A Primer on Financial Markets: Part I

Why this handout?

To help *Futures* students with the material being covered, I am providing a "financial markets primer." It covers many of the relevant chapters in BKM (the textbook that I have recommended as supplement for *Futures*).

Students are strongly encouraged to review the material in this handout prior to the second lecture. This material, to which I will frequently refer, will not be covered in class.

1. FINANCIAL MARKETS

A **financial market** is a trading arrangement for **financial assets. Financial assets** are usually contractual claims against the earning power of **real assets** (such as a plant, piece of equipment, or land). Financial assets are issued by a variety of entities, mainly companies and governments.

Financial markets can be characterized in a variety of ways. The initial sale of a security occurs on the **primary market** -- for example, each Monday's auction of Treasury bills (or short-term government debt) by the US Treasury. The resale market is called the **secondary market** -- e.g., the New York Stock Exchange provides a market for the resale of corporate stocks. Why are secondary markets important? Most importantly they provide **marketability**, the ability to convert an asset into money. Unlike assets that must be bartered, an asset with an active, currency-based secondary market provides more value -- primarily because of the greater ability to sell the asset quickly for a fair price.

Markets where delivery occurs within a short time span (one to three days) following the original agreement to transact are called **cash** or **spot markets** -- the two terms are used interchangeably. Deferral of delivery until some future date is characteristic of **forward markets** (which typically involve two parties, the buyer and the seller) and **futures markets (**where the agreement between buyer and seller is facilitated and guaranteed by an exchange).

Money markets and **capital markets** are defined as markets for trading securities that have

maturities of, respectively, one year or less and greater than one year. Treasury bills and short-term business debt (called commercial paper in the U.S.) are examples of money market instruments; Treasury notes and bonds, as well as most mortgage-backed securities, are examples of capital market instruments.

If an agreement (contract) requires the delivery of an asset, it is said to be a **firm commitment** or **mandatory delivery contract**. Parties to a mandatory delivery contract *must* carry out the original agreement: one party will buy and the other sell under the specific terms of the agreement (price, quantity, delivery date, etc.). In contrast, a **standby commitment** or **optional delivery contract** gives one party (the purchaser, who is **long** the commitment) the right to walk away from the commitment without taking or making delivery (who is **short** the commitment).

2. PRIMARY/SECONDARY MARKETS

The **primary market** is the market in which a security is initially sold to investors. Stocks and bonds of large corporations are typically sold first by investment bankers who are said to "**underwrite**" the issue. Those investment bankers (some of which may also act as retail brokerage firms -- Merrill Lynch is the largest worldwide) generally contact potential buyers by phone or mail.

Secondary markets are resale markets and exist for stocks, bonds and various other financial assets or securities. **Exchanges** are major players in the secondary market for stocks, bonds and options, but **over-the-counter (OTC) markets** are giving them stiff competition. Secondary markets allow owners of securities to exchange the latter for cash by selling them to a counterparty. The ability for investors to re-sell financial assets on a liquid market enhances overall economic efficiency. For example, the lack of marketability of mortgages used to be (and still is, in several industrialized countries and most emerging economies) a serious impediments to providing financing for house purchases. In some developed countries, however, there is now a secondary market for mortgages. In the U.S., for example, the Federal National Mortgage Association ("Fannie Mae") is a giant player in the secondary mortgage market, with hundreds of billions in assets. The marketability arising from the development of secondary markets for mortgages and mortgage-backed securities tends to make the mortgages more desirable, and their prices therefore rise (required returns fall), making it cheaper for

individuals to obtain financing for homes and other property.

