自然选择

Natural Selection | PCN

Course Notes

专业课笔记

Professional Course Notes

# 自然选择-专业课笔记-内容清单

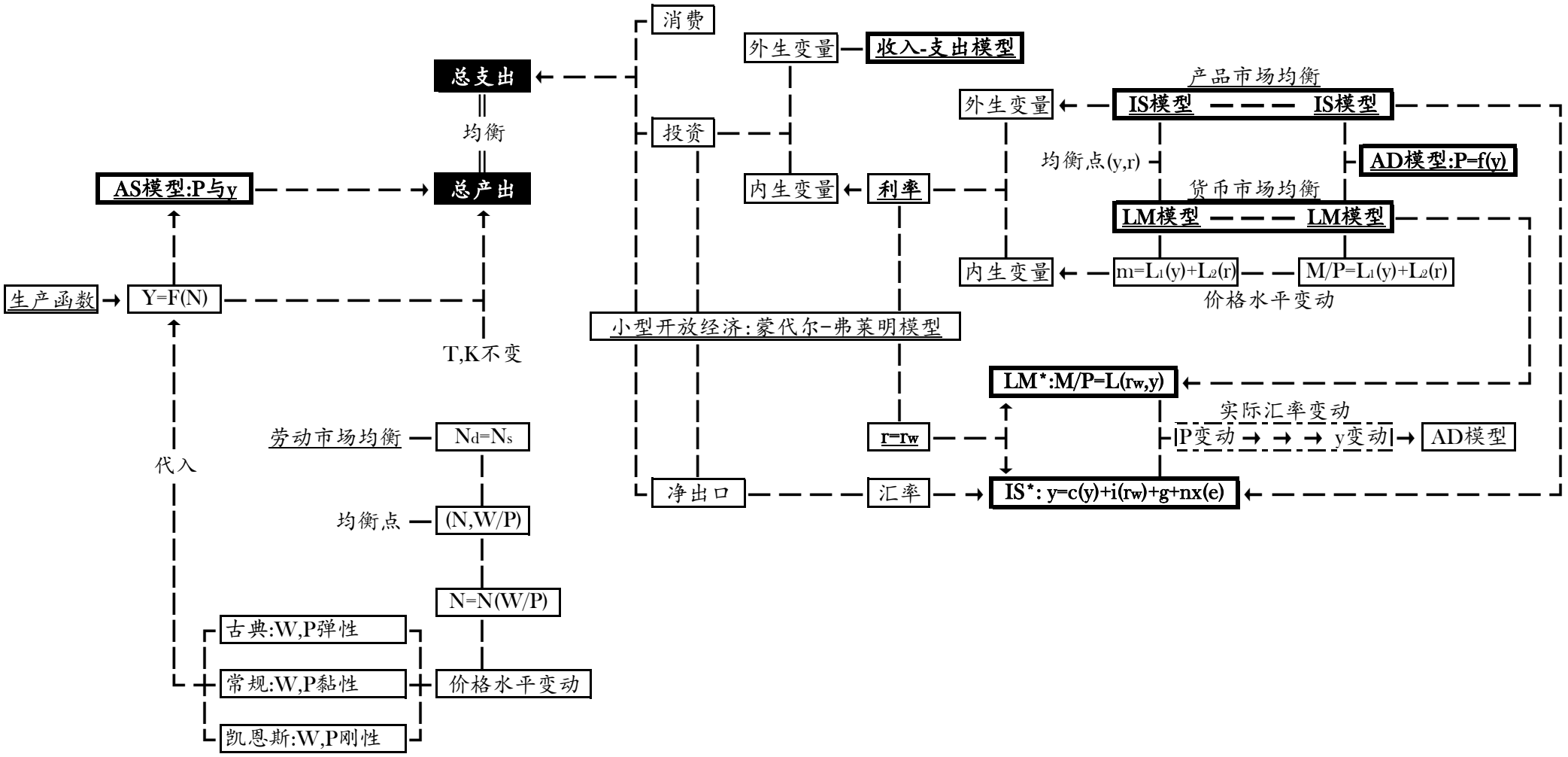
第一版
第二次分享



- 宏观经济学框架
- 基本指标及其衡量
- 收入-支出模型
- IS-LM模型
- AD-AS模型
- 失业与通货膨胀
- 宏观经济政策
- 开放短期经济模型
- 经济增长
- 微观基础
- 新古典vs新凯恩斯
- 经济学派时间轴

- Quantitative
- Economics
- Financial Reporting Analysis
- Corporate finance
- Equity
- Fixed-income
- Derivative
- Alternative
- Portfolio management
- Products&risk models
- Market Risk
- Credit Risk

宏观经济学框架


消费
外生变量
收入-支出模型
总支出
投资
均衡
AS模型:P与y
总产出
内生变量
利率
生产函数
Y=F(N)
T,K不变
小型开放经济:蒙代尔-弗莱明模型
产品市场均衡
外生变量
IS模型
IS模型
均衡点(y,r)
AD模型:P=f(y)
货币市场均衡
LM模型
LM模型
内生变量
m=L1(y)+L2(r)
M/P=L1(y)+L2(r)
价格水平变动
LM*:M/P=L(rw,y)
实际汇率变动
P变动
y变动
AD模型
r=rw
劳动市场均衡
Nd=Ns
代入
均衡点
(N,W/P)
N=N(W/P)
古典:W,P弹性
常规:W,P黏性
凯恩斯:W,P刚性
价格水平变动
净出口
汇率
IS*: y=c(y)+i(rw)+g+nx(e)

# 宏观经济的基本指标及其衡量(2-1)

张子涉

## 宏观经济学的特点

研究对象

研究社会总体的经济行为及其后果

**研究国民收入**

如何使国民收入稳定以较合适的速度增长

经济波动⇌就业与失业问题

价格水平⇌通胀问题

经济增长问题

重要指标

**国民收入**及其增长率

国内生产总值；国内生产净值；

国民生产总值；国民生产净值；

国民收入(狭义)；个人收入；

个人可支配收入

失业率，物价水平及其变动

微观经济学

以价格为中心⇒价格理论

**宏观经济学**

**以国民收入为中心⇒收入理论**

**基本理论框架**

**三大部门：家庭，企业，政府**

**三大市场：产品，货币，劳动**

国民收入决定的**收入-支出模型**

**产品市场供求关系⇒国民收入决定**

国民收入决定的***IS-LM*模型**

**加入货币市场供求关系⇒国民收入决定**

国民收入决定的***AD-AS*模型**

**再加入劳动市场供求关系⇒国民收入决定**

与微观经济学的异同

相同点

有着相同的供求曲线形状，交点决定价格和产量

经济政策都是政府运用一定经济手段引导和规范微观经济主体行为，使之趋向有利于改善社会的经济福利

不同点

| | 微观经济学 | 宏观经济学 |
|---|---|---|
| | 个体经济活动参与者行为及其后果 | 社会总体的经济行为及其后果 |
| | 单个商品的价格和成交量 | 整个社会的价格水平和产出水平 |
| 经济政策目标 | 解决资源优化配置的问题 | 解决资源利用的问题 |

## 国内生产总值*GDP*及其核算方法

国内生产总值概念

国民收入核算(核心指标*GDP*)

研究定义和计量总产出or总收入的方法

最终产品：在一定时期内生产的并由其最后使用者购买的产品和劳务

中间商品：用于再出售而供生产别种产品用的产品

**国内生产总值**

经济社会(一国或一地区)在一定时期内运用生产要素所**生产**的全部**最终产品**(物品和劳务)的**市场价值**

1.市场价值；2.最终产品；3.生产(非销售)；4.流量(非存量)；5.地域概念；6.市场活动

**产出=收入=支出**

国民生产总值

某国国民所拥有的全部生产要素在一定时期内所生产的最终产品的市场价值

*GDP*核算方法

**支出法　*GDP=C+I+G+(X-M)***

核算在一定时期内整个社会购买最终产品的总支出

**消费支出**

包括购买耐用消费品、非耐用消费品和劳务的支出

**投资**：增加或更换资本资产的支出

折旧：资本物品由于损耗造成的价值减少

生产中资本物品的有形磨损&资本老化的无形磨损

固定资产投资+存货投资

**总投资=净投资+重置投资**

**政府购买**(政府购买⊂政府支出)

各级政府购买物品和劳务的支出

转移支付&公债利息⊂政府支出,不计入*GDP*

**净出口**

**收入法**

用要素收入(企业生产成本)核算GDP

**包括间接税+折旧+未分配利润等**

**包含项目**

1.工资+利息+租金等生产要素的报酬

2.非公司企业主收入

3.公司税前利润

公司所得税+社会保险税+div.+R/E

4.企业转移支付及企业间接税

间接税：货物税+销售税+周转税

5.资本折旧

与支出法计算理论相等

实际中加统计误差

## 名义GDP和实际GDP

ΔGDP=ΔQ×ΔP

**名义GDP(货币GDP)**

用生产物品和劳务当年价格计算的全部最终产品的市场价值

**实际GDP**

用从前某一年作为基期价格计算出来的全部最终产品的市场价值

**GDP折算指数=名义GDP/实际GDP**

名义GDP不反映实际产出的变动

不作说明，本书GDP均为实际

小写字母表示实际量

## 加总法(注意事项)

宏观分析中有些总量变化**可以**从微观分析的个量直接加总

有时微观经济学一些个体变量**可以加总，但达不到研究**社会经济行为的**目的**

有时微观经济个体的行为根本**不能直接加总**

# 宏观经济的基本指标及其衡量(2-2)

子 張
沐 涔

## 国民收入的其他衡量指标

### 国民收入衡量

**国内生产总值GDP**

未扣除当期的资本耗费即折旧

若扣除→国内生产净值

**国内生产净值NDP**

**NDP=GDP - 资本折旧**

扣除资本消耗或者说重置投资部分

**国民收入NI**

**NI=NDP - 间接税 - 企业转移支付 + 政府补助金**

此处指按生产要素报酬计算的国民收入

一国生产要素在一定时期内提供生产性服务所得到报酬意义上的国民收入

工资+利息+租金+利润

**个人收入PI**

**PI=NI - 公司未分配利润 - 公司所得税 - 社会保险税(费) + 政府对个人的转移支付**

**个人可支配收入DPI**

**DPI=PI - 个人所得税**

### 几点说明

GNP=GDP + 国外要素所得净额

国外要素所得净额(国外要素净支付)
=本国生产要素在他国获得收入 - 本国付给外国生产要素在本国获得的收入

本国在国外要素所得的净额，而非外国的要素

国民收入并不会都给个人

减去公司留存收益和社保缴款

净利息=企业付给家庭部门的利息 - 家庭部门付给企业的利息(消费信贷)

GDP的意义上

**总收入=总支出=总产量**

**收入 ⇒ NI= 工资+利息+租金+利润=消费+储蓄**

**支出 ⇒ GDP=C+I+G+(X-M)**

**产量 ⇒ Y**

## 国民收入的基本公式

**两部门经济**(家庭+企业)

无企业间接税，无折旧

**⇒ Y=GDP=NDP=NI**

定义：GDP=C+I; NI=C+S

⇒ **I=S**

**恒等式由储蓄和投资的定义得出**

支出角度GDP(Δ库存=存货投资)

↳ GDP=C+I　　NI=C+S ↰

收入角度NI(按收入去向计算)

**三部门经济**(家庭+企业+政府)

政府收入=税收

政府支出=政府购买+转移支付

**支出角度**Y=GDP=C+I+G

转移支付已包含在C+I

**收入角度**Y=NI=C+S+T

政府净收入$T=T_0-t_r$

=税收-转移支付

I+G=S+T,or **I=S+(T-G)**

**投资=私人储蓄+政府储蓄**

T-G=政府储蓄

**四部门经济**(家庭+企业+政府+国外)

**支出角度**Y=GDP=C+I+G+(X-M)

**收入角度**$Y=NI=C+S+T+K_r$

$K_r$:本国居民对外国的转移支付

$I+G+(X-M)=S+T+K_r$

**$I=S+(T-G)+(M-X+K_r)$**

**投资=储蓄(私人+政府+海外)**

加入企业间接税和折旧，等式仍成立

Y=GDP:包含折旧的总投资和总储蓄

Y=NDP:不含折旧的净投资和净储蓄

Y=NI:两边同减间接税的量值

名义值增加部分

**目前数量×(目前价格-基期价格)**

扣除后为实际增量→GDP折算指数用帕氏

基期交易量易获得→CPI用拉氏

## 失业与物价水平的衡量

### 失业的衡量

美国劳工统计局人口分类

未满16岁+现役军人+精神病人和劳教人员

非劳动力:操持家务者+在校学习者+年老退休者+病残者

劳动力:就业者+失业者

**劳动力=就业人数+失业人数**

**失业率=(失业人数/劳动力数量)×100%**

劳动力参与率=(劳动力数量/成年人口总数)×100%

失业率的局限性

不能明确区分全日制工作和打短工

存在劳动者未能充分利用其技能的问题

劳动者或由于各种原因虚报、谎报就业状况以谋取好处

经济增长与失业率变动关系

注意是劳动密集型还是资本密集型

### 物价水平的衡量

物价总水平(一般物价水平/价格指数)

**所有商品和劳务交易价格总额的加权平均值**

3种价格指数

**消费价格指数CPI**(生活费用价格指数)

通过计算城市居民日常消费的生活用品和劳务的价格水平变动而得到的指数

**CPI=(现期价格指数/基期价格指数)×100%**

**生产者价格指数PPI**

通过计算生产者在生产过程中所有阶段上所获得的产品的价格水平变动而得到的指数

GDP的价格指数：**GDP折算指数**

**GDP折算指数与CPI的区别**

| | |
|---|---|
| 全部最终产品与劳务 | 消费品，不含生产性物品 |
| 只包括国内产品价格 | 进口产品价格影响CPI |
| 各种产品权重变动 | 各种产品权重固定 |

### 几点说明

CPI计算未把居民所购消费品全部计入

只挑选对居民生活影响较大的

CPI只能大致反映居民生活成本(未考虑产品性能&质量)

**价格指数统计方法的区别(交易量是基期/当期)**

基期加权价格指数/拉氏价格指数/拉斯拜尔公式

$L_P=\Sigma P_1Q_0/\Sigma P_0Q_0$　夸大成本上升(未考虑替代品)

计算期加权价格指数/帕氏价格指数/帕煦公式

$P_P=\Sigma P_1Q_1/\Sigma P_0Q_1$　低估生活质量的下降(替代品)

# 国民收入的决定：收入-支出模型(2-1)

张子涉

## 均衡产出

最简单的经济关系

**假设**

**二部门经济**

只有家户部门和企业部门
消费和储蓄都发生在家户部门
生产和投资都发生在企业部门
企业投资是外生的,不随利率&产量变动

**凯恩斯定律**

不论需求量是多少，经济社会均能以不变的价格提供相等的供给量
总需求变动影响产量和收入以达到供求相等，不影响价格
定律适用于短期，价格具有黏性

**折旧和公司未分配利润为零**

*GDP=NDP=NI=PI*

均衡产出的概念

**均衡产出或收入:和总需求相等的产出**

产出=需求 ⇒ ***y=c+i* ⇒ 均衡条件**

*c+i*:居民和企业实际想要有的消费和投资
意愿(计划)消费和投资的数量
不是国民收入构成公式中的实际发生
区别
**国民收入核算：**
实际产出=计划支出+非计划存货支出
**国民收入决定理论：**
均衡产出=计划需求(支出)

均衡产出是和总需求相一致的产出，也就是经济社会的收入正好等于全体居民和企业想要有的支出

***E*代表支出，*y*代表收入:*E=y***

均衡产出水平决定于总需求或总支出水平

**投资等于储蓄(均衡条件)**

*E=c+i, y=c+s*

计划支出=计划消费+计划投资
收入=计划消费+计划储蓄
***i=s* 均衡条件**

经济达到均衡，计划投资必须等于计划储蓄
区别：此处为均衡条件，国民收入核算为根据定义得出的实际数字必然相等

## 凯恩斯的消费理论

**消费函数**

影响消费最重要的因素是家户收入(凯恩斯)
消费函数/消费倾向：消费和收入的关系

**边际消费倾向*MPC*** *(Δc/Δy,dc/dy)*

增加的消费与增加的收入的比率
**边际消费倾向递减**

**平均消费倾向*APC*** *(c/y)*

任一收入水平上消费支出在收入中的比率
平均消费倾向递减，但始终大于*MPC*

**凯恩斯绝对收入消费理论**

***c=α+βy***

*α*:自发消费部分
*β*:边际消费倾向*MPC*
随收入增加，*APC*趋向于*MPC*

**储蓄函数**

储蓄函数：储蓄与收入的关系

**边际储蓄倾向*MPS*** *(Δs/Δy,ds/dy)*

储蓄增量对收入增量的比率

**平均储蓄倾向*APS*** *(s/y)*

任一收入水平上储蓄在收入中所占的比率

消费函数和储蓄函数的关系

**定义*s=y-c*, *s= -α+(1-β)y***

*APC&MPC*都随收入增加而递减，*APC>MPC*
*APS&MPS*都随收入增加而递增，*APS<MPS*

***APC+APS≡1,MPC+MPS≡1***

家庭消费函数和社会消费函数

**前者推导后者需考虑的限制条件**

国民收入的分配
不均等⇒社会消费曲线向下移动
政府税收政策
累进个人所得税⇒消费多
公司未分配利润在利润中所占比例
未分配利润占比大⇒消费少

**影响消费的其他因素**

利率
**替代效应**(低收入):利率提高⇒储蓄增加
**收入效应**(高收入):利率↑⇒未来收入↑
⇒认为自己富有⇒消费增加,储蓄减少

价格水平
通过实际收入改变影响消费
物价↑⇒实际收入↓⇒保持生活水平⇒*MPC*↑
货币幻觉
物价&货币收入↑⇒
消费者误以为实际收入↑⇒*APC*↑

收入分配
国民收入分配平均⇒*APC*↑

社会保障制度

## 两部门经济中国民收入的决定及变动

使用消费函数决定收入

假设:计划净投资是外生变量

$$\begin{cases} y=c+i \\ c=\alpha+\beta y \end{cases} \Rightarrow y=\frac{\alpha+i}{1-\beta}$$

消费曲线:c
消费投资曲线:*c+i*⇒总支出曲线

使用储蓄函数决定收入

$$\begin{cases} i=s=y-c \\ s=-\alpha+(1-\beta)y \end{cases} \Rightarrow y=\frac{\alpha+i}{1-\beta}$$

国民收入决定·小节

| | 均衡条件 | 函数 | |
|---|---|---|---|
| ❶ | **产出需求(支出)等式** | **消费函数** | 联立 |
| ❷ | **投资储蓄等式** | **储蓄函数** | 联立 |

## 乘数论

**投资乘数*(k=Δy/Δi)***

收入变化与带来该变化的投资支出的变化的比率

增加投资购买的是最终产品

最终产品价值=国民收入

$$k=\frac{1}{1-MPC}=\frac{1}{1-\beta}=\frac{1}{MPS}$$

国民收入的决定：收入-支出模型(2-2)



## 三部门经济的收入决定

支出角度 $Y=GDP=C+I+G$

- 转移支付已包含在C+I

收入角度 $Y=NI=C+S+T$

- 政府净收入 $T=T_0-t_r$

**宏观均衡条件**

- $c+i+g=c+s+t$；**$i+g=s+t$**

税收

- 定量税:税收量不随收入而改变
- 比例所得税:随收入增加而增加

定量税下：

外生变量:t,i,g

$i+g=s+t$，$s=y-c$ → $y=\frac{\alpha+i+g-\beta t}{1-\beta}$

$c=\alpha+\beta y_d$

$y_d=y-t$　　$s+t=-\alpha+(1+\beta)t+(1-\beta)y$

- $y_d$:可支配收入

## 四部门经济中国民收入的决定

收入决定

总支出(总需求)

- $y=c+i+g+nx$; $nx=x-m$
- $y$= 需求(家庭+企业+政府+外国(净))
- $x$:由外国购买力和购买需求决定
- $m$:随收入提高而增加(独立的消费函数)
  - **$m=m_0+\gamma y$**　国民收入↑⇨m↑⇨nx↓
    - $m_0$:自发性进口；$\gamma$:边际进口倾向

| | |
|---|---|
| $y=c+i+g+x-m$ | 外生变量 |
| $c=\alpha+\beta y_d$ | $t=t$　$i=i$ |
| $y_d=y-t+t_r$ | $g=g$　$t_r=t_r$ |
| $m=m_0+\gamma y$ | $x=x$ |

⇓

$$y=\frac{1}{1-\beta+\gamma}(\alpha+i+g-\beta t+\beta t_r+x-m)$$

乘数

**对外贸易乘数**　$dy/dx$

出口增加1单位引起国民收入变动的多少

$$\frac{dy}{dx}=\frac{1}{1-\beta+\gamma}<\frac{1}{1-\beta}\quad \because 1>\gamma>0$$

投资乘数、政府购买乘数均变小

$$k=k_g=\frac{1}{1-\beta+\gamma}<\frac{1}{1-\beta}$$

增加的收入一部分购买进口商品

结束语

关于乘数理论的限制

- 社会中过剩生产能力的大小
- 投资和储蓄决定的相互独立性
- 货币供给量增加能否适应支出增加的需要
- 增加的收入不能用于购买进口货物

## 三部门经济中各种乘数

$$y=\frac{\alpha+i+g-\beta t}{1-\beta}$$

**政府购买支出乘数**

收入变动对引起这种变动的政府购买支出变动的比率

$$k_g=\frac{\Delta y}{\Delta g}=\frac{1}{1-\beta}$$

**税收乘数**

收入变动对引起这种变动的税收变动的比率

$$k_t=\frac{\Delta y}{\Delta t}=\frac{-\beta}{1-\beta}$$

$t$↑⇨可支配收入↓⇨消费↓⇨总支出↓

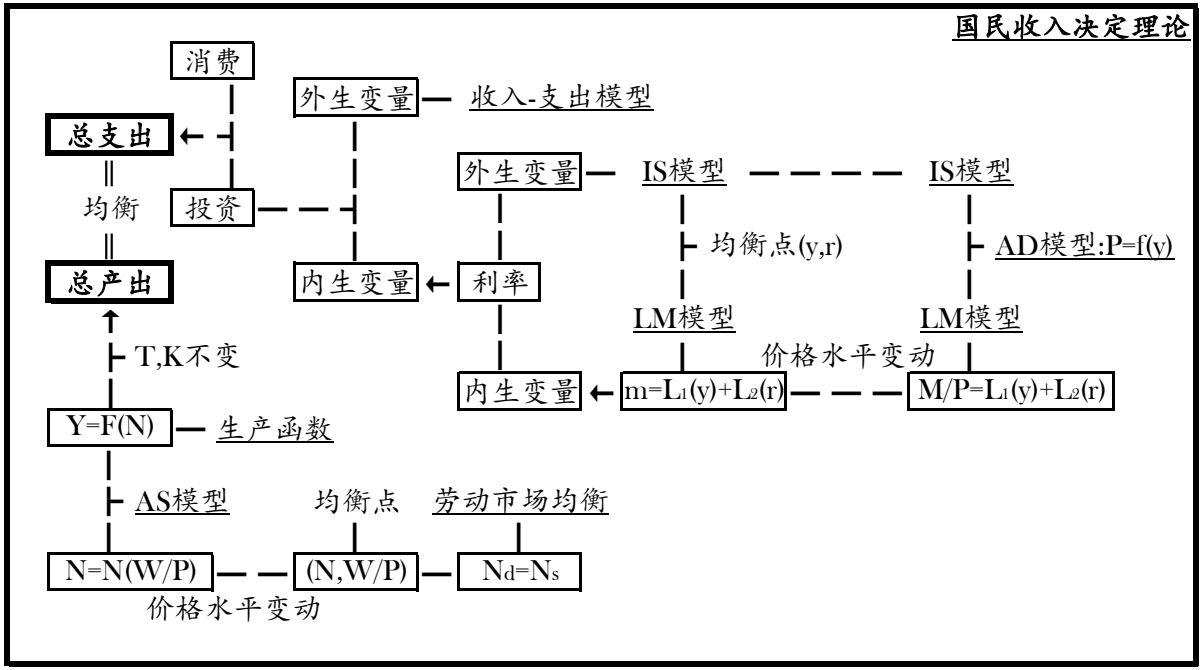
**政府转移支付乘数**

收入变动对引起这种变动的政府转移支付变动的比率

$$y=\frac{\alpha+i+g+\beta t_r-\beta t}{1-\beta}\quad;\quad k_{t_r}=\frac{\Delta y}{\Delta t_r}=\frac{\beta}{1-\beta}$$

**平衡预算乘数**(税收和政府购买)　**$k_b=\Delta y/\Delta g=1$**

政府收入和支出同时以相等数量增加或减少时,国民收入变动与政府收支变动的比率



国民收入的决定：IS-LM模型(3-1)　*IS:* 由利率解释投资;*LM:* 由供求解释利率

子 張
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投资的决定

打破假设:将投资变为内生变量

投资:资本的形成，社会实际资本的增加

厂房、设备等的增加

**决定投资的因素**

实际利率，预期收益率，投资风险

**实际利率与投资**

凯恩斯:投资取决于(预期利润率vs利率)

实际利率=名义利率 - 通胀率

***i=i(r)=e-dr；*** *e:* 自主投资

***d:* 投资需求对于利率变动的反应程度**

**资本边际效率*MEC***

一种贴现率，使得一项资本物品的使用期内各项预期收益的现值之和等于这项资本品的供给价格或重置成本(IRR)

$R=\sum_{i=1}^{n}\frac{R_i}{(1+r)^i}+\frac{J}{(1+r)^n}$ ；*r:MEC*

资本边际效率曲线

预期收益($R_i$,$J$)既定时,R↑r↓

即:投资量↑资本边际效率↓

投资量和利率反向变动

**投资边际效率**曲线*MEI*

由于R上升而被缩小的r的数值

*int.rate* ↓⇨投资↑⇨需求(资本品)↑⇨投资量R↑⇨r↓

更精确地表示投资与利率的关系

**预期收益与投资**(影响预期收益的因素)

对投资项目的产出的需求预期

产品成本

特别是劳动者的工资成本

① 工资↑⇨投资需求↓

② 工资↑⇨需求(购买机器替代人力)↑

投资税抵免　新古典经济学

政府规定,投资的厂商可从其所得税单中扣除其投资总值的一定百分比

取决于政策是临时的or长期的

**风险与投资**(经济繁荣,risk↓)

凯恩斯:投资需求与投资者情绪大有关系

托宾的q说

*q*= 企业的股票市场价值/新建企业的成本

IS曲线

**IS曲线及其推导**

产品市场均衡

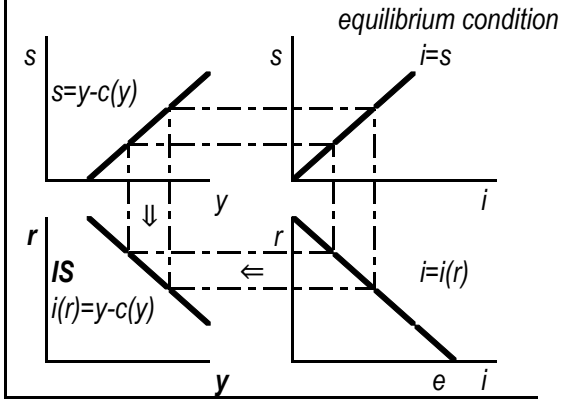
产品市场上总供给等于总需求

$y=\frac{\alpha+i}{1-\beta}\Rightarrow y=\frac{\alpha+e-dr}{1-\beta}$ ☆ (↱ *i=e-dr* ↴)

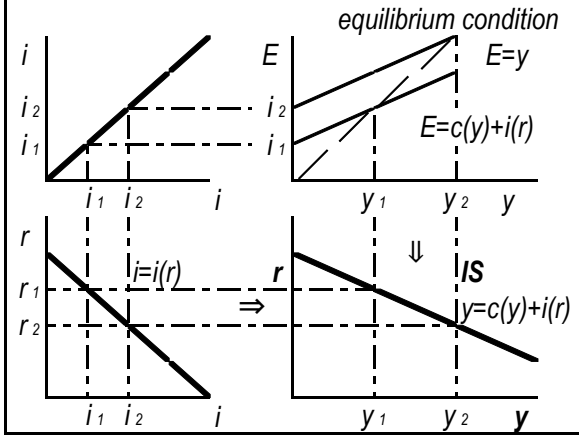
**IS曲线**

☆式是一条反映利率和收入间相互关系的曲线；该曲线上任何一点所代表的利率与收入的组合下，i=s，从而产品市场是均衡的

**投资函数=(i=s)=储蓄函数⇒IS曲线**




**(投资函数+消费函数)=(E=y)⇒IS曲线**




**IS曲线的斜率**

$y=\frac{\alpha+e-dr}{1-\beta}$ ； $r=\frac{\alpha+e}{d}-\frac{1-\beta}{d}y$ ★

★式是IS曲线的代数表达式

|斜率|=|-(1-β)/d|=(1-β)/d

*d:* 投资需求对于利率变动的反应程度

d↑⇨投资对利率变化敏感⇨斜率小⇨IS平缓

*β:* 边际消费倾向

β↑⇨支出乘数↑⇨利率引发投资变动时,y变动加剧

**三部门经济**

定量税下(斜率不变)

比例所得税下

*c=α+β(1-t)y*； *t*:边际税率

$|斜率|=\left|\frac{1-\beta(1-t)}{-d}\right|=\frac{1-\beta(1-t)}{d}$

*t* ↓⇨投资乘数↑⇨IS越平缓

西方观点

影响IS斜率的主要是d,因为β比较稳定;t一般不变

以上分析均以预期不变为前提

加入预期因素,IS会更陡峭

利率↓⇨企业预期预期未来实际利率不会如此低

⇨企业不按照d大幅改变投资计划

人们预期不会持久的收入变化对c+i的影响很有限

β↓，投资乘数↓

**IS曲线的移动**

**一切自发支出量变动,都会移动IS.(α,e,g,t)**

**移动幅度：Δ×对应乘数**　**投资↑⇒IS右移**

定量税下:$y=\frac{\alpha+e+g-\beta t-dr}{1-\beta}$

投资需求变动(e变动,k=1/(1-β))

投资Δ↑⇨投资需求曲线右移Δ⇨IS右移

储蓄变动(α变动,k=1/(1-β))

储蓄↑⇨储蓄曲线左移⇨ 投资不变时，较低IS左移⇦y↓⇦ 收入即可满足投资

政府购买性支出变动(g变动,,k=1/(1-β))

政府购买性支出↑⇨投资↑⇨IS右移

政府税收变动(t变动,,k=β/(1-β))

税收↑⇨投资or消费↓⇨y↓⇨IS左移

**财政政策(扩张:IS右移)(紧缩:IS左移)**

国民收入的决定：IS-LM模型(3-2)　*IS:* 由利率解释投资;*LM:* 由供求解释利率

子 張
沐 涔

## 利率的决定

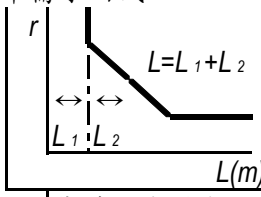
古典学派
- 投资和储蓄只与利率有关
  - 投资/储蓄是利率的减/增函数

凯恩斯:储蓄更收收入的影响
- **利率由货币供给量和需求量决定**
  - 货币实际供给量m由国家控制

**流动性偏好**
- =对货币的需求=灵活偏好=流动偏好
- 由于货币具有使用上的灵活性，人们宁肯牺牲利息收入而储存不生息的货币来保持财富的心理倾向
- **三大动机**
  - $L_1=L_1(y)=ky$; LM与y的联系桥梁
    - **交易动机**
      - 个人和企业需要货币是为了进行正常的交易活动
      - 主要决定于收入,正相关
    - **谨慎动机/预防性动机**
      - 为预防意外支出而持有一部分货币的动机
      - 全社会看,大体也和收入成正比
  - $L_2=L_2(r)=-hr$； h:货币投机需求的利率系数
    - **投机动机**
      - 人们为抓住有利的购买有价证券的机会而持有一部分货币的动机
      - 利率高⇨证券价格低⇨人们买入
        ⇨投机动机货币需求量↓

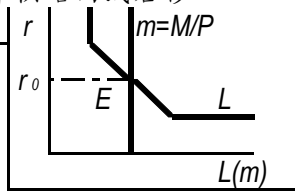
**流动偏好陷阱(凯恩斯陷阱)**
- 人们不管有多少货币都愿意持在手中的情况
- 利率极高⇨证券价格极低⇨ 人们认为利率不会更高 ⇦ 持有货币全部买证券
- 利率极低⇨⇨⇨证券价格极高⇨⇨⇨ 人们认为利率不会更低 ⇦ 所有证券换成货币 ⇦ 有了货币也不买证券 ⇨ 流动偏好趋向无穷大
- 货币需求关于利率的系数
  - 也叫流动偏好的利率系数

**货币需求函数**
- $L=L_1+L_2=ky-hr$
  - L,$L_1$,$L_2$:实际货币需求量
- $m=M/P$, m:实际货币量
  - M:名义货币量; P:价格指数
- **名义货币需求函数:$L=(ky-hr)P$**
- 货币需求曲线




