Portfolio Management of Global Bonds and Fixed Income Derivatives

Study Session 10

Topic Weight on Exam	**5–10%***
Study Notes Reference	**Book 3, Pages 61–141**
Video CD Reference	**CD 10**
Audio CD Reference	**CD 12 & 13**

* Tested as part of Asset Valuation

Notice that fixed income derivatives (Study Session 12 in 2006) has been moved to Fixed Income. The material in this study session, specifically international fixed income hedging strategies and fixed income derivatives, is very important for the exam. You will more than likely see these two areas tested, probably in the afternoon.

Relative-Value Methodologies for Global Credit Bond Portfolio Management[1]

Cross-Reference to CFA Institute Assigned Reading #37

In relative value analysis, assets are compared along readily identifiable characteristics and value measures. In comparing firms, for example, we can use measures such as P/E. With bonds, some of the characteristics used include sector, issue, and structure, which are used to rank the bonds across and within categories by expected performance, which should focus on total return.

1. The terminology presented in this section follows industry convention as presented in *Fixed Income Readings for the Chartered Financial Analyst® Program*, 2nd Edition, Chapter 5, Frank J. Fabozzi, ed., (Frank J. Fabozzi Associates, 2004).

Cyclical and Secular Changes

Cyclical changes. Increases in the number of new bond issues are sometimes associated with narrower spreads and relatively strong returns, because the valuation of new issues validates the prices of outstanding issues.

Secular changes. There are at least three implications associated with product *structures*:

1. Securities with embedded options have scarcity value.

2. Credit managers seeking longer durations pay a premium for longer duration securities.

3. Credit-based derivatives are increasingly used to take advantage of return and/or diversification benefits across sectors, structures, et cetera.

Rationales for Secondary Trades

- Yield/spread pickup trades.
- Credit-upside trades.
- Credit-defense trades.
- New issue swaps.
- Sector-rotation trades.
- Yield curve-adjustment trades.
- Structure trades.
- Cash flow reinvestment.

Rationales for Not Trading

- Portfolio constraints.
- Story disagreement.
- Buy and hold.
- Seasonality.

Bond Structures

Short-term bullets have maturities of one to five years and are used on the short end of a barbell strategy.

Medium-term bullets (maturities of 5 to 12 years) are the most popular sector in the U.S. and Europe.

Long-term bullets (30-year maturities) are the most commonly used long-term security in the global corporate bond market. They offer managers and

investors additional positive convexity at the cost of increased effective duration.

Due to the negative convexity caused by the embedded option, **callable** bonds will do the following:

- **Underperform** non-callables when interest rates fall.
- **Outperform** non-callables in bear bond markets with rising rates as the probability of call falls.
- When yields are very high, relative to coupon rates, the callable bond will behave much the same as the non-callable.

Sinking funds provide for the early retirement of a portion of an issue of bonds. Sinking fund structures priced at a discount to par have historically retained upside price potential during interest rate declines as long as the bonds remain priced at a discount to par (the firm can call the bonds back at par). Furthermore, given that the issuer is usually required to repurchase part of the issue each year, the price of sinking fund structures does not fall as much relative to callable and bullet structures when interest rates rise.

Figure 1 contains a summary of relative value methodologies.

Figure 1: Relative Value Methodologies

Methodology	Description	Strategy
Total return analysis	Consider coupons (yield) as well as potential price increases or decreases.	Study past bond reactions to macroeconomic changes to project future returns.
Primary market analysis	Supply of and demand for new issues affects returns. Increases (decreases) in new issues tend to decrease (increase) relative yields.	When you expect rates to fall, you expect new issues and refinances to increase.
Liquidity and trading analysis	Liquidity drives bid-ask prices and yields. As liquidity increases, demand increases. As trading increases, prices increase and yields decrease.	Identify issues/sectors that you expect to increase in price from increased liquidity.
Secondary trading rationales	Reasons for trading.	Yield/spread pickup trades. Credit-upside trades. Credit-defense trades. New issue swaps. Sector-rotation trades. Curve-adjustment trades. Structure trades. Cash flow reinvestment.
Secondary trading constraints	Reasons for not trading.	Portfolio constraints. "Story" disagreement. Buy and hold. Seasonality.
Spread analysis	Analyze the various spreads. With increased rate volatility (uncertainty), spreads tend to increase and widen with maturity.	Mean-reversion analysis. Quality-spread analysis. Percentage yield spread analysis.
Structural analysis	Study the structure of bond issues.	Determine which bond structures will perform best given your macro predictions.
Corporate curve analysis	Study credit and yield curves. With increased rate volatility (uncertainty), spreads tend to increase and widen with maturity.	Corporate spread curves tend to change with the economic cycle (i.e., narrow during upturns and widen during downturns).
Credit analysis	Upgrades cause reduced yields and increased prices. Downgrades cause increased yields and decreased prices.	Identify credit upgrade and downgrade candidates.
Asset allocation/ Sector analysis	Macro allocation is across sectors. Micro allocation is within a sector.	Identify sectors/firms expected to outperform.

