxation**
  - 2 primary sources of investment income
    - ✓ Coupon payments (investment income);
    - ✓ Capital gains or losses.
  - Tax is payable only on capital gains and interest income that have actually been received
    - ✓ **Zero-coupon bond**: return on a zero-coupon bond is not taxed entirely as a capital gain;
    - ✓ $t_{S-T\ capital\ gain} > t_{L-T\ capital\ gain}$
    - ✓ $t_{capital\ gain} < t_{interest\ income/coupon}$
    - ✓ Capital loss不能用于抵减coupon; Capital loss只能用于抵减capital gain; Capital loss:当年的loss能抵税部分叫做"carried forward"到未来.

专业 · 创新 · 增值

Fixed-Income Portfolio Taxation

- **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%. The following Exhibit provides relevant data for the two bond positions.

专业 · 创新 · 增值

Fixed-Income Portfolio Taxation

	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?

专业 · 创新 · 增值

Fixed-Income Portfolio Taxation

1. **Correct Answer:**
   - The taxation of capital gains and capital losses has minimal consequences to tax-exempt investors. Consistent with the portfolio managers investment views, the portfolio manager would likely **liquidate Position A**, which she considers slightly overvalued rather than liquidating Position B, which she considers slightly undervalued.

专业 · 创新 · 增值

Fixed-Income Portfolio Taxation

2. **Correct Answer:**
   - All else equal, portfolio managers for taxable investors should have an incentive to defer capital gains taxes and realize capital losses early (tax-loss harvesting) so that losses can be used to offset current or future capital gains. Despite the slight undervaluation of the position, the portfolio manager might want to **liquidate Position B** because of its embedded capital loss, which will result in a lower realized net capital gain being distributed to investors. This decision is based on the assumption that there are no other capital losses in the portfolio that can be used to offset other capital gains. Despite the slight overvaluation of Position A, its liquidation would be less desirable for a taxable investor because of the required capital gains tax.

专业 · 创新 · 增值

Liability-Driven and Index-Based Strategies

专业 · 创新 · 增值

Framework

1. Liability- Driven Investing
   - Types of liability
   - Managing single liability
   - Managing multiple liabilities
   - Derivatives overlay
   - Example of DB plan
   - Risks in liability-driven investing
2. Matching a Fixed-Income Portfolio to An Index
   - Pure indexing
   - Enhanced indexing
   - Benchmark selection
3. Laddered Bond Portfolio

专业 · 创新 · 增值

1. Describe LDI

- **Asset-liability management**
  - Consider both assets and liabilities in the portfolio decision-making process;
  - Provide better balance on the interest rate exposure of assets and liabilities;
  - The coordinated rate decisions and measurement of gaps between asset and liability would reduce the interest rate risk.

专业 · 创新 · 增值

Describe LDI

- **Liability-driven investing (LDI) and asset-driven liability (ADL) are special cases of ALM**
  - With **ADL**, the ***assets are given*** and ***liabilities are structured to manage*** interest rate risk.
    - ✓ Example: a leasing company with short-term contracts that chooses to finance itself with short-term debt;
  - With **LDI**, the ***liabilities are given and assets are managed***.
    - ✓ Example: life insurance company acquires a liability portfolio based on the insurance policies underwritten by its sales force.

专业 · 创新 · 增值

1.1 Types of Liability

	Type I liability	**Type II liability**	**Type III liability**	**Type IV liability**
Cash outlay amount	Known	Known	Unknown	Unknown
Timing	Known	Unknown	Known	Unknown
Example	Fixed income bond having no embedded options	Callable bond Putable bond Term life insurance	Floating rate note Structure notes have principal inflation indexed bonds	Property and casualty insurance company DB plan
Advantage	Yield duration statistics can be used to measure the interest rate sensitivity of the liability			

专业 · 创新 · 增值

1.2 Managing Single Liability

- **LDI**
  - Manage the interest rate risk on single liability
    - ✓ Risk of the classic investment strategy known as interest rate immunization.
    - ✓ **Immunization:** The process of structuring and managing a fixed-income bond portfolio to minimize the variance in the realized rate of return over a known time horizon.

专业 · 创新 · 增值

Managing Single Liability

- **Interest rate risk immunization**
  - The most obvious way: ***buy a zero-coupon bond*** that matures on the obligation's due date, and the face value matches the liability amount.
    - ✓ **No cash flow reinvestment risk➔** there are no coupon payments to reinvest;
    - ✓ **No price risk➔** the bond is held to maturity.
    - ✓ However, zero-coupon bonds are ***not always available***.

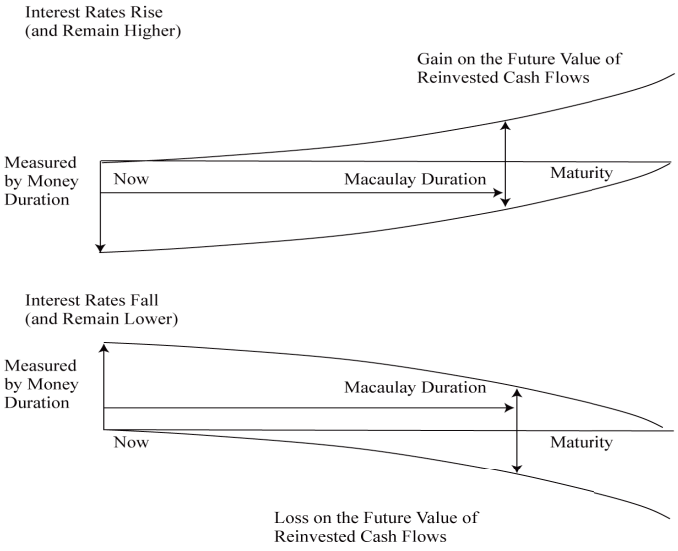
专业 · 创新 · 增值

Managing Single Liability

- **Interest rate immunization**
  - Immunization can be reached by ***using a coupon bearing fixed-income bonds***.
    - ✓ The bonds exposed to **interest rate risk**: the bond's value falls when the yield curve upward shift;
    - ✓ The bonds exposed to **reinvestment risk**: the reinvestment return increases as the yield curve upward shift.
    - ✓ At Macaulay duration, the two effects, the price effect and the coupon reinvestment effect, cancel each other.
    - ✓ Investors can have an investment horizon equal to the bond's Macaulay duration.

专业 · 创新 · 增值

Managing Single Liability



专业 · 创新 · 增值

Managing Single Liability

- **Interest rate immunization**
  - Immunizing with coupon bearing bonds needs to continuously ***match the portfolio Macaulay duration with the Macaulay duration of the zero-coupon bond*** over time.
    - ✓ The Macaulay duration of zero-coupon bond always matches the investment horizon.
  - The bond portfolio's ***initial market value*** has to ***match or exceed*** the ***present value of the zero-coupon bond***;
  - The **interest rate risk** to an immunization strategy is that the change in the cash flow yield on the portfolio is not the same as on the ideal zero-coupon bond.

专业 · 创新 · 增值

Managing Single Liability

- **Interest rate immunization**
  - **Key assumption** to achieve immunization: any ***ensuing change in the cash flow yield on the bond portfolio is equal to the change in the yield to maturity on the zero-coupon bond***.
    - ✓ A sufficient but not necessary condition: ***a parallel shift to the yield curve***.
      - ◆Sufficient: if the yield curve shift is parallel, the change in the bond portfolio's cash flow yield will equal the change in yield to maturity of the zero-coupon bond, which is enough to ensure immunization.
      - ◆However, it is not necessary that the yield curve shifts in a parallel manner to achieve immunization.

专业 · 创新 · 增值

Managing Single Liability

- **Structural risk**
  - **Definition:** Structural risk arises from portfolio design, particularly the choice of the portfolio allocations.
  - The risk arise because ***yield curve twists and non-parallel shifts*** lead to changes in the cash flow yield that do not match the yield to maturity of the zero-coupon bond that provides for perfect immunization;
  - Structural risk is ***reduced by minimizing the dispersion (convexity)*** of the bond positions;
    - ✓ For ***zero-coupon bond***, it matches the date of the single obligation, and it has ***no structural risk***.

$$\text{convexity} = \frac{\text{Mac. Duration}^2 + \text{Mac. Duration} + \text{Dispersion}}{(1 + \text{cash flow yield})^2}$$

专业 · 创新 · 增值

Managing Single Liability

- **The characteristics of a bond portfolio structured to immunize a single liability**
  - Has an initial market value that equals or exceeds the present value of the liability;
  - Has a portfolio Macaulay duration that matches the liability's due date;
  - ***Minimizes the portfolio convexity*** statistic.
- **The portfolio must be regularly rebalanced over the horizon to maintain the target duration**
  - The portfolio's Macaulay duration changes as time passes and yields change;
  - A trade-off between incurring transaction costs from rebalancing and allowing some duration gap.

专业 · 创新 · 增值

Bullet and Barbell Strategies

- **Bullet portfolio:** targeting a single segment of the curve, lower dispersion of cash flows, lower convexity.

- **Barbell portfolio:** combining securities concentrated in short and long maturities. higher dispersion of CF, higher convexity.

专业 · 创新 · 增值

Example

➢ An institutional client asks a fixed-income investment adviser to recommend a portfolio to immunize a single 10-year liability. The adviser proposes two portfolios of coupon-bearing government bonds because zero-coupon bonds are not available, and the portfolios have the same market value. The institutional client's objective is to minimize the variance in the realized rate of return over the 10-year horizon. The two portfolios have the following risk and return statistics:

	Portfolio A	Portfolio B
Cash flow yield	7.64%	7.65%
Macaulay duration	9.98	10.01
Convexity	107.88	129.43

专业 · 创新 · 增值

Example

- Statistics are based on aggregating the interest, and principal cash flows for the bonds that constitute the portfolios;
- The cash flow yield is stated on a semi-annual bond basis
- The Macaulay durations and convexities are annualized.

Indicate the portfolio that the investment adviser should recommend, and explain the reasoning.

专业 · 创新 · 增值

Example

➢ **Correct Answer:**

The adviser should recommend Portfolio A.

First, **the cash flow yields of both portfolios are the same, and both portfolios have Macaulay durations close to 10, the horizon for the liability**. The convexity for two portfolios are 107.88 and 129.43, a more convex bond gains more if the yield goes down and loses less if the yield goes up than a less convex bond.

The client's objective is to minimize the variance in the realized rate of return over the 10-year horizon, **which indicates a conservative immunization strategy by building the duration matching portfolio and minimizing the portfolio convexity**.

The structural risk leads to changes in the cash flow yield that do not track the change in the yield on the zero-coupon bond. This risk is minimized by selecting the portfolio with the lower convexity (and dispersion of cash flows).

Default risk is neglected in this discussion

专业 · 创新 · 增值

1.3 Managing Multiple Liabilities

- **Approaches to manage multiple liabilities**
  - **Cash flow matching**
    - ✓ Entails building a dedicated portfolio of zero-coupon or fixed-income bonds to ensure that there are sufficient cash inflows to pay the scheduled cash outflows.
  - **Duration matching**
    - ✓ Extends the ideas of the previous section to a portfolio of debt liabilities.
  - **Contingent immunization**
    - ✓ Allows for active bond portfolio management until a minimum threshold is reached and that threshold is identified by the interest rate immunization strategy.

专业 · 创新 · 增值

Cash Flow Matching

- It is a classic strategy to ***eliminate the interest rate risk*** through building a dedicated asset portfolio of high-quality fixed-income bonds, so that ***matches the amount and timing of the scheduled cash outflows***.
  - Each cash flow are placed in a held-to-maturity portfolio
- **Why company do not buy back and retire its liabilities?**
  - The buyback strategy would be difficult and costly;
  - Most corporate bonds are rather illiquid
  - The corporate has motivation to improve the company's credit rating by cash flow matching.

专业 · 创新 · 增值

Cash Flow Matching

- **Accounting defeasance**
  - A way of extinguishing a debt obligation by setting aside sufficient high quality securities, such as US Treasury notes, to repay the liability.
- **A concern for cash flow matching strategy is the cash-in-advance constraint**
  - **Cash-in-advance constraint** means securities are not sold to meet obligations;
  - For company, sufficient funds must be available on or before each liability payment date to meet the obligation;
  - There might be large cash holdings between payment dates, so cash reinvestment risk would be faced, as the short-term investments returns are relatively low.

专业 · 创新 · 增值

Duration Matching

- **Duration matching for multiple liabilities**
  - The money duration of the immunizing portfolio matches the money duration of the debt liabilities;
  - Market values and cash flow yields of the assets and liabilities are not necessarily equal.
  - **Match money duration is useful.**
- **Basis point value (BPV)** is used to measure money duration, means ***1bps change in cash flow yield, the market value change***.
- Short-term and long-term yields go up while the medium term yields go down. This type of twist is a butterfly movement, in this case a "***positive butterfly***." (In a "***negative butterfly***" twist, short-term and long-term yields go down and intermediate-term yields go up.)

专业 · 创新 · 增值

Duration Matching

- **Immunization of multiple liabilities is essentially an interest rate risk hedging strategy**
  - Changes in the market value of the asset portfolio closely match changes in the debt liabilities whether interest rate changes.
  - Although money duration for assets and liabilities are the same, the difference in structure of asset and liability shows a ***difference in dispersion and convexity***.
- **Rebalancing is needed**
  - In theory, asset manager needs to make a rebalance when needed, so that the money duration of the asset can match the money duration of the liability;
  - In reality, the manager likely waits until the ***mismatch is large enough*** to justify the transactions costs in selling some bonds and buying others.
  - Method to rebalance
    - ✓ Sell or buy the bonds;
    - ✓ Use interest rate derivatives.

专业 · 创新 · 增值

Contingent Immunization

- **Contingent immunization**
  - The presence of a ***significant surplus*** allows the asset manager to consider a hybrid passive-active strategy;
  - The idea behind contingent immunization is that asset managers can pursue active investment strategies.
    - ✓ When actively managed assets performed poorly, the mandate reverts to the purely passive strategy of building a duration matching portfolio, and then managing it to remain on duration target.

专业 · 创新 · 增值

1.4 Derivatives Overlay

- **Higher or lower interest can arise from**
  - Change in expected inflation;
  - Change in monetary policy;
  - Change in macroeconomic conditions.
- **Interest rate derivatives** can be a cost-effective method to **rebalance the immunizing portfolio to keep it on its target duration** as the yield curve shifts and twists and as time passes.
- To analyze the LDI for single and multiple liabilities, the essential relationship for **full interest rate hedging** can be summarized as
  - $Asset\ BPV \times \Delta Asset\ yields + Hedge\ BPV \times \Delta Hedge\ yield \approx Liability\ BPV \times \Delta Liability\ yields$

专业 · 创新 · 增值

Derivatives Overlay

- **Calculate the required number of futures contract (N_f)**
  - $Asset\ portfolio\ BPV + N_f \times futures\ BPV = Liability\ portfolio\ BPV$
  - $N_f = \frac{Liability\ portfolio\ BPV - Asset\ portfolio\ BPV}{futures\ BPV}$
    - ✓ If N_f is a ***positive*** number ➔ the asset manager goes ***long*** the required number of futures contracts;
    - ✓ If N_f is a ***negative*** number ➔ the asset manager goes ***short*** the required number of futures contracts.
  - **Decided by cheapest-to-deliver bond's duration**
    - ✓ Achieving the target duration (liability portfolio)

$$Futrues\ BPV = \frac{BPV_{CTD}}{CF_{CTD}}$$

专业 · 创新 · 增值

Derivatives Overlay

- **Use interest swap**
  - The notional principal (NP) on the interest rate swap needed to close the duration gap to zero can be calculated by using the formula
    - ✓ **Asset BPV+ NP* Swap BPV/100= liability BPV**
    - ✓ $NP = \frac{Liability\ portfolio\ BPV - Asset\ portfolio\ BPV}{Swap\ BPV/100}$
- **Swaption**
  - Instead of entering a swap, the pension fund could purchase an option to enter a similar received-fixed swap, which is called a receiver swaption.
    - ✓ **Increase duration**: enter a ***receiver swaption***
    - ✓ **Decrease duration**: enter a ***payer swaption***

专业 · 创新 · 增值

Derivatives Overlay

- **Hedging ratio:** the extent of interest rate risk management
  - A hedge ratio of ***0%*** indicates ***no hedging*** at all;
  - A hedge ratio of ***100%*** means ***fully immunized***;
  - In practice, the partial hedge ratios are common.
- **Flexibility in selecting the hedge ratio**
  - When interest rate are ***lower***, plan manager would have ***higher hedging ratio***;
  - When interest rate are ***higher***, plan manager would have ***lower hedging ratio***;
- In all likelihood, the prudent course of action for the manager is to ***use a partial hedge*** rather than attempt to reduce the duration gap to zero.

专业 · 创新 · 增值

Derivatives Overlay

- An asset manager want to use futures exchange to manage the gaps that arise from "duration drift" in a portfolio of German government bonds that are used to immunize a portfolio of corporate debt liabilities. This futures contract has a notional principal of EUR 100,000 and a 6% coupon rate. The German government bonds that are eligible for delivery have maturities between 8.5 years and 10.5 years.
  - Market value of the debt is EUR 330,224,185
  - Modified duration of debt is 7.23
  - **BPV of the debt is EUR 238,752.**
  - Market value of the asset portfolio is EUR 332,216,004
  - Modified duration of the asset portfolio is 7.42
  - BPV of the asset portfolio is EUR 246,504.
  - BPV for each futures contract is EUR 65.11.

  1) Does the asset manager go long (buy) or go short (sell) the futures contract?