Some secondary markets are said to be **organized** (they have a central trading floor) while others trade **over the counter** (they feature a conglomeration of traders connected by phone, fax, video screens and computer networks instead of a central trading floor). For example, the largest financial market worldwide is the interbank foreign exchange (Forex) market, where currencies are traded OTC for spot and forward delivery. The secondary market for U.S. Treasury issues, likewise, has always been OTC (the major players are forty or so government securities dealers).[1] Until fairly recently, most growing young U.S. companies aspired to have their stock traded on the New York Stock Exchange (or NYSE). However, OTC markets have very much gained in acceptability. For example, the number of shares traded OTC on the NASDAQ is now larger than the volume on the NYSE -- although the NYSE retains the advantage in terms of dollar volume. Indeed, two huge companies that trade on Nasdaq (Microsoft and Intel) have recently been added to the **Dow Jones** Industrial Index.

3. CASH or SPOT *vs.* FORWARD and FUTURES MARKETS *vs.* OPTIONS MARKETS

Cash (or **spot**) **markets** are characterized by "immediate" delivery of the traded assets. The definition of "immediate varies with markets. Overnight bank deposits (called "Federal funds" markets in the U.S.) usually involve same-day payment, while markets such as the Forex market and the secondary market for U.S. Treasury debt typically entail a two day lag between purchase and delivery. Retail stock purchases generally require three business days for delivery. All these are considered cash (spot) market transactions.

Forward markets entail contractual agreements for delivery at some future date, at which time the contractually agreed price will be paid. It is essential to note that all the terms of delivery (price, date, etc.) are fixed when the contract is entered into -- even though the actual delivery will often not take place for months. Futures markets differ from forward markets in that the latter are usually customized two-party negotiated agreements, whereas futures markets always involve an (organized) exchange acting as an intermediary between buyers and sellers. In contrast to forward markets, where

[1] One dealer, Salomon Brothers, dominated the May 1991 auction by illegally placing large orders in customers' names-- it was subsequently fined and pressured by the government to dismiss high-ranking company officers

contracts are almost never guaranteed by a third party, performance on futures contracts is guaranteed by the futures exchange.

Forward-delivery markets can entail either mandatory or optional delivery. In the former case, both parties are bound to the original agreement unless a mutually acceptable alternative is negotiated.[2] The largest forward market worldwide is the OTC forex market, where more than $800 billion worth of currencies are traded every day for forward delivery. Organized futures markets, such as the Chicago Board of Trade (**CBOT**) and Mercantile Exchange (**CME**), the London International Futures Exchange (LIFFE), and the Singapore Futures Exchange, deal mostly in mandatory delivery markets.

Sometimes, parties prefer to contract for optional delivery case. In such a case, the party who is designated as having the right to choose to trigger delivery is said to have an **option**, for which a fee has typically been paid. The counterparty who must "stand by" and wait and see whether delivery is triggered (or "exercised") is said to have "**written**" or "sold" an option, and typically has received a fee for taking the risk.[3] Some customized options trade OTC, but most option contracts have been standardized and trade on organized standby-delivery markets with central trading floors (such as the Chicago Board Options Exchange) that are known as "**option markets**." The organized options and futures markets, unlike stock markets, have the primary and secondary markets operating together at the same location (**why**?). A major advantages of the organized markets is the marketability afforded by the central resale market, the guarantee of performance by the exchange, and the standardization of contract terms, all of which facilitate a smoothly functioning market that allows quick sales at fair prices. The main downside is that the contracts cannot be customized to the exact needs of the parties, which explains why some options still do trade OTC (especially for foreign-exchange transactions).

[2] Note that the delivery date may, but need not, be very far off into the future. All that matters is that the delivery date extend beyond what would constitute spot delivery for the financial asset at hand (e.g. more than 3 days for shares or more than 2 days for a currency such as the UK pound).

[3] What risk is being taken by agreeing to be the standby party? Under what circumstances does the standby party lose money? When, if ever, does the standby party win big?

4. MONEY MARKETS

Money markets, also called "short-term debt" markets, are often viewed as temporary parking places for funds by large institutions and are typically characterized by investors who place a high value on safety and liquidity. Some of the main money market instruments are Treasury bills (T-bills), jumbo certificates of deposit (CDs), Eurodollar CDs, repurchase agreements and commercial paper.