International Bond Portfolio Management

Cross-Reference to CFA Institute Assigned Reading #38

Currency Exposure

Exposure limits may include maximum weightings for any single currency or maximum deviation in specified weightings from a given benchmark. The **benchmark** used should reflect the portfolio manager's hedging. There are three basic options: partially hedged benchmarks, unhedged benchmarks, and fully hedged benchmarks.

Bond portfolio management strategies (or styles) may be broadly classified into four types:

1. The *experienced trader* trades frequently to capture opportunities.
2. The *fundamentalist* uses economic and firm data to forecast opportunities.
3. The *black box approach* relies upon quantitative models.
4. The *chartist* (technical analyst) uses historical price and volume data.

Forward Exchange Rates and Differentials: Example

Suppose that the U.S. dollar is trading at a spot rate of $1.50 per £1.00, and 1-year U.S. dollar Eurocurrency deposits are yielding 6.50%, while 1-year pound sterling Eurocurrency deposits are yielding 5.75%. What is the equilibrium 1-year forward rate, and what is the pound sterling forward premium or discount?

First, use Interest Rate Parity (IRP) to determine the implied forward exchange rate:

$$F = S_0\left(\frac{1+c_d}{1+c_f}\right) = 1.50\left(\frac{1.065}{1.0575}\right) = 1.51064 \text{USD/GBP}$$

Once the forward exchange rate is calculated, we can show that the premium (forward differential) is approximately equal to the nominal risk-free interest differential between the two countries.

$$f_{d,f} = \frac{F - S_0}{S_0} = \frac{1.51064 - 1.50}{1.50} = 0.71\%$$

or

$$f_{d,f} \approx c_d - c_f = 6.5 - 5.75 \approx 0.75\% \text{ (approximation)}$$

Covered Interest Arbitrage

Covered interest arbitrage forces interest rates toward parity. If the *nominal* home interest rate is low relative to the *nominal* foreign interest rate, the forward foreign currency *must* trade at a discount (i.e., a negative forward differential). Alternatively, if the nominal home interest rate is high relative to the nominal foreign interest rate, the foreign currency must trade at a forward premium.

We can check for an arbitrage opportunity by using the *covered interest differential*, which says that the difference between the domestic interest rate and the *hedged* foreign rate should be *zero*.

The *covered interest differential* can be written as:

$$(1 + c_d) - (1 + c_f)\left(\frac{F}{S_0}\right) = \text{covered interest differential}$$

The Hedging Decision

The *hedged total return* in domestic currency on an international bond portfolio is given by:

$$R_{d,h} = \sum_{i=1}^{N} w_i (r_i + f_{d,i})$$

It is possible to decompose the domestic return derived from any foreign asset into three parts:

1. The risk-free rate in the *domestic* currency.
2. The excess return of the asset over the risk-free rate in the asset's currency.
3. The asset's excess currency return versus the domestic currency. The excess return represents the difference between your prediction of changes in exchange rates versus what the forward rates imply.

Currency Hedging Strategies

- **Unhedged**: $R_{d,i} = c_d + (r_i - c_i) + (e_{d,i} - f_{d,i})$
- **Standard hedge**: $R_{d,i} = c_d + (r_i - c_i) + 0$
- **Cross hedge**: $R_{d,i} = c_d + (r_i - c_i) + (e_{d,j} - f_{d,j})$
- **Proxy hedge**: $R_{d,i} = c_d + (r_i - c_i) + [(e_{d,i} - e_{d,j}) - f_{j,i}]$

Breakeven Rate Analysis involves determining how many basis points the spread between two bonds has to change in order for their total returns to be equivalent over a given period. We can approximate the percentage price change for a given change in yield using modified (or effective) duration:

(1) $\%\Delta\text{price} = -\text{duration} \times \Delta y$

(2) $\frac{\%\Delta\text{price}}{-\text{duration}} \times 100 = \Delta y \text{ in basis points}$

If the bonds are denominated in **different currencies**, be sure to adjust the spread for the currency differential before determining which bond is at the yield advantage or disadvantage.

