NPTEL Course

Course Title: Security Analysis and Portfolio Management

Course Coordinator: Dr. Jitendra Mahakud

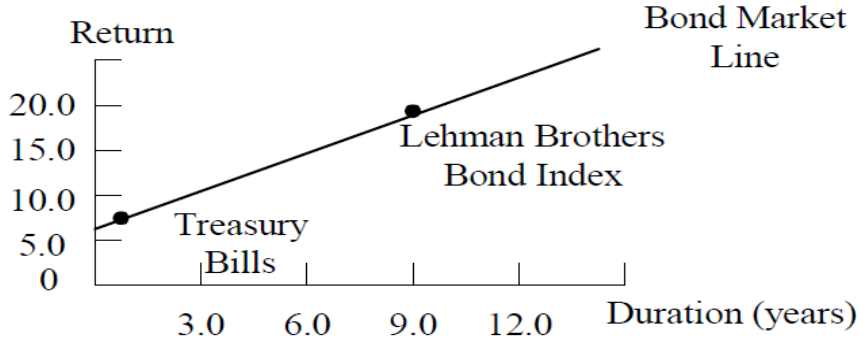
Module-20
Session-40
Portfolio performance Evaluation-II

30.1. Evaluation of Bond Portfolio Performance

Unlike the equity portfolio management no such simplified analysis technique is available for the bond market, where numerous and complex factors can influence portfolio returns. Theare are two major issues that are the basic impediment to develop a performance measure for bond portfolio management. How did performance compare among portfolio managers relative to the overall bond market or specific benchmarks? and What factors explain or contribute to superior or inferior bond-portfolio performance?. In this section we will try to discuss some of the important methods that can be used effectively for bond portfolio management. There are three major techniques for bond portfolio performance analysis, which we would like to discuss here: (1) Bond market line, (2) Decomposing portfolio returns and, (3) Analyzing sources of return.

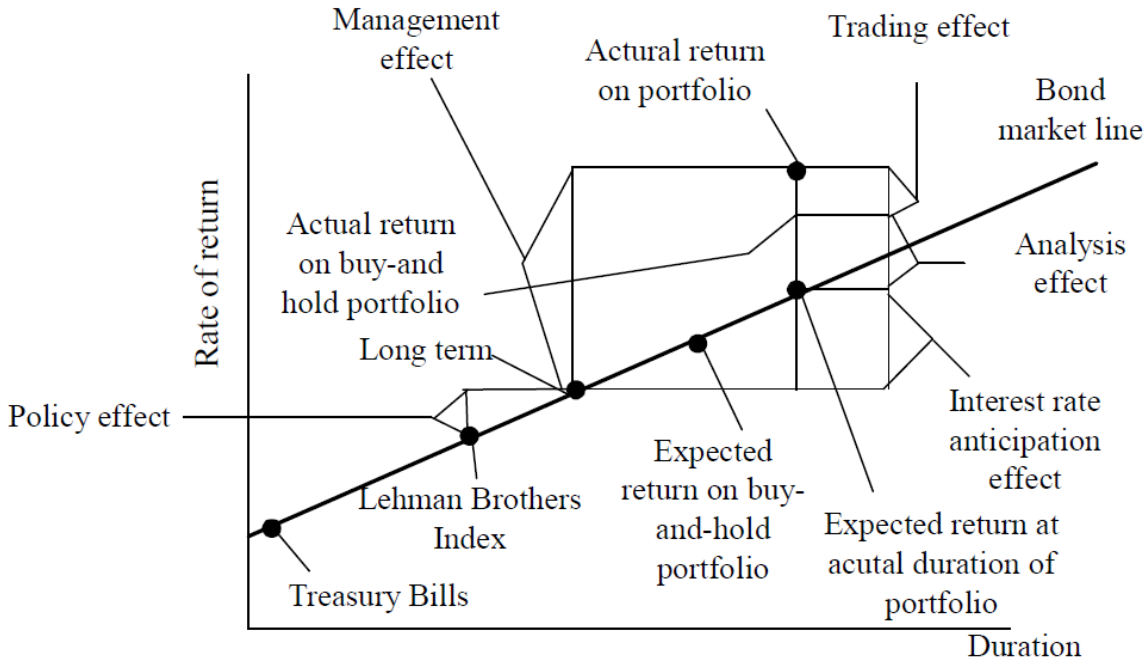
30.1.1. Bond Market Line

Wayne et al. (1977) have developed bond market line by applying asset pricing techniques to the evaluation of bond portfolio. Although in case of stocks the measure of systematic risk i.e., beta is well defined, in case of bonds to get an appropriate definition of measurable risk is difficult task. Because bond's maturity and coupon have a significant effect on the volatility of its prices and bond's duration statistic captures the net effect of this volatility. Using this duration statistics as a measure of risk Wayne et al. (1977) have developed the concept of bond market line.