Treasury Bills (T-BILLS)

T-bills are viewed as the safest U.S. investment vehicle, and the most liquid of money market instruments, because of their government backing and their very active secondary market (which provides excellent liquidity). Normally, rates on other money market instruments will be above T-bill rates in proportion to the greater risk of default and lesser liquidity and marketability.

The Treasury Department, with the help of the Federal Reserve banks, accepts bids for three-month (91 day) and six-month (182 day) T-bills from interested parties until 1:00 P.M. each Monday. Twelve-month (364 day) T-bill auctions occur every four weeks. **Competitive bidders** bid a rate (quoted to two decimals) and the Treasury accepts bids, starting with the lowest rate and working up, until its announced target volume of T-bills has been sold. **Non-competitive** bidders can buy up to a few million $ in T-bills without bidding a rate and risking that their bids will be rejected: their non-competitive bids are filled at the weighted average rate of the accepted competitive bids.

T-bills are always sold at a discount from par. Rather than pay interest directly, they generate a return to the investor by appreciating from this discounted value to their **face value** or **par**, which is a minimum of $10,000 (with other denominations in $5,000 increments above $10,000 also available[4]). In order to provide reasonable returns, the discount must be greater for longer-term T-bills (what about the discount rate?).

Rates on money market instruments are (almost always) quoted on an annualized basis. For historical and practical reasons, however, various formulas are used to quote rates. The three formulas most typically used in calculating money market rates are given below, with a numerical example.

[4] Quotes for odd denominations, however, can seldom -- if ever -- be found in the news media.

Examples: rate computation on the money market.

Consider a T-bill with a Face Value = $10,000, Price = $9,600, and N = 182 days.

BANK DISCOUNT RATE (BDR)

BDR = ((Face - Price)/Face) x (360/N)
= (($10,000 - $9,600)/$10,000) x (360/182)
= (($400)/$10,000) x 1.978
= .0791 = 7.91%

Importance: this formula is used in pricing T-bill futures.

Drawbacks: the BDR formula makes three unfortunate simplifications. (i) It uses a round number (the par value of $10,000) instead of the actual price paid as denominator in the rate-of-return computation. (ii) There are more than 360 days in the year. (iii) The compounding of interest is erroneous. All three simplifications are designed to make calculations easier: in precalculator/precomputer days, this saved many hours of calculations. However, the cost of these simplifications is inexactness if one is interested in the effective yield of the instrument.

BOND EQUIVALENT YIELD (BEY)

BEY = ((Face - Price)/**Price**) x (**365**/N)
= (($10,000 - $9,600)/$9,600) x (365/182)
= (($400)/$9,600) x 2.0056
= .0836 = 8.36%

Advantage: The BEY formula corrects for two oversimplifications in the BDR formula by using the actual purchase price as a denominator in place of the $10,000 face price, and by using 365 rather than 360 days.

Drawbacks: The compounding of interest is still erroneous.

EFFECTIVE ANNUAL YIELD (EAY) [2]

$$EAY = (Face/Price)^{(365/N)} - 1 = (\$10{,}000/\$9{,}600)^{(365/182)} - 1 = (1.04167)^{2.0056} - 1 = 8.53\%$$

Advantage: The EAY, by using a power formulation, correctly accounts for the compounding of interest. The EAY formula generates the same numbers that the internal rate of return method you used in your first finance course generates.

The differences in the three formulas can be quite significant. In the example above, there is a yearly difference of 62 basis points when comparing BDR to EAY. Differences tend to be greater at higher levels of interest rates. A rule of thumb is that BDR < BEY < EAY. The only exception is the rare case when N = 365, in which case BEY = EAY because there is no compounding during the year.

