



Financial Market Introduction

Summary

- ◆ Financial Market Definition
- ◆ Financial Return
- ◆ Price Determination
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- ◆ Fixed Income and Interest Rate Market
- ◆ Currency or FX Market
- ◆ Equity Market
- ◆ Historical Volatility vs Implied Volatility

Financial Market Definition

- ◆ A financial market is a market where people trade financial products.
- ◆ Types of financial markets
 - ◆ Fixed income and interest rate market
 - ◆ Currency market
 - ◆ Equity market
 - ◆ Commodity market
 - ◆ Credit market
- ◆ There are the spot market and the derivative market within each market above.

Financial return

- ◆ Financial return is the measurement of profit and loss on an investment or an asset.
- ◆ Return is more important than value itself.
- ◆ Return types
 - ◆ Absolute return: $R_A = V_t - V_{t-1}$
 - ◆ Relative return: $R_R = \frac{V_t}{V_{t-1}} - 1$
 - ◆ Log return: $R_L = \ln\left(\frac{V_t}{V_{t-1}}\right)$

Financial return (Cont)

- ◆ Return attributes
 - ◆ Log return is similar to continuously compounding.
 - ◆ Log return is additive, i.e., $R_{02} = R_{01} + R_{12}$.
 - ◆ For a short horizon, $R_R \approx R_L$
 - ◆ Returns are nearly independent and similar to a random walk.
 - ◆ Returns in future are unpredictable.

Price Determination

- ◆ Actual market price determination
 - ◆ Determined by supply and demand.
 - ◆ Gauged in the real-world measure.
 - ◆ Supply side determination factors:
 - Transaction costs
 - Liquidity
 - Risk/reward preferences of suppliers
 - Capital availability
 - Tax rules
 - Differential information

Price Determination (Cont)

- ◆ Demand side determination factors:
 - Transaction costs
 - Liquidity
 - Accounting
 - Tax rules
- ◆ Model price determination
 - ◆ Determined by model and calibration.
 - ◆ Gauged in the risk neutral measure.
 - ◆ If a trade has the market price, then
 - Model is mainly used to compute risk, such as sensitivities.
 - The model price should be calibrated to the market price.
 - ◆ If a trade doesn't have a market price, then
 - Model price is used for transaction.
 - Model should be calibrated to Vanilla products.

No Arbitrage and Risk Neutral Measure

- ◆ No arbitrage
 - ◆ The law of one price: The same cash flow should have the same price.
 - ◆ It is impossible to invest 0 today and receive positive tomorrow.
 - ◆ Two portfolios having the same payoff at a given future date must have the same price today.
- ◆ Risk neutral probability measure or simply risk neutral measure
 - ◆ Risk neutral probability measure is no arbitrage.
 - ◆ The Arrow security prices are so-called risk neutral probabilities.
 - ◆ A risk-neutral probability is not a real mathematical probability.
 - ◆ These prices are called probabilities as they fulfill the criteria of probabilities so that the probability theory can be used.
 - ◆ In finance, Martingale measure is equivalent to risk neutral measure

Fixed Income and Interest Rate Market

- ◆ Fixed income and interest rate market mainly consists of bonds, notes, debentures, certificates, mortgages, money market funds and interest rate derivatives.
- ◆ Central to any interest rate related topics is to calculate accrued interest.
- ◆ One needs two factors to compute accrued interest: compounding and day count.
- ◆ Commonly used compoundings:
 - ◆ Annual compounding: the accrual interest is given by
$$A(0, t) = (1 + r)^t$$
where r is annual compounded interest rate and t is the accrual period in years.

Fixed Income and Interest Rate Market (Cont)

- ◆ N-time compounding per year, such as semi-annually ($n=2$), quarterly ($n=4$), monthly ($n=12$), etc.; the accrual interest can be expressed as

$$A(0, t) = \left(1 + \frac{r}{n}\right)^{nt}$$

- ◆ Continuously compounding: the accrual interest can be represented as

$$A(0, t) = \exp(rt)$$

- ◆ Simply compounding: the accrual interest is given by

$$A(0, t) = rt$$

Fixed Income and Interest Rate Market (Cont)

- ◆ Day count convention or day count fraction
 - ◆ Day count convention is used to determine accrual period.
 - ◆ Commonly used day count conventions are 30/360, Act/Act, Act/365, Act/360.
 - ◆ For example, the accrual period of 30/360 convention between t_1 and t_2 is
$$t_{12} = \{360 * (Y_2 - Y_1) + 30 * (M_2 - M_1) + (D_2 - D_1)\} / 360$$
- ◆ Interest rate curve:
 - ◆ Yield curve or zero-coupon curve is the term structure of interest rates.
 - ◆ Zero bond curve is the term structure of discount factors.
 - ◆ Bond curve is the term structure of bond yields.
 - ◆ Swap curve is the term structure of liquid instruments, such as futures and swap rates.

Currency or FX Market

- ◆ Currency market convention is one of the biggest sources of confusion for those new to the market.
- ◆ FX quotation
 - ◆ The quotation 1.25 EUR/USD means that one Euro is exchanged for 1.25 USD.
 - ◆ In this case, EUR (nominator) is the base currency and USD (denominator) is the quoted currency.
- ◆ Spot date
 - ◆ The spot date or value date is the day in which the two parties actually exchange the two currencies.
 - ◆ A currency pair requires a specification of the number of days between trade date and spot date, typically 2 business days.

Equity Market

- ◆ Equity price is quoted by Exchanges.
- ◆ Dividend convention
 - ◆ Record date or cut-off date is the date of dividend payment eligibility. The shareholders of record as of the record date will be entitled to receive the dividend.
 - ◆ Ex-dividend date is set exactly 2 business days before the record date. On and after the ex-dividend date, a buyer of the stock will not receive the dividend.
 - ◆ The stock price usually drops at the ex-dividend date.
- ◆ Dividend types:
 - ◆ Discrete dividend.
 - ◆ Dividend yield or continuous dividend.

Historical Volatility vs Implied Volatility

- ◆ Historical volatility
 - ◆ It is the standard deviation of the time series of an asset return.
 - ◆ It is calculated under the real world measure.
- ◆ Implied volatility
 - ◆ It is a model parameter used to back up the market price.
 - ◆ It is derived under the risk neutral measure.
 - ◆ Implied volatilities could be bigger or smaller than historical volatilities.



Thanks!



You can find more details at
<https://finpricing.com/lib/EqRainbow.html>

