

NPTEL ONLINE CERTIFICATION COURSES

Management of Fixed Income Securities

Prof. Jitendra Mahakud
Department of Humanities and Social Sciences
Indian Institute of Technology Kharagpur

Lecture 46: Bond Investment Strategies-I

CONCEPTS COVERED

- Active bond investments strategies
- Interest Rate Anticipation Strategies

NPTEL

KEYWORDS

- Rate-Anticipation Swap
- Yield Curve Shifts and Strategies
- Bullet strategy
- Barbell strategy
- Bond ladder

NPTEL

Types of Bond Strategies

- Active Strategies: Strategies that involve taking active bond positions with the primary objective of obtaining an abnormal return (beating the market) Attempts to outperform a passive benchmark portfolio on a risk-adjusted basis
- Passive Strategies: Strategies in which no change in the position is necessary once the bonds are selected. (Following the market) Strategy of holding a portfolio of securities without attempting to outperform other investors through superior market forecasting
- Hybrid Strategies: Strategies that have both active and passive features.

NPTEL

Active Strategies

- Interest Rate Anticipation Strategies
- Credit Strategies
- Fundamental Valuation Strategies
- Other Swap Strategies

NPTEL

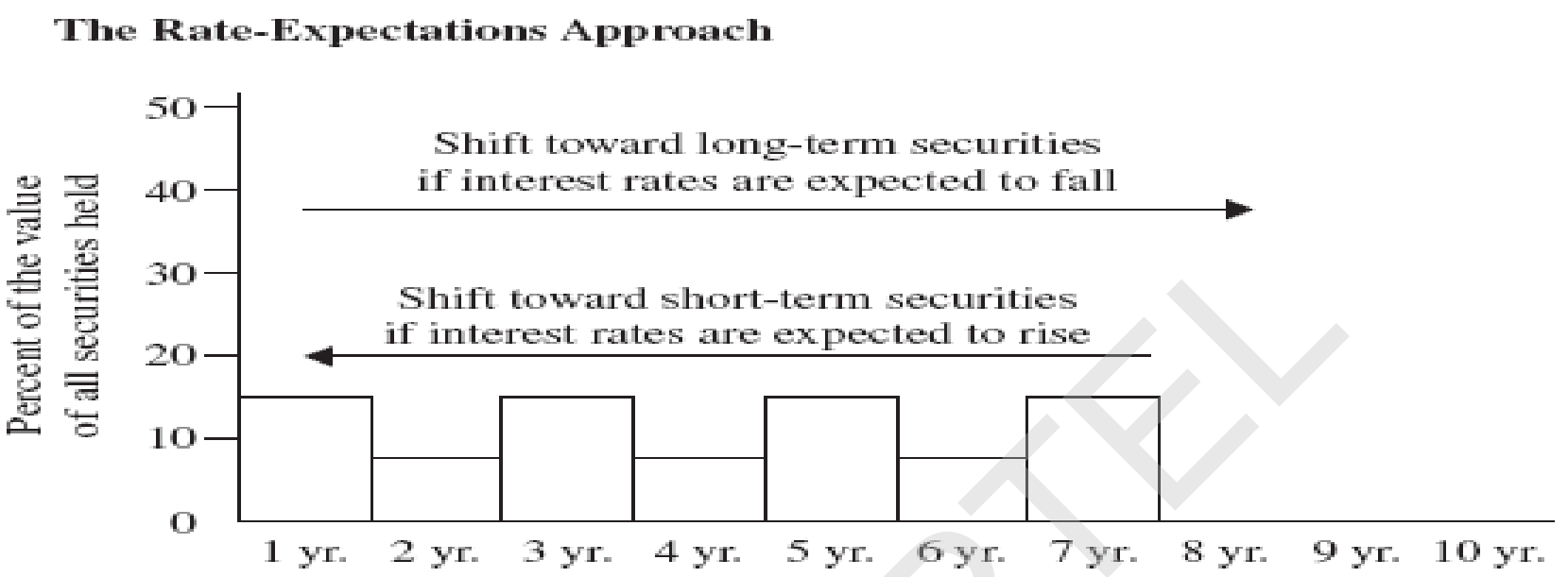
Interest Rate Anticipation Strategies

- ***Rate-Anticipation Strategies*** are active strategies of selecting bonds or bond portfolios with specific *durations* based on interest rate expectations. These strategies are based on interest rate expectations and shifts in the yield curve

- ***Rate-Anticipation Swap*** is a rate-anticipation strategy that involves simultaneously selling and buying bonds with different durations.

NPTEL

Rate Expectation Approach



- **Most aggressive of all management strategies**
- **Continually shifts maturities of securities in line with current forecasts of interest rates and the economy**
- **Calls for shifting of investments toward the short end of maturity spectrum when interest rates are expected to rise and towards the long end when interest rates are expected to fall**
- **Offers potential for large capital gains but also increases chances of substantial loss**

NPTEL

Rate-Anticipation Swap

- When interest rates are expected to decrease across all maturities

Strategy: Lengthening the portfolio's duration:
Manager could sell her lower duration bonds and buy higher duration ones.

Expect $R \downarrow$ and $\therefore P_0^B \uparrow$ across all maturities

$\Rightarrow$

Long high duration bonds

Short low duration bonds

- The portfolio's value would be more sensitive to interest rate changes and providing greater upside gains in value if rates decrease but also greater losses in value if rates decrease.

NPTEL

Rate-Anticipation Swap

- When interest rates are expected to increase across all maturities

Strategy: Shorten the portfolio's duration:

Manager could sell her higher duration bonds and buy lower duration ones.

Expect $R \uparrow$ and $\therefore P_0^B \downarrow$ across all maturities

$\Rightarrow$

Short high duration bonds

Long low duration bonds

- Defensive Strategy: Objective is to preserve the value of a bond fund.

NPTEL

Rate-Anticipation Swap: Cushion Bonds

- One way to shorten a bond portfolio's duration is for the manager to sell longer duration bonds (possibly option-free) and then buy ***cushion bonds***.
- A cushion bond is a callable bond with a coupon that is above the current market rate.
- Cushion bond has the following features:
  - High coupon yield
  - With its embedded call option, a market price that is lower than a comparable noncallable bond in a low interest rate environment

NPTEL

Rate-Anticipation Swap: Cushion Bonds (Example)

Suppose:

(i) A bond manager with portfolio consisting of 10-year, 10% option-free bonds valued at 113.42 per Rs. 100 par to yield 8%.

(ii) In the market, there are comparable 10-year, 12% coupon bonds callable at 110 that are trading at a price close to their call price – cushion bond.

(iii) If the manager expected rates to increase, he could cushion the negative price impact on the fund's value by: (1) Selling the option-free bonds (2) Buying the higher coupon, callable bonds – the cushion bonds

(iv) The swap of existing bonds for the cushion bonds provides: (1) An immediate gain in income of 3.42 per Rs. 100 par 113.42 −110 = 3.42 and a higher coupon income in the future: 12% instead of 10%

NPTEL

Rate-Anticipation Swap: Cushion Bond

- A callable bond has a lower duration than a noncallable one with the same maturity and coupon rate.
- The 10-year cushion bond with it call feature and higher coupon rate has a relatively lower duration than the 10-year option-free bond.
- *The swap of cushion bonds for option-free bonds in this example represents a switch of longer duration bonds for shorter ones* – a rate-anticipation swap.