  - 货币需求量与收入水平正向关系
    - ky是函数的截距,y↑曲线右移

**货币供求均衡和利率的决定**
- **M1**狭义的货币供给(以下只涉及M1)
  - 流通中的硬币、纸币和银行活期存款
- **M2**广义的货币供给 =M1+定期存款
- **M3**更广泛的货币供给
  - M2+个人&企业持有的政府债券等流动资产
- 西方认为:货币供给由国家决定,是外生变量
  - 与r无关,货币供给曲线垂直于横轴
- 货币需求↑货币需求曲线右移
- 货币供给↑货币供给曲线右移
- 货币市场均衡




**LM曲线的移动(截距= -m/h)**
- 不考虑转动斜率不变k&h不变
- LM移动只受货币供给量m变动的影响
- m=M/P　**m↑⇒LM右移**
  - 名义货币供给量M变动
    - M↑m↑-m/h↓LM右下方移动
  - 价格水平P的变动
    - P↑⇨m↓⇨ -m/h↑⇨LM左上方移动
    - 价格水平与收入反向⇒AD曲线

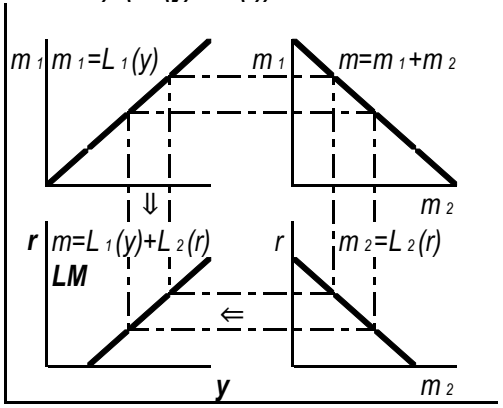
## LM曲线

### LM曲线及其推导

货币市场均衡(★式:LM曲线)

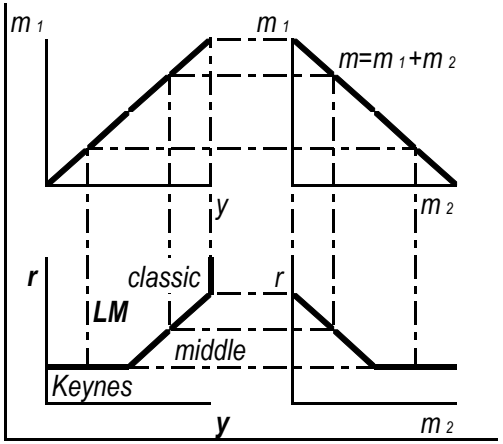
$$m=ky-hr\ ;\ y=\frac{h}{k}r+\frac{m}{k}\ ;\ r=\frac{k}{h}y-\frac{m}{h}\quad ★$$

**LM曲线**
- 线上任一点所代表的利率和收入的组合下,货币需求和供给都是相等的,即货币市场是均衡的
- **$(m=m_1+m_2)=(L_1(y)+L_2(r))$ ⇒LM曲线**




### LM曲线的斜率

- **斜率=k/h**
- 西方观点:交易需求函数比较稳定，斜率主要受h影响
- LM曲线的三个区域



国民收入的决定：IS-LM模型(3-3)　*IS:* 由利率解释投资;*LM:* 由供求解释利率

IS-LM分析

两个市场同时均衡的利率和收入

**凯恩斯《通论》**

总收入 ← 有效需求(=总供给) ← 消费支出 + 投资支出

资本边际效率 → 引致投资 + 自发投资

货币供给 → 利率

货币需求 → 利率

交易需求 + 投机需求 ← 利率

短期稳定：↑消费支出

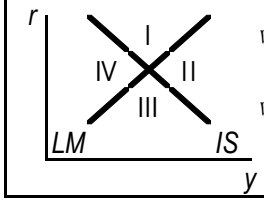
商品市场：收入⇐投资⇐利率

货币市场：利率⇐交易需求⇐收入

**希克斯:联立产品市场和货币市场,解决循环推论问题**

IS曲线:i(r)=s(y)

LM曲线:M=L1(y)+L2(r)




曲线上方:超额供给

曲线下方:超额需求

**均衡收入和利率的变动**

IS和LM的交点同时实现两个市场均衡

**该均衡不一定是充分就业的均衡**

可通过财政&货币政策调节交点位置

**财政政策(投资↑IS右移)**

政府变动支出和税收调节国民收入

**货币政策(m↑LM右移)**

央行变动货币供给量改变利率和收入

**IS-LM模型的用处**

可清楚直观地表示/表现出

经济短期波动原因

投资/消费/政府支出/税收/货币供给/货币需求

政府干预经济用的是财政政策还是货币政策

构成总需求诸因素对总需求变动影响的强弱程度

斜率⇒利率变动如何影响总需求

政府干预经济政策的效果(与斜率相关)

凯恩斯主义和货币主义为什么对财政政策和货币政策态度不同

总需求曲线的来历　挤出效应

其他不变:P↑⇨m↓⇨ -m/h↑⇨LM左上方移动

凯恩斯的基本理论框架

凯恩斯的国民收入决定理论

① 消费 — 自发消费 — 平均消费倾向APC=c/y

② 消费 — 消费倾向 — 边际消费倾向MPC=β=Δc/Δy

② 消费 — 收入 — 投资乘数k=1/(1-β)

① 投资 — ④ — 利率 — ⑤ — 需求 — 流动偏好 — 交易动机 + 谨慎动机 + 投机动机

⑤ 货币数量$m=m_1+m_2$

④ 投资 — 资本边际效率MEC — ⑥ — 预期收益

⑥ 重置成本或资产的供给价格

① 国民收入决定于消费和投资　② 消费由消费倾向和收入决定

③ 消费倾向比较稳定，国民收入波动主要受投资波动影响

④ 投资由利率(反比)和资本边际效率(正比)决定

⑤ 利率决定于流动偏好和货币数量

⑥ 资本边际效率由预期收益和资本资产的供给价格或说重置成本决定

**关于大萧条**

凯恩斯

**原因**

需求不足

消费:边际消费倾向<1

投资:资本边际效率长期内递减

**政策**

财政政策有效,货币政策无效(流动偏好陷阱)

IS-LM模型的数学表达

| | | | |
|---|---|---|---|
| 产品市场均衡条件 | $s=i$ | $s=s(y)$ | 储蓄函数(与y相连) |
| | | $i=i(r)$ | 投资函数(与r相连) |
| 货币市场均衡条件 | $m=L$ | $L=L_1+L_2=L_1(y)+L_2(r)$ | 货币需求函数(与y,r相连) |
| | | $M/P=m=m_1+m_2$ | 货币供给函数 |

国民收入的决定：总需求-总供给模型(2-1)　取消价格不变假设

子 张
沐 涔

## 总需求曲线

含义(总需求(常以产出水平表示))

经济社会对产品和劳务的需求总量

总需求=需求(消费+投资+政府+国外)

不考虑国外需求下

价格,收入和其他经济变量在既定条件下，家庭,企业和政府将要支出的数额

衡量经济中各种行为主体的总支出

总需求函数

**以产量(国民收入)所表示的需求总量和价格水平之间的关系**

**图形**(从$y=C+I+G+NX$解释)

向右下方倾斜,价格水平与总需求反向关系

**P对家庭部门的消费的影响**

P↓⇨货币真实价值↑⇨消费者感觉富有⇨更多支出⇨需求量(物品和劳务)↑

P↑⇨货币真实价值↓⇨消费者感觉贫穷⇨减少支出⇨需求量(物品和劳务)↓

**P对企业部门的投资的影响**

价格水平是货币需求量的决定因素

$L=(ky-hr)P$

P↓⇨购买物品&劳务的货币需求量↓⇨利率↓⇨企业投资↑

利率效应:P变动通过影响利率进而影响企业投资的效应

**推导**

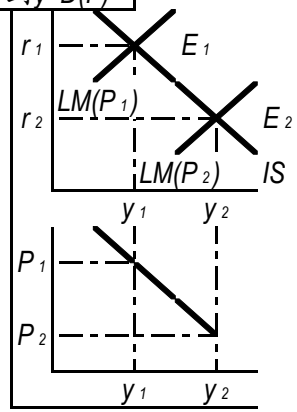
总需求函数的数学推导

***IS:*** $y=c(y-t)+i(r)+g$

***LM:*** $M/P=L_1(y)+L_2(r)$

→ 联立消去r,得到$y=D(P)$

总需求曲线的图形推导




**P对IS,LM的影响**

IS曲线:无影响

决定IS的变量被假定是实际量,非名义量

LM曲线

P改变⇨m改变⇨LM移动⇨新均衡的y

总需求曲线

表示社会的需求总量和P之间的反向关系

**移动**

价格水平既定下

总需求曲线右移

消费/投资/政府购买/净出口增加

| | 财政政策 | 货币政策 | AD |
|---|---|---|---|
| 扩张 | IS右移 | LM右移 | 右移 |
| 紧缩 | IS左移 | LM左移 | 左移 |

## 总供给的一般说明

总供给

**经济社会所提供的总产量(或国民收入),即经济社会投入基本资源所生产的产量**

基本资源

劳动,生产性资本存量,技术

生产函数

描述总产出与劳动,资本,技术间的关系

**短期与长期宏观生产函数**

**宏观生产函数(总量生产函数)**

假定经济社会在一定的技术水平下

$y=f(N,K)$

y总产出;K社会的资本存量;

N社会就业水平或就业量

产出主要取决于

就业量N、资本存量K、技术水平T

**短期宏观生产函数**(K,T不会有较大变化)

$y=f(N,\bar{K})$　$\bar{K}$:不变的资本存量

一定技术水平和资本存量下,y取决于N

**假定宏观经济函数(上式)有两条性质**

总产出随总就业增加而增加

总就业增加,总产出按递减比率增加

T和K不变;边际报酬递减规律

**长期生产函数**(N,K,T均可变)

$y_f=F(N^*,K^*)$

N*各个短期中的充分就业量

K*各期的资本存量

$y_f$各期的充分就业时的产量(潜在产量)

总供给←就业水平←劳动市场(本书仅限短期生产函数)

## 劳动市场

总供给理论的争议←劳动市场理论的争议

**完全竞争的劳动市场**

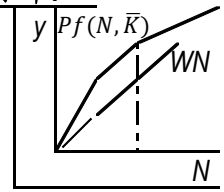
企业只能接受既定的市场工资和其产品的市场价格

企业选一个就业水平→边际产品=实际工资

**实际工资=名义工资W/价格水平P**

劳动的边际产品随劳动投入增加而降低

⇒劳动需求函数是实际工资的减函数




**上述微观经济学意义上的关系在宏观也成立**

**劳动需求函数**

$N_d=N_d(W/P)$; $N_d$与实际工资(W/P)成反方向变动

**劳动供给函数**

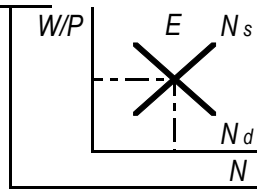
$N_s=N_s(W/P)$; $N_s$与实际工资(W/P)成正方向变动

**劳动市场均衡**

$N_S\left(\frac{W}{P}\right)=N_d\left(\frac{W}{P}\right)$

均衡的实际工资

均衡的就业量




**两点说明**

**有伸缩性的工资和价格下**

实际工资调整到劳动供求相等的水平;从而劳动市场均衡⇒**充分就业**

充分就业并非每个愿意工作的人都就业

摩擦性失业,自愿失业等均可以在均衡状态下存在

**劳动市场在经济的总供给方面处于主导地位**

在任一时点,K都由以往的投资决策决定(K不变)

更进一步地

工资和价格具有完全伸缩性的情况下,经济中的产量始终等于充分就业时的产量(潜在产量)

国民收入的决定：总需求-总供给模型(2-2)　取消价格不变假设

两种极端的总供给曲线

**按货币工资和价格水平进行调整所要求的时间长短划分**

古典总供给曲线
凯恩斯总供给曲线
常规总供给曲线

**古典总供给曲线**

**长期中**

↘ **价格和货币工资具有伸缩性**⇨劳动市场均衡⇨经济处于**充分就业水平**

↘ 经济的就业水平或产量不随价格水平而变,**始终处于充分就业状态**

↘ 经济的**产量水平位于潜在产量**或充分就业的水平上,不受价格影响

**总供给曲线**是一条位于经济潜在产量或充分就业产量水平上的**垂直线**

**原因**

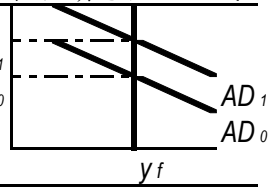
①古典学派假设货币工资和价格水平可以**迅速调节**,使实际工资总处于充分就业水平下

②古典学派一般研究经济的长期状态,**长期中**二者**有充分时间调整**

古典总供给曲线代表长期总供给曲线

**政策含义**

增加需求的政策不能改变产量,只能造成物价上涨,甚至通货膨胀




**凯恩斯总供给曲线**

**假设:货币工资具有刚性**

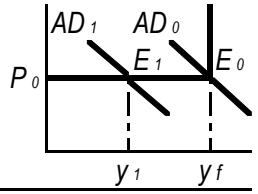
产量变动,价格和货币工资均不变化

**原因**　**一条水平线**

①货币工资具有**刚性**
②研究的是**短期**,二者**来不及调整**

**政策含义**

只要国民收入或产量处在小于充分就业的水平,就可以用增加需求的政策使经济达到充分就业状态




**常规总供给曲线**

图形

右上方延伸

价格水平越高,总产出越多

微观经济学

短期,工资和其他资源价格相对固定,企业产品价格提升,增产通常盈利

**推导**(从黏性价格模型推导)

**价格黏性原因**

价格由长期合约约定
更改价格有成本

**个体企业的定价决策**

基本讨论:有定价权企业

***p=P+a(y-yf)***

两种成本

总价格水平P
总收入水平y产生需求

边际成本↑(更高生产水平上)

**两种企业**

**价格有弹性**(占比(1-b),按上式)

**价格有黏性**(占比b)

**按自己预期事先宣布价格**

*p=EP+a(Ey-Eyf)* ⇒ ***p=EP***

假设预期产出=自然水平

**价格总水平**

P=黏性企业定价加权+弹性企业定价加权

*P=bEP+(1-b)(P+a(y-yf))*

$$P = EP + \frac{(1-b)a}{b}(y - y_f)$$

$$y = y_f + \lambda(P - EP);\ \lambda = \frac{b}{(1-b)a}$$

**常规总供给曲线方程**

**移动**

| | |
|---|---|
| 可得到的劳动量<br>物质资本or人力资本 ↑<br>自然资源可获得性<br>技术知识/可得到的技术 | ⇨ AS右移 |
| 预期价格水平↑<br>(要求高工资) | AS左移 ⇧ |

**①投入品价格上升,短期AS曲线左移**
**②名义工资增加,短期AS曲线左移**

总需求-总供给模型对现实的解释

**宏观经济的短期目标**

**充分就业和物价稳定**

不存在非自愿失业

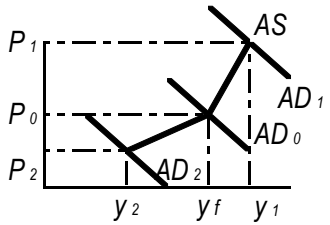
**总需求曲线移动的后果**

**低于充分就业水平时**

AD左移:价格下降比例小于产量下降比例
AD右移:价格上升比例低于产量上升比例

**高于充分就业水平时**

AD左移:价格下降比例高于产量下降比例
AD右移:价格上升比例高于产量上升比例




**总供给曲线移动的后果**

**左移**

滞涨状态

失业和通货膨胀并存

二者变动比例相对关系不明确

右移十分少见

短期内生产技术可能提高,但难以快速得到成果

总需求-总供给模型的政策含义

需求管理政策

财政政策,货币政策

供给管理政策

总需求-总供给模型的数学小节

| | |
|---|---|
| 产品市场均衡条件 $y = c(y-t) + i(r) + g$ | 总需求函数<br>联立消去r,得到y与P的关系 |
| 货币市场均衡条件 $\frac{M}{P} = L_1(y) + L_2(y)$ | |
| 劳动市场均衡条件 $f(N) = \frac{W}{P}; h(N) = \frac{W}{P}$ | 总供给函数<br>联立消去N,得到y与P的关系 |
| 短期总量生产函数 $y = y(N, \bar{K})$ | |

# 失业与通货膨胀(3-1)

张子沐涔

## 失业的描述

### 失业的数据

#### 失业率

劳动力中没有工作而又在寻找工作的人所占的比例

其波动反映就业的波动

### 自然失业率和自然就业率

**自然失业率**

**经济社会在正常情况下的失业率,是劳动力市场处于供求稳定状态时的失业率**

稳定状态:不会造成通胀或通缩的状态

劳动市场处于稳定状态

***fU=lE***

⇓

N劳动力,E就业人数,

U失业人数,l离职率,f就职率

E=N-U

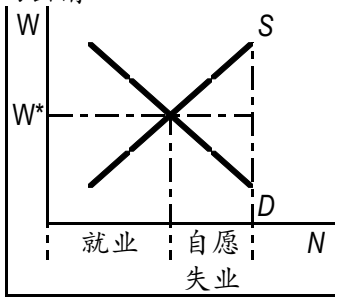
自然失业率=U/N=l/(l+f)

自然就业率(二者之和=100%)

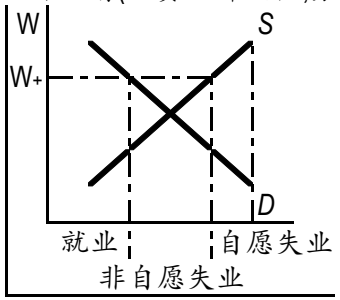
统称为自然率

### 失业的经济学解释

市场出清




市场非出清(工资无伸缩性,劳动力价格W+)




## 失业的原因

### 分类

摩擦性失业;结构性失业;

**周期性失业**

由于整体经济的支出和产出水平下降,即经济的需求下降造成的失业

**摩擦性失业的原因**

原因

求职者和空缺职位的信息流动不完全

工人在不同地区间流动不即刻

部门转移总发生,工人改变部门需要时间

部门转移:需求在不同行业和地区之间的构成变动

**结构性失业的原因**

**劳动力的供给和需求不匹配所造成的失业**

**原因**

**工资刚性**

工资不能调整到使劳动市场均衡从而消除失业的水平

**工资刚性的原因**

**最低工资法**

对不熟练的工人,最低工资法将他们的工资提到均衡水平之上

**效率工资**

高工资使工人生产效率高

减少劳动力的更替

提高工人的努力程度

即便有超额劳动供给,也不减工资

**工会的垄断力量**

## 失业的影响与奥肯定律

### 失业的影响

社会影响(吸毒,离婚率,犯罪率)

**经济影响(机会成本)**

失业者的收入总损失等于生产的损失

丧失的产量:用来计量周期性失业损失

**奥肯定律**(产品市场和劳动市场间的关系)

**失业率每高于自然失业率1个百分点,实际GDP将低于潜在GDP2个百分点**

$$\frac{y-y_f}{y_f}=-\alpha(u-u^*);\ \alpha>0$$

y实际产出; u实际失业率;

yf潜在产出; u*自然失业率

## 通货膨胀的描述

通货膨胀的数据(通货膨胀率)

通货膨胀的衡量

当一个经济中的**大多数**商品和劳务的价格**连续**在一段时间内**普遍上涨**时,称该经济经历着通货膨胀

**通货膨胀率**

定义为从一个时期到另一个时期价格水平变动的百分比

$$\pi_t=\frac{P_t-P_{t-1}}{P_{t-1}}$$

价格指数

描述经济中各种商品和劳务价格的总体平均数

GDP折算指数

CPI,PPI

**通货膨胀的分类**

**按价格上升速度划分**

温和的通货膨胀(通胀率<10%)

奔腾的通货膨胀(10%<通胀率<100%)

超级通货膨胀(100%<通胀率)

**按对不同商品价格影响大小划分**

平衡的通货膨胀

每种商品的价格同比例上升(包括生产要素)

非平衡的通货膨胀

**按人们的预期程度加以区分**

未预期到的通货膨胀

预期到的通货膨胀

具有自我维持的特点

又叫惯性的通货膨胀

失业与通货膨胀(3-2)

张子沐涔

通货膨胀的原因

三个方面解释

**货币数量论;总需求与总供给;**

**经济结构因素的变动**

**作为货币现象的通货膨胀**

货币数量论解释的基本思想

**每一次通货膨胀背后都有货币供给的迅速增长**

**交易方程式**(费雪)

$MV=Py$

⇓

MV:经济中的总支出

Py:名义收入水平

⇓

M货币供给量;P价格水平;

V货币流通速度;y实际收入水平

V定义为名义收入与货币量之比

$\pi=\hat{m}-\hat{y}+\hat{v}$

⇓

π通货膨胀率;m货币增长率;

v货币流通速度变化率;y产量增长率

$\pi=\hat{m}-\hat{y}$ **假定货币流通速度不变**

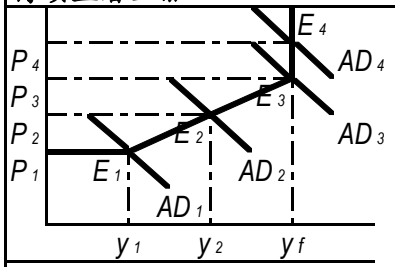
$\pi=\hat{m}$ **长期内,实际产量增长率不变**

归纳为宏观的基本共识

**通货膨胀时时处处都是一种货币现象**

**需求拉动的通货膨胀**

**超额需求通货膨胀,指总需求超过总供给所引起的一般价格水平的持续显著上涨**




**瓶颈式的通货膨胀**(价格水平从$P_1$到$P_2$、$P_3$)

瓶颈现象:由于劳动/原料/生产设备等不足而使成本提高

**需求拉动的通货膨胀**(价格水平从$P_3$到$P_4$)

需求方面的原因或冲击

财政政策,货币政策,消费习惯的突然改变

国际市场的需求变动

**成本推动的通货膨胀**

成本通货膨胀或供给通货膨胀

**在没有超额需求的情况下由于供给方面成本的提高所引起的一般价格水平持续和显著的上涨**

**工资推动的通货膨胀**

**不完全竞争的劳动市场**造成的过高工资所导致的一般价格水平的上涨

工会⇒不再是竞争性的工资,而是工会与雇主集体议价的工资

**工资-价格螺旋**

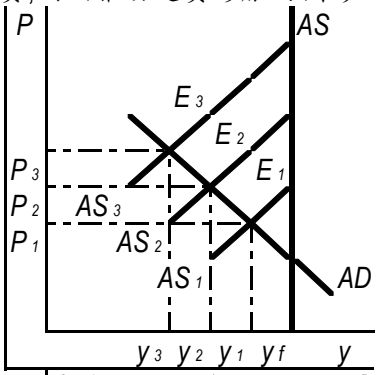
工资↑⇌价格↑

**利润推动的通货膨胀**

垄断企业和寡头企业利用市场势力谋取过高利润所导致的一般价格水平的上涨

**前提:不完全竞争的产品市场**

工资,利润推动通货膨胀的图形




**成本↑⇨AS左移⇨P↑,y↓**

混合通货膨胀理论

供给和需求两方面及相互影响

**结构性通货膨胀**

经济结构本身具有的特点(不同部门)

**生产率提高的速度**看:快vs慢

**经济发展的过程**看:迅速发展vs渐趋衰落

**同世界市场的关系**看:紧密(开放部门)vs不紧密(非开放部门)

**结构性通胀原因**

**现代社会经济结构不容易使生产要素从后者转移到前者**

**后者在工资和价格问题上要求"公平",导致一般价格水平上涨**

**通货膨胀率=货币工资增长率-劳动生产增长率**

微观:**货币工资=劳动边际产品价值**

$W=P\times MP$ [W平均货币工资,P价格水平,MP劳动边际产品]均为社会值

⇓ 对t求微分

$\dot{W}=\dot{P}\cdot MP+\dot{MP}\cdot P$

⇓ 同除W(=P×MP)

$\frac{\dot{P}}{P}=\frac{\dot{W}}{W}-\frac{\dot{MP}}{MP}\Rightarrow \Delta\%P=\Delta\%W-\Delta\%MP$

通货膨胀的持续

**通货膨胀螺旋**

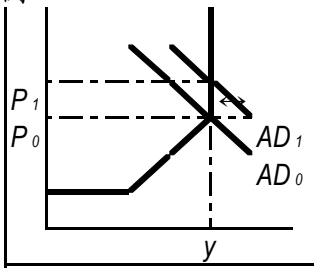
多数情况下,通货膨胀有惯性

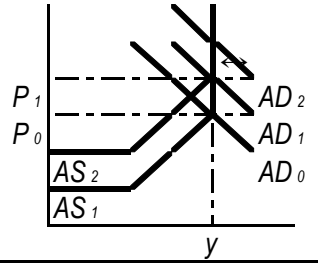
**原因:预期** 通货膨胀不是价格水平一次改变,而是持续上升

单纯用需求拉动或成本推动不足以说明一般价格水平的持续上涨

只要通胀开始,需求拉动和成本推动几乎都发挥作用

举例




**总需求↑ ⇨ AD右移 ⇨ 超额需求 ⇨ 价格↑**

⇧ ⇩

**消费↑ ⇦⇦ 货币收入↑ ⇦⇦ 工资↑ ⇨ AS上移**

# 失业与通货膨胀(3-3)

子 張
沐 涔

## 通货膨胀的成本

**预期到的通货膨胀成本**

菜单成本
- 调整价格的成本

鞋底成本
- 为了使保留的钱少于没有通货膨胀时的数量,人们必须牺牲的时间与便利

税收扭曲
- 一个经济的税率不会对预期到的通货膨胀作出充分调整,会对经济中当事人产生一种成本
  - 税收按名义值而非真实值征收,名义值>真实值

**相对价格变动导致的资源配置不当**
- 通货膨胀扭曲相对价格(各资源间),消费者的决策被扭曲,市场资源配置效率下降

**未预期到的通货膨胀成本**

**不确定性的增加**(经济效率/福利降低)
- 对经济当事人而言,与其预期相异的通货膨胀可能导致不正确的投资和储蓄决策
- 扭曲关于工作多长时间和企业该雇用多少劳动的决策
  - 工资与劳动时间成正比

**不合意的财富再分配**
- 一种与才能,需要无关的方式在经济中重新分配财富
  - 通胀不利于靠固定货币收入生活的人
    - 靠变动收入的人获益
  - 通胀对储蓄者不利
  - 导致债务人和债权人间收入再分配

**相对价格变动性的增加**
- 经济的低效率和资源的不当配置
  - eg.通胀率>企业预期通胀率
    - 企业按预期通胀率提价⇨ 实际价格偏低 ⇦ 需求增加 ⇦ 企业扩产
      - **高于预期的通胀或导致生产过剩**

## 失业与通胀的关系:菲利普斯曲线

曲线的提出

**菲利普斯曲线(最初)**
- 横轴表示失业率,纵轴表示货币工资增长率,向右下方倾斜的曲线

**新古典综合派对其改造的出发点**

**通胀率=货币工资增长率-劳动生产增长率**

⇓ 劳动生产增长率=0

**通胀率=货币工资增长率**

⇓

$$\pi = -\alpha(u - u^*);\ \alpha > 0$$

- a衡量价格对于失业率变动的反应程度
- 失业率超过自然失业率,价格水平下降

与奥肯定律(GDPvs失业率)对比

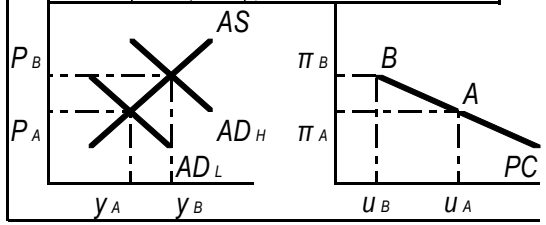
$$\frac{y - y_f}{y_f} = -\alpha(u - u^*);\ \alpha > 0$$

**曲线的推导**

经济短期中出现的通胀与失业的组合

∵总需求冲击⇒总需求曲线的移动

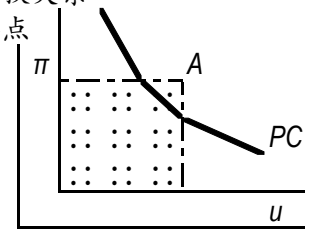
**⇒经济沿着短期总供给曲线变动**




**政策含义**

通胀率与失业率有替换关系

经济社会选一个临界点
- 组合区域内,不干预




**牺牲率和痛苦指数**

**牺牲率**(也可根据奥肯定律,用失业率表示)
- 为了**使通胀率降低一个百分点**而必须放弃的一年实际GDP的百分点数

**痛苦指数=失业率+通货膨胀率**

## 附加预期的菲利普斯曲线

**工人对通货膨胀的预期**
- 预期通胀率越高,名义工资增加越快

**短期菲利普斯曲线**

预期通胀率保持不变时,表示通胀率与失业率之间关系的曲线

$$(\pi - \pi^e) = -\alpha(u - u^*)$$

$$\pi = \pi^e - \alpha(u - u^*)$$

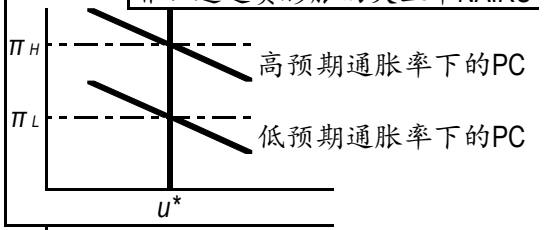
短期:从预期到需要根据通胀作出调整的时间间隔

**∵预期短期不能及时改变**

现代菲利普斯曲线or附加预期的菲利普斯曲线

**当实际通胀率=预期通胀率时,失业率=自然失业率**

自然失业率的又一定义
- 非加速通货膨胀的失业率NAIRU




附加预期的菲利普斯曲线

**短期中,预期通胀率<实际通胀率,替换关系仍存在**
- 货币主义:调节总需求的政策短期内有效

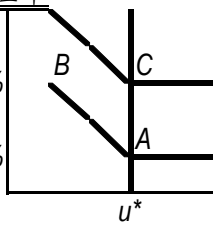
**长期菲利普斯曲线**

**长期中,预期通胀率=实际通胀率**
- 无法通过调节工资来调节失业率

长期PC是一条垂直线
- 长期中,失业率与通胀率不存在替换关系
- 长期中,实现充分就业,失业率=自然失业率

**推导**

**短期**,起点A:扩张性政策⇨总需求↑ ⇨价格↑,通胀⇨π>π(e),**实际工资↓** ⇨生产↑⇨就业↑,终点B




- A:预期通胀率3%
- B:实际通胀率6%>预期

**长期**,起点B:工人发现价格↑实际工资↓ ⇨ 要求名义工资↑ ⇨ 提高预期通胀率 ⇨ **实际工资上升**

终点C ⇦ 失业率回归 ⇦ **回归**

宏观经济政策(5-1)

子 張
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## 宏观经济政策目标以及经济政策影响

**宏观经济政策**

政府为增进整体经济福利,改善整体经济运行状况,以达到一定的经济目标而对宏观经济领域进行的有意识的干预

**目标**

**充分就业**(通常指劳动)

(广泛意义上)一切生产要素都有机会以自己愿意的报酬参加生产的状态

失业率=失业人数/劳动力人数

**摩擦性失业**

在生产过程中由于难以避免的摩擦而造成的短期,局部性失业

劳动力流动性不足
工种转换的困难

**自愿失业**

工人不愿接受现行工资水平而形成的失业

**非自愿失业**

愿意接受现行工资但仍找不到工作的失业

**结构性失业**

由经济结构变化等原因造成的失业

可视为摩擦性失业的极端形式

**周期性失业**

经济周期中衰退或萧条时因需求下降而造成的失业

奥肯定律

**充分就业:**仅有摩擦性和自愿失业(凯恩斯)

**自然失业率**(货币主义)

在没有货币因素干扰的情况下,让劳动市场和商品市场自发供求力量发生作用时,总需求和总供给处于均衡状态的失业率

**价格稳定**

价格总水平的稳定(宏观经济概念)

**经济持续均衡增长**(常用Δ%GDP/年)

在一个特定时期内经济社会所生产的人均产量和人均收入的持续增长

**国际收支平衡**

## 作用和影响

宏观经济政策

**需求管理政策**

**财政政策**

政府**变动税收和支出**以便**影响总需求**进而影响就业和国民收入的政策

**变动税收**

税率
税率结构

eg.所得税,高/低收入者

**变动政府支出**

政府对商品和劳务的购买支出
转移支付

投资税收抵免,加速折旧

**货币政策**

货币当局(央行)通过银行体系**变动货币供给量**来**调节总需求**的政策

**均通过[利率,消费,投资]影响总需求**

| 财政政策 | 利率 | 消费 | 投资 | GDP |
|---|---|---|---|---|
| 所得税↓ | ↑ | ↑ | ↓ | ↑ |
| g↑,tr↑ | ↑ | ↑ | ↓ | ↑ |
| 投资津贴↑ | ↑ | ↑ | ↑ | ↑ |

| 货币政策 | 利率 | 消费 | 投资 | GDP |
|---|---|---|---|---|
| 货币供给↑ | ↓ | ↑ | ↑ | ↑ |

**供给管理政策**

人力政策,收入政策

实现既定经济政策目标,需要:

