W1 Fin Assets and Markets

financial assets: legal claims to future benefits which have monetary values

financial markets: structures where financial assets are traded

financial institutions: institutions or business entities which provide financial services e.g. banks

financial assets

assets: any possession that has value in an exchange; tangible = have values based on physical properties e.g. land; intangible = legal claims to future benefits e.g. financial assets: stocks, bonds

roles: reallocate scarce resources from non-productive to productive use; pool funds; distribute ownership e.g. limited liability; mgmt of risk

types: •debt - fixed payment e.g. bank loans; govt bonds; corporate bonds •equity: payment is based on earnings e.g. common stocks; preferred stocks •others: combi/ derivation of the above two e.g. convertible securities (convertible bonds); derivatives (futures, options, swaps)

properties

1. moneyness (money or near money)

money: cash or check (demand deposit of checking account); near money: saving deposits, fixed/ time deposits, T-bills

2. divisibility: minimum size for liquidation or exchange for money (minimum trade size)

•deposits: (almost) infinitely divisible •equity shares: US→100 shares per lot (round lot 100 shares); SG→100 shares per lot (used to be 1000) •T-bills and bonds: USD/SGD1000

3. reversibility/ round-trip cost

bid-ask spread→difference between the price where the market (or market maker) is willing to buy and sell, function of risk; commission or brokerage fee; stamp fee/ duty; loadings

avg price of bid and ask prices ("mid-price") can change

4. negotiability (negotiable = ownership can be transferred from one party to another party)

5. term to maturity (time interval to final payment) •demand instruments: payment at any time e.g. checking account deposits •short term: T-bills •long-term: bonds •infinite maturity: perpetuities or consols (UK), equities

6. liquidity (thickness of market) •loss due to immediate liquidation: if market is thick, this loss is low •no. of ready buyers and sellers •affects the bid-ask spread 7. currency: exchange rate exposure and risk 8. risk (measure with volatility, beta etc.)

9. convertibility 10. tax status (capital gain tax etc.)

financial markets

roles: provision of liquidity: provide a place of gathering of willing buyer and sellers; price discovery process: determination of price or return of financial assets + influence many factors (e.g. risk, liquidity, info, transaction process); reduction of transaction costs: reduce search time and cost, contracting cost and risk

structure - basic categorisations

1. primary and secondary markets [by stage]

pri: new issue of securities - private placements, IPOs and SEOs; sec: trading of issued securities

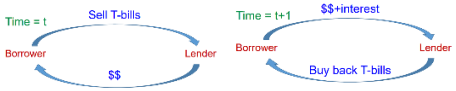
2. by asset class – debt, equity, FX, derivatives

3. money and capital markets [by time to maturity]

money markets: maturity<1 year e.g. T-bills

e.g. repurchase agreement/ "repo"

acquires immediately available funds by selling securities and simultaneously agreeing to repurchase the same or similar securities after a specified time at a given price



yield/return/holding period return: (P2-P1)/P1

discount yield: (P2-P1)/P2 [for money market]

buy at P1, sell at P2 or get P2 upon maturity

capital markets: maturity>1 year e.g. stocks, bonds

4. exchange and OTC markets [by trading]

exchange market: trade, clear and settle in and by an exchange (or its clearing house); products traded must be well standardised

OTC or off-exchange market: trade is done directly between 2 parties without supervision of an exchange, price is not necessarily publicly disclosed → counterparty risk

5. spot and forward markets [by delivery]

spot = immediate; forward = future

W2 Fin Institutions

roles: economy of scale/ scope; risk sharing; alleviate problems caused by asymmetric info

categorised by sources of funds (deposits or not)

depository institutions: institutions that accept deposits and make loans i.e. banks

commercial banks: institutions that accept deposits, make loans, and offer related services •deposits: checking/ savings accounts, time/ certified deposits etc.• loans: commercial & industrial/ consumer loans, mortgages etc. •services: payment, transfer, wealth mgmt •profit sources: interest margins, fees, commissions, off-balance-sheet (OBS) activities

finance companies in SG *in US: don't raise funds by taking deposits, issue commercial papers, bonds, and stocks, and lend these funds to consumers and small businesses