NPTEL

Yield Curve Shifts and Strategies

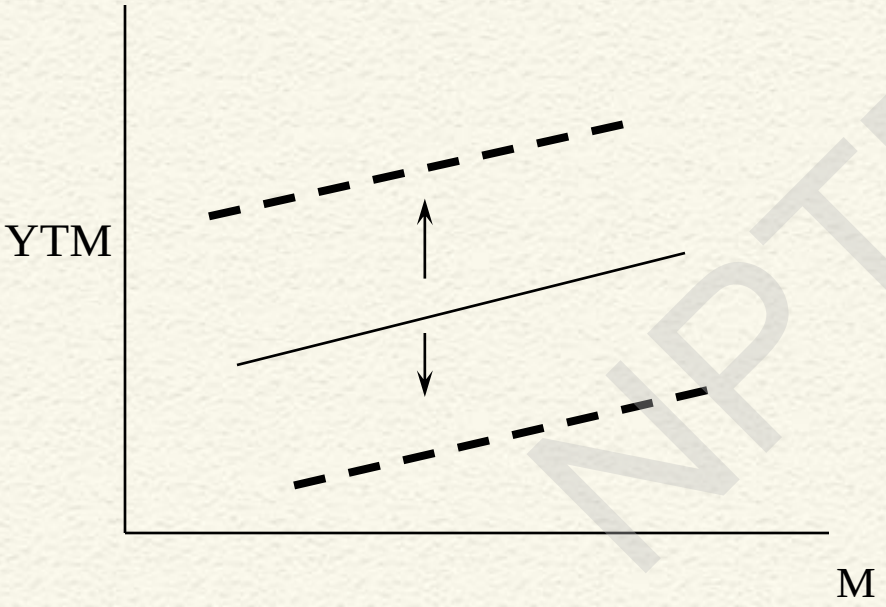
- Some rate-anticipation strategies are based on forecasting the type of yield curve shift and then implementing an appropriate strategy to profit from the forecast.

- Three types of yield curve shifts occur :
  - Parallel Shifts
  - Shifts with Twists
  - Shifts with Humpedness

NPTEL

Yield Curve Shifts: Parallel

- Rates on all maturities change by the same percentage of basis points.

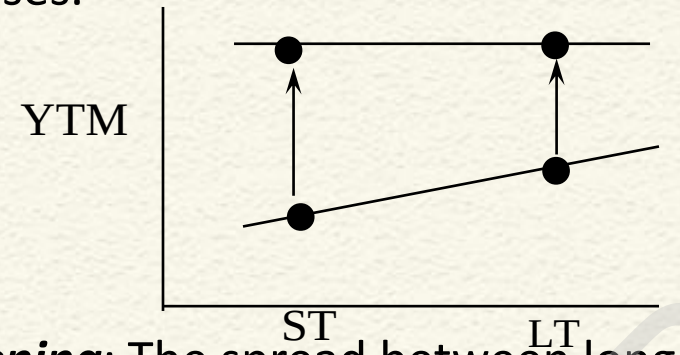


NPTEL

Yield Curve Shifts: Twist

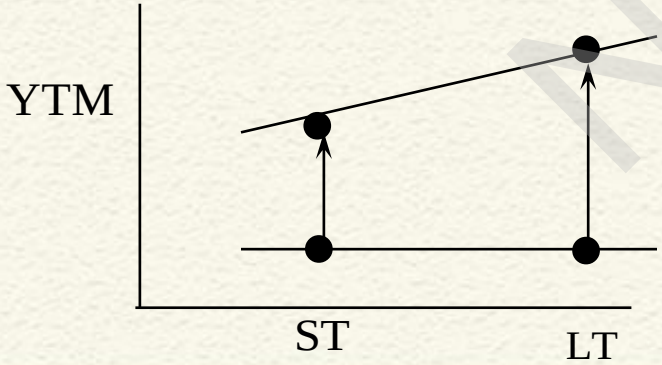
Shifts with a Twist: A twist is a non-parallel shift, with either a flattening or steepening of the yield curve.

- ***Flattening***: The spread between long-term and short-term rates decreases.



$$(YTM_{LT} - YTM_{ST}) \downarrow$$

- ***Steepening***: The spread between long-term and short-term rates increases.



$$(YTM_{LT} - YTM_{ST}) \uparrow$$

NPTEL

Yield Curve Shifts: Humpedness

- ***Shifts with Humpedness***: A shift with humpedness is a non-parallel shift in which short-term and long-term rates change by greater magnitudes than intermediate rates.

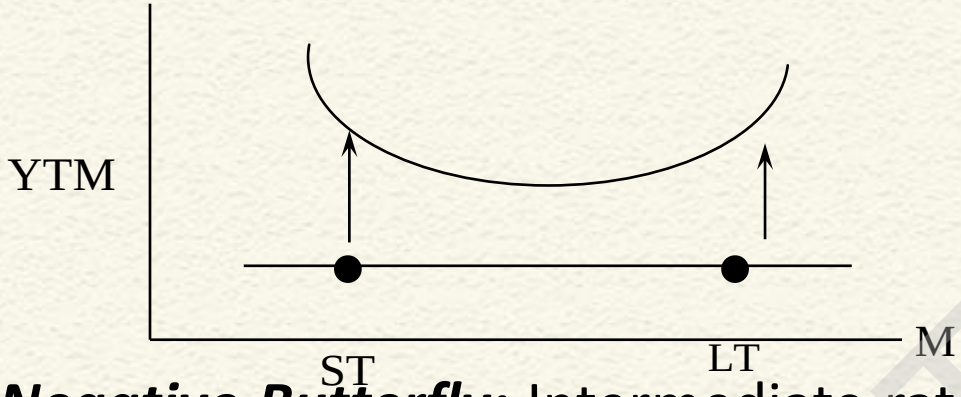
  - ***Positive Butterfly:*** There is an *increase* in both short – term and long-term rates relative to intermediate rates.

  - ***Negative Butterfly***: There is a *decrease* in both short-term and long-term rates relative to intermediate rates.

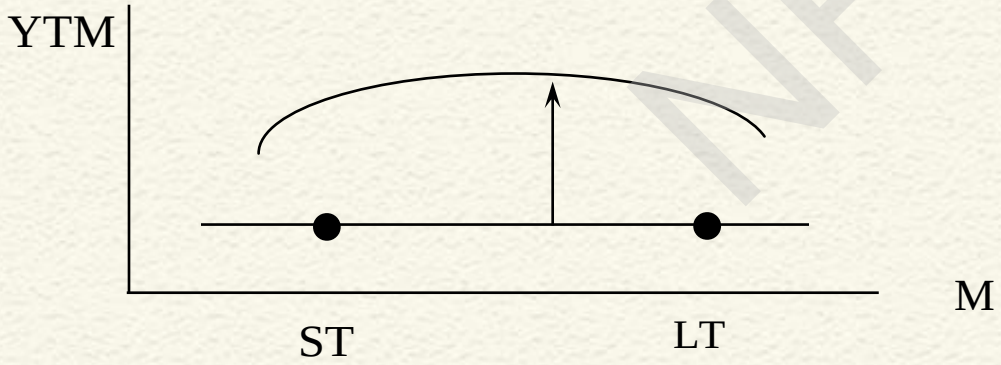
NPTEL

Yield Curve Shifts: Humpedness

- ***Positive Butterfly***: ST and LT rates change more than intermediate:



- ***Negative Butterfly:*** Intermediate rates change more than ST and LT rates:



NPTEL

Yield Curve Shift Strategies

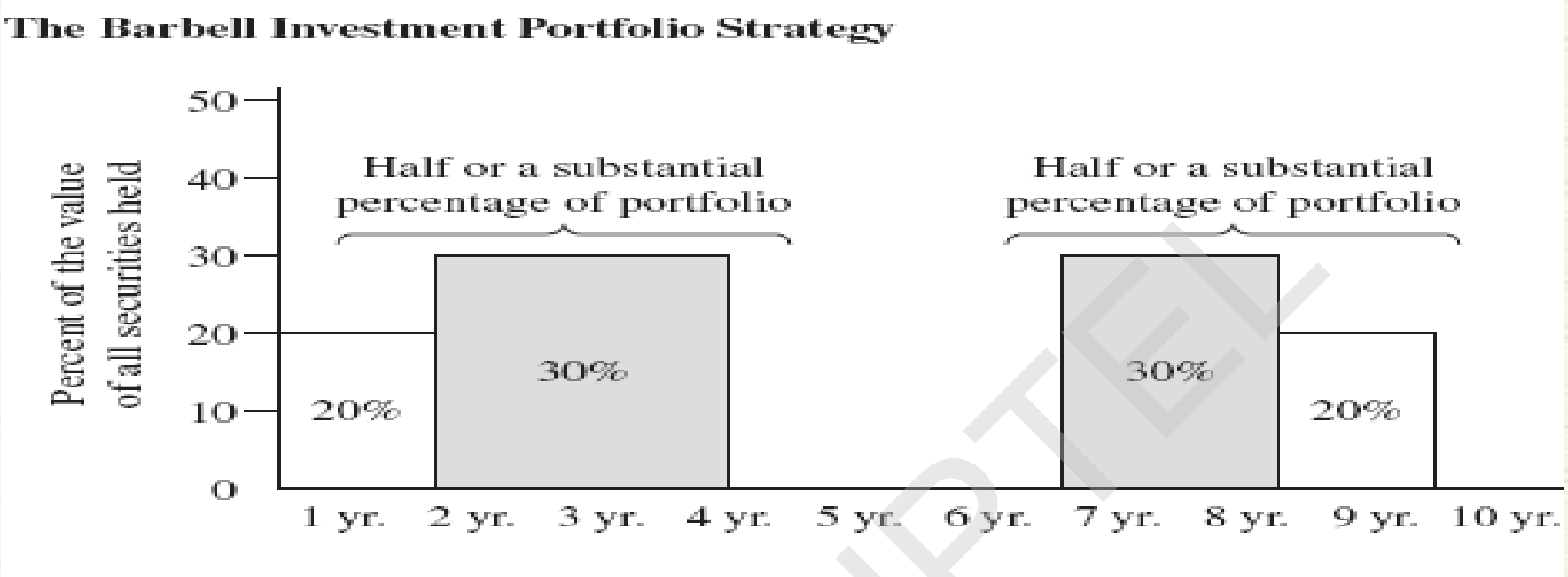
- **Bullet strategy:** It is formed by constructing a portfolio concentrated in one maturity area. For example: a bullet strategy consisting of a portfolio of long-term bonds could be formed if there is an expectation of a downward shift of the yield curve with a twist that long-term rates are expected to decrease more than short-term rates.
- If an investor expects a simple downward parallel shift in the yield curve, a bullet strategy with longer duration bonds yield greater return