各种政策手段必须相互配合,协调一致
制定目标时,不能追求单一目标,而要综合考虑
考虑到政策本身的协调性和对实际的把握程度

## 供给管理的政策

**短期供给管理政策的含义**

在短期内如何从供给方面采取一些政策措施来消除较大经济波动带来的失业和通胀

收入政策和人力政策

**收入政策**

用来**限制垄断企业和工会**对物价和工资操纵的一种重要政策

以管制工资-物价为主要内容的政策

包括措施

**工资-物价'指导'线**(对企业和工会)

政府根据长期劳动生产率增长趋势确定工资和物价增长标准(工资和物价限制在全社会劳动生产率平均增长幅度以内)

政府进行**'权威性'劝说或施压**来扭转局势

对某种具体的较快上涨的工资/物价形式

**实施工资-物价的硬性管制**(颁布法令)

**以税收为基础的收入政策**

以税收为奖惩,限制工资增长

**人力政策**

用以改进劳动市场状况,**消除劳动市场不完全性**,以便克服失业和通胀进退两难的困境

发展多吸收劳动力的服务部门
政府雇佣非熟练工人,使之提升为正规工人
加强劳动力的重新训练
协助失业人员寻找工作
增加劳动力在地区或职业方面的流动性

**供给学派的政策主张**

**强调激励的作用**　认为凯恩斯的需求管理政策:

政府支出↑ ⇨ 为弥补赤字,税
挫伤积极性 ⇦ 收&货币供给↑

增强激励的措施

**减税,降低高边际税率(Δt/Δy)**

肯尼迪时期的解释

减税增加储蓄,提高资本形成能力

其他政策主张

减少政府开支,削减福利支出
货币供给量增长和长期经济增长相适应
减少国家对经济的干预和控制

# 财政政策及其效果

## ❶ 财政的构成与财政政策工具

### 国家财政

#### 政府收入

**税收**(政府收入最主要部分)

国家为实现其职能按照法律预先规定的标准,强制地、无偿地取得财政收入的一种手段

财政收入的主要来源

财政政策的重要手段

特点

强制性,无偿性,固定性

**根据课税对象划分**

**财产税**(对不动产等所征收的税)

包括遗产税

**所得税**(对个人和公司的所得征税)

西方政府中,比重很大,影响经济活动

**流转税**(eg.增值税)

对流通中商品和劳务买卖的总额征税

**根据收入中被扣除的比例划分**

**累退税**(税率随征税客体总量增加而递减)

**比例税**(税率不随征税客体总量变动而变动)

多用于流转税和财产税

**累进税**(税率随征税客体总量增加而增加)

所得税多属于累进税

**乘数效应**

**税率的变动➡总收入**

主要改变所得税税率

**税收绝对量的变动➡总收入**

#### 政府支出

国家中各级政府支出总和

**政府购买**

政府对商品和劳务的购买

军需品,机关办公品,雇员薪酬,公共项目工程

① 是一种实质性支出

② 有商品和劳务的实际交易

③ 直接形成社会需求和购买力

④ 是国民收入的组成部分

**政府转移支付**

政府在社会福利保险,贫困救济和补助等方面的支出

eg.政府对农业的补贴

① 是一种货币性支出

② 并无相应的商品和劳务的交换

③ 一种不以取得本年生产出来的商品和劳务作为包场的支出

④ 不能算作国民收入的组成部分

通过转移支付乘数作用于国民收入

其乘数效应小于政府购买支出

**公债**

政府对公众的债务,公众对政府的债权

短(3m,6m,1y)中(1-5y)长(5y以上)

中长期债券

资本市场上最主要的交易品种之一

作用

增加财政收入,影响财政收支

属于财政政策

对金融市场(货币+资本)的扩张和紧缩起重要作用,影响货币供求,调节总需求水平

## ❷ 自动稳定与斟酌使用

**自动稳定器**(内在稳定器)

经济系统本身存在的一种会减少各种干扰对国民收入冲击的机制,能够在经济繁荣时期自动抑制通胀,在经济衰退时期自动减轻萧条,无需政府采取任何行动

① 政府税收的自动变化 ⇒⇒⇒ 乘数效应小于自发性支出的乘数效应

实行累进税

② 政府转移支付的自动变化 ⇒⇒

③ 农产品价格维持制度

**斟酌使用的财政政策**(权衡性的财政政策)

为确保经济稳定,政府要审时度势,主动采取一些财政措施,变动支出水平或税收以稳定总需求水平,使之接近物价稳定的充分就业水平

刺激总需求:扩张性财政政策

抑制总需求:紧缩性财政政策

交替使用:补偿性财政政策

**限制其发挥作用的因素**

时滞

不确定性 ①乘数大小难以确定

挤出效应 ②政府需预测总需求通过财政政策作用达到预定目标的时间

③外在随机因素干扰

## ❸ 功能财政和预算盈余

**功能财政**(凯恩斯主义)

根据斟酌使用的财政政策,政府实施财政政策主要为了实现无通货膨胀的充分就业水平,目标实现时,预算可以盈余,也可赤字

**预算赤字**:政府支出大于收入的差额

**预算盈余**:政府收入超过支出的余额

实施难度

经济波动难以预测

决策需要时间,效果也滞后

年度平衡预算

要求每个财政年度的收支平衡

周期平衡预算

政府收支在一个经济周期中保持平衡

## ❹ 赤字与公债

弥补赤字

借债 出售政府资产

向央行借债(央行增加基础货币,通胀)

向国内公众,外国举债 本质:通胀税➡解决赤字

利率↑⇨央行出面稳定⇨通胀

**总赤字=非利息赤字+利息支出**

非利息赤字=(政府支出-利息)-政府收入

**赤字↑⇨债务↑⇨利息↑⇨赤字↑**

公债利息支出赤字和公债↑的重要因素

**债务-收入比率**

一国债务/GDP, 取决于 公债的实际利息率

实际GDP的增长率

非利息预算盈余的状况

解决财政赤字

增税(对富人);减少支出(对穷人);举债

张子涉

# 财政政策及其效果

## ❺ 西方财政的分级管理模式

一国通过财政政策所进行的一切干预活动,必须以本国的财政管理体制为基础

**分级管理的财政体制**

**原则:财权和事权相一致**

**中央财政预算**

| 支出 | 中央政府 | 收入(税收) |
|---|---|---|
| 中央政府支出 | | 中央税<br>共享税 |

├ 各自分开 ⇓ 调节:
├ 自求平衡 ⇓ 税收返还制度
**地方财政预算** ⇓ 财政补助

| 支出 | 地方政府 | 收入(税收) |
|---|---|---|
| 地方政府支出 | | 地方税<br>共享税 |

共享税:中央与地方共享税

美国为例:

联邦财政预算

| 支出 | 联邦政府 | 收入 |
|---|---|---|
| 国防和国际关系,<br>社会保险 | | 个人所得税<br>社会保险税<br>财产税 |

⇒ 占60%

地方财政预算 ⇓ 预算支出的10%补助地方

| 支出 | 地方政府 | 收入 |
|---|---|---|
| 教育,道路,<br>公共福利,<br>公共设施 | | 公共设施税<br>财产税 |

⇒ 占40%

影响地方发展,促进全美经济平衡,调动地方理财积极性

**宏观调控手段**

政府预算收支,失业保险,所定制的税制结构与累进所得税制

## ❻ 财政政策效果的IS-LM图形分析

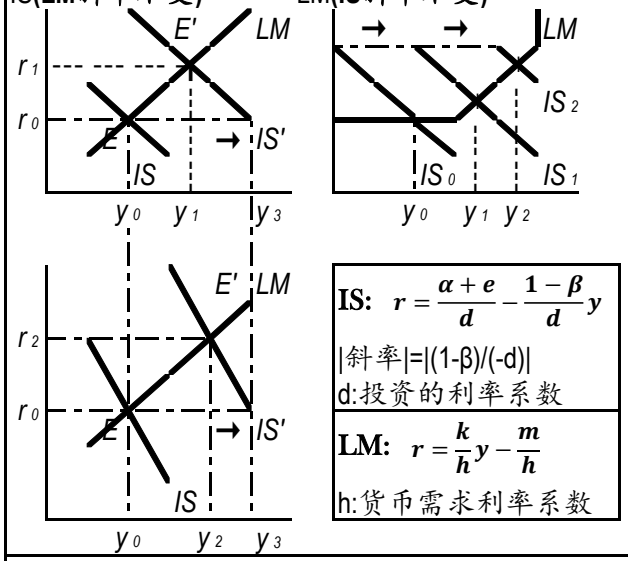
财政政策的效果

政府收支变化使IS曲线变动对国民收入变动产生的影响

**IS越陡峭,移动IS时收入变化越大(LM不变)**

**LM越陡峭,移动IS时收入变动越小(IS不变)**

IS(LM斜率不变) LM(IS斜率不变)




**IS:** $r=\frac{\alpha+e}{d}-\frac{1-\beta}{d}y$

|斜率|=|(1-β)/(-d)|
d:投资的利率系数

**LM:** $r=\frac{k}{h}y-\frac{m}{h}$

h:货币需求利率系数

**原理:**

IS平坦 ⇓ d大 ⇓ **投资对利率变动敏感** ⇓ 私人投资下降很多

**扩张性财政政策** ⇓ 利率↑ ⇓ **货币需求对Δ利率不敏感** ⇓ 利率↑↑

LM陡峭 ⇓ h小 ⇓ 货币需求↑ ⇐ ⇐

挤出效应

政府支出增加所引起的私人消费或投资降低的效果

若d极大,h极小,支出乘数很大也难以奏效

支出乘数的影响

支出乘数大,政策效果大

## ❼ 财政政策案例:肯尼迪减税

背景(20世纪60年代初)

高失业率(最高7.1%),美元贬值

萨缪尔森:既保美元又刺激增长

货币政策

短期贷款利率↑⇨阻止美元外流
长期贷款利率↓⇨刺激国内投资

财政政策

降低税收⇨增加收入⇨促进消费&投资

政府措施

降低公司税收

投资税优惠,提高加速折旧率

降低个人所得税

效果(1964-1966)

GDP平均增速5.5%;失业率降至4.4%
通货膨胀率低于3%

### 关于总需求管理政策的争论

**要不要干预(反对干预)**

**政府预测能力有限**

**政策的时滞**

**内在时滞**(财政政策,尤其是决策)

从经济发生不稳定到决策者制定出适当政策并付诸实践之间的时间间隔

认识/决策/实施时滞

**外部时滞**(货币政策)

从经济政策实施到对经济发生作用并达到预期目标所需要的时间过程(中间变量⇨目标变量)

**公众对政策的反应**(预期)

**政策有效性的争论**

凯恩斯主义

发公债比增加税收弥补赤字要好

**巴罗-李嘉图等价**

用公债和增税筹资对经济影响相同

## 按什么规则对经济进行干预(以货币政策为例)

| | | | | |
|---|---|---|---|---|
| 稳定比率货币供应量增长的规则 | 自由主义 | 以真实利率为操作变量 | 以名义GDP为目标变量 | (操作变量:货币供给) |
| 单一规则,增长率(国民收入+人口) | | 泰勒规则,目标变量都是GDP,通胀 | 以名义通胀率为目标 | |

# 货币政策及其效果

## ❶ 商业银行和中央银行

**货币政策通过银行制度实现**

金融机构

**金融中介机构**

**商业银行**

负债业务:吸收存款

资产业务

- 放款:为企业提供短期贷款
- 投资:购买有价证券获得利息收入

中间业务

- 代客户办理事项,收取手续费

**保险公司,私人养老基金等**

**中央银行**

一国的最高金融当局,统筹管理全国金融活动,实施货币政策以影响经济

**职能**

**发行的银行**,发行国家的货币

**银行的银行**

为银行提供贷款,保管存款准备金,为银行办理全国结算业务

**国家的银行**

代理国库

- 代收税款和公债,代拨付经费

提供政府所需资金

- 贴现短期国债或购买国债

代表政府与外国发生金融业务关系

执行货币政策

监督管理全国金融市场的活动

**M1:流通中的硬币,纸币和银行存款**

货币被定义为在商品和劳务的交换及债务清偿中作为交换媒介或者支付工具而被法定为普遍接受的物品

**货币供给**

$M=\frac{r_c+1}{r_c+r_d+r_e}\times H$ 影响货币供给的因素都可归结到准备金变动上

基础货币供给,法定准备率,贴现率,利率,现金-存款比率

## ❷ 存款创造和货币供给

**准备金**

存款准备金

- 经常保留的供支付存款提取用的一定金额

法定准备率

- 由政府规定的准备金在存款中所占的比率的最低值

法定准备金

- 按该比率提留的准备金;
- 存放:库存现金+央行存款账户

超额准备金ER

- 超过法定准备金要求的准备金

**实际准备金=法定准备金+超额准备金**

**存款创造**

央行新增一笔原始货币供给将使活期存款总和(货币供给量)扩大为这笔新增原始货币供给量的(1/$r_d$)倍

***D=R/r*** $_d$

- D存款总和;R原始存款;$r_d$法定准备率

**货币创造乘数k**(把活期存款作为货币供给)

| | | |
|---|---|---|
| $k=\frac{1}{r_d}$ | 商业银行没有超额储备;银行客户将一切货币收入存入银行 | |
| $k=\frac{1}{r_d+r_e}$ | 超额准备率$r_e$=ER/D<br>实际准备率=$r_d$+$r_e$ | 利率↑<br>⇨$r_e$↓⇨k↑ |
| $k=\frac{1}{r_d+r_e+r_c}$ | $r_c$现金在存款中的比率 | 再贴现率↑<br>⇨$r_e$↑⇨k↓ |

**基础货币H**(货币基础,高能货币,强力货币)

商业银行的准备金总额(法定+超额)+非银行部门持有的通货

- 是存款扩张的基础,会派生出货币

**基础货币H=$C_u$+$R_d$+$R_e$**

- $C_u$非银行部门持有的通货
- $R_d$法定准备金;$R_e$超额准备金

**货币供给M=$C_u$+D**

M1角度:通货和活期存款之和

$\frac{M}{H}=\frac{C_u+D}{C_u+R_d+R_e}=\frac{r_c+1}{r_c+r_d+r_e}=k$

把活期存款和通货作为货币供给

## ❸ 债券价格与市场利息率的关系

二者**反向**变化,该关系适用于一切金融市场

## ❹ 货币政策及其工具

**货币政策**(主流观点,凯恩斯主义观点)

央行通过控制货币供应量以及通过货币供应量来调节利率进而影响投资和整个经济以达到一定经济目标的行为

**财政政策:直接影响总需求规模,没有中间变量**

**货币政策:通过利率变动影响总需求,间接作用**

扩张性货币政策:增加货币供给以拉动总需求

紧缩性货币政策:削减货币供给以降低总需求

**工具**

**①再贴现率政策**(重要性已削弱)

再贴现率:央行对商业银行及其他金融机构的贷款利率(放款利率)

- 贴现率↑⇨准备金↓⇨货币供给量↓
- 贴现率↓⇨准备金↑⇨货币供给量↑

贴现窗口主要满足临时准备金不足

该政策往往作为补充手段搭配公开市场操作

**②公开市场操作**(最重要最常用,∵灵活)

央行在金融市场上公开买卖政府债券以控制货币供给和利率的行为

**调节货币供给量**(eg.联储公开市场购买政府债券)

向个人或公司等非银行机构买入

- 联储开支票→卖方→银行→联储(准备金)

向银行买入

- 直接按债券金额增加银行在联储的准备金

**调节利率**

央行买入债券⇨债券价格↑⇨利率↓

**③变动法定准备率**

**一般不轻易使用**

银行向央行报告准备金和存款状况有时滞;该作用十分猛烈

常配合使用

- 公开市场出售债券⇨利率↑
- 调高再贴现率⇨防止银行增加贴现

道义劝告

央行运用自己在金融体系中的特殊地位和威望,通过对银行及其他金融机构的劝告,影响其贷款和投资方向,以达到控制信用的目的

张子涉

# 货币政策及其效果

## ❺ 货币政策操作方式和泰勒规则

曾经选用的中介目标

- 利率,货币供应量

**泰勒规则**

在各种影响物价水平和经济增长率的因素中,真实利率是唯一能与物价和经济增长率保持长期稳定关系的变量

- **货币政策⇒真实利率⇒物价经济增长率**

央行货币政策应遵循

- 假定存在'真实'的均衡利率,就业率和物价均保持在自然法则水平下
- $i=i^*+\alpha(p-p^*)-b(u-u^*)$ ; $a>0,b>0$
  - p实际通胀率;p*目标通胀率;
  - u实际失业率;u*自然失业率;
  - i名义利率;i*名义目标利率
- 选择通胀目标:
  - 不仅考虑当前通胀,也考虑失业情况

与CFA对比

- $R=r_n+\pi+\alpha(\pi-\pi^*)+\beta(y-y^*)$
  - *R:central bank policy rate(implied by Talor)*
  - *$r_n$:netrual real policy int.rate*
  - *π:current inflation rate*
  - *π*:central bank's target inflation rate*
  - *y:log of current level of output*
  - *y*:log of central bank's target(sustainable) output*
  - *α,β:policy response coefficient*
  - *real int.rate=r= R-π =$r_n$+α(π-π*)+β(y-y*)*

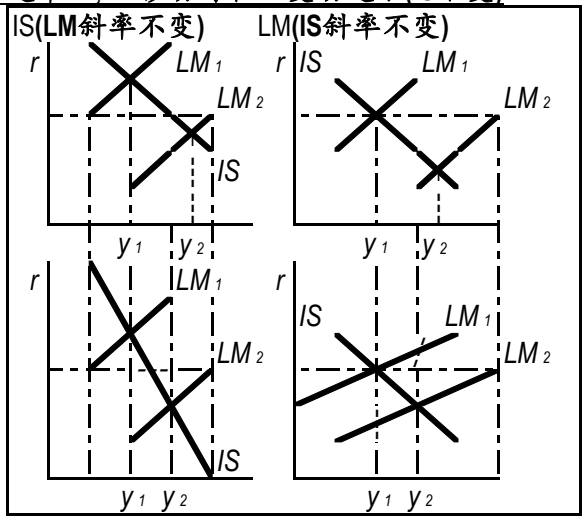
## ❻ 货币政策的IS-LM图形分析

货币政策的效果

- 变动货币供给量对总需求的影响

**IS越平坦,LM移动时收入变化越大(LM不变)**

**LM越平坦,LM移动时收入变动越小(IS不变)**




| IS: $r=\frac{\alpha+e}{d}-\frac{1-\beta}{d}y$ | LM: $r=\frac{k}{h}y-\frac{m}{h}$ |
|---|---|
| d:投资的利率系数 | h:货币需求利率系数 |

**原理:**

| IS陡峭 | 扩张性货币政策 | LM平坦 |
|---|---|---|
| ⇩ | ⇩ | ⇩ |
| ⇩ | 货币供给量↑ | ⇩ |
| d小 | ⇩ ⇩ | h大 |
| ⇩ | 利率↓ 利率↓ | ⇩ |
| ⇩ | ⇩ ⇩ | ⇩ |
| **投资对利率变动不敏感** | | **货币需求对Δ利率敏感** |
| ⇩ | | ⇩ |
| 投资不会增加很多 ⇦ ⇦ | 利率下降幅度不大 ⇦ ⇦ | 货币需求↑↑ |

## ❼ 货币政策的局限性

通胀时的紧缩效果好,**衰退时的扩张效果不明显**

- 反通胀主要表现于反需求拉动的通胀;
- 对成本推进的通胀,效果很小

看货币市场均衡:用货币供给影响利率,

- **必须保证货币流通速度不变**

货币政策的**外部时滞**影响政策效果

- 变动货币供给量⇨利率⇨投资⇨国民收入;
- 即使开始采用时间不长,但执行后到产生效果时间很长

**开放经济中**,还会因为资金在国际上流动而受到影响

## ❽ 货币政策案例:沃克尔紧缩货币治理通胀

背景:1979年,美国通胀率14.8%

措施:沃克尔出任联储主席

- 超常规紧缩银根;
- 80年代初联邦基金利率上升至20%

效果:1987年通胀率降至4.4%

- 美国经济进入30年代以来最大一次萧条

两种政策的混合使用

| 财政 | 货币 | 产出 | 利率 | |
|---|---|---|---|---|
| 扩张 | 紧缩 | - | ↑ | 萧条但不严重 |
| 紧缩 | 紧缩 | ↓ | - | 严重通胀 |
| 紧缩 | 扩张 | - | ↓ | 不严重通胀 |
| 扩张 | 扩张 | ↑ | - | 严重萧条 |

不仅看经济形势,还要考虑政治上的需要

- 不同政策可以对不同人群影响不同;
- 改变GDP组成比例

博弈论在宏观经济政策中的应用

货币政策的博弈论描述

- 政府(央行)vs工会
- 博弈规则
  - step.1.工会要求增加货币工资
    - 增加名义工资or不增加名义工资
  - step.2.政府的相机抉择权
    - 提高货币增长率or不提高货币增长率

**货币政策的博弈模型**

| | | 政府: 不增 | 政府: 增 | 不增 | 增 |
|---|---|---|---|---|---|
| 工会 | 不增 | 低 通胀<br>低 失业 | 高 通胀<br>低 失业 | (5,5) | (1,7) |
| 工会 | 增 | 低 通胀<br>高 失业 | 高 通胀<br>高 失业 | (7,1) | (2,2) |

**时间不一致性**

一项起初适合于今天的政策,随着时间的推移,就可能不再适合于明天

赢得信誉的可靠办法

- 借助于人人相信决策者必须遵从有约束力的规则来消除政府可能改变政策的可能性

# 开放经济下的短期经济模型(2-1)

子 張
沐 涔

## 汇率和对外贸易

### 汇率及其标价

**汇率** $A:B=2 \Leftrightarrow 2\ B/A$
- 一个国家货币折算成另一个国家货币的比率

**直接标价法(D/F,F:D)**
- 用一单位外国货币作为标准,折算为一定数额的本国货币的汇率

**间接标价法(F/D,D:F)**
- 用一单位本国货币作为标准,折算为一定数额的外国货币的汇率

**名义汇率** 汇率高，币值高
- 两个国家**通货**的相对价格
  - 本章:e为名义汇率,间接标价F/D

### 汇率制度

**固定汇率制**
- 一国货币同他国货币的汇率基本固定,其波动限于一定的幅度之内

**浮动汇率制**
- 一国不规定本国货币与他国货币的官方汇率,听任汇率由外汇市场的供求关系自发地决定
  - **自由浮动**:央行不采取任何措施
  - **管理浮动**:对外汇市场进行干预

### 自由浮动制度下汇率的决定(€为例)

使货币市场上对货币的供求达到均衡
- 横轴:€的数量;纵轴:€的价格($/€)

**固定汇率制度的运行**

联储宣布:2€/$ ⇨ 套利:2€⇒1$⇒3€
均衡汇率:3€/$ ⇨ 套利:1$⇒3€⇒1.5$ ⇨
联储购买套利者的€⇨$供给↑⇨均衡汇率↓

**实际汇率**

两国**产品**的相对价格

$$\text{实际汇率}=\frac{\text{名义汇率}\times\text{国内产品价格}}{\text{外国产品价格}}$$

实际汇率ε=名义汇率×物价水平比率
- ε=e×(P/Pf)；物价水平比率:无单位
- 实际汇率↑⇨本币价值↑
- ⇨外国产品相对价值↓

### 净出口函数

出口:该国向其他国家销售产品和提供劳务
进口:该国从其他国家购买产品和劳务
净出口:出口额与进口额的差额
- 贸易顺差:净出口>0;贸易逆差:净出口<0

**影响净出口的最主要因素**(宏观经济学)

**汇率**
- 一国净出口反向地取决于实际汇率

**国内收入水平**
- 一国净出口反向地取决于一国的实际收入
  - 出口不直接受一国实际收入的影响

净出口函数

$$nx=a-\gamma y-n\varepsilon=a-\gamma y-ne\times\left(\frac{P}{P_f}\right)$$

- a,γ,n>0,γ:边际进口倾向

为强调汇率的影响,写作:nx=nx(ε)

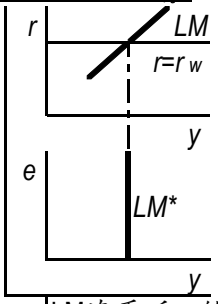
### 货币市场与LM*曲线(LM*方程式)

用与IS-LM模型相似的方程:

**LM: M/P=L(r,y)**
- =: 实际货币供给M/P=货币需求L(r,y)
- r: 实际货币的需求反向地取决于利率
- ⇓
- y: 正向地取决于收入y
- M: 货币供给是由央行控制的外生变量
- P: MF模型分析短期波动

(令r=rw) **短期,假设物价水平是外生固定的**

**LM*: M/P=L(rw,y)**




LM连系r和y,给定rw⇨
LM变为LM*⇨LM*决定y
- 汇率没有进入LM*,不影响y

## 蒙代尔-弗莱明模型

把对经济总需求的分析扩展到开放经济环境中,建立的模型

**关键假设:资本完全流动的小型开放经济**

**小型**
- 所考察的经济是世界市场的一小部分,从而其本身对世界某些方面,特别是利率的影响微不足道

**资本完全流动**
- 该国居民可以完全进入世界金融市场,**该国政府不阻止国际借贷** ⇨ $\text{利率}_{\text{该国}}=\text{利率}_{\text{世界}}$ (r=rw)
  - 假设:国际资本流动之迅速足以使r=rw

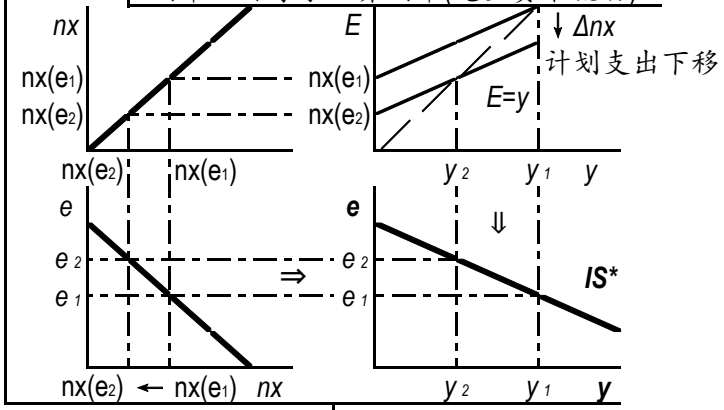
**开放经济的IS曲线(IS*方程式)**

在IS-LM模型上增加净出口:

**IS: y=c(y)+i(r)+g+nx(ε)**
- 消费正向取决于y;
- MF模型假设:
- 投资/净出口反向取决于r / ε

⇓
- ①**国内物价水平和国外物价水平固定**
- ②令r=rw
  - 实际汇率与名义汇率是同比例的

**IS*: y=c(y)+i(rw)+g+nx(e)**
- *:利率始终等于世界利率(完全资本流动)



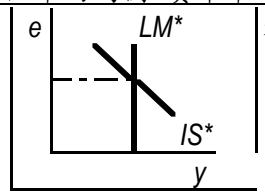

IS*曲线向右下方倾斜
- 高汇率净出口↓总收入↓

### 蒙代尔-弗莱明模型

IS*与LM*联立

**IS*: y=c(y)+i(rw)+g+nx(e)**
**LM*: M/P=L(rw,y)**

产品市场均衡+货币市场均衡




外生变量:
- 财政变量g,货币变量M,
- 物价水平P,世界利率rw

内生变量
- 收入y,世界利率rw

开放经济下的短期经济模型(2-2)

蒙代尔-弗莱明模型的应用



## 浮动汇率制下的财政政策和货币政策

允许汇率对经济状况的变动做出反应

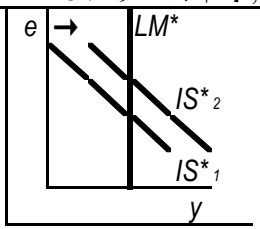
汇率调整⇨产品&货币市场同时均衡

### 财政政策

政府购买↑⇨计划支出↑⇨

⇨ IS*右移⇨汇率↑,收入水平不变

⇨ IS右移⇨利率↑,收入水平不变




**关键变量:利率&汇率**

① **封闭经济中**

收入↑⇨L1↑⇨利率↑

② **小型开放经济中**

收入↑⇨利率↑⇨ r>rw ⇨ 资本流入 ⇨r↓

购买本币, ⇦ ⇦ ⇦ ⇦

本币需求↑ ⇨ **本币升值,净出口↓**

财政政策完全失效的原因:

**LM: M/P=L(r,y)**

①和②中

央行固定M ⇨ ⇨ ⇨ 实际货币

价格黏性 ⇨ P固定 ⇨ 余额供给量

LM均衡:需求=供给 ⇦ 固定

封闭: 财政扩张 ⇨ **均衡r↑** + **均衡y↑**

⇩ ⇩

L不变 ⇦ ⇦ ⇦ L↓ ⇦ ⇦ ⇦ L↑

开放: 财政扩张 ⇨ **r≡rw** ⇨ **收入不变**

汇率和净出口变动

完全抵消财政政策的影响

### 货币政策

央行增加M↑ ⇨ ⇨ 实际货币

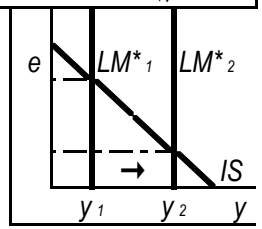
价格黏性 ⇨ P固定 ⇨ 余额供给量

LM*向右移动 ⇦ ⇦ 增加

货币供给↑

收入↑

汇率↓




**关键变量:利率&汇率**

① **封闭经济中**

M↑⇨利率↓⇨投资↑

② **小型开放经济中**(通过汇率而非利率影响y)

M↑⇨利率↓⇨ r<rw ⇨ ⇨ 资本流出 ⇨r↑

抛售本币, ⇦ ⇦ ⇦ ⇦

本币供给↑ ⇨ **本币贬值,净出口↑**

南-北关系的一种经济分析

北方:工业化,技术先进,出口工业制成品

南方:农业,技术相对落后,出口初级产品

**两种思路**(①对称方法;②非对称方法)

① 在同一基本结构中按同一模型运行

② 各自具有根本区别的结构 具体参数不同

**用对称方法分析南-北关系**

北方收入恒等式 $y_n = \beta_n y_n + a_n + x_n - m_n y_n$

南方收入恒等式 $y_s = \beta_s y_s + a_s + x_s - m_s y_s$

⇓ 互为进出口国:$x_n=m_s y_s$, $x_s=m_n y_n$

$y_n = \beta_n y_n + a_n + m_s y_s - m_n y_n$

$y_s = \beta_s y_s + a_s + m_n y_n - m_s y_s$

y:产出;β边际消费倾向;

a投入在自己生产中的实际支出;

x实际出口;m边际进口倾向

未知量:两地产出水平(相互依赖):

$$y_n^* = \left(\frac{k_n}{1-k_n k_s m_s m_n}\right)(a_n + m_s k_s a_s)$$

$$y_s^* = \left(\frac{k_s}{1-k_s k_n m_n m_s}\right)(a_s + m_n k_n a_n)$$

开放经济乘数k(非相依乘数):

$$k_n = \frac{1}{1-\beta_n + m_n}$$

$$k_s = \frac{1}{1-\beta_s + m_s}$$

划线部分为相依乘数;

相依乘数>非相依乘数

① 非相依乘数越大,相依乘数越大

② 相互依赖提高每个地区乘数,各地自主支出↑

③ 进口倾向低,倾向具有较高收入(非相依乘数)

北方具有持久的收入优势:$m_n$低

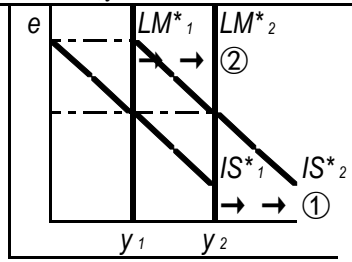
## 固定汇率制下的财政政策和货币政策

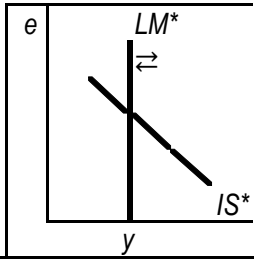
### 财政政策

汇率↑:本币升值压力

政府购买↑⇨ IS*右移⇨ 汇率↑ ⇨ 套利者卖出外汇

LM*右移,y上升⇦ 本币供给扩张⇦ 央行买入外汇




### 货币政策(名义货币政策无效)

央行增加M⇨ LM*右移⇨汇率↓⇨ 套利者卖出本币

LM*左移,y不变⇦ 本币供给减少⇦ 央行买入本币

央行可以决定改变所固定的汇率水平

货币贬值:通货的官方价值的下跌

货币升值:通货的官方价值的上升

类似 货币贬值下:

← — — — LM*右移⇨本币贬值,净出口↑

**小结**

| | 浮动汇率 | | | 固定汇率 | | |
|---|---|---|---|---|---|---|
| | y | e | nx | y | e | nx |
| 财政扩张 | - | ↑ | ↓ | ↑ | - | - |
| 货币扩张 | ↑ | ↓ | ↑ | - | - | - |

浮动汇率 财政被汇率&净出口抵消

固定汇率 货币全部用于维持汇率

**小型开放经济的总需求曲线**(打开物价不变假设)

**IS*: y=c(y)+i(rw)+g+nx(ε)** 名义汇率≠实际汇率

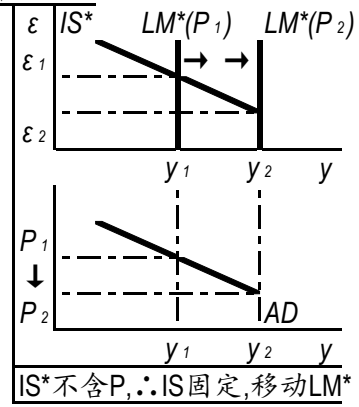
**LM*: M/P=L(rw,y)**

实际汇率ε=eP/Pf;名义汇率e

给定价格:

收入↑⇨AD右移

收入↓⇨AD左移




IS*不含P,∴IS固定,移动LM*

# 经济增长(3-1)

张子涔

## 国民收入长期趋势和波动

本章之前:短期宏观经济分析
- 解释和分析经济波动

本章:长期宏观经济分析
- 解释和分析经济体潜在产出的演进

## 经济增长的描述和事实

### 经济增长和经济发展

**经济增长**:产量的增加(总量或人均)

**经济发展**:反映一个社会经济总体发展水平的综合性概念

变量Z从t到t+Δt的增长率

$$g_z = \frac{Z(t+\Delta t) - Z(t)}{\Delta t Z(t)}$$

**变量Z在时间t的瞬时增长率**

$$g_z = \frac{\dot{Z}(t)}{Z(t)} = \frac{d\ln Z(t)}{dt}$$

**三个结论**

- $Z(t)=X(t)\cdot Y(t) \Rightarrow g_z = g_x + g_y$
- $Z(t)=X(t)/Y(t) \Rightarrow g_z = g_x - g_y$
- $z(t)=[X(t)]^a \Rightarrow g_z = a \times g_x$

总产量意义下的增长率:

$$g_Y = \frac{Y_t - Y_{t-1}}{Y_{t-1}}$$

人均产量意义下的增长率:

$$g_y = \frac{y_t - y_{t-1}}{y_{t-1}}$$

### 经济增长和发展的一些事实

### 经济增长的基本问题

基本问题
1. 为什么一些国家富裕,一些贫穷?
2. 什么是影响经济增长的因素?
3. 怎样理解一些国家的增长奇迹?