Which formula is best? If the only objective is comparing returns for different money market instruments of the same maturity and interest payment characteristics, it is reasonable to use any of the formulas, as long as rates are calculated and compared using the same formula. Still, the EAY formula is more precise (it corresponds to the usual way of computing returns that we know from the early finance course). Thus, if the goal is to represent an absolute measure of annualized return per dollar invested, the EAY formula is appropriate. The EAY is also preferred when comparing instruments of different maturities, or when one instrument is sold at par while another is sold at a discount. Nevertheless, the BDR and BEY formulas are more often used by U.S. businesses; the BDR because of inertia, the BEY because it is a variation of the standard formula used in quoting yields on (longer-term) bonds.

We conclude this section on T-bill markets by giving (on the following page) a general example illustrating how to "switch" between the three quotes.

Question

A bill has a bank discount yield of 6.81% based upon the asked price, and 6.90% based upon the bid price. The maturity of the bill (already accounting for skip-day settlement) is 60 days.

(a) Find the bid and asked prices of the bill.
(b) Calculate the bond equivalent yield of the bill as well as its effective annual yield based upon the asked price.
(c) Confirm that these yields exceed the discount yield.

Answer

(a) $P = 10{,}000\,[1 - r_{BD}\,(n/360)]$, where r_{BD} stands for the discount yield. Thus,

$P_{ask} = 10{,}000\,[1 - 0.0681\,(60/360)] = \$9{,}886.50$

$P_{bid} = 10{,}000\,[1 - 0.0690\,(60/360)] = \$9{,}885.00$

(b) $r_{BEY} = [(10{,}000 - P)/P](365/n)$. Thus,

$r_{BEY} = [(10{,}000 - 9{,}886.5)/9{,}886.5](365/60) = 6.98\%$,

which exceeds the discount yield of 6.81%.

(c) In order to obtain the effective annual yield, r_{EAY}, note that the 60-day growth factor for invested funds is (10,000/9,886.50) = 1.01148. Annualizing this growth rate results in:

$(1+ r_{EAY}) = (1.01148)^{(365/60)} = 1.0719$, which in turns gives $r_{EAY} = 7.19\%$.

5. CAPITAL MARKETS

The long-term markets, or capital markets, include such financial instruments as Treasury notes and bonds (T-notes and T-bonds), corporate bonds, municipal bonds, mortgages, and common and preferred stock. Investors in the capital markets are usually less risk averse than money market investors. And in fact, the capital markets generally experience more price volatility (which is largely a function of **interest rate risk** for long-term debt instruments), more **credit risk** and sometimes more **marketability risk**. In both the money and capital markets, the Treasury instruments are generally viewed as the foundations of the markets, with rates on other instruments being higher in proportion to their higher risks. U.S. T-notes and T-bonds are viewed as having zero credit risk and good marketability, although both have significant interest rate risk. [5]

T-NOTES AND T-BONDS

T-notes and T-bonds are typically issued and mature at prices of $1,000 or multiples thereof (although some of the shorter term T-notes have minimum denominations of $5,000), and they pay interest semi-annually. This contrasts with T-bills, which are zero-coupon instruments that appreciate in value over their lives rather than pay interest. T-notes come in maturities of two to ten years, while T-bonds are typically issued with 30-year maturities. At the time a new issue of T-bonds is offered to

[5] The government debt of countries subject to overthrow or which might refuse to pay off their debt is **not** risk free and may even have to pay rates higher than the debt issues of strong private companies.

the public, the Treasury typically attempts to set the coupon rate on the issue so that the issue will sell as close to par ($1,000) as possible.

After the initial offering of a T-bond issue, supply and demand determine secondary market prices. For example, an increase in the general level of interest rates will cause previously-issued low-coupon bonds to fall to a discount from their $1,000 **par** value in the resale market. Changes in interest rates give rise to the major risk from investments in T-bonds: **interest rate risk**.

