**CHAPTER XII**

**INTERNATIONAL BOND MARKETS**

Despite the complexity associated with the bond market, a bond is simple and it might be consider a bit boring when compared with a stock. After all, a stock represents a piece of a company's wealth. An evaluation of a stock requires an evaluation of the entire company's worth. An ordinary bond is an agreement that merely entitles one party to make and another to receive a series of cash flows. While differences among forms of equity are small, there is a wide range of bonds; innovative financial engineers are creating new fixed-income securities almost continuously.

In this chapter, we will introduce a wide variety of bond types used in international bond markets. Then, we will describe how bond markets are organized around the world. Finally, we will show how tools and concepts used in international bond markets.

**I. Introduction to International Bond Markets**

Debt certificates have been traded internationally for several centuries. Kings and emperors borrowed heavily to finance their wars. In the 14th century, for example, Edward I financed his wars through bond issues launched in Italy by the then big banking families. Centuries later, the great coalition against Louis XIV led by William of Orange was financed by a group of Dutch families operating from The Hague. Later, the Rothschilds became famous for supporting the British war effort against Napoleon I through their European family network.

Although debt financing has always been international in nature, there is still no unified international bond market. The international bond market is divided into three bond market groups:

i.      *Domestic bonds*. They are issued locally by a domestic borrower and are usually denominated in the local currency.

ii.     *Foreign bonds*. They are issued on a local market by a foreign borrower and are usually denominated in the local currency. Foreign bond issues and trading are under the supervision of local market authorities.

iii.    *Eurobonds*. They are underwritten by a multinational syndicate of banks and placed mainly in countries other than the one in whose currency the bond is denominated. These bonds are not traded on a specific national bond market.

Example XII.1: Distinction between bond markets.

(A) Domestic bonds.
In February 2015, Apple, the U.S. tech giant, issued bonds for USD 6.5 billion in the U.S. for placement in the U.S. domestic market.
The issue was underwritten by a syndicate of investment banks: Bank of America Merrill Lynch, Deutsche Bank, Goldman Sachs, and JP Morgan.
The issue is denominated in the currency of the intended investors, i.e., USD.

(B) Foreign bonds.
In August 2015, Apple issued bonds for AUD 2.25 billion for placement in the Aussie market alone. The issue was underwritten by a syndicate of securities houses, with Goldman Sachs, Commonwealth Bank and Deutsche Bank as the lead managers.

(C) Eurobonds.
In September 2015, Apple issued bonds for EUR 2.8 billion, in London. The issue was underwritten by an international syndicate of securities houses, led by Goldman Sachs and Deutsche Bank.
The issue is denominated in EUR to be traded mainly in London, but also in other markets. ¶

Foreign bonds issued on national markets have a long history. They often have colorful names: Yankee Bonds (in the U.S.), samurai bonds (in Japan), Rembrandt bonds (in the Netherlands) and bulldog bonds (U.K.). Government regulations have forced many international borrowers to leave foreign bond markets and borrow instead in the Eurobond market.

The Eurobond market has had a fantastic growth during the past 30 years. At its inception, in the early 1960s, the Eurobond market was mainly a Eurodollar bond market, that is, a market for USD bonds issued outside the U.S. Today, the Eurobond market comprises bonds denominated in all the major currencies and several minor currencies.

Together the foreign bond and Eurobond markets make up the international bond market. As we will see below, Eurobonds are no different from domestic or foreign bonds. The distinction between these markets is based on technical and historical reasons. For example, as illustrated in Example XII.1, a difference between foreign and Eurobond markets is the composition of the underwriting syndicate.


1.A    Euromarkets

The Eurobond market is an offshore market where borrowers and lenders meet because of its lower costs and lack of regulation. The Eurobond market is just one segment of the so-called Euromarket, which also includes Eurocurrency, Euronotes, Eurocommercial paper, and Euroequity markets. Euromarkets are offshore capital markets, in the sense that the currency of denomination is not the official currency of the country where the transaction takes place. For example, a Malayan firm deposits USD not in the U.S. but with a bank outside the U.S., for example in Singapore or in Switzerland. This USD deposit outside the U.S. is called an Eurodeposit.

Today, Euromarkets are well-developed, sophisticated markets where the traded instruments are denominated in many currencies, not just in the major currencies. For example, in 1996, the Eurobond market included issues denominated in the Egyptian pound, Polish zloty and Croatian kuna. At its inception, however, Euromarkets were just Eurodollar markets. For example, the first Euromarket was the market for short-term USD deposits and USD loans, where European banks acted as intermediaries between investors and borrowers.


1.A.1   Origins of Euromarkets

Long before World War II it was not rare for banks outside the U.S. to accept deposits denominated in U.S. dollars. The volume of such deposits, however, was small and the market for them had little economic significance. During the 1950s things began to change. Since Russia and other communist countries had to deal in hard currency for their international trade transactions, the central banks of these countries ended up holding USD balances. Initially these balances were held in New York. But as the cold war tensions increased, the communist government transferred these balances to banks in London and other European centers.

While the cold war may have initiated the Eurocurrency market, there were other factors that stimulated its development. Historically, the pound sterling played a key role in world trade. A great deal of trade was denominated in GBP. Two events helped to boost the USD as the currency for international trade:

(1) The sterling crisis in the U.K. in the mid-1950s. In 1957, the U.K. imposed controls on non-resident GBP borrowing and lending by U.K. banks. These institutions then turned to the USD to finance their international trade.

(2) In 1958, West European countries in preparation for the creation of the EEC (now, EU) allowed banks to trade freely in USD to finance trade.

On the hand, the U.S. government, unknowingly, gave a very important stimulus to the growth of the Euromarket with several regulations. During the 1960s the U.S. government imposed several measures to control international capital flows. These measures were aimed to improve the U.S. balance of payments, which was in a big deficit:

(1) In 1963, the U.S. government imposed an Interest Equalization Tax (IET) on foreign securities held by U.S. investor. The government's idea was to equalize the after-tax interest rate paid by U.S. and foreign borrowers, and, thus, discourage U.S. residents to buy foreign securities (reducing capital outflows). The IET forced non-U.S. corporations to pay a higher interest rate in order to attract U.S. investors. Therefore, non-U.S. corporations started to look into the Euromarket to borrow USD.

(2) Since the IET did not reduce significantly capital outflows, the U.S. Federal Reserve imposed another financial regulation in 1965, the Foreign Credit Restraint Program (FCRP). The FCRP restricted the amount of credit U.S. banks could extend to foreign borrowers. Foreign subsidiaries of U.S. multinational corporations were considered "foreign", under the FCRP. The government's idea behind the FCRP was to reduce capital outflows. The FCRP started as a "voluntary" program but was changed to a mandatory program in 1968. Again, foreign borrowers and U.S. subsidiaries were forced to go somewhere else to borrow USD.

(3) In 1968, the government passed the Foreign Investment Program, which limited the amount of domestic USD U.S. corporations could use to finance foreign investments.

In addition, for a long time, the Federal Reserve Board regulated the interest rates that U.S. banks could pay on term deposit. This regulation was called Regulation Q. The tight money years of 1968 and 1969 made money market rates to rise above the rates banks where allowed to pay under

Regulation Q. Regulation Q, widened the interest differential between a USD deposit in the U.S. and a USD deposit abroad.

All these restrictions brought the major financial institutions to European money centers like London, Zurich, and Luxembourg. This development had some spillover effects on financial centers in other parts of the world such as Tokyo, Hong Kong, Singapore, Beirut, Bahamas, and Bahrain.

Several European governments also imposed capital controls during this period, which triggered the creation of the non-USD segments of the Eurocurrency market. For example, during the 1970s, the Bundesbank required foreigners with DEM accounts to place a fraction of their funds in noninterest-bearing accounts. This regulation gave an incentive to foreigners to make DEM deposits outside Germany, and, then, the Euro-DEM was born.

The regulations and restrictions that gave birth to Euromarkets have all disappeared. Euromarkets, however, have continued to grow. Today, Euromarkets are free from regulations, exempt from national taxes and reserve requirements. These conditions allow international banks to take advantage of the lower cost of funds. Then, they can lend the funds to international borrowers at lower rates than those that can be obtained in domestic markets.

1.A.2   Eurocurrency Markets

The first Euromarket to emerge was the market for short-term deposits and loans, where banks acted as intermediaries between investors and borrowers. The Eurocurrency market for short-term deposits -Eurodeposits- rapidly became a reference market for domestic market-makers. For example, several domestic instruments started to be priced taking the interest rate on Eurodeposits as the relevant discount rate.

When Eurocurrency markets started to emerge, a typical Eurodeposit involved a *time deposit*, that is, a non-negotiable, registered instrument with a fixed maturity. When investing in a Eurocurrency time deposit, the investor commits funds for a certain period of time, at a specified rate. At maturity the investor receives the principal plus the interest. Later, Eurodeposits included more flexible instruments. The most popular instrument is the *certificate of deposit* (CD), which is negotiable -can be sold to another investor at any time- and is often a bearer instrument. There are several kinds of CDs: *tap* CDs, *tranche* CDs, and *rollover* CDs. The tap CD is a standard fixed-time deposit, which is denominated in amounts of USD 1 million or more. The trance CD is a tap CD that has been divided into several portions to make it attractive to small investors. The rollover CD is an instrument by which an investor buys a CD on a continuous basis with floating interest rates adjusted by market conditions when the CD matures and rollovers occur. According to the Bank of England more than 90 percent of the Eurodeposits are time deposits.

The majority of the Eurodeposits have a very short-term duration, for example, one or seven days, or one, three, or six months. For long-term CDs (up to ten years), there is a fixed coupon or floating-rate coupon. For CDs with floating-rate coupons, like rollovers, the life of the CD is divided into subperiods of usually six months. The interest earned over such period is fixed at the beginning of the period, the *reset date*. This interest rate is based on the prevailing market interest rate at the time.

This market rate is usually the *LIBOR*, the London Interbank Offer Rate or the Interbank Offer Rate in the currency's domestic financial center.

Although the majority of Eurodeposits are in the form of time deposits, CDs play a significant role in the Eurocurrency market because of a liquid secondary market. Banks, regularly, buy and sell their own CDs in the secondary market to insure investor of the liquidity of the secondary market, and therefore, making the CDs more attractive. The CD rates shown in newspapers are usually the secondary market rates. Most CDs issued in London are denominated in USD.

In general, the deposits will be effective two business days after the contract is in effect, and mature, for example, 30 days later. On maturity, payment is usually made by a transfer in the currency's home country (i.e., Japan for Euroyen). The minimum period for delivery of funds is usually two working days, which is the usual settlement period in the wholesale foreign exchange market.

Example XII.2: A Eurodollar Transaction

Suppose IBM has USD 1 million in excess cash available for a week. IBM decides to invest this USD 1 million in a 7-day deposit. Bank of New York pays 5.25% for a 7-day domestic deposit. Banco Santander Central Hispano (BSCH) has a bid rate of 5.50% for a 7-day Eurodollar time deposit. IBM deposits the USD 1 million with Banco de Santander for 7 days.

The transaction involves the following steps:

i.      BSCH must have a USD bank account with a U.S. bank, say, with Citibank.
ii.     IBM deposits USD 1 million with Citibank for credit to the account of BSCH.
iii.    BSCH withdraws the funds from its account at Citibank.
iv.     In 7 days, BSCH transfers USD 1 million plus accrued interest through its account at Citibank to the account designated by IBM.

Note that if Bank of New York had received the deposit, they should have set aside a part of the deposit as reserve, as specified by the U.S. Federal Reserve. BSCH is free to loan the Eurodeposit to anyone, without any reserve requirement. The absence of reserve requirements lowers BSCH costs. ¶

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♦ **Eurobanks: More competitive rates**
As we mentioned above, the unregulated framework allows Eurobanks to be more competitive than domestic regulated banks. In general, due to competition and the unregulated nature of Eurobanking, we observed that the domestic deposit rate is lower than the London Interbank Bid Rate (*LIBID*) and the domestic lending rate is higher than the LIBOR. ♦

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1.B     Eurobonds: Some Descriptive Statistics

1.B.1   Borrowers

According to the BIS, in 1999, the total amount borrowed in the international bond market was USD 1,152.7 billion. The major borrowers on the international bond markets were industrial countries

(93% of total amount borrowed in 1999). The U.S. (39%), and the Euro area (40%) were by far the heaviest borrowers. The heaviest largest borrowers were financial institutions, with a 51% share. The corporate sector issues and the public sector –governments and state agencies—issued 30% and 17% of the international bond debt, respectively. Supranational corporations –the World Bank, European Investment Bank, Asian and African Development Banks, the European Community-- had seen their participation substantially decreased in the last 5 years: from 4.22% in 1995 to 2% in 1999.

1.B.2    Size and Instruments

Few investors would consider an investment strategy that systematically excludes the fixed-income market from his or her portfolio. Yet, U.S. investors routinely ignore non-USD bonds, which account for almost 55 % of the world bond market.

Table XII.A presents the major bond issues, by currency of denomination and sector.

**TABLE XII.A**
INTERNATIONAL BOND MARKETS
(Nominal Value of New Offerings (Net), Billions of USD, 2015)

| Bond Market | Straight | Floating | Equity- Related | Total |
|---|---|---|---|---|
| USD | 391.3 | 67.2 | 10.2 | 468.7 |
| EUR area | 284.1 | 99.8 | 24.7 | 387.7 |
| JPY | 13.9 | 4.4 | 5 | 20.9 |
| GBP | 42.2 | 28.0 | 0.2 | 70.4 |
| CHF | 6.8 | 1.1 | - | 4.0 |
| Total | 784.4 | 208.6 | 31.1 | 1010.0 |

Source: BIS

According to the BIS, governments and state agencies mainly borrow in the straight (fixed) rate market (92%). Corporations also tend to borrow in the straight rate market (74%). On the other hand, financial institutions have a more balanced borrowing portfolio: 54% in the straight rate segment, and 44% in the floating rate segment.

1.C    Type of Bond Instruments

The variety of bonds offered to the international or even domestic investor is amazing due to the recent development of bonds with variable interest rates and complex optional clauses. (For a review of the basic concepts and techniques behind bonds, see Appendix XII.) Most issues on the international bond market, however, are fixed interest bonds, see Table XII.A. The most popular instruments in international bond markets are:

• Straight or fixed income bonds: a fixed income bond is a financial instrument with specific interest payments on specified dates over a period of years. On the last specified date, or *maturity*, the payment includes a repayment of principal. The interest rate or coupon is expressed as a percentage of the issue amount and is fixed at launch. For the issuer, the attraction of these bonds is the knowledge of level payments on interest and a set repayment schedule. For investors, the attraction of straight bonds lies in a known income.

Example XII.3: Straight bond.
In January 2004, Companhia Vale do Rio Doce (CVRD) issued straight coupon Eurobonds, with the following terms:

| | |
|---|---|
| Amount: | USD 500 million. |
| Maturity: | January 2034 (30 years). |
| Issue price: | 100% |
| Coupon: | 8.25% payable annually |
| YTM: | 8.35% (Brazil's government bonds traded at YTM 9.02% at the time) |

Note: CVRD, which is the world's largest iron ore miner, was initially planning to sell USD 300 million worth of the bonds, but ended up placing USD 500 million thanks to strong demand that surpassed USD1 billion. ¶


• Partly-paid bonds: these are standard straight bonds in all respects but for the payment of principal by investors on the closing date of the issue -which is limited to 0-33 percent of the principal amount, with the balance falling due up to six months later. These bonds are popular with issuers who can tailor the second payment to their cash flow requirements.

Example XII.6: Partly-paid bonds.
In April 1998, the European Investment Bank (EIB) issued a partly-paid GBP bond in which investors only hand over 25% of the principal. The remaining 75% will be paid in 12 months. The GBP bond raised GBP 300 million and was aimed at overseas investors attracted by the relatively high yield on offer in the UK but concerned about the unusually strong GBP. ¶


• Zero-coupon bonds: a zero-coupon bond is a straight bond with no schedule of periodic interest payments. The cash flow consists of two payments, the receipt of the proceeds on issue date and the repayment of principal on maturity. For the issuer, zero coupon bonds are an ideal financing instrument for a project, which generates no income for some years. On the other hand, the loading of the debt service of the bond into a single payment some years later creates a higher credit risk. For this reason the market is confined to highly rated borrowers. Investors are attracted to zero-coupon bonds to meet future liabilities.

Example XII.4: Zero-coupon bonds ("zeros").
In June 1981, PepsiCo Overseas issued zero-coupon Eurobonds, with the following terms:

| | |
|---|---|
| Amount: | USD 100 million. |
| Maturity: | June 1984 (3 years). |
| Issue price: | USD 67.255. |

Redemption price:                100%

Since the bonds would be repaid in three years at 100 percent of face value, the compounded annual interest yield was
$$(100/67.25)^{1/3} - 1 = 14.14\%.$$

By contrast, in 1985, Deutsche Bank Finance N.V. issued a zero-coupon bond with the following terms:

Amount:                        USD 200 million
Maturity:                      10 years.
Issue price:                   USD 100.
Redemption price:              287%

The interest yield on this issue by Deutsche Bank Finance was: $(287/100)^{1/10} - 1 = 11.12\%.$ ¶


• Floating rate notes (FRNs): FRNs are a medium-term instrument similar in structure to straight bonds but for the interest base and interest rate calculations. The coupon rate is reset at specified regular intervals, normally 3 months, 6 months, or one year. The coupon comprises a money market rate (e.g., the London Interbank Offered Rate for 6-month deposits, or LIBOR) plus a margin, which reflects the creditworthiness of the issuer. FRNs usually carry a prepayment option for the issuer. Issuers like FRNs because they combine the lower pricing of a bank loan and larger maturities than the straight bond market. Investors are attracted to FRNs because the periodic resetting of the coupon offers the strongest protection of capital.

Example XII.5: FRNs ("floaters").
In January 2004, The United Mexican States (UMS) issued a USD Eurobond, with the following terms:

Amount:                        USD 1,000 million.
Maturity:                      January 2009 (5 years).
Issue price:                   99.965
Coupon:                        6-mo LIBOR + 70 bp payable quarterly.

At the time the notes were offered, 6-mo LIBOR was 3.64 percent. So for the first three months Christiania Bank paid an interest at an annual rate of
        3.64% + .70% = 4.64%.

Afterward, at the end of each six-month period the interest rates on the bonds are updated to reflect the current 6-mo LIBOR rate for dollars. ¶


• Perpetual FRNs: They are FRNs but have no maturity date. Issuers have a call option to prepay investors. Perpetual FRNs usually have investors put options or options to exchange the undated bonds for bonds with finite maturity. Perpetual FRNs have subordinated status and in some cases junior subordinated status, so they can rank close to equity. As a quasi-equity instrument, they qualify as capital, and for the purposes of capital adequacy, are treated as equity.