分析方法

**增长核算**
- 把产量增长的不同决定因素的贡献程度数量化

**增长理论**
- 把增长过程中生产要素供给,技术进步,储蓄和投资互动关系模型化

## 增长核算

### 经济增长的决定因素

**直接原因**
- 与经济中的投入要素,如资本和劳动的积累有关,还与能够影响这些生产要素生产率的变量,如规模经济和技术变化有关

**基本原因**
- 对一国积累生产要素的能力以及投资于知识生产的能力产生的变量
  - 人口增长,金融部门影响力,宏观环境等

$Y_t = f(K_t, R_t, N_t, A_t, B_t)$
- **Y**经济总产出,**K**资本存量,**R**自然资源,**N**劳动投入,**A**该经济应用知识的储量,**B**基本因素(社会文化环境/社会能力)

### 增长核算方程

经济的生产函数:

$$Y = AK^aN^{1-a}, 0 < a < 1$$
- Y总产出,A技术状况,N投入劳动量,K投入资本量

**增长核算方程**

$$g_Y = g_A + ag_K + (1-a)g_N$$
- 总产出增长率$g_Y$;
- 技术增长率$g_A$(全要素生产率);
- 资本增长率$g_K$;劳动增长率$g_N$

产出增长=生产率增长的贡献+资本增长的贡献+劳动增长的贡献

全要素生产率(索洛余量):

$$g_A = g_Y - ag_K - (1-a)g_N$$

### 增长的经验估算

### 经济增长因素分析(E.F.Denison)

经济增长因素分类
- 生产要素投入量
  - **劳动**(可变),**资本**(可变),土地(不变)
- 生产要素生产率(产出/投入量)
  - **资源配置状况**,
  - **规模经济**,
  - **知识进展**,
    - 技术知识,管理知识
  - **其他因素**

总国民收入增长的源泉,1929-1982年

| 增长因素 | | 增长率(%) | 占比 | 举例或说明 |
|---|---|---|---|---|
| 总要素投入 | | **1.90** | **65%** | |
| 劳动 | ★ | 1.34 | 46% | |
| 资本 | | 0.56 | 19% | |
| 单位投入的产量 | | **1.02** | **35%** | |
| 知识进展 | ★ | 0.66 | 23% | 是发达资本主义国家最重要的 |
| 资源配置 | | 0.23 | 8% | 劳动力从农村到城市就业 |
| 规模经济 | ★ | 0.26 | 9% | 小规模时技术的效率可能不高 |
| 其他 | | -0.13 | -4% | |
| 国民收入 | | **2.93** | 100% | |

## 促进经济增长的政策

根据增长核算方程,政府可决定:
- 技术进步;资本形成;劳动投入

投入量

**鼓励技术进步**
- 专利制度;教育;
- 为进行研发的企业提供税收减免

**鼓励资本形成:**
- 鼓励储蓄和投资
  - 资本存量增长由储蓄和投资推动

**增加劳动供给**
- 人力资本
  - 教育,培训体系

生产效率

**建立适当的制度**
- 各国指导稀缺资源配置的制度不同
- 制度:能支配个人和企业行为的一套规则,体制和惯例
  - 影响经济增长最基础最根本的制度:产权
    - 维护产权的基本方式:法制

经济增长(3-2)

构建和分析新古典增长模型(20世纪50-60)

张子涔

模型建立在新古典生产方程体系上,封闭且没有政府的经济中,储蓄&人口增长&技术进步对增长的作用

**关注焦点:直接原因**

**dk/dt=投入量(储蓄)-消耗量(折旧+人口↑+技术↑)**

**❶ 基本假定**

① 经济由一个部门组成,该部门生产一种既可用于投资也可用于消费的商品

② 生产的规模报酬不变

③ 技术进步&人口增长&资本折旧速度由外生因素决定

④ 社会储蓄函数S=sY,s为储蓄率

**❹ 稳态及其条件**

稳态:包括资本存量和产出在内的有关内生变量将不会随时间的推移而变化的一种状态

**新古典增长模型稳态条件:** $\dot{k}=0$

没有技术进步的情况:

$sf(k)=(n+\delta)k$

有技术进步的情况:

$sf(\hat{k})=(n+\delta+a)\hat{k}$

图形表示:投入曲线与消耗曲线交点

**新古典增长模型的稳态是稳定的**

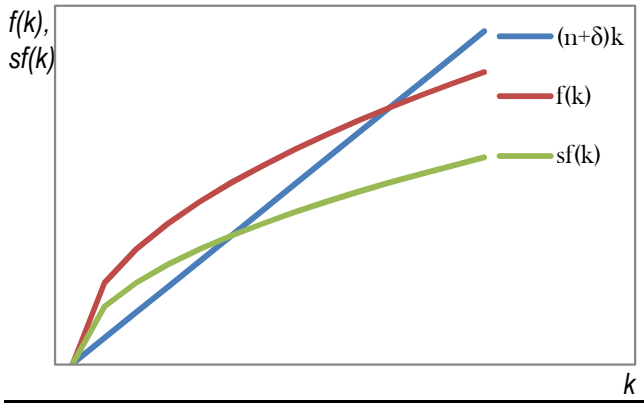
实际资本水平<稳态水平

实际水平在交点左边⇨

⇨ s(f)>(n+δ)k ⇨ 资本存量↑

与资本的边际报酬递减密切相关

人均资本,人均产量,人均储蓄稳态值均为常量




**❷ 没有技术进步的新古典增长模型**

**生产函数**

Y=F(N,K)

总产出Y,总量劳动N,总量资本K

⇩ 均随时间变化而变化

λY=F(λN,λK), 取λ=1/N

Y/N=F(1,K/N)

假定全部人口参与生产,则:

⇩ 人均产量Y/N只依赖于K/N

人均产量y=Y/N,人均资本k=K/N

**y=f(k)**,生产函数人均形式

f(k)=F(1,K/N)

**资本积累收到的影响&基本方程推导**

**投资**I(=S);**折旧**(固定比率δ∈(0,1))

$\dot{K}=I-\delta K=S-\delta K=sY-\delta K$

⇩ 两边同除以N

$\frac{\dot{K}}{N}=\frac{sY}{N}-\frac{\delta K}{N}=sy-\delta k=sf(k)-\delta k$

$k=\frac{K}{N},\frac{\dot{N}}{N}=n$

⇩ 对k关于时间变量t求导

$\frac{\dot{K}}{N}=sf(k)-\delta k$

⇩

$\dot{k}=\frac{dk}{dt}=\frac{NdK-KdN}{N^2dt}=\frac{dK}{Ndt}-\frac{K}{N}\left(\frac{dN}{dt}\cdot\frac{1}{N}\right)=\frac{\dot{K}}{N}-nk$

⇩ ⇩

$\dot{k}=sf(k)-(n+\delta)k$ ⇦ ⇦ ⇦ ⇦ $\frac{\dot{K}}{N}=\dot{k}+nk$

**新古典增长模型的基本方程**

**人均资本变化=人均储蓄-(n+δ)k**

(n+δ)k:必要的,临界的投资

劳动力增长nk+折旧δk

**资本深化=人均储蓄(投资)-资本广化**

注意:假设中全部人口生产,∴n=人口增长率

**新古典增长模型的图形表示**

(图中折线部分为作图所致,本应平滑)

横轴k; 纵轴Y

直线:(n+δ)k

下方曲线(投入量):sf(k)

上方曲线(消耗量):f(k)

**❸ 具有技术进步的新古典增长模型**

**生产函数**

Y=F(AN,K)

AN:有效劳动

⇩ 更改假定:Y是K和AN的一次齐次函数

λY=F(λAN,λK)

按有效劳动平均的产量/资本

⇩ $\hat{y}=\frac{Y}{AN},\hat{k}=\frac{K}{AN}$

$\hat{y}=f(\hat{k})$

技术进步是外生给定的

假定A以固定比例a增长: $\hat{A}/A=a$

**基本方程推导**

$k=\frac{K}{AN}$ $\frac{\dot{N}}{N}=n,\frac{\hat{A}}{A}=a$

⇩ 两边关于时间变量t求导

$\dot{\hat{k}}=\frac{AN}{AN^2}\dot{K}-\frac{K}{AN^2}[A\dot{N}+\dot{A}N]$

$=\frac{\dot{K}}{AN}-\frac{K}{AN}\cdot\frac{\dot{N}}{N}-\frac{K}{AN}\cdot\frac{\dot{A}}{A}$ ← n, a

$=\frac{sY-\delta K}{AN}-\hat{k}\cdot n-\hat{k}\cdot a=\frac{sY}{AN}-(\delta+n+a)\hat{k}$

⇩

$\dot{\hat{k}}=sf(\hat{k})-(n+\delta+a)\hat{k}$

**具有技术进步的新古典增长模型的基本方程**

每单位有效劳动的资本存量的变化

=每单位有效劳动的实际投资量-投资平衡水平

必须维持一定投资水平的原因:

磨损折旧

劳动(人口)和知识的增长,有效劳动不断增加

**❺** 稳态时相关内生变量的增长率(稳态增长率)

没有技术进步

| 内生变量 | g |
|---|---|
| K/N | 0 |
| Y/N | 0 |
| K | n |
| Y | n |

有技术进步

| 内生变量 | g | 内生变量 | g |
|---|---|---|---|
| K/N | a | K/AN | 0 |
| Y/N | a | Y/AN | 0 |
| K | n+a | | |
| Y | n+a | | |

经济增长(3-3)

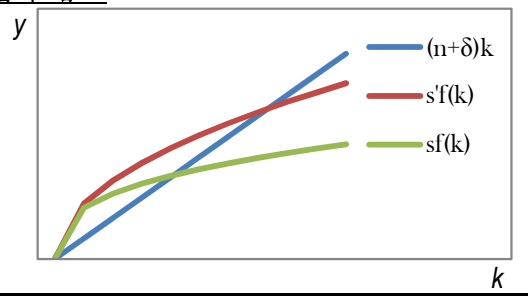
子张沐涔

## 应用新古典增长模型

### 对收入差异的解释

进行比较静态分析,考虑储蓄率增加和人口增长对经济稳态的影响

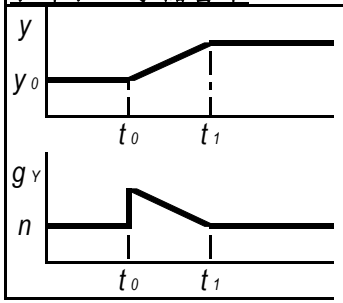
**储蓄率增加**




**储蓄率↑⇨稳态的人均资本↑人均产量↑**

短期:更高的储蓄率⇨总产量↑人均产量↑

上图两个交点都是稳态,**稳态中总产量增长率独立于储蓄率**

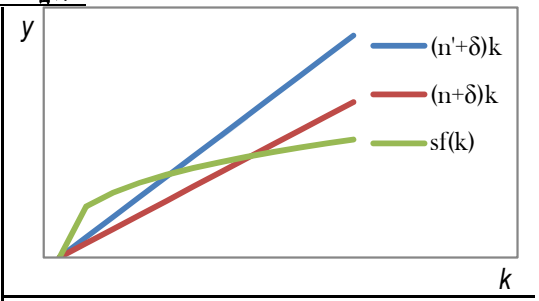



新古典增长理论的结论(与现实吻合)

储蓄率的增加不能影响到稳态增长率,但能提高收入的稳态水平

只有水平效应,没有增长效应

**人口增加**




新古典增长理论的结论(与现实吻合)

人口增长率↑⇨(n+δ)k上移至(n'+δ)k⇨稳态的人均资本↓人均产量↓

另一个结论:

人口增长率↑⇨总产量的稳态增长率↑

人均产量的下降<人口增长率的增加

**资本的黄金律水平**

如何处理积累和消费

人均消费最大化:资本的黄金律水平

$f'(k_{gold})=n+\delta$

稳态人均资本量的选择应使:

资本的边际产品=劳动增长率+折旧率

对应的储蓄率:储蓄率的黄金律水平

### 对增长率差异的解释

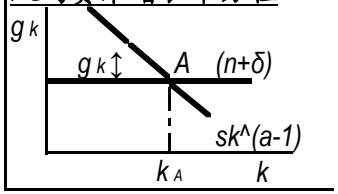
在特定生产函数y=k^a假定下

$\dot{k}=sk^{\alpha}-(n+\delta)k,0<a<1$

⇩ 两边同除以k

$g_k=\dot{k}/k=sk^{\alpha-1}-(n+\delta)$

**人均资本增长率方程**




**新古典增长模型的三个预言**

① 两国储蓄率(或投资率)相同,则初始人均资本较低的国家有更高的经济增长

② 两国初始人均资本相同,投资率较高的国家有更高的经济增长

③ 如果一国提高投资水平,则收入增长率也会提高

新古典增长模型分析相对经济增长率的关键在于考察未处于稳态水平的经济

∵稳态下,经济增长率=n

## 内生增长理论

基本模型(AK模型)

生产函数:$Y=AK$;资本存量K,A是常量

不存在资本边际收益递减(与新古典区别)

资本积累

$\Delta K=sY-\delta K$

→ **$\Delta Y/Y=\Delta K/K=sA-\delta$**

只要$sA>\delta$,没有外生技术进步也会增长

**关于放弃资本边际收益递减的讨论**

资本边际收益会递减

若K只包括厂房,设备存量等

资本边际收益不会递减

若知识也视为一种资本

内生增长理论:知识收益递增

如果可以被累积的生产要素有固定报酬,则稳态增长率将被这些要素的积累率所影响

两部门模型

制造业企业:生产物品和劳务,可用于消费和投资;

研究性大学:生产知识(生产要素),供两部门免费使用

| | |
|---|---|
| 企业的生产函数 | $Y=F[K,(1-u)EN]$ |
| 大学的生产函数 | $\Delta E=g(u)E$ |
| 资本积累方程 | $\Delta K=sY-\delta K$ |

**u**大学的劳动力比例;**(1-u)**企业的劳动力比例;

**E**知识存量;**(1-u)EN**有效工人;g(u)知识增长取决于u

一般,假设企业的生产函数是规模收益不变

$\lambda Y=F[\lambda K,\lambda(1-u)EN]$

该模型除大学生产函数外,与新古典模型一致

若u不变,则E按不变比率g(u)增长(与新古典一致)

宏观经济学的微观基础(3-1)

张子沐涔

消费

消费:一国居民对本国和外国生产的最终产品和服务的支出

总支出的最大组成部分

**跨期消费决策**(1930,欧文▪费雪)

假设

两个时期(青年,老年);

时期1:收入$y_1$,消费$c_1$;

时期2:收入$y_2$,消费$c_2$;

没有通货膨胀;可以借贷或储蓄

① **跨期消费的预算约束**

时期1:储蓄$s=y_1-c_1$

时期2:消费$c_2=(1+r)s+y_2$

r:实际利率;

无时期3,∴消费者时期2不储蓄和借贷,而是花光所有积蓄

$c_2=(1+r)(y_1-c_1)+y_2$

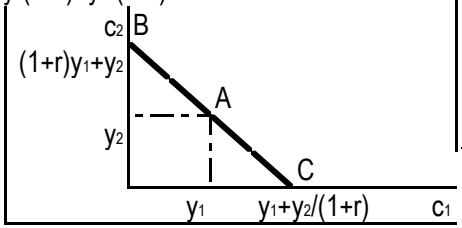
⇩

$$c_1+\frac{c_2}{1+r}=y_1+\frac{y_2}{1+r}$$

**消费者跨期消费预算约束(标准方法)**

Σ两期消费现值=Σ两期收入现值

$c_2=y_1(1+r)+y_2-(1+r)c_1$




② **跨期消费的消费者偏好**

斜率表示两期消费之间的边际替代率;

偏好具有非饱和性

跨期消费最优决策行为

必须满足条件:

必须是消费者最偏好的两期消费组合;

必须位于给定的预算约束线上

无差异曲线与预算线的切点

边际替代率=预算约束线的斜率

MRS= -(1+r)

凯恩斯消费理论

人们在特定时期的消费与该时期的可支配收入相关

**收入变动对消费的影响**

$y_1$↑ or $y_2$↑:预算约束线外移

所消费的商品都是正常品

消费平稳化

无论哪期收入增长,消费者都把它分摊到两个时期的消费上去

收入的现值=$y_1+y_2/(1+r)$

消费取决于Σ两期收入现值,是以消费者预期在其一生中所得到的资源为基础

**实际利率变动对消费的影响**

r↑⇒预算约束线围绕($y_1$,$y_2$)顺时针旋转

**收入效应**:利率上升使得消费者收入增加,从而可以向更高的无差异曲线移动,并把增加的收入分摊到两期消费中

r↑⇨收入↑⇨$c_1$↑ $c_2$↑

**替代效应**:两期消费的相对价格变动造成两期消费量的变动

r↑⇨$c_1$的机会成本↑⇨$c_1$↓

两个效应都增加$c_2$

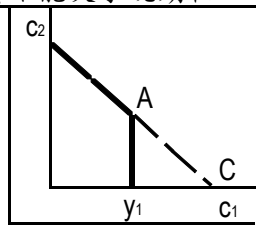
两个效应对$c_1$影响相反

借贷约束/流动性约束

借贷限制

现期消费不能大于现期收入

$c_1 \leqslant y_1$




消费者希望$c_1<y_1$

借贷约束没有约束力

消费者希望$c_1>y_1$

借贷约束有约束力(角点解)

**消费的随机游走假说**(1978,罗伯特▪霍尔)

假设:

永久收入假说正确;

消费者理性预期

结论

消费随时间推移而发生的变动就是不可预测的(随机游走)

**相对收入消费理论**(杜森贝利)

消费者会受自己过去的消费习惯和周围消费水准的影响来决定消费

长期消费函数:$c=\beta y$

长期:消费与收入比率固定

**棘轮效应**:消费者易随收入的提高增加消费,不易随收入降低而减少消费

**示范效应**:消费者的消费行为受周围人消费水准

**生命周期的消费理论**(莫迪利安尼) — — — — 侧重对储蓄动机的分析(财富作为变量)

人们会在更长时间范围内计划消费开支,以达到整个生命周期内的最佳配置

**C=aWR+cYL**

WR实际财富;a财富的边际消费倾向;

YL工作收入;c工作收入的边际消费倾向

总储蓄和总消费部分地依赖于人口年龄分布

年轻人&老年人比例大,消费倾向大;

中年人比例大,消费倾向小

**永久收入的消费理论**(弗里德曼) — — — — 侧重个人如何预测自己未来收入

消费者的消费支出由永久收入决定:$C=cY_P$

永久收入:消费者可以预计到的长期收入

大致可根据观察到的年收入数值的加权平均数计得

$Y_P=\theta Y+(1-\theta)Y_{-1}$ 距现在时间越近,权数越大

$Y_P$永久收入;θ权数

$C=cY_P=c\theta Y+(1-\theta)cY_{-1}$;当前收入的$MPC=c\theta<c$

短期边际消费倾向较低的原因:

收入↑⇨人们不能确信收入的增加是否持续⇨不会立刻充分调整其消费

只有收入变动最终证明是永久的,人们才会在永久收入上充分调整其消费

政府的税收政策无法影响总需求

减税带来的收入增加,不会立刻用于消费

单个消费者是前向预期决策者

消费不只同现期收入相关;

一次性暂时收入变化引起的消费支出变动很小;

政府增减税若只是临时的,消费不会受到很大影响

宏观经济学的微观基础(3-2)

投资

**企业固定投资**

企业固定投资(=Δ资本存量)

企业购买用于生产的机器设备和建筑物的活动

企业固定投资的存量(资本存量)

企业在生产和服务中使用的机器设备和建筑物

**新古典投资模型**

企业分类

生产企业(生产职能)

租赁资本以生产产品和提供服务

租赁企业(投资职能)

从事固定资产投资,把资本转租给生产企业

**最优资本存量的决定**

**生产企业**(使用资本和劳动)

二者可以相互替代

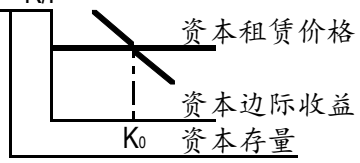
资本存量的决定

租金率=R,产品价格P

每单位资本实际成本=R/P

MR=MC,MR=MP×P,MC=R

MP=R/P




资本租赁价格由供求决定

需求:Σ生产企业资本边际收益曲线

供给:垂直线(市场上资本存量固定)

**租赁企业**(购买资本品并转租)

收益:出租每单位资本的实际租赁价格R/P

成本:利息成本;价格波动成本;资本折旧成本

单位资本的成本 $= P_K(i - \pi^e + \delta) = P_K(r + \delta)$

单位资本价格PK;名义利率i;预期通胀率π

折旧率δ;实际利率r

存货投资

存货:企业持有作为储备的产品

占总支出很小,但在经济周期中变动很大,成为经济波动研究的重点

企业持有存货的原因

保证生产的平稳化

避免脱销

提高经营效率

在产品

加速模型

假设:企业存货量与产出水平成比例

N=aY ⇒ I=ΔN=aΔY

存货量N,产量Y

**最优资本存量的动态调整**

企业实际投资存量≠最优资本存量

⇨迅速调整成本较高⇨逐步调整

现期结束的资本存量

$K=K_{-1}+\lambda(K^*-K_{-1})$ , $0<\lambda<1$

$K_{-1}$上期结束时的资本存量;

K*最优资本存量

对投资波动的理解:

K*本身的不稳定性

K不断趋向于K*

以柯布-道格拉斯生产函数为例

柯布-道格拉斯生产函数

$\boldsymbol{Q = AK^{a}L^{1-a}, 0 < a < 1}$

⇩ Q产量;a资本在产出中所占份额

⇩ K&L资本和劳动的投入量

$\boldsymbol{MP_K = aA(L/K)^{1-a}}$ 资本的边际产量

⇩ 均衡状态下,

⇩ 资本实际租赁价格R/P=资本边际产量

$\boldsymbol{R/P = aA(L/K)^{1-a}}$

资本存量低,劳动投入量高,技术水平高

⇨资本实际租赁价格高

**住房投资**

购房目的:自住,收租金,增值

对住房投资的分析

存量均衡;流量供给

**住房相对价格取决于现有住房存量的供求**

供给是固定的,垂直线;

需求右下方倾斜,位置取决于:

① 人们的财富↑,住房需求↑

② 拥有住房的真实净收益↑,住房需求↑

总收益:自住的隐性收益,出租租金,增值的资本收益

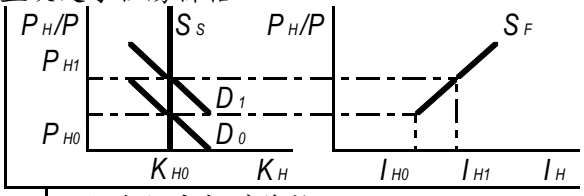
总成本:抵押贷款,物业费,物业税,折旧

③ 其他资产的真实净收益↑,住房需求↓

新住房供给的决定

成本取决于平均价格水平

收益决定于住房价格




纵轴为住房相对价格

短期中,住房存量市场的供求决定住房价格

长期中,新住房投资会将$S_S$右移

**两个结论**

长期中,如果人口或财富以固定比率增长,均衡状态的投资率必须能够补偿折旧率和住房存量的增长率

因为时滞,住房供给实际上是对预期住房建成后的价格作出反应

投资:购置物质资本的活动

①固定投资:在新资本品上的支出

企业固定投资;住房投资

②存货投资:公司持有存货的增加

宏观经济学的微观基础(3-3)

张子涔沐

# 货币需求

## 建立货币需求模型的思路

影响货币需求的宏观经济变量

- 价格水平↑,货币需求↑
- 实际收入↑,货币需求↑
- 利率↑,货币需求↓
  - 利率是非货币资产预期收益

货币需求函数

- $M^d = P \cdot L(Y, r)$
- ⇩ 货币需求与价格同比例变化
- $M^d/P = L(Y, r)$ 货币需求函数
  - 实际货币需求(实际余额)
    - 用货币所能购买的各种产品来测量货币需求量

影响货币需求的其他因素

- 预期股票收益(negative)
- 预期债券收益(negative)
- 预期通胀率(negative)
- 实际财富(positive)

资产组合理论

- $M^d/P = L(r_s, r_b, \pi^e, W)$
  - 把货币作为资产组合的一部分,货币提供不同于其他资产的风险与收益的组合,货币本身没有收益
    - 强调货币价值储藏手段

## 货币需求的交易理论

强调持有货币是为了进行购买,通过权衡持有货币的成本和收益,来决定持有的货币量

### 鲍莫尔-托宾模型

持有货币是有机会成本的

- 购买生息资产获得的利息

持有货币是为了交易方便

- 收益在于减少交易成本

假设

- 消费者一年中计划逐渐支出Y元;
- 物价水平不变;支出均以现金进行

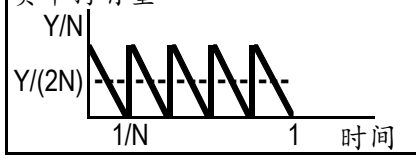
过程

① 消费者去N次银行/年;

- 每次提取Y/N美元

② 在一年的第1/N时期中逐渐花完

- 货币持有量




假定

- 消费者每次去银行成本为F;

推导

- 去银行总成本=FN;放弃的利息=rY/(2N)
- 持有的平均货币量=Y/(2N);
- 总成本:
  - $C=rY/(2N)+FN$
- 两边对N求导
  - $N^* = (rY/2F)^{1/2}$
- 平均货币持有量
  - $= \frac{Y}{2N} = (YF/2r)^{1/2}$

更广义的理解

- r:货币资产与非货币资产的收益差;
- F:非货币资产转换为货币资产的成本
- 货币需求正向取决于支出,反向取决于利率

新古典宏观经济学和新凯恩斯主义经济学(4-1)

张子涉

## 新古典宏观经济学的理论渊源

### 货币主义的理论基础

#### 新货币数量论

**费雪:交易方程,1911**

**Py=MV**

价格水平P;流通中的货币数量M;实际国民收入y;货币流通速度V

V,y被视为常量

V由支付习惯,交通通信等制度上的因素决定,短期内不会变化

y取决于资源,技术条件(充分就业下,不会变化)

**P∝M**

强调货币交易媒介,流通手段作用

**庇古:剑桥方程,1917**

**M=kY=kPy**

名义or实际国民生产总值Y or y;k:经常持有的货币量

k,y被视为常量

k取决于商业习惯和制度等因素;y在充分就业均衡时是已知常数

**P∝M**

强调货币贮藏手段,货币持有方面(货币需求)

相同点:P∝M;不同点:强调点不同

**凯恩斯:引入灵活偏好**

**M/P=L(y,r)=L₁(y)+L₂(r)**

货币主义对凯恩斯的批评

只注意到利息率和收入对货币需求的影响,忽略人们对财富的持有量也是决定货币需求的重要因素

**弗里德曼的货币需求函数**

$$M=f\left(P,r_b,r_e,\frac{1}{P}\cdot\frac{dP}{dt},w,Y,u\right)$$

M财富持有者手中保存的名义货币量;

P价格水平;rb债券利息率;re股票收益率;

(1/P)/(dP/dt)=rp预期的物质资产的收益率;

Y名义收入;u其他因素;

价格预期变动率

w非人力财富与人力财富之比

价格及货币收入单位变化,货币需求应同比例变化

⇩ 方程是P与Y的一次齐次式

$$f(\lambda P,r_b,r_e,r_p,w,\lambda Y,u)=\lambda f(P,r_b,r_e,r_p,w,Y,u)$$

⇩ 令λ=1/P

$$\frac{M}{P}=f(r_b,r_e,r_p,w,y,u)$$

对实际货币需求的关系

**货币需求取决因素:**

总财富

其中之一是个人挣钱能力(永久收入y)

非人力财富在总财富中的比例

人力财富转为非人力财富比较困难;

非人力财富占比越小,对货币需求越大

越缺钱,越需要钱

各种非人力财富的预期报酬率

预期报酬率越高,货币需求越小

其他因素

$$\frac{M}{Y}=f\left(r_b,r_e,r_p,w,\frac{P}{Y},u\right)$$

货币流通速度的倒数

**新货币数量论**

货币流通速度不是常数,稳定的是函数,而不是函数值

**自然率假说**

任何资本主义社会都存在一个自然失业率,大小取决于该社会的技术水平,资源数量和文化传统.长期中,该社会的经济总是趋向于自然失业率

自然失业率=摩擦性失业+自愿失业

资本主义长期中不存在非自愿失业

**市场出清**

劳动市场的工资和产品市场的价格都具有充分的灵活性,可以根据供求迅速调整

不存在超额供给

### 货币主义的主要观点及政策主张

**理论观点**

① 货币供给对名义收入变动具有决定性作用

货币供给与影响货币需求的因素完全无关

② 长期中,货币数量的作用主要在于影响价格及其他用货币表示的量,而不能影响就业量和实际国民收入

通货膨胀归根到底是一种货币现象

③ 短期中,货币供给量可以影响实际变量

V在短期中可以有轻微变动

④ 私人经济具有内在稳定性,国家经济政策会破坏这一稳定性

**政策主张**

反对凯恩斯主义的财政政策

挤出效应,非生产性投资代替生产性投资

反对斟酌使用的货币政策

政策的滞后性

力主单一政策规则

以货币供给量作为货币政策的唯一控制指标,排除利率,信贷流量,准备金等因素

货币政策能够胜任的任务(弗里德曼)

① 防止货币成为经济混乱的主要根源

② 给经济提供一个稳定的环境

### 新古典宏观经济学的基本假设

**个体利益最大化**

宏观经济理论必须有微观经济理论的基础

**理性预期**

理性预期:在有效地利用一切信息的前提下,对经济变量作出的在长期中平均说来最为准确的,而又与所使用的经济理论,模型相一致的预期

① 作出经济决策的经济主体是有理性的

② 为了作出正确预期,经济主体会力图得到有关的一切信息

③ 经济主体在预期时不会犯系统性错误

长期中,经济主体对某一经济变量的未来预期值与未来实际值会一致

**自然率**

## 实际经济周期理论

总产量的不稳定
- 源于实际冲击而非货币冲击

作为波动源的技术冲击
- 技术变化
  - 任何使生产函数发生移动,而不涉及投入要素数量变化的因素
  - 用以解释 经济增长
  - 劳动生产率的变动

基本理论

假设:人口和劳动力固定

**总量生产函数**

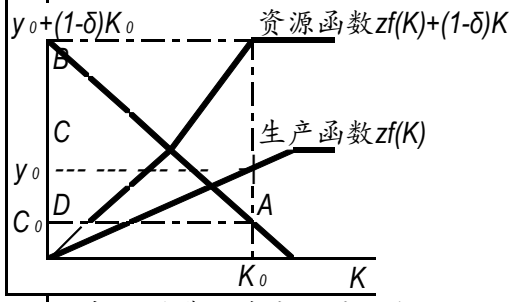
**y=zf(K)**
- 实际收入y,资本存量K,技术状况z
- 折旧率δ⇒未折旧资本存量(1-δ)K