thrifts (S&L associations, mutual savings banks, credit unions) in the US

credit union: no corporate stock ownership; owner by members: mutual; deposits are called shares; membership limited to groups having a common bond of occupation or association

non-depository institutions

insurance: transfer of risk to an entity that pools the risk of loss and provides payment if a loss occurs. risk: timing/ magnitude of payment are uncertain, adverse selection, moral hazard, long lag between receipt and payment (need asset mgmt)

pension funds: retirement plans by govt/ companies/ labour unions; defined contribution (amount contributed) and defined benefit (amount payable); portable vs non-portable; SG – CPF

investment banks: 1. corp fin - securities underwriting (IPOs/SEOs, private placement), M&A 2. sales & trading of securities - asset securitisation (turn illiquid fin assets into marketable securities), creation/trading of securities, market making, arbitrage, investor service (facilitate block trading, provide research, fund mgmt)

investment companies

1. mutual funds: •open-ended - constantly offer and redeem shares, bought & sold at NAV •closed-ended - offer limited no of shares once, traded at discount or premium (closed-end discount puzzle)

2. unit trusts: •fixed no of unit certificates (like closed-end mutual funds) •securities held are specific and not managed (fixed)after the inception

3. private equity: equity investment in private companies – startups or more mature companies, partnership structure (general and limited) 4. hedge funds: derivatives trading; partnership structure like private equity funds, might be restricted to accredited investors, short overvalued & long undervalued 5. sovereign wealth funds: state-owned investment companies (aka govt investment funds); sources of funding via oil & gas exports + non-commodity: transfer of assets from official FX reserves, govt budget surpluses, privatisation revenue

W4 Banks and Risk Mgmt

banks are exposed to and manage interest rate risk, liquidity risk, credit risk, FX risk, trading/ market risk

gap analysis

interest income received from assets; interest expense incurred from liabilities

for a given horizon e.g. 1 day

gap = rate sensitive assets - rate sensitive liabilities

gap position: positive = benefit/ suffer when interest rate increase/ decrease; negative = benefit/ suffer when interest rate decrease/ increase

problems: →basis risk - interest rates in different instruments do not always move together in and in the same magnitude →embedded option risk – pre-withdrawal: when interest rate ↑, depositors exercise option and withdrawal on fixed deposits before maturity and re-deposit at higher rate – pre-payment: when interest rate ↓, borrowers exercise option and prepay loan and refinance at lower rates in either case, interest margin ↓ so impose penalty

duration: CF-weighted avg of time to maturity

$$D = \frac{\sum_{t=1}^{T} \frac{t \cdot C_t}{(1+i)^t}}{\sum_{t=1}^{T} \frac{C_t}{(1+i)^t}}$$

•the longer the duration, all else constant, the more vulnerable the portfolio is to changes in interest rate •penalises later CF →portfolios with more CF earlier, all things constant, will have shorter duration than portfolios with more CF later •portfolios with all CF at termination will have duration = maturity

modified duration: = duration / $(1 + i_0)$

% price change = $\Delta P/P_0 = -ModD \times \Delta i$

$ price change = $\Delta P = -ModD \times \Delta i \times P_0$

duration gap

$$D_{Gap} = D_{Assets} - \frac{MV_{Liabilities}}{MV_{Assets}} \cdot D_{Liabilities}$$

$$\Delta MV_{Bank} = -D_{Gap} \cdot \left[\frac{\Delta i}{(1+i_0)}\right] \cdot MV_{Assets}$$

$$\%\Delta MV_{Net\ worth} = \frac{\Delta MV_{Bank}}{MV_{Assets}} = -D_{Gap} \cdot \left[\frac{\Delta i}{(1+i_0)}\right]$$

•(+)Dgap benefits from interest rate ↓ •(-)Dgap benefits from interest rate ↑ •immunisation: achieving zero Dgap to immunise against shift in interest rate •still does not consider basis risk and embedded option risk