  2) How many contracts does the manager buy or sell to close the duration gap?

专业 · 创新 · 增值

Derivatives Overlay

- **Correct Answer:**

  1) The money duration of the assets, as measured by the BPV, is greater than the money duration of debt liabilities. This relationship is true of the modified duration statistics as well, but the money duration is a better measure of the gap because the market values differ. The asset manager needs to go short (or sell) Long Bund futures contracts.

  2) $N_f = \frac{Liability\ portfolio\ BPV - Asset\ portfolio\ BPV}{futures\ BPV}$

  Liability portfolio BPV=238,752, asset portfolio BPV=246,504, and future's BPV=65.11

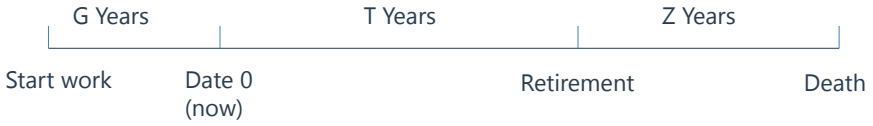
  N_f=-119.06

  Asset managers should go short 119 contracts to close the duration gap.

专业 · 创新 · 增值

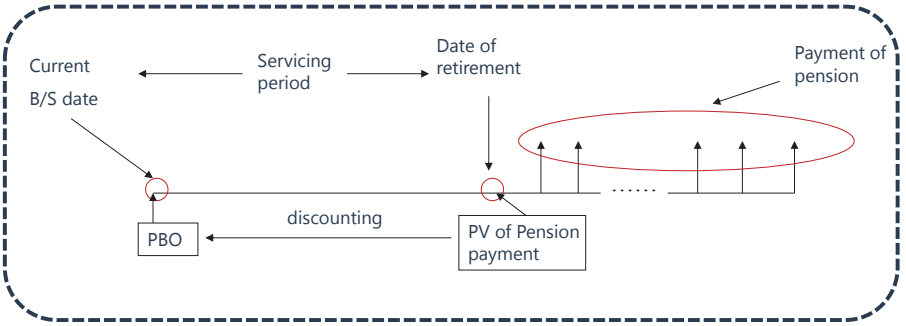
1.5 LDI-Example of DB Plan

- **DP plan**
  - A good example of type IV liabilities;
  - Both amounts and dates are uncertain.
- **Basic assumptions**
  - This employee has worked for G years, a sufficient length of time to ensure that retirement benefits are vested;
  - The employee is expected to work for another T years;
  - The employee will retire and live for Z years then.



专业 · 创新 · 增值

LDI-Example of DB Plan



- The payment of pension after the retirement is committed by the firm. Therefore, these cost should be recognized during the servicing period of the employees. The present value of the cost as at the end of current year is called PBO
- The firm (sponsor) usually set up a fund to meet the liability.

专业 · 创新 · 增值

LDI-Example of DB Plan

- **Two measures of the retirement obligation**
  - Accumulated benefit obligation (ABO)
    - ✓ Calculates the liability based on the G years worked and **current wage W_0**; m is a multiplier.
    - ✓ The use of the current annual wage and the number of years worked is because the ABO represents the legal liability today;
    - ✓ ABO is the present value of the annuity, discounted at an annual rate on high-quality corporate bond.
    - ✓ $ABO = \frac{1}{(1+r)^T} \times [\frac{m \times G \times W_0}{1+r} + \frac{m \times G \times W_0}{(1+r)^2} + \cdots + \frac{m \times G \times W_0}{(1+r)^Z}]$
    - ✓ $ABO = \frac{m \times G \times W_0}{(1+r)^T} \times [\frac{1}{r} - \frac{1}{r \times (1+r)^Z}]$

专业 · 创新 · 增值

LDI-Example of DB Plan

- **Two measures of the retirement obligation**
  - Projected benefit obligation
    - ✓ Uses the **projected wage for year T** instead of the current wage in the Z-year annuity, $\mathbf{W_T}$;
    - ✓ It is the liability reported in financial statements and used to assess the plan's funding status.
    - ✓ $PBO = \frac{1}{(1+r)^T} \times [\frac{m \times G \times W_T}{1+r} + \frac{m \times G \times W_T}{(1+r)^2} + \cdots + \frac{m \times G \times W_T}{(1+r)^Z}]$
    - ✓ $PBO = \frac{m \times G \times W_0 \times (1+w)^T}{(1+r)^T} \times [\frac{1}{r} - \frac{1}{r \times (1+r)^Z}]$
    - ✓ PBO always larger than the ABO by the factor of $(1+w)^T$, assuming positive wage growth in nominal terms.

专业 · 创新 · 增值

LDI-Example of DB Plan

- **Assuming w is less than r**
  - Employees are generally compensated for price inflation, and some part of real economic growth, as well as for seniority and productivity improvements;
  - But overall the labor income growth rate does not quite keep pace with the nominal return on high-quality financial assets.
- **Longevity risk**
  - The risk that employees live longer in their retirement years than assumed in the model;
  - The higher value of Z increases both the ABO and PBO measures of liability.

专业 · 创新 · 增值

LDI-Example of DB Plan

- **Choose ABO or PBO?**
  - If the corporation want to convert the retirement plan from DB to DC, the ABO measure matters more than PBO;
  - If the sponsor sees itself as an ongoing independent institution that preserves the pension plan's current design, PBO is more appropriate measure for pension plan liabilities.
- **Addressing the Duration Gap**
  - The pension fund manager can choose to reduce, or even eliminate, the duration gap using derivatives and select a suitable hedging strategy.
  - Using Futures to Reduce the Duration Gap
  - Using Interest Rate Swaps to Reduce Duration Gap
  - Using Options to Reduce Duration Gap
  - Using a Swaption Collar

专业 · 创新 · 增值

1.6 Risks in LDI

- **Risks in LDI**
  - Model risk
  - Interest rate risk
  - Yield curve risk
  - Spread risk
  - Credit risk
  - Collateral exhaustion risk
  - Liquidity risk

专业 · 创新 · 增值

Risks in LDI

- **Model risk**
  - The risk that the assumptions in the model turn out to be wrong and the approximations are inaccurate
    - ✓ Previously, the effective duration of the alternative and equity are assumed to be 0, this assumption might be wrong, leading to the mis-measurement of the asset BPV.
    - ✓ Measurement error for asset BPV can also arise in the classic immunization strategy for type I cash flows;
    - ✓ The measurement error for asset BPV is minimized when the underlying yield curve is flat or when future cash flows are concentrated in the flattest segment of the curve.
    - ✓ The model assumes that the change of asset yield, hedge yield and liability yields are the same, and this would increase the model risk as well.

专业 · 创新 · 增值

Risks in LDI

- **Interest rate risk**
  - Approximations are based on duration, but convexity ignored.
- **Yield curve risk**
  - Non-parallel shift of yield curve. Minimizing dispersion of the cash flows in the asset portfolio mitigates this risk.
- **Spread risk**
  - The risk that the respective spreads on the broad index and the high quality sector do not move in unison with a shift in the government bond yield curve;
  - Yields on high-quality corporate bonds are less volatile than more-liquid treasuries.
  - There is less volatility in the corporate/swap spread than in the corporate/Treasury spread.

专业 · 创新 · 增值

Risks in LDI

- **Counterparty credit risk**
  - May occur when interest rate swap overlay are uncollateralized.
  - It entails the joint probability of default by the counterparty and movement in market rates that results in the swap being valued as an asset.
- **Collateral exhaustion risk**
  - Derivatives used in LDI strategy introduces a new risk factor——the risk that available collateral becomes exhausted.
  - In pension plan, it would need to enter a sizable derivatives overlay;
  - The same concern about cash management and collateral availability arises with the use of exchange –traded futures contracts.
- **Liquidity risk**
  - A risk factor in strategies that combine active investing to the otherwise passive fixed-income portfolio.

专业 · 创新 · 增值

2. Matching a FI Portfolio to An Index

- **Basic terminologies**
  - **Tracking risk:** deviation of returns on the selected portfolio from bond market index returns;
    - ✓ **Tracking error:** the standard deviation of a portfolio's active return for a given period, and active return is defined as
      - ◆Active return= portfolio return- benchmark index return
  - **Pure indexing:** the investor aims to replicate an existing market index by purchasing all of the constituent securities in the index to minimize tracking risk;
    - ✓ **Full replication approach:** the purchase of all securities within an index
  - **Enhanced indexing strategy:** the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.
  - **Active management:** involves taking positions in primary risk factors that deviate from those of the index in order to generate excess return.

专业 · 创新 · 增值

Matching a FI Portfolio to An Index

- **Fixed income market**
  - ***Unique characteristics*** which make them ***difficult to track***
  - Investors face significant challenges in replicating a bond market index
    - ✓ ***Size and breadth*** of the bond market
    - ✓ ***Wide array*** of fixed income security characteristics
    - ✓ ***Unique issuance and trading pattern*** of bonds
      - ◆The pattern would influence the index composition, construction, pricing and valuation.

专业 · 创新 · 增值

2.1 Passive Investment

- **Passive investment**
  - The one that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, types of borrower, maturity, and duration rather than express a specific market view;
  - The approach is ***consistent with the efficient market hypothesis***
    - ✓ Portfolio manager seeks to ***replicate*** broader fixed-income market ***performance rather than outperform the market***;
    - ✓ Not require in-depth analysis to achieve the above market return.
  - Consistent with the highest degree of portfolio diversification.

专业 · 创新 · 增值

Passive Investment

- **Bond market index replication**
  - Most straight forward strategy a manager use to mimic index performance;
  - Has the brief that active managers cannot consistently outperform the index on a risk-adjusted basis;
  - Do not require manager analysis;
  - The manager's task is to purchase or sell bonds when there are changes to the index in addition to managing inflows and outflows for a specific fund.
  - **Advantages**
    - ✓ Best means of ***diversification***.
  - **Disadvantage**
    - ✓ ***Neither feasible nor cost-effective*** for investors to pursue full replication.

专业 · 创新 · 增值

Alternative Methods for Passive Investment

- **Mutual fund**
  - Pooled investment vehicles whose shares or units represent a proportional share in the ownership of the assets in an underlying portfolio.
  - Open-ended mutual fund
    - ✓ New shares may be issued or redeemed at the fund's NAV established at the end of each trading day
      - ◆NAV is calculated based on the fund's valuation of all existing assets minus liabilities, divided by the total number of shares outstanding.
      - ◆Characteristics
        - ☐ Economies of scale;
        - ☐ Better diversification;
        - ☐ The mutual fund must outline its stated investment objectives and periodic fees, but actual securities holdings are available on a retroactive basis;
        - ☐ Has no maturity date;
        - ☐ Be able to redeem their holdings at the fund's NAV

专业 · 创新 · 增值

Alternative Methods for Passive Investment

- **Exchange-traded funds**
  - Share some mutual fund characteristics, but have ***more tradability*** features.
  - Authorized participants
    - ✓ ETF solicit broker/ dealers
  - Creation units
    - ✓ Large block of ETF shares often traded against a basket of underlying securities.
  - ETF has ***greater liquidity*** than mutual funds, because of their availability to be purchased or sold ***throughout the trading day at a discount or premium relative to the NAV*** of the underlying bonds;
    - ✓ Authorized participant has arbitrage opportunity.
  - Synthetic strategies provide another arbitrage opportunity, as the portfolio manager can trade in both OTC and exchange traded market.

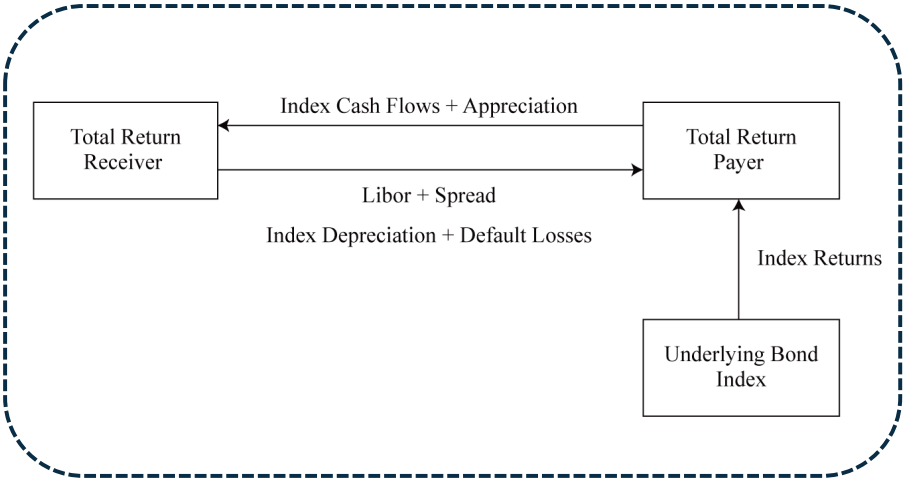
专业 · 创新 · 增值

Alternative Methods for Passive Investment

- **Total return swap (TRS)**
  - Combining elements of interest rate swaps and credit derivatives;
  - The most common over-the-counter portfolio derivative strategy.
  - Total return receiver: receives both the ***cash flows from the underlying index*** as well as any appreciation in the index over the period in exchange for ***paying LIBOR plus a pre-determined spread***.
  - The total return payer is responsible for paying the reference obligation cash flows, and return to the receiver but will also be compensated by the receiver for any depreciation in the index or default losses incur.

专业 · 创新 · 增值

Alternative Methods for Passive Investment



专业 · 创新 · 增值

Alternative Methods for Passive Investment

- **Total return swap**
  - **Attractiveness of TRS**
    - ✓ Efficient risk transfer on the reference obligation from one counter party to another on a confidential basis, with ***no requiring of the full cash outlay*** associated with the mutual fund or ETF purchase.
  - **Disadvantages of TRS**
    - ✓ The investor does ***not actually own the underlying assets***, but rather has a combined synthetic long position in both the market and credit risk of the index that is contingent upon the performance of the total return payer.
    - ✓ TRS allow investors to gain particular access to subsets of the fixed income markets. The markets are relatively illiquid, or the cost and administrative procedure are complex. All these prohibitive for the investor.

专业 · 创新 · 增值

2.2 Enhanced Indexing Strategy

- **Enhanced indexing strategy**
  - The goal of the approach
    - ✓ Mirror the ***most important index characteristics***;
    - ✓ Closely track index performance.
  - General method: **stratified sampling**
    - ✓ Identify the characteristic of ***each cell*** or ***significant index portfolio***;
    - ✓ The fixed-income portfolio manager identifies a subset of bonds or bond-linked exposures;
    - ✓ The positions in each cell are adjusted over time given changes to the underlying index versus existing portfolio positions.
    - ✓ The stratified sampling approach provides an asset manager the ability to optimize portfolio performance. Portfolio manager also seeks to minimize tracking error and limit the need to purchase or sell thinly traded securities.
  - The strategy aims to replicate the index performance under different market scenarios ***more efficiently*** than the full replication of a pure indexing approach.

专业 · 创新 · 增值

Enhanced Indexing Strategy

- **Enhancement strategies for portfolio managers**
  - **Lower cost enhancement**
    - ✓ The most obvious enhancement is in the area of **cost reduction - reduce** fund expenses or reduce the bid-ask cost of trading.
  - **Issue selection enhancement**
    - ✓ By using **bond valuation models,** identify specific issues that are undervalued to their implied value, and help enhance the return.
  - **Yield curve enhancement**
    - ✓ Using **analytical models** to gauge and calculate relative value across the term structure of interest rates allows managers to develop strategies to both overweight undervalued securities and underweight overvalued securities.

专业 · 创新 · 增值

Enhanced Indexing Strategy

- **Enhancement strategies for portfolio managers**
  - **Sector/ quality enhancements**
    - ✓ Overweighting specific bond and credit sectors across the business cycle to enhance returns, and other sectors are underweighted as a result.
  - **Call exposure enhancement**
    - ✓ Effective duration is a sufficient risk measure for relatively small rate changes;
    - ✓ Larger yield changes may affect bond performance significantly. Callable bonds are added to the portfolio, and the sensitivity to the price would be decreased.

专业 · 创新 · 增值

Primary Indexing Risk Factors

- **Risk factors for primary indexing**
  - **Portfolio modified adjusted duration**
    - ✓ ***Effective duration*** is the first approximation of an index's exposure to interest rate changes;
    - ✓ The factor is important in option-adjusted duration so that the analysis reflects securities with embedded call risk.
  - **Key rate duration**
    - ✓ Takes into account rate changes in a specific maturity along the yield curve while holding the remaining rates constant.
    - ✓ This measure gauges the index's sensitivity to ***non-parallel yield curve shifts***.

专业 · 创新 · 增值

Non-Parallel Yield Curve Shifts

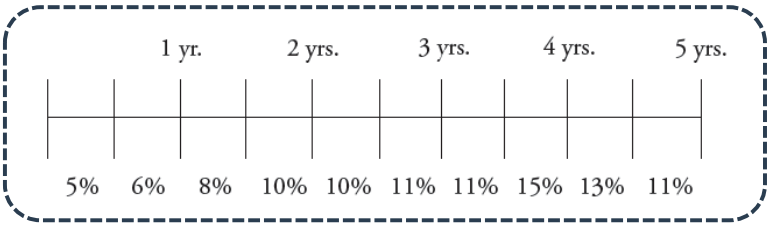
- **Present value of distribution of cash flows methodology (PVD)**
  - Divides the cash flows for each non-callable security in the index into discrete semi-annual periods and aggregates them.
  - Adds the cash flows for callable securities in the index based on the probability of call for each given period.
  - Compute the present value of aggregated cash flows for each semi-annual period, and the total present value of aggregated cash flows equal to the index's present value. The percentage of the present value of each cash flow vertex is calculated.
  - The time period is then multiplied by the present value of each cash flow.
  - Each period's contribution to duration is added to arrive at a total representing the bond index's duration.