- **Barbell strategy: It** is formed with investments concentrated in both short-term and long-term bonds. This strategy could be profitable who is forecasting a negative butterfly yield curve shift

- **Ladder strategy: It** is formed with equally allocated investments in each maturity group.

NPTEL

Barbell Strategy

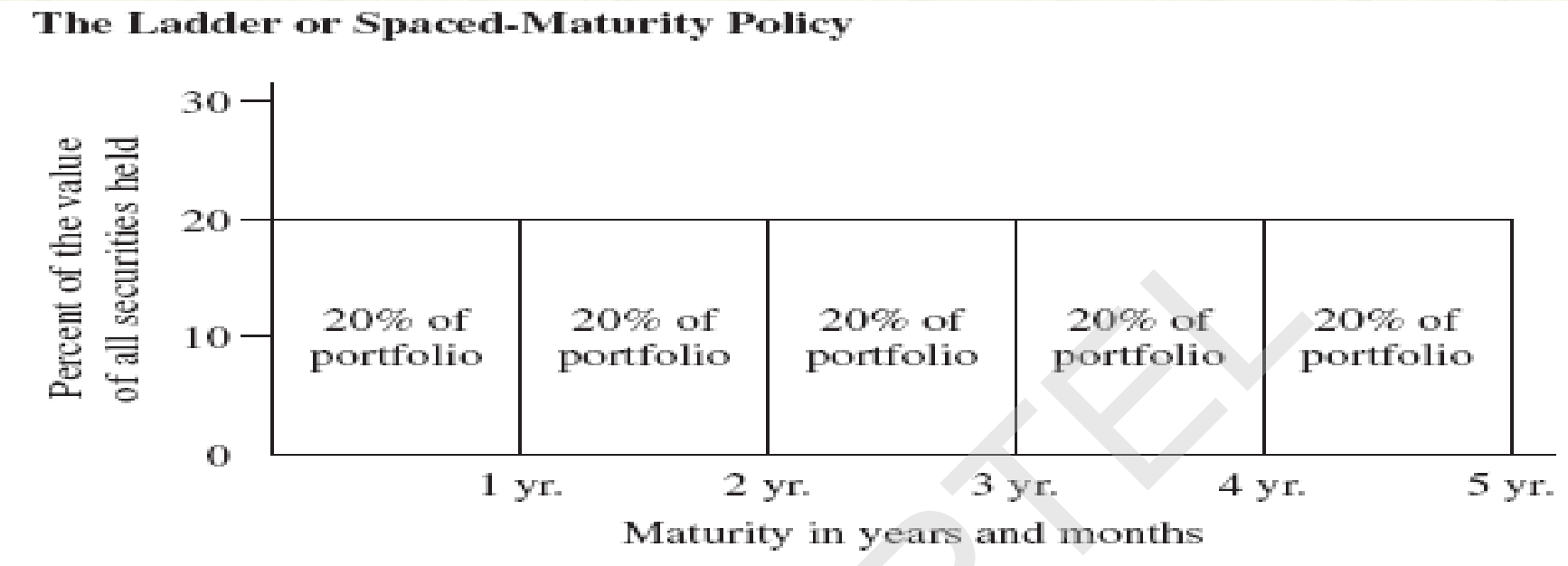


Investing institution places most of its fund in short term portfolio of highly liquid securities at one extreme and in a long term portfolio of bonds in the other extreme; minimal investment holding in intermediate maturities

Short term portfolio provides liquidity; long term portfolio designed to generate income

NPTEL

Ladder Strategy



Invest in equal proportions of securities in each of several maturity intervals until maximum acceptable maturity is reached

Strategy does not maximize investment income but has advantage of reducing income fluctuations

NPTEL

CONCLUSIONS

- Active Strategies attempt to outperform a passive benchmark portfolio on a risk-adjusted basis
- Active bond investment strategies are based on interest rate anticipations, credit quality of the bond, fundamental valuations and swaps
- Rate-Anticipation Strategies are strategies of selecting bonds or bond portfolios with specific *durations* based on interest rate expectations and forecasting the type of yield curve shift
- Yield curve shift strategies include bullet strategy, barbell strategy and bond laddering

NPTEL

REFERENCES

- Johnson, S. R (2010): Bond Evaluation, Selection and Management, John Wiley & Sons, 2nd Edition.
- Fabozzi, J. Frank and Mann, V. Steven (2005): The Hand Book of Fixed Income Securities, Tata McGraw-Hill, 7th Edition.
- Reilley, K. Frank and Brown, C. Keith (2012): Analysis of Investments and Management of Portfolio, Cengage Learning, 10th Edition

NPTEL



NPTEL ONLINE CERTIFICATION COURSES

Management of Fixed Income Securities

Prof. Jitendra Mahakud
Department of Humanities and Social Sciences
Indian Institute of Technology Kharagpur

Lecture 47: Bond Investment Strategies-II

CONCEPTS COVERED

- Horizon analysis
- Credit strategies
- Fundamental analysis of corporate credit

NPTEL

KEYWORDS

- Quality swap
- Sector rotation
- Fundamental analysis

NPTEL

Yield Curve Strategies: Horizon Analysis

- The correct yield curve strategy depends on the forecast of the yield curve shift.
- One approach to use in identifying the appropriate strategy is horizon analysis.
- **Horizon Analysis (or Total Return Analysis**) involves determining the possible total returns from different yield curve strategies given different yield curve shifts.

NPTEL

Yield Curve Strategies: Horizon Analysis Example

Consider three bonds:

1. Bond A: 5-year, 6% bond selling at par, with duration of 4.46
2. Bond B: 11-year, 6% bond selling at par, with duration of 8.36
3. Bond C: 20-year, 6% bond selling at par, with a duration of 12.16

Assume yield curve is currently flat at 6%.