• Convertible bonds: A convertible bond is a bond that can usually be exchanged or converted at the

option of the holder into other assets at a fixed conversion rate set at time of launch. Convertible bonds are usually launched in conditions of poor fixed-rate bond markets, high interest rates and an expectation of falling rates. Issuers benefit from (1) the lower funding costs relative to short-term money markets and (2) the possibility of no repaying the principal if the conversion right is exercised. Investors benefit because they receive the benefit of regular coupon payments plus the option of locking in to a better yield later.

Example XII.7: Convertible bonds ("convertibles").
In March 2000, the Swiss company Roche Holdings issued convertible bonds ("Sumo bond") with the following terms:

| | |
|---|---|
| Amount: | JPY 104,600,000,000. |
| Maturity: | March 2005 (5 years). |
| Coupon: | 0.25% payable annually. |
| Issue Price: | 96.4% |
| Conversion structure: | Each bond of JPY 1,410,000 par value is exchangeable for one non-voting equity security of Roche Holding Ltd at an exchange ratio of 1.03292. |
| Conversion period: | At any time after the first interest payment. |

That is, if the conversion right is exercised each USD 10,000 bond would buy 597.13 ADRs. ¶


Example XII.8: Convertible bonds into other bond.
In May 1983, CEPME issued Eurobonds with the following terms:

| | |
|---|---|
| Amount: | GBP 35 million. |
| Maturity: | May 1995 (12 years). |
| Denominations: | GBP 1,000 |
| Coupon: | 11.25% payable annually. |
| Conversion structure: | Each bond is convertible at the bondholder's option into a USD 12-year FRN paying semiannual dollar interest equal to six-month LIBOR. |
| Conversion exchange rate: | 1.55 USD/GBP |
| Conversion period: | At any time after the first interest payment. |

That is, if the conversion right is exercised each bond would buy a USD 1550 12-year FRN. ¶


• Bonds with warrants: Bonds with warrants resemble convertibles except that the warrant can be traded separately. The proceeds from the warrants are applied to the reduction of the cost of the host bond. Bonds can have equity warrants, bond warrants, or commodity warrants attached. Bonds with equity warrants differ from convertible bonds in one other aspect: when the warrants are exercised new money is normally used to subscribe for the shares, and the total capitalization of the borrower increases. This is unlike the conversion of a convertible bond, which merely shifts debt capital into equity capital. The equity warrant is effectively a call option on the underlying stock. Therefore, pricing a warrant relies on (1) variations of the Black-Scholes formula, and (2) a market view based on supply and demand.

Example XII.9: Bonds with equity warrants.

In May 1990, Cannon issued Euro-USD bonds with equity warrants attached. The terms of the issue are as follows:

| | |
|---|---|
| Amount: | USD 370 million. |
| Maturity: | May 31, 1995 (5 years). |
| Denominations: | USD 5,000 |
| Coupon: | 4% |
| Number of warrants: | 74,000 |
| Warrants per bond: | 1 |
| Shares per warrant: | 468.06 |
| Exercise price: | JPY 1487 |
| Conversion exchange rate: | 139.2 JPY/USD |
| Exercise period: | At any time after the first interest payment, ending one week before the maturity of the bond. |

Almost all Japanese Euro-USD bonds with equity warrant attached (USD Eurowarrants) have similar terms to the Cannon's issue. ¶

Eurowarrants dominated Japanese new issue financing during the Japanese bull market of the late 1980s. *Japanese warrants*, as they were called, were issued in USD, DEM, CHF, FRF, NLG, GBP, ECU, and JPY. Almost all Japanese warrants have been issued outside Japan, and as such are principally traded OTC in various European centers.


• Dual-currency bonds: Dual-currency bonds are bonds that are purchased in terms of one currency but pay coupons or repay principal at maturity in terms of a second currency. Japanese firms have frequently issued CHF-denominated bonds convertible into common shares of a Japanese company. A foreign investor can benefit from purchasing this bond in any one of three situations:
(1) A drop in the market interest rate on CHF bonds (as on any straight CHF bond).
(2) A rise in the price of the company's stock (because the bonds are convertible into stocks).
(3) A rise in the JPY relative to the CHF (because the bond is convertible into a JPY asset).

Dual currency bonds represent a combination of an ordinary bond combined with one or more forward contracts.

Example XII.10: *Dual-currency* bonds.
In July 1985, Swiss Bank Soditic led the issue of a dual currency bond for First City Financial. Each bond could be purchased for its full face value of CHF 5000. Interest on these bonds is paid on CHF. At maturity, at the end of ten years, the bond principal will be repaid in the amount of USD 2,800.

At the time of the issue, this bond could be view as the combination of (a) an ordinary ten-year CHF bond that would repay principal in the amount of CHF 5000, plus (b) a ten-year forward contract to buy USD 2800 at 1.7857 CHF/USD (=CHF 5000/USD 2800). ¶


Exhibit XII.1 presents the advertisement of a bond issued in 1986 by NKK. This bond is a dual currency bond.

**Exhibit XII.1**
Eurobond Tombstone

*These securities have been sold outside the United States of America and Japan. This announcement appears as a matter of record only.*

<u>NEW ISSUE</u>                                                                                                17th April, 2010

# *NTK*

## *Nakatomi Tsushin Koygo*

**1 per cent. Dual Currency
Yen/British Pound Bonds Due 2020**

**Issue Price: 100 per cent. of the Issue Amount**

| | |
|---|---|
| Issue Amount: | JPY 30,000,000,000 |
| Redemption Amount at Maturity: | GBP 120,000,000 |

**Nomura International Limited**          **Mitsubishi Trust & Banking Corporation**
**CFS International**                      **Yamaichi International (Europe) Limited**

**Bankers Trust International Limited**               **Crédit Lyonnais**
**Credit Suisse First Boston Limited**      **Dresdner Bank Aktiengesellschaft**
**EBC Amro Bank Limited**                   **Fuji International Finance Limited**
**Housemann Bank International**            **Banca Nazionale del Laboro**
**Lloyds Mercant Bank Limited**                   **Morgan Guaranty Ltd**
**Morgan Stanley International**                    **Bertoni Bank Limited**
**Banco Santander Central Hispano**    **Union Bank of Switzerland (Securities)**
**S.G. Warburg & Co. Ltd.**

There are several points worth noticing:

i.      The underwriting syndicate is made up of banks from numerous countries (Japan, the U.S., Germany, Italy, Spain, and Switzerland).

ii.     U.S. commercial banks (Morgan Guaranty, Bertoni Bank) participate, as well as U.S. investment banks (Morgan Stanley, CFS). Note, however, that the British subsidiaries of the U.S. banks are involved and not U.S. head companies (note the word *limited* after the name of the bank).

iii.    This is dual-currency bond: it is issued in JPY (30 billion) with interest coupons fixed in yen (8%), but its principal repayment is fixed in GBP (120 million).

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♦ **Applied Corner: Currency crises close markets**

The 1997 Asian currency crisis had as one of the main casualties, the Asian convertible bond market. For example, in the November 1997 issue of Euromoney a trader says: "we are even marking down the convertible Eurobond for Kepco, the South Korean electricity utility, as a sell which I never imagined we would have to do." Asian's equity prices have fallen so far that, according to a Salomon Brothers trader, most existing convertibles are trading as straight bonds because the equity conversion element has become effectively valueless.

"The hardest hit convertibles have been those that have had redemption to a fixed amount of local currency," said a vice-president of Merrill Lynch in Euromoney.

So great was the effect of the crisis that the new issue sector in Asia virtually grounded to halt. At least USD 2 billion worth of convertibles for Korean companies were delayed until early 1998. **Source**: Euromoney, November 1997. ♦

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## II. Eurobond Markets

### 2.A    Historical development of the Eurobond Market

The growth of the Eurobond market was extraordinary. Shortly after the introduction of the Interest Equalization Tax, in June 1963, the first offshore bond issue denominated in U.S. dollars was launched. In the same year a total of USD 145 million in new Eurobond issues was raised, and by 1968 the volume had risen to USD 3 billion.

On the strength of its early success, the Eurobond market quickly established itself:

i.      It had a *marketplace* in London.

ii.     The U.K. authorities allowed the market to develop without regulations or restrictions. London became, and remains today, the principal center for new issues and the trading of USD denominated Eurobonds.

iii.    The speed and simplicity of issuing in the Eurobond market compared favorably with the principal foreign bond market, the U.S. Yankee market.

iv.     The establishment in 1969 of the Association of International Bond Dealers (AIBD) provided a forum for improving the design of the market.

v.      The early establishment of a clearing system, Euroclear and Cedel in 1969 and 1970,

respectively, resolved the problem of delivery and custody.

The repeal of all the U.S. regulation did not slow the growth of the U.S. dollar Eurobond market. When the IET was abolished in 1974, the share of the U.S. foreign bond market increased but not substantially. Later, in 1984, the U.S. government, to make its domestic bond market more competitive, abolished the withholding tax imposed on foreign lenders. Many people thought that this change in the U.S. tax code would result in the absorption of the Eurodollar bond market into the U.S. foreign bond market. The Eurodollar bond market continued to grow. International issuers were tired of the delays and costs of registering new issues with the S.E.C. The Eurobond market, because of its lack of government regulation, continues to be the dominant international bond market.

The abolition of the U.S. withholding tax triggered, however, similar fiscal liberalization in European countries and was followed by the dismantling of exchange controls regulating access of domestic investors to foreign securities markets. Eurobond issuing houses quickly identified the potential and established new markets of onshore investors to the benefit of international issuers. The definition of the Eurobond market is thus no longer an issue. From having been a market for anonymous offshore investors, the target audience is only limited by the creative nature of the issuing houses.

2.B     Characteristics of Eurobonds

The first Euromarket was the market for short-term USD deposits and USD loans. This market is called the Eurodollar market, which is a segment of the Eurocurrency market. The Eurocurrency market rapidly became a broader market, including different currencies. The Eurocurrency market for short-term deposits (Eurodeposits) rapidly became a reference market for domestic market-makers. For example, several domestic instruments started to be priced taking the interest rate on Eurodeposits as the relevant discount rate.

The Eurocurrency market is a money market for short-term funds. Most of the assets and liabilities are of less than one year's maturity. For medium or long-term funds the main market is the Eurobond Market.

A Eurobond is an international debt security and its structure is similar to the standard debt security used in domestic bond markets. The basic characteristics are listed below:

i.      a Eurobond is a debt contract between a borrower and an investor, which records the borrower's obligation to pay interest and the principal amount of the bond on specified dates.
ii.     a Eurobond is transferable.
iii.    a Eurobond is intended to be tradeable.
iv.     a Eurobond is a medium- to long-term debt security.
v.      a Eurobond is generally launched through a public offering and listed on a stock exchange.

It is a fundamental, and for all practical purposes essential, requirement of a Eurobond that it be transferable; and its transfer should be simple. Transferability can be achieved by a number of techniques, but two particular methods are generally used. These two methods are represented by the

*bearer* bond, where the issuer promises to pay the bearer of the physical instrument, and the *registered* bond, where the promise is that payment will be made to the person whose name appears on the register as the holder of the bond. Since payment on a bearer bond is due to the physical holder of the bond, the right to receive that payment can be transferred by physical delivery of the bond itself by one person to another. In addition, bearer bonds are not only transferable, but usually also negotiable. Given these features, the majority of Eurobonds are bearer bonds. Bearer bonds have a long history in European financing. Bearer bonds are an invention of European Jewish traders, more than three hundred years ago, whose property was always under threat and who might be forced to move at short notice. The emergence of reliable impersonal securities was one of the many financial innovations designed by the European Jewish traders and bankers during the early modern period.

Each Eurobond is subject to the terms and conditions, which make up its structure. A typical structure comprises some twenty such terms and conditions which recur in most issues. Some of these, such as covenants, are adapted in each issue to reflect the conditions in the bonds markets, the circumstances of the borrower, and the particular financing which is the subject of the issue. Other provisions, such as bearer form, payments of interest free of withholding tax, remain unchanged and are considered as "market practice." The full terms and conditions of an issue are printed on the actual bond, which has three components:

i.      The face. Sets out the name of the borrower, short detail on maturity, the interest-rate coupon (or in the case of FRN, the interest base and margin), and the formal promise to pay interest and principal.
ii.     The reverse. Sets out (1) the terms and conditions of the issue and (2) the details of the banks responsible for payments of interest and principal.
iii.    The coupons. They are a series of detachable coupons, which are presented on interest payment dates as evidence of entitlement to payment. These are identical in all respects except the date of payment.

An attractive characteristic of Eurobond markets for issuers is the fact that the Eurobond and foreign bond markets seem to be segmented markets. For example, issues by frequent international borrowers in the U.S. foreign market have tended to trade at significant higher yields than their corresponding issues in Eurobond markets. The World Bank, for example, has issued extensively in the U.S. foreign bond market and in the Euromarkets where issues of similar maturity have yielded 10 to 20 basis points less. The usual explanation for this differential is the absence of any requirement of registered form in the Eurobond market where issuers are able to take advantage of the desire for anonymity of investors.

The formal characteristics of Eurobonds make clear that Eurobonds are no different from domestic or foreign bonds. As pointed out in the introduction the structure of the underwriting syndicate is one of the main differences between other bonds and Eurobonds. Now, we turn our attention to this point.

♦ **Eurobonds: The stuff that movies are made of**
The bearer characteristic of Eurobonds makes them very attractive to movie criminals. In *Die Hard*, Hans Gruger (Alan Rickman) was after USD 600 million Eurobonds that Mr. Nakatomi (a

sophisticated investor) was holding. At the beginning of *Beverly Hills Cop*, Axel Foley's (Eddie Murphy) friend is murdered while in possession of (stolen) DEM Eurobonds. In *Mission Impossible* Jim Phelps (Jon Voight), after selling a list of Western agents, is paid in Eurobonds. ♦

2.B.1   Issue Procedures in the Eurobond Market

The International Primary Market Association (IPMA) was established in 1984 as a voluntary organization of some 50 firms to promote standards in the primary market in Eurobonds in documentation, information disclosure, and syndication practice. Ninety percent of issues now conform to the standards of the association, which are set out in a list of "Recommendations."

2.B.1.i          Organization of a Traditional Eurobond Syndicate

Eurobonds are issued and sold through underwriting syndicates. Participants in these syndicates are investment banks, merchant banks, and the merchant banking subsidiaries of commercial banks.

A potential borrower -a company, a bank, an international organization, or a government- receives unsolicited proposals. These proposals keep the potential borrower in touch with market opportunities and pricing and, when the borrower, or *issuer*, asks for new issue proposals, help to ensure competitive bidding. Each house offers some niche of expertise in placement or in derivative products, which together bring the issuer a broad understanding of the marketplace. Borrowers look to issuing houses which demonstrate commitment and competence in the analysis of their borrowing requirement in the submission of timely, cost attractive, and marketable proposals.

Based on the proposals, the borrower selects an investment bank and invites it to become the *lead manager* of a Eurobond issue on the borrower's behalf. The major contribution of the lead manager, or *issuing house*, lies in its expertise with respect to the presentation of a first-time issuer, the selection of a syndicate, the decision of a timely launch, the support of the issue in the aftermarket, and the maintenance of an effective secondary market.

After being selected by the issuer, the lead manager invites a small additional group of banks to assist it in negotiating terms with the borrower, in assessing the market, and in organizing and managing the new issue. These additional banks are called the *co-managers*. The co-managers and the lead manager become the *managing group*. The lead-manager in selecting banks to make up a management group has two priorities: (1) sharing the risk of the issue and (2) helping to place it. In practice, the lead-manager consults with the potential co-managers on pricing prior to submission of a proposal, and, in doing so, will measure their interest in the issue. The co-managers, however, give no commitment and in the event of bad market conditions -i.e., adverse changes in interest rates- may decline the invitation. In addition, two other categories of banks -*underwriters* and the selling group- will be invited to participate in bringing the bonds to market. In general, proposals include recommendations for a syndicate of underwriters who enhance the placement.

The borrower sells the bonds to the managing group. In turn, the managing group sells the bonds either directly to both the underwriters and the selling group or else sells the bonds to the

underwriters, who in turn sell the bonds to the selling group. Members of the selling group sell to final investors. Underwriters differ from pure sellers in that underwriters commit themselves ahead of time to buy the bonds at a set minimum price from the managers even if the bonds cannot be resold to sellers or end investors for a price greater than this pre-agreed minimum. Roles in a Eurobond syndicate are nested: Managers are also underwriters and sellers, and underwriters are usually also sellers.

The *principal paying agent* in a Eurobond issue is the bank that has the responsibility for receiving interest and principal payments from the borrower and disbursing them to end investors. When a *fiscal agent* is used in a new issue, the fiscal agent and the principal agent are the same. A fiscal agent is a bank appointed to act on behalf of the borrower, one that takes care of the mechanics of bond authentication and distribution to investors as well as acting as principal agent. An alternative to a fiscal agent is a *trustee*. A trustee acts as the representative of all bondholders in any legal action stemming from bond covenant defaults. If a trustee is used for a new Eurobond issue, then a separate paying agent will be appointed to act on behalf of the bond issuer.

Exhibit XII.2 presents a summary of the role players in a new Eurobond issue.

**Exhibit XII.2**
Role players in a new Eurobond issue
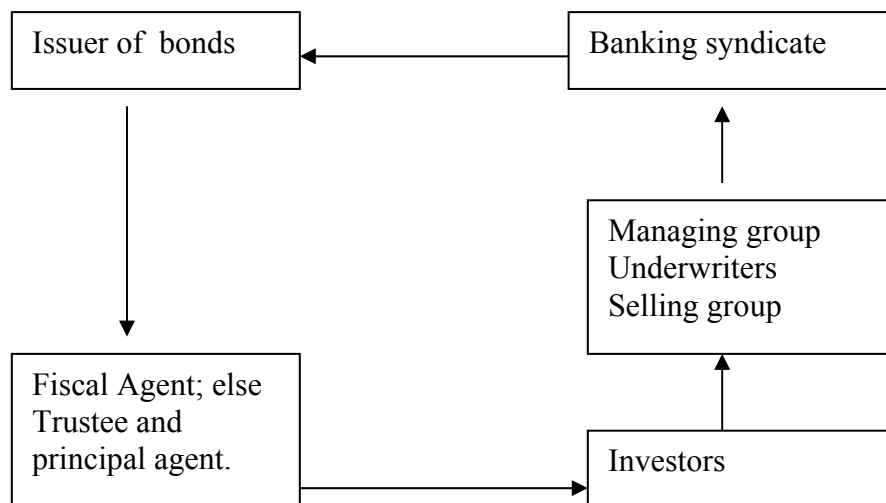


2.B.1.ii          Selecting a Lead Manager

Competitive pressures and poor profitability have contributed to highly variable degrees of professionalism in the preparation of new issues and maintenance of a secondary market. While proposals show good, creative thinking, actual issues commonly suffer from incorrect pricing, wrong timing, and inadequate aftermarket support. The selection of a professional issuing house to lead-manage the issues is a critical decision for the borrower. This decision has important implications (other things being equal) for the placement of the issue.