Controlling Interest Rate Risk With Derivatives

Cross-Reference to CFA Institute Assigned Reading #39

There are four main advantages to using **interest rate futures** over cash market instruments. Futures:

1. Are easier to sell short.
2. Have lower transactions costs.
3. Have lower margin requirements (higher leverage).
4. Make longer durations achievable.

Controlling interest rate risk in this context means *adding* futures positions (i.e., a derivatives overlay) to an existing portfolio to achieve some *target dollar duration*. The logic of the process is seen in the following expression:

$$DD_T = DD_P + DD_{Futures}$$

Determining the **number of contracts** needed to achieve a dollar duration is as follows:

$$\text{number of contracts} = \frac{DD_T - DD_P}{DD_f}$$

The dollar duration for a futures contract can be calculated as:

$$DD_f = -(\text{effective duration})(\text{decimal change in interest rates})(\text{face value})\left(\frac{\text{futures price}}{100}\right)$$

or

$$DD_f = \frac{DD_{CTD}}{\text{CTD conversion factor}}$$

Hedging

There are several ways to describe the concept of hedging. Hedging is taking a derivatives position:

- Which locks in a particular transaction in the future.
- Where every loss (gain) in an initial position is exactly offset by the hedge.
- Which achieves a dollar duration of zero for the combined portfolio.

A *long hedge* is a long position in futures contracts taken to achieve any or all of the effects previously listed. There are two related cases where a manager would want to consider a long hedge. The manager knows that:

- Bonds will mature soon and he wishes to hedge reinvestment risk.
- There will be a large inflow of cash from some other source and he wishes to "pre-invest" the cash.

A *short hedge* is a short position in futures contracts that gives a target duration of zero. There are two cases where a manager would want to consider a short hedge. The manager:

- Is uncertain about future market conditions.
- Has a particular cash need in the future and plans to liquidate a portion of the portfolio to meet the cash need.

When hedging with futures and other instruments, the two important characteristics are the *correlation* of the futures price with the position and the *liquidity* of the futures contract.

Managers must choose to focus on either locking in the spot rate or the *futures rate*. A manager locks in the *spot rate* by hedging for a very short term. If the manager holds the hedge to *delivery*, convergence will lead to the futures rate equaling the spot rate on the delivery date, and the manager earns the futures rate effective at inception. In other words, the futures rate (or price) is *locked in*.

Basis risk is the variability of the basis, either rate or price, and is important for hedges lifted before the maturity of the futures. At the initiation of a hedge, a manager substitutes the uncertainty of the basis for the uncertainty of the price of the hedged security.

There are three basic sources of hedging error. There can be an error in the:

1. Forecast of the basis at the time the hedge is lifted.
2. Estimated duration of the hedged instrument.
3. Measure and stability of the yield spread.

Hedging Mortgage Securities to Capture Relative Value

Cross-Reference to CFA Institute Assigned Reading #40

Using a hedging instrument that has positive convexity to hedge an asset with negative convexity can be problematic. Even if an adequate hedge can be formed using instruments with positive convexity, any change in rates will change the durations of the securities (i.e., the security held and the hedging instruments) in opposite directions and the hedge will probably not hold for future changes unless significantly modified.

You should be able to list the following five risks associated with mortgage securities and their identifying features:

1. **Spread risk** is the risk of the mortgage security's yield spread over the corresponding T-bond widening, thus lowering the value of mortgage security relative to the T-bond.

2. **Interest rate risk** is the price fluctuation caused by the volatility of yields, and is distinct from spread risk.

3. **Prepayment risk.** As yields fall, borrowers have the ability (the option) to refinance.

4. **Volatility risk** is associated with the embedded prepayment option. An increase in volatility increases the value of an option.

   increased yield volatility → increased value of option → decreased value of mortgage security

5. **Model risk.**

Yield curve risk refers to flattening or twists in the yield curve. The usual approach to handling yield curve risk for a portfolio is to focus on a few particular **key rate** durations. For a single noncallable bond, yield curve risk is not particularly important because of the comparatively large cash flow at maturity.

Yield curve risk is much more important for mortgage securities because there is no bullet payment at maturity, so a manager has to consider hedging against changes in more than a single key rate. Also, principal-only (PO) strips have negative key rate durations in the short and intermediate rates, which turn positive for longer (e.g., 10-year) rates. Interest-only (IO) strips start out with positive key rate durations which turn negative.

Addressing the possibility of yield curve *twists* requires many assumptions in forming the hedge. Under a given set of assumptions, managers can form a hedge by using **two** hedging instruments from two maturity sectors.