Consider two strategies:

1. Barbell: Invest 50% in A and 50% in C.
2. Bullet: 100% in Bond B

Consider two types of yield curve shifts one year later:

1. **Parallel shifts** ranging between −200 basis points and + 200 basis points.
2. **Flattening**: Yield curve shifts characterized by a flattening in which for each change in Bond B (the intermediate bond), Bond A increases 25 bp more and Bond C decreases by 25 bp less:

$$\Delta y^A = \Delta y^B + 25 \text{ bp}$$

$$\Delta y^C = \Delta y^B - 25 \text{ bp}$$

NPTEL

Yield Curve Strategies: Horizon Analysis Example (Parallel Shift)

Yield Curve	Proportional	Value	Value	Value	Return	Return	Return	Return	Return	
Change in BP	Change	A	B	C	A	B	C	Barbell	Bullet	Difference
200	0.02	93.38	86.58	80.79	-0.62	-7.42	-13.21	-6.92	-7.42	0.50
150	0.015	94.98	89.70	85.06	0.98	-4.30	-8.94	-3.98	-4.30	0.31
100	0.01	96.61	92.98	89.66	2.61	-1.02	-4.34	-0.86	-1.02	0.16
50	0.005	98.29	96.41	94.63	4.29	2.41	0.63	2.46	2.41	0.05
25	0.0025	99.14	98.18	97.26	5.14	4.18	3.26	4.20	4.18	0.02
0	0	100.00	100.00	100.00	6.00	6.00	6.00	6.00	6.00	0.00
-25	-0.0025	100.87	101.86	102.84	6.87	7.86	8.84	7.86	7.86	0.00
-50	-0.005	101.75	103.77	105.80	7.75	9.77	11.80	9.78	9.77	0.01
-100	-0.01	103.55	107.72	112.09	9.55	13.72	18.09	13.82	13.72	0.09
-150	-0.015	105.38	111.87	118.89	11.38	17.87	24.89	18.14	17.87	0.27
-200	-0.02	107.26	116.22	126.27	13.26	22.22	32.27	22.76	22.22	0.54

Bullet Return = 0.5(Bond Return for A) + 0.5(Bond Return for C)

The bullet portfolio has a duration of 8.31

Duration = (0.5)(4.46) + (0.5)(12.16) = 8.31

This is approximately the same as the duration of Bond B.

NPTEL

Yield Curve Strategies: Horizon Analysis Example

- For different parallel shifts in the yield curve, there is *not much difference in the returns* on the bullet portfolio and the barbell. This is due to both having the same duration.

- If one were expecting a significant downward shift in the yield curve, Bond C with the largest duration would give you the greatest gains.

- If one were expecting a significant upward shift in the yield curve, Bond A with the lowest duration would give you the minimum loss.

- The returns are consistent with duration as a measure of a bond's price sensitivity to interest rate changes.

NPTEL

Yield Curve Strategies: Horizon Analysis Example (Flattening)

Yield Change for B in BP	Proportional Change	Value A	Value B	Value C	Return A	Return B	Return C	Return Barbell	Return Bullet	Difference
200	0.02	92.59	86.58	82.89	-1.41	-7.42	-11.11	-6.26	-7.42	1.16
150	0.015	94.17	89.70	87.32	0.17	-4.30	-6.68	-3.25	-4.30	1.04
100	0.01	95.79	92.98	92.10	1.79	-1.02	-1.90	-0.05	-1.02	0.97
50	0.005	97.45	96.41	97.26	3.45	2.41	3.26	3.35	2.41	0.95
25	0.0025	98.29	98.18	100.00	4.29	4.18	6.00	5.14	4.18	0.96
0	0	99.14	100.00	102.84	5.14	6.00	8.84	6.99	6.00	0.99
-25	-0.0025	100.00	101.86	105.80	6.00	7.86	11.80	8.90	7.86	1.04
-50	-0.005	100.87	103.77	108.88	6.87	9.77	14.88	10.88	9.77	1.11
-100	-0.01	102.64	107.72	115.42	8.64	13.72	21.42	15.03	13.72	1.31
-150	-0.015	104.46	111.87	122.50	10.46	17.87	28.50	19.48	17.87	1.61
-200	-0.02	106.32	116.22	130.19	12.32	22.22	36.19	24.25	22.22	2.03

$\Delta y^A = \Delta y^B + 25$ bp

$\Delta y^C = \Delta y^B - 25$ bp

In contrast to parallel shifts, there are *differences between the barbell and bullet portfolios* when the yield curve shift has a twist, even though they have the same durations.

NPTEL

Credit Strategies

- **Quality swap**: It is a strategy of moving from one quality group to another in anticipation of a change in economic conditions.

- **Credit analysis strategy**: This involves a credit analysis of corporate, municipal, or foreign bonds in order to identify potential changes in default risk. This information is then used to identify bonds to include or exclude in a bond portfolio or bond investment strategy.

NPTEL

Quality Swaps

- Strategy of going long and short in bonds with high or low quality rating based on the expectation of a change in economic states.

Strategy:

Expect Recession	$\Rightarrow$	Long in high quality bonds Short in low quality bonds

Expect Expansion	$\Rightarrow$	Long in low quality bonds Short in high quality bonds

NPTEL

Quality Swaps

- Quality swaps often involve a **sector rotation** in which more funds are allocated to a specific quality sector in anticipation of a change in economic conditions.
- Suppose a bond fund manager expected a *recession* accompanied by a flight to safety in which the demand for higher quality bonds would increase and the demand for lower quality ones would decrease.
- To profit from this expectation, the manager could change the allocation of her bond fund by selling some of her low quality ones and buying more high quality bonds.
- Suppose a bond fund manager expected *economic expansion* in which the demand for lower quality bonds would increase and the demand for higher quality ones would decrease.
- To profit from this expectation, the manager could change the allocation of her bond fund by selling some of her high quality bonds and buying more low quality ones.

NPTEL

Quality Swaps

- Quality swaps can also be constructed to profit from anticipated changes in yield spreads between quality sectors.

- If the economy were at the trough of a recession and was expected to grow in the future, speculators might anticipate a narrowing in the spread between lower and higher quality bonds. To exploit this, they could form a quality swap by taking a long position in lower quality bonds and a short position in higher quality bonds with similar durations.

- Whether rates increase or decrease, speculators would still profit from these positions, provided the quality spread narrows.

NPTEL

Quality Swaps

- Strategy: Long position in lower quality bonds (B) and a short position in higher quality bonds (A) with similar durations.
- **If rates decrease but the quality spread narrows**, then the percentage increase in price for the lower quality bonds would be greater than the percentage increase for the higher quality bonds in absolute value:

$$\%\uparrow P_B > \%\uparrow P_A$$

$$\left|Gain\,in\ Long\ \ B\ \ Position\right| > \left|Loss\,in\ Short\ A\ \ Position\right|$$

- In this case, the capital gain from the long position in lower quality bonds would dominate the capital loss from the short position in the higher quality bonds.

NPTEL

Quality Swaps

- Strategy: Long position in lower quality bonds (B) and a short position in higher quality bonds (A) with similar durations.
- **If rates increase but the quality spread narrows**, then the percentage decrease in the price of lower quality bonds would be less than the percentage decrease in the price of higher quality bonds in absolute value:

$$\%\downarrow P_B \; < \; \%\downarrow P_A$$

$$\left|Loss\ in\ Long\ \ B\ Position\right| < \left|Gain\ in\ Short\ A\ Position\right|$$

- In this case, the capital gain from the short position in the higher quality bonds would dominate the capital loss from the long position in the lower quality bonds.
- Speculators would lose from these positions if the quality spread widens.

NPTEL

Credit Analysis

- The **objective of a credit analysis strategy** is to determine expected changes in default risk.
- If changes in quality ratings of a bond can be projected prior to an upgrade or downgrade announcement, bond investors can realized gains by buying bonds they project will be upgraded, and they can avoid losses by selling or not buying bonds they project will be downgraded.
- The strategy of many managers of high-yield bond funds is to develop effective credit analysis models so that they can identify bonds with high probabilities of upgrades to include in their portfolios, as well as identify bonds with high probabilities of downgrades to exclude from their fund.
- Credit analysis can be done through basic fundamental analysis of the bond issuer and the indenture and with statistical-based models, such as a multiple discriminant model.

NPTEL

Fundamental Analysis of Corporate Credits

- Industry Analysis
- Company Fundamental Analysis
- Asset and Liability Analysis
- Indenture Analysis

NPTEL

CONCLUSIONS

- Horizon Analysis involves determining the possible total returns from different yield curve strategies given different yield curve shifts.
- Quality swap strategy is of going long and short in bonds with high or low quality rating based on the expectation of a change in economic states.
- The objective of a credit analysis strategy is to determine expected changes in default risk.

NPTEL

REFERENCES

- Johnson, S. R (2010): Bond Evaluation, Selection and Management, John Wiley & Sons, 2nd Edition.
- Fabozzi, J. Frank and Mann, V. Steven (2005): The Hand Book of Fixed Income Securities, Tata McGraw-Hill, 7th Edition.