经济中可利用资源=zf(K)+(1-δ)K
- 当期产量+未折旧资本存量

假定每个人具有相同偏好(存在代表)
- 代表的偏好(仅依赖于)
  - 可延续未来无限期的每年的消费
    - 消费中获得的边际效用递减
- ∴在整个生命期内均匀地消费

**总资源函数=zf(K)+(1-δ)K**

**生产函数和资源函数的图形解释**




约束线(消费和资本积累可能线)
- 斜率=-1,(K,C)的组合

下期资本存量K0;实际收入y0;
消费C0;投资I0=y0-C0

if资本存量和生产函数不变⇒将重复下去
- 图中资源函数在交点处弯折
- 是作图所致,本应平滑

## 一个新古典宏观经济学的AD-AS模型(卢卡斯模型)

卢卡斯总供给函数

设企业i的供给函数:

$y_i = h(P_i - P) + y_i^*, h > 0$

⇩ $P_i$产品价格;P市场价格总水平;
⇩ y产量;$y^*$企业潜在或正常产量
⇩ h企业对两个价格偏离的反应
⇩ 纵坐标$P_i$;横坐标$y_i$;正斜率
⇩ ⇦ 企业无法知道P,因此**用预期**

$y_i = h(P_i - P^e) + y_i^*$

⇩ 企业对价格总水平的预期(**两部分组成**)
⇩ ⇦ $P^e = \hat{P} + b(P_i - \hat{P})$
⇩ $\hat{P}$: 社会有关机构预测并公布的价格预测值
⇩ 企业根据其经验对预测值调整
⇩ b为调整系数

$y_i = h(1-b)(P_i - \hat{P}) + y_i^*$

⇩ ⇦ **加总**获得总供给函数

$y = nh(1-b)(P - \hat{P}) + y^*$

⇩ $y^*$经济的潜在产量
⇩ 经济总产量&未预测到的价格上升

$y = y^* + \gamma(P - \hat{P}), \gamma > 0$ 正相关

含义:偏离(预期价格与实际价格)
⇒ 偏离(实际产出与经济正常产出)

**对宏观经济波动的解释**

假定:技术进步
⇒生产函数和资源函数上移

**资本存量不变情况下:**

| | | |
|---|---|---|
| 产量↑↑ ⇨ | 总资源↑↑ ⇨ | 下期 |
| 社会选择 ⇦ | 约束线右移 ⇦ | C↑K↑ |
| 新组合点 ⇨ | 资本存量↑ ⇨ | 产量↑ |
| 新稳态⇦约束线右移(递减)⇦ | 总资源↑ | |

技术变化的影响
- 技术:跳跃增长,之后恒定;
- 投资:跳跃增长,之后增长递减;
- 收入:增长持续递减

实际经济周期理论
- 强调技术变化是收入和投资变动的根源

模型的基本思想

说明
- 对货币量和一般价格水平的不完全信息怎样导致货币的非中性
- Δ货币量怎样导致对一般价格和相对价格变化的短期混淆

政策含义
① 系统的货币政策无效;
② 随机的货币政策有害

简化的新古典宏观经济模型

设经济的**总需求函数**:

$y_t^d = \alpha_t + \beta(m_t - p_t), \beta > 0$
- **α**:除货币供给以外其他引起总需求变化的因素
- **m,p**:货币供给和价格水平取对数后的值
- (m-p):实际货币供给量(M/P)的对数
- **β**:货币供给量对总需求的乘数

**附加预期的总供给函数**(卢卡斯供给函数):

$y_t^s = y_n + \gamma(p_t - p_t^e), \gamma > 0$

均衡条件

$y_t = y_t^d = y_t^s$

**理性预期下:**

对总需求和总供给函数两边取期望:

$y_t^e = \alpha_t^e + \beta(m_t^e - p_t^e)$
$y_t^e = y_n$

联立解出理性预期的均衡价格水平:

$p_t^e = m_t^e - \frac{1}{\beta}(y_n - \alpha_t^e)$

**预期不是理性:**

总需求和总供给函数对期望式做差:

$y_t - y_n = (\alpha_t - \alpha_t^e) + \beta(m_t - m_t^e) - \beta(p_t - p_t^e)$

$y_t - y_n = \gamma(p_t - p_t^e)$ 总需求中未预期的部分
- 产出对自然率水平的偏离

联立解出产出和价格:

$y_t = y_n + \frac{\gamma}{\gamma+\beta}[(\alpha_t - \alpha_t^e) + \beta(m_t - m_t^e)]$

$p_t = m_t^e - \frac{1}{\beta}(y_n - \alpha_t^e) + \frac{1}{\gamma+\beta}[(\alpha_t - \alpha_t^e) + \beta(m_t - m_t^e)]$
- 公众预期到的总需求变动不能影响产出
- 预期到和未预期到的总需求变化都能影响价格

# 新古典宏观经济学和新凯恩斯主义经济学(4-3)

子 張
沐 涔

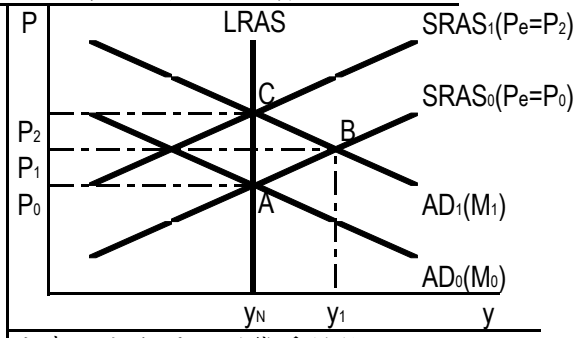
## 一个新古典宏观经济学的AD-AS模型(卢卡斯模型)

### 新古典宏观经济学模型的政策含义

波动的根源是货币冲击

货币冲击一般由央行引起

只要货币当局的政策具有系统性，就不能改变产出增长的长期路径




当事人完全遇见到货币供给:A→C

AD右移(货币增加),SRAS左移(预期调整)

当事人未能预期:A→B→C

AD右移(货币增加)

当事人发现相对价格未变,SRAS左移(预期调整)

观点

能预期到的货币供给的变化只能改变价格水平,对实际产量和就业量没有影响

只有未预期到的货币供给的变化才影响实际产量

宏观经济政策要想有效,必须具有欺骗性质

古典二分法

名义变量对实际变量没有实质性影响

工资,价格由伸缩性

新凯恩斯主义:古典二分法失效

名义黏性

出现名义需求扰动时,某种因素使得名义价格水平变动的比例不同于名义需求变动的比例

实际黏性

某种因素阻止实际工资调整,或一种工资/价格相对另一种工资/价格的黏性

## 新凯恩斯主义形成的理论背景和特征

凯恩斯主义阵营(关键区别)

新古典综合派

假定一个固定的名义工资

新凯恩斯主义

为工资和价格黏性提供微观基础

新凯恩斯主义形成的理论背景

客观条件

原凯恩斯主义的理论缺陷

缺乏微观基础

使用需求不足和名义工资刚性解释失业,但没有说明名义工资刚性

新古典宏观经济学解释现实乏力

对比吸收

新凯恩斯:工资&价格黏性,非市场出清

原凯恩斯:工资&价格刚性,非市场出清

新古典:工资&价格伸缩性,市场出清

将假设与宏观的产量&就业量等结合

**新凯恩斯主义的假设条件**

**非市场出清(最重要假设)**

在出现需求或供给冲击后,工资和价格不能迅速调整到使市场出清的状态

调整过程中,经济处于持续的非均衡

**工资和价格黏性**

**经济当事人最大化原则**

厂商利润最大化,家庭效用最大化

**理性预期**

新凯恩斯主义的特征

货币是非中性的(∵黏性)

经济中实际市场的不完全性对理解经济波动十分关键

对企业定价行为的看法

新古典宏观经济学

企业是价格接受者

新凯恩斯主义

企业是制定价格的不完全竞争市场中的企业

(市场不完全性+不对称信息)

⇨ 工资和价格具有黏性

## 名义黏性

工人:理性的效用最大化者

厂商:理性的利润最大化者

**名义工资黏性**

早期:长期劳动合同

劳动合同中的工资并非完全刚性

**合同影响经济的关键:**

对工资变化的规定

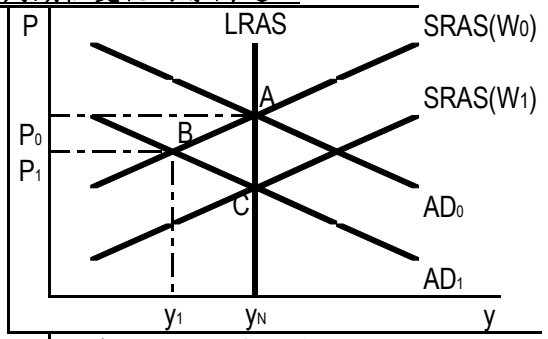
有计划的变化;

按生活费用协议的规定变化

对合同期限的规定

合同交错:所有合同不会同时期结束

**长期劳动合同是实际收入和失业呈周期性变化的原因之一**




AD左移⇨AS短期不变,A→B

⇨AS长期调整,B→C

长期劳动合同对厂商和工人均有益

① 工资谈判费时

② 谈判破裂可能性存在,代价太大

③ 面临不利的需求冲击,对厂商而言,调整工资率不是最优策略

**名义价格黏性**

菜单成本理论

垄断厂商决定价格,但更改价格有成本

菜单成本:厂商调整价格花费的成本

包括调整的机会成本

利润函数π(P),利润最大化价格P*

**价格不调整到P*的损失:**

$$\pi(P^*)-\pi(P)=\pi'(P^*)(P^*-P)-\frac{1}{2}\pi''(P^*)(P^*-P)^2$$

π'(P*)=0,价格稍微偏离,不调整的损失很小

新古典宏观经济学和新凯恩斯主义经济学(4-4)

一个新凯恩斯主义的AD-AS模型



## 新凯恩斯主义的**短期供给曲线**

### 短期供给曲线的推导

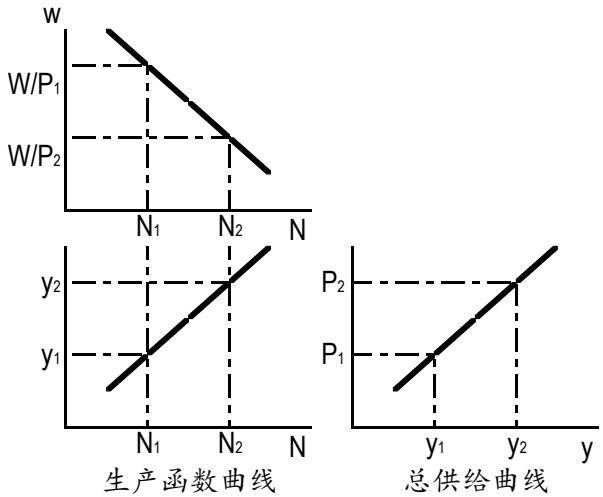
P→W/P

① 名义工资黏性;

② 给定固定名义工资,则实际工资W/P取决于价格水平

③ 劳动由需求决定

取决于劳动需求曲线




给定固定名义工资

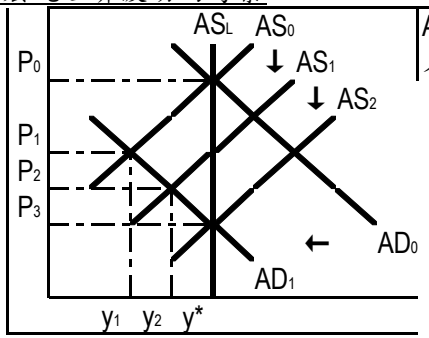
价格水平↑⇨实际工资↓⇨劳动需求↑⇨就业↑⇨产出↑

### 短期供给曲线的移动

① 名义工资↑⇨实际工资↑⇨AS左移

② 全要素生产率A↓⇨生产函数曲线↓⇨AS左移

## 对宏观经济波动的考察




AD左移

名义工资黏性

AS0→AS1→AS2

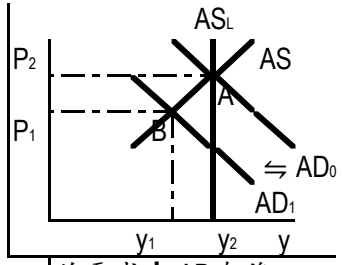
总供给需要时间调整

## 新凯恩斯主义的**稳定化政策**

∵工资和价格黏性

经济在需求冲击后,回归均衡过程缓慢

需要用需求政策刺激,减少短期痛苦




总需求↓,AD左移:

政府不行动,经济停在B点(至少短期如此);

政府刺激需求,AD右移,回归A点

## **目前宏观经济学的基本共识**

① **在长期,一国生产物品和劳务的能力决定该国居民的生活水平**

② **制度对于长期经济增长是非常重要的**

基础性制度(产权,无腐败等)

③ **在长期,货币增长率决定通胀率**

④ **在短期,总需求影响一国生产的物品与服务的数量**

在短期,价格是黏性的,∴总需求至关重要

⑤ **在短期,政策制定者面临通胀和失业之间的权衡**

⑥ **预期是重要的**

**经济学流派整理**

| | | | | |
|---|---|---|---|---|
| 色诺芬,柏拉图,亚里士多德 | 托马斯▪孟,让▪博丹,科尔贝尔 | **配第**,洛克,休谟,斯图亚特(英);布阿吉尔贝尔,坎蒂隆(法) | 魁奈,杜尔哥(法) | **亚当▪斯密** |
| **公元前430-公元1566** | **15世纪-17世纪中叶** | **17世纪中叶-19世纪20年代** | **18世纪50-70年代** | |
| 古希腊,古罗马,中世纪经济思想 | 英法重商主义 | 古典政治经济学 | 重农学派 | |

| | | | | | |
|---|---|---|---|---|---|
| 富兰克林,汉密尔顿 | **李斯特**(历史学派),屠能 | 西尼尔(英);巴师夏(法);穆勒(英) | **马尔萨斯,萨伊**,李嘉图体系解体 | 西斯蒙第(法) | **李嘉图** |
| **19世纪左右** | **19世纪上半期** | **19世纪30-60年代** | **19世纪初** | | |
| 美国经济思想 | 德国经济学说 | 英法经济学说 | | | |

| | | | | | |
|---|---|---|---|---|---|
| 凯里,乔治 | **门格尔**(奥);**杰文斯,瓦尔拉斯**(法) | 门格尔,**庞巴维克**,维塞尔 | 杰文斯,威克斯蒂德 | 瓦尔拉斯,**帕累托** | 克拉克 |
| **19世纪末** | **19世纪70年代** | **19世纪70年代-20世纪初** | **19世纪70年代** | | **19世纪末** |
| 美国 | 边际效用学派创立,边际革命开始 | 奥地利学派 | 英国边际效用学派 | 洛桑学派 | 美国理论学派 |

| | | | | | |
|---|---|---|---|---|---|
| 米塞斯 | 维克赛尔,卡塞尔,俄林,缪尔达尔,林达尔 | 成本曲线,序数论,不完全竞争,福利 | **马歇尔**(美) | 凡勃仑 | 瓦格纳 |
| **新自由主义** | **20世纪20-30年代** | | **20世纪20年代** | **19世纪末** | **20世纪左右** |
| 新奥地利学派 | 瑞典学派 | 新古典学派 | 边际革命完成 | 美国制度学派 | 德国新历史学派 |

| | | | | | |
|---|---|---|---|---|---|
| 坎南,罗宾斯 | 米塞斯,泰勒,兰格,**哈耶克** | 奈特,西蒙斯,哈耶克 | 康蒙斯,米契尔,艾尔斯,贝利 | **熊彼特**(奥) | **凯恩斯** |
| **20世纪20-30年代** | | **20世纪20年代** | **20世纪初** | **20世纪上半叶** | **20世纪30年代后** |
| 伦敦学派 | 关于社会主义的讨论 | 芝加哥学派 | 美国制度学派 | | 凯恩斯革命 |

| | | | |
|---|---|---|---|
| 欧肯,艾哈德 | **琼▪罗宾逊**,斯拉法,卡尔多,卡莱斯基 | **汉森,托宾,希克斯,哈罗德,多马,索罗,莫迪利安尼,杜森贝利,萨缪尔森** | |
| **20世纪30-40年代** | **20世纪50年代** | **20世纪30-70年代** | |
| 弗莱堡学派(德)(新自由主义) | 新剑桥学派(新凯恩斯主义) | 新古典综合派 | |

| | | | | | |
|---|---|---|---|---|---|
| 加尔布雷恩,鲍尔丁 | 林德伯克 | **弗里德曼** | 拉弗,费尔德斯坦 | 布坎南 | **科斯**,诺斯,威廉姆森 |
| **20世纪50年代** | **20世纪60-80年代** | **20世纪50年代至今** | **20世纪70年代** | **20世纪60年代** | **20世纪下半叶** |
| 新制度学派(美) | 之前瑞典学派 | 现代货币学派 | 供给学派 | 公共选择学派 | 新制度经济学学派 |

| | | | |
|---|---|---|---|
| 管理,计量,发展,比较,人口,信息,演化,实验 | | 价格和工资黏性,效率工资,经济周期 | 假设:货币经济周期,实际经济周期,李嘉图等价 |
| **当代** | **20世纪70年代** | | |
| 经济学学科发展 | 二者融合 | 新凯恩斯主义 | 新古典主义(理性预期学派) |

# Correlation and regression

## correlation

- scatter plots
- sample covariance&correlation

$$Cov(X,Y)=\frac{\Sigma(X_i-X_{avg})(Y_i-Y_{avg})}{n-1}$$

$$r=\frac{Cov(X,Y)}{s_x s_y} \qquad -1< r <+1$$

- population:ρ; sample:r

**significant test($H_0$:X=0)** of the correlation

- $H_0:\rho=0$; $H_A:\rho \neq 0$
- test statistic:

$$t=\frac{r-0}{\sqrt{((1-r^2)/(n-2))}} \qquad df=n-2$$

- decision rule
  - reject $H_0$ if t>+tcritical or t<-tcritical
- conclusion
  - significantly different from zero

limitations to correlation analysis

- outliers
- spurious correlation
  - chance relationships
  - divided by a third variable
  - relation to a third variable
- nonlinear relationships

## linear regression

Y:dependent,explained,endogenous,predicted
X:independent,explanatory,exogenous,predicting

$$Y_i=b_0+b_1X_i+\varepsilon_i$$

- interpretation of regression coefficient
  - $b_0$:estimated intercept coefficient
  - $b_1$:estimated slope coefficient

**6 assumptions**

- linear relationship exists between X&Y;
- X is not random( $\rho_{X,\varepsilon}=0$ ); $E(\varepsilon_i)=0$;
- Var(ε) is constant(homoskedastic);
- $Cov(\varepsilon_i,\varepsilon_j)=0$; ε is normally distributed.

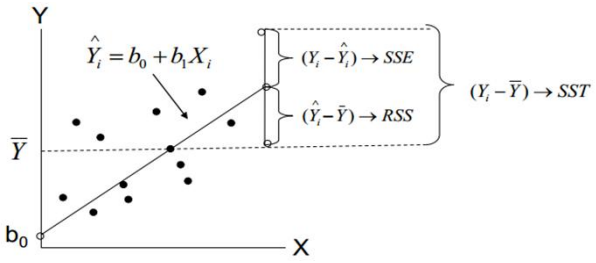
ordinary least squares(OLS)

- minimize the squared residuals

$$b_1=\frac{Cov(X,Y)}{Var(X)} \qquad b_0=Y_{avg}-b_1X_{avg}$$

Analysis of Variance(ANOVA) table

- component




**ANOVA table**

| | df | SS | MSS(variance) |
|---|---|---|---|
| Regression | k=1 | RSS | MSR=RSS/k |
| Error | n-2 | SSE | MSE=SSE/(n-2) |
| Total | n-1 | SST | - |

- **RSS:regression/explan**
- **SSE:error/residual**

standard error of estimate(SEE)

- smaller,better
- SEE= ✓(SSE/(n-2))= ✓MSE

coefficient determination($R^2$)

- **$R^2$=RSS/SST=1-SSE/SST**
- for simple linear regression:$R^2=r^2$
  - BUT they are different

| hypothesis test | | confidence interval |
|---|---|---|
| $(\pm)t=\frac{b_{predict}-b_{null}}{S_{b\,predict}}$ | ←→ | $(b_{null}=)b_{predict}\pm tS_{b\,predict}$ |

$H_0:b_1=0$

- regression coefficient **confidence interval**
  - doesn't include 0 → null is rejected
- **hypothesis testing** about regression coefficient( **df=n-2** )
  - $t \notin [-t_{critical},+t_{critical}]$ → null is rejected
- p-value
  - $p < \alpha$ → null is rejected

predicted value of the dependent variable

- point estimate
  - $\hat{Y}=\hat{b}_0+\hat{b}_1X'$
- confidence interval estimate
  - $\hat{Y}\pm(t_c\times s_f)$
  - $t_c$=the critical t-value with df=n-2
  - $s_f$=the standard error of the forecast , SEE ↑ ,$s_f$ ↑

$$s_f=SEE\times\sqrt{1+\frac{1}{n}+\frac{(X'-\bar{X})^2}{(n-1)s_X^2}}=SEE\times\sqrt{1+\frac{1}{n}+\frac{(X'-\bar{X})^2}{\sum(X_i-\bar{X})^2}}$$

limitations of regression analysis

- regression relations **changes** over time
- if others are also **aware of and act on** the relationship
- regression **assumptions** are violated
  - heteroskedastic
  - autocorrelation

# Multiple regression and issues in regression analysis

子沐 張涔

$Y_i = b_0 + b_1 X_{1i} + b_2 X_{2i} + \ldots + b_k X_{ki} + \varepsilon_i$

- interpretation of regression coefficient
  - slope:holding other independent variables constant

**assumptions**

1. linear relationship exists between X&Y
2. X is not random($\rho_{x,\varepsilon}=0$) **$Cov(X_1, X_2)=0$;** 3. $E(\varepsilon_i)=0$;
4. Var(ε) is constant(homoskedastic); 5. $Cov(\varepsilon_i, \varepsilon_j)=0$;
6. ε is normally distributed

dummy variables

- can only take two values,0&1
- distinguish n categories,need n-1 dummy variables

Analysis of Variance(ANOVA)

**ANOVA table**

| | df | SS | MSS(variance) |
|---|---|---|---|
| Regression | k | RSS | MSR=RSS/k |
| Error | n-k-1 | SSE | MSE=SSE/(n-k-1) |
| Total | n-1 | SST | - |

standard error of estimate(SEE)

- $SEE = \sqrt{(SSE/(n-k-1))} = \sqrt{MSE}$

coefficient determination($R^2$)

- $R^2 = RSS/SST = 1 - SSE/SST$

adjusted $R^2$

$$ad.\ R^2 = 1 - \frac{SSE/(n-k-1)}{SST/(n-1)} = 1 - \left[\left(\frac{n-1}{n-k-1}\right) \times (1-R^2)\right]$$

- adjusted $R^2 \leqslant R^2$
- adjusted $R^2$ may be less than zero

unbiased&consistent

- unbiased:$E(\text{parameter}_{sample}) = \text{parameter}_{population}$
- consistent:sample size ↑ ,accuracy ↑

**hypothesis testing about regression coefficient**

**significance test** for a regression coefficient($b_j, j \in [1,k]$)

- $H_0: b_j = 0$
- test statistic

$$t = \frac{b_{predict}}{S_{b_{predict}}} \qquad df = n-k-1$$

**p-value** (the smallest significance level)

- reject $H_0$ if p-value < α
- fail to reject $H_0$ if p-value > α

regression coefficient **confidence interval**

- $b_{predict} \pm t S_{b_{predict}}$
- estimate regression coefficient±(critical value)(coefficient standard error)

regression coefficient **F-test**

define hypothesis

- $H_0: b_1 = b_2 = \ldots = b_k = 0$
- $H_A$: at least one $b_j \neq 0$

F-statistic

$$F = \frac{MSR}{MSE} = \frac{SSR/k}{SSE/(n-k-1)}, \quad \frac{S^2_{regression}}{S^2_{error}}$$

decision rule

- reject $H_0$:if F(test statistic) > F(critical value)
- F-test here is always a one-tailed test

**assumptions → violations**

**heteroskedasticity(violate 4)**

- unconditional heteroskedasticity
- conditional heteroskedasticity
  - $S^2_{error}$ is related to the level of independent variables
  - creat significant problems for statistical inference
- effective of heteroskedasticity on regression analysis
  - not affect consistency, $b_j$ are not affected
  - standard errors are usually unrealiable estimates
    - $S_{b1}$ ↑↓ ⇒ $t = \frac{b-0}{S_{b1}}$ , ↓↑ ⇒ hard to reject, **type II** / easy to reject, **type I**
  - F-test is also unrealiabe
  - **summary:not affect($b_0, b_j$); affect(t, F, SEE, $R^2$)**
- **detecting** heteroskedasticity
  - residual scatter plots(ε&x)
  - **Breusch-Pager** **$\chi^2$ test(BP test)**
    - **$H_0$:no heteroskedasticity,one-tailed test**
    - **Chi-square test test:$BP = n \times R^2_{residual}$, df=k**
      - $R^2_{residual} \rightarrow \varepsilon^2 = b_0 + b_1 x + \varepsilon$
    - **decision rule:BP test statistic big,reject $H_0$**
- **correcting** heteroskedasticity
  - robust standard errors( **White -corrected** standard errors)
  - generalized least squares

**multicollinearity(violate 2)**

- effect all($b_0, b_1, t, F, SEE, R^2$,type II)
- **detect** (fail:not reject; pass:reject)
  - **t-test fail, F-test pass, $R^2$ high;**
  - $|\rho(X_i, X_j)| > 0.7$.
- **correct** :omit one or more $X_i$

**serial correlation(autocorrelation,violate 5)**

effective of serial correlation(like hetero.)

- **positive** serial correlation(++++)
  - $S_{b1}$ ↓ , **type I** , F-test unrealiable
- negative serial correlation(+-+-)
  - type II

**detecting** serial correlation

- residual scatter plots
- **Durbin-Watson test**
  - **$H_0$:no serial correlation**
  - **$DW \approx 2\times(1-r)$** , $r = r(\varepsilon_i, \varepsilon_j)$
  - decision rule

| reject $H_0$ | | not | | reject $H_0$ |
|---|---|---|---|---|
| ++++ | - | reject | - | +-+- |

0 $d_1$ $d_u$ 4-$d_u$ 4-$d_1$ 4

  - **$H_0$:no positive serial correlation**
  - $DW \approx 2\times(1-r)$
  - decision rule

| reject $H_0$ | - | fail to reject |
|---|---|---|

0 $d_1$ $d_u$

**correcting** serial correlation

- **Hansen method**
  - (also correct for conditional hetero.)
  - only hetero.:White-corrected
- improve model(time-series)

model misspecification

- functional form can be misspecified
  - important variables are omitted;
  - variables should be transformed(eg. ln);
  - data is improperly pooled.
- time series misspecification
  - a lagged Y used as a X;
  - a function of Y used as a X(forecasting the past);
  - X is measured with ε.
- effect $b_0, b_1$

qualitative dependent variables

- probit model
- logit model
- discriminant model(Z-score)

子 張
沐 涔

## Time-series analysis

### trend models

- linear: $y_t = b_0 + b_1 t + \varepsilon_t$ | limitation
- log-linear: $y_t = \exp(b_0 + b_1 t)$ | inconsistent $b_0, b_1$
  - $\ln(y_t) = b_0 + b_1 t + \varepsilon_t$ | $\mu, \sigma^2$ of time series changes over time

### ★ autoregressive models(AR)

**AR(p): $X_t = b_0 + b_1 X_{t-1} + b_2 X_{t-2} + \ldots + b_p X_{t-p} + \varepsilon_t$**

**3 assumptions**

#### no autocorrelation

detecting autocorrelation in an AR

- $H_0: r_{\varepsilon_t, \varepsilon_{t-k}} = 0$
- $t = \dfrac{r_{\varepsilon_t, \varepsilon_{t-k}} - 0}{S_r} = \dfrac{r_{\varepsilon_t, \varepsilon_{t-k}}}{1/\sqrt{n}}$
- differ significantly from 0, modify model
- correction: add lagged values

seasonality

- seasonal autocorrelation of $\varepsilon$ differ from 0
  - $X_t = b_0 + b_1 X_{t-1} + b_2 X_{t-4} + \varepsilon_t$

compare forecasting power with RMSE(AR)

- $RMSE = (\Sigma \varepsilon_i^2)/n$, like SEE, smaller, better

regression with more than one time series

- any time series contains a unit root
  - OLS may be invalid
- use DF tests for each time series to detect unit root
  - none has: we can use multiple regression
  - some has, some not: we can't use
  - all have: weather the time series are cointegrated
- **cointegration**
  - use Dickey-Fuller Engle-Granger test( **DF-EG test** )
    - **$H_0$: no cointegration**

#### covariance-stationary series

3 conditions

- **constant&finite $\mu, \sigma^2$, Cov of time series**

past stationary not guarantee future stationary

all covariance-stationary time series

- have a finite mean-reverting level

**mean reversion**

- mean reverting level: $x_t = \dfrac{b_0}{1 - b_1}$
  - $x_t > MRL \Rightarrow x_{t+1} < x_t$ but no less than MRL

instability of regression coefficient

- financial&economic relationship are dynamic
- models estimated with shorter time series
  - are more stable than longer

test $b_1 = 1$

#### no conditional heteroskedasticity

test(ARCH(1))

- $\varepsilon^2_t = a_0 + a_1 \varepsilon^2_{t-1} + u_t$
- **$a_1$ differ from 0, time series is ARCH(1)**
  - **$\Rightarrow$ heteroskedasticity**
- correction: generalized least squares

#### $b_1 = 1$ random walks

- random walk without a drift
  - $X_t = X_{t-1} + \varepsilon_t \quad b_0 = 0, b_1 = 1$
- random walk with a drift
  - $X_t = b_0 + X_{t-1} + \varepsilon_t$
- features
  - has an undefined mean reverting level
  - is not covariance stationary

**unit root test($b_1 = 1$)**

- have a unit root $\Rightarrow b_1 = 1$
- **Dickey-Fuller test(DF test)**
  - $X_t = b_0 + b_1 X_{t-1} + \varepsilon_t$
    - $\Rightarrow X_t - X_{t-1} = b_0 + (b_1 - 1) X_{t-1} + \varepsilon_t$
    - $\Rightarrow X_t - X_{t-1} = b_0 + g X_{t-1} + \varepsilon_t$
  - **$H_0: g = 0$ (have a unit root, nonstationary)**
  - **$H_A: g < 0$ (don't have a unit root, stationary)**
  - cpt conventional t-statistic, use revised t-table

**correction**

- first differencing
  - define $y_t = x_t - x_{t-1} = \varepsilon_t$
  - AR(1): $y_t = b_0 + b_1 y_{t-1} + \varepsilon_t$, $b_0 = b_1 = 0$
  - $y_t$ is covariance stationary

### Probabilistic approaches: senario analysis, decision trees, simulations

| risk type and probabilistic approaches | | | |
|---|---|---|---|
| discrete/ continuous | correlated/ independent | sequential/ concurrent | risk approach |
| discrete | correlated | sequential | decision trees |
| discrete | independent | concurrent | senario analysis |
| continuous | either | either | simulations |

# Economics3-1 Currency exchange rate:determination and forecasting

currency exchange rate(d:domestic; f:foreign)(2-1)

exchange rate

A:B=2 ⇌ 2 B/A

A:base currency; B:price currency

nominal exchange rate&real exchange rate

FX real(d/f)=FX nominal(d/f)×$CPI_f/CPI_d$

spot rate&forward rate

bid-ask spread (bank/dealer)

spread quoted by dealer(bank-client)

spread in the interbank market(benchmark);

size of transaction(larger,larger spread);

relationship between dealer&client.

❶ **interbank spread**

currencies involved(high-volume:$,€,£, ¥);

time of day(NewYork&London ⇉highest volume);

market volatility(higher,higher);

spread $_{forward}$ increases with maturity.

❷ **cross rate**

相乘同边($/¥, €/$: bid×bid, ask×ask)

相除对角(¥/$, €/$: bid/ask, ask/bid)

**triangular arbitrage** (eg.$,€,¥)

| $→€ | €→¥ | ¥→$ |
|---|---|---|
| $→¥ | ¥→€ | €→$ |
| mkt1,2 | mkt3 | |

step1.calculate cross rate €/¥ in mkt 1&2;

step2.compare with €/¥ in mkt 3;

step3.buy low sell high(mkt1,2).