For major issuers the choice is restricted by the prior selection of intermediaries with whom they maintain relationships. Other borrowers make clear their willingness to hear proposals from any house. Some frequent issuers select a lead manager based on only one criterion: lowest cost of funds. Mandates, however, are not normally awarded on cost alone and potential issuers look for assurances with regard to other criteria, including:

(1) Coordination of the syndicate: the lead managers discuss arrangements for the proper and coordinated placement of the issue on the terms proposed.
(2) Capital commitment of the lead manager: the ability to submit a fully underwritten offer and assurance to support the issue in the case of adverse yield movements.
(3) Effective market making: the ability of the lead manager to promote liquidity for the issue.
(4) Ability to deliver a wide range of derivative products which may enter into the structure of the issue.
(5) Market standing: the ability of a lead manager to demonstrate good relationships with other market participants.

The ability to offer derivative products linked to the Eurobond issue is in several cases crucial to the issue. A Eurobond issue is often raised in a currency, which is foreign to the issuer, yet the end currency requirement is generally for funds denominated in its domestic currency. A Eurobond issue in foreign currency must present a cost or other advantages in relation to a domestic financing arrangement or a Eurobond issue denominated in the domestic currency. A foreign currency Eurobond issue creates currency risk unless the issuer is able to service the debt out of revenues in the same currency. Lead-managers, in their proposals, will package the foreign Eurobond issue with a hedging instrument, usually a currency swap. The borrower will compare the all-in cost (including the cost of the hedging instrument) of the foreign Eurobond issue to the cost of the domestic issue or a Eurobond issue in the borrower's home currency.

> ♦ **Eurobonds: Flexible features might dominate cost**
> The advantage of a foreign currency Eurobond issue may not always be one of cost. An issue may be preferred in terms of longer maturities, early call options, issue sizes, etc. Recall that Eurobond markets are not regulated and can offer more flexibility. ♦

Table XII.B identifies the top lead managers of Eurobond issues for 1998.

### TABLE XII.B
### Top Lead Managers of International Issues (all currencies) Issues (2015)

| Firm | Issues | Amount (USD bn) | Percentage |
|------|--------|-----------------|------------|
| JP Morgan | 1368 | 343.19 | 8.69 |
| Citi | 1183 | 314.44 | 7.96 |
| BofA Merrill Lynch | 1098 | 308.20 | 7.80 |
| Barclays | 1002 | 284.57 | 7.20 |

| Deutsche Bank | 973 | 229.95 | 5.82 |
|---|---|---|---|
| Total | 15,742 | 3,949.252 | |

Source: IFR New Issue League Tables

This list has changed significantly during the past ten year. Japanese investment banks, like Nomura Securities, Daiwa Securities, Yamaichi, and Nikko Securities were at the top of the list. The severe recession that the Japanese, suffered during the 1990s, reduced the role of those banks.


2.B.1.iii                      Fee Structure for new Eurobond Issues

Fees are extracted by discounts on the prices at which bonds are provided to syndicate members.

Example XII.11: A French company issues USD 1,000 bonds at 100 (i.e., 100% of face value, or "par"). The managing group agreed to pay the borrower USD 975 for each USD 1,000 bond. The USD 25 discount (2.5%) is the *flotation cost* or *investment banking spread* of 2.5%. ¶

Syndicate members really receive the full flotation cost (in the above example, USD 25 per bond) if the bonds are actually sold to retail at the issue price (in the above example, USD 1,000). This might not happen. Once the bonds are in the hands of the underwriters or seller (after the signing of the final terms), there is no enforceable contract to make them sell the bonds in the market at the issue price or better. Therefore, any or the entire fee may be passed along to the buyer of a bond, depending on the price the bank charges.

In the U.S. domestic market, by contrast, underwriters are obligated to maintain the market price of the bonds at a level equal to the issue price or higher until the bond syndicate is disbanded. This obligation is enforceable because domestic bonds are registered and hence the identity of parties making particular transaction can be traced.

Also, by contrast to the U.S. domestic market, there is considerable price discrimination in sales to final investors. Institutions with "buying power" -such as insurance companies and banks- get considerable discounts.

A typical structure of fees for a Eurobond issue, with a two percent total investment banking spread, can be structure in the following way::

Lead manager pays borrower USD 980 per USD 1,000 bond.
Lead manager makes bonds available to underwriters at USD 985.
Lead manager makes bonds available to sellers at USD 990.

That is,

USD 1,000 - USD 980 = USD 20        "Flotation cost" or "spread"
USD 1,000 - USD 990 = USD 10        "Selling concession"
USD 990 - USD 985 = USD 5           "Underwriting allowance"

USD 985 - USD 980 = USD 5          "Management fee"

An underwriter is a privileged seller who gets bonds at a lower price than an ordinary member of the selling group. Underwriters who are also sellers get both and underwriting allowance and a selling concession, and managers who are also underwriters and sellers get all three fees.
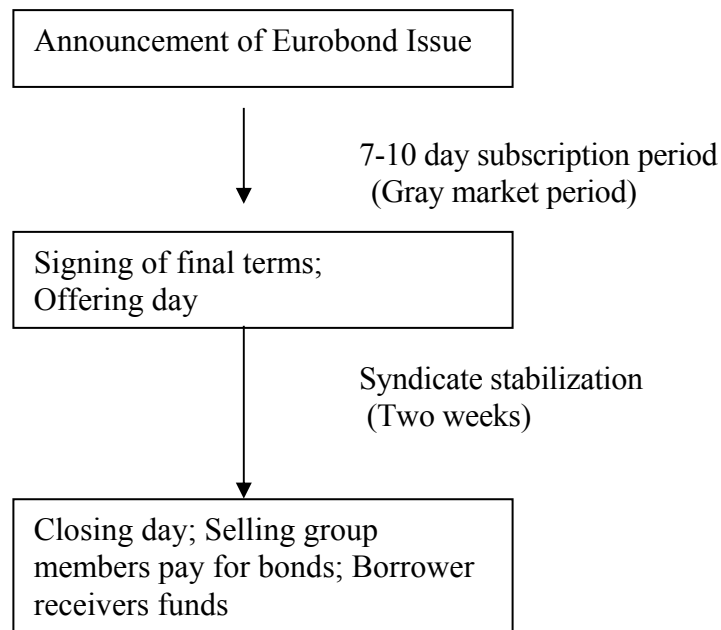
For USD Eurobond, 2% is the typical notional spread, before discounting, for issues ten years or longer. Shorter maturities have smaller spreads. Typical spreads for some of the foreign bond markets are these: USD foreign bonds, .5 to 1%; JPY foreign bonds and DEM foreign bonds, 2 to 2.5%; NLG foreign bonds, 2.5%; and CHF foreign bonds, 2.5 to 3%.

2.B.1.iv          Traditional Time Schedule for a New Offering

Unlike national markets, the Eurobond market has neither registration formalities nor *waiting queues*. A new issue may be place within three weeks. A typical timetable is shown in Exhibit XII.3.

Exhibit XII.3
Traditional Timetable of New Eurobond Offering

```
┌─────────────────────────────────────────┐
│ Announcement of Eurobond Issue          │
└─────────────────────────────────────────┘
                │
                │    7-10 day subscription period
                ▼         (Gray market period)
┌─────────────────────────────────────────┐
│ Signing of final terms;                 │
│ Offering day                            │
└─────────────────────────────────────────┘
                │
                │    Syndicate stabilization
                ▼         (Two weeks)
┌─────────────────────────────────────────┐
│ Closing day; Selling group              │
│ members pay for bonds; Borrower         │
│ receivers funds                         │
└─────────────────────────────────────────┘
```

Usually, two weeks before the announcement day, the lead manager and the borrower will meet for preliminary discussions. They will discuss terms (coupon, amount, offering price) of the bond issue. Except in the case of a *bought deal*, these terms will remain provisional until the formal offering day. A fiscal agent or trustee and principal paying agent will be selected, and if the issue is to be listed on a stock exchange (usually Luxembourg or London), a listing agent as well. The prospectus will describe the borrower and its history. For a corporate borrower, audited financial statements will be

included in the prospectus, while for a government borrower there will be relevant GNP and central bank data.

On the announcement day, there will be a press release announcing the new issue, and invitation faxes will be sent out inviting other banks to participate in the syndicate. Potential participants will have a week to ten days to respond (the offering period or subscription period). If the borrower is not well known, the borrower may at this point begin a tour, or "road show," in major financial centers.

The lead manager, meanwhile, will keep a *syndicate book* in which a record of the total demand for the bond issue is recorded. As interest in the bond issue is expressed, the lead manager will begin to make preliminary allotments of bonds among syndicate members, while waiting to receive signed underwriting and selling group agreements.

At the end of the subscription period, final bond pricing terms are decided upon between the managing banks and the borrower. Then, underwriters have a day within which to accept or reject these terms, assuming they have the right of prior approval. Finally, the bonds are formally offered (the offering day) when the borrower and managing banks sign a subscription agreement setting out the final terms of the bond issue. At this point the syndicate has in effect purchased the bonds from the borrower at an agreed price.

The lead manager may either over- or underallocate the number of available bonds. Sellers then have a number of days, after which they must notify managers whether their allotments are sold. In the meantime, the bonds are bought and sold over the counter, though no money (or bonds) yet changes hands.

At the end of the stabilization period (closing day), syndicate members pay for the bonds they have purchased by depositing money into a bank account opened by the lead manager. Final investors at this point receive book-entry credit for the bonds they have purchased. A tombstone, or advertisement (see Exhibit 1), of the bond will later be published in a financial newspaper or journal.

The individual bearer bonds can usually be picked up from an office of the paying agent after ninety days have passed. In the meantime, there is a global bond, a temporary debt certificate representing the entire bond issue.


2.B.1.v      Gray Market

Suppose a seller knows she will receive an allocation of bonds from the lead manager and knows that she will get a 1.75% discount. If the trader could sell immediately the bonds for 1.50%, the trader would lock a .25% profit, without facing any interest rate risks.

The bonds themselves are not yet in formal existence. There is nothing, however, to prevent a forward market from emerging in which people make contractual commitment to trade theses bonds at agreed price once the bonds officially exist. Such a market in Eurobond new issues emerged around 1977. It is referred as the *gray market* or premarket. Bonds are traded in the gray market at a percentage discount on the future (yet-unknown) issue price.

Example XII.12: A price of "less 1" would mean a price of 98.75 if the bonds are issued at 99.75. A USD 1,000 bond would then be exchanged between the two parties for 98.75% of its face value, or USD 987.50. ¶

Deals on the gray market are said to be on an "if as, and when issued" basis. That is, the deals will stand if there are only minor changes (if any) to the terms of the issue or its launch (i.e., the settlement date). The deals, however, will be voided if the issue is withdrawn or pulled by the issuer or canceled by the issuing house after invoking the force majeure clause.

The pricing of new Eurobonds issued according to the traditional timetable is, in fact, heavily influenced by gray market prices. The gray market price represents the price at which potential demand is brought into equilibrium with potential supply.

2.B.1.vi          Stabilization

Stabilization refers to the efforts made by the lead manager to influence the market price of a bond during the time between the offering day and the closing day. The ability of a lead manager to stand by the issue is an important element considered by the issuer. Stabilization is very important for issues aimed at retail investors, as distribution takes a long time, and price stability is needed to attract investors. The lead manager will put together a small group from the syndicate who will stand ready to buy up bonds to support their price if necessary. The rule of thumb followed is that the price of the bond in the market will not be allowed to fall below the amount of the selling concession (which is usually about 1.5% of the issue price of the bond). The price at which the managing group bids for bonds is referred to as the "syndicate bid."

Example XII.13: Suppose interest rates rise over the course of the selling period and, therefore, the price of a USD 1,000 bond falls to USD 980, the lead manager will buy bonds in the market at USD 985. ¶

2.B.1.vii          Variations on Issuing Procedure

A number of variations in the traditional procedure for making new Eurobond issues exist. These variations respond to competitive pressures and interest rate risk.

The *bought deal* is the primary example, as it has become the new standard for Eurobond issues. In the bought deal, the lead manager buys the entire bond issue from the borrower at set terms -amount, coupon, issue price- prior to its announcement. Preset prices arise because of competition between individual investment banks to win mandates. They compete by quoting the borrower a package deal up front. The issuing house assumes the full underwriting risk. This risk is rapidly syndicated among co-managers. The magnitude of the risk and the relative capital commitment make the bought deal market a limited market. Less than 30 major international issuing houses have the resources to compete in this market.

Example XII.14: In April 1980, CSFB bought an entire USD 100 million issue overnight from General

Motors Acceptance Corporations. Only afterward CSFB arranged syndication. ¶

The bought deal is very popular with borrowers for two reasons: (1) the total time it takes to bring the issue to market is shortened and (2) it removes the risk of price changes before launching the issue -for example, during the gray market period.

Some investment bankers use the bought deal to take advantage of *windows* -a "window" represents a drop in interest rates (or an increase in bond demand) that is perceived to be of short duration. Given these expectations, an investment banker might view the shorter time as implying an overall lower risk in terms of rising interest rates. Note that adverse movement in interest rates (for example, an increase in interest rates) will cause a substantial loss to the buyer of the issue.

A different approach is the *auction issue* (*tender system*), in which the borrower announces the maturity and the coupon rate of a new bond issue and invites investors to submit bids. International investors submit bid price as a percentage of par (for example 98.9), along with a statement of the amount they are willing to take at this price. The borrower then sells the bonds, starting with the highest bidder and working down until all bonds have been allotted. The auction system eliminates management fees and the costs of syndication. Auction systems are very popular domestically. U.S. government securities are sold through an auction system.

Example XII.15: The Peruvian Central Bank announces an issue of 100,000 USD 1,000 Treasury Bills with a maturity of 1 year. The highest bid of 95.3 percent totaling USD 30,000,000 receives full allocation (that is, 30,000 T-bills). The second highest bid of 95.1 percent totaling USD 40,000,000 receives full allocation (40,000 T-bills). The third highest bid of 95.0 totaling USD 60,000,000 receives 50% of the amount applied for (30,000 T-bills). Therefore, all offers above 95.0 are accepted. ¶

Under a *fixed price reoffer* (FPRO), the lead manager (book runner) and co-managers sign a contract legally obligating them not to discount fees through selling concessions. They are thus virtually guaranteed a *marginal* return on each bond sold, since institutional buyers are not able to buy bonds at a discount to the issue price.

It is equivalent to the way bonds are underwritten in the U.S. domestic market. The FRPO was introduced by Morgan Stanley International in a Eurobond issue for the World Bank in 1989, as a reaction to the low returns being realized on new Eurobonds issues.

More than 20% of new Eurobonds were issued under FPRO terms in the first three quarters of 1990. Typical spreads in an FPRO are (5/16) to (3/8) percent instead of 2 percent.

Example XII.16: On September 21, 1994, the *Financial Times* published the following list of new International Bond Issues.

| | NEW INTERNATIONAL BOND ISSUES | | | | | | |
|---|---|---|---|---|---|---|---|
| **Borrower** | **Amount m.** | **Coupon %** | **Price** | **Maturity** | **Fees %** | **Spread bp** | **Book runner** |
| **US DOLLARS** | | | | | | | |
| World Bank | 1.5bn | 7.125# | 99.471R | Sep.1999 | 0.25R | +9(6¼%-99) | Lehman Bros./UBS |
| HACCMT I, Class A(a,s)☐ | 870 | (a1) | (a1) | Dec.1999 | - | - | Goldman Sachs & Co |
| Yasuda Trust Asia Pac.(b)+ | 100 | (b1) | 102.00 | Sep.2004 | 2.00 | - | Nomura International |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bc. de la Prov. de Cordoba | 60 | 11.00# | 99.70R | Sep.1996 | 1.875R | -475(6½%-96) | Yamaichi Intl (Euro.) |
| Banco Fibra | 50 | 10.50# | 97.04R | Sep.1997 | 1.00R | +497(6%-97) | ING Bank |

**YEN**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Daiwa Intl.Fin.(Cay)(c,s)□ | 15.5bn | (c1) | 100.00 | Jan.2005 | undiscl. | - | Nomura International |

**STERLING**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Halifax Building Society | 250 | 8.75 | 99.34R | Oct.1997 | 0.20R | +30(8¾%-97) | SG Warburg Secs. |
| Leeds Permanent B/S+ | 100 | (d) | 100.00 | Oct.1999 | unidscl. | - | HSBC Markets |

**ITALIAN LIRE**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Republic of Argentina | 300bn | 13.45 | 99.125R | Oct.1997 | 0.50R | +185(8½%-97) | Carpio |

Final terms and non-callable unless stated. The yield spread (over relevant government bond) at launch is supplied by the lead manager. □Unlisted. + Floating rate note. #Semi-annual coupon. R: fixed re-offer price; fees are shown at the re-offer level. a) Household Affinity Credit Card Master Trust. Expected maturity: 15/12/97. Expected average life: 3 yrs. Monthly coupons. a1)Priced later at 35-37 over 3 yr Treasuries. b) Amortises after 3 yrs at rate linked to Libor index. b1) 3-mth Libor+¾%, max 10%. c) Callable on 6/1/00 at par. c1) 5% to 6/1/00 and 5½% thereafter. d) 3-mth Libor+½%. s Short 1st coupon.

## 2.B.2   U.S. Legal Aspects of Eurodollar Bond Issues

The U.S. Securities Act of 1933, called the Glass-Steagall Act, presents a set of regulations designed to protect domestic investors. The act requires that all public issues of securities be registered with the Securities and Exchange Commission (SEC). In general, any bond not registered with the SEC cannot be sold to U.S. citizens at the time of the issue. Bonds issued in foreign markets and Eurobonds do not meet this requirement, but Yankee bonds do. All other bonds cannot be purchased by U.S. citizens at the time of issue; they may only be purchased after they are seasoned (usually, three months, but sometimes a longer period such as nine months).

U.S. authorities make no special attempt to control the issuing of dollar-denominated Eurobonds by foreigners. There are, however, a number of U.S. regulations that affect the management and sale of dollar Eurobonds. The (outdated) Glass-Steagall prohibits U.S. commercial banks from underwriting securities. Thus, among U.S. firms only investment banks, or merchant banking subsidiaries of U.S. commercial banks, get involved in dollar Eurobond issues.

U.S. banks can participate in Eurobond issuing syndicates only if they institute a procedure guaranteeing that U.S. investors cannot purchase the bonds, which is difficult, given the usual bearer form of Eurobonds.