NPTEL



NPTEL ONLINE CERTIFICATION COURSES

Management of Fixed Income Securities

Prof. Jitendra Mahakud
Department of Humanities and Social Sciences
Indian Institute of Technology Kharagpur

Lecture 48: Bond Investment Strategies-III

CONCEPTS COVERED

- Industry analysis
- Company fundamental analysis
- Asset-liability Analysis
- Indenture analysis

NPTEL

KEYWORDS

- Fiscal Soundness
- Multiple Discriminate Analysis
- Yield Pickup Swap
- Tax Swap
- Callable/Noncallable Swap

NPTEL

Industry Analysis

- The growth rate of the industry
- Stage of industrial development
- Cyclically of the industry
- Degree of competition
- Industry and company trends
- Government regulations
- Labor costs and issues.

NPTEL

Company Fundamental Analysis

- Comparison of the company's financial ratios with other firms in the industry and with the averages for comparable bonds based on their quality ratings.
- Ratios often used for analysis include:
  - Interest Coverage Ratio (EBIT/Interest)
  - Leverage (long-term debt/total assets)
  - Cash flow (net income + depreciation + amortization + depletion + deferred taxes) as a proportion of total debt (cash flow/debt)
  - Return on Equity

NPTEL

Asset and Liability Analysis and Indenture Analysis

- **Asset and Liability Analysis**
  - The market values of assets and liabilities,
  - Age and condition of plants
  - Working capital
  - Intangible assets and liabilities
  - Foreign currency exposure
- **Indenture Analysis**
  - Analysis of protective covenants, including a comparison of covenants with the industry norms

NPTEL

Fundamental Credit Analysis: Municipal Issues

- Debt burden
  - For general obligations, debt burden should include determining the total debt outstanding, including moral obligation bonds, leases, and unfunded pension liabilities.
  - For revenue bonds, debt burden should also focuses on relevant coverage ratios relating the debt on the revenue bond to user charges, earmarked revenue, lease rental, and the like.
- Fiscal Soundness
  - The objective of this analysis is to determine the issuer's ability to meet obligations.
  - For general obligation bonds, the areas of inquiry can include: What are the primary sources of revenue? Is the issuer dependent on any one particular source of revenue?
  - For revenue bonds, relevant questions relate to the *soundness* of the project or operation being financed
- Overall Economic Climate
- Red Flags

NPTEL

Fundamental Credit Analysis: Municipal Issues

- Overall Economic Climate
  - Growth rate for income
  - Growth rate for population
  - Growth rate for property values
- Red Flags
  - Unemployment increases
  - Decreased in the number of building permits
  - Declines in property values
  - Loss of large employers
  - Use of debt reserves and declines in debt coverage ratios
  - For *revenue bonds*, additional red flags could include (i) Cost overruns on projects (ii) Schedule delays (iii) Frequent rate or rental increases

NPTEL

Fundamental Credit Analysis: Foreign Issues

- **Cross-Border Risk**: Risk due to changes in political, social, and economic conditions in countries where the bonds are issued or where the company is incorporated.
- **Sovereign Risk**: The risk that the government is unable or unwilling (due to political changes) to service its debt.
- **Exchange-rate risk** relates to the ability of the foreign government to purchase the foreign currency to meet its debt obligations.

NPTEL

Multiple Discriminate Analysis

- Multiple discriminate analysis is a statistical technique that can be used to forecast default or changes in credit ratings.
- When applied to credit analysis, the model estimates a bond's credit score or index, S, to determine its overall credit quality.
- The score is based on a set of explanatory variable, X_i, and estimated weights or coefficients, c_i, measuring the variables relative impact on the bond's overall credit quality:

$$S = c_0 + c_1X_1 + c_2X_2 + \cdots + c_nX_n$$

- For corporate bonds, possible explanatory variables include:
  - Interest Coverage Ratio
  - Leverage Ratio
  - Capitalization Level
  - Profitability Ratios (e.g., earnings before interest and taxes to total assets)
  - Variability (e.g. variance of profitability ratio)

NPTEL

Multiple Discriminate Analysis

- One way to apply multiple discriminate analysis is to compute and then rank the credit quality scores of a number of bonds. To do this, requires
  - **Estimating the c coefficient** (using a cross-sectional regression technique)
  - **Determining the explanatory variables** (X) for each company or credit
  - **Computing the quality scores, S**: Given c and X values for a number of companies, each company's current credit quality score S can be computed using the estimated score equation.
  - **Ranking Bonds**: Once the scores are estimated, then the bonds can be ranked in the order of their scores to assess each bond's relative default risk.
- Discriminate analysis can also be used to forecast a change in default risk. In this case, the expected future financial ratios of each company are estimated and then used in the above equation to determine the company's future score or expected change in score.

NPTEL

Fundamental Valuation Strategies

- ***Fundamental bond analysis*** involves determining a bond's intrinsic value and then comparing that value with the bond's market price
- The active management of a bond portfolio using a fundamental strategy involves buying bonds that are determined to be underpriced and selling or avoiding those determined to be overpriced
- A bond fundamentalist often tries to determine a bond's intrinsic value by estimating the required rate for discounting the bond's cash flows.
- This rate, R, depends on the current level of interest rates as measured by the risk-free rate, R_f, and the bond's risk premiums: default risk premium (DRP), liquidity premium (LP), and option-adjusted spread (OAS):

$$R = R_f + DRP + LP + OAS$$

NPTEL

Fundamental Valuation Strategies

- Fundamentalists use various models to estimate the various spreads. These include:
  - Regressions
  - Multiple discriminate analysis
  - Option pricing models
  - Binomial Interest Rate Trees

NPTEL

Yield Pickup Swaps

- In a yield pickup swap, investors or arbitrageurs try to find bonds that are identical, but for some reason are temporarily mispriced, trading at different yields
- **Strategy**: When two identical bonds trade at different yields, abnormal return can be realized by going long in the underpriced (higher yield) bond and short in the overpriced (lower yield) bond, then closing the positions once the prices of the two bonds converge
- The strategy underlying a yield pickup swap can be extended from comparing different bonds to comparing a bond with a portfolio of bonds constructed to have the same features.

NPTEL

Yield Pickup Swaps (Example)

- Suppose a portfolio consisting of (i) *AAA quality, 10-year, 10% coupon bond* and *A quality, 5-year, 5% coupon bond* is constructed such that it has the same cash flows and features as say *AA quality, 7.5-year, 7.5% coupon bond*
- If an AA quality, 7.5-year, 7.5% coupon bond and the portfolio do not provide the same yield, then an arbitrageur or speculator could form a yield pickup swap by taking opposite positions in the portfolio and the bond.
- A fundamentalist could also use this *methodology for identifying underpriced bonds*: buying all AA quality, 7.5-year, 7.5% coupon bonds with yields exceeding the portfolio formed with those features.

NPTEL

Tax Swap

- In a ***tax swap***, an investor sells one bond and purchases another in order to take advantage of the tax laws.
- Suppose a bond investor purchased Rs. 10,000 worth of a particular bond and then sold it after rates decreased for Rs. 18,000, realizing a capital gain of Rs.8,000 and also a capital gains tax liability. One way for the investor to negate the tax liability would be to offset the capital gain with a capital loss. If the investor were holding bonds with current capital losses of say Rs. 8,000, he could sell those to incur a capital loss to offset his gain.

NPTEL

Tax Swap

- Another type of tax swap involves switching between high and low coupon bonds to take advantage of different tax treatments applied to capital gains and income.

- This swap can be used if the tax rate on capital gains differs from the tax rate on income.
  - If it does, then an investor might find it advantageous to swap a low coupon bond for a high coupon bond with the same duration.