专业 · 创新 · 增值

Yield Curve Risk 2 – PVD 1

补充

- **PVD …**
  - Present value distribution of cash flow of the index used as the portfolio benchmark
  - PVD measures the proportion of the index's total duration attributable to cash flows falling within the selected time periods



专业 · 创新 · 增值

Yield Curve Risk 2 – PVD 2

补充

- **Calculating PVD**

$$Step\,1 \rightarrow w_i = PV(CF_i)/TPV(CF)$$
$$Step\,2 \rightarrow Duration_{C-i} = Duration_i \times w_i$$
$$Step\,3 \rightarrow Total\ Duration_C = \sum Duration_{C-i}$$
$$Step\,4 \rightarrow w_{DC} = D_{C-i}/TD_C$$

If a manager matches the weights in the final column for a portfolio to those of the portfolio's benchmark, duration will be matched as well as exposure along the yield curve.

Cash Flow					
Amount	*Due in Year*	*PV at periodic r of: 0.02*	*PV/Total PV*	*Duration Contribution*	*Duration Contributions as % of Total Duration*
1.500	0.500	1.471	0.015	0.007	0.005
1.500	1.000	1.442	0.015	0.015	0.010
101.500	1.500	95.646	0.970	1.455	0.985
bond price =		98.559	1.000	1.477	1.000

专业 · 创新 · 增值

Primary Indexing Risk Factors

- **Risk factors for primary indexing**
  - **Sector and quality spread duration contribution**
    - ✓ Portfolio manager minimize deviations from the benchmark by matching the amounts of index duration associated with the respective issuer sectors and quality categories;
    - ✓ **Spread duration** refers to the change in a non-treasury security's price given a widening or narrowing of the spread compared with the benchmark;
    - ✓ Matching the quality between the portfolio and the fixed-income index will minimize this risk.
  - **Percent in sector and quality**
    - ✓ Index yield is most effectively matched by targeting the same percentage weights across fixed income sectors and credit quality;
    - ✓ Refers to the issuers' type and industry segment of the bond issuer.

专业 · 创新 · 增值

Primary Indexing Risk Factors

- **Risk factors for primary indexing**
  - **Sector/ coupon/ maturity cell weights**
    - ✓ Asset managers face a number of challenges in matching price/ yield sensitivity beyond the use of effective duration.
    - ✓ For callable bond, its convexity may be negative, and there is a possibility that the bond can be called by the issuer. This makes the cost of rebalancing to be significant.
    - ✓ Managers seeks to match the sector, coupon and maturity weights of callable bonds by sector.
  - **Issuer exposure**
    - ✓ Concentration of issuers within a portfolio exposes the asset manager to issuer-specific event risk.

专业 · 创新 · 增值

2.3 Benchmark Selection

- It is **the final steps** in the broader asset allocation process and asset allocation start with a clear delineation of the portfolio manager's investment goals and objectives.

Asset allocation	
The manager must agree on an investment policy with asset owners, beneficiaries, and other constituents outlining return objectives, risk tolerance, and constraints to narrow choices available in the broader capital markets to meet these objectives.	
Strategic asset allocation	**Tactical asset allocation**
Targeting specific weightings for each permissible asset class is the result of this process	Provides the investment manager some short-term flexibility to deviate from these weightings in response to anticipated market changes.

专业 · 创新 · 增值

Benchmark Selection

- **Criteria for benchmark selection**
  - Benchmark selection must factor in the broad range of issuers and characteristics available in the fixed-income markets.
  - The use of an index as a widely accepted benchmark requires
    - ✓ Clear, transparent rules for security inclusion;
    - ✓ Weighting;
    - ✓ Investability;
    - ✓ Daily valuation;
    - ✓ Availability of past returns and turnover.

专业 · 创新 · 增值

Benchmark Selection

- **The dynamics of fixed income market require investors to more actively understand**
  - Their underlying duration preferences;
  - A desired risk and return profile within their fixed income allocation.
- **Smart beta**
  - Smart beta involves the use of simple, transparent, rules-based strategies as a basis for the well-established, static strategies that tend to drive excess portfolio returns;
  - In theory, asset managers can capture excess returns with similar transaction fees by using this strategy. It is more commonly used in equity manger, and fixed income manager start to use as well.

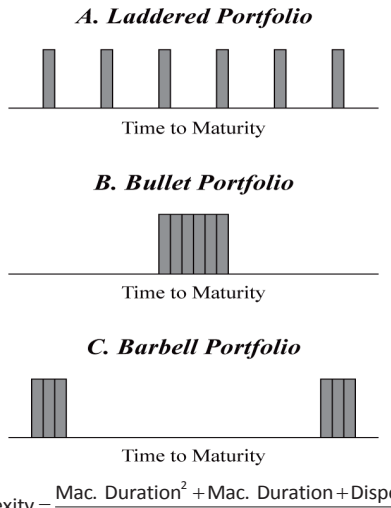
专业 · 创新 · 增值

3. Laddered Bond Portfolio

- **Laddered portfolio**
  - **Laddered portfolio** spreads the bonds' maturities and par values more or less evenly along the yield curve;
  - **Bullet portfolio** concentrates the bonds at a particular point on the yield curve;
  - **Barbell portfolio** places the bonds at the short-term and long-term ends of the curve.
- **The way to build a ladder portfolio**
  - Build the ladder directly;
  - Use fixed-maturity corporate bond ETFs, and these ETFs have a designated year of maturity and credit risk profile.

专业 · 创新 · 增值

Laddered Bond Portfolio



$$\text{convexity} = \frac{\text{Mac. Duration}^2 + \text{Mac. Duration} + \text{Dispersion}}{(1 + \text{cash flow yield})^2}$$

专业 · 创新 · 增值

Laddered Bond Portfolio

- **Advantage to laddered portfolio**
  - ***Protection from shifts and twists***——the cash flows are essentially "***diversified***" across the time spectrum; the investor has a ***balanced position*** between cash flow reinvestment and market price volatility;
  - ***The convexity for ladder is in the middle*** of bullet and barbell, and compared to barbell, the ladder portfolio has much less cash flow reinvestment risk;
  - Ladder has ***advantage in liquidity management***, especially when bond is not actively traded.

专业 · 创新 · 增值

Laddered Bond Portfolio

- **Limitations for ladder portfolio**
  - The decision to build a laddered bond portfolio should be weighed against buying shares in a fixed-income mutual fund;
    - ✓ Mutual fund provides greater diversification of default risk.
  - Actual bonds entails a much higher cost of acquisition;
  - Mutual fund shares can be redeemed more quickly than the bonds can be sold, and likely at a better price.

专业 · 创新 · 增值

Laddered Bond Portfolio

- A Radford School Board member has stated that she prefers a bond portfolio structure that provides diversification over time, as well as liquidity. In addressing the board members inquiry, Ng examines a bullet portfolio, a barbell portfolio, and a laddered portfolio.
- Which portfolio structure should Ng recommend that would satisfy the school board member's preference?
  - A. Bullet portfolio
  - B. Barbell portfolio
  - C. Laddered portfolio
- **Correct Answer: C**

专业 · 创新 · 增值

Reading 13

Yield Curve Strategies

专业 · 创新 · 增值

Framework

1. Yield curve
2. Yield curve strategies
   - Static Yield Curve
   - Dynamic Yield Curve
     - Divergent Rate Level View
     - Divergent Rate Slope View
     - Divergent Rate Shape View
     - Yield Curve Volatility Strategies
   - Key Rate Duration for a Portfolio
3. Active Fixed-income Management Across Currencies
4. A Framework for Evaluating Yield Curve Strategies

专业 · 创新 · 增值

1. Yield curve

➢ **Yield curve**

- A yield curve is a stylized representation of the yields available to investors at various maturities within a market.

➢ **Problems with modeling yield curve**

- ***Unsynchronized*** observations of various maturities on the curve (non-parallel shift);
- Gaps in maturities that require ***interpolation*** and/or smoothing;
- Observations that seem ***inconsistent*** with neighboring values;
- Use of ***on-the-run bonds*** only versus all marketable bonds;
- ***Differences in accounting or regulatory*** treatment of certain bonds that may make them look like ***outliers***.

专业 · 创新 · 增值

1.1 Primary yield curve risk factors

- ***Level***
  - A parallel "shift" in the yield curve.
- ***Slope***
  - A flattening or steepening "twist" of the yield curve.
    - ✓**Spread = $Y_L - Y_S$**
    - ✓As this spread increases (widens), the yield curve is said to ***steepen***, while a decrease (narrowing), is referred to as a ***flattening*** of the yield curve.
    - ✓In most instances, the spread is ***positive*** and the yield curve is upward-sloping. If the spread turns negative, the yield curve is described as "***inverted***."

专业 · 创新 · 增值

Primary yield curve risk factors

- **Shape or curvature (or "butterfly movement")**
  - The relationship between YTM at the short end of the curve, at a midpoint along the curve ,and at the long end of the curve.
  - **Curvature**: a difference between medium-term yields and a linear interpolation between short-term and long-term YTM.
  - A **common measure of yield curve curvature** is the butterfly spread:
    - ✓**Butterfly spread$= -Y_S + 2 \times Y_M - Y_L$**
    - ✓A **positive butterfly** spread indicates a concave (humped) shape to the midpoint of the curve,
    - ✓while a convex (saucer) shape indicates the spread is **negative**.

专业 · 创新 · 增值

1.2 Duration and Convexity

- **Macaulay duration** (effective maturity)
  - Weighted average of time to receive the bond's promised payments. The present value of each payment to be received is weighted by the present value of all future payments.
- **Modified duration**
  - Direct measure of the relationship between changes in a bond's yield and percentage changes in its price. Modified duration is the Macaulay duration statistic divided by one plus the yield to maturity for each period.
- **Effective duration**
  - The sensitivity of a bond's price to a change in a benchmark yield curve. Used to describe bonds with ***embedded options***.
- **Key rate duration** (partial duration, partials)
  - Measure of a bond's sensitivity to a change in the benchmark yield curve at a specific maturity point or segment.

专业 · 创新 · 增值

Duration

- **Money duration (dollar duration)**
  - Measure of the price change in units of the currency in which the bond is denominated. Money duration can be stated per 100 of par value or in terms of the bond's actual position size in the portfolio.
- **Price value of a basis point (PVBP, DV01, BPV)**
  - Estimate of the change in a bond's price given a 1 bp change in yield to maturity.

专业 · 创新 · 增值

Convexity

- **Convexity (second order)**
  - Describes a bond's price behavior for larger movements in yield.
  - The expected return of a bond with positive convexity will be higher than the return of an identical-duration, lower-convexity bond if interest rates change.
- **Effective convexity**
  - Like effective duration, uses a methodology that can accommodate cash flows that change when yields change. Used to describe ***bonds with embedded options***.

$$\%\Delta \mathrm{PV}^{full} \approx -(ModDur \times \Delta Yield) + [\frac{1}{2} \times Convexity \times (\Delta Yield)^2]$$

专业 · 创新 · 增值

2. Yield curve strategies

- ***2.1 Static Yield Curve***
- A portfolio manager may believe that bonds are **fairly priced** and that the existing yield curve will ***remain unchanged over an investment horizon***.
- The two basic ways in which a manager may actively position a bond portfolio versus a benchmark index to generate excess return from a static or stable yield curve is to **increase risk** by ***adding either duration*** or ***leverage*** to the portfolio.
- **(1) Buy and hold**
  - In an upward sloping curve, extend maturity (and therefore duration) to ***earn a higher yield and expected return***.
  - **Benefit from**:
    - ✓ coupon collection and reinvestment, indicating by higher YTM;
    - ✓ another advantage of this strategy will be low turnover and transaction costs;
  - Although hold without active trading, it is still an ***active management***, since the bond's characteristics ***diverge from the benchmark***.

专业 · 创新 · 增值

Cash-Based Static Yield Curve Strategies

- **(2) Riding (roll down) the yield curve**
  - This strategy is based on the fact that as time passes, the bond's remaining maturity and duration decrease.
  - When price is **upward sloping**, ***buy long term bonds (sell short term bonds)***;
  - **Benefit from**:
    - ✓ higher gain during price appreciation and lower loss during price depreciation;
    - ✓ Then, after the yield declines, the manager sells the bond and rolls out the curve to repeat the process by buying another bond at the end of a steep segment of the curve;
  - Particularly useful when: yield curve are stable and relatively ***steep***, since the price will appreciate more as the time passes.
  - If the ***forecast ending yield*** on a particular bond is ***lower (higher) than the forward rate***, then it can be expected ***to earn a return greater than (less than) the one-period rate***.

专业 · 创新 · 增值

Cash-Based Static Yield Curve Strategies

- **(3) Carry trade (Repurchase agreement /Repo trade)**
  - A carry trade involves ***buying a security*** and ***financing it at a rate that is lower*** than the yield on that security;
  - **Benefit from:** In a stable upward sloping curve, the repo market involves buying a long-term security and financing it at a short-term rate below the long-term YTM— that is, earning a positive "repo carry";(**the spread between two rates**)
  - The carry trade can be inherently risky, because the portfolio holds (typically) longer-term securities financed with short-term securities.

专业 · 创新 · 增值

Cash-Based Static Yield Curve Strategies

Strategy	Description	Income	Objective
Buy-and-hold	Constant without active trading	Coupon income	Add duration beyond target given static yield curve view
Rolling down the yield curve	Constant, with Δ Price as maturity shortens	Coupon income +/− Rolldown Return	Add duration and increased return if future shorter-term yields are below current YTM
Repo carry trade	Finance bond purchase in repo market	(Coupon income +/− Rolldown return) - Financing cost	Generate repo carry return if coupon plus rolldown exceeds financing cost

专业 · 创新 · 增值

Derivatives-Based Static Yield Curve Strategies

- **Long futures position**
  - Active managers whose investment mandate ***extends to the use of synthetic means to increase risk by adding duration or leverage*** to the portfolio might consider using the derivatives-based strategies to increase duration exposure beyond a benchmark target.
  - Although the long futures example ***is similar to rolling down the yield curve***, it ***relies solely on price appreciation*** rather than bond coupon income.
- **Receive fixed swap**
  - The receive-fixed swap, ***is similar to the cash-based repo carry trade***, but the investor receives the fixed swap rate and pays a market reference rate (MRR), which is often referred to as "swap carry."

专业 · 创新 · 增值

Derivatives-Based Static Yield Curve Strategies

Strategy	Description	Targeted Return	Goal
Long futures position	Purchase contract for future bond delivery	(Δ Price / Δ Bond yield) – Margin cost	Synthetically increase duration (up-front margin and daily mark-to-market valuation)
Receive fixed swap	Fixed-rate receiver on an interest rate Swap	(Swap rate – MRR) + (Δ Swap mark-to- market / Δ Swap yield)	Synthetically increase portfolio duration (up-front / mark-to- market collateral) + / – Swap Carry

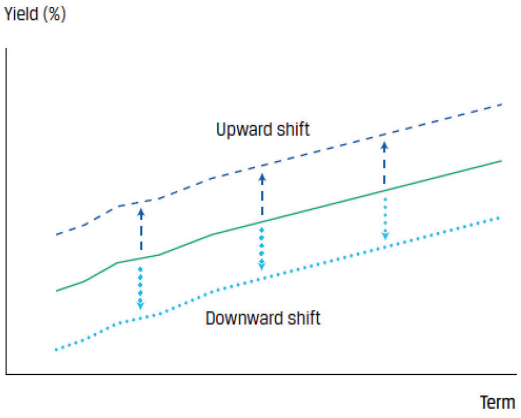
专业 · 创新 · 增值

2.2 Dynamic Yield Curve

- **2.2.1 Divergent Rate *Level* View**
  - For active fixed-income managers with a divergent rate level view, positioning the portfolio to ***increase profit as yield levels fall*** or ***minimizing losses as yield levels rise*** is of primary importance.
  - Interest rates fall, increase duration.
  - Interest rates rise, decrease duration.
  - Portfolio managers frequently use average duration and yield level changes to estimate bond portfolio performance in broad terms. However, these approximations are ***only reasonable if we assume a parallel yield curve shift***.