If a Eurobond offering is structured to fall under the "private placement" exemption of the Securities Act of 1933, then it can be sold to U.S. residents -such as foreign branches of U.S. banks- at the time of issue, even though the bonds are not registered with the SEC. This exemption applies when the purchasers of the bonds have the following features:

i.-     They are limited in number.
ii.-    They are "sophisticated."
iii.-   They are able to bear the loss if the bond issuer defaults.

iv.-    They purchase bonds as principals (i.e., not for resale).

v.-    They have access to information similar to that which would be contained in a registered offering prospectus.

In 1984, the U.S. government implemented a series of changes to allow U.S. bonds to be more competitive in the world bond market. Now, there is no U.S. withholding tax on payments to foreigners who hold U.S. government or corporate bonds. In addition, U.S. corporations are allowed to issue bearer bonds directly to non-U.S. residents.

These new changes have reduced significantly the distinction between domestic bonds in the U.S. and Eurodollar bonds issued by U.S. nationals.


2.B.3   Eurobond secondary market

Public Eurobond issues are listed on one or more stock exchanges. The principal exchanges for issues in USD, CAD, ECUs, and AUD are the Luxembourg Stock Exchange and the London Stock Exchange. Issues denominated in European currencies tend to be listed on the home exchange; for example, issues in Dutch guilder are listed on the Amsterdam exchange. Although Eurobond issues are listed, there is no legal obligation on dealers to deal on the exchanges. From early on, dealers in Eurobonds dealt directly or over-the-counter, adopting the practice of money and foreign exchange markets.

In 1969, Eurobond dealers created an around the clock market among financial institutions across the world that formed the AIBD (Association of International Bond Dealers). The AIBD's original purpose was to create a framework of rules under which the fledging over-the-counter Eurobond marekt could function and to provide direction and stability to this rapidly changing market. In 1991, the AIBD was reorganized into the International Securities Market Association (ISMA) to recognize the fact that many AIBD members expanded into other securities. The ISMA, based in Zurich, is the self-regulatory industry body and trade association for the international securities market. The ISMA has some similarities to the U.S. National Association of Securities Dealers (NASD). All market-makers and dealers in Eurobonds are part of the ISMA. The ISMA requires its members to report the terms of their deals through a trade-matching and confirmation electronic system named TRAX. This is done to ensure price transparency in the market. TRAX handles 40,000 to 50,000 transactions per day, providing reliable traded prices on over 3,500 securities daily. Therefore, the ISMA in effect serves as an alternative stock exchange. It has no trading floor, nor does it specify formal listing requirements or issuer reporting requirements.

Table XII.C shows the geographical location of ISMA members.

TABLE XII.C
### Geographical Breakdown of ISMA Members

| Locality | Number of members |
|---|---|
| U.S. | 48 |
| Belgium | 33 |
| Far East | 33 |
| France/Spain | 52 |
| Germany/Austria | 57 |
| Italy | 26 |
| Luxembourg | 63 |
| Middle East | 33 |
| Netherlands | 47 |
| Scandinavia | 55 |
| Switzerland | 141 |
| U.K. | 219 |

Swiss banks are the largest investors, but because of a local stamp tax on all Swiss transactions, they often consummate their deals elsewhere. London is the main center for Eurobond trading.

A market-maker quotes a net price to a financial institution in the form of a bid and ask price. No commissions are charged. Market makers always take on a number of costs in providing liquidity services. These costs include (i) acquiring a non-optimal portfolio from a liquidity point of view, and (ii) the cost of running the dealing room and settlements system. Eurobonds market makers have an additional cost: being forced to trade with some investors who may have superior information (insider trading is quite possible in a Eurobond market that enjoys no direct protection from any regulatory body, like the Securities Exchange Commission). Bid-ask spreads on Eurobonds vary according to the liquidity of the traded Eurobond. Spreads vary between .125 percent on very liquid issues (and less on FRNs) to as much as .50 percent and more on small-size issues with little secondary trading.

Traders are constantly checking computer terminals to evaluate market conditions. The Reuters service is used universally and provides a very extensive range of information on markets in debt and equity securities, foreign exchange and money markets. Eurobonds are assigned individual codes and details of an issue can be accessed by entering the dedicated code. Eurobond prices are published on Reuters screens by market makers and serve as a guide to dealing prices at any moment. Other sources of information for traders are Telerate (Reuters main competitor, based in the U.S.), Datastream, and Bloomberg.

When a trade is made, settlement by exchange of bonds and cash takes place on the value date, in general, three business days later. The standard-size transaction is 100 bonds (with USD 1000 of face value). Quoted prices apply to standard-size transactions. Smaller transactions are negotiated at higher spread costs.

Two international securities clearing systems were developed in 1969 and 1970, respectively. Euroclear was the first, set up in Brussels by Morgan Guaranty Trust Company. One year later, Cedel was established in Luxembourg. Physical delivery of the bonds has become rare. The Eurobonds are held with depositories, in different countries, to the order of the clearing house. The accounting of the transaction is carried out in Brussels or Luxembourg. Both clearing houses provide financing as well as settlement functions. The ease of settlement has been further facilitated by the introduction of the ACE system, a joint project between the two clearing systems, to match and confirm several times each day trades involving members of both systems. The system abolishes a long-standing discrepancy in the delay between processing and the book entry of the security, which benefited Euroclear.

For many years, liquidity problems have plagued Eurobond markets. For certain issues, liquidity is still a big problem. This is not a problem of unreliable market making so much as primary distribution capability into established and liquid bond markets. The Eurobond market for many years was a market of primarily offshore investors, who tended not to trade actively. The ISMA has designed several mechanisms to increase the liquidity of the market. Issuers take liquidity considerations into account when new issues are launched. The bigger the size of the issue, the more liquid it will be in the secondary market. It is very rare to see a new issue of less than USD 50 million equivalent. On the other hand, new issues of more than USD 1 billion equivalent are common. Liquidity is provided by the market makers, but also by brokers acting between market makers and/or investors. In adverse conditions, market makers tend to stop providing bid-ask quotes. Instead, market makers can go defensive by not trading certain issues ("dropping") or going *basis only*. A basis only price is a reference price and a client cannot deal for sure on the price.

The volume of trading in Eurobond markets has grown rapidly. In 1979, total turnover was estimated to be USD 156 billion, while in 1990, total turnover was USD 6.5 trillion. While the aggregate turnover has grown at a strong pace in the period 1979-1990, turnover denominated in dollars weakened. By value, only 38% of 1990 turnover was denominated in USD, a sharp decrease from over 90% in 1979.

High volume of trading can generate substantial profits for dealers. In 1990 the estimated profits from Eurobond dealers were estimated to be between USD 4 to USD 8 billion.

The *Financial Times* publishes a list of quotes of Eurobonds traded in the secondary market (FT/ISMA International Bond Service). Table XII.D presents some quotes from March 16, 1995.

TABLE XII.D
Eurobond quotes

| | Issued | Bid | Offer | Chg. | Yield |
|---|---|---|---|---|---|
| **U.S DOLLAR STRAIGHTS** | | | | | |
| Abbey Natl Treasury 6½ 03 | 1000 | 92¼ | 92½ | -¼ | 7.81 |
| Alberta Province 7¼ 98 | 1000 | 101 | 101½ | | 7.28 |
| Austria 8½ 00 | 400 | 104¾ | 105 | | 7.30 |
| Bank of Tokyo 7 96 | 100 | 101⅛ | 101½ | -¾ | 7.21 |
| Belgium 5½ 03 | 1000 | 86½ | 86¾ | | 7.69 |
| British Gas 0 21 | 1500 | 12½ | 12¾ | | 8.16 |
| Canada 6½ 97 | 2000 | 98½ | 98¾ | | 7.14 |
| China 6½ 04 | 1000 | 87¾ | 88¼ | -¼ | 8.69 |

## 2.B.4   The Global Bond

Global bonds attempt to address one of the frequent shortcomings of Eurobond issues mentioned above: poor liquidity. For many years, Eurobond issuers have attempted to tap into the more liquid domestic markets of the U.S. and Japan. Clearly, access to a wider range of markets makes easier the launching of new issues in larger sizes. Provided there are committed market makers in each market, a larger-size and well-placed issue makes for better liquidity, smaller trading spreads in the secondary market and, hence, a lower cost of funds to the issuer.

One of the key problems for accessing the U.S. foreign market with Eurodollar bonds is the usual bearer nature of Eurobonds. In 1988, The World Bank conducted a study, which suggested that anonymity was not that important for many international investors. The World Bank discovered that more than a third of non-resident holdings of USD denominated debt were U.S. T-bills or other U.S. domestic securities issued in registered form. Based on this evidence and the changes in U.S. regulations mentioned above, in 1989, The World Bank launched simultaneously a 10-year 8 3/8% Eurobond issue in the U.S. foreign and Eurodollar bonds markets. The issue size was USD 1.5 billion, which was the largest fixed rate international offering ever. This Eurobond issue was the first global bond. Clearly the ability to trade an issue freely in both European and U.S. domestic markets enhances its liquidity and reduction of issuance costs. The principal distinguishing feature of the bonds was their registered form, which satisfied U.S. regulations. The further requirement of registration under the Glass-Steagall Act was dispensed with under an exemption.

The experience of this issue was a big success. The World Bank's global bond issues trade at yields which are lower than both their U.S. domestic bonds (10-20 basis points) and their USD Eurobond (5-10 basis points). As a result, The World Bank now raises bond finance primarily in this form.

A key element in global issues is that the issuer should have a homogeneous credit perception around the world. The World Bank, for example, has a favorable perception throughout the world. For example, global World Bank issues are handled in the U.S. by dealers specializing in U.S. government-sponsored agencies.

Several governments and big companies have successfully emulated The World Bank. U.S. multinational corporations are not exempted from registration of their issue with the SEC. In order to

avoid the delay, these borrowers have resorted to a standard Eurobond issue launched simultaneously with a U.S. private placement, which together make an international issue rather than a global bond.


## III. Foreign Bond Markets

Ninety years ago, the international bond markets consisted solely of foreign bonds, that is, bonds issued, placed, and traded in a bond market which was foreign to the issuer's country of incorporation. These markets had most of the features that are standard in today's bond markets:

i.- Issuers were typically foreign governments or private sector utilities such as railway companies.
ii.- Issues were subscribed by retail and institutional investors.
iii.- Issuers and investors were connected by continental private banks and old London merchant houses.
iii.- Underwriting and the syndication of underwriting risk were established practices, and the structure of a bond was similar to that prevailing today.

After WW I, the world saw a strong U.S. economy and a strong U.S. dollar. During this period, world capital markets served primarily to channel European savings into the U.S. economy. Issuance activity elsewhere in the international markets remained small. This dominance of the U.S. foreign bond market, called the Yankee bond market, became even stronger after WW II.

For years the Yankee bond market was the largest and most important foreign bond market. In recent years, however, it has been surpassed by the CHF foreign bond market (see Table XII.A). As mentioned above, the growth of the Yankee bond market was impeded by the U.S. Interest Equalization Tax that was in force between 1963-1974.

Other foreign bond markets have a sizable share of the international market. Now, we will briefly describe the main features of some of these foreign markets.


3.A    Yankee Bonds

Yankee bonds must be registered under the Securities Act of 1933, which involves meeting the disclosure requirements of the U.S. S.E.C. If the bonds are listed (usually NYSE), they must also be registered under the Securities Exchange Act of 1934. The ordinarily long four-week registration period can be speeded up by *shelf registration*. In shelf registration, the borrower files a prospectus that covers all anticipated borrowing within the coming year. Then at the time of a new issue, the borrower only has to add a prospectus supplement, which takes only a week to clear.

Yankee issues are usually rated by a bond rating agency such as Standard and Poor's Corporation or Moody's Investors Services, Inc. A rating is necessary if the bonds are to be sold to certain U.S. institutional investors. Use of the Yankee bond market has tended to be restricted to borrowers with AAA credit ratings.

There is no withholding tax on coupon payments to foreigners who purchase Yankee bonds. Coupons are usually paid semiannually.

The secondary market for Yankee bonds tends to be more liquid than that for USD Eurobonds and bid/ask spreads are smaller. New issue costs are smaller than for Eurobonds (about 7/8% versus 2% for Eurobonds). Therefore, we should be cautious in comparing interest rates in the Yankee market with rates in the dollar Eurobond market: smaller issue cost and more frequent coupon payments should be taken into account.

Example XII.17: On October 17, 1994, the weekly *Barron's*, published the following quotes for Yankee Bonds, in the Bonds Section:

**FOREIGN BONDS**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 126 | 112½ | AmocoCda 7¼ 13 | 6.3 | 178 | 119 | 116½ | 117¼ | -1¼ |
| 57 | 45 | CdnPc 4s perp | 8.5 | 175 | 47½ | 47 | 47¼ | -¾ |
| 55½ | 45¾ | CdnPc 4s reg | 8.4 | 50 | 47 | 47½ | 47½ | -½ |
| 92½ | 84 | CGDina 8s 04 | 9.1 | 39 | 88 | 84½ | 88 | +3 |
| 53 | 40 | Cuba 4½77mf | ... | 42 | 45 | 42 | 42 | -10¾ |
| 108¾ | 84 | EmplCA 5s04 | ... | 4 | 104 | 104 | 104 | -1 |
| 110 | 99 | Inco 7¾ 16 | 7.5 | 38 | 104 | 103 | 104 | +½ |

### 3.B    Samurai Bonds and JPY Eurobonds

In May 1984, the U.S. and Japan announced, as part of the general agreement on Japanese financial deregulation, a reduction in restrictions on JPY Euro financing. The Euro-JPY would be expanded to allow, for the first time, both Japanese and non-Japanese corporations to make public JPY Eurobond issues, and foreign banks would be allowed to serve as lead managers.

The market was opened to issues by foreign banks in 1985, and dual-currency, zero-coupon, and FRNs were also approved. Although some restrictions remained, the consequences of deregulation were immediately apparent, with the amount of JPY Eurobonds achieving second place after the USD Eurobonds in 1991. Issuance terms (i.e., maturity, calls, denominations, etc.) on JPY Eurobond are unregulated and standard practice on Eurobond issues is applied. There is no requirement of a Japanese lead manager, but non-Japanese lead managers must have offices in Tokyo. Euro-JPY bonds are usually listed in Luxembourg or London, while samurai bonds are listed on the Tokyo Stock Exchange.

The main issuers of JPY Eurobonds are supranational agencies (The World Bank, EU), governments (New Zealand, Argentina), government agencies, international commercial banks and multinational corporations. Aside from supranational agencies and governments, most non-Japanese borrowers have sought to swap the proceeds of their issues out of JPY into their domestic currency or a secondary currency of exposure.

### 3.C    Swiss Franc International Bonds

There is no CHF Eurobond market and international borrowers have access to what is for all intents and purposes a domestic market only. The Swiss government does not allow issues in CHF outside Switzerland and international banks may not lead-manage, co-manage or underwrite issues by foreign borrowers except through subsidiaries incorporated in Switzerland. This regulation has created in Switzerland the largest foreign bond market in the world. The CHF is chosen as a unit of account with relatively stable purchasing power, while Swiss banks act as politically neutral institutions. CHF foreign bonds are bearer bonds, have annual coupons, and have a minimum denomination of CHF 5000. They are usually listed and traded on one of the Swiss stock exchanges.

CHF bonds are usually lead managed by one of the "big three": Swiss Bank Corporation, Union Bank of Switzerland, or Credit Suisse. A certain percentage of the Swiss francs received by the borrower have to be converted to other currencies.

While nonresidents are subject to a 35% withholding tax on Swiss franc domestic bonds, they are exempt from withholding on CHF foreign bonds. Therefore, it is not rare to find that foreign (to Switzerland) savers are lending to foreign borrowers, with the amount of the debt obligation fixed in terms of CHF.


**IV. Differences Among Bond Markets**

4.A      <u>Issuing Techniques</u>

Domestic bonds are usually underwritten by a syndicate of national banks. Dutch, British, Canadian and Swiss government bonds are sold under a tender system, where banks place bids. In the U.K. once an issue has been listed, the Bank of England often sells part of a gilts issue directly on the market through its broker.

Eurobonds are issued through an international syndicate of financial institutions. Institutional investors may buy new bonds directly a few days before they are officially issued. This is the so-called gray market. In the Eurobond market bonds are sold under a variety of procedures: the traditional issuing system, the bought deal, the FPRO, and the tender system.


4.B      <u>Dealing</u>

Trading of U.S. domestic bonds is transacted between *market makers*, which are specialized in financial institutions. On European bond markets, orders are generally sent to the exchange floors through brokers.

In the U.S. trading usually takes place over the counter, although some bonds, especially foreign dollar bonds, are listed on the NYSE. Over the counter trading also takes place in Switzerland, U.K., Germany, the Netherlands for non-government issues. In Japan, bonds are both traded over the counter and on the securities exchanges.

In brokers' markets bond buyers and sellers pay the same price, but must pay a commission to the broker. In the U.S. prices are net of commissions, but there is a bid-ask spread on all quotations.

Although the Eurobond market has no physical location, most of the bonds are listed on the Luxembourg or London stock exchanges to satisfy the requirement of obtaining a public quotation at least once a year or quarter. However, very few transactions go through the exchange.


4.C     Quotations

Bonds are usually quoted on a price-plus-accrued-interest basis. This means the price is quoted separately (as a percentage of the bond's nominal value) from the percentage coupon accrued from the last coupon date to the trade date. That is,

Cash price = Quoted price + Accrued Interest = P + A.

This means that the market price, P, is clean of coupon effect -i.e., accrued interest, A- and allows meaningful comparison between various bonds.

Other bonds, like convertible bonds, index linked bonds or FRNs where the coupon is determined ex-post (at the end of the coupon period) are quoted with coupons attached. Some straight bonds follow this method, as in the U.K. gilt market, the market for UK government bonds. In the U.K., bonds with more than five years to maturity are traded without any separate allowance for accrued interest (i.e., with the coupon attached). That is, in the U.K. gilt market the price quoted falls on the *ex-dividend*, or *ex date*, the date when the bond trades without the next coupon payment.