乘小除大($ buy €: ×€/$; ÷$/€)

❸ forward discount (-)&premium (+)=$F - S_0$

forward point=$F - S_0$

❹ market-to-market value(of a forward)

time T: $V_T=(FP_T-FP)\times$ **contract size**

$FP_T$:sopt rate at T; FP:forward price

time t: $V_t=\dfrac{(FP_t-FP)\times \text{contract size}}{1+R\times(\text{days}/360)}$

经济学:先轧差，再折现

衍生品:先折现，再轧差

❺ international parity relationship

①**interest rate parity(IRP, FX&r)**

**covered interest rate parity**

covered:bound by arbitrage

assumptions:

currencies freely traded;

forward contracts available.

**interest differential ≈forward differential**

int.rate parity relationship

**F&S: X/Y**; r:nominal $R_f$ in X/Y

$(1/S)(1+r_Y)F=1+r_X$

$$\Rightarrow \boxed{\frac{F}{S}=\frac{1+r_X}{1+r_Y}}$$

$$\Delta\%FX=(F-S)/S=(r_X-r_Y)(1+r_Y)\approx r_X-r_Y$$

$$\Rightarrow \boxed{\Delta\%FX\approx r_X-r_Y}$$

day count convention(days/360)

$$\frac{F}{S}=\frac{1+r_X(\text{days}/360)}{1+r_Y(\text{days}/360)}$$

$$\Delta\%FX=\frac{(r_X-r_Y)(\text{days}/360)}{1+r_Y(\text{days}/360)}$$

arbitrage

$F/S>(1+r_X)/(1+r_Y)$, borrow X

profit=$(F/S)(1+r_Y)-(1+r_X)$

calulate:1.F or S; 2.forward point;

3.Δ%FX=(F-S)/S; 4.arbitrage profit.

**uncovered interest rate parity**

assume that investors are risk-neutral

$$\frac{E(S_t)}{S}=\frac{1+r_X}{1+r_Y}$$

$$\Delta\%FX=(E(S_t)-S)/S\approx r_X-r_Y$$

$$\Rightarrow \boxed{\Delta\%FX\approx r_X-r_Y}$$

$(r_X-r_Y)>0\Rightarrow\Delta\%FX>0, Y\uparrow$

$(r_X-r_Y)<0\Rightarrow\Delta\%FX<0, Y\downarrow$

②**international Fisher relation** ( **R&π**; short run ✘; long run ✔)

**int.rate differential ≈expected inflation differential**

assume that real int.rate are stable and equal( $R_{real,x}=R_{real,y}$ )

$1+R_{n,x}=(1+R_{r,x})(1+\pi_{e,x})$

‖ stable&equal, $\approx\Delta\%GDP_x$ (or$\Delta\%GDP_y$)

$1+R_{n,y}=(1+R_{r,y})(1+\pi_{e,y})$ n:nominal; r:real; e:expected; π:inflation

exact methodology linear approximation

$$\frac{1+R_x}{1+R_y}=\frac{1+\pi_{e,x}}{1+\pi_{e,y}},\qquad R_x-R_y\approx\pi_{e,x}-\pi_{e,y}$$

③**purchasing power parity(PPP, FX&π)**

absolute PPP

law of one price;

might not hold weights $_{goods}$ in 2 ecnomies not be same.

relative PPP

ex-post $\dfrac{S_1}{S_0}=\dfrac{1+\pi_x}{1+\pi_y}$

**ex-ante version of PPP(short run ✘; long run ✔)**

$$E(S_t)/S_0=\left(\frac{1+\pi_{e,x}}{1+\pi_{e,y}}\right)^{\wedge}t,\qquad \Delta\%FX\approx\pi_{e,x}-\pi_{e,y}$$

compare

$(\pi_{e,x}-\pi_{e,y})>0\Rightarrow\Delta\%FX>0, Y\uparrow$

$(\pi_{e,x}-\pi_{e,y})<0\Rightarrow\Delta\%FX<0, Y\downarrow$

coverd ✔ uncovered:if F=E(S1), ✔

if uncovered&Fisher ✔, ex-ante version of PPP ✔

combining Fisher&relative PPP ⇒uncovered

if relative PPP holds at any moment, real exchange rate →constant

equilibrium real exchange rate(mean-reversion)

❻ long-run fair value of an exchange rate

macroeconomic balance approach

BOT: **current account** balance ⇉FV of exchange rate

external(debt) sustainability approach

external **debt/GDP** (20%-40%) towards its sustainable level

reduced-form econometric **model** approach

**compare**

| covered | uncovered |
|---|---|
| no-arbitrage forward rate | expected future spot rate |
| by arbitrage | if uncovered holds ,F is an unbiased predictor of $E(S_t)$ |
| all ✔ | in the short run ✘; in the long run ✔ |

# Economics3-2 Currency exchange rate:determination and forecasting

currency exchange rate(d,DC:domestic; f,FC:foreign)(2-2)

**7** balance-of-payments accounts

- accounts
  - current account; financial account; official reserve.
    - in short-term,capital flows →dominant factor
- influence of BOP on exchange rates
  - **current account** influence
    - **flow mechanism** (DC ↓ improve deficit)
      - **deficit ⇨DC ↓** ⇨**price ex ↓** ⇨**Q ex ↑** ⇨**EX ↑**; ⇨**price im ↑** ⇨**Q im ↓** ⇨**IM ↓**
      - initial deficit
      - elasticity should be large
      - influence of FX on domestic import&export prices
      - price elasticity of demand of the traded goods
    - portfolio composition mechanism
      - when rebalance,negative impact on investee
    - debt sustainability mechanism
      - when level of debt/GDP gets too high,currency ↓
  - **capital account** influence
    - one of major determinants
      - eg.capital into UK,demand of £ ↑ ,appreciation
    - problems(excessive capital into emerging mkts)
      - domestic currency: excessive real ↑ ;
      - financial asset/real estate bubbles ;
      - increases in external debt (business&government);
      - excessive consumption fueled by credit;
      - an overinvestment in risky projects.
  - real exchange rate
    - real exchange rate(A/B)=equilibrium real exchange rate +(real int.rate B - real int.rate A) - (risk premium B - risk premium A)
    - short-term; positive with int.rate; negative with risk.

**8** Talor rule

**$R=r_n + \pi + \alpha(\pi-\pi^*) + \beta(y-y^*)$** → → → → → →

- R:central bank policy rate(implied by Talor)
- $r_n$:netrual real policy int.rate
- π:current inflation rate
- π*:central bank's target inflation rate
- y:log of current level of output
- y*:log of central bank's target(sustainable) output
- α,β:policy response coefficient
- real int.rate=r= R-π =$r_n$+α(π-π*)+β(y-y*)

real exchange rate

- real exchange rate(A/B)
- =equilibrium real exchange rate
- +difference in netural real policy r(B-A)
- +α(difference in inflation gap(B-A))
- +β(difference in output gap(B-A))
- - (risk premium B - risk premium A)

**9** FX carry trade(A/B,uncovered( ✘ short-term))

- $r_A > r_B$, $S_0$, $S_1$, borrow B
  - **profit=($S_0$/$S_1$)(1+$r_A$) - (1+$r_B$)**
  - ⇓ $S_0/S_1 = 1/(1+\Delta\%S)$
  - profit=($S_0$/$S_1$)(1+$r_A$) - (1+$r_B$)
  - =($r_A$ - $r_B$ - Δ%S - $r_B$×Δ%S)/(1+Δ%S)
  - ≈(**$r_A$ - $r_B$) - Δ%S**
  - Δ%S ↑ (B ↑ ),$r_B$ ↑ ,$r_A$ ↓ ⇒profit ↓
- crash risk(capital move together)
  - return:not normal;- skewness;
  - excess kurtosis(eg,fat tail)
- risk management in carry trade
  - volatility filter:σ ↑ ,close
  - valuation filter:$V_{currency} > V_{long}$,close

signs of currency crisis

- trade deteriorate;
- official foreign reserves ↓ ;
- $DC_{real}$ > mean-reverting level;
- inflation ↑ ;
- equity market:boom-bust cycle;
- MS relative to bank reserve ↑ ;
- nominal private credit ↑ .

**10** exchange rate determination models

D:demand
CB:central bank
F.A.:financial account
C.A.:current account

- **Mundell-Fleming model** (short-term)
  - **flexible exchange rate regimes**
    - **high capital mobility**
      - monetary policy
        - **m ↑ ⇨r ↓ ⇨outflow ⇨DC ↓** (F.A.)
      - fiscal policy(expansion)
        - **$D_{DC}$ ↑ ⇨$r_{DC}$ ↑ ⇨inflow ⇨DC ↑** (F.A.)
        - **IM ↑ ⇨deficit ⇨DC ↓** (C.A.,less than F.A.)
    - **low capital mobility**
      - monetary policy
        - **m ↑ ⇨r ↓ ⇨outflow(less) ⇨DC ↓ (less)**
      - fiscal policy
        - **$D_{DC}$ ↑ ⇨$r_{DC}$ ↑ ⇨inflow(less) ⇨DC ↑ (less)**
        - **IM ↑ ⇨deficit ⇨DC ↓** (C.A. more than F.A.)
  - **fixed exchange rate regimes**
    - **high capital mobility**
      - monetary policy(fail)
        - **m ↓ ⇨r ↑ ⇨inflow ⇨DC ↑ ⇨CB sell DC**
      - fiscal policy(expansion)
        - **$D_{DC}$ ↑ ⇨$r_{DC}$ ↑ ⇨inflow ⇨DC ↑ ⇨CB sell DC**
- **the monetary approach**
  - compare with Mundell-Fleming model
    - MF:assume inflation play no role(short-term)
    - MA:assume output is fixed, m.policy ⇒inflation ⇒FX
  - pure monetary model(only long-term) MV=PY
    - **long-term:MS ↑ ⇨P ↑ ⇨π ↑ ⇨DC nominal ↓**
    - $DC_{real}$:no change
    - PPP:only π → FX nominal
  - Dornbusch overshooting model
    - long-term ⇒pure monetary model,$DC_{real}$:no change
    - short-term ⇒Mundell-Fleming model,$DC_{real}$:change
- **the portfolio balance** (asset market) **models** (long-term,fisical policy)
  - **gov.exp. ↑ ⇨deficit ↑ ⇨confidence ↓ ⇨outflow ⇨DC ↓**

central bank intervention

- excessive capital inflows to A:also lead to a currency crisis
- objective
  - DC does not appreciate excessively
- effectiveness
  - developed markets:relative ineffective

Economics3-3 Economic growth and investment decision

## economic growth and investment decision

1. preconditions for growth
   - savings&investment
   - financial mkt&intermediaries
   - political stability
   - investment in human capital
   - tax and regulatory systems
   - free trade&unrestricted capital flow

stock market,sustainable growth rate
- P=GDP×(E/GDP)×(P/E)
- ⇒ Δ%P=Δ%GDP+Δ%(E/GDP)+Δ%(P/E)
- long-term:Δ%(E/GDP)=0; Δ%(P/E)=0
- **long time horizon:Δ%P=Δ%GDP**

2. importance of potential GDP
   - higher protential GDP growth implies
     - **higher real interent rates&real asset returns;**
     - expected credit risk ↓
     - credit quality of all debt issues ↑
   - actual GDP - potential GDP=rising price

3. factors inputs and economic growth
   - **Cobb-Douglas production function**
     - $Y=TK^{\alpha}L^{\beta}$
     - **T:total factor productivity(TFP)**
       - technological progress of economy
     - **α+β=1:exhibits constant returns to scale**
       - K×2,L×2 ⇒Y×2
   - ①**output per worker(Y/L,labor productivity)** (X/L=x)
     - $Y/L=T(K/L)^{\alpha}$ → $y=Tk^{\alpha}$
       - K/L:capital per worker(capital deepening)
     - **Δ%y=Δ%T+αΔ%k**
     - Δ%per-capita protential GDP(Δ%labor productivity)
       =Δ%technology+αΔ%capital-to-labor ratio
     - α<1:add. capital →a diminishing effect on productivity
     - capital deepening k ↑ :developing nations gain more
   - in sready state,marginal product of K=marginal cost of K
     - $MP=d(TK^{\alpha}L^{1-\alpha})/dK=\alpha Y/K=r=MC$ ⇒α=rK/Y
     - ⇒ **α=rK/Y:** amount of Y that is allocated to providers of K
   - growth accounting relations (r:int.rate)
     - ②**Δ%Y=Δ%T+αΔ%K+(1-α)Δ%L**
     - ③**Y=(Y/L)×L=y×L ⇒Δ%Y=Δ%y+Δ%L**

4. factors influencing economic growth
   - natural resources
     - role in economic growth is complex
     - Dutch disease
       - global demand for a country's resources ↑
         ⇨EX ↑ ⇨DC ↑ ⇨other industries EX ↓
   - labor supply factors
     - demographics
       - population ages&individuals live>working age
         - ⇨labor force decline
     - labor force participation= $\frac{\text{labor force}}{\text{working age population}}$
     - immigration; average hours worked
   - human capital
   - physical capital
     - telecommunications(ICT)&non-ICT capital
     - public infrastructure
   - tech. development:developed:R&D; developing:copy

5. ecomonic growth theories
   - classical growth theory(exogenous)
     - growth in real GDP isnot permanent
     - tech. ↑ ⇨invest in new K ↑ ⇨y ↑
       ⇨real wages ↑ ⇨population ↑ ↑ ⇨real GDP ↓
     - subsistence real wage
   - **neoclassical growth theory** (exogenous)
     - long-term steady state growth rate
       - **tech. ↑ ⇨K ↑ ⇨k ↑ ⇨y ↑ (marginal ↓ ) ⇨stable**
       - **economy equilibrium:constant Y/K, Δ%k=Δ%y**
       - sustainable growth of output per capita g*
         - **g*=Δ%y=θ/(1-α), θ=Δ%T**
       - sustainable growth rate of output G*
         - **G*=Δ%Y=θ/(1-α)+Δ%L**
     - **capital deepening:k ↑ ⇒Y ↑ ; k ↑ ⇏Δ%Y**
       - **k ↑ ⇒y ↑ ⇒stable**
     - economy's growth rate →steady state
     - **steady state: MPK=αY/K**
       - MPK:marginal product of capital,ΔY/ΔK
       - marginal productivity(Δy/Δk) diminishing
   - endogenous growth theory(tech. ⇌K ↑ )

6. convergence hypotheses
   - absolute convergence hypotheses
   - conditional convergence hypotheses
   - club convergence hypotheses
     - countries can 'join' club by making changes
   - expected impact of removing trade barriers

## Economics of regulation

economics of regulation
- regulations
  - statutes:laws made by legislative bodies
  - administrative regulations:government
  - judicial law:court
- regulators
  - independent regulators(SEC,etc)
  - self-regulating organizations(SROs)
    - outside bodies — may have conflicts of interest
- economic rationale for regulatory intervention
  - informational frictions
  - externalities
- **regulatory interdependencies**
  - **regulatory capture theory** (by industry experts)
  - **regulatory competition**
  - **regulatory arbitrage**
- tools of regulatory intervention
  - price mechanisms(taxes&subsidies)
  - restricting/requiring certain activities
  - provision of public goods/financial of private projects
- regulating commerce%financial mkt
  - commerce:laws
  - financial mkt:securities mkt
    - prudential supervision →financial institutions
- antitrust regulation
- cost benefit analusis of regulation
  - regulatory burden&sunset clause(period of validity)
- effects of a specific regulation
  - help or hinder

FSA 5-1 Intercorporate investment

| overview | passive | active | | |
|---|---|---|---|---|
| | **financial assets** | **associates** | business combination | joint ventures |
| **degree of influence** | no significant | significant | control | shared control |
| typical % interest | ＜20% | 20%-50% | 50%＜ | varies ($\frac{1}{n}$) |
| US GAAP | cost or mkt HTM;AFS; FV through P/L. | equity method | acquisition method | equity method (proportionate consolidation) |
| IFRS | | | | |

**financial assets**

- **held-to-maturity(HTM)**
  - positive intent & ability to HTM
  - only for debt securities
  - initial recognition(similar)
    - IFRS:FV+transaction costs
    - US:at cost including transaction costs
  - over the holding period
    - **B:BV $_{BGN}$=ΣPVCF,discount rate=r $_{mkr\ int.}$**
    - **A:Int.=BGN×r $_{mkt\ int.}$, →Gain,I/S**
    - **S:coupon →CF**
    - **E:BV $_{END}$=B+A-S**
- **FV through P/L**
  - debt&equity held for trading (TS)
  - designated at FV
- **available-for-sale(AFS)**
  - not classified as HTM,FV through P/L
  - **assets →at FV**
  - **realized G/L →I/S**
  - **unrealized G/L →OCI**
  - FX changes
    - P/L:IFRS,debt(other changes →OCI)
    - OCI:all others(all US GAAP)

| summary | HTM | AFS | FV thr. P/L |
|---|---|---|---|
| carrying V | amortized | FV | FV |
| I/S | int. realized G/L | int.&div. realized G/L | int.div. realized G/L unrealized G/L |
| OCI | | unrealized G/L | |

no FV,no unrealized G/L

reclassification
- IFRS:only AFS⇆HTM
- US:all

**impairment(IFRS)**
- effect CF(be estimated reliably)
- **loss event**
  - **debt:** default
  - **equity:** extended decline
    - unlikely recover
- **reversals(in I/S)**
  - **debt:** recovery event
  - **equity:** not permitted(I/S)
- **HTM(debt)**
  - carrying amount ＞ PVCF
  - impairment loss →I/S
  - reversal →I/S
    - loss event disappear
- **AFS(debt&equity)**
  - carrying amount ＞ FV
  - cumulative OCI →I/S
  - reversal →I/S
    - debt: I/S
    - equity:not I/S

**impairment(US GAAP)**
- decline no temporary
- **no reversal(I/S)**

IFRS 9(reclassification:D)
- amortized cost(D)(HTM)
- FVPL(D&E)(FV thr. P/L)
- FVOCI(E only)(AFS)

**associate(A⇉invest⇉B,x%)**

**significant influence**
- representation of board;
- participation in policy making;
- material transactions;
- interchange of mgt personnel;
- technological dependency.

❶ **equity method(basic)**
- **one-line consolidation**
  - **B/S:** recognize cost of investment
  - **B/S&I/S:** share NI
  - **B/S:** decrease if div.
- **B/S:** carrying amount
  - **invest $_{END}$=cost+accum(NI-div.)×x%**
- **I/S:** gain=NI×x%

❷ **equity method(complicated)**

| acquisition cost | | |
|---|---|---|
| FV of net identifiable assets | | GW |
| BV of net identifiable assets | FV app. | GW |

- unidentifiable assets:GW
- appreciation ↳ not list separately
  - PP/E →dep.
  - intangible →amort.
  - inventory →COGS
  - **NI $_{adj}$=NI-(dep.+amort.+COGS) $_{FV\ app.}$**
  - **invest $_{END}$=invest $_{BGN}$+(NI $_{adj}$-div.)×x%**

**FV option**
- **US:** allow equity method at FV;
- **IFRS:** only available to VC,mutual fund;
- use of FV option is irrevocable;
- changes in value →I/S.

**impairment**
- **IFRS**
  - loss event (future CF);
  - entire carrying amount;
  - impairment loss →I/S.
- **US:** FV ＜ carrying value,permanent
  - impairment loss →I/S
- both **prohibit** the reversal

❸ **equity method(transaction with associates)**
- **upstream** (A⇇sell⇇B)
- **downstream** (A⇉sell⇉B)
- elimination of unrealized profit
  - transaction $_{in}$=t $_{in}$ (A buy from B)
  - transaction $_{out}$=t $_{out}$ (A sell out)
  - unrealized profit=pft $_{un}$
  - **$pft_{un}=(t_{in}-cost_{in})\frac{t_{in}-t_{out}}{t_{in}}\times x\%$**
  - **equity income $_{aj}$=NI $_{aj}$×x% - pft $_{un}$**

analyst issues
- equity method higher earning than passive
  - ∵ NI ＞ div.
- one line consolidation(vs acquisition method)
- quality of the equity earning

joint ventures
- US GAAP&IFRS
  - **equity method**
- rare circumstances(US&IFRS)
  - proportionate consolidation
    - similar to a business acquisition
    - report proportionate of B/S,I/S
    - no minority interest

FSA 5-2 Intercorporate investment

**controlling interest investment(A ⇉invest ⇉B,x%)**

controlling interests
- parent → subsidiary

❶ **acquisition method(basic)**
- step1.-investment;-investment income
- step2.+TA,+TL;+I/S
- step3.+MI;-P/L attribute to MI holders

minority interest
- an isolated item

transactions among entities
- are eliminated

**business combination**
- **merger:** A+B=A
- **acquisition:** A+B=(A+B)
- **consolidation:** A+B=C
- SPE or VIE

❷ **acquisition method(complicated)**
- **step1.parent** $_{post\text{-}acq.,FV,A\&L}$ **+target** $_{FV,A\&L}$
- **step2.-investment**
- **step3.+Goodwill** (separate from investment)
- **step4.+MI**
- **step5.=equity** $_{parent}$
- **step1.+I/S;-investment income**
- **step2.-(dep.+amort.+COGS)** $_{FV\ app.}$
- **step3.-P/L attribute to MI**

**goodwill**
- not amortized
- an impairment test at least annually
  - carrying value > FV,impaire
- bargain acquisition
  - negative GW(→gain)
- **full goodwill** ( IFRS & US GAAP )

$$GW=\frac{consideration}{x\%}-equity_{B,FV}$$

$$MI=\frac{consideration}{x\%}(1-x\%)$$

- **partial goodwill** ( IFRS )
  - GW=consideration - equity $_{B,FV}$ ×x%
  - MI=equity $_{B,FV}$ ×(1-x%)
  - full GW×x%=partial GW

**goodwill impairment**
- unit:associate;subsidiary
- **IFRS** : cash generating unit
  - **carring amount** $_{unit}$ > **recoverable amount**
  - **recoverable amount**
    - **=max(going concern,bankrupcy liquidation)**
  - impairment loss
- **US** : reporting unit
  - **carring value** $_{unit}$ > **FV** $_{unit}$
  - **cpt implied GW**
  - **impairment loss=GW-implied GW**

summary( **equity,acq.,propor.** )
- same NI
- **equity:** acq.(+MI) > equity=propor.
- **assets,liabilities,sales,exp.**
  - acq. > propor. > equity

acquisition vs pooling-of-interest(has been eliminated)
- purchase method:acquisition method(before)

| | **acquisition** | **pooling** |
|---|---|---|
| combination | FV | BV |
| pre-acq.earn | not recg. | recg. |
| post-acq.earn | (dep.,etc) $_{app.}$ | no |
| profit margin | lower | higher |
| ROA | lower | higher |
| ROE | lower | higher |

**SPE&VIE**
- in the past,SPEs off-balance-sheet
- US GAAP,VIE
  - at-risk equity insufficient without add financial support;
  - equity investors **lack any one** of following
    - decision making rights;
    - obligation to absorb losses;
    - right to receive expected residual returns.
- must be consolidated by the primary beneficiary

Post-retirement and share-based overview
- typical
  - **defined-contribution pension plan(DC)**
  - **defined-benefit pension plan(DB)**
  - **other post retirement benefits(OPB,like DB)**
- key to identify DC/DB
  - **who bear the investment risk**
  - employer's future obligation
- OPB regarded as an extension of DB

| | **DC** | **DB** | **OPB** |
|---|---|---|---|
| amount of benefit | not determined depend on FV of plan assets | pre-determined | depend on specifications of plan |
| investment risk | born by employee | born by employer | depend |
| employer's obligation | make periodic contributions | make pre-determined pmt to retiree | similar to PB usually unfunded |

illustration of DB
- **PBO** (PV(pension))
  - **PBO** ,projected benefit obligation(US GAAP)
  - **PVDBO** ,PV of defined benefit obligation(IFRS)
- **ABO**
  - accumulated benefit obligation
- **VBO**
  - vested benefit obligation

| | definition | calculation base/assumptions |
|---|---|---|
| PBO | actuarial PV of all benefits(plan's benefit formula) | expected future salary increases; going concern |
| ABO | actuarial PV of benefits based on current&past | current compensation levels ; liquidation of pension obligation |
| VBO | amount of ABO which employee is entitled | ABO; vesting schedule |

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**funded status**( IFRS&US GAAP )
- **=FV of plan assets-PV of PBO**
- as a net pension assets( ceiling )/lia.;
- plan asset > PBO,overfunded plan;
- plan asset < PBO,underfunded plan.

**FV of plan assets**
- **B: FV** $_{BGN}$
- **A: employer contributions** (EC)
- **actual return**
  - fund operation
- **S: benefit paid to employee** (BP) = = =
- **E: FV** $_{END}$ **=B+A-S**

**PV of PBO**
- **B: PBO** $_{BGN}$
- **A: current service cost** (C.S.C.)
  - PV(Δpension) certain
- **interest cost** (int.)
  - r×PBO $_{BGN}$
- **past service cost** (P.S.C.)
  - plan amendments during the year
- **actuarial L/G** (act. L/G)
  - changes in actuarial assumptions
- **S: benefit paid to employee** (BP)
- **E: PBO** $_{END}$ **=B+A-S=PV(PVCF retire date )**

**US GAAP B/S**

| | | | | |
|---|---|---|---|---|
| - | cash -Δ | | | |
| ❷ | FV $_{BGN}$ | ❶ | PBO $_{BGN}$ | |
| + | EC +Δ | | + C.S.C. | ❸ - C.S.C. |
| | | | + int. | ❹ - int. |
| + | actual R | | | + ER |
| | | | + P.S.C. | ❺ - P.S.C.,amort. |
| | | | +/- act.L/G | ❻ - act.L/G,amort. |
| - | BP | ❽ | - BP | - [ER-actual R],amort. |
| | | | OCI: | |
| | | | - P.S.C.,unamort. | |
| | | | -/+ act.L/G,,unamort. | |
| | | | - [ER-actual R],unamort | ❼ |

**IFRS B/S**

| | | | | |
|---|---|---|---|---|
| - | cash -Δ | | | |
| ❷ | FV $_{BGN}$ | ❶ | PBO $_{BGN}$ | |
| + | EC +Δ | | + C.S.C. | ❸ - C.S.C. (service cost) |
| | | | + P.S.C. | ❺ - P.S.C. |
| + | actual R | | + int. | ❹ - int.=r×PBO $_{BGN}$ (net int. E/I) |
| | | | +/- act.L/G | + "ER"=r×FV $_{BGN}$ |
| - | BP | ❽ | - BP | |
| | | | OCI: | ❻ |
| | | | -/+ act.L/G | |
| | | | - "ER"-actual R | ❼ |

US GAAP&IFRS:funded status → same

**assumptions** of DB obligation
- firm discloses
  - **discount rate** (r)
    - int. rate of high quality corp. bond
    - duration :bond=PBO
  - **rate of compensation growth**
  - **expected vesting rate(US)**
  - **expected return on plan assets(IFRS)**
- estimate of future compensation
  - final-pay plan(in CFA)

**periodic pension cost** ( US GAAP )
- certain
  - **+current service cost(C.S.C.)**
  - **+interest cost(int.)**
  - **-expected return(ER)**
- uncertain(amortized)
  - **+actuarial L/G(general)**
    - **act. L/G** :changes in actuarial assumptions
    - **ER-actual R**
    - corridor approach
      - act.L/G(g) > max(PBO $_{BGN}$,FV $_{BGN}$)×10%,
      - must amort.;amort. must consistent
      - amort. at least remaining service life
  - **+past service cost(P.S.C.)**
    - amort. over remaining service life
- **OCI** (unamortized)
  - -past service cost(P.S.C.)
  - -actuarial L/G(general)

**periodic pension cost**( IFRS **,no amortized)**
- **service cost**
  - +current service cost(C.S.C.)
  - +past service cost(P.S.C.)
- **net interest expense/income**
  - =interest cost-expected return
  - =r×(PBO $_{BGN}$-FV $_{BGN}$)
  - expected rate of return=discount rate
- **remeasurement** (actuarial L/G(general))
  - **actuarial L/G** (act. L/G)
  - "ER"-actual R,r=discount rate
- **OCI** (not amortized)
  - remeasurement

**effect of changing pension assumption**
- **discount rate** ↑
  - reduce PV:PBO ↓ ,funded status ↑
  - service cost ↓
  - int. ↓ =PBO×r,(usually)
    - unless plan is mature(duration)
- **rate of compensation growth** ↓
  - reduce pmt:PBO ↓ ,funded status ↑
  - current service cost ↓ ,int.cost ↓
- **expected return on plan assets**
  - not affect PBO&funded status

other post-employment benefits **(OPB)**
- assumptions
  - similar → PBO
  - **healthcare inflation rate**
    - ultimate healthcare trend rate
    - replace compensation growth rate
- firm can reduce OPB by:
  - near-term healthcare infl. rate ① ↓
  - ultimate healthcare trend rate ② ↓
  - time needed to reach ② ↓

**share-based compensation**
- stock compensation plan(forms)

| equity settles | cash settles |
|---|---|
| stock options | stock appreciation rights |
| stock grants | phantom shares |

- equity settled
  - recognize exp. over svrvice period
  - disadvantages
    - mgt have limited influence over MV
    - risk averse/excessive risk-taking
    - dilute
  - accounting:FV&vesting schedule
- cash settled
  - stock appeciation right(SARs,public com.)
    - phantom stock× Δ P, FV
  - phantom shares(private com.)
    - by private companies

FSA 5-4 Post-retirement and share-based

analyst view

- evaluating the disclosure-assumptions
  - **disclosure assumptions**
    - discount rate
    - expected compensation increases
    - medical expense inflation
    - expected return on plan assets
  - **evaluate these assumptions**
    - consistent with other comparable companies
    - consistent with economic environment
    - consistent internally
- **B/S:net pension liability or asset**
  - adjust the net for gross
- **I/S:total periodic pension costs**
  - net periodic pension cost
  - total period pension cost
  - economic pension cost
  - **cpt net periodic pension cost**
    - = Δ **funded status** $_{END-BGN}$ **-employer's contribution**
      - funded status: assets → +; liability → -
      - result: + → pension income; - → pension expense
      - =actual return-4A of PBO
  - **adjust US GAAP to IFRS**
    - +past service costs
    - -amort.of past service costs
    - +return of plan by dicount rate rather than expected
  - **adjust:(pension cost → operating)**
    - current service cost still operating
    - int. expense → financing cost
    - return of plan → other income
- **cash flow**
  - **overcontribution**
    - contribution > total periodic pension costs(TPPC)
      - CFF-(contribution-TPPC)×(1-t),repayment
      - CFO+(contribution-TPPC)×(1-t)
  - **undercontribution**
    - contribution < total periodic pension costs(TPPC)
      - CFF+(TPPC-contribution)×(1-t),borrowing
      - CFO-(TPPC-contribution)×(1-t)

Multinational operations

translation of foreign currency FS

- classification of currency
  - **local currency** (subsidiary)
  - **functional currency** (sales,finances,etc.)
  - **reporting currency** /presentation currency
    - parent
  - local=functional:independent
  - reporting=functional:nonindependence
- two methods of translation
  - reporting currency
    - ↑ **current rate method(CR); translation**
  - functional currency
    - ↑ **temporal method(T); re-measurement**
  - local currency
- comparison of 2 methods

| **B/S** | rate under T | rate under CR |
|---|---|---|
| monetary A/L | current | current |
| non-monetary A/L(inv.,FA,unearned rev.) | **historical** | **current** |
| capital(g) | historical | historical |
| R/E | balancing | balancing |
| equity(as a whole) | **mixed** | **current** |

capital(g)=capital+additional paid-in-capital

| **I/S** | rate under T | rate under CR |
|---|---|---|
| sales& other exp. | average | average |
| COGS | **historical** | **average** |
| depreciation | **historical** | **average** |
| rev.&other exp | average | average |
| translation G/L | recognize on I/S | recognize in OCI(CTA) |

**CTA:cumulative translation adjustment**

**exposure to translation** (translation G/L,risky → ending rate)

- temporal method
  - exposure=monetary assets-monetary liabilities
- current rate method
  - exposure=equity

**translation G/L=flow effect+holding G/L effect**

- **flow effect(in $)= Δ exposure(in LC)×(ending rate-average rate)**
- **holding G/L effect**
  - **=exposure** $_{BGN}$ **(in LC)×(ending rate-beginning rate)**

**current rate method**

| 2nd. B/S | | 1st. I/S | |
|---|---|---|---|
| assets (ending rate) | liabilities (ending rate) | sales | |
| | | COGS | AVG |
| | | SG&A | AVG |
| | | D&A | AVG |
| | TL(ending rate) | int | AVG |
| | capital(historical) | tax | AVG |
| TA (ending rate) | **R/E** $_{END}$ **=R/E** $_{BGN}$ **+NI-div.** | ← NI,avg | |
| | OCI: CTA | **TA=TL+capital+R/E** $_{END}$ **+CTA** | |

(ending rate=current rate)

**temporal method**

| 1st. B/S | | 2nd. I/S | |
|---|---|---|---|
| money (ending) | money (ending) | sales | AVG |
| | | COGS | H |
| non-money (historical) | non-money (historical) | SG&A | AVG |
| | | D&A | H |
| | | int | AVG |
| | TL | tax | AVG |
| | capital(historical) | NI(before translation) | |
| TA | **R/E=TA-TL-capital** | +translation G/L | |
| | **R/E** $_{END}$ **=R/E** $_{BGN}$ **+NI(after)-div.** | → NI(after translation) | |

foreign currency transactions

- **date of transactions** → foreign currencies into function currency
- **balance sheet date** → re-valued monetary A/L in foreign currencies
- **settlement date**
  - foreign currency appreciation → export sales:gain;import purchase:loss
  - recognized on the I/S(IFRS&US GAAP) → operating or non-operating