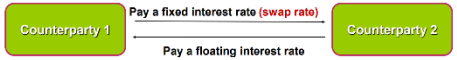
for 2 bonds with different maturity→combining them, cannot take simple arithmetic average of their duration, but should scale them by PV

managing interest rate risk

decision based on gap analysis: target is 0 gap (matched case) for a horizon

decision based on Dgap analysis: target is 0 Dgap

→balance sheet strategies – change balance sheet positions: increase assets - buy assets, issue more loans; decrease assets - sell assets/ securitise; increase liabilities - borrow more funds; decrease liabilities - reduce debt
→off-balance-sheet strategies using interest-rate derivatives: swaps, forwards
fixed-for-floating interest-rate swap



exchange of CF between 2 counterparties
formally: bilateral agreement between counterparties to exchange interest payments calculated using specific rules on a given notional principal (principal is NOT exchanged in the swap)
e.g. a bank had fixed-rate assets and floating-rate liabilities = vulnerable to increase in interest rates →enter a swap where the bank pays fixed and receives floating
forwards: a bilateral agreement between 2 counterparties: a buyer (long position) and a seller (short position) to trade in a specified quantity of a specified good (the underlying) at a specified price (the delivery price) on a specified date (the maturity date) in the future
types of hedging: •transaction hedge/ microhedging: hedge a specific asset or liability •balance sheet hedge/ macrohedging: hedge the entire Dgap to achieve immunisation •routine hedging: seeking to hedge all interest rate exposures •selective hedging: partially hedging
potential issues: ▪when interest rate doesn't move in the direction bank worries about, bank loses money in the hedging position ▪cross-hedge may not be perfect due to basis risk ▪counterparty risks of swaps and forwards
asset & liability mgmt (ALM): manages interest rate risk, overseen by Asset and Liability Committee (ALCO) ▪comprehensive: include full portfolio of assets and liabilities ▪flexible: simulate different interest rate scenarios ▪clear and simple: reports, tables and charts that top mgmt can understand
liquidity risk: banks must have sufficient liquidity to meet obligations, failure→bank runs
reserves requirement – portion of reserves that must be kept in bank to guard against liquidity risk → replenish by 1. interbank borrowing (Fed funds market) 2. selling securities, loans
level of liquidity needed, from an operational standpoint: ▪short-term requirement ▪seasonal requirement ▪structural changes in liquidity requirement || liquidity regulation: ▪Minimum Cash Balance (MCB) ▪Minimum Liquid Assets (MLA) ▪Liquidity Coverage Ratio (LCR) ▪Net Stable Funding Ratio (NSFR) ▪MAS Notices 613, 758, 649, 652
credit risk: risk of default from any counterparty: ▪retail/ corporate borrowers ▪issuers of securities ▪swap counterparties →measure by probability of default (PD) and loss given default (LGD)
FX risk: risk due to fluctuations of foreign currencies, commonly managed by derivatives
market/ trading risk: market risk due to trading activities
central banks: a supposedly independent entity responsible for the monetary policy of its country or of a group of member states (e.g. EU)
•core responsibility: to maintain the stability of national currency and money supply e.g. ▪Federal Reserve System (Fed) in USA ▪European Central Bank (ECB) in EU ▪Monetary Authority of Singapore (MAS) || functions: •issuance of currency •implementation of monetary policy •controlling of money supply •act as a lender of last resort •setting of official interest rate (not SG) •managing FX and gold reserves •managing FX rate •regulation and supervision of banking industry
MAS: founded in 1971, oversees various monetary functions of banking and finance; promotes monetary stability, and credit and exchange policies conducive to economy growth; sets the monetary policy via the FX mechanism (by intervening in the SGD market) rather than the interest rate
The Basel Accords: 3 series of banking regulations (Basel I, II and III) set by the Basel Committee on Bank Supervision (BCBS), an intl committee formed to develop standards for banking regulation, founded in 1974 by central banks from the G10 countries || purpose: ▪ensure banks have enough capital to meet obligations and absorb unexpected losses ▪promote financial stability