Example XII.18: The U.K. gilt quotation.
The ex date is normally 37 calendar days before each coupon date, plus or minus a couple of days to allow for weekends and vacations. An investor who buys the bond during this thirty-seven-day-period does not receive the coupon. Instead, it goes to the previous bondholder. Furthermore, investors are allowed to trade *cum*, or ex-dividend, for a period of 21 days preceding the ex date. This is known as *special ex-dividend*. In Graph XII.1, we reproduce the unusual hypothetical market price behavior over time for a long term U.K. gilt, assuming that the market interest rate stays constant. (Tax effects not included.) ¶

**GRAPH XII.1**
MARKET PRICE BEHAVIOR OF A LONG-TERM UK GILT
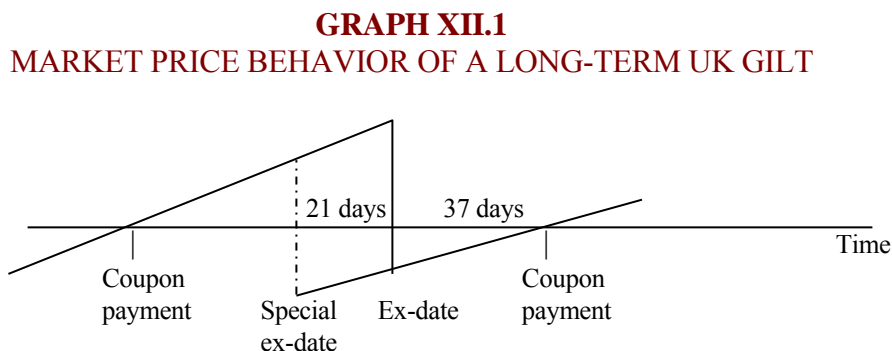


Bonds also differ in the way accrued interest is calculated and in frequency payment. In the U.S., straight bonds usually pay a semiannual coupon. The day-count method is used in accrued interest

calculations is based on 30-day months in a 360-day year. The same day-count method is used in West Germany, Switzerland, and the Netherlands.

Example XII.19: An investor holding a U.S. straight bond for one month receives 30/360 or 1/12 of the annual coupons (1/6 of the semiannual coupon). ¶

By contrast, the U.K., Canada, and Japan use a day-count based on the actual number of days in a 365-day year.

Example XII.20: An investor holding a Japanese straight bond for February 1995 will receive 28/365 of the annual coupon. ¶

Straight Eurobonds use the U.S. convention regardless of their currency of denomination, so that a yen or sterling Eurobond uses a 30-day month in a 360-day year. Straight Eurobonds pay annual coupons.

On the other hand, Euro-FRNs use actual days in a 360-day year, which is also the convention used for money markets and short-term deposits. This follows naturally since FRN coupons are indexed to short-term interest rates. Euro-FRNs pay quarterly or semiannual coupons.

Table XII.E summarizes the characteristics of the major bond markets.

**TABLE XII.E**
**COUPON CHARACTERISTICS OF MAJOR BOND MARKETS**
**(Straight bonds)**

| Market | Usual Frequency of coupon | Day count (month/year) |
|---|---|---|
| Yankee bonds and U.S. corporate | semiannual | 30/360 |
| U.K. corporate and GBP money markets | semiannual | actual/365 |
| U.S., U.K., and other Treasury bonds | semiannual | actual/actual |
| Canada | semiannual | actual/365 |
| Japan | semiannual | actual/365 |
| Australia | semiannual | actual/365 |
| Switzerland | semiannual | 30/360 |
| Germany | annual | 30/360 |
| Netherlands | annual | 30/360 |
| France | annual | actual/365 |
| Eurobonds | annual | 30/360 |

| | | |
|---|---|---|
| FRNs | quarter or semiannual | actual/360 |
| Most money market instruments | at maturity | actual/360 |

## 4.D    Yields

Most financial institutions around the world calculate and publish yields-to-maturity on bonds. Unfortunately, the methods differ across countries.  Therefore, yields are not comparable.

Most European institutions calculate an annual, and accurate, actuarial yield-to-maturity using the AIBD-recommended formula. U.S. (and often U.K.) institutions publish a semiannual actuarial yield.

Example XII.21: A U.S. bond issued at par with 12% coupons will pay USD 6 semiannually per USD 100 of face value, and is reported as having a semiannual yield-to-maturity of 12%.  Europeans would quote this bond as having a 12.36% (annual) yield-to-maturity. ¶

The situation is even worse in Japan, where financial institutions tend to report yield-to-maturity based on simple-interest calculation. The sample formula given below shows how this is done:

$$\text{Yield} = [\, C + \frac{100 - P}{T} \,] \times \frac{100}{P},$$

where C is the coupon rate, P is the current price of the bond, and T represents the years to maturity. This simple yield understates the true yield-to-maturity for bonds priced over par and overstates the yield for bonds priced below par.

**Example XII.22:** A Japanese bond has 5 years left to maturity, the coupon rate is 12%. The bond is selling at 95. The yield (for a Japanese financial institution) would be 17.89. ¶

**Example XII.23:** On September 21, 1994, the *Financial Times* published the following yields on International Government Bonds:

**BENCHMARK GOVERNMENT BONDS**

| | Coupon | Red Date | Price | Day's Change | Yield | Week ago | Month ago |
|---|---|---|---|---|---|---|---|
| Australia | 9.000 | 09/04 | 93.1800 | - | 10.10 | 10.00 | 9.40 |
| Belgium | 7.250 | 04/04 | 91.1500 | +0.050 | 8.63 | 8.63 | 8.42 |
| Canada* | 6.500 | 06/04 | 84.4000 | -0.450 | 8.94 | 8.80 | 8.79 |
| Denmark | 7.000 | 12/04 | 85.6500 | -0.200 | 9.22 | 9.18 | 8.87 |
| France    BTAN | 8.000 | 05/98 | 101.2500 | -0.230 | 7.56 | 7.45 | 7.26 |
|          QAT | 5.500 | 04/04 | 82.4700 | -0.450 | 8.21 | 8.03 | 7.84 |
| Germany Bund | 6.750 | 07/04 | 93.5000 | -0.410 | 7.71 | 7.52 | 7.27 |
| Italy | 8.500 | 04/04 | 81.3900 | +0.590 | 11.81H | 12.00 | 11.72 |
| Japan    No 119 | 4.800 | 06/99 | 103.5870 | - | 3.91 | 3.92 | 3.92 |
| | 4.100 | 12/03 | 97.0710 | +0.220 | 4.55 | 4.56 | 4.61 |
| Netherlands | 5.750 | 01/04 | 87.7000 | -0.190 | 7.64 | 7.45 | 7.31 |
| Spain | 8.000 | 05/04 | 80.7000 | -0.100 | 11.37 | 11.37 | 11.01 |
| UK Gilts | 6.000 | 08/99 | 88-30 | -9/32 | 8.83 | 8.50 | 8.44 |

|  | | | | | | | |
|---|---|---|---|---|---|---|---|
|  | 6.750 | 11/04 | 85-02 | -11/32 | 9.02 | 8.70 | 8.64 |
|  | 9.000 | 10/08 | 100-07 | -12/32 | 8.97 | 8.69 | 8.65 |
| US Treasury* | 7.250 | 08/04 | 98-03 | -7/32 | 7.52 | 7.42 | 7.29 |
|  | 7.500 | 11/24 | 96-18 | -13/32 | 7.80 | 7.68 | 7.52 |
| ECU (French Gov) | 6.000 | 04/04 | 82.2800 | -0.600 | 8.81 | 8.62 | 8.43 |

London closing. *New York mid-day                                                    Yields: Local market standard.
HGross (including withholding tax at 12.5 per cent payable by nonresidents)
Prices: US, UK in 32nds, others in decimal


4.E     Legal Aspects


Bonds are issued in either *bearer* or *registered* forms. In most of the issues on Eurobond markets, the bearer of a bond is assumed to its legal owner. Bearer bonds provide confidentiality, which is very important to some investors. On the other hand, in the U.S. owners must be registered in the books of the issuer. Share registration allows for easier transfer of interest payments and amortization.

Coupons are usually paid annually on markets where bonds are issued in bearer form (this reduces the cost associated with coupon payments). Straight Eurobond coupons in all currencies are paid this way.

In many countries, retail purchases of foreign bonds are restricted. The motivation for these restrictions stems from exchange controls or attempts by government to ensure domestic investor protection.

**Example XII.24:** In 1981 France imposed a special exchange rate for security transactions. This forced French investors to pay a currency premium to purchase and sell bonds. This regulation was promulgated to curb capital outflows and defend the French franc. On the other hand, in the U.S., the Glass-Steagall Act is designed to protect domestic investors. ¶


**V. Bonds Indexes**

Bond indexes are benchmarks for measuring performance and quantifying risk across fixed income bond markets. Government bond indexes are considered the benchmark for international comparisons. The government indexes measure the total principal, and interest returns in each market and can be reported in different currencies. Government bond indexes tend to include only traded issues available to international investors, thus the indexes provide a realistic measure of market performance.

There are two approaches to the calculation of bond indexes:

(1) Use a small but representative sample of actively traded bonds. This index provides a good indication of short-term movements in interest rates.

(2) Use all the bonds in the market. Since many issues are not liquid and their prices old, exhaustive market indexes tend to lag the interest rate movements, but they reflect the current valuation of a market portfolio.

The first approach tends to be used to calculate daily indexes, and the latter, monthly indexes. Given the high correlation among all bond prices on a given bond market, bond indexes tend to be highly correlated.

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♦ **J.P. Morgan Daily Government Bond Indexes**

J.P. Morgan publishes widely used daily bond indexes. The J.P. Morgan Government Bond Indices are comprised of only traded markets, instruments, and issues, providing liquidity without sacrificing stability. Investors therefore benefit from lower transaction costs both in their initial investment and in their ongoing management. The index tracks only issues that are readily available for purchase at actively quoted prices. All instruments included in the index must be tradeable and redeemable for cash, and they must not appeal to domestic investors for local tax or regulatory reasons. Of all the non-U.S. fixed income domestic government bonds maintained by the GBI, approximately 85% are considered to be "investable." The J.P. Morgan family of indices tracks only issues within this traded universe. Each month, constituent index bonds are reviewed to identify any new issues or changes in liquidity classification. Purchase and sinking fund redemptions, reopenings, funging, exchanges, buy-ins, and reverse auctions are reflected in changes to the amounts outstanding. ♦

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Graph XII.2 compares the annualized yield on the J.P. Morgan Government Indexes for the main three Euro-area markets.

**GRAPH XII.2**

J.P. Morgan Government Bond Indexes
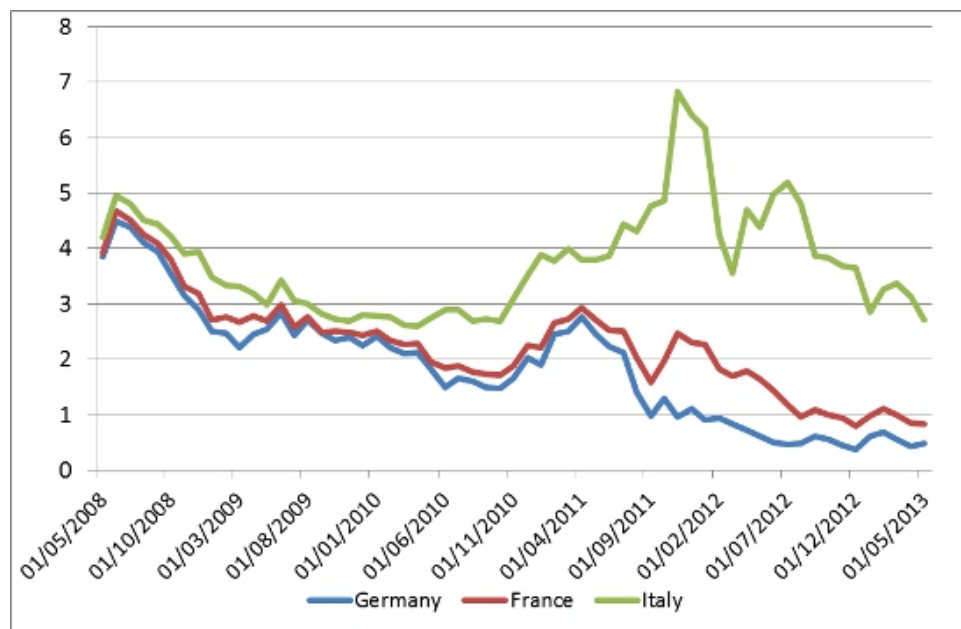


Despite marked differences in index composition, the yield of the government indexes tend to move together has converged over the years. The European monetary union had a clear effect on the yield convergence across European bond markets.

Many institutions calculate bond indexes, which are widely cited in the financial press. As was the case for international equity markets, there are domestic bond indexes and international bond indexes. Investment banks calculate daily and monthly indexes. For example, in the U.S., the Wall Street Journal publishes the Lehman Brothers and Merrill Lynch daily domestic indexes. Among the most popular international bond indexes we find:

(a) Salomon Brothers publishes daily indexes. They are published monthly in *Euromoney*.

(b) Lombard Odier and Cie. publishes daily indexes since 1982. They are published in the *Wall Street Journal (Europe)*.

(c) *The Financial Times* publishes daily quotes on "benchmark" bonds representative of each market.

(d) The ISMA publishes total-return and price-only indexes for the Eurobond market.

(e) Intersec publishes monthly indexes in *Institutional Investor*.

**Example XII.25**: On November 15, the *Wall Street Journal* published the following U.S Bond Indexes:

**MAJOR INDEXES**

| HIGH | LOW | (12 MOS) | CLOSE | NET | %CHG | 12-MO CHG | %CHG | FROM 12/31 | %CHG |
|---|---|---|---|---|---|---|---|---|---|
| U.S. TREASURY SECURITIES (Lehman Brothers indexes) | | | | | | | | | |
| 4158.35 | 3966.84 | Intermidiate | 4042.70 + | 8.47 + | 0.21 - | 65.50 - | 1.59 - | 74.01 - | 1.80 |
| 5656.03 | 4897.46 | Long-term | 4954.83 + | 39.81 + | 0.81 - | 588.28 - | 10.61 - | 557.80 - | 10.12 |
| 1604.42 | 1307.21 | Long-term | 1320.03 + | 8.92 + | 0.68 - | 274.06 - | 17.19 - | 251.09 - | 15.98 |
| 4500.55 | 4199.01 | Composite | 4954.83 + | 15.28 + | 0.36 - | 179.42 - | 4.04 - | 179.46 - | 4.04 |
| | | | | | | | | | |
| U.S. CORPORATE DEBT ISSUES (Merrill Lynch) | | | | | | | | | |
| 709.45 | 656.43 | Corporate Mas | 665.13 + | 1.79 + | 0.27 - | 30.19 - | 4.34 - | 32.60 - | 4.67 |
| 518.52 | 487.79 | 1-10 Yr Mat | 498.14 + | 0.86 + | 0.17 - | 10.70 - | 2.10 - | 13.22 - | 2.59 |
| 544.83 | 490.84 | 10+ Yr Mat | 494.67 + | 2.10 + | 0.43 - | 38.23 - | 7.17 - | 39.14 - | 7.33 |
| 332.37 | 317.57 | High Yield | 325.97 + | 0.46 + | 0.14 - | 5.45 - | 1.70 - | 1.03 - | 7.33 |
| 520.54 | 477.83 | Yankee Bonds | 482.89 + | 1.31 + | 0.27 - | 27.29 - | 5.35 - | 28.58 - | 5.99 |

## VI. Why Do Investors Care About International Bonds?

We already know the answer to the above question: portfolio diversification. From the point of view of returns, the U.S. bond market has been generally attractive, but from 1986 to 2011 the U.S. bond market has never ranked first. Since 1986, the Australian, British and Japanese bond markets have outperformed the rest of the developed bond markets three times each, while the Canadian, French, and Swedish bond markets have outperformed the rest only one time each.

While investing in foreign bonds can increase your returns, adding foreign bonds can significantly reduce the overall risk of your bond portfolio. Diversification also works in the world bond market. The lower the correlation, the greater the diversification benefits. Within the domestic U.S. bond market, correlations are relatively high. These high correlations reflect common sources of

uncertainty in U.S. monetary and fiscal policies as well as in U.S. economic activity. Therefore, as the number of U.S. fixed-income instruments in the portfolio increases, the reduction in risk soon becomes marginal. Foreign policies, however, are not synchronized with those of the U.S. Because of the lack of co-movements across national markets, the risk reduction attained from investing in a given number of global securities is likely to be much greater.

**Example XII.26**:  The correlation between Treasury and U.S. corporate bonds is of the order of .92. Unless we consider non-investment-grade bonds, the correlations in the U.S. fixed-income markets are generally above .90. On the other hand, correlations between U.S. bonds and foreign bonds are significantly lower. Table XII.F shows the correlation coefficient of government bonds returns in USD of some markets (1993-2009).

**TABLE XII.F**
Correlations of Monthly Government bond returns in USD (1993-2009)

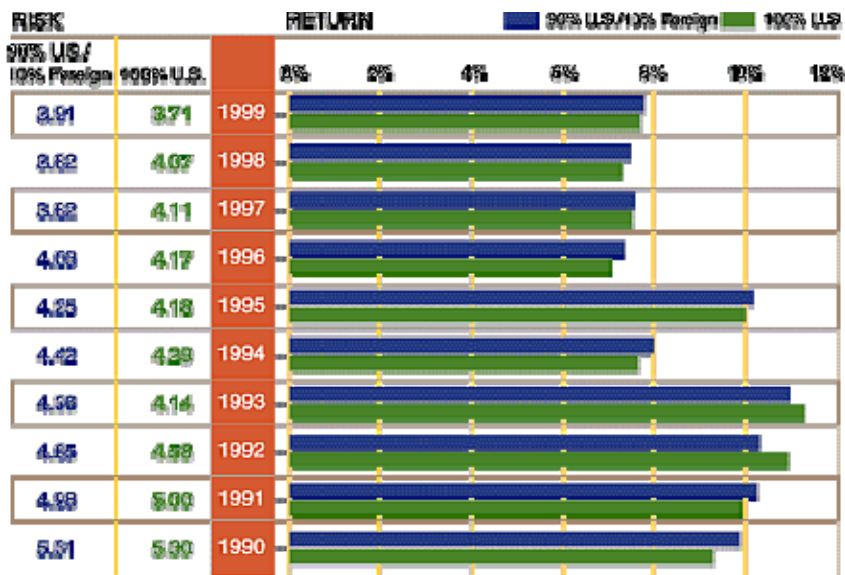| Market | with US Bonds | with German Bonds | with Japanese Bonds |
|---|---|---|---|
| Australia | .30 | .48 | .15 |
| Canada | .40 | .36 | .05 |
| Denmark | .43 | .96 | .36 |
| France | .45 | .98 | .37 |
| Germany | .43 | 1.00 | .40 |
| Italy | .41 | .78 | .20 |
| Japan | .22 | .40 | 1.00 |
| U.K. | .42 | .66 | .19 |
| U.S. | 1.00 | .43 | .22 |
| Global | .65 | .87 | .65 |
| Emerging Markets | .18 | .03 | -.05 |

Source: J.P. Morgan.

Emerging markets, Japanese and Australian governments bonds would have provided the best diversification instrument for U.S. bondholders. ¶


6.A    Benefits from International Diversification


Given the above correlations, we can form an internationally well-diversified bond portfolio that will outperform a U.S. bond portfolio, in the mean-variance space. The optimal allocation, however, can place a very low weight on the U.S. bond market. This allocation might no be reasonable for many U.S. investors (remember the "home bias"). Therefore, we consider a minimally diversified portfolio: 10% invested in developed bond markets and 90% invested in the U.S. bond market. Graph XII.3 presents the five year performance (risk and return) of this 10/90 bond portfolio and a 100% U.S. bond portfolio.