FSA 5-5 Multinational operations

translation of foreign currency FS

**summary(before&after CR method)**

| | pure B/S& pure I/S | mix ratios |
|---|---|---|
| LC appreciating | same | lower(ROA,ROE,turnover) |
| LC depreciating | same | higher(ROA,ROE,turnover) |

**comparison of ratios under 2 methods**

| LC depreciating | temporal | current rate |
|---|---|---|
| current ratio | **higher** | **lower** |
| quick ratio | same | same |
| A/R turnover | same | same |
| inventory turnover | uncertain | uncertain |
| fixed assets turnover | **lower** | **higher** |
| GP% | **lower** | **higher** |
| NI%,ROE,ROA (translation G/L) | uncertain | uncertain |
| int. coverage | **lower** | **higher** |
| LTD-to-total capital(E+D) | **lower** | **higher** |

**hyperinflation economies**

- 3 years > cumulative 100% or **26%/1 year**
- US GAAP:temporal
- IFRS:restated for inflation,
  - then translation using current rate

**statutory tax rate&effective tax rate**

- statutory tax rate
- +effect of disallowed exp.
- -effect of exempt income
- **+effect of tax in foreign jurisdictions**
- -effect of recognition of prior losses
- =effective tax rate

revenue ↑ =price×volume×FX

larger proportion of accrual component in earnings,
the faster the reversion will occur

**aggregated accruals=accrual-based earnings - cash earnings**

- AA:aggregated accruals
- NOA:net operating assets
- AR:accrual ratio

Evaluating quality of financial reporting

quality of financial reports

- 2 basic points
  - **GAAP-compliant&decision-useful results are highly quality**
- aggressive vs. conservative

potential problems

- measurement&timing issues

| | recongnition | NI | E | L | A |
|---|---|---|---|---|---|
| sales | aggressive, premature | ↑ | ↑ | - | ↑ |
| exp. | omission delayed | ↑ | ↑ | ↓ | ↑ |

- classification issues
  - classification choices
    - B/S,CI,CF/S
- mergers and acquisitions issues
  - acquirer
  - target company
- FS that diverges from economic reality

Integration of FSA techniques

framework

- define the purpose&context
- collect input
- process data
- analyze/interpret data
- develop&communicate conclusions&recommendations
- follow up

case1 LT equity investment

- Dupont analysis

case2 Off-BS leverage from operating lease

case3 changes in accounting

financial reporting quality

- decomposition with BS approach
  - NOA=(TA-cash)-(TL-total debt)
  - $AA_{B/S}=NOA_t - NOA_{t-1}$
  - $(AR)_{B/S}=AA_{B/S}/((NOA_t+NOA_{t-1})/2)$
- decomposition with CF approach
  - **$AA_{C/F}=NI_t-(CFO_t + CFI_t)$**
  - **$(AR)_{C/F}=AA_{C/F}/((NOA_t+NOA_{t-1})/2)$**

evaluating the quality of financial reports

**Beneish model**

M-score: +DSRI,GMI,AQI,SGI,DEPI,Accruals; -GAI,LEVI (I:index)

- **DSRI(days sales receivables)** =(recievables/sales)$_t$/(recievables/sales)$_{t-1}$
- **GMI(gross margin)** =(gross margin)$_{t-1}$/(gross margin)$_t$
- **AQI(asset quality)** =(1-(PPE+CA)/TA)$_t$/(1-(PPE+CA)/TA)$_{t-1}$
- **SGI(sales growth)** =sales$_t$/sales$_{t-1}$
- **DEPI(dep.)** =(dep.rate)$_{t-1}$/(dep.rate)$_t$
  - dep.rate=dep./(dep.+PPE)
- **Accruals** =(income before extra-items - CFO)/TA
- **SGAI(SG&A)** =(SGA/sales)$_t$/(SGA/sales)$_{t-1}$
- **LEVI(leverage)** =leverage$_t$/leverage$_{t-1}$ , leverage=D/A

**N(M-score)=probability of earnings manipulation**

limitation

- 1.accounting data; 2.game the measures used

bankruptcy prediction models(Altman model)

- z<1.81:high probability of bankruptcy
- z>3.00:low probability of bankruptcy
- limitation
  - 1.accounting data; 2.single-period static model

**I/S**

quality of earnings

- high-quality
  - sustainable&adequate(cover company's cost of capital)
- model
  - **$Earnings_{t+1}=\alpha+\beta_1 Earnings_t+\varepsilon$ , $\beta_1$ :persistence**
  - **$Earnings_{t+1}=\alpha+\beta_1 CF_t+\beta_2 Accruals_t+\varepsilon$**

mean reversion in earnings

evaluate the earnings quality

- revenue&expense recognition

**CF/S**

indicators of cash flow quality

- focus on OCF
- manipulate
  - timing issues(sell recievables/delay paying)
  - classification issues

evaluate the cash flow quality

- unusual items/revenue quality/strategic provisioning

**B/S**

quality of balance sheet

- high-quality: completeness,unbiased measurement,clear presentation
  - completeness
    - off-BS obligations(take-or-pay contracts,operating lease)
    - intercorporate investments

sources of information about risk

- FS,auditor's report,footnotes,MD&A,SEC from "NT",financial press

# capital budgeting

- cash flow projection
  - classified as:
    - replacement; new product/mkt;
    - expansion; mandatory investment.
  - **principles of capital budgeting**
    - decision based on CF(incremental)
      - not accounting income;
      - sunk cost ✘ ;externalities ✔ .
    - CF based on opportunity costs;
    - timing; after tax basis;
    - **financing cost reflected in R** *required rate.*
- capital budgeting process
  - 1.idea generation; 2.analyzing project proposals;
  - 3.create the firm-wide capital budget;
  - 4.monitor decisions&conduct a post-audit.
- **categories of capital budgeting projects**
  - **replacement projects** (maintain&cost reduction)
  - **expansion projects** (existing/new product)
  - mandatory investment(regulatory)
  - other projects(pet)
- MACRS
  - accelerated depreciation method
    - **1st year:straight line**

★ **expansion project**

- **initial outlay= $-FC_{INV} - NWC_{INV}$**
- **$OCF=(S-C-dep.)(1-t)+D=(S-C)(1-t)+dep.\times t$**
- **$TNOCF=NWC_{INV} + Sal_T - t(Sal_T - BV_T)$**
  - TNOCF:terminal year after-tax non-operating CF

★ **replacement capital project**

- assumption:same useful life of old&new assets
- **initial outlay** $= -FC_{INV} - NWC_{INV} + [Sal_0-(Sal_0-BV_0)t]$
- **$\Delta CF=$** $(\Delta S-\Delta C-\Delta dep.)(1-t)+\Delta D=$ **$(\Delta S-\Delta C)(1-t)+\Delta dep.\times t$**
  - VS. expansion project: **incremental x**
- $TNOCF=NWC_{INC} + Sal_T - t(Sal_T - BV_T)$

- cash flow projection
  - current after-tax salvage value of old assets
    - reduces the initial outlay
  - depreciation is Δ
  - accelerated depreciation method:ATCF ↑ NPV ↑
  - **interest is not included in OCF**

★ **inflation effects on capital budgeting**

- nominal → nominal; real → real
- if inflation is higher than expected:
  - probability of investment<expected;
  - **tax shelter** ↓ (dep.),NPV underestimated;
  - corporate's real taxes ↑ (tax shelter ↓ );
  - value of fixed pmt to bondholder ↓ .
- **inflation affects costs&sales differently.**

**mutually exclusive projects with different lives**

- projects with different lives → can not compare
- methods
  - **least common multiple of lives approach**
  - **equivalent annual annuity(EAA)**
    - N,I/Y,PV,FV → cpt PMT
      - **PMT should be discounted.**

capital rationing

- **hard/soft capital rational** (budget cannot/can ↑ )
- less capital than profitable projects → combination

★ **risk analysis**

- stand-alone methods
  - **sensitivity analysis** (change only 1 variable)
  - **scenario analysis** (all independent variable)
    - worst case,best case,base case
  - simulation analysis(Monte Carlo)
    - probability distributions of each input
- **market risk methods**
  - **discount rate is risk-adjusted,not WACC.**
  - WACC:company's risk,not project's risk.
  - **CAPM can be uesd:** $R_{project}=R_f+\beta_{project}[E(R_M)-R_f]$.

**evaluating projects with real options**

- similar to financial call/put; based on real assets;
- offer managers flexibility that can improve NPV
- **overall NPV=project NPV+option value - option cost**
- 4 types
  - **timing options** (allow company to delay investing)
  - **sizing options**
    - abandonment option(put,if do so → PVCF ↑ )
    - expansion option(call)
  - **flexibility options**
    - price-setting option(P ↑ ,benefit from excess demand)
    - production flexibility option(profit from working overtime)
  - **fundamental options** (payoff contingent on an underlying)

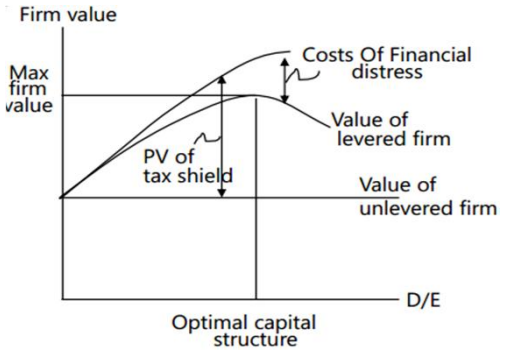
★ valuation:4 approaches

- **economic income** (vs. accounting)
  - **EI=(after-tax CF)+(Δproject's MV)**
    - **=CF - economic depreciation**
      - economic depreciation=$MV_{BGN}-MV_{END}$
  - calculate
    - **$PV_0=(PV_1+CF_1)/(1+r)(=\Sigma PVCF)$**
    - **$PV_0\times(1+r)=PV_1+CF_1$**
    - **$EI=CF_1-(PV_0-PV_1)=PV_0\times r$**
  - economic income(EI) vs. accounting income(AI)

| EI=ATCF-eco.dep. | AI=rev.-exp. |
|---|---|
| eco.dep.:decrease in MV of investment | accnt.dep.:decrease in BV based on original cost |
| financing cost:ignored | subtracted to arrived at NI |

- **economic profit approach**
  - **economic profit(EP,or EVA)**
    - **=NOPAT-$WACC=EBIT×(1-T) - WACC×capital**
      - reflects the income earned by all capital holders
  - **market value added**
    - **$MVA=NPV(EP)=\Sigma[EP/(1+WACC)^t]$**
    - **$V_{firm}=MVA+investment;$** investment:$capital_{BGN}$
- **residual income approach**
  - **$RI_t=NI_t - r_e\times B_{t-1}$**
    - reflects the income to equity holders only
  - $NPV=\Sigma[RI/(1+r_e)^t]$
  - **$V_{EQUITY}=NPV+BV_{EQUITY}$**
- claims valuation approach $V_{FIRM}$= ①+②
  - ①FCFCreditors discounted at $R_{DEBT}$
  - ②FCFE discounted at $R_{EQUITY}$

common capital budgeting pitfalls




trade-off theory

for next page

# capital structure

- capital structure objective
  - minimize WACC → maximize $V_{FIRM}$
    - $WACC = \frac{D}{V} r_d \times (1-t) + \frac{E}{V} r_e$ D:MV or BV; E:MV.
  - optimal capital structure **is not** the one that makes the maximum EPS/ROE
- capital structure theory
  - **MM theory** (Modigliani-Miller)
    - ★ **MM proposition 1 without taxes**
      - $V_L = V_U$ (capital structure irrelevance)
      - assumptions
        - investors agree on the expected CF;
        - bonds&shares of stock are traded
          - in a perfect capital market;
        - investors can borrow/lend at $R_f$;
        - no agency costs;
        - financing/investment decision:independent.
    - ★ **MM proposition 2 without taxes**
      - higher leverage raises the cost of equity
      - $r_e = r_0 + (r_0 - r_d) \times D/E$
        - $r_0$:when debt=0, $r_{firm}$ ($=r_e$)
        - $\beta_a = \beta_d \times (D/V) + \beta_e \times (E/V)$
      - assumption ⇒ $\beta_e = \beta_a + (\beta_a - \beta_d) \times (D/E)$
        - financial distress has no cost;
        - debtholders have prior claim to A&income.
      - $V = EBIT/r_0$ $r_d < r_e$
        - D/E ↑ ⇉ $r_e$ ↑ ,maintain constant WACC
    - ★ **MM proposition 1 with taxes**
      - $V_L = V_U + t \times d$
    - ★ **MM proposition 2 with taxes**
      - WACC is minimized at 100% debt.
      - $V_L = EBIT(1-t)/r_0$
      - $r_e = r_0 + (r_0 - r_d) \times (D/E) \times (1-t)$
      - do not consider:cost of financial distress/bankruptcy.
    - **no tax:irrelevant**
    - **with tax: WACC is minimized at 100%debt**
    - no optimal capital structure,or a structure with all debt

| ★ | without taxes | with taxes |
|---|---|---|
| proposition 1 | $V_L = V_U$ | $V_L = V_U + t \times d$ |
| proposition 2 | $r_e = r_0 + (r_0 - r_d) \times D/E$ | $r_e = r_0 + (r_0 - r_d) \times (D/E) \times (1-t)$ |

**3 kinds of costs**

- ★ **costs of financial distress**
  - increased costs when earing ↓
    - has trouble paying fixed costs
  - **two components**
    - **cost of financial distress&bankruptcy**
      - direct(cash)&indirect(trust) costs.
    - **probability of financial distress**
      - operating&financial leverage;
      - quality of mgt&corp.governance.
  - **lower cost** of financial distress **if:**
    - firm's **assets have a ready second mkt.**
      - safe,tanginble assets,lower cost.
- ★ **agency costs(net agency costs of equity)**
  - costs associated with **conflict of interest**
    - **managers vs. owners**
  - smaller stake mgt. have,higher cost
  - **three components**
    - **monitoring costs; bonding costs;**
    - **residual loss.**
  - better governed,agency cost ↓ .
  - use of debt ↑ ,agency cost ↓ .
- ★ **cost of asymmetric information**
  - **mger have more information than investor**
  - **pecking order theory**
    - mger prefer way of financing:
      - disclose less information.
    - **order**
      - **1.internally generated equity(R/E);**
      - **2.debt; 3.external equity.**
    - capital-structure is a by-product
      - ↓↓ of individual financing decisions
    - issuance of equity:negative signal

static trade-off theory

- $V_L = V_U + t \times d$ **- PV(costs of financial distress)**
- key points
  - **with increase in financial leverage :**
    - tax shield ⇉firm value ↑
    - 3 costs ⇉firm value ↓
  - **optimal capital structure**
    - **balance of tax shield&3 costs** (lowest WACC,highest $V_{firm}$)

target capital structure

- maximize value of firm: **target=optimal**
- **in practice,actual capital structure will fluctuate:**
  - mgt's exploitation of mkt opportunities;
  - market value fluctuate.
- role of debt rating
  - maintaining certain minimum debt ratings.

**evaluating capital structure policy**

- factors should consider:
  - **overtime;**
  - **competitors** with similar business risk;
  - company- **specific** factors(governance).
- scenario analysis

international differences in leverage

- include:
  - total debt(Japan,Europe(no UK))
  - longer debt maturity(north America)
  - emerging market differences(more total debt)
- reasons:
  - institutional&legal factors;
  - financial mkt&banking system factors;
  - macroeconomic factor.

mergers and acquisitions(T:target; A:acquirer)(2-2)

- ★ evaluating a merger bid
  - **post-merger value of A**
    - $V_{AT} = V_A + V_T + S - C$; s:synergies; C:cash paid
  - **gains accrued to T**
    - $gain_T = TP = P_T - V_T$; TP:takeover premium
  - **gains accrued to A=S-TP=S-($P_T$-$V_T$)**
- who benefits from merger
  - short-term
    - stock:T 30% ↑ ; A 1%-3% ↓ ;
    - winner's curse; hubris of acquirers' mgt
  - long-term
    - A tend to underperform;failure to capture synergies
  - some merger enhance value
    - strong buyer; low premium;
    - few bidders; favorable mkt reaction
- divestitures(equity carve-out; spin-off; split-off; liquidation)

CorporateFinance4-3 Corporate finance

dividends and share repurchases:analysis

- **dividend policy&company value theory**
  - **does not matter**
    - inference from MM;
    - perfect capital market assumptions;
    - dividend is irrelevant to company value.
      - do not mean dividend per share is irrelevant.
  - **bird in hand argument**
    - pay dividends will have a lower cost of equity.
  - **tax aversion**
    - investors prefers the way with lower tax;
    - **dividends tax rate>capital gain's;**
    - want a zero dividend payout ratio.
  - **clientele effect**
    - different investors desire different dividend policy
    - **$\Delta P(1-T_{CG})=div.(1-T_D)$;** $T_{CG} < T_D$,drops $<$ div.
  - **signaling**
    - managers have more information(asymmetric);
    - dividend is meaningful( ∵ asymmetric);
    - **unexpected dividend ↑ / ↓ :strong/negative.**
  - **agency issues**
    - **shareholders vs. managers**
      - reduce agency cost:payout of FCF as dividends ↑
    - **shareholders vs. bondholders**
      - resolved via provisions in bond indenture
- **factors affecting dividend policy**
  - investment opportunities;
  - expected volatility of future earnings;
  - financial flexibility;
  - tax considerations;
  - flotation costs(high → less dividend);
  - contractual and legal restrictions.

- **repurchase vs. cash dividend**
  - rationales for shares repurchase
    - **$T_D > T_{CG}$;** share price support/signaling;
    - offsetting dilution from employ stock options;
    - added flexibility; increase financial leverage
- global trends in payout policy(lower&trended downwards)
- calculation of dividend coverage ratio
  - NI method: **dividend coverage ratio=NI/dividend paid**
  - FCF method: **FCFE coverage ration=FCFE/(dividends+share repurchases)**

- **tax consideration-taxation methods**
  - core:effective tax rate(ETR)
    - **double-taxation**
      - **effective tax rate=$t_{corporate}+(1-t_{corporate})t_{individual}$**
    - **split-tax rate system** (t:corporate income tax)
      - NI=div.+non.div.; div. →$t_1$; non.div. →$t_2$
    - **tax-imputation system**
      - ETR=shareholder's marginal tax rate(MTR)
      - **shder's MTR>company's,shders pays differences**
      - **shder's MTR<company's,shders receive a tax credit**
  - **shders preference for current income(CI) vs. capital gains(CG)**
    - CI: $t_{dividend} < t_{capital\ gain}$;
    - CG: buy high-payout shares for a tax-exempt retirement acount(TEA);
      tax-exempt institutions.
      $T_{CG}$ not have to be paid until being sold,Td immediately.
- **payout policies**
  - **stable dividend policy** (target payout adjustment model)
    - **expected dividend=previous dividend +**
      **(expected ΔEPS)(target payout ratio)(adjustment factor)**
      - adjustment factor=1/years over which adjustment occur
  - constant dividend payout ratio policy(seldom)
  - **residual dividend policy**
    - model is **based on** firm's:
      - **investment opportunity schedule;**
      - **target capital structure;**
      - **access to and cost of external capital.**
    - steps to determine the target payout ratio:
      - 1.indentify optimal capital budget
      - 2.determine financing by equity
        - for a given capital structure
      - 3.meet equity required with retained earning
      - 4.pay dividend with residual earning
    - **dividend=earnings-(capital budget×equity%in capital structure)**
      - **or zero**
    - advantages
      - easy; maximizes allocation of earnings to investment
    - disadvantage
      - div. fluctuates with investment opportunities&earnings;
      - uncertainty cause higher expected return,lower valuation
    - long-term residual dividend(low div.&repurchase)

Corporate finance:financing and control issues

corporate performance,governance,and business ethics

- **stakeholders of company**
  - internal(stockholders,employees,mgers,board)
  - external
- maximize shareholders' return
  - ⇒ maximize company's long-run profitability
- an agency relationship
  - potential conflicts between
    - **managers vs. shareholders**
      - using funds to expand the size of firm;
      - granting excessive compensation;
      - investing in risky ventures;
      - not taking enough risk.
    - **directors vs. shareholders**
      - lack of independence;
      - board mambers have personal relationship
        - have consulting/other business with firm
      - interlinked boards;
      - directors are overcompensated.
  - suggestion
    - shape the behavior of agent(in accordance with);
    - reduce information asymmetry;
    - develop mechanisms for removing bad agent.
- roots of unethical behavior
  - self-dealing;
  - information manipulation;
  - anticompetitive behavior;
  - opportunistic exploitation(violate suppliers);
  - substandard working conditions;
  - environmental degradation;
  - corruption.
- philosophical approaches to ethics
  - the Friedman doctrine(stockholder theory)
    - weakness:no regard for justice.
  - utilitarian(greatest num. of people)
    - weakness:no regard for justice.
  - Kantian ethics
    - weakness:no place for moral emotions
  - rights theories
  - justice theories.

CorporateFinance4-4 Corporate finance:financing and control issues

corporate governance

- a system of principles,policies,procedures;
  - clearly defined responsibilities&accountabilities
  - used by stakeholders to overcome conflicts of interest.
- two major objectives
  - eliminate or reduce conflicts of interest;
  - consistent with the best interests of investors&other stakeholders.
- three major business forms
  - sole proprietorships; partnerships; corporations
- responsibilities of the board of directors
- **evaluate effectiveness of BOD**
  - board composition and independence;
    - at least 3-quarters of board members should be independent
    - lack of independence
      - former employment with the company;
      - business relationships;personal relationships;
      - interlocking directorships;
      - ongoing banking or other creditor relationships.
  - independent chairman of the board;
    - dual role of CEO and chairman of the board ✘
  - qualification of directors;
  - annual election of directors;
  - annual self-assessment;
  - separate sessions of independent directors;
  - ★ ***3 committees;***
    - **audit committee**
      - consists only of **independent directors** ;
      - has **expertise** in financial&accounting matters;
      - has **full access** to and the cooperationof management;
      - meets with auditors **at least** once annually.
    - **nominating committee**
      - consists only of **independent directors**
    - **compensation committee**
  - independent or expert legal counsel;
  - corporate governance policies:should assess the following;
    - codes of ethics,etc.
  - disclosure and transparency;
  - insider or related party transactions;
  - shareholder proxy votes.

multi-term board(change 1/3):bad

mergers and acquisitions(T:target; A:acquirer)(2-1)

- types of mergers
  - **horizontal merger**
  - **vertical merger** (forward,backward)
  - **conglomerate merger**
- forms of integration
  - statutory merger:A+B=A
  - subsidiary merger:A+B=A+B
  - consolidation:A+B=C
- merger motivations
  - synergies
  - achieving more rapid growth
    - organic/external growth
  - increasing market power
  - gain access to unique capabilities&resources
  - diversification ✘
  - bootstrapping earning ✘
    - EPS ↑ ✔;P/E donot change ✘
  - personal benefits for managers ✘
  - tax benefit ✘
  - unlocking hidden value
  - achieve international business goals
- industry life cycle&merger motivative

| | |
|---|---|
| pioneering | conglomerate/horizontal |
| rapid growth | conglomerate/horizontal |
| mature growth | vertical/horizontal |
| stabilization | horizontal |
| decline | all |

- valuing a target company(equity notes)
  - **takerover premium:PRM=(DP-SP)/SP**
    - DP:deal price per share; SP:T'S stock price
  - T's takeover price=estimated $V_{stock}$×(1+PRM)

environmental,social and governance factors

- risks can be categorized:
  - legislative and regulatory risk
  - legal risk; reputational risk;
  - operating risk; financial risk
- the strength&effectiveness
  - risks of an ineffective corporate system
    - financial disclosure risk
    - asset risk; liability risk; strategic policy risk

| form of acquisition | **stock purchase** | **asset purchase** |
|---|---|---|
| payment | to target firm shders | to target company |
| approval | majority shders | no,unless substantial |
| tax:corporate | no | target:Tax CG |
| tax:shder | Tax CG | no |
| liabilities of T | acquirers | avoids |

- **method of payment(securities offering&cash offering)**
  - 3 main factors(considered) when deciding pmt method
    - 1.distribution of risk and reward between A&T
      - A is confident →cash method
    - 2.relative valuation(A) of companies involved
      - stock of A ↑ →stock offering
    - 3.changes in capital structure
- **attitude of target mgt**
  - friednly merger
  - hostile merger offers
    - bear hug(BOD); tender offer(shders); proxy battle
- **takeover defense** mechanisms
  - **pre-offer takeover defense** (shark repellents)
    - poison pill
      - flip-in(T's shders buy T at a discount);
      - flip-over(to A's stock);
      - dead hand provision(by vote of continuing directors).
    - poison put
      - give right to bondholders of T to put the bonds to T
    - states with restrictive takeover laws
    - straggered board(only a part of board are due to election)
    - restricted voting rights — multi-term board
    - supermajority voting provision for merger
    - fair price ammendment; **golden parachutes**
  - **post-offer takeover defense**
    - "just say no" defense; litigation(lawsuit)
    - greenmail(allow T to repurchase back at a premium)
    - share repurchase(T's shders)
    - leverage recapitalization(repurchase)
    - **crown jewel defense** (sell what A likes)
    - pac-man defense(acquie A); **white knight/squire defense**

**HHI=Σ(MS×100)²; MS $_i$ :mkt share of i**

| post-merger HHI | concentration | change in HHI | government |
|---|---|---|---|
| <1000 | no | any amount | no action |
| (1000,1800) | moderately | 100 or more | possible |
| >1800, | highly | 50 or more | challenge |

# Equity 4-1 Valuation concept

## value&valuation

- value
  - intrinsic value
    - $IV_{analyst}$-price=($IV_{actual}$-price)+($IV_{analyst}$-$IV_{actual}$)
  - fair market value , investment value , liquidation value
- valuation on individual security ↳particular buyer
  - not to index stratagy but active
- valuation process
  - business-forecast-model-convert-decision
- **Porter's 5 forces** / **3 generic strategies**
  - threat of new entrants; / cost leadership;
  - threat of substitutes; / product differentiation;
  - bargaining power of buyers; / focus.
  - bargaining power of suppliers;
  - rivalry among existing competitors.
- quantitative factors(accounting&financial information)
- **qualitative factors**
  - quality of mgt team;
  - transparency of its performance;
  - analyst's confidence in the firm's;
  - industry's accountiong practices.
- quality of inputs
  - α
    - ex ante α=$HPR_{expected}$-required R
    - ex post α=$HPR_{actual}$-contemporaneous required R
- sum-of-the-parts valuation
  - Σ(break-up value) ＞firm operates unrelated idustries
  - conglomerate discount
    - internal capital inefficiency;
    - endogenous factor(reverse synergy);
    - research errors.

## return concept

- holding period return
- required return=opportunity cost=cost of capital
  - =IRR(efficient market)
- **equity risk premium(ERP)**
  - $ERP=R_{required\ on\ equity\ index}-r_{risk\text{-}free}$
  - historical estimate
    - select an index(stationary);
    - time period(long).
    - arithmetic mean or geometric mean;
    - long term or short term as risk-free;
    - survivorship bias.
  - forward-looking estimate (FLE,3 models)
    - on current informationℰ
    - models&behavioral bias.
  - 3 models
    - **GGM** (mkt datas)
      - $ERP=\frac{D_1}{P_0}+g-r_{risk\text{-}free}$
      - g:earning growth
    - **supply-side** estimates
      - (macroeconomic model)
      - $ERP=(1+i)(1+rEg)(1+PEg)-1+Y-R_f$
      - all the inputs are expected
        - i=inflation
        - rEg=real growth in GDP
        - PEg=changes in the P/E ratio
        - Y=yield on index
        - $rEg=g_{labor\ productivity}+g_{labor\ supply}$
    - **survey estimate**

| | strength | weakness |
|---|---|---|
| HS | familiar&popular; unbias; objective quality. | precision issues; stationary assmp.; countercyclical; survivorship bias. |
| FLE | available; non-stationarity& data bias. | models bias; behavioral bias. |

| | strength | weakness |
|---|---|---|
| GGM | popular; developed eco.; typically sample sources. | change through time; stable growth rate. (assump.) |
| suppl y-side | proven models; current information. | only developed eco. |
| survey | easy to obtain. | wide disparity. |

$$WACC=\frac{MVD}{MVD+MVCE}r_d(1-T)+\frac{MVCE}{MVD+MVCE}r_{ce}$$

discount rate ⇌CF:nominal-nominal,real-real,firm-firm,equity-equity

## required return on equity

- **CAPM**
  - $R_i=R_{current\ expected\ risk\text{-}free}+\beta_i\times ERP$
  - key assumptions
    - investors are risk aversion;
    - decision by μ&σ of portfolio.
  - **β estimates**
    - **public** companies
      - choice of index;
      - length&frequency;
        - 5 years of monthly data;
        - 2 years of weekly(fast growth mkt).
      - adjusted β
        - **adjusted β=unadjusted β×2/3 + 1.0×1/3**
        - β drift:1.0×1/3 ↱pure play method
    - **nonpublic** companies($\beta_{public,asset}=\beta_{non\text{-}public,asset}$)
      - step1.select benchmark company(public)
      - step2.estimate benchmark β
      - step3. $\beta_{U,non}=\frac{\beta_{E,public}}{1+(D/E)_{public}}$
      - step4. $\beta_{E,non}=(1+(D/E)_{non})\beta_{U,non}$
      - $\beta_{debt}=0$
- **multifactors model**
  - $R=R_{risk\text{-}free}+RP_1+RP_2+\cdots+RP_n$
  - $RP_i$=factor sensitivity $_i$×factor risk premium $_i$
  - **FF** (Fama-French model)& **PSM** (Pastor-Stambaugh model)(β>0 ⇉former)
    - $R=R_f+\beta_{mkt}(R_{mkt}-R_f)+\beta_{smb}(R_s-R_b)+\beta_{hml}(R_h-R_l)+\beta_{liq}(R_l-R_h)$
  - **macroeconomic multi-factor models** ( unexpected )
    - confidence risk(ΔCS); time horizon risk($Y_{T\text{-}bond}-Y_{T\text{-}bill}$);
    - inflation risk; business-cycle risk; market timing risk(all others).
- **build-up method** (β=1)
  - $R=R_f+ERP$±one or more premium
  - private company
    - **$R=R_f+ERP+$ size premium + specific company premium**
  - bond yield plus risk premium method
    - $R_{BYPRP}=YTM_{company's\ long\text{-}term\ debt}$+risk premium
- exchange rate risk(or country risk premium,CRP)
  - $ERP=ERP_{on\ developed\ mkt}+CRP$
  - country spread model(1 risk):$R=R_F+RP_1+RP_2+\cdots+CRP$
  - country risk rating model(n risks):$R=R_F+\beta_1 RP_1$
    - developed $RP_1$ → new country $RP_1$

Equity 4-2 Valuation models

## Discounted dividend valuation

**Gordon Growth model** $V_0 = \frac{D_1}{r-g}$

assumptions
- 1.pay a dividend; 3. g<r.
- 2.dividend grow at a constant rate,g;

limitations
- sensitive to estimates of r&g;
- difficult with non-dividend stocks;
- difficult with unpredictable growth patterns.

**$V_0 = E_0/r + PVGO$**
- E:no-growth earnings level
- PVGO:PV of growth opportunities

**justified P/E**
- leading P/E= $V_0/E_1 = (1-b)/(r-g)$
- trailing P/E= $V_0/E_0 = (1-b)(1+g)/(r-g)$

strengths
- stable,mature,dividend paying company;
- valuing market indices;
- easily communicated&explained;
- used to determine g,r,PVGO(implied);
- supplement more complex methods.

weakness
- sensitive to estimate of r&g;
- not applicable to non-dividend;
- not applicable to unstable growth.

valuing preferred stock $V_P = D_P/K_P$

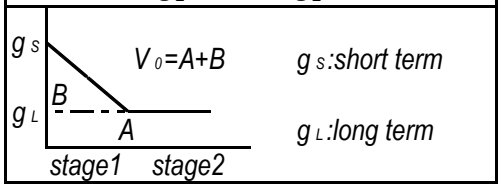
**multistage dividend discount models**

**two-stage DDM(1.TV;2.PV)**

**three-stage DDM**

**H-model**

$$V_0 = \frac{D_0 \times (1+g_L)}{r-g_L} + \frac{D_0}{r-g_L} \times \frac{t}{2}(g_S - g_L)$$




$V_0$=A+B

$g_S$:short term

$g_L$:long term

spreadsheet modeling
- any pattern of dividend growth;
- can project different growth rates;
- flexibility&computational accuracy.