W5/6 Interest Rates and Debt Market

Fisher Equation:
(i + i) = (1 + r)(1 + p)
With tax:
(1 + (1 – t)i) = (1 + (1 – t)r)(1 + p)
Inflation:

$$\text{Inflation (p)} = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \times 100$$

or

$$\frac{E(CPI_{t+1}) - CPI_t}{CPI_t} \times 100$$

•**Headline inflation** (total inflation of an economy, may not necessarily reflect the current state of the economy) and **core inflation** (exclude items such as food and energy; MAS core inflation in sg exclude accommodation and private transport)
• **expected inflation:** people's expectation, need to be carefully managed because it might lead to (i) preponement of purchase of G&S (ii) preponement of investments in properties and commodities (iii) demand higher wages
• **deflation:** reduction in prices →(i) past debts more difficult to service (ii) real interest rate can be relatively too high (iii) expected deflation can cause delay in purchase and investment
• **stagflation**: worst type of inflation, persistent high inflation combined with high unemployment and stagnant demand in the economy →both fiscal and monetary policies will hurt the economy
Compounding and non-compounding interest r
• m: # of times interest is compounded in a year

$$1 + EAR = \left(1 + \frac{APR}{m}\right)^m$$

Amortized loan: periodic loan instalments consisting of interest due and reduction of principal (annuity cash flow structure)

$$PV = \frac{C}{r} - \frac{C}{r}\frac{1}{(1+r)^T}$$

• **Flat basis** interest payments are based on original loan amount:
Total interest = P * int rate * years
Monthly payment(PMT) = (P + total int) / (years * 12)
Find i using fin cal (for 1 month)
APR = i * 12 → EAR apply formula
• **Discounted flat** based on original loan amount (same as flat basis) but use "discount yield":
P + interest = P/ (1 – i * years)
PMT = (P + int) / (years * 12)
Solve for i (fin cal) --> APR = i * 12 → EAR
• **Annual rest basis** interest based on beginning-of-year loan balance.
Solve PMT using fin cal (annual payment) n = 3
PMT per month --> annual PMT / 12
Solve for i using fin cal with PMT=monthly PMT
• **Declining balance** interest based on beginning-of-month loan balance (In this case, same as monthly rest).
I = APR/12 (APR = quoted rate) --> EAR can be derived
PMT (monthl) --> plug into fin cal
Interest is calculated based on the outstanding balance of the loan at the beginning of each month. As the outstanding loan amount is paid down every month, the interest also reduces over time.
• **Discount vs Flat basis**:
• Flat: yield = (total payment-Principal)/Principal vs discount uses discount yield= (total payment-principal)/total payment
Bond: promissory note/ security issued by borrower that obligates issuer to make specified payments to the holder over specific period
• YTM = IRR that solves the following equation, *m for no. of times paying per year.

$$P_0 = \sum_{t=1}^{T} \frac{C_t}{(1+YTM)^t} + \frac{F_T}{(1+YTM)^T}$$

• EAY = (1 + YTM/m)^m – 1
• Bond price and market interest rates are negatively related
• YTM < coupon > premium, discount vice versa
•All else constant, longer maturity →more price sensitive to interest rate changes. •All else constant, lower coupon rate → more price sensitive to interest rate changes •For any bond, a given increase in interest rate will cause a smaller price change than a decrease in interest rate of the same magnitude.
types of bonds: level coupon bonds (periodic fixed PMT) | perpetual bonds (price = C/i) | pure discount/zero-coupon | callable (bond with call provision) | convertible (can convert to stocks at pre-specified ratios) | floating rate (adjustable C, tied to int rate index, traded close to par) | Euro (mkt of issue != currency) | Asian dollar (Eurobond issued in Asia) | foreign bonds (mkt of issue = currency NOT nationality of issuer) | domestic (currency = mkt of issue = nationality) | Dim Sum (Yuan denominated bond issued outside china by chinese firm) | Diaspora, social impact, green, catastrophe, pandemic) • green bond = environmentally friendly investments with potential govt support/tax exemption → greenwashing
Yield curve: graphical r/s between yield and maturity for 0-coupon bonds of same credit rating (same risk) but different maturity. •most commonly used: constructed with T-bills and T-bonds →minimal default, liquidity risk •possible shapes: upward, flat, downward sloping
US Treasury securities •issued by US treasury to finance national debt and other federal govt expenditures •backed by full faith and credit of US govt •seemingly default free; pay relatively low yields •types: T-bills(0-coupon with maturity < 1 year), T-notes (semi-annual, 2< maturity <10), T-bonds (semi-annual, 10 < maturity < 30), T-strips (periodic interest pmt separated from final principal pmt→2 sets of securities), Municipal securities (issued by state/ local govt)