As an example of the magnitude of interest rate risk in the T-bond market, recall that U.S. T-bonds issued in the 1960's (when interest rates were very low) ended up selling at discounts of over forty percent from par in the secondary market during the high interest rate environment of the early 1980's. While that example might appear a tad bit extreme, note that interest rates in Japan have been extremely low for a few years, and that it would take a relatively small interest rate increase there to bring about severe capital losses for the holders of recently issued long-term Japanese government bonds.

ZERO COUPON BONDS

Zero coupon bonds are single-payment debt instruments sold at a discount that accrue interest over their life, then pay off in one lump-sum payment at par at maturity.[6] Prior to the 1980s they were rarely issued, but starting in the 1980s they have been issued in a variety of forms. Some corporations have issued zeros, and insurance companies have offered them as single-payment insurance or investment plans. Investment houses have created zeros by (i) buying T-bonds, (ii) "stripping" them, i.e., packaging each of the interest and principal payments to be received from the Treasury separately and (iii) selling these artificially created zero coupon instruments to investors. A key reason for buying "zeroes" used to be tax-minimization, but the tax code has since been rewritten to eliminate this motive. Much more important is the use of those instruments by companies -- such as insurance companies or pension funds -- that have well-know liabilities at some future date and wish to choose investment tools that allow them to fund those liabilities with little risk.

[6] As previously noted, T-bills are a short-term variant of zero coupon bonds.

CALCULATING BOND RATES OF RETURN

Rates of return on bonds, including T-bonds and zeroes, are often calculated using the yield to maturity (YTM) method, an application of the present value method (see the following paragraph) familiar to students of finance. In newspapers and news service reports, the rate is typically computed in two steps: (i) the periodic (usually semi-annual) yield is computed using the internal rate of return method and (ii) that number is then simply doubled to arrive at the quoted yield, which is called a "**Bond Equivalent Yield**." (*compare with the BEY of T-bills*) For example, an 8% coupon T-bond paying $40 interest semi-annually (4% every six months) would be reported as having a YTM of 8% if selling at par, although in reality its effective annual yield is (1.04) x (1.04) - 1 = .0816 = 8.16%.

DETERMINANTS OF INTEREST RATES

The interest rate on any debt instrument is affected by a number of factors. Among the most important are expected inflation, monetary/fiscal/trade policies, credit (default) risk, marketability, term to maturity, tax treatment, competitive factors and servicing/origination costs. Inflation and monetary-fiscal-trade policies tend to affect the general level of interest rates, and thus tend to have a similar effect on the rates of virtually all debt instruments. The remaining factors (credit risk, marketability, etc.), are often unique to particular types of debt instruments and, hence, cause variations in rates across financial instruments.

INFLATION

It is often suggested that inflation is the most important determinant of the general level of interest rates. The higher the expected rate of inflation, the higher the **nominal** or stated rate of return required by any lender, whether a banker making a business loan or an individual loaning to the government by buying government debt. This is a natural reaction to the inflation-induced decline in the purchasing power of money lent out relative to money returned at the loan's maturity. For U.S. T-bills, studies have shown that the **real rate of return** (nominal rate less the inflation rate) averaged

close to one percent for the 50 years preceding 1980. During the 1980s, the real rate of return on T-bills and other short-term debt instruments averaged significantly higher, possibly reflecting inflation risk (changes between tight and lax monetary and fiscal policies, etc.) and perhaps also because (in hindsight) actual inflation was less than expected inflation.

MONETARY/FISCAL/TRADE/POLICY

Although inflation is the most important determinant of the general level of interest rates, governmental policies can greatly affect interest rates, whether by creating inflation or deflation, or by temporarily stimulating or reining in the economy. The mid- and late-1980's in the U.S. were characterized by lax fiscal policy (high government spending and low taxation) and relatively tight monetary policy, the latter necessitated by the perceived need both to fight inflation and to keep interest rates high to defend the dollar *vis-a-vis* other currencies. Partly because of efforts to fine-tune the economy, short-term interest **rates** tend to be more variable than long-term rates.[7]

CREDIT RISK

The greater the probability of full or partial default on a loan, the higher the interest rate in order to compensate for the risk. Thus, AAA corporate bonds, the highest rated corporates, yield only slightly more than Treasury debt, while **junk bonds** (bonds rated below Moody's Baa or Standard & Poor's BBB) usually have calculated yields that are typically at least 200 basis points above Treasury debt rates.