NPTEL

Callable/Noncallable Swap

- If investors expect the spread between callable and noncallable bonds to narrow, they could capitalize by forming a ***callable/noncallable bond swap***: long in the callable bond and short in the noncallable one.
- ***Callable/noncallable bond swap*** can also be defined in terms of an overall portfolio strategy of buying callable bonds and selling noncallble in *anticipation* of the spread between callable and noncallable bonds narrowing
- To effectively apply this bond swap requires investors to forecast changes in the spread.
- Similar swaps can also be extended to bonds with and without other option features, such as putable and nonputable bonds

NPTEL

CONCLUSIONS

- The credit analysis strategy involves industry analysis, company fundamental analysis, asset and liability analysis and indenture analysis
- The credit analysis of the bonds varies across the types of bonds
- Multiple discriminate analysis is a statistical technique that can be used to forecast default or changes in credit ratings.
- ***Fundamental bond analysis*** involves determining a bond's intrinsic value and then comparing that value with the bond's market price
- Other active bond investment strategies include, yield pickup swap, tax swap and callable/non-callable swap

NPTEL

REFERENCES

- Johnson, S. R (2010): Bond Evaluation, Selection and Management, John Wiley & Sons, 2nd Edition.
- Fabozzi, J. Frank and Mann, V. Steven (2005): The Hand Book of Fixed Income Securities, Tata McGraw-Hill, 7th Edition.
- Reilley, K. Frank and Brown, C. Keith (2012): Analysis of Investments and Management of Portfolio, Cengage Learning, 10th Edition

NPTEL



NPTEL ONLINE CERTIFICATION COURSES

Management of Fixed Income Securities

Prof. Jitendra Mahakud
Department of Humanities and Social Sciences
Indian Institute of Technology Kharagpur

Lecture 49: Bond Investment Strategies-IV

CONCEPTS COVERED

- **Passive bond investment strategies**

NPTEL

KEYWORDS

- Buy and hold approach
- Bond Indexing
- Tracking error
- Cell matching
- Cash-flow Matching

NPTEL

Passive Strategies

- Strategies that once they are formed do not require active management or changes
- The **objectives** of passive management strategies can include:
  - A simple **buy-and-hold** approach of investing in bonds with specific maturities, coupons, and quality ratings with the intent of holding the bonds to maturity
  - Forming portfolios with returns that **mirror** the returns on a bond **index**
  - Constructing **portfolios** that ensure there are sufficient funds to meet **future liabilities**.

NPTEL

Passive Strategies

- Bond Indexing
- Cash-flow Matching
- Classical Immunization

NPTEL

Bond Indexing

- **Bond Indexing** is constructing a bond portfolio whose returns over time replicate the returns of a bond index
- The first step in constructing a bond index fund is to select the appropriate index. Bond indices can be **General**, **Specialized** or **Customized**
- The second step is to determine how to replicate the index's performance. Alternatives Approaches (i) Full-Replication (ii) Sampling

NPTEL

Full-Replication Approach (or **pure bond indexing)**

- The full-replication approach consists of purchasing *all* of the bonds comprising the index in the same proportion that they appear in the index.

- This approach would result in a perfect correlation between the bond fund and the index.

- However, with some indices consisting of as many as 5,000 bonds, the transaction costs involved in acquiring all of the bonds is very high.

NPTEL

Sampling Approach

- An alternative to selecting all bonds is to use only a sample.
- By using a smaller size portfolio, the transaction costs incurred in constructing the index fund would be smaller.
- However with fewer bonds, there may be less than perfect positive correlation between the index and the index fund.
- The difference between the returns on the index and the index fund are referred to as **tracking errors**.
- A popular sampling approach is to use a cell matching strategy.

NPTEL

Cell Matching

- A **cell matching** strategy involves decomposing the index into cells, with each cell defining a different mix of features of the index (duration, credit rating, sector, etc.).
- ***Example:***
- Decompose a bond index into
  1. 2 Durations: D > 5 and D < 5
  2. 2 Sectors: Corporate and Sovereign
  3. 2 Quality Ratings: AAA and AA
- With these feature, eight cells can be formed

C_1 = D < 5, AAA, Corp
C_2 = D < 5, AAA, Sovereign
C_3 = D < 5, AA, Corp
C_4 = D < 5, AA, Sovereign
C_5 = D > 5, AAA, Corp
C_6 = D > 5, AAA, Sovereign
C_7 = D > 5, AA, Corp
C_8 = D > 5, AA, Sovereign

- The index fund is constructed by selecting bonds to match each cell and then allocating funds to each type of bond based on each cell's allocation.

NPTEL

Cell Matching

- One cell matching approach is to base the cell identification on just *two features* such as the durations and sectors or the durations and quality ratings.

Example:

- **Duration/quality index** is formed by determining the percentages of average durations of each quality-rating group making up the index.
- **Duration/sector index** is formed by determining the percentages of average durations of each sector group making up the index.

NPTEL

Enhanced Bond Indexing

- A variation of straight indexing is ***enhanced bond indexing***. This approach allows for minor deviations of certain features and some active management in order to try attain a return better than the index.
- Usually the deviations are in quality ratings or sectors, and not in durations, and they are based on some active management strategy.
- For example: A fund indexed primarily to Barclays composite but with more weight given to lower quality bonds based on an expectation of an improving economy would be an enhanced index fund combining indexing and sector rotation.

NPTEL

Cash Flow Matching Method

- A ***cash flow matching strategy*** involves constructing a bond portfolio with cash flows that match the outlays of the liabilities. Cash flow matching is also referred to as a ***dedicated portfolio strategy***
- One method that can be used for cash flow matching is to start with the final liability for time T and work backwards
- For the last period, one would select a bond with a principal (F_T) and coupon (C_T) that matches the amount of that final liability (L_T):

$$L_T = F_T + C_T$$

$$L_T = F_T(1 + C^{RO})$$

$$\text{where: } C^{R0} = C_T / F_T$$

- To meet this liability, one could buy L_T /(1+ C^{R0}) of par value of bonds maturing in T periods

NPTEL

Cash Flow Matching Method

- To match the liability in period T − 1, one would need to select bonds with a principal of F_{T-1} and coupon C_{T-1} (or coupon rate of $C^{R1} = C_{T-1}/ F_{T-1}$) that is equal to the projected liability in period T − 1 (L_{T-1}) less the coupon amount of C_T from the T-period bonds selected:

$$L_{T-1} - C_T = F_{T-1} + C_{T-1}$$
$$L_{T-1} - C_T = F_{T-1}(1 + C^{R1})$$

- To meet this liability, one could buy $(L_{T-1} - C_T)/(1+ C^{R1})$ of par value of bonds maturing in T-1 periods.
- To match the liability in period T − 2, one would need to select bonds with a principal of F_{T-2} and coupon C_{T-2} (or coupon rate of $C^{R2} = C_{T-2}/ F_{T-2}$) that is equal to the projected liability in period T −2 (L_{T-2}) less the coupon amounts of C_T and C_{T-1} from the T-period and T-1-period bonds selected:

$$L_{T-2} - C_T - C_{T-1} = F_{T-2} + C_{T+2}$$
$$L_{T-2} - C_T - C_{T-1} = F_{T-2}(1 + C^{R2})$$

- To meet this liability, one could buy $(L_{T-2} - C_T - C_{T-1})/(1+ C^{R2})$ of par value of bonds maturing in T-2 periods.

NPTEL

Cash Flow Matching Example

- Suppose the cash flow matching strategy calls for constructing a portfolio to match theses liabilities with 3-year, 2-year, and 1-year bonds each paying 5% annual coupons and selling at par.

Bonds	Coupon Rate	Par	Yield	Market Value	Liability (Rs)	Year
3-Year	5%	100	5%	100	4m	3
2-year	5%	100	5%	100	3m	2
1-year	5%	100	5%	100	1m	1

Cash-Flow Matching Strategy:

1. The Rs. 4 million liability at the end of year 3 is matched by buying Rs. 3,809,524 worth of three-year bonds: 3,809,524 = 4,000,000/1.05.
2. The Rs. 3 million liability at the end of year 2 is matched by buying Rs. 2,675,737 of 2-year bonds: 2,675,737 = (3,000,000 – (0.05)(3,809,524))/1.05.
3. The Rs.1 million liability at the end of year 1 is matched by buying Rs.643,559 of 1-year bonds: 643,559 = (Rs.1,000,000 – (0.05)(3,809,524) – (0.05)(2,675,737))/1.05

Cash Flow Matching Example

1	2	3	4	5	6
Year	Total Bond Values	Coupon Income	Maturing Principal	Liability	Ending Balance (3) + (4) – (5)
1	71,28,820	3,56,441	6,43,559	10,00,000	0
2	64,85,261	3,24,263	26,75,737	30,00,000	0
3	38,09,524	1,90,476	38,09,524	40,00,000	0

- With cash-flow matching the basic goal is to construct a portfolio that will provide a stream of payments from coupons, sinking funds, and maturing principals that will match the liability payments.