Source: Arsic, V. Bogojevic, (2003), "Evaluation of Bond Portfolio Performance", International Scientific Days, Available at: http://www.fem.uniag.sk/mvd2006/zbornik/sekcia5/s5_bogojevic-arsic_vesna_109.pdf

As per this technique of bond market line, the managed bond portfolio return in excess of a market wide bond index (for e.g., in the context of U.S. the preferred bond index is Lehman Brothers Government–Corporate Bond Index) can be divided in to four components: (I) a policy effect, (II) a rate anticipation effect, (III) an analysis effect, and (IV) a trading effect. Where the latter three effects combined referred as the management effect.[1]



Source: Arsic, V. Bogojevic, (2003), "Evaluation of Bond Portfolio Performance", International Scientific Days, Available at: http://www.fem.uniag.sk/mvd2006/zbornik/sekcia5/s5_bogojevic-arsic_vesna_109.pdf

Bond market line evaluation:

- Policy effect: Difference in expected return due to portfolio duration target and the duration of the index. The duration of a portfolio being evaluated that differs from the index duration indicates a basic policy decision regarding relative risk (measured by duration), and there should be a difference in expected return consistent with that risk policy decision.[2]
- Interest rate anticipation effect: Differentiated returns from changing duration of the portfolio. The interest rate anticipation effect is attributable to changes in portfolio duration resulting from attempts to profit from and ability to predict

[1] Reilly, Frank. and Brown, Keith, "Investment Analysis & Portfolio Management", 7th Edition, Thomson Soth-Western.
[2] Reilly, Frank. and Brown, Keith, "Investment Analysis & Portfolio Management", 7th Edition, Thomson Soth-Western.

bond market movements. It is the difference between the expected return at the actual portfolio duration and the expected return at the

- Analysis effect: attributable to the selection of issues with better-than-average long-term prospects, is the difference between the actual return of the buy-and hold portfolio (used to differentiate between trading gains secured within a quarter and long-term analysis gains) at the beginning of the quarter and the expected return of that buy-and-hold portfolio.[3]
- Trading effect: this effect occurs because of short-run changes in the portfolio during the period.

30.1.2. Decomposing Portfolio Returns

Dietz, Fogler, and Hardy (1980) developed a technique to decompose the bond portfolio returns into maturity, sector, and quality effects.[4]

Under this method the total return for a bond = (known income effect + unknown price change effect) = (yield to maturity) + [(interest rate effect + sector/quality effect + residual effect)]

The yield-to-maturity (income) effect is the return an investor would receive if nothing had happened to the yield curve during the period. Interest rate effect measures changes in the term structure of interest rates during the period. The sector/quality effect measures expected impact on returns because of changing yield spreads between bonds in different sectors and ratings. The residual effect is what is left after accounting for the first three factors. A large positive residual would indicate superior selection capabilities. Time-series plot demonstrates strengths and weaknesses of portfolio manager.

30.1.3. Analyzing Sources of Return

This alternative performance evaluation technique that likewise divides the total returns *(R)* into several components that affect bond returns such as: the effect of the external

[3] Arsic, V. Bogojevic, (2003), "Evaluation of Bond Portfolio Performance", International Scientific Days, Available at: http://www.fem.uniag.sk/mvd2006/zbornik/sekcia5/s5_bogojevic-arsic_vesna_109.pdf
[4] Dietz, Peter O., Fogier, H. Russell, and Hardy, Donald J., (1980), "The Challenge of Analyzing Bond Portfolio Returns," *Journal of Portfolio Management*, Vol. 6, No. 3, pp. 53–58.

interest rate environment *(I)*, which is beyond the control of the portfolio manager, and the contribution of the management process *(C).* In a mathematical sense:

$$R = I + C$$

Where *I* is the summation of expected rate of return *(E)* or market's implicit forecast on a portfolio of default-free securities, and the unexpected return on the Treasury index that is due to actual changes in forward rates *(U)*. The term C is composed of three factors namely: In turn, *C* (the management contribution) is composed of three factors: (*M) is* return from maturity management, *(S)* return from spread/quality management, and *(B)* is the return attributable to the selection of specific securities. The above expression can be written as:

$$R = (E + U) + (M + B + S)$$

30.2. Computing Portfolio Returns

To evaluate portfolio performance, we have to measure it. Holding period yield (HPY) , which equals the change in portfolio value plus income divided by beginning portfolio value:

$$\text{HPY} = \frac{(\text{Ending Value})}{\text{Beginning Value}} - 1$$

Additional Readings:

- Alexander, Gordon, J., Sharpe, William, F. and Bailey, Jeffery, V., "Fundamentals of Investment, 3rd Edition, Pearson Education.
- Arsic, V. Bogojevic, (2003), "Evaluation of Bond Portfolio Performance", International Scientific Days, Available at: http://www.fem.uniag.sk/mvd2006/zbornik/sekcia5/s5_bogojevic-arsic_vesna_109.pdf
- Bodie, Z., Kane, A, Marcus, A .J., and Mohanty, P. " Investments", 6th Edition, Tata McGraw-Hill.
- Bhole, L.M., and Mahakud, J. (2009), Financial institutions and markets.5th Edition, Tata McGraw Hill (India).
- Fisher D.E. and Jordan R.J., "Security Analysis and Portfolio Management", 4th Edition., Prentice-Hall.
- Jones, Charles, P., "Investment Analysis and Management", 9th Edition, John Wiley and Sons.
- Johnson, R. Safford, "Bond Evaluation, Selection and Management", 2nd Edition, John Wiley and Sons.

- Prasanna, C., “Investment Analysis and Portfolio Management”, 3rd Edition, Tata McGraw-Hill.
- Reilly, Frank. and Brown, Keith, “Investment Analysis & Portfolio Management”, 7th Edition, Thomson Soth-Western.

Additional Questions with Answers

Session 40: Portfolio performance Evaluation-II

---

1. Write short note on Bond Market Line Evaluation.

Ans.

- Bond Market Line :a measure of risk such as beta coefficient for equities
- Difficult to achieve due to bond maturity and coupon effect on volatility of prices
- Composite risk measure is the bond’s duration
- Duration replaces beta as risk measure in a bond market line
- The Bond Market Line differs from the SML in the selection of the measure of risk (duration v. beta) and the selection of a proxy for the market index

Bond Market Line Evaluation

- Policy effect: Difference in expected return due to portfolio duration target
- Interest rate anticipation effect: Differentiated returns from changing duration of the portfolio
- Analysis effect: Acquiring temporarily mispriced bonds
- Trading effect: Short-run changes

2. How to Analyze Sources of Return?

Ans.

Step- 1: Decomposing Portfolio Returns:

- Total return during a period is the income effect and a price change effect
- The yield-to-maturity (income) effect is the return an investor would receive if nothing had happened to the yield curve during the period
- Interest rate effect measures changes in the term structure of interest rates during the period
- The sector/quality effect measures expected impact on returns because of changing yield spreads between bonds in different sectors and ratings
- The residual effect is what is left after accounting for the first three factors
- A large positive residual would indicate superior selection capabilities
- Time-series plot demonstrates strengths and weaknesses of portfolio manager

Step-2: Analyzing Sources of Return:

- Total return (R) made up of the effect of the interest rate environment (I) and the contribution of the management process (C)

  $R = I + C$
- I is the expected rate of return (E) on a portfolio of default-free securities and the unexpected return (U) on the Treasury Index

  $I = E + U$

- C is composed of
  M = return from maturity management
  S = return from spread/quality management
  B = return attributable to the selection of specific securities

$$R = I + C$$
$$= (E + U) + (M + S + B)$$

3. How to undertake Portfolio Performance Evaluation of the Portfolio Manager?

Ans.

Portfolio Performance Evaluation of the Portfolio Manager can be broadly undertaken under the following aspects:

- Performance Attribution Analysis: Asset allocation Effect, Selection Effect
- Manager Universe Comparison: style
- Subjective Vs. Objective Comparison: Practical constraints
- Comparison with Existing Benchmark
- Choosing and Constructing the Benchmark: Objective and Strategy
- Multicurrency Investment: Currency risk management
- Balance Benchmark: Weighted average of all benchmarks

4. How to Compute Portfolio Returns?

Ans:

- To evaluate portfolio performance, it is essential to measure it
- Holding period yield, which equals the change in portfolio value plus income divided by beginning portfolio value:

$$\text{HPY} = \frac{(\text{Ending Value})}{\text{Beginning Value}} - 1$$

Computing Portfolio Returns:

- Dollar-weighted rate of return (DWRR): Internal rate of return on the portfolio's cash flows
- Time-weighted rate of return (TWRR): Geometric average return
- TWRR is better: Considers actual period by period portfolio returns, No size bias - inflows and outflows could affect results