专业 · 创新 · 增值

Divergent Rate Level View



专业 · 创新 · 增值

Major Yield Curve Strategies to Increase Portfolio Duration

Strategy	Description	Expected Excess Return	Downside Risks
Cash bond ***purchase*** ("bullet")	Extend duration with longer-dated Bonds	Price appreciation as YTM Declines	Higher yield levels
Receive-fixed Swap	Fixed-rate receiver on an interest rate swap	Swap MTM gain + "carry" (fixed - floating rate)	Higher swap yield levels and/or higher floating rates
Long futures Position	Purchase contract for forward bond Delivery	Futures MTM gain – Margin cost	Higher bond yields and/or higher margin cost

专业 · 创新 · 增值

Major Yield Curve Strategies to Reduce Portfolio Duration

Strategy	Description	Expected Excess Return	Downside Risks
Cash bond ***sale*** ("bullet")	Reduce duration with short sale/switch to shorter-dated Bonds	Smaller price decline as YTM increases	Lower yield levels
Pay-fixed (interest rate swap)	Fixed-rate payer on an interest rate swap	Swap MTM gain + "swap carry" (MRR – Fixed swap rate)	Swap MTM loss amid lower swap yield levels and/or lower floating rates
Short futures Position	Sell contract for forward bond Delivery	Futures MTM gain – Margin cost	Futures MTM loss amid lower bond yields and/or higher margin cost

专业 · 创新 · 增值

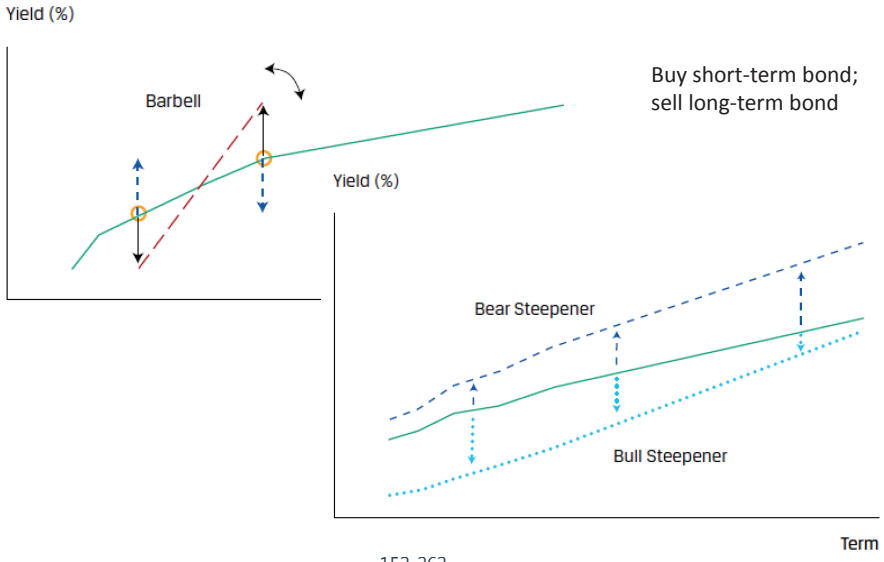
Dynamic Yield Curve

➢ **2.2.2 Divergent Rate *Slope* View**

- While a positively sloped yield curve prevails under most economic scenarios, this ***difference between long-term and short-term YTM can vary significantly over time***.
- A combination of positions in both short and long maturities with ***greater cash flow dispersion*** is particularly well-suited to position for ***yield curve slope changes or twists***.
- We focus solely on portfolio value changes due to yield changes, ***ignoring any associated funding or other costs*** that might arise as a result.
- A ***bear steepening*** occurs when long-term YTM rise more than short-term YTM. A ***bull steepening*** occurs when long-term YTM rise less than short-term YTM.

专业 · 创新 · 增值

Divergent Rate Slope View (steepen)



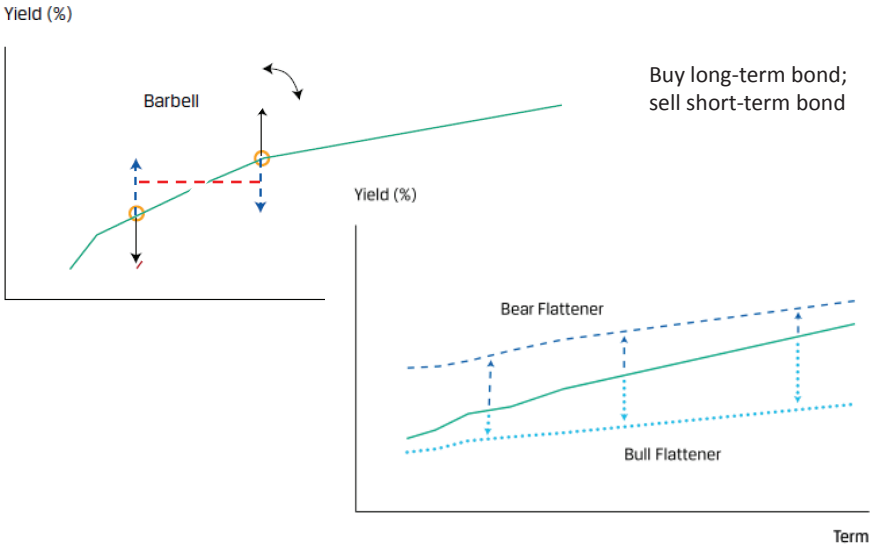
专业 · 创新 · 增值

Yield Curve Steepener Strategies

Strategy	Description	Expected Excess Return	Downside Risks
Duration neutral	Net zero duration	Portfolio gain from yield curve slope Increase	Yield curve flattening
Bear Steepener	Net negative (“short”) Duration	Portfolio gain from slope increase and/or rising yields	Yield curve flattening and/ or lower yields
Bull Steepener	Net positive (“long”) Duration	Portfolio gain from slope increase and/or lower yields	Yield curve flattening and/ or higher yields

专业 · 创新 · 增值

Divergent Rate Slope View (flatten)



专业 · 创新 · 增值

Yield Curve Flattener Strategies

Strategy	Description	Expected Excess Return	Downside Risks
Duration neutral	Net zero duration position	Portfolio gain from yield curve slope decrease	Yield curve steepening
Bear flattener	Net negative duration position	Portfolio gain from slope decrease and/or rising yields	Yield curve steepening and/or lower yields
Bull flattener	Net positive duration position	Portfolio gain from slope decrease and/or lower yields	Yield curve steepening and/or higher yields

专业 · 创新 · 增值

Dynamic Yield Curve

- **2.2.3 Divergent Rate *Shape* View**
  - ***Yield curve shape or curvature*** describes the relationship between short-, medium-, and long-term YTM across the term structure.
  - We quantify the butterfly spread by subtracting both short- and long-term rates from twice the intermediate YTM.
  - Since the difference between short- and medium-term rates is typically greater than that between medium- and long-term rates, ***the butterfly spread is usually positive***.

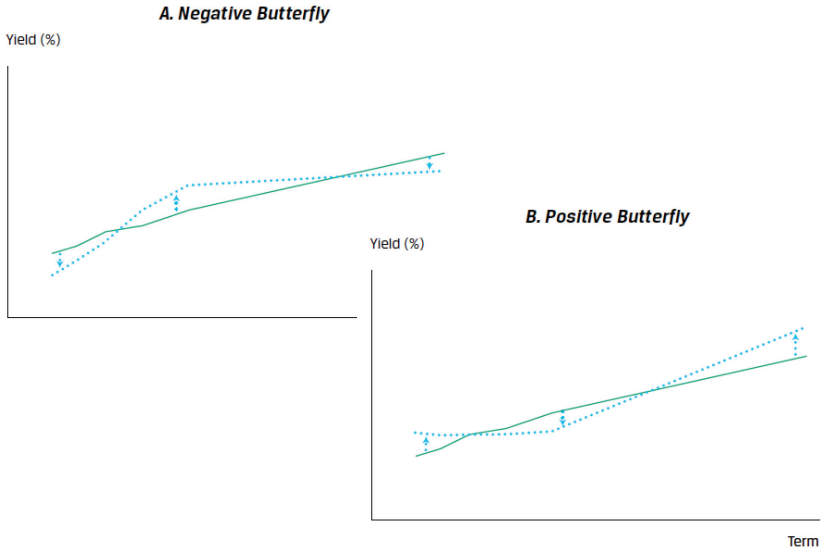
专业 · 创新 · 增值

Divergent Rate Shape View

- **Divergent Rate *Shape* View**
  - The most common yield curve curvature strategy ***combines a long bullet with a short barbell portfolio (or vice versa)*** in what is referred to as a butterfly strategy to capitalize on expected yield curve shape changes. The short-term and long-term bond positions of the barbell form the "wings," while the intermediate-term bullet bond position forms the "body" of the butterfly.
  - The positive butterfly, which indicates a ***decrease in the butterfly spread*** due to an expected rise in short- and long-term yields-to-maturity combined with a lower medium-term yield-to- maturity.
  - The negative butterfly, which indicates an ***increase in the butterfly spread***.

专业 · 创新 · 增值

Divergent Rate Shape View



专业 · 创新 · 增值

Yield Curve Curvature Strategies

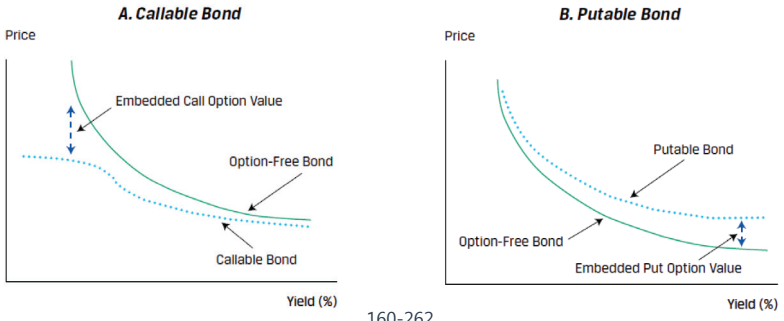
Expected Scenario	Investor's Expectation	Active Position
Negative butterfly	Lower short- and long-term yields, Higher medium-term yields	Short bullet, Long barbell (long positions in short- and long-term bonds)
Positive butterfly	Higher short- and long-term yields, Lower medium-term yields	Long bullet, Short barbell (short positions in short- and long-term bonds)

专业 · 创新 · 增值

Dynamic Yield Curve

➢ **2.2.4 Yield Curve *Volatility Strategies***

- We now explicitly address ***the role of volatility*** in active fixed-income management.
- "Short" volatility (i.e., has sold the right to call a bond at a fixed price to the issuer), as for callable bonds, or "long" volatility (i.e., owns the right to sell the bond at a fixed price to the issuer), as for putable bonds.



专业 · 创新 · 增值

Long Option, Swaption, and Bond Futures Option Strategies

Strategy	Description	Targeted Return	Portfolio Impact
Long receiver swaption	Own the right to receive-fixed on an interest rate swap at a strike rate	Max (Swap rate − Strike rate, 0) − Swaption premium	Increase in portfolio duration and convexity (up-front premium)
Long call option on bond future	Own the right to take forward bond delivery at a strike price	Max (Bond futures price at lower yield − Strike price, 0) − Call premium	Increase in portfolio duration and convexity (up-front premium)
Long bond call option	Purchase right to take forward bond delivery	Max (Bond price at lower yield − Strike price, 0) −Call premium	Increase portfolio duration and convexity (up-front premium)

专业 · 创新 · 增值

Long Option, Swaption, and Bond Futures Option Strategies

Strategy	Description	Targeted Return	Portfolio Impact
Long payer swaption	Own the right to pay-fixed on an interest rate swap at a strike rate	Max (Strike rate − Swap rate, 0) − Swaption premium	Decrease in portfolio duration and convexity (up-front premium)
Long put option on bond future	Own the right to deliver bond in the future at a strike price	Max (Strike price − Bond futures price at higher yield, 0) − Put premium	Decrease in portfolio duration and convexity (up-front premium)
Long bond put option	Purchase right to deliver bond in the future	Max (Strike price − Bond price at higher yield, 0) − Put premium	Decrease portfolio duration and convexity (up-front premium)

专业 · 创新 · 增值

2.3 Key Rate Duration for a Portfolio

➢ **Key Rate Duration**

- We have evaluated changes in yield curve level, slope, and curvature using one, two, and three ***specific maturity points*** across the term structure of interest rates, respectively.
- The concept of ***key rate duration (or partial duration)*** introduced previously measures portfolio sensitivity over a set of maturities along the yield curve, with ***the sum of key rate durations being identical to the effective duration*** (where r_k represents the k_{th} key rate and PV is the portfolio value) :

$$\text{Key rate } duration_k = \frac{1}{PV} \times \frac{\Delta PV}{\Delta r_k}$$

$$\sum_{k=1}^{n} KeyRateDur_k = EffDur$$

163-262

专业 · 创新 · 增值

Key Rate Duration for a Portfolio

➢ **Key Rate Duration**

- In contrast to effective duration, key rate durations help identify "***shaping risk***" for a bond portfolio—that is, a portfolio's sensitivity to changes in the shape of the benchmark yield curve.
- By breaking down a portfolio into its individual duration components by maturity, an active manager ***can pinpoint and quantify key exposures along the curve***, as illustrated in the following simplified zero-coupon bond example.

164-262

专业 · 创新 · 增值

Key Rate Duration for a Portfolio

➢ **Key Rate Duration**

"Index" Zero-Coupon Portfolio

Tenor	Coupon	Annualized Yield	Price (per $100)	Position ($ MM)	ModDur	KeyRateDur
2y	0.00%	1%	98.03	98.03	1.980	0.738
5y	0.00%	2%	90.57	90.57	4.902	1.688
10y	0.00%	3%	74.40	74.40	9.709	2.747

"Active" Zero-Coupon Portfolio

Tenor	Coupon	Annualized Yield	Price (per $100)	Position ($ MM)	ModDur	KeyRateDur
2y	0.00%	1%	98.03	51.40	1.980	0.387
5y	0.00%	2%	90.57	−46.00	4.902	−0.857
10y	0.00%	3%	74.40	257.60	9.709	9.509

165-262

专业 · 创新 · 增值

Key Rate Duration for a Portfolio

- **Key Rate Duration**
  - A comparison of the active versus index portfolio duration summary statistic does not tell the entire story. Instead, we can ***compare the key rate or partial durations for specific maturities*** across the index and active portfolios to better understand exposure differences.

Tenor	Active	Index	Difference
2y	0.39	0.74	−0.35
5y	−0.86	1.69	−2.55
10y	9.51	2.75	6.76
Portfolio	9.04	5.17	−3.87

专业 · 创新 · 增值

3. Active Fixed-income Management Across Currencies

- Here we will primarily focus on extending our analysis of yield curve strategies from ***a single yield curve to multiple yield curves across currencies***.
- Investors measure return in functional currency terms—that is, ***considering domestic currency returns on foreign currency assets***.

$$Single\ asset:\ R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$$

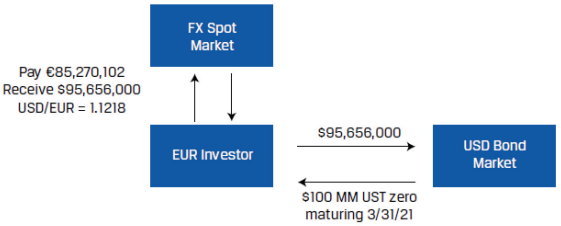
$$Portfolio:\ R_{DC} = \sum_{i=1}^{n} w_i(1 + R_{FC,i})(1 + R_{FX,i}) - 1$$

- R_{DC} and R_{FC} are the domestic and foreign currency returns expressed as a percentage;
- R_{FX} is the percentage change of the domestic versus foreign currency;
- ω_i is the respective portfolio weight of each foreign currency asset (in domestic currency terms) with the sum of ω_i equal to 1.
- R_{DC} simply combines the factor, +/−E (Δ Price due to investor's view of benchmark yield), and the factor, +/−E (Δ Price due to investor's view of currency value changes).

专业 · 创新 · 增值

Active Fixed-income Management Across Currencies

- The manager pays €85,270,102 (= $95,656,000/1.1218) for a $100 million face value Treasury security.
- As in the single currency yield curve case, the investor will benefit from ***bond price appreciation*** if the US Treasury YTM falls during the holding period. In addition, since our domestic returns are measured in EUR, we will also benefit if the USD we receives upon sale of the bond or at maturity buy more EUR per USD in the future—that is, if ***USD/EUR decreases*** (i.e., USD appreciates versus EUR).



专业 · 创新 · 增值

Active Fixed-income Management Across Currencies

- ***Covered interest rate parity*** establishes a fundamental ***no-arbitrage relationship*** between spot and forward rates for individual cash flows in T periods.

$$F\left[\frac{DC}{FC}, T\right] = S_0\left(\frac{DC}{FC}\right)\frac{(1+r_{DC})^T}{(1+r_{FC})^T}$$

  - If an investor uses a forward contract to fully hedge foreign currency cash flows, he should expect to earn the domestic risk-free rate.
  - A higher-yielding currency will trade at a forward discount, while a lower-yielding currency will trade at a premium.
  - Although forward FX rates should in theory be an unbiased predictor of future spot FX rates if uncovered interest rate parity holds, in practice investors sometimes ***seek to exploit a persistent divergence*** from interest rate parity conditions (known as the forward rate bias) by ***investing in higher-yielding currencies***.

专业 · 创新 · 增值

Active Fixed-income Management Across Currencies

- Assume that the current USD/AUD rate is 0.80 and that the manager wishes to hedge an investment in USD 100 million par of a 10-year U.S. Treasury bond currently trading at par. The manager enters into a fixed-fixed cross-currency swap to pay-fixed USD and receive-fixed AUD with principal sizes of USD 100 million and 100 million/0.80=AUD 125 million.

Position	At Initiation	Periodic Semiannual Payments for Next 10 Years	At the End
U.S. Treasury Bond	Pay out USD 100 million to purchase the U.S. bond	Receive-fixed USD bond coupon	Receive USD 100 million par at maturity of bond
Fixed-Fixed Cross-Currency Swap	Receive USD 100 million and pay AUD 125 million in exchange of principal amounts	Pay-fixed USD leg Receive-fixed AUD leg	Pay USD 100 million and receive AUD 125 million in exchange of principal amounts
Net Flow	Pay AUD 125 million principal outflow	Receive-fixed AUD payment	Receive AUD 125 million principal inflow

专业 · 创新 · 增值

Active Fixed-income Management Across Currencies

- As can be seen from the net flow box, the resulting exposure for the Australian manager is the same as investing in a domestic Australian bond. This is analogous to the scenario with the zero-coupon bond—if parity relations hold, a manager that hedges a foreign exposure will earn their domestic return on the hedged position.
- The pay USD, receive AUD fixed-fixed cross-currency swap just described is, in practice, ***generated through a combination of the three underlying swaps*** (swaps A, B, and C) listed here:
- The resulting yield curve strategy ***faces three potential risks***: (1) yield curve movements—level, slope, or curvature—in the overweight currency; (2) yield curve changes in the underweight currency; and (3) exchange rate changes.