- A dedicated portfolio strategy is subject to:
  - Some market risk given that some cash flows may need to be reinvested forward
  - Default risk if lower quality bonds are purchased
  - Call risk

NPTEL

CONCLUSIONS

- Passive strategies do not require active management or changes over the time
- The objective of buy-and-hold approach is to hold the bonds to maturity
- Bond Indexing is constructing a bond portfolio whose returns over time replicate the returns of a bond index
- There are two approaches used in bond indexing process i.e. full replication and sampling
- A popular sampling approach is to use a cell matching strategy
- A cash flow matching strategy involves constructing a bond portfolio with cash flows that match the outlays of the liabilities

NPTEL

REFERENCES

- Johnson, S. R (2010): Bond Evaluation, Selection and Management, John Wiley & Sons, 2nd Edition.
- Fabozzi, J. Frank and Mann, V. Steven (2005): The Hand Book of Fixed Income Securities, Tata McGraw-Hill, 7th Edition.

NPTEL



NPTEL ONLINE CERTIFICATION COURSES

Management of Fixed Income Securities

Prof. Jitendra Mahakud
Department of Humanities and Social Sciences
Indian Institute of Technology Kharagpur

Lecture 50: Bond Investment Strategies-V

CONCEPTS COVERED

- Classical immunization
- Contingent Immunization

NPTEL

KEYWORDS

- Rebalancing
- Focus strategy
- Combination matching
- Cushion spread
- Safety margin

NPTEL

Classical Immunization

- Immunization is a strategy of minimizing market risk by selecting a bond or bond portfolio with a duration equal to the horizon date.
- For liability management cases, the liability payment date is the liability's duration, D_L.
- Immunization can be described as a duration-matching strategy of equating the duration of the bond or asset to the duration of the liability.
- When a bond's duration is equal to the liability's duration, the direct interest-on-interest effect and the inverse price effect exactly offset each other.
- As a result, the total return rate from the investment (TR) or the value of the investment at the horizon or liability date does not change because of an interest rate change.
- Redington's immunization strategy is referred to as *classical immunization*

NPTEL

Classical Immunization

- An investor has a *single* liability of Rs. 1,352 due in 3.5 years, D_L = 3.5 years
- A current investment to cover the liability of Rs. 968.30: Rs. $968.30(1.10)^{3.5}$ = Rs. 1,352
- The current relevant yield curve is flat at 10%
- There is 4-year, 9% annual coupon trading at YTM of 10% for P_0 = Rs. 968.30. This bond has a Macaulay duration of 3.5.
- *Immunization Strategy*: Buy bond with Macaulay's duration of 3.5 years to match the duration liability of 3.5 years
- Buy 4-year, 9% annual coupon at YTM of 10% for P_0 = Rs. 968.30. This bond has both a duration of 3.5 years and is worth Rs. 968.50, given a yield curve at 10%.
- If the investor buys this bond, then any parallel shift in the yield curve in the very near future would have price and interest-on-interest rate effects that exactly offset each other. As a result, the cash flow or ending wealth at year 3.5, referred to as the *accumulation value* or *target value*, would be exactly Rs. 1,352.

NPTEL

Classical Immunization

- Ending Target Values at 3.5 Years Given Different Interest Rates for 4-Year, 9% Annual Coupon Bond with Duration of 3.5

Duration = 3.5

Time (yr)	6%	10%	11%
1	Rs. $90(1.06)^{2.5}$ = Rs.104.11	Rs. $90(1.10)^{2.5}$ = Rs. 114.21	Rs. $90(1.11)^{2.5}$ = Rs. 116.83
2	$90(1.06)^{1.5}$ = Rs. 98.22	$90(1.10)^{1.5}$ = Rs. 103.83	$90(1.11)^{1.5}$ = Rs. 105.25
3	$90(1.06)^{.5}$ = Rs. 92.66	$90(1.10)^{.5}$ = Rs. 94.39	$90(1.11)^{.5}$ = Rs. 94.82
3.5	$1090/(1.06)^{.5}$ = Rs. 1058.70	$1090/(1.10)^{.5}$ = Rs. 1039.27	$1090/(1.11)^{.5}$ = Rs. 1034.58
Target Value	Rs. 1,352	Rs. 1,352	Rs. 1,352

In addition to matching duration, immunization also requires that the initial investment or current market value of the assets purchased to be equal to or greater than the present value of the liability using the current YTM as a discount factor.

In this example, the present value of the Rs. 1,352 liability is Rs. 968.50 (= $Rs.1,352/(1.10)^{3.5}$), which equals the current value of the bond and implies a 10% total return:

Total Return = $[1352/968.50]^{1/3.5} - 1] = 0.10$

Classical Immunization

- Classical duration-matching strategy works by having offsetting price and reinvestment effects.
- In contrast, a *maturity-matching strategy* where a bond is selected with a maturity equal to the horizon date has no price effect and therefore no way to offset the reinvestment effect.
- This can be seen in the next example where unlike the duration-matched bond, a 10% annual coupon bond with a maturity of 3.5 years and initially priced at Rs.1,000 (not Rs. 968.50) has different ending values given different interest rates.

NPTEL

Classical Immunization

Duration = 3.5

Time (yr)	6%	10%	11%
1	$90(1.06)^{2.5} = 104.11$	$90(1.10)^{2.5} = 114.21$	$90(1.11)^{2.5} = 116.83$
2	$90(1.06)^{1.5} = 98.22$	$90(1.10)^{1.5} = 103.83$	$90(1.11)^{1.5} = 105.25$
3	$90(1.06)^{.5} = 92.66$	$90(1.10)^{.5} = 94.39$	$90(1.11)^{.5} = 94.82$
3.5	$1090/(1.06)^{.5} = 1058.70$	$1090/(1.10)^{.5} = 1039.27$	$1090/(1.11)^{.5} = 1034.58$
Target Value	1352	$1352	1352
Total Return From 968.50	10%	10%	10%

Maturity = 3.5 years

Time (yr)	6%	10%	11%
1	$100(1.06)^{2.5} = 109.13$	$100(1.10)^{2.5} = 126.91$	$100(1.11)^{2.5} = 129.81$
2	$100(1.06)^{1.5} = 115.68$	$100(1.10)^{1.5} = 115.37$	$100(1.11)^{1.5} = 116.95$
3	$100(1.06)^{.5} = 102.96$	$100(1.10)^{.5} = 104.88$	$100(1.11)^{.5} = 105.36$
3.5	$1050 = 1050$	$1050 = 1050$	$1050 = 1050$
Target Value	1378	1397	1402
Total Return From 1,000	9.59%	10%	10.135%

- The 4-year, 9% bond with duration of 3.5 is initially priced at $968.50 and has a total return of 10% for each scenario: Total Return = $[1352/968.50]^{1/3.5} - 1]$
- The 3.5 year, 10% bond is priced at 1,000 and has a target value and total return that varies with each scenario: Total Return = $[\text{Target Value}/1{,}000]^{1/3.5} - 1]$

NPTEL

Immunization and Rebalancing

- *Fisher and Weil* compared duration-matched immunization positions with maturity-matched ones under a number of interest rate scenarios. They found that:
  - The duration-matched positions were closer to their initial YTM than the maturity-matched strategies, but that they were not absent of market risk.
- Fisher and Weil offered two reasons for the presence of market risk with classical immunization:
  - The shifts in yield curves were not parallel
  - Immunization only works when the duration of assets and liabilities are match *at all times*.
- To achieve immunization, Fisher and Weil argued that the **duration of the bond must be equal to the remaining time in the horizon.**

NPTEL

Immunization and Rebalancing

- The durations of assets and liabilities change with both time and yield changes:
- The duration of a coupon bond declines more slowly than the terms to maturity.
- In our earlier example, our 4-year, 9% bond with a Maculay duration of 3.5 years when rates were 10%, one year later would have duration of 2.77 years with no change in rates.
- Duration changes with interest rate changes. Specifically, there is an inverse relation between interest rates and duration.
- A bond and liability that currently have the same durations will not necessarily be equal as time passes and rates change.
- Immunized positions require active management, called **rebalancing**, to ensure that the duration of the bond position is always equal to the remaining time to horizon.

