Financial Market Introduction

Summary

- Financial Market Definition
- Financial Return
- Price Determination
- No Arbitrage and Risk Neutral Measure
- 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: $R_L = \ln(\frac{V_t}{V_{t-1}})$

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

$$t_{12} = \{360 * (Y_2 - Y_1) + 30 * (M_2 - M_1) + (D_2 - D_2)\}/360$$

- 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/IrCurve.html