专业 · 创新 · 增值

Active Fixed-income Management Across Currencies

Swap	Description	Interest Paid	Interest Received	Principal Exchange at Outset	Principal Exchange at End
A	USD interest rate swap	USD Fixed	USD Floating	-	-
B	AUD interest rate swap	AUD Floating	AUD Fixed	-	-
C	Cross-currency basis swap	USD Floating	AUD Floating	Receive in USD principal, pay out AUD principal	Pay out USD principal, receive in AUD principal

Position	At Initiation	Periodic Semiannual Payments for Next 10 Years	At the End
U.S. Treasury Bond	Pay out USD 100 million to purchase the U.S. bond	Receive-fixed USD bond coupon	Receive USD 100 million par at maturity of bond
Combination Swap	Receive USD 100 million principal and pay AUD 125 million principal	Pay-fixed USD leg Receive-fixed AUD leg	Pay USD 100 million principal and receive AUD 125 million principal
Net Flow	Pay AUD 125 million principal outflow	Receive-fixed AUD payment	Receive AUD 125 million principal inflow

专业 · 创新 · 增值

Active Cross-Currency Strategies

Strategy	Purchase	Sell/Borrow	Expected Unhedged Return
Receive fixed/ pay-fixed	High-yielding fixed-income asset	Lower-yield fixed-rate loan	Carry (higher yield minus lower yield) assuming uncovered interest parity does not hold
Receive-fixed/pay-floating	High-yielding fixed-rate asset	Short-term, lower yield floating-rate loan rolled over until maturity	Carry (higher yield minus lower yield) plus long- versus short-term rate differential for lower-yielding currency
Receive-floating/pay-fixed	High-yield floating-rate asset	Lower-yield fixed-rate loan	Carry (higher floating yield minus lower fixed yield)
Receive-floating/ pay-floating	High-yield floating-rate asset	Short-term, lower yield floating-rate loan rolled over until maturity	Carry (higher floating yield minus lower floating yield)

专业 · 创新 · 增值

4. A Framework for Evaluating Yield Curve Strategies

- Investors evaluate the expected return on an active fixed-income portfolio strategy by combining coupon income and rolldown return with expected portfolio changes based on benchmark YTM, credit, and currency value changes over the investment horizon.
- Unexpected market changes or risks to portfolio value are frequently evaluated using scenario analysis.
- The fixed-income portfolio risk and return impact of rolldown return versus carry, changes in the level, slope, and shape of a single currency yield curve, and an extension to multiple currencies (where spot and forward FX rates are related to relative interest rates) are best illustrated with a pair of examples.

专业 · 创新 · 增值

A Framework for Evaluating Yield Curve Strategies

- **AUD Bullet versus Barbell**
- A US-based portfolio manager plans to invest in Australian zero-coupon bonds denominated in Australian dollars (AUD). He projects that over the next 12 months, the Australian zero-coupon yield curve will experience a downward parallel shift of 60 bps and that AUD will appreciate 0.25% against USD. The manager is weighing bullet and barbell strategies using the following data:

Statistic	Bullet	Barbell
Investment horizon (years)	1.0	1.0
Average bond price in portfolio (today)	98.00	98.00
Average portfolio bond price (in 1 year/stable yield curve)	99.75	100.00
Expected portfolio effective duration (in 1 year)	3.95	3.95
Expected portfolio convexity (in 1 year)	19.50	34.00
Expected change in AUD zero-coupon yields	-0.60%	-0.60%
Expected change in AUD versus USD	+0.25%	+0.25%

专业 · 创新 · 增值

A Framework for Evaluating Yield Curve Strategies

- Solve for the expected return over the 1-year investment horizon for each portfolio using the step-by-step estimation approach.
  E(R) ≈ Coupon income
  +/- Rolldown return
  +/- E(Δ Price due to investor's view of benchmark yields)
  +/- E(Δ Price due to investor's view of yield spreads)
  +/- E(Δ Price due to investor's view of currency value changes)

- **Rolldown Return**
  - The sum of coupon income (in %) and the price effect on bonds from "rolling down the yield curve." Since both portfolios contain only zero-coupon bonds, there is no coupon income and we calculate the rolldown return using $(PV_1 - PV_0) / PV_0$, where PV_0 is today's bond price and PV_1 is the bond price in one year, assuming no shift in the yield curve.
  - 1 Bullet: 1.7857% = (99.75 − 98.00) / 98.00
  - 2 Barbell: 2.0408% = (100.000 − 98.00) / 98.00

专业 · 创新 · 增值

A Framework for Evaluating Yield Curve Strategies

- **E (Δ Price Due to Investor's View of Benchmark Yield)**
  - The effect of the interest rate view on expected portfolio return, using effective duration and convexity in one year's time to evaluate the expected 60 bp downward parallel yield curve shift:

$$\%\Delta PV^{Full} = -(ModDur \times \Delta Yield) + [\frac{1}{2} \times Convexity \times (Yield)^2]$$

  - 1 Bullet: 2.4051% = (−3.95 × −0.0060) + [1/2 × 19.5 × (−0.0060)²]
  - 2 Barbell: 2.4312% = (−3.95 × −0.0060) + [1/2 × 34.0 × (−0.0060)²]
  - E(R) ≈ % Rolldown return + E (% Δ Price due to investor's view of benchmark yield) + E (% Δ Price due to investor's view of currency value changes)
  - In addition to rolldown return and expected price changes due to changes in YTM, the expected 0.25% appreciation of AUD versus USD must be incorporated in order to arrive at the USD investor's domestic currency return. R_{FC} equals the sum of rolldown return and changes in price due to YTM changes, while R_{FX} is 0.25%. Expected returns are as follows:

专业 · 创新 · 增值

A Framework for Evaluating Yield Curve Strategies

$$Single\ asset:\ R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$$

- E(R_1) = 4.4513%, or [(1 + 0.017857 + 0.024051) × (1.0025)] − 1
- E(R_2) = 4.7332%, or [(1 + 0.020408 + 0.024312) × (1.0025)] − 1
- Overall, the barbell outperforms the bullet by approximately 28 bps. Rolldown return contributes most of this outperformance. Rolldown return contributed approximately 25.5 bps of outperformance (i.e., 2.0408% − 1.7857%) for the barbell, and the greater convexity of the barbell portfolio contributed just over 2.6 bps of outperformance (i.e., 2.4312% − 2.4051%). Currency exposure had the same impact on both strategies. The strong rolldown contribution is likely driven by the stronger price appreciation (under the stable yield curve assumption) of longer-maturity zeros in the barbell portfolio relative to the price appreciation of the intermediate zeros in the bullet portfolio as the bonds ride the curve over the 1-year horizon to a shorter maturity.

专业 · 创新 · 增值

A Framework for Evaluating Yield Curve Strategies

- **US Treasury Bullet versus Barbell**
- Assume a 1-year investment horizon for a portfolio manager considering US Treasury market strategies. The manager is considering two strategies to capitalize on an expected rise in US Treasury security zero-coupon yield levels of 50 bps in the next 12 months:
- 1 A bullet portfolio fully invested in 5-year zero-coupon notes currently priced at 94.5392.
- 2 A barbell portfolio: 62.97% is invested in 2-year zero-coupon notes priced at 98.7816, and 37.03% is invested in 10-year zero-coupon bonds priced at 83.7906.

专业 · 创新 · 增值

A Framework for Evaluating Yield Curve Strategies

- Further assumptions for evaluating these portfolios are shown here:

Statistic	Bullet	Barbell
Investment horizon (years)	1.0	1.0
Average bond price in portfolio (today)	94.5392	92.6437
Average portfolio bond price (in 1 year/stable yield curve)	96.0503	94.3525
Expected portfolio effective duration (in 1 year)	3.98	3.98
Expected portfolio convexity (in 1 year)	17.82	32.57
Expected change in US Treasury zero-coupon yields	0.50%	0.50%

- Solve for the expected return over the 1-year investment horizon for each portfolio using the step-by- step estimation approach.

专业 · 创新 · 增值

A Framework for Evaluating Yield Curve Strategies

- **Rolldown Return**
  - The sum of coupon income (in %) and the price effect on bonds from "rolling down the yield curve." Since both portfolios contain only zero-coupon bonds, there is no coupon income and we calculate the rolldown return using $(PV_1 - PV_0) / PV_0$, where PV_0 is today's bond price and PV_1 is the bond price in one year, assuming no shift in the yield curve.
  - Bullet: $(96.0503 - 94.5392) \div 94.5392 = 1.5984\%$
  - Barbell: $(94.3525 - 92.6437) \div 92.6437 = 1.8445\%$
- **E (Δ Price Due to Investor's View of Benchmark Yield)**
  - The effect of the interest rate view on expected portfolio return, using effective duration and convexity in one year's time to evaluate the expected 50 bp upward parallel yield curve shift:
  - Bullet: $-1.9677\% = (-3.98 \times 0.0050) + [1/2 \times 17.82 \times (0.0050)^2]$
  - Barbell: $-1.9493\% = (-3.98 \times 0.0050) + [1/2 \times 32.57 \times (0.0050)^2]$

专业 · 创新 · 增值

A Framework for Evaluating Yield Curve Strategies

- Expected total return in percentage terms for each portfolio is equal to:
- E(R) = % Rolldown return + E (% Δ Price due to investor's view of benchmark yield)
- The total expected return over the 1-year investment horizon for the bullet portfolio is −0.3693%, or 1.5984% − 1.9677%, and the expected return for the barbell portfolio is −0.1048%, or 1.8445% − 1.9493%.
- If the manager's expected market scenario materializes, the barbell portfolio outperforms the bullet portfolio by 26 bps. The higher barbell convexity contributed just under 2 bps of outperformance, whereas the rolldown return contributed nearly 25 bps. Stronger price appreciation (under the stable yield curve assumption) resulted from a greater rolldown effect from the 10-year zeros in the barbell versus the 5-year zeros over one year.

专业 · 创新 · 增值

Fixed-Income Active Management: Credit Strategies

专业 · 创新 · 增值

Framework

1. Key Credit and Spread Concepts for Active Management
2. Credit Strategies
3. Liquidity and Tail Risk
4. Synthetic Credit Strategies
5. Credit Spread Curve Strategies
6. Global Credit Strategies
7. Structured Credit
8. Fixed-Income Analytics

专业 · 创新 · 增值

1. Key Credit and Spread Concepts for Active Management

- It is prudent for **investment-grade** and **high-yield** credit portfolio managers to be aware of
  - ***Spread risk*** and ***default risk***;
  - ***Spread duration–based*** and ***market value–based*** risk measures.
- For high-yield portfolio managers: credit risk is usually the most important consideration.
- **Default Probabilities and Recovery Rates**:
  - The ***credit valuation adjustment (CVA)*** framework shown comprises the present value of credit risk for a loan, bond, or derivative obligation.
  - **Default risk (POD)**: The probability that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest.
  - **Loss severity (LGD)**: is the amount of loss if a default occurs.
  - ***The one-period credit spread*** estimate from an earlier lesson on CDS where we ignored the time value of money was simply the product of LGD and POD (***Spread ≈ LGD × POD***).

专业 · 创新 · 增值

1.1 Credit Risk Considerations

Expected exposure (EE) — *Total projected exposure under event of default*

Recovery rate (RR) — *Percentage of loss recovered in default*

EE x (1 – RR) = LGD

Loss given default (LGD) — *Amount of loss if a default occurs*

Probability of default (POD) — *Conditional probability of borrower default (assuming no prior default)*

LGD x POD = EL

Expected loss (EL) — *Probability-weighted amount of loss*

PV of expected loss (EL) — *Present value calculated at the risk-free rate*

CVA = ∑ (PV of Expected Loss)

专业 · 创新 · 增值

Credit Migration

- **Credit migration**
  - The forced sales caused by the credit quality decreasing of investment-grade bonds can result in losses to a portfolio.
  - This effect occurs because ***the chance of downgrade exceeds that of an upgrade***, and the yield spread increase at lower credit ratings is far greater than the spread decrease in the event of a credit upgrade.

Two-Year Average Global Corporate Default/ Downgrade,1981–2019

Statistic/Rating	AAA	AA	A	BBB	BB	B	CCC
Default Probability (%)	0.03	0.06	0.14	0.45	1.96	7.83	36.49
One Notch Downgrade (%)	16.22	13.79	8.81	5.66	9.82	5.22	

Source: S&P Global Ratings

专业 · 创新 · 增值

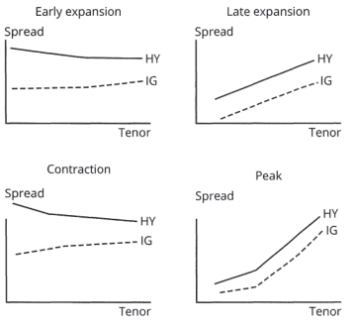
Credit Spread Curves

- Active managers often position spread-based portfolios to ***capitalize on expected credit spread curve changes***.
- Primary credit risk factors for a specific issuer ***include the level and slope*** of the issuer's credit spread curve.
- Credit spread curve changes are broadly ***driven by the credit cycle***, the expansion and contraction of credit over the business cycle, which translates into asset price changes based on default and recovery expectations across maturities and rating categories.

专业 · 创新 · 增值

General Credit Cycle Characteristics

	Early Expansion (Recovery)	Late Expansion	Peak	Contraction (Recession)
Economic Activity	Stable	Accelerating	Decelerating	Declining
Corporate Profitability	Rising	Peak	Stable	Falling
Corporate Leverage	Falling	Stable	Rising	Peak
Corporate Defaults	Peak	Falling	Stable	Rising
Credit Spread Level	Stable	Falling	Rising	Peak
Credit Spread Slope	Stable for high grade, inverted for low ratings	Steeper for both higher and lower ratings	Steeper for both higher and lower ratings	Flatter for high grade, inverted for low ratings



Why inverted: the probability of downgrade or default is higher in the near term than the longer term.

专业 · 创新 · 增值

Credit Spread Curves

- Active managers often position spread-based portfolios to ***capitalize on expected credit spread curve changes***.
- ***Lower-rated issuers tend to experience greater slope and level changes*** over the credit cycle, including more frequent inversion of the credit curve, given their larger rise in annual credit losses during economic downturns.
- ***Higher-rated issuers face smaller credit spread changes*** and usually exhibit upward-sloping credit curves and fewer credit losses during periods of economic contraction.
- Credit spread differences between major ratings categories tend to ***narrow during periods of strong economic growth*** and ***widen when growth is expected to slow***.
- Under a "flight to quality" market stress scenario, ***investors sell high-risk, low-rated bonds***, which fall in price, and ***purchase government bonds***, which experience price appreciation. This observed negative correlation between high-yield credit spreads and government benchmark yields to maturity often leads fixed-income practitioners to use statistical models and historical bond market data to estimate ***empirical duration*** rather than rely on analytical duration estimates based on duration and convexity.

专业 · 创新 · 增值

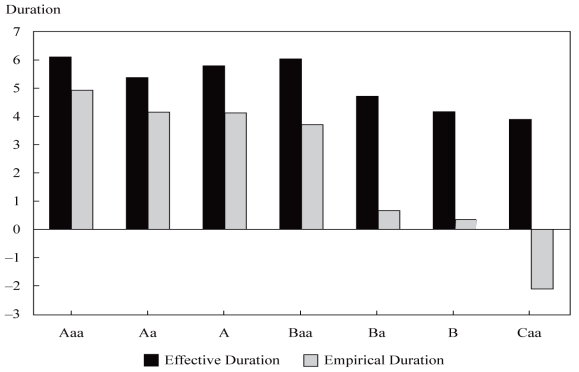
Empirical duration

- **Interest rate risk**
  - A bond's yield = a default risk-free interest rate + a spread
  - **In theory**, a change in interest rates has the ***same effect*** on a risk-free bond (a bond assumed to have no default risk) as it does on a risky bond.
  - **In practice**, however, ***credit spreads tend to be negatively correlated with risk-free interest rates***.
    - ✓ changes in risk-free rates tend to generate smaller changes in corporate bond yields than theoretical measures of duration suggest.
    - ✓ Bonds with large credit spreads have less sensitivity to interest rate changes than bonds with smaller credit spreads.
  - ***Empirical duration***: is a measure of interest rate sensitivity that is determined from market data.

专业 · 创新 · 增值

Empirical duration

- **Effective Duration and Empirical Duration by Rating Category**



  - **Highly rated bonds**, which typically have lower credit spreads, have greater empirical duration.
  - **Caa rated bonds** actually have negative empirical durations.

专业 · 创新 · 增值

1.2 Credit Spread

➢ **1.2.1 Fixed-Rate Bond Credit Spread Measures**

- **Credit spread**: is perhaps the single most important measure in credit security selection.
- **Benchmark Spread** = the yield on a credit security - the yield on a benchmark bond with a similar duration
  - ✓ Usage: pricing and hedging credit securities;
  - ✓ Disadvantages: the potential maturity mismatch.

专业 · 创新 · 增值

G-Spread

➢ **G-Spread = the yield on a credit security - the yield on government bond (When interpolated, weighted by maturity.)**

- **Advantage**: simplicity. It is easy to calculate and understand, and different investors usually calculate it the same way.
- **Usage**:
  - ✓ Is useful for portfolio construction, because the calculation indicates a way to hedge the credit securities' interest rate risk.
  - ✓ Is also useful for estimating yield and price changes for fixed-rate credit securities without embedded options.