NPTEL

Rebalancing Strategies when $D_B \neq D_L$

- Sell bond and buy new one
- Add a bond to change the portfolio's duration
- Reinvest cash flows differently
- Use futures or options to adjust the portfolio

NPTEL

Immunization: Focus and Barbell Strategy

- For a *single liability*, immunization can be attained with either a ***Focus strategy o***r *B**arbell strategy***.
- In a ***focus strategy***, a bond is selected with a duration that matches the duration of the liability or a bullet approach is applied where a portfolio of bonds are selected with all the bonds close to the desired duration.
- Example: If the duration of the liability is 4 years, one could select a bond with a 4-year duration or form a portfolio of bonds with durations of 4 and 5 years.
- In a ***barbell strategy***, the duration of the liability is matched with a bond portfolio with durations more at the extremes.
- Example: For a duration liability of 4 years, an investor might invest half of his funds in a bond with a two-year duration and half in a bond with a six-year duration.

NPTEL

Immunizing Multiple-Period Liabilities

For multiple-period liabilities, bond immunization strategies can be done by either **Matching** the duration of each liability with the appropriate bond or bullet bond portfolio OR Constructing a **portfolio** with a duration equal to the weighted average of the durations of the liabilities (D^P_L)

Example

If a fund had multiple liabilities of Rs. 1 million each in years 4, 5, and 6.

Alternatives:

1. *Matching*: Invest in three bonds, each with respective durations of 4 years, 5 years, and 6 years

2. *Portfolio:* Invest in a bond portfolio with duration equal to 5 years:

$$D_L^P = \left(\frac{1m}{3m}\right)4yrs + \left(\frac{1m}{3m}\right)5yrs + \left(\frac{1m}{3m}\right)6yrs = 5yrs$$

NPTEL

Immunizing Multiple-Period Liabilities

- The portfolio approach is relatively simple to construct, as well as to manage.
- Some studies found that matching the portfolio's duration of assets with the duration of the liabilities does not always immunize the positions
- For multiple-period liabilities, the best approach is generally considered to be one of immunizing each liability.
- As with single liabilities, this also requires rebalancing each immunized position.
- An alternative to frequent rebalancing is a ***combination matching*** strategy:
- Combination Matching: (i) Use cash flow matching strategy for early liabilities and (ii) Immunization for longer term liabilities

NPTEL

Contingent Immunization

- ***Contingent immunization*** is an enhanced immunization strategy that combines active management to achieve higher returns and immunization strategies to ensure a floor.
- In a contingent immunization strategy, a client of an investment management fund with a specified horizon agrees to accept a potential return below an immunized total return.
- The lower potential return is referred to as the ***target rate***
- The difference between the immunized market rate and the target rate is called the ***cushion spread***
- The acceptance of a lower target rate means that the client is willing to take a horizon target value, known as the ***minimum target value***, which is lower than the fully immunized value.

Contingent Immunization Example

- Suppose an investment company offers a contingent immunization strategy for a client with HD = 3.5 years based on a current 4-year, 9% annual coupon bond trading at a YTM of 10% (assume flat yield curve at 10%).The bond has a duration of 3.5 years and an immunization rate of 10%. Suppose the client agrees to a lower immunization rate of 8% in return for allowing the fund to try to attain a higher rate using some active strategy.

- By accepting a target rate of 8%, the client is willing to accept a ***minimum target value*** of Rs. 1,309,131 at the 3.5-year horizon date (assume annual compounding): Minimum Target Value = Rs. $1{,}000{,}000(1.08)^{3.5}$ =Rs. 1309131

- The difference between the client's investment value (currently Rs. 1M) and the present value of the minimum target value is the management fund's ***safety margin*** or cushion.
- Safety Margin = Investment Value – PV(Minimum Target Value)
- Safety Margin = Rs. 1,000,000 – Rs. $1{,}309{,}131/(1.10)^{3.5}$ = Rs. 62,203

- As long as the safety margin is positive, the management fund will have a cushion and can therefore pursue an active strategy.

NPTEL

Contingent Immunization Example

Suppose the fund expected long-term rates to decrease in the future and invested the client's funds in bonds with the following features:

Maturity of 10-year, 10% annual coupon , Trading at par (YTM = 10%)

Suppose one year later the yield curve shifted down (as the management fund was hoping) to 8% (continue to assume a flat yield curve).

$$Bond\ Value = \sum_{t=1}^{9} \frac{10}{(1.08)^t} + \frac{100}{(1.08)^9} = 112.4938$$

$$Investment\ Value = \frac{112.4938}{100}(1{,}000{,}000) + (0.10)(1{,}000{,}000) = 1{,}224{,}938$$

$$PV(MTV) = \frac{1{,}309{,}131}{(1.08)^{2.5}} = 1{,}080{,}000$$

$$\text{Safety Margin} = \text{Rs. } 1{,}224{,}938 - \text{Rs. } 1{,}080{,}000 = \text{Rs. } 144{,}938$$

If *rates in the future decreased* as expected, then the value of the investment and the safety margin would increase.

The downward shift in the yield curve has led to an increase in the safety margin from Rs. 62,203 to Rs. 144,938.

Contingent Immunization Example

- At this point, the investment management fund could maintain its position in the original 10-year bond, take some other active position, or it could immunized the position.
- If the company immunizes, it would liquidate the original 10-year bond and purchase a bond with HD = 2.5 years yielding 8% (assume flat yield curve at 8%). If it did this, it would be able to provide the client with a 11.96% rate for the 3.5 year period (assume annual compounding):

$$TR = \left(\frac{1{,}224{,}938(1.08)^{2.5}}{1{,}000{,}000} \right)^{1/3.5} - 1 = 0.1196$$

NPTEL

Contingent Immunization Example

- If *rates increased*, though, the value of the investment and safety margin would decrease.
- Moreover, if rates increased to the point that the investment value were equal to the present value of the minimum target value (that is, where the safety margin is zero), then the management fund would be required to immunize the investment position. Suppose after one year, the yield curve shifted up to 12.25% instead of down to 8%.

$$Bond\ Value = \sum_{t=1}^{9} \frac{10}{(1.1225)^t} + \frac{100}{(1.1225)^9} = Rs.88.1245$$

$$Investment\ Value = \frac{88.1245}{100}(1{,}000{,}000) + (0.10)(1{,}000{,}000) = Rs.981{,}245$$

$$PV(MTV) = \frac{1{,}309{,}131}{(1.1225)^{2.5}} = Rs.980{,}657$$

$$Safety\ \ M\,\text{arg}\,in = Rs.981{,}245 - Rs.980{,}657 = Rs.588$$

NPTEL

Contingent Immunization Example

- The investment management fund now would be required to immunize the portfolio.

- This could be done by selling the bond and reinvesting the proceeds plus the coupon (total investment of Rs. 981,245) in bonds with durations of 2.5 years and yielding the current rate of 12.25% (assume flat yield curve).

- Doing this would yield a value of Rs. 1,309,916, which is approximately equal to the minimum target value of Rs. 1,309,131 and the target rate of 8%:

$$TR_{3.5} = \left[\frac{Rs.981{,}245(1.1225)^{2.5}}{Rs.1{,}000{,}000}\right]^{1/3.5} - 1 = 0.08$$

Contingent Immunization

- The contingent immunization strategy provides investors with a return-risk opportunity that is somewhere between those provided by active and fully-immunized strategies.

- In practice, setting up and managing contingent immunization strategies are more complex than this example suggests.
  - Safety margin positions must be constantly monitored to ensure that if the investment value decreases to the trigger point it will be detected and the immunization position implemented.

  - Active positions are more detailed, non-parallel shifts in the yield curve need to be accounted for, and if the immunization position is implemented, it will need to be rebalanced.

NPTEL

CONCLUSIONS

- Immunization is a strategy of minimizing market risk by selecting a bond or bond portfolio with a duration equal to the horizon date.
- Immunized positions require active management, called rebalancing, to ensure that the duration of the bond position is always equal to the remaining time to horizon.
- Contingent immunization is an enhanced immunization strategy that combines active management to achieve higher returns and immunization strategies to ensure a floor.

NPTEL

REFERENCES

- Johnson, S. R (2010): Bond Evaluation, Selection and Management, John Wiley & Sons, 2nd Edition.
- Fabozzi, J. Frank and Mann, V. Steven (2005): The Hand Book of Fixed Income Securities, Tata McGraw-Hill, 7th Edition.

NPTEL



NPTEL