MARKETABILITY

Marketability is a function of the trading volume and efficiency of the secondary (resale) market for an instrument. Secondary markets for U.S. Treasury debt are quite active and efficient: billions of dollars of Treasuries are resold every business day, and **bid/ask** spreads are very narrow. In contrast, some corporate and municipal bonds may trade once or twice a week and **bid/ask spreads** (the

[7] Because f their shorter maturity, **prices** of short-term instruments tend nevertheless to be more stable than those of long-term instruments

difference between the price buyers are offering to pay and sellers are willing to accept) can exceed five (5 !) percent of the face value of the instrument.

TERM TO MATURITY

As explained more fully further below, long-term debt instruments typically exhibit higher rates to compensate for the higher interest rate risk arising from their longer maturity.

TAX TREATMENT

Tax advantages can result in significant differences in rates: the classic example in the U.S. is that of bonds issued by state and local governments (municipal bonds) which, because their interest payments are exempt from Federal taxation, generally yield lower rates than high grade corporate debt with comparable default risk characteristics.

COMPETITIVE FACTORS

Because of market conditions, some types of loans may be characterized by a degree of monopoly power, providing the lender with the ability to extract a higher return. Rural loan markets and consumer loans are examples of loan types that sometimes provide lenders with monopoly profits. In both cases borrowers have limited alternative sources of financing, because rural and consumer loans are usually made only by local financial institutions, and there may be only one or two local lenders.

SERVICING/ORIGINATION COSTS

Some types of debt instruments are more expensive to **originate** (sell) and/or **service** (i.e., manage and do the related bookwork). **Consumer loans** are a classic example. Because they are typically small and require significant credit analysis, as well as paperwork to process payments, they must generate higher gross yields to provide reasonable net returns after expenses.

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BOX: WHY ARE RETAIL CD RATES USUALLY HIGHER THAN JUMBO CD RATES?[8]

Often, **retail** CDs (certificates of deposit for small investors) pay higher rates than jumbo CDs (wholesale market CDs that are sold in $100,000 minimums), a phenomenon that mystifies some market observers. However, consideration of the list of factors affecting interest rates considered above provides some clues why this can occur. The important factors are marketability, competitive factors, and servicing-origination costs.

Compared to retail CDs, jumbo CDs of large banks have greater marketability due to the fact that they can be resold on the secondary market. Investors may be willing to accept lower returns on jumbos because of this marketability, which is in contrast with retail CDs, which have no secondary market, and are usually subjected to a penalty if cashed in early.

From the perspective of the borrower (the depository institution), retail CDs are a more stable source of financing because retail depositors are less rate-sensitive than jumbo depositors. Depository institutions should be willing to pay something extra for this greater reliability. A second aspect of the competitive factors argument is that retail CDs are more likely to tie the depositor to the bank and its array of other money-making services than will a jumbo CD -- another reason for banks to pay a higher rate on retail CDs.[9]

Servicing/origination expenses are higher per dollar for retail CDs than for jumbos, so this factor should mitigate toward lower retail CD rates.

Apparently when all is said and done, the downward pressure on jumbo CD rates caused by high marketability and low reliability (loyalty) outweigh other factors in pricing CDs. Why else would retail (small denomination) CD rates often be higher than jumbo CD rates?

[8] CDs are time deposits (usually from 3 months to one year) offered by banks and other depository institutions.

[9] A counter argument to this is that, if local depositors are less concerned about rates (i.e., they have a relatively low elasticity of demand), then banks should exploit this by offering low rates on CDs