专业 · 创新 · 增值

G-Spread

➢ On 31 March 2016, a portfolio manager gathers information for the following bonds.

1. Citigroup 3.75% due 16 March 2024
2. US Treasury 1.5% due 31 March 2023 (on-the-run 7-year Treasury note)
3. US Treasury 1.625% due 15 February 2026 (on-the-run 10-year Treasury note)

	Price	Yield	Maturity	Effective Duration
Citigroup 3.75%	103.64	3.24%	7.96	7.0
US Treasury 1.5%	99.80	1.53%	7.00	6.7
US Treasury 1.625%	98.70	1.77%	9.88	9.1

Later, the 7-year Treasury note's yield falls from 1.53% to 1.43% while the 10-year Treasury note yield remains unchanged.

专业 · 创新 · 增值

G-Spread

- **Q1: What is the new yield on the Citigroup, assuming its spread remains unchanged ?**
- **Correct Answer :**
  - Assume weight of the 7-year note "a", weight of the 10-year note "b".
  - Maturity match: 7.0 a + 9.88b = 7.96; a + b = 1 → a= 66.7%; b=33.3%.
  - The linearly interpolated yield on the 7.96-year benchmark maturity is: 66.7%×1.53% + 33.3%×1.77% = **1.61%**.
  - The G-spread on the Citigroup bond is 1.63% = 3.24% – 1.61%.
  - The new yield on the interpolated Treasury: **1.54%** = [66.7%(1.43%) + 33.3%(1.77%)].
  - The interpolated Treasury yield has fallen by 0.07%, from 1.61% to 1.54%.
  - Add the G-spread of 1.63% to the interpolated Treasury yield to arrive at a new yield for the Citigroup bond：3.17%=1.54%+1.63%.

专业 · 创新 · 增值

G-Spread

- **Q2: Based on the interest rate changes, what is the new price of the Citigroup bond ?**
- **Correct Answer :**
  - The new price on the Citigroup bond can be estimated based on its yield change and its duration. The price has risen from 103.64 to 104.15:

$$104.15 = 103.64 \times [1 + (7 \times 0.07\%)]$$

  - Representing an absolute increase of 0.51 or a percentage increase of 0.49%.

专业 · 创新 · 增值

I-Spread &Asset Swap Spread

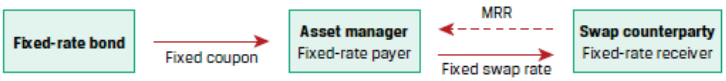
- **I-Spread**

$$I - Spread = YTM - Swap\ rate$$

  - **Advantage**: swap curves may be "smoother" (less disjointed) than government bond yield curves.
    - ✓ Government bond yield curves are sometimes affected by supply and demand for specific government bonds, especially on-the-run issues.
- **Asset Swap Spread (ASW)**

$$ASW = Coupon\ rate - Swap\ rate$$

  - Asset swaps convert a bond's periodic fixed coupon to MRR plus (or minus) a spread. If the bond is priced close to par, this spread approximately equals the bond's credit risk over the MRR.



专业 · 创新 · 增值

I-Spread &Asset Swap Spread

- Consider the information from the bank and government annual coupon bonds :

Issuer	Term	Coupon	Yield	ModDur
Bank	8y	2.75%	2.68%	7.10
Government	7y	1.5%	1.39%	6.61
Government	10y	1.625%	1.66%	9.16

- Assuming that 7- and 10-year swap spreads over the respective government benchmark yields to maturity are 15 bps and 20 bps, calculate the ASW and the I-spread for the bank bond, and interpret the difference between the two.

专业 · 创新 · 增值

I-Spread &Asset Swap Spread

- **Solution:**
  - **1** Solve for the weights of the 7-year and the 10-year bond in the interpolation calculation.
    - ✓ 7-year bond weight = w_7 = 66.7% (= (10 − 8)/(10 − 7)).
    - ✓ 10-year bond weight = w_{10} = 33.3% (or (1 − w_7).
    - ✓ Note that (w_7 × 7) + (w_{10} × 10) = 8.
  - **2** The interpolated 8-year swap rate is a weighted average of the 7-year swap rate (1.54% = 1.39% + 0.15%) and the 10-year swap rate (1.86% = 1.66% + 0.20%).
    - ✓ $r_{Swap8yr} = w_7 \times r_{Swap7yr} + w_{10} \times r_{Swap10yr}$
    - ✓ (66.7% × 1.54%) + (33.3% × 1.86%) = 1.647%
  - **3** The ASW equals the difference between the bank bond *coupon* of 2.75% and the 8-year swap rate of 1.647%, or 110.3 bps.
  - **4** **The I-spread** is the difference between the bank bond's current YTM of **2.68%** and the 8-year swap rate of 1.647%, or 103.3 bps.

专业 · 创新 · 增值

I-Spread &Asset Swap Spread

- **Solution:**
- The ASW is an estimate of the spread over MRR versus the bond's original coupon rate to maturity,
- While **the I-spread** is an estimate of the spread over MRR for a new par bond from the bank issuer, with the difference largely **reflecting the premium or discount of the outstanding bond price.**

专业 · 创新 · 增值

Z-spread &CDS &OAS

- **Z-spread**

$$PV = \frac{PMT}{(1+z_1+Z)^1} + \frac{PMT}{(1+z_2+Z)^2} + \cdots + \frac{PMT+FV}{(1+zN+Z)^N}$$

  - **Usage**: compare relative value for bonds without embedded options.
- **Credit default swap (CDS) basis = CDS spread- Z-spread**
  - Refers to the difference between the Z-spread on a specific bond and the CDS spread of the same (or interpolated) maturity for the same issuer.
  - ***Negative basis*** arises if the yield spread is above the CDS spread, and ***positive basis*** indicates a yield spread in excess of the CDS market.
  - As in the case of asset swaps, CDS basis is a pricing measure, but unlike ASW, a CDS contract is terminated and settled following a credit event with ***no residual interest rate swap mark-to-market exposure***.
- **Option-adjusted spread**
  - **Usage**: is ***most useful for comparing bonds with different features***, such as ***embedded options***.
  - The ***most appropriate*** measure for a **portfolio-level spread** is the ***OAS***. To calculate a portfolio OAS, **each bonds OAS is weighted by its market value**.

专业 · 创新 · 增值

Z-spread &CDS &OAS

Key Fixed-Rate Bond Credit Spread Measures

Spread	Description	Advantages	Disadvantages
Yield spread	Difference between bond YTM and government benchmark of similar tenor	Simple to calculate and observe	Maturity mismatch, curve slope bias, and inconsistent over time
G-spread (Government spread)	Spread over interpolated government bond	Transparent and maturity matching default risk-free bond	Subject to changes in government bond demand
I-spread (Interpolated spread)	Yield spread over swap rate of same tenor	Spread versus market based (MRR) measure often used as hedge or for carry trade	Point estimate of term structure and limited to option-free bonds
ASW (Asset swap)	Spread over MRR of fixed bond coupon	Traded spread to convert current bond coupon to MRR plus a spread	Tradable spread rather than spread measure corresponding to cashflows and limited to option-free bonds

专业 · 创新 · 增值

Z-spread &CDS &OAS

Key Fixed-Rate Bond Credit Spread Measures

Spread	Description	Advantages	Disadvantages
Z-spread (Zero volatility spread)	Yield spread over a government (or swap) spot curve	Accurately captures term structure of government or swap zero rates	More complex calculation limited to option-free bonds
CDS Basis	Yield spread versus CDS spread of same tenor	Interpolated CDS spread versus Z-spread	Traded spread rather than spread measure corresponding to cashflows and limited to option-free bonds
OAS	Yield spread using Z-spread including bond option volatility	Provides generalized comparison for valuing risky option-free bonds with bonds with embedded options	Complex calculation based on volatility and prepayment assumptions; bonds with embedded options are unlikely to earn OAS over time

专业 · 创新 · 增值

1.2 Credit Spread Measures

- **1.2.2 Floating-Rate Note Credit Spread Measures**
- In contrast to fixed-rate bonds, floating-rate notes (FRNs) pay a periodic interest coupon comprising a variable MRR plus a (usually) constant yield spread.
- Each interest payment is MRR plus the ***quoted margin*** (QM) times par (FV) and divided by m, the number of periods per year.
- Rather than a fixed YTM as for fixed-rate bonds, the periodic discount rate per period is MRR plus the ***discount margin*** (DM) divided by the periodicity (m), or (MRR + DM)/m.

专业 · 创新 · 增值

1.2 Credit Spread Measures

- **1.2.2 Floating-Rate Note Credit Spread Measures**

Exhibit 14 FRN Discount, Premium, and Par Pricing

FRN price	Description	QM versus DM
Par	FRN trades at a price (PV) equal to its future value (FV)	QM = DM
Discount	FRN trades at PV < FV	QM < DM
Premium	FRN trades at PV > FV	QM > DM

专业 · 创新 · 增值

1.2 Credit Spread Measures

- **1.2.2 Floating-Rate Note Credit Spread Measures**
- The ***zero-discount margin (Z-DM)*** incorporates forward MRR into the yield spread calculation for FRNs.
- a drawback of the discount margin is that it assumes the MRR stays constant at its current level over the life of the bond. The zero-discount margin (Z-DM) addresses this drawback by incorporating the term structure of interest rates into its calculation.
- The derivation of the Z-DM is similar to that of the DM; however, future coupon rates are equal to the relevant MRR forward rate plus the QM, and discount rates are equal to the relevant spot MRR plus the Z-DM
- **the Z-DM is playing a similar role to floating-rate securities that the z-spread played to fixed-coupon bonds. (respecting the term structure of MRR)**

专业 · 创新 · 增值

1.2 Credit Spread Measures

- **1.2.3 Portfolio Return Impact of Yield Spreads**
- We now turn from credit spread measures to their impact on expected portfolio return. Roll-down return and E (Δ Price due to investor's view of yield spreads), are directly relevant for active ***managers targeting excess return*** above a benchmark portfolio using credit strategies.
- For fixed-rate bonds priced at a spread over the benchmark, roll-down return from coupon income is higher by the bond's original credit spread. Note that this higher return comes with greater risk and assumes all promised payments take place and the bond remains outstanding.

专业 · 创新 · 增值

Portfolio Return Impact of Yield Spreads

$$\%\Delta PV^{Spread} \approx -(\text{EffSpreadDur} \times \Delta\text{Spread}) + (\frac{1}{2} \times \text{EffSpreadCon} \times (\Delta\text{Spread})^2)$$

- The first term of Equation is sometimes simply referred to as ***spread duration***, or, alternatively, as ***OAS duration*** when OAS is the underlying spread.
- **Spread changes for lower-rated bonds tend to be consistent on a proportional percentage (ΔSpread/spread)** rather than absolute basis; therefore, adjusting spread duration to capture this ***Duration Times Spread (DTS)*** effect is important.

$$DTS = (EffSpreadDur \times Spread)$$

专业 · 创新 · 增值

Portfolio Return Impact of Yield Spreads

- **DTS Example**
- A financial analyst compares a portfolio evenly split between two technology company bonds trading at par to **an index with an average OAS of 125 bps.**

Issuer	OAS	EffSpreadDur
A Rated Bond	100 bps	3.0
BB Rated Bond	300 bps	4.0

- Calculate the portfolio DTS, and estimate how the technology bond portfolio will perform if index OAS widens by 10 bps.

专业 · 创新 · 增值

Portfolio Return Impact of Yield Spreads

- **Solution:**
  - Portfolio DTS is the market value–weighted average of DTS

$$\sum_{i=1}^{n} w_i(EffSpreadDur_i \times Spread_i)$$

  - **1** Portfolio DTS in this two-asset example is w_A(EffSpreadDur$_A$ × Spread$_A$) + w_{BB}(EffSpreadDur$_{BB}$ × Spread$_{BB}$) with equal weights (w_A = w_{BB} = 0.50). Solve for portfolio DTS of 750 (= (0.5 × 100 bps × 3.0) + (0.5 × 300 bps × 4.0)).
  - **2 Index spread widening of 10 bps is equivalent to 8% (10 bps/125 bps spread) on a ΔSpread/Spread basis**. We can therefore calculate the estimated basis point change in the technology bond portfolio **by multiplying the portfolio DTS of 750 by the 8%** expected percentage spread change to get an **expected 60 bps** p.a. widening for the technology bond portfolio.

专业 · 创新 · 增值

Excess Spread Return

- As active credit managers consider incremental effects of credit-based portfolio decisions, they often use spread duration–based statistics to gauge the first-order impact of spread movements. The ***annualized excess spread return*** for a spread-based bond,

$$ExcessSpread \approx Spread_0 - (EffSpreadDur \times \Delta Spread)$$

  - Spread$_0$ is the initial yield spread, which changes to (Spread$_0$/Periods Per Year) for holding periods of less than a year.
  - Note that this calculation ***assumes no defaults*** for the period in question.
- While relatively rare, as an event of default grows more likely, expected future bond cash flows are impaired, and a bond's value instead approaches the present value of expected recovery. The ***annualized expected excess return*** shown in Equation ***incorporates both default probability and loss severity***:

$$E[ExcessSpread] \approx Spread_0 - (EffSpreadDur \times \Delta Spread) - POD \times LGD$$

  - Equation captures a key goal of active credit management, which is to ***maximize expected spread return in excess*** of the portfolio credit loss or realized percentage of par value lost to defaults over time.

专业 · 创新 · 增值

Excess Spread Return

- A corporate bond has an effective spread duration of five years and a credit spread of 2.75% (275 bps).
- **1** What is the approximate excess return if the bond is held for six months and the credit spread narrows 50 bps to 2.25%? Assume the spread duration remains at five years and that the bond does not experience default losses.
- **2** What is the instantaneous (holding period of zero) excess return if the spread rises to 3.25%?
- **3** Assume the bond has a 1% annualized expected POD and expected loss severity of 60% in the event of default. What is the expected excess return if the bond is held for six months and the credit spread is expected to fall to 2.25%?

专业 · 创新 · 增值

Excess Spread Return

- **Solution to 1:**
  - The excess return on the bond is 3.875% = (2.75% × 0.5) − [(2.25% − 2.75%) × 5].
- **Solution to 2:**
  - The instantaneous excess return on the bond is approximately −2.5% = (2.75% × 0) − [(3.25% − 2.75%) × 5].
- **Solution to 3:**
  - The expected excess return on the bond is approximately 3.575% = (2.75% × 0.5) − [(2.25% − 2.75%) × 5] − (0.5 × 1% × 60%).

2. Credit Strategies

- **Bottom-Up Credit Strategies** involve selecting the individual bonds or issuers that the investor views as having ***the best relative value*** from among a set of bonds or issuers with similar features.
- **1. Defining the Credit Universe**
  - ✓ A bottom-up approach typically begins with a manager defining the universe of eligible bonds within a mandate and then ***grouping the universe into categories*** that allow consistent ***relative value analysis*** across comparable borrowers.

2.1 Bottom-Up Credit Strategies

- **2. Bottom-Up Credit Analysis**
  - Once the credit universe has been divided into sectors and prospective bonds identified, the investor evaluates each issuer's implied credit risk comparing ***company-specific financial information*** to spread-related compensation for assuming default, credit migration, and liquidity risks for comparative purposes.
  - Beyond the prospects within a company's industry, its competitive position within that industry, and operating history, ***financial ratios*** are a valuable tool to compare creditworthiness across firms.

Ratio	Description	Advantages	Disadvantages
EBITDA/ Total Assets	**Profitability** Cash flow as a percentage of assets	Combines operating income with non-cash expense	Ignores capital expenditures and working capital changes
Debt/ Capital	**Leverage** Fraction of company's capital financed with debt	Direct measure of relative reliance on debt financing	More relevant for investment-grade than high-yield issuers
EBITDA/ Interest Expense	**Coverage** Cash flow available to service debt	Measures relative issuer ability to meet debt payments	Volatile measure for firms with high cash flow variability

Bottom-Up Credit Strategies

➢ **2. Bottom-Up Credit Analysis**

- While offering a relatively consistent basis for comparison across firms and over time, reliance on financial ratios based on publicly available accounting data alone is of limited value because ***of comparability issues across firms and industries*** as well as ***the historical nature*** of financial statements.
- Alternative measures combine several relevant financial ratios with market-based measures to ***establish a forward-looking approach*** to creditworthiness. Established that statistical credit analysis models to measure individual issuer creditworthiness can be categorized as either **reduced form credit models** or **structural credit models**.

Bottom-Up Credit Strategies

➢ **2. Bottom-Up Credit Analysis**

- ***Reduced form models*** solve for ***default intensity***, or ***the POD*** over a specific time period, using observable company-specific variables such as financial ratios and recovery assumptions as well as macroeconomic variables, including economic growth and market volatility measures. An early example of the reduced form approach is the Z-score established by Altman.
- ***Structural credit models*** use market-based variables to estimate the market value of an ***issuer's assets and the volatility of asset value***. ***The likelihood of default is defined as the probability of the asset value falling below that of liabilities***.

Bottom-Up Credit Strategies

➢ **2. Bottom-Up Credit Analysis**

- Structural credit models used in practice include Moody's Analytics Expected Default Frequency (EDF) and Bloomberg's Default Risk (DRSK) models, both of which ***provide daily POD estimates*** for a broad range of issuers over a selected period.
- The EDF model estimates a ***forward-looking POD*** defined as ***the point at which the market value of assets falls below a firm's obligations***. The model uses asset volatility to determine the likelihood of reaching the default point and is calibrated for different industries, regions, and observed credit market dynamics.
- Both the EDF and DRSK approaches are sometimes referred to as ***"distance to default" models*** because a probability distribution is used to determine how far an issuer's current market value of assets is from the default threshold for a given period.