**GRAPH XII.3**

Domestic vs. Diversified Bond Portfolio: Rolling 5-year Performance (1990-1999)

| RISK | | | RETURN | 90% U.S./10% Foreign | 100% U.S. |
|---|---|---|---|---|---|
| 90% U.S./10% Foreign | 100% U.S. | | | | |
| 3.91 | 3.71 | 1999 | | | |
| 3.62 | 4.07 | 1998 | | | |
| 3.62 | 4.11 | 1997 | | | |
| 4.09 | 4.17 | 1996 | | | |
| 4.25 | 4.18 | 1995 | | | |
| 4.42 | 4.29 | 1994 | | | |
| 4.56 | 4.14 | 1993 | | | |
| 4.65 | 4.59 | 1992 | | | |
| 4.98 | 5.09 | 1991 | | | |
| 5.31 | 5.30 | 1990 | | | |

Source: T. Rowe Price

In eight of the 10 rolling five-year periods, the 10/90 portfolio outperformed the U.S. bond portfolio. In six out of ten periods, however, the 10/90 portfolio had modestly higher volatility. Keep in mind, that the 10/90 portfolio does not represent an optimal portfolio. An optimal portfolio, would have clearly moved the risk-return performance to the Northwest in the mean-variance space.

**Example XII.27**: From 1978 to 1989, an investor could have maintained the 10.1 percent return on the U.S. index while reducing risk from 11.0 percent –the U.S. risk- to 9.8 percent. Alternatively, keeping the portfolio risk (SD) constant, the return could have been increased form 10.1 to 11.7 percent. This improvement of 160 basis points could have been achieved by passively investing 51% in the dollar, 43% in the yen, 4% in Canadian dollar, and 2% in pounds. ¶

---

♦ **Another theoretical word on hedging**

We can measure the benefits of hedging in light of financial theory. Long-term relationships exist between expected return and risk. Assuming risk is priced uniformly in the bond market and in the foreign exchange market, any reduction in risk must be accompanied by a reduction in expected return. Under this situation, hedging reduces risk but adds no value to the portfolio on a risk-adjusted basis.

On the other hand, what if segmentation occurs in international capital markets? It could very well be that risk is not priced uniformly across markets. In such a case, hedging could add value.

This dilemma, still unresolved, remains a major challenge to researchers in international investment.
♦

## 6.B     The Impact of Currency Hedging

Investing in international bonds entails currency risk. If currency exposure is to be avoided, hedging can dramatically reduce the risk of non-USD bonds. The usual hedging tools, forward contracts, futures and option, can be used to reduce currency risk.

**Example XII.28**: Currency hedging.
One possible strategy is entering into a forward contract every month to sell the value of the investment in the foreign currency. At the end of the month, if the foreign currency has depreciated, the translation loss on the bond will be offset by the gain on the forward contract. Of course, any gain due to a currency appreciation will also be offset by a loss on the forward contract. Overall, this strategy should yield much more stable returns. ¶

Stripping away the currency risk by forward hedging also allows the investor to measure how returns are affected by exchange rates. Recall that local returns are completely irrelevant for U.S. investors, whereas hedged foreign returns could have been realized in practice. Thus, currency-hedged returns provide the only correct benchmark to measure the impact of exchange rate movements.

**Example XII.29**: From 1978 to 1989, hedging JPY exposure dropped the volatility of the JPY bond market from 17.3% to 6.4% a year. This hedged Japanese bond market volatility was much lower than the volatility of the U.S. bond market, which was 11%. ¶

While hedging currency risk decreases volatility, hedging currency movements can increase or decrease returns. The intuition is very simple. During periods of USD appreciation, hedging would have enhanced performance of the foreign bond market, while during periods of USD depreciation, hedging would have hurt the performance of the foreign bond market.

**Example XII.30**: Figure XII.4 shows the relation between monthly unhedged international bond (USD) returns and monthly changes in the TWC USD Index from 1988 to 2013. There is a clear inverse relation between both series. That is, as the USD appreciates, unhedged international bond (USD) returns decrease.

Figure XII.5 shows the relation between monthly hedged international bond (USD) returns and monthly U.S. bond returns from 1988 to 2013. Both series seem highly correlated. Now, once hedging is done, international bonds behave similarly to domestic bonds. That is, currency exposure breaks the high correlation between international bonds and U.S. bonds.

# GRAPH XII.4
## USD and unhedged international bond (USD) returns



**Notes:** International bonds represented by Citigroup World Government Bond Ex-US Index through 1989 and Barclays Global Aggregate ex-USD Index thereafter. The U.S. dollar is represented by the Federal Reserve's Nominal Major Currencies Trade-Weighted Dollar Index. The correlation of monthly returns for unhedged international bonds to the U.S. dollar index is −0.6. All data through December 31, 2013.

Sources: Vanguard, Thomson Reuters Datastream, Barclays, Citigroup, and U.S. Federal Reserve.

# GRAPH XII.5
## U.S. bonds and hedged international bond (USD) returns
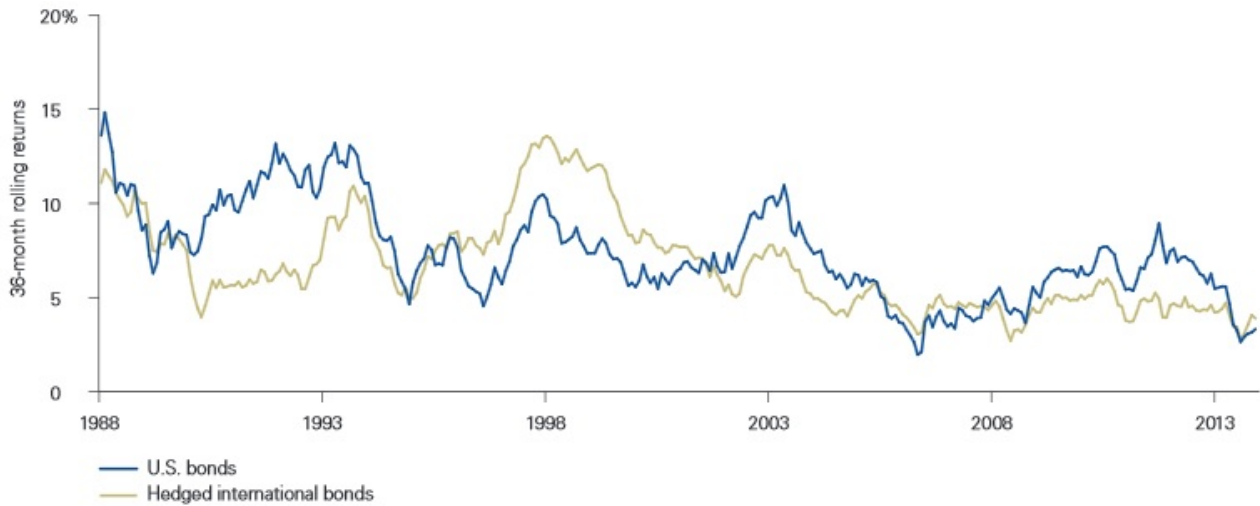


**Notes:** International bonds represented by Citigroup World Government Bond Ex-US Hedged Index through 1989 and Barclays Global Aggregate ex-USD Hedged Index thereafter; U.S. bonds represented by Barclays U.S. Aggregate Bond Index. The correlation of monthly returns for hedged international bonds to U.S. bonds is 0.6. All data through December 31, 2013.

Sources: Vanguard, Thomson Reuters Datastream, Barclays, Citigroup, and U.S. Federal Reserve.

We can evaluate the performance of hedging by focusing on a simple strategy, such as investing in different portfolios, with hedging and without hedging. In Table XII.G we present the performance for this portfolio and others.

<div align="center">

**TABLE XII.G**

Performance of Bond Portfolios (Jan. 78 - Sep. 89)

</div>

|  | Return | SD |
|---|---|---|
| U.S. Dollar Value Weighted Index | 10.1 | 11.0 |
| Non-dollar Value Weighted Index | 11.3 | 13.8 |
| World Value Weighted Index | 10.6 | 10.2 |
| Global Equal-Weighted Index | 10.0 | 12.0 |
| Global Hedged Equal-Weighted Index | 10.7 | 5.5 |

The volatility of the global hedged equal-weighted bond portfolio is reduced from 12.0 to 5.5, while improving the performance 70 basis points.

As a final word, hedging on average increases the correlation with the U.S. bond Index across markets. This is because movements in exchange rates are weakly related to movement in U.S. bond prices. Thus, hedging exchange risk reduces a source of diversification.

## VII. Looking Ahead

We have studied the international bond markets. The Eurobond market is, by far, the biggest segment of the international bond market. It is a very flexible, without major regulations and with a wide selection of instruments. Thus, investors and borrowers have a choice in selecting debt instruments. Pricing bonds in international markets is done with the same techniques used for pricing bonds in domestic markets. The variety of instruments, however, complicates the pricing of some Eurobonds. The selection of the best bond for a particular company can also be complicated in Eurobond markets. In the next chapter we will cover technical issues related to bonds: pricing, optimal selection of instruments. In the next chapter, we will also study bond risk management issues.

**Related readings**:

**International Investments**, by Bruno Solnik, published by Addison Wesley.

**The Economist Intelligence Unit Guide to Eurobonds**, by Noel Clarke, published by McGraw-Hill, Inc.

For facts, technical details, strategies, and more information on International Bond Markets, see **The**

**Global Bond Markets**, by Jess Lederman and Keith K. H. Park.)

**APPENDIX XII**

**REVIEW OF BOND TECHNIQUES AND RELATED CONCEPTS**

**A.XII.1        Bond Prices and Yields**

Before reviewing the basics of bond mathematics, we will introduce some notation:

P = current market value of a bond = present value of the bond.
FV = face value or future value at a certain date, usually maturity (FV is not a forward price).
r = internal rate of return (yield-to-maturity) of a bond.
B = discount factor = $1/(1+r)$.
T = number of years to final maturity.
C = coupon rate of the bond.

A.XII.1.i            Yield-to-maturity

The theoretical value of a bond is determined by computing the present value of all future cash flows generated by the bond discounted at an appropriate interest rate. Conversely, one may calculate the internal rate of return, or *yield-to-maturity* (YTM), of a bond on the basis of its current market price and its promised payments. The YTM is also referred as yield. The YTM measures the expected total return on the overall investment. No other financial instrument has such an easily observed or intuitively understandable expected return.

Example A.XII.1: A Eurodollar bond that pays at maturity $FV_1$ = USD 100. The market price of the Eurodollar bond is P = USD 92.91. Maturity is one year from now. The Eurodollar bond has a yield-to-maturity r, given by

$$P = \frac{FV_1}{1+r} \quad \Rightarrow \quad 92.91 = 100 / (1+r).$$

Hence,

$$92.91(1+r) = 100 \quad \Rightarrow \quad (1+r)=100/92.91 \quad \Rightarrow \quad r = 0.0763. \; \P$$

Similarly, one may compute the yield-to-maturity of zero-coupon bonds maturing in T years using the formula:

$$P = \frac{FV_T}{(1+r)^T},$$

where r is expressed as a yearly interest rate. The term $1/(1+r)^T$ is the discount factor for year T. The YTM is defined as the interest rate at which P dollars should be invested in order to realize $F_T$ dollars T years from now:

$$P(1+r)^T = FV_T.$$

Example A.XII.2: A two-year zero-coupon Eurodollar bond paying $FV_2$ = USD 100 is currently selling at a price P = USD 85.20, has a YTM, r, given by

$$85.20 = 100/(1+r)^2, \quad \Rightarrow r = (100/85.20)^{1/2} - 1, \quad \Rightarrow r = 0.08338. \ \P$$

The YTM should not be confused with the *current yield* or *dividend yield*. The current yield on a bond is the ratio of the coupon bond to its current price.

Example A.XII.3: A bond with a price of 90 and a coupon of 10 percent has a current yield of: 10/90 = .1111 = 11.11%. ¶

A.XII.1.ii      Yield curves

Similar bonds -i.e., bonds with similar characteristics: risks, coupons, maturities- should have the same return. Suppose we have bonds with similar characteristics but with the only exception of maturity. As illustrated above, the YTM of two zero-coupon bonds in the same currency but with different maturities is usually different.

Graphing the yields to maturity on similar bonds with different maturities allows us to draw a *yield curve*. The yield curve shows the YTM computed on a given date as a function of the maturity of the bonds. Therefore, the graph should have on the horizontal or x-axis years to maturity and on the vertical or y-axis the YTM. It provides an estimate of the current *term structure* of interest rates. To be meaningful a yield curve must be drawn from bonds with identical characteristics, except for their maturity.

A yield curve is a best fit average of the individual yields, so the individual bond yields may well lie above or below the line when it is drawn. This gives an indication as to whether a particular bond has a relatively high or low yield in relation to its market. Points above the curve may be considered as high-yielding (*cheap*), and those below as low-yielding (*dear*).

The normal slope of the curve when the market is in equilibrium is positive, that is, yields rise as maturity lengthens. Under these conditions, investors are receiving higher remuneration for forgoing immediate consumption and for the increased risks associated with longer-term investments.

The slope of the curve is important: the curve becomes steeper when the market expects a general rise in interest rates, and therefore traders sell longer dated bonds, forcing the price down and the yield up.

A flat curve arises when investors are indifferent to maturity risk, that is, short-term and long-term interest rates are very similar.

An uncommon yield curve arises where the yield curve has one or more humps of relative high yields, with lower yields on either side. Usually, there is a technical explanation for such a curve, such as oversupply of issues in a particular maturity band, for example a major issue by a

government. Graph A.XII.1 presents an uncommon yield curve.

GRAPH A.XII.1
EXAMPLE OF A YIELD CURVE
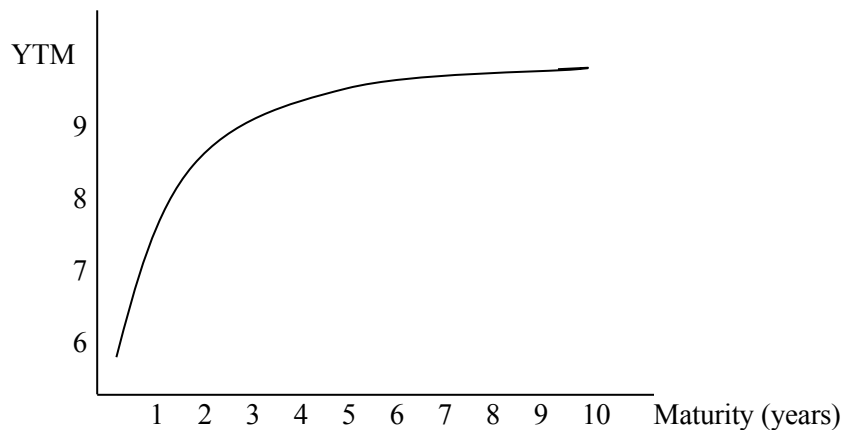
Two zero-coupon bonds are represented as two points on the yield curve in the above Graph.

The so-called Treasury yield curve is constructed from on-the-run Treasury issues. These are the most recently auctioned Treasury securities: 3-month, 6-month, 1-year, 2-year, 4-year, 5-year, 10-year, and 30-year.

The first three issues are Treasury bills, which are issued at discount and pay no coupon. That is, these Treasury bills are zero-coupon securities. In contrast, the five other issues are coupon bonds. In fact, there are no zero-coupon securities issued by the U.S. Department of the Treasury with a maturity greater than one year. Consequently, the Treasury yield curve is a combination of zero-coupon securities and coupon securities.

There are, in fact, zero-coupon Treasury securities with a maturity greater than one year that are created by government dealer firms. These securities are called *stripped Treasury securities*. All stripped Treasury securities are created by dealer firms under a Treasury Department program called STRIP (Separate Trading of Registered Interest and Principal Securities).


A.XII.1.iii      Forward interest rates.

YTM is a sort of average rate on a bond held to maturity. YTM assumes a constant rate of interest over the life of a bond, but as we have already seen, interest rates are contingent on the maturity of a bond.

Example A.XII.4: The YTM on a one-year and two-year zero-coupon Eurodollar bonds, $r_1$ and $r_2$, is generally different. ¶

Forward interest rates, also called implied forward interest rates, are future interest rates *implied* by long-term interest rates.

The YTM on a T-year bond, $r_T$, may be thought of as the rollover of one-year investments until the bond expires. Let's use $f_1$ to represent the interest rate on a one-year bond maturing in a year, and $f_2$ to represent the forward interest rate on a one year bond maturing in two years (i.e., issued one year from now). Similarly, $f_3$, $f_4$,..., represent the forward interest rates on one-year bonds maturing three, four,... years from now.

The value of the forward rates is determined by the following set of equations:

$$(1+f_1)(1+f_2)....(1+f_T) = (1+r_T)^T.$$

Note that $f_1 = r_1$. $f_2$ is derived from the yield curve, knowing the YTM on a one year and a two-year bond,

$$(1+r_1)(1+f_2) = (1+r_2)^2.$$

Hence, $f_2 = \dfrac{(1+r_2)^2}{(1+r_1)} - 1,$

and so on for $f_3$, $f_4$, etc.

Example A.XII.5: Suppose the yield of a one-year German government zero-coupon bond is 4.120, while the yield of a two-year German government zero-coupon bond is 4.322. We want to calculate the implied forward yield, $f_2$.

$$f_2 = \dfrac{(1.04322)^2}{(1.04120)} - 1 = .04524. \; \P$$

A firm can obtain this forward rate by combining two transactions. At time zero, the firm buys the two-year bond at $r_2 = 4.322\%$, and simultaneously shorts the one-year bond at $r_1 = 4.120\%$. During the first year, the long and short positions are mutually offsetting. After one year, the firm is left in a long position at rate $f_2$ such that

$$1 + f_2 = \dfrac{(1+r_2)^2}{(1+r_1)}.$$

That is, the one-year interest rate must move to 4.524% in the year 1999 for an investor to be indifferent to buying a two-year bond in 1998 or buying a one-year bond and rolling it over in 1999. Many investors believe that it is possible to infer expectations about future interest rates using the implied forward rate.

Table A.XII.1 computes the implied one-year forward rate for the term structure of zero-coupon German (Euro-denominated) government bonds:

TABLE A.XII.1
Implied Forward Interest Rates

| N maturity (years) | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

| N-years interest rate (%) | 4.120 | 4.322 | 4.544 | 4.678 | 4.792 |
|---|---|---|---|---|---|
| Implied one-year forward interest-rate (%) | 4.120 | 4.524 | 4.989 | 5.081 | 5.249 |

A.XII.iv                 Valuing a bond with coupons

The theoretical value of a bond with coupons may be considered the present value of a stream of cash flows (coupons and principal payments). The cash flows occur at different times and they should be discounted at the interest rate corresponding to their date of disbursement. In essence, a coupon-paying bond is a combination of bonds with different maturities.