Credit Derivatives in Bond Portfolio Management

Cross-Reference to CFA Institute Assigned Reading #41

Default risk is the risk that the issuer will not meet the obligations of the issue and can be effectively hedged using *credit default swaps, total return swaps,* and *credit options*.

Credit spread risk is the risk of an increase in the yield spread on an asset, and it can be managed with *total return swaps, credit spread options,* and *credit spread forwards*.

Downgrade risk is the possibility that the credit rating of an asset/issuer is downgraded. Downgrade risk can be managed through the use of *total return swaps, credit swaps,* and *credit options.*

Credit Derivatives

A **credit default swap** can be viewed as protection against default on an underlying credit instrument. The party that sells the protection receives a

periodic fee in exchange for a commitment to stand behind an underlying bond or loan should its issuer default.

A **credit default option** is similar to a credit default swap, except there is only a payment at the inception of the option as opposed to periodic (e.g., quarterly) payments until the credit event or the maturity of the contract.

Credit spread products are designed to make payments when the yield on a reference obligation exceeds the yield on a reference benchmark by some strike amount.

Credit spread options are designed to be triggered only when the yield on a given asset exceeds that of some referenced benchmark (e.g., a Treasury bond) by a designated amount.

Credit spread **puts** are analogous to protective puts. If the credit spread on an asset exceeds the reference spread, the put holder has the right to sell the asset to the put writer at the price determined by the reference spread.

A credit spread **call** would be purchased in anticipation of a credit upgrade. If the underlying asset (e.g., bond) is upgraded, its credit spread will narrow and its price will increase. If the price rises sufficiently, the credit call holder can purchase the asset at the price determined by the reference credit spread.

Credit spread forwards have the usual property of forward contracts where there is almost always a cash payment by one of the parties at settlement. There is no payment only when the market spread exactly equals the contracted credit spread.

Total return swaps require the *total-return receiver* to pay periodic (floating) payments in exchange for the total return from an underlying bond or loan, including any cash flows and price changes. The *total-return payer* agrees to receive the floating payments and pay the total return on the underlying. If a credit event occurs that makes the bond decline in value, the swap requires the total-return receiver to pay the total-return payer.

A **credit event** initiates the (contingent) payments made by the protection seller (i.e., the *protection leg*). The credit event is something that changes the nature or risk of the payments of the reference obligation. Swap participants can define the contracts any way they choose, but some widely used credit events include *bankruptcy*, *downgrade*, *merger*, *restructuring*, *obligation acceleration*, *cross default*, *failure to pay*, and *repudiation*.

Credit Options

Credit options appear in two forms:

1. *Credit options written on an underlying asset* directly protect against declines in the value of the asset.
2. *Credit spread options* protect against adverse movements of the credit spread over a referenced benchmark, such as a Treasury security.

Binary credit options offer a very basic form of credit protection.

- **Binary credit options with a predetermined payout**. Pays the holder a fixed sum in the event that an issue or issuer goes into default.
- **Binary credit options based on a credit rating.** Pays the holder in the event that the credit rating of an issue or issuer falls to a pre-specified level.

A **credit spread put** can allow an investor to put bonds back to the issuer at a specified price if the credit spread widens beyond a specified strike spread. Other conditions can make a credit spread widen, however, such as a change in the economic environment.

The payoff for a credit spread put:

$$OV_t = (\text{face value}) \times \frac{\max[(X_t - P_t), 0]}{100}; \text{if } (BY_t - RY_t) > SS$$

Note that even if $(BY_t - RY_t) > SS$, the option does not necessarily have value, because its value is also determined by the relationship of the current price of the bond or loan as compared to the exercise price [i.e., $(X_t - P_t)$].

A **credit spread call** allows an investor to call for additional coupon payments. Credit spread call options can be tied to a borrower's credit rating and protect against credit downgrades.

Credit spread call options are not usually specified in binary terms. The value is determined by the difference in a market spread and a reference spread:

$$OV_t = MAX\left\{\left[(BY_t - RY_t - SS) \times NP \times RF\right], 0\right\}$$

Basket Default Swaps

Senior basket default swaps have a maximum payout for each of the reference entities and there is no payout until a specific *threshold* is reached. The

maximum payout is the number of reference entities times the maximum payout per entity minus the threshold.

Subordinate basket default swaps also have a maximum payout for each reference entity, but there is also a specified maximum aggregate payout. There is no threshold so payment begins with the first default.

A **Nth-to-default swap** is triggered by the Nth default and terminates with the payoff. There is no payment for the first N – 1 defaults or for defaults N + 1, N + 2, N + 3, et cetera.