Bottom-Up Credit Strategies

- **3. Bottom-Up Relative Value Analysis**
  - Given two issuers with ***similar credit risk***, the investor will typically choose bonds of the issuer with the ***higher yield spread***, given the greater potential for excess returns. For issuers with different credit-related risk, the investor must decide ***whether the additional spread is sufficient compensation*** for the incremental exposure. ***The excess expected return*** calculation captures the relationship between yield spreads and the components of credit risk.

专业 · 创新 · 增值

Bottom-Up Credit Strategies

- **3. Bottom-Up Relative Value Analysis**
  - In practice, bonds from different issuers usually also have various maturity, embedded call or put provisions, liquidity, and other characteristics, so these additional features should be taken into account during the security selection process.
  - Also, bonds recently issued in larger tranches by frequent issuers will tend to have narrower bid–offer spreads and greater daily transaction volume, allowing investors to buy or sell the bond at a lower cost.
  - Finally, other factors driving potential yield spread differences to be considered include split ratings or negative ratings outlooks, potential merger and acquisition activity, and other positive or negative company events not adequately reflected in the analysis.

专业 · 创新 · 增值

Bottom-Up Credit Strategies

- **3. Bottom-Up Relative Value Analysis**
  - When deciding among frequent issuers with several bond issues outstanding, investors might consider using ***credit spread curves*** for these issuers across maturities to gauge relative value.
  - Many issuers have several bond issues, each of which typically has a different maturity and duration. To reflect the various maturities, a spread curve can be developed for each issuer and can be useful in ***conducting relative value analysis***. A spread curve is the fitted curve of credit spreads for similar bonds of an issuer plotted against the maturity of those bonds.
  - Once a manager has identified specific issuers and bond maturities to actively over- or underweight versus a benchmark, the next important step is to ***quantify and track these active investments*** in the context of the primary indexing risk factors identified in the active portfolio construction process.

专业 · 创新 · 增值

2.2 Top-Down Credit Strategies

- **Top-Down Credit Strategies**
  - ***Choose sectors*** of the credit market with attractive relative value ***based on macro factors***.
    - ✓ Sector divisions used by a top-down investor are often broader.
  - Selecting the bonds from these sectors.
  - Assessment of these factors guides investors in selecting credit market sectors with attractive relative value characteristics, with an increased bond allocation to more attractive sectors and an underweight (or possibly short bond positions in) less favorable sectors. Top-down investors ***frequently use broader sector distinctions*** than under a bottom-up approach.

专业 · 创新 · 增值

Top-Down Credit Strategies

- **1. Assessing Credit Quality in a Top-Down Approach**
  - Active top-down and bottom-up credit managers frequently ***use public ratings to categorize*** and rank the credit quality of bonds within a portfolio. As investors compare investments across credit ratings, the fact that ***default risk rises more rapidly*** as ratings decline is important to consider.
- **2. Sector Allocation in a Top-Down Approach**
  - Industry sector allocations (or weightings) are an important part of a top-down approach to credit strategy. To determine which sector(s) to over- or underweight, an active portfolio manager usually begins with an interest rate and overall market view established using ***macroeconomic variables***. This view is a key step in determining whether specific sectors of the economy are likely to ***over- or underperform over the manager's investment time horizon***. Quantitative methods such as regression analysis are often used in making industry allocation decisions.

专业 · 创新 · 增值

Top-Down Credit Strategies

- **Average credit rating:** Arithmetic weighting and Non-arithmetic weightings

Moody's	S&P	Fitch	Arithmetic Factor	Moody's Rating Factor
Aaa	AAA	AAA	1	1
Aa3	AA–	AA–	4	40
A1	A+	A+	5	70
Baa1	BBB+	BBB+	8	260
Baa2	BBB	BBB	9	360
Baa3	BBB–	BBB–	10	610
Ba1	BB+	BB+	11	940
Ba2	BB	BB	12	1,350
Ba3	BB–	BB–	13	1,766
B1	B+	B+	14	2,220
B2	B	B	15	2,720

专业 · 创新 · 增值

Top-Down Credit Strategies

- **Top-Down Excess Returns**
- An investor has formed expectations across four bond rating categories and intends to overweight the category with the highest expected excess return over the next 12 months. Evaluate which rating group is the most attractive based on the information in the following table and assuming no change in spread duration:

Rating Category	Current OAS	Expected ΔOAS	Expected Loss (POD × LGD)	EffSpreadDur
A	1.05%	−0.25%	0.06%	5.5
Baa	1.35%	−0.35%	0.30%	6.0
Ba	2.45%	−0.50%	0.60%	4.5
B	3.50%	−0.75%	3.00%	4.0

专业 · 创新 · 增值

Top-Down Credit Strategies

- **Solution:**
  - The following table summarizes expected excess returns $E[\text{ExcessSpread}] \approx \text{Spread}_0 - (\text{EffSpreadDur} \times \Delta\text{Spread}) - (\text{POD} \times \text{LGD})$ for each of the four rating categories. For example, expected excess return for rating category A is 2.37% (=1.05% − (5.5 × −0.25%) − 0.06%).

Rating Category	Current OAS	Expected ΔOAS	Expected Loss (POD × LGD)	EffSpreadDur	E(Excess Return)
A	1.05%	−0.25%	0.06%	5.5	2.37%
Baa	1.35%	−0.35%	0.30%	6.0	3.15%
Ba	2.45%	−0.50%	0.60%	4.5	4.10%
B	3.50%	−0.75%	3.00%	4.0	3.50%

专业 · 创新 · 增值

2.3 Factor-Based Credit Strategies

- Active credit investors are increasingly turning to strategies based on style factors.
- **1. Key Factors Affecting Credit Spreads**
  - The application of systematic risk factors such as size, value, and momentum in fixed-income markets is relatively new.

Factor	Rationale	Measures Used
Carry	Expected return measure if POD or aggregate risk premium is unchanged	OAS
Defensive	Empirical research suggests safer low-risk assets deliver higher risk-adjusted returns	Market-based leverage, gross profitability, and low duration
Momentum	Bonds with higher recent returns outperform those with lower recent returns	Trailing six-month excess bond and equity returns
Value	Low market value versus fundamental value indicates greater than expected return	Bond spread less default probability measure, which includes rating, duration, and excess return volatility

专业 · 创新 · 增值

Factor-Based Credit Strategies

- **2. Environmental, Social, and Governance Factors**
  - The growing relevance of ESG factors in active portfolio management is evidenced by growing adoption of the Principles for Responsible Investment.
  - Active credit investors usually incorporate ESG factors into portfolio strategies in one of three basic ways:
    - ✓ The use of screens to either ***exclude*** specific industries with less favorable ESG Characteristics.
    - ✓ Use of ESG ratings to target issuers within a given sector or rating category with ***relatively favorable*** ESG characteristics while ***matching*** a specific index risk and return.
    - ✓ Targeting fixed-income investments that ***directly fund*** ESG-specific initiatives.

专业 · 创新 · 增值

Factor-Based Credit Strategies

- **2. Environmental, Social, and Governance Factors**
  - The wide range of quantitative and qualitative criteria used to measure ESG attributes and differences in methodology and weighting leads to ***greater dispersion in ESG versus credit ratings***. That said, ESG and credit ratings tend to be ***positively*** correlated for two reasons.
    - ✓ First, issuers with ***more financial resources*** are better able to meet more stringent ESG standards, while those with a greater likelihood of financial distress often face governance or other adverse risks.
    - ✓ Second, major rating agencies now ***explicitly incorporate ESG risks*** into the traditional credit rating process.
  - ***Green bonds*** are fixed-income instruments that directly fund ESG-related initiatives such as those related to environmental or climate benefits.

专业 · 创新 · 增值

3. Liquidity Risk &Tail Risk

- **Liquidity risk**
  - **Effective factor**
    - ✓ Bond's issue size; the size of the market; Bonds that are held in dealers' inventories;
    - ✓ The growth of electronic trading platforms (ETPs) has potentially improved credit market liquidity.
  - Price discovery for infrequently traded individual bonds often begins with ***matrix pricing (or evaluated pricing)*** techniques introduced earlier in the curriculum using bonds from similar issuers and actively traded government benchmarks to establish a bond's fair value.

专业 · 创新 · 增值

3.1 Liquidity Risk

- **Measure of secondary market liquidity risk**
  - **US data are used** to evaluate liquidity. Because data may be less available in other markets.
  - **Trading volume**
  - **Spread sensitivity to fund outflows**
    - ✓ Economic conditions, spread widening, high-yield prices and spreads than on investment-grade.
  - **Bid–ask spreads**
    - ✓ Bid-ask spread is stable only when market are stable;
    - ✓ Volatile market conditions often have a negative effect on bid–ask spreads.

$$Trade\ size \times \left[Trade\ price - \frac{Bid + Ask}{2}\ for\ buy\ orders\right]$$

$$Trade\ size \times \left[\frac{Bid + Ask}{2} - Trade\ price\ for\ sell\ orders\right]$$

232-262

专业 · 创新 · 增值

Liquidity Risk

- **Management of liquidity risk**
  - **Holding cash**
  - **Managing position sizes**: more-liquid credit securities are given greater portfolio weight, all else being equal.
  - **Holding liquid, non-benchmark bonds**
    - ✓ outside portfolio managers' benchmark.
  - **Credit default swap (CDS) index** derivatives
  - **Exchange-traded funds (ETFs)**
    - ✓ Disadvantage: because ETFs are easy to trade, the funds may experience unusual market movements during periods of high credit volatility, and their prices may deviate from their net asset values.
  - When relatively illiquid bond positions are purchased or sold over longer periods portfolio managers might consider hedging strategies such as ***asset swaps to mitigate the benchmark risk*** of a portfolio position.

233-262

专业 · 创新 · 增值

3.2 Tail Risk

- **Tail risk:** is the risk that there are more actual events in the tail of a probability distribution than probability models would predict.
- **VaR** was introduced as a measure of the minimum portfolio loss expected to occur over a given time period at a specific confidence level. (5%: 1.65sd; 1%: 2.33sd)
- The simplicity and transparency of VaR can be ***misleading***.
  - First, VaR tends to underestimate the frequency and severity of extreme adverse events. It also fails to capture the downside correlation and liquidity risks associated with market stress scenarios.
  - Finally, it fails to quantify the average or expected loss under an extreme adverse market scenario.
- ***CVaR***, measures the average loss over a specific time period conditional on that loss exceeding the VaR threshold. CVaR is often measured using historical simulation or Monte Carlo techniques.
- An analyst seeking to measure the impact of adding or removing a portfolio position might use an ***incremental VaR (or partial VaR)***.
- An investor could use ***relative VaR*** to measure the expected tracking error versus a benchmark portfolio by calculating VaR (or CVaR) based on a portfolio containing the active positions minus the benchmark holdings under a market stress scenario.

234-262

专业 · 创新 · 增值

Tail Risk

- Tail risk assessment is typically conducted using one of the three methods summarized.

Method	Description	Advantages	Disadvantages
Parametric Method	Uses expected value and standard deviation of risk factors assuming normal distribution	Simple and transparent calculation	Not well suited for non-normally distributed returns or option-based portfolios
Historical Simulation	Prices existing portfolio using historical parameters and ranking results	Actual results, accommodates options, with no probability distribution assumed	Highly dependent on historical period and repetition of historical market trends
Monte Carlo Analysis	Involves generating random outcomes using portfolio measures and sensitivities	Randomly generated results from a probability distribution, accommodates options	Highly dependent on model assumptions and less transparent

235-262

专业 · 创新 · 增值

Fixed-rate bond VaR

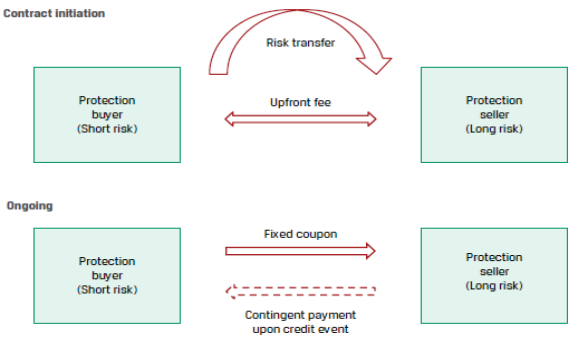
- A fixed-income manager holds $100 million par of a 15-year bond with a coupon of 2%, yield of 3%, and a modified duration of 12. If daily yield volatility is assumed to be 1.5%, what is the VaR for the position at 99% confidence (1% in the tail) for one month (assuming 20 trading days in the month and normally distributed yields)?
- **Solution:**
  - First, scale up the daily yield volatility to 20-day volatility by multiplying the square root of 20 (recall that variance scales up with time; therefore, standard deviation, which is the square root of variance, scales up by multiplying through by the square root of time). Hence, the 20-day yield volatility is $1.5\% \times \sqrt{20} = 6.708\%$. This is a proportionate measure; hence, a single standard deviation move in yields = $0.06708 \times 3\% = 0.2012\%$. The 99% confidence level for yield changes, which corresponds to the 1% VaR for the portfolio value, is $2.33 \times 0.2012\% = 46.9$ bps.
  - The impact on the portfolio of a 46.9 bps move is -12 x 0.469% = -5.63%. Given a portfolio value of $100 million, this implies a 20-day 1% VaR of $5.63 million.

236-262

专业 · 创新 · 增值

4. Synthetic Credit Strategies

- A CDS is the basic building block for strategies to manage credit risk separately from interest rate risk.
- CDS are often more liquid than an issuer's underlying bonds, enabling investors to take long or short positions, access maturities, and establish other exposures unavailable in cash markets with a smaller cash outlay than direct bond purchases.



237-262

专业 · 创新 · 增值

Synthetic Credit Strategies

- CDS contracts are usually quoted on an **issuer's CDS spread**, which corresponds to a price equal to the present value difference between the CDS spread and a fixed coupon rate on the notional amount over the contract life.
- **Fixed CDS coupon rates of 1% for investment-grade issuers and 5% for high-yield.**（标准化，但并不fair，所以要进行调整）
- The CDS price at contract inception or on a coupon payment date as a percentage of notional can be approximated using Equation :

$$\text{CDS Price} \approx 1 + ((\text{Fixed Coupon} - \text{CDS Spread}) \times \text{EffSpreadDur}_{CDS})$$

专业 · 创新 · 增值

Synthetic Credit Strategies

$$\text{CDS Price} \approx 1 + ((\text{Fixed Coupon} - \text{CDS Spread}) \times \text{EffSpreadDur}_{CDS}))$$

- Where CDS Spread is the issuer's current CDS market spread and $\text{EffSpreadDur}_{CDS}$ is the CDS contract's effective spread duration (sometimes referred to as CDS DV01). At contract inception, **the protection buyer must either make a payment to or receive a payment from the protection seller equal to the CDS contract price difference from par.**
- CDS contracts have similarities to both bonds and interest rate swaps.

Description	Upfront Premium
CDS Spread = Fixed Coupon	None
CDS Spread < Fixed Coupon	Protection buyer *receives* ((Fixed Coupon - CDS Spread) × $\text{EffSpreadDur}_{CDS}$)
CDS Spread > Fixed Coupon	Protection buyer *pays* ((CDS Spread - Fixed Coupon) × $\text{EffSpreadDur}_{CDS}$)

专业 · 创新 · 增值

CDS Price and Price Changes

- An investor seeks to purchase credit protection under a five-year CDS contract at a CDS market spread of 0.50% p.a. for an investment-grade issuer with an estimated effective spread duration (EffSpreadDurCDS) of 4.75.

1. Determine whether the investor must pay or receive an upfront amount upon CDS contract inception and calculate the difference from par.

- **Solution to 1:**
  - Because investment-grade CDS contracts have a fixed coupon of 1.00% p.a. versus the 0.50% p.a. CDS market spread, the investor buying protection should receive the difference from par upfront in exchange for paying an "above market" coupon under the contract. Calculate the estimated difference using Equation ((Fixed Coupon − CDS Spread) × EffSpreadDurCDS)) with CDS Spread of 0.50%, Fixed Coupon of 1.00%, and EffSpreadDurCDS equal to 4.75. Upfront premium: 2.375% of CDS notional (= (1.00% − 0.50%) × 4.75).

专业 · 创新 · 增值

CDS Price and Price Changes

2. Calculate the change in contract price if the CDS spread rises to 0.60% p.a. and interpret the impact of the change on the protection buyer.

- **Solution to 2:**
  - Calculate the upfront premium using Equation and a 0.60% spread. Upfront premium: 1.90% of CDS notional (= (1.00% − 0.60%) × 4.75). The protection buyer realizes a mark-to- market gain equal to 0.475% (2.375% − 1.90%) of the CDS contract notional because of the wider CDS spread.

专业 · 创新 · 增值

Synthetic Credit Strategies

- Active fixed-income portfolio managers ***buy or sell CDS protection*** across issuers, maturities, and/or sectors to alter portfolio exposure.
- While CDS contracts are available across maturities, the five-year tenor is generally the most frequently traded contract.
- CDS strategies are commonly used by active fixed-income portfolio managers to ***over- or underweight credit spread exposure*** to individual issuers, specific sectors, or borrower types.
- As with benchmark yield curves, ***CDS portfolio positioning strategies*** are usually based on expected changes in the credit curve level, slope, or shape.
  - The **CDS curve** is a credit curve, or the ***plot of CDS spreads across maturities*** for a single reference entity or index.
- A similar long–short strategy can be applied under a top-down approach. An investor might overweight (underweight) a specific sector given an expectation of narrower (wider) spread levels versus the total portfolio by selling (buying) protection on a CDS subindex contract.