Example A.XII.6: A five-year EUR 1,000 bond with an annual coupon of EUR 80 is a combination of five bonds. Each bond has a nominal value of EUR 80 and a maturity of one to five years, and a bond with a nominal value of EUR 1,000 and a maturity of five-years. ¶

The YTM, r, of a T-year coupon-paying bond is given by

$$P = C_1/(1+r) + C_2/(1+r)^2 + C_3/(1+r)^3 + ... + C_T/(1+r)^T,$$

where $C_i$ is the coupon payment, including final reimbursement, at date T=i.

---
♦ **Price of a bond = f(Coupon, YTM, T)**
The formula for the price of a bond shows that the bond's price is a function of the maturity of the coupon rate and of the YTM. Other factors being constant, the higher the coupon rate, the higher the value of the bond. Other factors being constant, the higher the YTM, the lower the price of the bond.
♦

---

Coupons may be paid semiannually or quarterly, and a valuation may be made at any time during the coupon period. This calls for the more general valuation formula to determine YTM:

$$P = C_1 t_1/(1+p)^{t1} + C_2 t_2/(1+p)^{t2} + C_3 t_3/(1+p)^{t3} + ... + C_T t_T/(1+p)^{tT},$$

where p is the daily yield, i.e., $(1+p)^{365} = (1+r)$, and $t_1, t_2,.., t_T$ are the dates on which the cash flows occur, expressed in number of days from the current date. Cash flows include all payments.

The majority of U.S. domestic bonds pay interest twice a year. In this case, the above formula simplifies to:

$$P = C_1/(1+r/2)^1 + C_2/(1+r/2)^2 + C_3/(1+r/2)^3 + ... + C_T/(1+r/2)^T,$$

where r is the annual YTM of the bond.

Example A.XII.7: Annual v. Semiannual coupon bonds
A. Annual coupon bond.
An 8% annual coupon bond with a face value of USD 1,000 and with 5 years remaining to maturity has a YTM of 10%, the current price P is:

$P = 80/(1.10) + 80/(1.10)^2 + 80/(1.10)^3 + 80/(1.10)^4 + 1{,}080/(1.10)^5 = 924.18.$

Note: the YTM of 10% is higher than the current yield of
    USD 80/USD 924.18 = 8.66%.


B. Semiannual coupon bond.
An 8% semi-annual coupon bond with a face value of USD 1,000 and with 5 years remaining to maturity has a YTM of 10%, the current price P is:

$P = 40/(1.05) + 40/(1.05)^2 + 40/(1.05)^3 + 40/(1.05)^4 + 40/(1.05)^5 + 40/(1.05)^6 +$
$+ 40/(1.05)^7 + 40/(1.05)^8 + 40/(1.05)^9 + 1040/(1.05)^{10} = 922.78.$

Note: The YTM on the semiannual coupon bond is higher than the YTM on the annual bond. The annualized YTM on the semiannual yield is $(1 + .10/2)^2 - 1 = .1025$, or 10.25%. ¶


Two factors affecting YTM should be taken into account:

(1) Coupons and capital gains usually have different tax status. Investors may prefer low coupon-bonds, since in general coupons have a higher tax-rate. Conversely, investors require a higher YTM from high-coupon bonds to compensate for this tax effect. Table A.XII.2 shows the average yield differential for high- and low-coupon government bonds with comparable maturities in six countries.


TABLE A.XII.2
Yield differentials between High- and Low-coupon Government Bonds

| Country | Representative bonds | Yield differentials (basis points) | | |
|---|---|---|---|---|
| | | Average | Maximum | Minimum |
| Japan | 8 '86 v. 6.6 '87 | -50 | -23 | -95 |
| Switzerland | 5¾ '93 v. 3¾ '92 | 53 | 68 | 30 |
| U.K. | 15¼ '96 v. 12 '98 | 34 | 92 | 23 |
| U.S. | 16½ '86 v. 12¾ '87 | 12 | 54 | -10 |
| Canada | 11¼ '89 v. 10 '89 | 12 | 33 | -29 |
| Germany | 10¾ '91 v. 8½ '92 | 6 | 16 | -1 |

(2) The use of *call* provisions (particularly important in the Eurobond market). Low-coupon bonds offer greater call protection than high-coupon bonds. This is because low-coupon bonds must sell at a higher market price than high-coupon bonds with a similar maturity in order to provide a comparable YTM. High-coupon bonds are more likely to be called (repaid at a set price) by the issuer, a risk that must be offset by a higher YTM for the investor.


A.XII.1.v          Sinking Fund


The most common bond is the *bullet bond*. That is, a bond in which all of the principal is repaid in a single installment at maturity. For some bonds, however, the principal is repaid in installments according to a predetermined repayment schedule. Three methods are used by issuers for early bond

redemption:

i.    *Lot drawing at par*. After a grace period, the bond issue is repaid according to a fixed schedule. The bonds to be repaid are drawn at random and reimbursed at par value.

ii.    *Market repurchase*. Part of the bond issue is repaid according to a fixed schedule by which it is purchased in the market at market prices.

iii.    *Issuing of serial bonds*. Serial bonds each have a serial number, and each series has a different maturity and yield. Investors know at issue which bond will be reimbursed and when. This method is seldom used because each series represents a different bond, which reduces the liquidity of the issue.

Sometimes a combination of methods is used.

Example A.XII.8: Ten-year 8% Eurodollar bonds issued by Sony in 1988 allows Sony to meet the redemption schedule by either drawing bonds at par or repurchasing them in the market. ¶

For each bond purchased, an investor can compute the expected cash flows, taking into account the probability each year of being reimbursed. From these cash flows she or he can compute an internal rate of return.

A bond with a mandatory redemption schedule has a smaller duration than a bullet bond with a similar maturity. The *average life* (AL) of a bond is usually defined as the average maturity of the whole issue.  Average life takes into account the fact that some bonds are reimbursed early, which makes it a weighted average of the maturities on each bond.

Example A.XII.9: Suppose we have a five-year, 8% coupon (annual) bond with a sinking fund determined by lot drawing at par. The bond is redeemed in equal parts amounting to one-fifth (20%) of all bonds each year. We want to calculate the AL of this bond.

$1 \times .20 + 2 \times .20 + 3 \times .20 + ... + 5 \times .20 = 3$ years. ¶

Worldwide, there is some confusion over the correct definition of yield-to-maturity for a bond with contractual amortization. Some institutions compute the YTM on Eurobonds as if there were no sinking fund. This is a *yield-to-final-maturity* (YFM) and it is equal to YTM only for those bonds that are reimbursed on the final date. These same institutions often call *yield-to-average-life* (YTAL) what we would call YTM, i.e., the actuarial yield that takes the mandatory sinking fund into account.

Example A.XII.10: Assume that the bond in Example A.XII.9 is trading at 93.84. We want to calculate the YTAL.

Now $T = AL = 3$ years. Using the usual present value formula, we have

$93.84 = 80/(1+YTAL) + 80/(1+YTAL)^2 + 1080/(1+YTAL)^3 \quad \Rightarrow YTAL = 10.50\%$. ¶

Early redemption at par improves the true YTM if a bond is selling under par in the market, but

reduces it if the bond is selling over par in the market. This feature does not apply if the bond is repurchased within the market.

Example A.XII.11: Table A.XII.3 reproduces the average life, duration and YTM for three bonds with a final maturity of ten years. The bonds were issued five years ago. The three bonds are:
1. A zero-coupon bond trading at 62.21.
2. A 8% coupon (annual) bond repaid in full in five years. This bullet bond currently trades at 92.42.
3. An 8% coupon (annual) bond with a sinking fund determined by lot drawing at par. The bond is redeemed in equal parts amounting to one-tenth of all bonds each year. This sinking fund bond currently trades at 93.84.

TABLE A.XII.3

| Bond | Market price | Final maturity (years) | AL (%) | YFM (%) | YTM (sensitivity) |
|---|---|---|---|---|---|
| 1. zero-coupon | 62.21 | 5 | 5 | 10.00 | 10.00 |
| 2. coupon | 92.42 | 5 | 5 | 10.00 | 10.00 |
| 3. coupon with sinking fund | 93.84 | 5 | 3 | 10.50 | 10.00 |

Note: The three bonds have the same YTM. An institution calculating YFM would find a lower yield of 11.25%. ¶


A.XII.1.vi                    Duration

The maturity, or date at which final repayment is made, is the traditional measure of the length of a bond. Another measure has been average life. Both of these measures are concerned only with the principal of the bond. They ignore all interim cash flows. The concept of duration measures the length of a bond incorporating in the measure all cash flows.

The *duration* of a bond is defined as its average maturity. It is a time-weighted average where each date is weighted by the present value of the cash flow paid by the bond on that date. That is, the duration of a bond is the present value weighted average time that bondholders have money owed to them, taking into account both coupon and principal. Duration, D, is a very useful concept: if the bond is held for its duration then the return on the bond is known, as the value of the bond is insensitive to movements in interest rates at t=D.

On the coupon date, D is computed as follows:

$$D = \frac{1}{P} [1\ C_1/(1+r) + 2\ C_2/(1+r)^2 + ... + T\ C_T/(1+r)^T].$$

Duration is easily computed on dates other than coupon dates using a daily compounding formula. Duration is a more precise definition of the average maturity of a coupon bond.

The duration of a zero coupon bond is the same as its maturity. The duration of a zero coupon declines in a straight line between the present time and that maturity date. The duration of a fixed-

rate bond decreases in a non linear way, and more slowly than the decline of a zero coupon bond; in general, duration will increase with maturity, and decrease in steps to zero at the final maturity date.

Duration has a nice property: duration is additive. The duration of a portfolio of bonds can be found by adding the individual duration of each of the bonds in the portfolio. If the duration of the portfolio is the same as the expected holding period then the portfolio is hedged against the risk of movements in interest rates.

Duration is an old concept, as Frederick Macaulay introduced it in 1938. It gained wide use recently when it was recognized that it also measures bond-price sensitivity to interest rate movements.

The percentage change in price induced by a small change, dr, in interest rate is given by

$$\frac{1}{P}\frac{dP}{dr} = \frac{-1}{P}\Sigma_t \frac{t\ C_t}{(1+r)^{t+1}} = -D\frac{1}{1+r} = -D^*.$$

If a coupon bond has a duration of 2, then, the full price of the security will move by 0.02 per cent for a 1 basis point (bp) change in yield (100 bp = 1%). D* is often called *interest rate sensitivity* or *modified duration*. It is a measure of the sensitivity of the price of a bond to interest rate movements.

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♦ **Duration = f(Coupon, YTM, T)**
The formula for the duration of a bond shows that duration -price sensitivity- is a function of the maturity of the bond, the coupon rate, and the YTM.  ♦

---

Example A.XII.12: Go back to Example A.XII.7 Part A. Recall,
FV = USD 1,000.
$C_t$ = USD 80  -coupon rate 10%.
T = 5 years.
YTM = 11% .
P = 924.18. 959.05.

We want to calculate the duration, D, and modified duration, D*, of that bond. In tabular form

| t | $C_t$ | $1/(1+r)^t$ | $C_t/(1+r)^t$ | $t\ C_t/(1+r)^t$ |
|---|---|---|---|---|
| 1 | 80 | .90909 | 72.727 | 72.727 |
| 2 | 80 | .82645 | 66.116 | 132.231 |
| 3 | 80 | .75131 | 54.641 | 180.316 |
| 4 | 80 | .68301 | 49.674 | 218.564 |
| 5 | 1080 | .62092 | 670.595 | 3352.975 |
| Total | | | 924.184 | 3956.813 |

D = 3956.813/924.184 = 4.2814.

D* = 4.1508/(1.1111) = 3.8921.

A bond with a modified duration of 3.8921 rises in price 0.38921% when the interest rate drops by ten basis points (0.10%):

Percent change in P = -D* x Change in interest rate = -3.8921 x (-.10) = .38921.

That is, the dollar gain is USD 924.184 x .0038921 = USD 3.59702. ¶

An increase in the yield will reduce the duration of the bond, and this particularly affects callable bonds, whose duration can be sharply reduced as rising yields increase the likelihood that the bonds will be called. The duration of a portfolio of fixed rate bonds will change with time and the portfolio may need to be reconfigured to ensure that it remains properly hedged. Large changes in interest rates will also affect the duration of the portfolio and again restructuring may be needed.

---

♦ **Duration and Modified Duration**
There are two main types of duration. Never confuse the two. A trader cannot hedge a position using Macaulay's duration. Hedging is possible using modified duration. We will use the concept of modified duration in a hedging application in Chapter XIII. ♦

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A.XII.1.vii     Accrued Interest

Bonds pay interest on coupon payment dates. When an investor sells a security, the buyer compensates for the interest foregone by including an amount of accrued interest in the settlement in the settlement price. This amount of accrued interest is calculated as the fraction of the interest period elapsed multiplied by the interest payment date. Different markets have different methods to calculate the fraction of the interest period using different day-count bases. Even different instruments in the same market have different methods. In Section XII.4.C we listed the most used approaches in different markets. Here, we will present typical examples of accrued interest calculations in the Eurobond market.

To work out accrued interest in the Eurobond market, we must use the Eurobond interest calculation convention. This is established in the AIBD's Rule 225, which says:

> With the exception of FRNs, accrued interest on a contract shall be calculated on a 360 days per year basis (each calendar month to be considered one-twelfth of 360 days, or 30 days, and each period from a date in one month to the same date in the next month to be considered 30 days) from and including the date of the last paid interest coupon or the date from which the interest is to accrue for a new issue, up to but excluding the value date of the transaction.

Therefore, for straight Eurobonds, accrued interest (A) is calculated using the following formula:

A = Nominal amount x coupon/100 x accrual period/360,

where the nominal amount is equal to the face value of the bonds purchase, and accrual period refers to the number of days between the last interest payment date and settlement date. (Note: the maximum number of days in any month by convention is 30; a full month of February also counts as 30 days).

Example A.XII.13: Suppose we have a straight Euro-USD bond that pays an annual coupon of 10% on July 1. Face value of the bond is USD 1,000. We sell the bond on August 29. Recall that delivery in the Eurobond market takes three business days. Therefore, delivery will take place on September 1 (value date). We want to calculate A.

The number of days between July 1 and August 31 (value date is excluded) is 30+30=60.

A = USD 1,000 x 10/100 x 60/360 = USD 16.67. ¶

For FRNs, accrued interest is calculated using a similar formula:

A = Nominal amount x coupon/100 x accrual period/360,

where accrual period now refers to days elapsed, that is, the actual number of days over a 360-day year calendar.

Example A.XII.14: Suppose we have an FRN Euro-USD bond that has a current annual coupon of 10% on July 1. Face value of the bond is USD 1,000. We sell the bond and delivery will occur on September 1. We want to calculate A.

The number of days between July 1 and August 31 is 31+31=62.

A = USD 1,000 x 10/100 x 62/360 = USD 17.22. ¶


Example A.XII.15: Failing to deliver is costly.
A trader sells short EUR 2,000,000 Eurobonds with a 6 per cent coupon at a price of 98%, for regular settlement on Monday 12, 1998. The bond carries 100 days of accrued interest. The proceeds of this transaction are:

| | |
|---|---|
| Principal: | EUR 1,960,000 (EUR 2,000,000 x .98%) |
| 100 days' accrued interest: | EUR   33,333 (EUR 2,000,000 x .06 x 100/360) |
| Total proceeds: | EUR 1,993,333 |

The trader cannot cover her position until Thursday 15, 1998, when she purchases back the EUR Eurobonds at 98%. The penalty for not covering a position is a full coupon payment for each day the bond is not delivered.

On settlement date, Tuesday 20, 1998, she will pay:

| | |
|---|---|
| Principal: | EUR 1,960,000 (EUR 2,000,000 x .98%) |
| 108 days' accrued interest: | EUR   36,000 (EUR 2,000,000 x .06 x 108/360) |
| Total proceeds: | EUR 1,996,000 ¶ |

---

♦ **Failing to deliver is expensive**
When a trader fails to deliver a bond, she loses the coupon interest per day, multiplied by the number

of days the bond is not delivered. As the majority of transactions are settled on a "delivery versus payment" basis, when a trader fails to deliver a security, she cannot gain access to the sale proceeds and she also loses the financing rate on that money. A fail, however, can be avoided if bonds can be borrowed through the repo market. ◆

## A.XII.1.viii    Convertible Bonds and the Global Premium

Convertibles are usually issued at par, or 100%, of the nominal value of the bond. This price includes the value of the investor's option to convert (or the conversion right), as well as the value of the bond as a straight debt instrument (which must therefore be less than par). It follows that to produce a YTM in line with current yields, the coupon level of the issue will be below-market. In practice, the coupon is set above the yield of the stock to encourage the investor to buy a convertible bond rather than the stock itself. The rule of thumb is to set the coupon at a level halfway between the yield of the stock and the coupon on a conventional straight bond.

Example A.XII.16: Voeller, a German corporation, has stock that yields 5.50% annually. Voeller's Eurobonds have a coupon of 7.125% annually and a YTM of 7.355%. Voeller is considering issuing a 7-year Euro-USD convertible bond. Voeller's stock price is DEM 120. The conversion price is set at DEM 150. With this information, an investment bank has a rough estimate for the coupon of the convertible:

(7.125 + 5.50)/2 = 6.3125%,

or, rounding up to the nearest 1/16, 6 5/16%. ¶

Once the coupon is determined, the lead manager calculates the price of the bond alone and subtracts this from 100% to derive the value of the conversion right per bond.

Example A.XII.17: Using the information in Example A.XII.16, the lead manager will attempt to estimate the value of the conversion right for Voeller's convertibles. The YTM on a similar Euro-USD bond with 7 years to maturity is 7.355%. Using the PV formula, the price for the bond alone is 94.45%.

Now, we can calculate the conversion right per bond:

Conversion right per bond: 100 - 94.45 = 5.55 (or USD 55.50 per USD 1,000).

Assume each bond is convertible into 15 shares. Then, the conversion right per share is worth

USD 55.50/15 = USD 3.70.