专业 · 创新 · 增值

Credit Underweight Using CDS

- A European-based fixed-income manager intends to underweight exposure to a BBB rated French media and telecommunications issuer. She observes that the issuer's current on-the- run five-year CDS contract is trading at a spread of 110 bps p.a. with an EffSpreadDurCDS of 4.595. Which position should she take in the CDS market?
- Calculate the result if spreads widen to 125 bps for a €10 million notional position.
- **Solution:**
  - The manager can underweight the issuer's credit by *purchasing* protection in the CDS market. This short risk position will realize a gain if the issuer's spreads widen.
  - For example, if the issuer's credit spreads widen from 110 bps p.a. to 125 bps p.a., we can estimate the change in CDS contract value by multiplying (−Δ(CDS Spread) × EffSpreadDurCDS) from Equation by the CDS notional to get €68,925 (=−€10,000,000 × (−0.15% × 4.595)).

专业 · 创新 · 增值

Synthetic Credit Strategies

Instrument	Description	Targeted Return	Portfolio Impact
Single-Name CDS	Protection buyer pays premium to seller in exchange for payment if credit event occurs	Buyer gains and seller loses if single-name credit spread widens or credit event occurs	Short (buyer) or long (seller) single-name credit spread exposure
Index-Based CDS	Protection buyer pays premium in exchange for partial payment if credit event occurs for index member	Buyer gains and seller loses if index member spreads widen or if credit event occurs	Short (buyer) or long (seller) index-based credit spread exposure
Payer Option on CDS Index	Option buyer pays premium for right to buy protection ("pay" coupons) on CDS index contract at a future date	Max (CDS Credit Spread Strike – CDS Credit Spread at expiration, 0) – Option Premium	Short CDS index-based credit spread exposure
Receiver Option on CDS Index	Option buyer pays premium for right to sell protection ("receive" coupons) on CDS index contract at a future date	Max (Credit spread at expiration – CDS Credit Spread Strike, 0) – Option Premium	Long CDS index-based credit spread exposure

专业 · 创新 · 增值

CDS Long–Short Strategies

- Consider the investor from the prior example who sought to underweight a French media and telecommunications issuer. Assume instead that the investor seeks to maintain a constant media and telecommunications credit allocation by overweighting a BBB rated German media and telecommunications competitor. CDS contract details are as follows:

Issuer	Tenor	CDS Spread	$\text{EffSpreadDur}_{\text{CDS}}$
French Media & Telecoms Issuer	5 years	110 bps	4.697
German Media & Telecoms Issuer	5 years	130 bps	4.669

- Describe an appropriate long–short CDS strategy to meet this goal, and calculate the investor's return if the French issuer's spreads widen by 10 bps and those of the German issuer narrow by 25 bps based on €10 million notional contracts.

专业 · 创新 · 增值

CDS Long–Short Strategies

- **Solution:**
  - The manager purchases protection on the French issuer and simultaneously sells protection on the German issuer. Use (−Δ(CDS Spread) × EffSpreadDurCDS) from Equation multiplied by the CDS notional to solve for changes in the short and long risk positions:

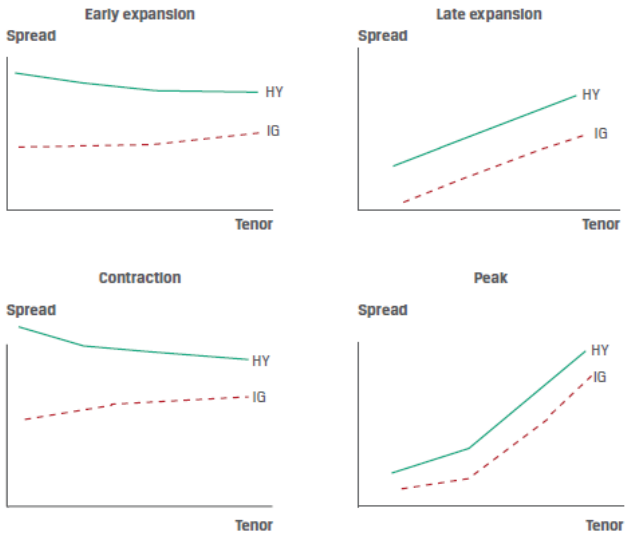
Short risk (French issuer): €46,970 (= €10,000,000 × (−0.10% × −4.697))
Long risk (German issuer): €116,725 (=−€10,000,000 × (−0.25% × 4.669))
The total gain on the long–short strategy is €163,695 (= €46,970 + €116,725).

专业 · 创新 · 增值

5. Credit Spread Curves Strategies

- We established that the credit cycle is a key driver of credit spread changes across maturities and ratings. The probability of issuer default and severity of loss over the cycle must be considered within the context of an overall market view.
- ***Early in an expansion***, as profits rise and defaults remain high, high-yield spreads remain elevated and well above investment-grade spreads, which often exhibit ***a flat to inverted spread curve***.
- As an ***expansion progresses***, lower defaults and increased profits cause short-term high-yield and investment-grade spreads to decline and ***credit spread curves to steepen***.
- ***Credit curve steepening continues*** as ***economic growth peaks*** amid higher leverage and inflation expectations.
- As economic growth slows or the ***economy enters a recession***, credit spreads rise, and ***spread curves flatten***, with **the high-yield curve inverting** in some instances amid falling profitability and rising defaults.

Credit Spread Curves Strategies



5.1 Static Credit Spread Curve Strategies

- An active credit manager might believe that current credit spreads are ***reasonably priced*** and that credit curves will ***remain stable or unchanged*** over an investment horizon while credit defaults and annual loss rates remain low.
- Manager could position a portfolio to generate excess return by either lowering the portfolio's average credit rating or adding credit spread duration by investing in longer-dated bonds with a similar rating to the current portfolio.
  - ***Buy and hold/ Carry and roll down***, buying risky bonds with durations above the benchmark without active trading during a subsequent period.
  - ***Adding credit duration***.
  - ***Derivative-based credit strategies*** to add credit spread duration or increase credit exposure include selling CDS single-name or index protection for longer maturities or lower credit quality or using a long–short approach to achieve a similar objective.

5.2 Dynamic Credit Spread Curve Strategies

- Active credit managers seek to capitalize on divergent market views using ***cash-based or derivative strategies*** related to specific issuers, sectors, or the overall credit market over the credit cycle ***given anticipated credit curve changes*** across both maturities and rating categories.
- In some cases, we assumes that an active manager is able to source and borrow the necessary bonds to sell short at no cost. However, in practice, the availability and cost of shorting bonds vary over the economic cycle, and shorting bonds is often far more difficult and costly during an economic slowdown. The synthetic, CDS-based strategy targets a similar objective.
- The early expansion phase of the credit cycle is usually characterized by rising profits and falling leverage, increasing cash flow coverage available to service outstanding debt.

专业 · 创新 · 增值

Tactical Credit Strategies – Economic Slowdown Scenario

- An active credit portfolio manager considers the following corporate bond portfolio choices familiar from an earlier example:

Rating Category	Current OAS	Expected Loss (POD × LGD)	EffSpreadDur
A	1.05%	0.06%	5.5
Baa	1.35%	0.30%	6.0
Ba	2.45%	0.60%	4.5
B	3.50%	3.00%	4.0

- The investor anticipates an economic slowdown in the next year that will have a greater adverse impact on lower-rated issuers. Assume that an index portfolio is equally allocated across all four rating categories, while the investor chooses a tactical portfolio combining equal long positions in the investment-grade (A and Baa) bonds and short positions in the high-yield (Ba and B) bonds.

专业 · 创新 · 增值

Tactical Credit Strategies – Economic Slowdown Scenario

- **1** Calculate excess spread on the index and tactical portfolios assuming no change in spreads over the next year (ignoring spread duration changes).
- **Solution to 1**:
- The following table summarizes expected excess returns E [ExcessSpread] ≈ $Spread_0$ −(EffSpreadDur × ΔSpread) − (POD × LGD) for each of the four rating categories with no change in spreads. For example, expected excess return for rating category A is 0.99% (=1.05% − (5.5 × 0) − 0.06%).
- Solve for the equally weighted versus tactical portfolios as follows:
- Equally weighted index: 1.10% (= (0.99% + 1.05% + 1.85% + 0.50%)/4)
- Tactical portfolio: −0.16% (= (0.99% + 1.05%)/2 − (1.85% + 0.50%)/2)

Rating Category	Excess Spread
A	0.99%
Baa	1.05%
Ba	1.85%
B	0.50%

专业 · 创新 · 增值

Tactical Credit Strategies – Economic Slowdown Scenario

- **2** Calculate excess spread under an economic downturn scenario for the index and tactical portfolios where both OAS and expected loss rise 50% for investment-grade bonds and double for high-yield bonds.
- **Solution to 2:**
- The following table summarizes expected excess returns E [ExcessSpread] ≈ $Spread_0$ −(EffSpreadDur × ΔSpread) − (POD × LGD) for each of the four rating categories with the expected 50% increase in both OAS and expected loss under the slowdown scenario. For example, expected excess return for rating category A is −1.928% (=1.05% − (5.5 × 0.525%) − 0.09%).
- Solve for the equally weighted versus tactical portfolios as follows.
- Equally weighted index: −7.84% = (−1.928% − 3.150% −9.775% − 16.500%)/4)
- Tactical portfolio: +10.6% = (−1.928% − 3.150%)/2 − (−9.775% − 16.500%)/2)

Rating Category	E(OAS)	E(Expected Loss)	E(Excess Spread)
A	1.575%	0.09%	−1.928%
Baa	2.025%	0.45%	−3.150%
Ba	4.900%	1.20%	−9.775%
B	7.000%	6.00%	−16.500%

专业 · 创新 · 增值

Synthetic Credit Strategies: Economic Recovery Scenario

- As in the prior example, an active fixed-income manager anticipates an economic rebound that is expected to cause high-yield credit curve steepening. The manager chooses a tactical CDX strategy combining 5-year and 10-year credit positions to capitalize on this view. Current market information for these high-yield CDX contracts is as follows:

CDX Contract	Tenor	CDS Spread	$EffSpreadDur_{CDS}$
CDX HY Index	5 years	450 bps	4.637
CDX HY Index	10 years	375 bps	8.656

- Describe an appropriate **duration-neutral** portfolio positioning strategy to capitalize on this view using these CDX HY contracts. Calculate the return assuming that 5-year CDX spreads immediately fall by 175 bps and 10-year spreads decline by 25 bps for an equivalent $10,000,000 notional on the 10-year CDX index contract.

专业 · 创新 · 增值

Synthetic Credit Strategies: Economic Recovery Scenario

- **Solution:**
- The appropriate strategy is to sell protection on the 5-year CDX HY and buy protection on the 10-year CDX HY.
- **1** Calculate the 5-year CDS contract notional that matches the BPV of a 10-year, $10,000,000 CDS ($BPV_{10yr}$ = $EffSpreadDur_{10yrCDS}$ × notional) using the effective spread duration ratio of 1.8667 ($EffSpreadDur_{10yrCDS}$/ $EffSpreadDur_{5yrCDS}$ = 8.656/4.637) multiplied by $10,000,000 to get $18,667,000.
- Confirm this equivalence by comparing BPV_{5yr} and BPV_{10yr}:
- BPV_{5yr}: $8,656 = $18,667,000 × 4.637/10,000
- BPV_{10yr}: $8,656 = $10,000,000 × 8.656/10,000

专业 · 创新 · 增值

Synthetic Credit Strategies: Economic Recovery Scenario

- **2** Calculate portfolio return for a 175 bp decline in 5-year CDX HY spreads and a 25 bp decline in 10-year CDX HY spreads, (−Δ(CDS Spread) × $\text{EffSpreadDur}_{CDS}$) multiplied by the CDS notional as follows:
- CDX HY 5 year: \$1,514,780 = (−1.75% × 4.637) × \$18,667,000
- CDX HY 10-year: −\$216,400 = (0.25% × 8.656) × −\$10,000,000
- Portfolio gain: \$1,298,380 = \$1,514,780 − \$216,400.
- Note that this equals the contract BPV of \$8,656 multiplied by the 150 bp credit curve steepening.

256-262

专业 · 创新 · 增值

6. Global Credit Strategies

- ***Developed market country***
- Fixed-income markets usually have well-established and liquid derivative and other capital markets and feature a broad range of private and public debt issuers with bonds denominated in a freely floating domestic or other major currency.
- Credit strategies across countries must take these and other individual market differences into consideration.
- Most developed markets face common macroeconomic factors that influence the bond term premium and expected returns, such as inflation, monetary policy, and economic growth, differences in the timing and magnitude of market changes, as well as the credit cycle across countries, are often reflected in interest rate differentials, exchange rates, and credit spreads.

257-262

专业 · 创新 · 增值

Global Credit Strategies

- ***Emerging or frontier markets***
- Emerging or frontier fixed-income markets are often dominated by sovereign issuers, state-owned or controlled enterprises, banks, and producers operating in a dominant domestic industry such as basic commodities.
- As some emerging economies face concentrated risk to a particular commodity or industry, investments across sovereign, bank, and private sector debt could offer little to no diversification. While many emerging-market bonds are denominated in a restricted domestic currency with varying degrees of liquidity, the sovereign government and a select few domestic issuers often issue global bonds in a major foreign currency such as US dollars or euros.
- Emerging markets are characterized by higher, more volatile, and less balanced economic growth than developed markets, often in addition to greater geopolitical risk, currency restrictions, and capital controls. Sovereign credit risk is therefore a critical starting point in considering fixed-income investments in emerging markets, where both the ability and willingness of issuers to repay debt is of importance.

258-262

专业 · 创新 · 增值

7. Structured Credit

- Active managers have access to a wide array of credit management tools beyond individual fixed-income securities that include structured financial instruments.

Instrument	Description	Exposure	Portfolio Applications
Collateralized Debt Obligations (CDOs)	Fixed-income securities backed by a diversified pool of debt obligations	Redistribute portfolio debt cash flows across ratings spectrum	Create tailored portfolio-based debt exposure categories/ profiles unavailable in the cash bond market
Collateralized Loan Obligations (CLOs)	Fixed-income securities backed by a diversified pool of floating-rate leveraged loan obligations	Redistribute portfolio loan cash flows across ratings spectrum	Create tailored portfolio-based loan and interest rate exposure profiles unavailable in the cash bond market
Mortgage-Backed Securities (MBS)	Fixed-income securities backed by a pool of commercial or residential mortgage loans	Provide portfolio-based exposure to real estate cash flows	Offer active managers exposure to real estate and to volatility (prepayment/extension risk) unavailable in the cash bond market
Asset-Backed Securities (ABS)	Fixed-income securities backed by a pool of credit card, auto, and other loans	Provide portfolio-based exposure to consumer loan cash flows	Offer active managers direct exposure to consumer loans and to volatility unavailable in the cash bond market
Covered Bonds	Senior debt obligations backed by pool of commercial/residential mortgages or public sector assets	Provide portfolio-based exposure to real estate cash flows with recourse to issuer	Offer active managers direct exposure to consumer loans and to real estate/public sector cash flows unavailable in the cash bond market

259-262

专业 · 创新 · 增值

8. Fixed-Income Analytics

- Key considerations for fixed-income analytical tools include both the accuracy of model inputs and assumptions and the degree of alignment between model outputs and specific fixed-income manager objectives. Bond price and YTM calculations are affected by assumptions related to the term structure of benchmark rates and volatilities and how they change over time based on term structure models. Model outputs are often tailored to match an active manager's objectives.
- An active fixed-income manager with fewer constraints might maximize risk-adjusted returns, while estimating and categorizing how each position contributes to active risk taking.
- An active manager facing liability constraints usually models the fixed-income characteristics of obligations to maximize the expected surplus of assets over liabilities.

260-262

专业 · 创新 · 增值

It's not the end but just beginning.

Your life can be enhanced, and your happiness enriched, when you choose to change your perspective. Don't leave your future to chance, or wait for things to get better mysteriously on their own. You must go in the direction of your hopes and aspirations. Begin to build your confidence, and work through problems rather than avoid them. Remember that power is not necessarily control over situations, but the ability to deal with whatever comes your way.

一旦变换看问题的角度，你的生活会豁然开朗，幸福快乐会接踵而来。别交出掌握命运的主动权，也别指望局面会不可思议的好转。你必须与内心希望与热情步调一致。建立自信，敢于与困难短兵相接，而非绕道而行。记住，力量不是驾驭局势的法宝，无坚不摧的能力才是最重要的。

261-262

专业 · 创新 · 增值

问题反馈

- 如果您认为金程**课程讲义/题库/视频**或其他资料中**存在错误，欢迎您告诉我们，**所有提交的内容我们会在最快时间内核查并给与答复。
- **如何告诉我们？**
  - 将您发现的问题通过电子邮件告知我们，具体的内容包含：
    - ✓ 您的姓名或网校账号
    - ✓ 所在班级（eg.2205CFA三级长线无忧班）
    - ✓ 问题所在科目（若未知科目，请提供章节、知识点）和页码
    - ✓ 您对问题的详细描述和您的见解
  - 请发送电子邮件至：academic.support@gfedu.net
- **非常感谢您对金程教育的支持，您的每一次反馈都是我们成长的动力**。后续我们也将开通其他问题反馈渠道（如微信等）。

专业 · 创新 · 增值