The exchange rate is .64 USD/DEM. Then, the DEM conversion right per share is

USD 3.70 x 1.5625 DEM/USD = DEM 5.7813. ¶

Whether or not the conversion price is a fair market value is measured by the level of an index called the *global premium* (GP), which is compared with the volatility of the underlying stock over the life of the convertible. The global premium is calculated using the following formula:

GP = (Conversion right per share + Conversion price)/Current share price

Example A.XII.18: Reconsider Example A.XII.16 and Example A.XII.17. Now, we want to estimate the global premium implicit in Voeller's convertibles. Using the above formula, we estimate

GP = (5.7813 + 150)/120 = 1.2982, or a premium of 29.82%. ¶


A.XII.1.ix                Call Options

Bonds are sometimes issued with a call or other options. This is very common in the Eurobond markets, but less so in certain domestic markets, such as the British gilt market. The most common call option is the right given to the issuer to call back the bond at a given date at a price set in the bond contract. This is profitable to the issuer if the market interest rate falls because he or she can redeem high-coupon bonds and issue new bonds with a lower coupon.


A.XII.1.x                Quality Spreads

The interest rate required by a bondholder is a function of the default risk assumed: the greater the risk, the higher the yield that the borrower must pay.

In established markets, agencies (for example, in the U.S., Standard and Poor's, Moody's) assess the creditworthiness of borrowers with respect to specific obligations. The rating is based on both the likelihood of default and the nature and protection afforded by specific obligations.

Moody's and Standard and Poor's provide credit ratings on most international bonds (foreign and Eurobonds).

Example A.XII.19: In Table A.XII.4 we present an example of Moody's and S&P Ratings for International Bonds, as quoted in the *Wall Street Journal* on October 12, 1994.


TABLE A.XII.4

**EURODOLLAR BONDS**
Provided by CS First Boston

| ISSUE (RATING: MOODY'S/S&P) | COUPON | MATURITY | PRICE | CHANGE | YIELD | CHANGE |
|---|---|---|---|---|---|---|
| Quebec (A1/AA-) | 9.125 | 08/22/01 | 104.610 | 0.624 | 8.066 | - 0.114 |
| Belgium (Aa1/NR) | 9.625 | 07/10/98 | 106.853 | 0.372 | 7.308 | - 0.114 |
| IntBkReconDev(Aaa/AAA) | 9.000 | 08/12/97 | 104.588 | 0.254 | 7.016 | - 0.102 |
| UnitedKingdom (Aaa/AAA) | 7.250 | 12/09/02 | 96.691 | 0.710 | 7.660 | - 0.118 |
| IBMJapan (A1/AA-) | 6.500 | 12/03/97 | 97.195 | 0.291 | 7.388 | - 0.101 |
| Sweden (Aa2/AA+) | 5.500 | 12/01/95 | 98.983 | 0.165 | 6.335 | - 0.140 |


Governments are much heavier borrowers than corporations in the international market. To evaluate the creditworthiness of corporate borrowers, traditional analysis can be used, but for governments the task is more difficult. There are different statistical techniques for forecasting sovereign default

and assessing country risk. However, as highlighted by the Latin American Debt Crises of 1982, these methods are not perfect.

*Euromoney* and *Institutional Investor*, at least once a year, publish country-risk rankings. Overall, both publications have similar rankings. For example, in 1994, the top fifteen countries in the list, the safest countries, are almost identical in both rankings.


## A.XII.2 Specific International Techniques

The multi-currency dimension is the major complication of international bond investment. A strategic approach implies decisions about currencies and maturities and requires the use of analytical tools to merge interest and exchange rate analysis.


### A.XII.2.i International yield comparisons

A term structure of interest rates exists for each currency. Investors focus on the yield curve for government bonds ("default-free term structure"). Yields generally differ across currencies. International interest rate differences are caused by a variety of factors, including differences in national monetary-fiscal policies and inflationary expectations.

Example A.XII.20: Two hypothetical term structures for EUR and USD bonds are shown below (the EUR yield is taken from Table A.XII.1):

| Maturity (T) | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| EUR Yield (%) | 4.120 | 4.322 | 4.544 | 4.678 | 4.792 |
| USD Yield (%) | 5.468 | 5.618 | 5.645 | 5.658 | 5.850 |

The difference in yield curves between two currencies is caused by foreign exchange expectations. ¶


### A.XII.2.ii Implied forward exchange rates

How do we compare exchange rate movements and YTM differentials? A higher yield in one currency is often compensated, ex post, by a depreciation in this currency, and in turn, an offsetting currency loss on the bond. It is important to know how much currency movement will exactly compensate the yield differential.

Consider a one-year T-bill with an interest rate $r_{d,1}$ in domestic currency, and $r_{f,1}$ in foreign currency. The current exchange rate is $S_t$, expressed as the domestic currency value of one unit of a foreign currency. Using the IRPT (interest rate parity theorem), derived in Chapter III, it is possible to calculate the forward exchange rate, $F_{t,1}$ that makes an investor indifferent between the two investments:

$$1 + r_{d,1} = (1 + r_{f,1}) \, F_{t,1}/S_t.$$

The implied offsetting currency depreciation is given by

$$\Delta S_1 = (F_{t,1} - S_t)/S_t = (r_{d,1} - r_{f,1})/(1 + r_{f,1}).$$

You should notice that the implied offsetting change in $S_t$ was called, in Chapter III, foreign currency premium (p).

Example A.XII.21: The USD one-year interest rate is $r_{d,1}$=5.468%, the EUR interest rate is $r_{f,1}$=4.120%, and the exchange rate is $S_t$=1.10 USD/EUR. The forward exchange rate is equal to:

$$F_{t,1} = S_t(1+r_{d,1})/(1 + r_{f,1}) = 1.10 \text{ USD/EUR } (1.05468)/(1.0412) = 1.1142 \text{ USD/EUR}.$$

The foreign currency premium (or implied offsetting currency movement) is therefore equal to:

$$\Delta S_1 = (1.1142 - 1.10)/(1.10) = 0.01295 \, (\text{or } 1.295\%).$$

Thus, a 1.295% appreciation of the EUR will exactly compensate the yield advantage of the USD investment.
¶

Similarly, we can calculate implied forward exchange rates on two-year zero-coupon bonds as well as on bonds of longer maturity.

The implied forward exchange rate for a t-year bond is given by:

$$F_{t,T}/S_t = [(1 + r_{d,T})/(1 + r_{f,T})]^T.$$

The implied currency appreciation or depreciation over the t-year period is equal to

$$\Delta S_T = [(1 + r_{d,T})/(1 + r_{f,T})]^T - 1.$$

Example A.XII.22: We are given two hypothetical term structures (five first years). Suppose that $S_0$= 1.10 USD/EUR. With this information we calculate the implied forward exchange rates in Table A.XII.5

TABLE A.XII.5
Implied Forward Exchange Rates and Currency Depreciation

| Maturity (T) | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| EUR Yield (%) | 4.120 | 4.322 | 4.544 | 4.678 | 4.792 |
| USD Yield (%) | 5.468 | 5.618 | 5.645 | 5.658 | 5.850 |
| $F_{t,T}$ (USD/EUR) | 1.1142 | 1.1275 | 1.1351 | 1.1418 | 1.1567 |
| $\Delta S_T$ (%) | 1.295 | 2.500 | 3.193 | 3.798 | 5.151 |

For the above calculations, we assume that the yield curves are for zero-coupon bonds. The formulas are slightly more complicated if we use yield curves for coupon bonds, because we must assume that the coupons are reinvested each year or semester until final maturity. ¶

A.XII.2.iii    Implied Forward Exchange Rate on a Par-Yield Curve

Consider the yield curve for coupon bonds selling at their par value. Our aim is to calculate the terminal value of a bond investment, assuming that all coupons are reinvested in the same currency until maturity.

Let's call $V_t$ this final value for a domestic t year bond and $V_t^*$ for a foreign t year bond. The implied forward exchange rate $F_t$ for maturity t is given by

$$F_t/S = V_t/V_t^*.$$

Assume we know the par yield curve $r_t$. $V_t$ is equal to the sum of the final repayment (and coupon) plus all reinvested coupons, so $V_t$ can be decomposed into its components $v_1$ to $v_t$. For a unit investment (say, USD 1) the final payment is equal to

$$v_t = 1 + r_t.$$

Assume, the annual coupon, which equals $r_t$, is paid every year. Now we must determine the interest rate at which this coupon is reinvested. We know that a coupon paid in year t-1 is reinvested for one year, but we do not know at what rate it will be reinvested.

The most natural assumption is that it will be reinvested at the forward interest rate derived from the term structure, let's call this one-year forward interest rate from the period t-1 to t, $f_t$.

$f_t$ is calculated using the following formula:

$$(1+f_t) = (1+r_t)^t/(1+r_{t-1})^{t-1},$$

where we should recall that $(1+r_1) = (1+f_1)$.

Therefore,    $(1+r_t)^t = (1+f_1)(1+f_2)...(1+f_t)$.

The final value, in local currency, of the reinvested coupon from year t-1 is equal to

$$v_{t-1} = r_t (1+f_t) = r_t (1+r_t)^t/(1+r_{t-1})^{t-1}.$$

Similarly, the final value, in local currency, of the reinvested coupon from year t-2 is equal to

$$v_{t-2} = r_t (1+f_t) (1+R_{t-1}) = r_t (1+r_t)^t/(1+r_{t-1})^{t-2}$$

and so on. For the first coupon paid at the end of the first year, we have

$v_1 = r_t(1+r_t)^t/(1+r_1)$.

Thus, the final value, in local currency, of our bond investment, $V_T$:

$V_T = v_T + v_{T-1} + ... + v_1$.

A similar computation can be performed for $V_T^*$, and then $F_{t,T}/S_t = V_T/V_T^*$ gives the value of the implied exchange rate $F_{t,T}$.


A.XII.2.iv      Implied Forward Exchange Rate: Applications

The implied forward exchange rate is not a forecast, but rather a break-even point. It provides investors with a yardstick against which to measure their own foreign-exchange forecasts. For example, in Example A.XII.22, a USD bond investment is clearly not attractive if we expect a big depreciation of the USD relative to the FRF.

In order to pick bond maturities we examine the term structure of implied forward exchange rates shown in Table A.XII.5. If exchange rate trends are our major concern, a medium-term investment (over five years) in EUR bonds is unattractive because the maximum implied depreciation obtains for five years.

Example A.XII.23: In January 1997 four-year bond yields for USD and JPY bonds of similar quality were 6.55% and 1.79% respectively. The difference in yields suggests that the JPY has to appreciate by 16.7% in four years to make a holder indifferent between both bonds. In other words, the JPY has to move from roughly 115.70 JPY/USD to 96.37 JPY/USD. ¶


We can also use implied forward exchange rates to value international bonds.

Example A.XII.24: Arbitrage and Eurobond Valuation.
In the OTC market in London a BRR 1000 Eurobond with a 4% coupon and with one year to maturity is quoted with a bid/ask price of 95.5-96. The one-year eurodollar rates are 10(1/2)-(5/8), the spot exchange rates are 2.4783-15 BRR/USD, and the one-year forward rates are 2.3954-27 BRR/USD. Clearing charges through Euroclear are USD 1.50. We want to determine if a dealer would buy the BRR Eurobond. If so, we want to determine the arbitrage-free price of the BRR bond.

In one year the BRR return, for the dealer, will be 1040/955=1.08901 (or 8.901%). The dollar return is:
    (1.08901)(2.4783/2.3981) = 1.12543(or 12.55%).

This is greater than the borrowing rate of 10.625.  Therefore, a trader will buy the BRR Eurobond.

We can also think along these lines:

The dealer will borrow Eurodollars to buy the BRR bond, that is, she will borrow USD(955/2.4783). At the

end of the year, she will have to pay [BRR 955/2.4783 BRR/USD](1.10626) = USD 426.29.

At the end of the year she will receive [BRR 1040/2.3981 BRR/USD]=USD 433.68.

Therefore, there exists a riskless profit and she will buy the bond at 95.5.

A. Bid
To avoid arbitrage, we need $(1040/P_{1-bid})(2.4783/2.3981) = 1.10625$.
Therefore, $P_{1-bid} = 971.553$.

B. Ask
To avoid arbitrage, we need $(1040/P_{1-ask})(2.4798/2.3954) = 1.105$.
Therefore, $P_{1-ask} = 974.338$. ¶

Exercises:

1.- What is the difference between a foreign bond and a Eurobond?

2.- Explain how a foreign currency coupon bond issue is, in terms of its cash flow implication for a domestic issuer, equivalent to a domestic currency coupon bond issue plus a series of forward exchange contracts. How then could a foreign currency coupon bond issue be completely hedged against foreign exchange risk?

3.- Suppose Nokkia needs EUR 10 million for two weeks. Nokkia decides to borrow EUR 10 million for 14 days. The Bank of Finland offers 6.55% for a 14-day domestic loan. BNL has an ask rate of 6.40% for a 14-day Euro-EUR loan. Nokkia decides to borrow from BNL. Describe the cashfows of this transaction.

4.- Let's consider the NTK dual-currency bond shown in Exhibit XII.1. It is a bond quoted in yen at 105%. What would happen to the market price of the bond if the following scenarios took place?

(a) The market interest rate on (newly issued) yen bonds drops significantly.
(b) The GBP drops in value relative to the yen.

5.- The NTK bond shown in Exhibit XII.1 matures in 2001. So far, has it been a good or bad investment?

6.- What are the potential biases of the simple interest calculation used in Japan? Take the example of two straight yen Eurobonds with the same maturity of five years. Bond A has a coupon of 12% and bond B a coupon of 8%. The current interest rate on yen bonds is 10%. These two bonds have the same yield-to-maturity of 10% and are correctly priced at USD 107.58 per bond A and USD 92.42 for bond B. What would be the yield to maturity indicated by the simple interest calculation?

7.- An investment banking syndicate follows the following table of flotation costs:

| Maturity | Management fee (%) | Underwriting Allowance (%) | Selling Concession(%) | Total (%) |
|---|---|---|---|---|
| <5 years | 1/8 | 5/8 | 1¼ | 2 |
| 5-8 years | ¼ | ½ | 1½ | 2¼ |
| >8 years | ½ | ½ | 1½ | 2½ |

The syndicate launches a USD 200 million 5-year eurobond issue. The syndicate is composed of a lead manager, who takes half of the management fee, and four co-managers who split the remainder. Five managing banks (who underwrite a total of 30% of the issue), 20 major underwriters (who underwrite 50% of the issue), and 30 minor underwriters (who underwrite the rest) underwrite the issue. The underwriting allowance is split up according to the amount underwritten. The five managers (USD 60 million total, divided equally), 20 major underwriters (USD 80 million total), 30 minor underwriters (USD 30 million total) sell the issue, and 50 additional selling banks (USD 30 million total). The selling concession is split according to the amount sold. Calculate the dollar amount of total fees going to

(a) The lead manager
(b) Each of the co-managers
(c) Each of the major underwriters
(d) Each of the minor underwriters
(e) Each of the selling banks, assuming all bonds are sold at the issue price of 100.
(f) The company

8.- Assume you are the lead manager for a new Eurobond issue. Explain how and under what circumstances the gray market could be helpful to you. Explain how and under what circumstances the gray market could hinder you.

9.- Make the same explanation as in Exercise 8, but from the point of view of a life insurance company portfolio manager.

10.- Is the FPRO a positive development? From whose point of view?

11.- Justify why movements in exchange rates are weakly related to movements in U.S. bond prices.

12.- You lend (repo) USD 10 million of U.S. Treasuries to another party for one week at a repo rate of 5.6 per cent. Repo interest is calculated actual/360 on the full price (i.e., the quoted net price plus accrued interest. There are 181 days in the current interest period and 154 days' accrued interest as of the start date (the initial settlement date) of the agreement. Calculate the proceeds you will receive on the initial settlement and the amount paid when you repurchase the securities. (Recall that interest on U.S. Treasuries is paid on an actual/actual semi-annual basis.)

13.- A trader buys 100 Eurobonds in the secondary market at a price of 84, each bond with a face value of USD 1000 and an annual coupon of 12%. As of the value date for the trade, 112 days will have passed since the last coupon. What is the trader's total dollar payment for the bonds?

14.- A SGD bond with a market price of SGD 4600 and a face value of SGD 5,000 pays annual coupons of SGD 400 and matures in one year. Calculate the coupon yield (C/principal), the current yield (C/P), and the YTM. Interpret each number.

15.- Calculate the YTM of the following bonds:
i. A 5-year zero-coupon bond trading at 45.
ii. A 5-year 10% Eurobond, with no call options or sinking fund. This bullet bond currently trades at 90.5.

16.- Go back to Example A.XII.7. Which of the two bonds has a higher semiannual YTM?

17.- Calculate the modified duration of a bond with 5% coupon, two and a half year until maturity, trading at 91.33 to yield 9%. (Hint: first, calculate the full price, i.e., price + accrued interest). Calculate the new price of the bond if the YTM increases by 1 bp.

18.- A U.K. corporation whose stock yield is 3% issues a 10-year Euro-USD convertible. The current share price is GBP 40 and the conversion right is GBP 55. The volatility of the stock price

has been estimated at 18.40% annually. The risk free rate in the U.K. is 5.5%. The coupon on a straight USD dollar bond of equivalent rating and maturity would be 8%, and with a YTM of 8.375%. The exchange rate is 1.50 USD/GBP. The convertible bonds are issued in denominations of USD 1,000. Assume that each bond is convertible into 10 shares. Using the rule of thumb discussed in Section A.XII.viii, calculate the conversion right per share and the global premium.

19.- By the end of the great bull market in Japan, many companies achieved negative financing through warrant issuance. In June 16, 1987, Tokyu Corp. issued a USD Eurowarrant with a coupon of .875%. The issue amount was USD 150,000,000. Typical of Japanese warrants, the bond has a 5-year maturity and denominations of USD 5,000. At launch, the spot rate was 145.60 JPY/USD. The forward exchange rates were (in JPY/USD) 141.80, 136.52, 131.32, 126.96, 122.79 for the 1-year, 2-year, 3-year, 4-year and 5-year contracts. Calculate the IRR for the Tokyu Corp. issue both in USD and JPY.

20.- In the OTC market in London a GBP 1000 Eurobond with a 6% coupon and with one year to maturity is quoted with a bid/ask price of 93.5-94. The one-year Eurodollar rates are 5 1/4-1/2, the spot exchange rates are .6983-20 GBP/USD, and the one-year forward rates are .6994-27 GBP/USD. Clearing charges through Euroclear are USD 1.50. Determine if a dealer would buy the GBP Eurobond.

21.- From the term structure of CHF government bonds and U.S. Treasuries, you have the following information:

| Maturity | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| CHF Yield (%) | 4.50 | 4.75 | 4.85 | 5.05 | 5.30 |
| USD Yield (%) | 5.70 | 6.00 | 6.30 | 6.50 | 6.90 |

(a) Without doing any calculations, do you expect the CHF to appreciate or depreciate against the USD?
(b) The current exchange rate is .68 USD/CHF. Calculate $F_t$ (USD/CHF) and $\Delta S_t$ (%) for t=1,...,5.

22.- Go back to Example A.XII.24. Calculate the discounted profits, in USD, of buying 100 BRR Eurobonds.