**sustainable growth rate(SGR)**

SGR=b×ROE, b=1-dividend payout rate

PART model

g=Retention rate×Profit%×Asset turnover×Leverage

## Free cash flow valuation

reasons
- no dividend; dividend due to board;
- for acquisition target(control perspective);
- more related to long-run profitability.

valuation approaches(r:CAPM , APT , build-up)
- FCFF(r → WACC)
- FCFE(r → $r_e$)

**FCFF**

**$FCFF = EBIT\times(1-T) + NCC - WC_{INV} - FC_{INV}$**

$FCFF = EBITDA\times(1-T) + NCC\times T - WC_{INV} - FC_{INV}$

$FCFF = NI + int\times(1-T) + NCC - WC_{INV} - FC_{INV}$

$FCFF = CFO + int\times(1-T) - FC_{INV}$

**$NI = (EBIT-int)(1-T)$**

**$CFO = NI + NCC - WC_{INV}$**

$EBIT = EBITDA - D - A = EBITDA - NCC$

**FCFE**

**FCFE=FCFF - int×(1-T)+net borrowing**

given debt ratio(D/A)
- net borrowing=$(WC_{INV} + FC_{INV} - dep)\times DR$

**6 issues**

**#1.non-cash charges**
- 1. +dep.; +2.amtz.;3. -G/ +L(long-term assets);
- 4. + non-cash loss( ∵ restructuring);
- 5. - non-cash income( ∵ restructuring);
- 6. +bond discount/ -premium(issuer,cash paid);
- 7.deferred taxes( -DTA/ +DTL) ↴

**#2.$WC_{INV}$** (NI ↓ >CF ↓ , +)

**$WC_{INV} = WC_{END} - WC_{BGN}$ , WC=CA-CL**
- excluding cash;notes,debt(with int.).

**#4.net borrowing**

**N.B.=Δ(L&S debt)**

**#5.preferred stock**

**$NI_{common} = NI_{total} - div._{preferred}$**

**#6.target debt ratio(D/A)**

**net borrowing=$(WC_{INV} + FC_{INV} - dep)\times DR$**

forecast FCF

**no effect on both:** div.;share repurchases;share issues

**leverage:** minor effect on FCFE;no effect on FCFF

## free cash flow models

single-stage model

$$V_{firm} = \frac{FCFF_1}{WACC-g}, \quad V_{equity} = \frac{FCFE_1}{r-g}$$

WACC usually calculated using target capital weights

**two&three-stage model**

sensitivity analysis
- future growth rate;
- base year for FCF growth forecast.

calculate terminal value
- single-stage;
- multiple approath
  - $TV_n$=(trailing P/E)×(earnings in year n)
  - $TV_n$=(leading P/E)×(forecast earnings in year n+1)

total capital=E + D - cash
=E + L - non.int.D - cash
=A - non.int.D - cash
=CA + nonCA - non.int.D - cash
=((CA - cash)- non.int.D) + nonCA
=WC + nonCA=WC + pp&e

$\Delta capital = \Delta WC + \Delta FA = WC_{INV} + FA_{INV} - dep.$ $\Delta FA = \Delta(BV)$

**#3.$FC_{INV}$**

**$FC_{INV}$=capital expenditure - proceeds**

no disposal

**$FC_{INV} = \Delta(GV)$**

**$FC_{INV} = \Delta(BV) + dep.$**
- CAPEX=Δ(GV)
- GV=BV + A.D.
- Δ(GV)=Δ(BV) + Δ(A.D.)
- dep.=Δ(A.D.)

disposal

**$FC_{INV} = \Delta(BV) + dep. - gain$**
- CAPEX=Δ(GV) + $GV_{dis}$
  - $=BV_{END} + A.D._{END} + BV_{dis} + A.D._{dis} - BV_{BGN} - A.D._{BGN}$
  - $=BV_{END} + BV_{dis} - BV_{BGN} + dep.$
- gain=proceeds-$BV_{dis}$ → proceeds=gain+$BV_{dis}$

## Residual income valuation

**concept**

- residual income(economic profit)
  - RI=NI - equity captial × cost of equity
- EVA(economic value added)
  - **EVA=NOPAT - WACC × invested capital**
    - **=EBIT×(1-T) - $WACC**
  - NOPAT:net operating profit after tax
- **total capital=BV** $_{\text{long-term debt}}$ **+ BV** $_{\text{equity}}$
  - **=net WC + net pp&e**
- **market value added(MVA)=MV - total capital**

**calculation**

- **RI** $_T$**=(EPS** $_T$**)-(r** $_e$**×B** $_{T-1}$**)=(ROE -r** $_e$**)×B** $_{T-1}$
  - clean surplus relation: $B_T = B_{T-1} + E_T - D_T$
- **V=BV** $_{\text{equity}}$ **+ ΣPVRI , (NI=$R** $_{\text{equity}}$ **+ RI)**
  - adjusted current BV of equity + PV of excepted future RI
    - relatively less sensitive to terminal value

**difference with DDM&FCFE**

- assumption(clean surplus relation)
- RI:B+ΣPVRI ; GGM&FCFE:ΣPVCF

**valuation models**

**single-stage RI valuation model**

$$V_0 = B_0 + \frac{(ROE - r_e)}{r_e - g} \times B_0$$

$$\Rightarrow \frac{P_0}{B_0} = 1 + \frac{(ROE - r_e)}{r_e - g}$$

justified P/B , ROE>$r_e$ , P/B>1

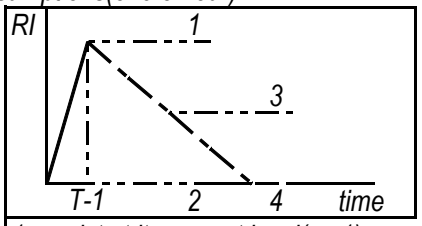
**assume constant ROE&g**

RI implied growth rate

$$g = r - \frac{B_0 \times (ROE - r)}{V_0 - B_0}, \quad (IV=\text{mkt price})$$

**multistage RI model ( IV=BV+ΣPVRI** $_{HIGH}$**+TVRI )**

assumptions(one of four)




1. persist at its current level(ω=1)
   - **TVRI** $_{T-1}$**=** $\omega RI_{T-1}/r-(\omega-1)$ **=RI** $_{T-1}$**/ r**
2. drop immediately to zero(ω=0)
   - **TVRI** $_{T-1}$**=** $\omega RI_{T-1}/(r-(\omega-1))$ **=0**
3. decline to a long-run average
   - **TVRI** $_T$**=V** $_T$**- B** $_T$**=(P/B)** $_T$**×B** $_T$ **- B** $_T$
4. decline over time as ROE falls to r
   - **TVRI** $_{T-1}$**=ωRI** $_{T-1}$**/(1+r-ω)**

$$= \frac{\omega RI_{T-1}}{r-(\omega-1)} = \frac{(1+g)RI_{T-1}}{r-g}$$

**persistent factors** (ω=1+g , g<0)

- high ω
  - low dividend payouts;
  - historical high RI persistence in the industry.
- low ω
  - high ROE;
  - significant levels of nonrecurring items;
  - high accounting accruals(NI=CF+accruals).

**strengths**

- TV don't dominate IV;
- accounting data easy to find;
- applicable:no div.;no positive expected FCF;
- applicable:high $\sigma_{CF}$ ,(TV highly uncertain);
- economic profitability.

**weakness**

- accounting data can be manipulated by mgt;
- accounting data requires numerous&significant adjustment;
- clean surplus relation.

**not appropriate**

- clean surplus relation is violated;
- significant uncertain → BV&ROE.

**appropriate for**

- no div. or high $\sigma_{div.}$;
- FCF are negarive;
- TV is highly uncertain.

**clean surplus relation**

may not hold(OCI):

- foreign currency translation gains&losses;
- pension accounting;
- changes in MV of AFS.

## Market-based valuation(price&enterprise value multiples)

**P/E**

**justified P/E**

$$\text{leading } P/E_1 = \frac{1-b}{r-g}, \quad \text{trailing } P/E_0 = \frac{(1-b)(1+g)}{r-g}$$

**normalizing EPS**

- historical average EPS
  - **good:** cyclical earning; **bad:** changes in business size
- average ROE
  - more accurate(company's size)

PEG not linear&differences in duration of growth(risk)

**P/B** (common stock)

**justified P/B**

$$P/B = \frac{ROE - g}{r - g}$$

common adjustment to BV

↳ excluding intangible assets(goodwill);use trailing BV.

**P/S**

$$\text{justified } P/S = \frac{(E_0/S_0)(1-b)(1+g)}{r-g}$$

$E_0/S_0$:profit margin

**EV/EBITDA** (EV:enterprise value) ★★

EV=MV (common stock+preferred stock+MI+debt) -cash-(short-term investment)

**dividend yield** justified D/P=(r-g)/(1+g)

$$\text{trailing } D/P = \frac{4\times\text{recent Q div.}}{P}, \quad \text{leading } D/P = \frac{\text{forecast next 4Q div.}}{P}$$

**momentum valuation indicators**

- unexpected earnings(UE)=EPS-E(EPS)
- standardized unexpected earnings(SUE)=UE/σ(UE)

**central tendency of a group of multiples( portfolio or index P/E )**

$$\text{weighted harmonic mean } P/E = 1/\left(\Sigma \frac{W}{X}\right), \quad W = P_i/\Sigma P$$

| | advantages | disadvantages |
|---|---|---|
| P/E | earning power;<br>popular. | earnings can be negative;<br>volatile earning;<br>mgt discretion distorts. |
| P/B | always>0;<br>more stable than EPS;<br>NAV, more fit for liquid assets. | size difference; assets off-B/S;<br>influened by accounting choices;<br>BV ≠ MV due to inflation/tech. |
| P/S | for distressed firms;<br>sales not easily manipulated;<br>σ(P/S)<σ(P/E);<br>for mature,cyclical,start-up. | sales don't imply profit/CF;<br>not capture cost structure;<br>sales still can be distorted. |
| EV/EBITDA | for different financial leverage,<br>for capital-intensive business;<br>usually >0. | WC ↑ ⇉EBITDA overstate CFO;<br>FCFF better. |

## Private company valuation

**company-specific factors**
- stage of life cycle(less mature than public firms);
- size;
- quality&depth of mgt;
- mgt/shareholder **overlap** ;
- long-term investor;
- quality of financial and other info.(less);
- taxes(more concerned).

**stock-specific factoers**
- less liquid; restrictions on marketability;
- concentration of control.

**reasons for valuation**
- transaction-related valuation:
  - VC;IPO;sale;bankruptcy;
  - performance-based mgt compensation.
- compliance-related valuation
  - financial reporting
  - tax purposes
- litigation-related valuation
  - shder suits,damage claims,etc

6 kinds of values
- fair value
  - fair market value
  - FV for financial reporting
  - FV for litigation
- MV , IV , investment value

GPCM

discount/premium in PE valuation
- discount of lack of control

$$DLOC = 1 - \frac{1}{1 + \text{control premium}}$$

- discount of lack of marketability

total discount=1-(1-DLOC)(1-DLOM)

3 issues of **financial statement adjustment**

**normalized earnings**
- exclude nonrecurring&unusual items;
- tax-motivated expenses;
- real estate separate from firm operation.

**strategic&nonstrategic buyers**
- synergies/not

**estimating(choose) cash flow**
- FCFF only

3 methods for valuation

**income approach(ΣPV)**
- FCFF method(2-stage)
- capitalized CF method(GGM)

$$V_{firm} = \frac{FCFF_1}{WACC - g}$$

$$V_{equity} = V_{firm} - MV_D$$

$$V_{equity} = \frac{FCFE_1}{r - g}$$

- **excess earnings method,EEM** (RI)
  - EE=total earnings-$R_{required}$ on WC&FA
    - $V_{intangible\ assets} = EE \times (1+g)/(r-g)$
  - $V_{firm} = FV_{WC} + FV_{F.A.} + V_{I.A.}$

**market approach**
- methods
  - guideline **public company** method(GPCM)
    - to estimate a control premium
  - guideline **transaction** method(GTM)
    - no control premium
  - **prior transaction** method(PTM)
- market multiples
  - **large size:** EBIT/EBITDA multiples
  - **small size:** NI multiples

**asset-based approach(ABA)**
- appropriate in followings
  - little hope for better prospect;
  - finance firms;
  - investment companies;
  - small companies/early stage companies;
  - natural resource firms.

## Fixed3-1 Term structure and int.rates dynamics

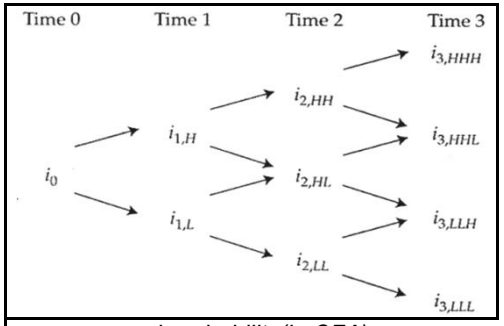
- benchmark curve
  - **spot int.rate**
    - $P(T)=\frac{1}{(1+r(T))^T}$
    - **discount factor** :P(T)
    - annualized,risk-free,no option,ZCB
  - **forward rate** (f(start,duration))
    - $F(T',T)=\frac{1}{(1+f(T',T))^T}$ $F(T',T)=\frac{P(T'+T)}{P(T')}$
    - forward **discount factor** :F(T',T)
    - a breakeven int.rate
    - avg.(forward)=spot ; avg.(spot)=YTM
    - curve
      - marginal $f$ ↑ ,avg. ↑ ,spot ↑
      - flatten at long maturities
    - riding the yield curve
      - +bonds(mtr. longer than invest. hrz. )
  - **par curve**
    - par rate:$P_{spot}$=par , coupon rate=par rate
    - bootstrapping
      - par rate=coupon rate , $P_{spot}$=par=1
      - cpt: spot rate ⇌par rate
  - **YTM**
    - HTM , coupon+principal made in full,
    - coupons reinvested at YTM
    - poor estimate of excepted R if:
      - int.rate volatile
      - yield curve steeply sloped
      - risk of default
      - embedded options
  - **swap rate** (a type of par rate)
    - $\Sigma \frac{s(T)}{(1+r(t))^t}+\frac{1}{(1+r(T))^T}=1$
    - $V_{float}=V_{fix}$ , $V_{float}$ =par,coupon rate
      - necessary mkt benchmark for int.rate
      - wholesale bank use swap rate
      - retail bank use gvmt. spot curve
      - reflect credit spread of commercial banks
      - not regulated by any gvmt.
      - yield at many mtr.,T-bond only on-the-run

mtr.=maturity
hrz.=horizon
gvmt.=gorverment

- spread
  - **swap spread** =swap rate-Treasure rate
  - **I-spread** =yield $_{risky}$ -swap rate $_{same\ security}$
    - only credit&liquidity risks
  - **Z-spread**
  - **TED spread** =LIBOR-T-bill
    - risk of default on interbank loan
  - **LIBOR-OIS spread**
    - low → (high market liquidity)
- **term structure theories**
  - pure expectations theory
    - risk neutral,E(future spot rate)
  - local expectation theory
    - longer →+risk premium
  - liquidity preference theory
    - liquidity premium
  - segmental market theory
    - each mtr. determined independent
  - preferred habitat theory
    - +premium,not related to mtr.
- modern term structure models(forward)
  - equilibrium term structure models
    - **CIR model**
      - $dr=\kappa(\theta-r)dt+\sigma\sqrt{r}dw$
      - volatility increases with int.rate
    - **Vasicek model**
      - $dr=\kappa(\theta-r)dt+\sigma dw$
      - disadvantage
        - don't force int.rate ≥0
  - arbitrage-free model
    - **Ho-Lee model**
      - $dr=\lambda(t)dt+\sigma dw$
- yield curve factor
  - change in level of int.rate(parallel),77%
  - change in slope/steepness of yield curve,17%
  - change in curvature of yield curve,3%
  - yield curve risk
  - manage yield curve risk
    - effective duration(only for parallel)
    - **cpt key rate duration**
  - int.rate volatility
    - $\sigma(t,T)=\frac{\sigma[\Delta r(t,T)/r(t,T)]}{\sqrt{(\Delta t)}}$

## Arbitrage-free valuation framework

- arbitrage opportunity(law of one price)
  - two types
    - value additivity
    - dominance
  - fixed-income arbitrage
    - stripping
    - reconsititution
- arbitrage-free valuation
  - step1.estimate the future cash flows
  - step2.determine the discount rate
  - step3.calculate PV of expected future CFs
- interest rate trees&arbitrage-free valuation
  - binomial interest rate tree construction




  - assume equal probability(in CFA)
  - node,path,step(Δt),period(time)
  - determine int.rate in int.rate trees(forward rate)
    - $i_H=i_L e^{2\sigma}$
      - σ:assumed volatility of the one-year rate
      - estimate:historical σ & mkt price of int.rate derivatives
  - construction of a binomial int.rate tree
  - **valuation a option free bond**
    - step by step,don't forget coupons
- arbitrage-free valuation
  - comparison:zero-coupon yield curve&binomial tree
- **pathwise valuation**
  - binomial tree n period,will be $2^n$ paths

| path | year1 | year2 | year3 | value(PV) |
|---|---|---|---|---|
| 1 SUU | $i_0$ | $i_U$ | $i_{UU}$ | |
| 2 SUL | $i_0$ | $i_U$ | $i_{UL}$ | |
| 3 SLU | $i_0$ | $i_L$ | $i_{LU}$ | |
| 4 SLL | $i_0$ | $i_L$ | $i_{LL}$ | |
| | | | AVG | ΣPV/4 |

- Monte Carlo simulation model(MCS)
  - boundaries or mean-reversion
  - advantage
    - solve path dependency

# Valuation and analysis:bond with embedded options

- fixed-income securities with embedded option
  - simple options
    - European/American/Bermudan(lockout)
  - complex options
    - estate put(contingent put option)
    - sinking fund bonds(sinkers)
      - call provisions;delivery options
      - acceleration provisions
- valuation and analysis:callable&putable
  - **callable&putable bond**
    - **①calculate value of the callable/putable bond**
      - strike time
        - **price $_{callable}$ ⩽call price**
          - price $_{callable}$ >call price, issuer repurchase
        - **price $_{putable}$ ⩾put price**
          - price $_{putable}$ <put price,investors redeem
    - **calculate value of the call/put(not directly)**
      - **$V_{callable}=V_{pure}-V_{call}$**
      - **$V_{putable}=V_{pure}+V_{put}$**
    - **②calculate call on bond(directly)**
      - call on **European** bond
        - only stike at a specific moment
      - call on **American** bond
        - every moment
          - Σprobability×PV of **max** $(V_1,V_2)$
    - rate in the up state
      - $R_u=R_d\times e^{2\sigma\sqrt{t}}$
  - **①effective of volatility on $V_{option}$**
    - $V_{callable}=V_{pure}-V_{call}$
      - **$\sigma\uparrow\Rightarrow V_{call}\uparrow\Rightarrow V_{callable}\downarrow$**
    - $V_{putable}=V_{pure}+V_{put}$
      - **$\sigma\uparrow\Rightarrow V_{put}\uparrow\Rightarrow V_{putable}\uparrow$**
  - **②effective of yield curve**
    - call option
      - int.rate ↓ ,$V_{call}$ ↑
      - upward sloping yied curve,$V_{call}$ lower
    - put option
      - int.rate ↑ ,$V_{put}$ ↑
      - upward sloping yied curve,$V_{call}$ higher

- **OAS & Z-spread**
  - zero-volatility spread(z-spread,one path)
    - **z-spread=R - $R_{free}$**
    - **z-spread:credit risk + liquidity risk + option risk**
  - option adjusted spread(OAS,many paths)
    - **OAS=credit-spread + liquidity spread**
    - **OAS:z-spread - option risk**
    - int.rate volatility and OAS
      - OAS of callable bond=z - $V_{call}$ (=z-|$V_{call}$|)
        - **call is bad,without call,risk ↓ ,OAS ↓**
      - OAS of putable bond=z - $V_{put}$ (=z+|$V_{put}$|)
        - **put is good,without put,risk ↑ ,OAS ↑**

| | Treasury benchmark | bond sector benchmark | issuer-specific |
|---|---|---|---|
| **N-spread Z-spread** | credit liquidity option | credit liquidity option | liquidity option |
| **OAS** | credit liquidity | credit liquidity | liquidity |
| **OAS>0** | overvalued OAS<$OAS_{rqd}$ / undervalued OAS>$OAS_{rqd}$ | overvalued OAS<$OAS_{rqd}$ / undervalued OAS>$OAS_{rqd}$ | undervalued |
| **OAS=0** | over | over | fairly priced |
| **OAS<0** | over | over | over |

  - $OAS_{rqd}$ :$OAS_{required}$ ,$OAS_{theory}$

- effective duration&effective convexity
  - **ED=** $\frac{P_{big}-P_{small}}{2P_0\Delta y}$ EC= $\frac{P_{big}+P_{small}-2P_0}{2P_0\Delta y^2}$
  - use binomial model to cpt effective duration&convexity
- **effective duration(among callable,putable,straight bonds)**
  - ED(with an option)<ED(straight)
  - ED(ZCB) ≈maturity of the bond
  - ED(have coupon)< maturity of the bond
  - ED(floater) ≈time to next reset date
  - int.rate ↑ ( ↓ ),putable(callable) strike,ED ↓

- float with cap(max)&floor(min)
  - floater:floating rate bond
  - capped floater protect **issuer(borrower)** against int.rate ↑
  - **③calculate value of floater(binomial)**
    - $V_{capped\ floater}=V_{straight}-V_{embedded\ cap}$
    - $V_{floored\ floater}=V_{straight}+V_{embedded\ floor}$
  - ratchet bond
    - ratchet down:coupon ↓
    - contingent put(on coupon reset date)

- **convertible bond(con.bond)**
  - **conversion ratio** :num. of stocks for a con.bond
  - **conversion price** = **bond issue price** /conversion ratio
  - **market conversion price** =bond market price/conversion ratio
  - **conversion value** =market price of stock×conversion ratio
  - straight value(pure value)
  - mkt conversion premium/share
    - =mkt conversion price-market price(stock)
  - mkt conversion premium ratio
    - =(mkt conversion premium/share)/mkt price of stock
  - premium over straight value= $\frac{\text{mkt price of con.bond}}{\text{straight value}}-1$
  - effects of embedded option in con.bond
    - **$V_{con.bond}=V_{straight}+V_{call\ on\ equity}$**
    - $\sigma\uparrow\Rightarrow V_{call}\uparrow\Rightarrow V_{con.bond}\uparrow$
    - stock price ↑ ↑ $\Rightarrow V_{con.bond}\uparrow$

- **convexity**
  - straight bonds&putable bonds, EC >0
  - callable bonds
    - int.rate ↑ ,unlikely to be call,EC >0
    - int.rate ↓ ,call is near the money,EC <0
- **③one-side durations**
  - price sensitivity of bond with option:not symmetrical
  - callable bond(down&up:int.rate)
    - one-side down-duration<one-side up duration
  - putable bond
    - one-side down-duration>one-side up duration
- key rate duration
  - bond with low coupon rate may have negative KRD( ≈0)

## Credit analysis models

### credit risk

- EL=PD×LGD×EAD
  - **PD** ,probability of default,%
  - **EAD** ,exposure at default,$
  - **LGD** ,loss given default,% (RR,recovery rate)
  - credit spread=YTM $_{\text{credit-risky ZCB}}$ - r $_{\text{risk-free}}$
- PV of expected loss
  - two adjustments
    - time value adjustment
    - risk-neutral probabilities
  - PVEL=EL+ risk premium - time value discount
    - PVEL=V $_{\text{risk-free}}$ - V $_{\text{risky}}$

### traditional credit models

- **credit scoring** (for small businesses&individuals)
  - ordinal rankings; don't improve with economy;
  - (pressure)prioritize stability; change over time;
  - different PD of same borrower.
- **credit rating** (least accurate)
  - strengths
    - simple to understand&reduce volatility
  - weakness
    - correlation of PD&rating ↓ (∵ stability )
    - don't adjust with business cycle
    - issuer-pays model

### structure models

**Merton model ($V_{equity}=max(A-K,0)$, $V_{debt}=min(A,K)$)**

**risk-neutral**

shareholder

Equity=call

$$V_{equity,t}=A_t N(d_1) - Ke^{-r(T-t)} N(d_2)$$

bondholder

debt $_{risky}$+EL=debt $_{risk-free}$ ; **D=V-E**

$$V_{debt,t}=A_t N(-d_1) + Ke^{-r(T-t)} N(d_2)$$

$$d_1=\frac{ln(A_t/K)+r(T-t)+0.5s^2(T-t)}{s\sqrt{(T-t)}}$$

$$d_2=d_1 - s\sqrt{(T-t)}$$

**r:risk-free rate**

**$PD=1-N(d_2)=N(-d_2)$**

**real world**

$$EL_T=V_{risk-free} - V_{risky}$$

$$=K-[A_t N(-e_1) + Ke^{-r(T-t)} N(e_2)]e^{r(T-t)}$$

$$=KN(-e_2) - A_t e^{r(T-t)} N(-e_1)$$

**$PVEL=EL_T \times exp(-r(T-t))$**

$$=Ke^{-r(T-t)} N(-d_2) - A_t N(-d_1)$$

$$e_1=\frac{ln(A_t/K)+\mu(T-t)+0.5\sigma^2(T-t)}{\sigma\sqrt{(T-t)}}$$

$$e_2=e_1 - \sigma\sqrt{(T-t)}$$

**μ:actual return rate of asset**

**$PD=1-N(e_2)=N(-e_2)$**

| | structure models | reduced form models |
|---|---|---|
| **assumption** | assets trading in a frictionless mkt; risk-free rate is constant; simple balance sheet structure(one debt,no coupon) | a frictionless&arbitrage-free mkt; r&state of economy are stochastic (random) |
| **strengths** | provide option analogy to cpt PD,debt,EL | historical simulation(input are observalbe) credit risk fluctuate with business cycle; do not require B/S structure |
| **weaknesses** | assumptions are not realistic; do not condider business cycle. | λ:hard to estimate |

### reduced form models

**exponential distribution** (λ=hazard rate)

**PD=1-exp(-λ(T-t))**

credit spread ≈PD×LGD

credit analysis of ABS is different from corporate bonds

- credit risk metric,waterfall(tranch)

allow input parameters vary with economy

value of debt(risk-neutral)

$$D_t=E\left(\frac{K}{\Pi(1+r_i)}\right), r_i=\text{risk-free rate for year}$$

## Credit default swaps

### CDS

- insurance contract;CDS spread;fixed coupon

single-name CDS

- cheapest-to-deliver

index CDS(basket)

credit event

- bankruptcy
- failure to pay
- restructuring

**cash settlement**

- par value - mkt value

**physical settlement**

- reference obligation(bond/loan);par value

market price of CDS

- CDS spread
  - **CDS spread=PD×LGD**
    - λ=hazard rate
- premium leg=protection leg
- upfront premium on a CDS
  - **upfront pmt=PV(protection leg)-PV(premium leg)**
  - **upfront premium% ≈(CDS spread - CDS coupon)×duration**
  - price of CDS(per $100) ≈$100-upfront premium(%)
    - **premium+coupon=protection,premium=spread-coupon**
- profit for protection buyer(%) ≈change in spread(%)×duration
- protection buyer is short credit risk and benefit when CS widen

naked CDS

long/short trade(long&short,different spread)

basis trade

CDO,synthetic CDO(eg.CLN)

# Derivative3-1 Pricing and valuation of forward commitment

## forward

- forward contracts
  - long forward position
    - party who agree to buy **assets**
  - **no-arbitrage principle**
    - assets with same identical future CF,same price
    - certain payoffs → risk-free rate of return
      - $FP=S_0\times(1+R_f)^T$
    - forward arbitrage(long low,short high)
      - $FP > S_0\times(1+R_f)^T$ ,cash and carry arbitrage
      - $FP < S_0\times(1+R_f)^T$ ,reverse cash and carry arbitrage
      - $profit=|FP - S_0\times(1+R_f)^T|$
- **pricing** a forward contract(no-arbitrage price)
- ★★ **$FP=S_0$+carrying costs - carrying benefits**
  - predetermine pmt to buy the asset at settlement date
- **valuation** of a forward contract
- ★★ determine $V_{forward,t}, t\in[0,T]$: **V=PVCF in -PVCF out**
- **forward contract price&value** ($\Delta t=T-t,\ t\in[0,T]$)
  - **T-bill(zero-coupon bond) forward**
    - price:$FP=S_0\times(1+R_f)^T$
    - value:$V_{long,t}=S_t - FP\times(1+R_f)^{-\Delta t}$
  - **forward on a dividend-paying stock**
    - price:$FP=(S_0-PVD_0)\times(1+R_f)^T$
    - value:$V_{long,t}=S_t - PVD_t - FP\times(1+R_f)^{-\Delta t}$
      - $=PV_{t,T}[F_t(T) - F_0(T)]$
  - **forward on an equity-index**
    - continuously compounded
    - price:$FP=S_0\times e^{(Rf-\delta)T}$
    - value:$V_{long,t}=S_t\times e^{-\delta\Delta t} - FP\times e^{-Rf\Delta t}$
      - $\delta$:dividend yield
  - **forward on coupon bonds**
    - **price:$FP=(S_0-PVC_0)\times(1+R_f)^T$**
    - value:$V_{long,t}=S_t - PVC_t - FP\times(1+R_f)^{-\Delta t}$
      - $=PV_{t,T}[F_t(T) - F_0(T)]$
  - **currency forward contracts**
    - price(covered int.rate parity)
      - $FP=S_0\times\frac{(1+R_{DC})^T}{(1+R_{FC})^T}$
    - value:
      - $V_{long,t}=\frac{S_t}{(1+R_{FC})^{\Delta t}} - \frac{FP}{(1+R_{DC})^{\Delta t}}$
      - $R_F$:return rate;$R_D$:discount rate

## forward rate agreement(FRAs,simple interest)

- underlying assets:LIBOR(Eurodollar)
  - LIBOR:London interbank offered rate(simple interest)
  - Euribor:Europe interbank offered rate
- **M×N FRA**, forward rate=$R_{FRA}$
  - int.rate $_{floating,M}$
  - ←m→ ← n →
  - S M N
  - settlement
- **settlement**
  - $payoff_L=NP\times\frac{(int.rate_{floating,M} - R_{FRA})(n/360)}{1+int.rate_{floating.M}\times(n/360)}$
    - NP:notional principal
- **FRA pricing** (no arbitrage forward rate($R_{MN}$))
  - $(1+R_{SN}\times(m+n)/360)=(1+R_{SM}\times m/360)(1+R_{MN}\times n/360)$
- **valuation** ($t\in[S,M]$,long)
  - $V_{FRA}=PV(CF_{in})-PV(CF_{out})$
    - M:NP in; N:(NP+$interes $_{FRA}$)out

## T-bond futures

- underlying
  - hypothetical 30 year T-bond with 6% coupon rate
- deliverable(deliver cheapest-to-deliver bond)
  - $100,000 par value T-bond,any coupon,maturity ⩾15 years
  - conversion facter(CF)
- **pricing**
  - $FP_{standard}=FP_A\times\frac{1}{CF_A}$
- **quoted futures price(QFP)**
  - clean price=full price - accrued interest
  - **$FP_{clean}=[(S_0+AI_0)\times(1+R_f)^T - FVC] - AI_T$**
  - $QFP=FP_{clean}\times\frac{1}{CF}$

## swaption contracts(option)

- an option to enter into a swap
  - 2×5 swaption
    - after 2time,bgn a swap of 5time
    - maybe month/year
- valuation(fixed payer)
  - V=max(PV(NP×periodic Δ),0)
    - Δ=current swap rate-swap rate
- **payer swaption** ( **fixed** payer,call on **int.** ,put on bond)
- **receiver swaption** ( **fixed** receiver,call on bond,put on **int.** )

## swap

- **interest rate swap(IRS)**
  - plain vanilla swap(fixed⇄float)
    - **pricing(fixed rate)**
      - $V_{fixed\ bond}=V_{float\ bond}$, $V_{float\ bond}$=par=1
      - **$1=CB_1+CB_2+\ldots+CB_n+1B_n$**
      - ★ **$C=\frac{1-B_n}{\Sigma B}$** ,$B_n$:discount factor
      - **swap rate=( annualized C)/1**
    - **valuation** (fixed out,float in)
      - $V_t=PV_{float} - PV_{fixed}$
        - $C_{float}$:latest future coupon
- **cross currency swap(CCS)**
  - A:$⇄€:B, $t\in[0,T]$

| | A(need €) | | B(need $) | |
|---|---|---|---|---|
| t=0 | $P out | €P in | $P in | €P out |
| $t\in(0,T)$ | $C in | €C out | $C out | €C in |
| t=T | $P in | €P out | $P out | €P in |

  - exchange principle&do not netting
  - **pricing(fixed rate,like IRS)**
    - $fixed⇄€float
      - $floating rate → $fixed rate
    - $fixed⇄€fixed
      - $floating rate → $fixed rate
      - €floating rate → €fixed rate
    - $float⇄€float
      - no pricing
  - **valuation** (BGN:$out, €in)
    - $V_t=PV_{in} - PV_{out}=PV\$_t - PV€_t$
      - **discount rate** :$ → $;€ → €
      - use **exchange rate at t**
- **equity swap contracts**
  - $R_{EQUITY}$ ⇆ fixed/ float/ $R_{EQUITY}$
  - **pricing(** fixed rate,like IRS,only $R_{EQUITY}$ ⇆ fixed **)**
    - **$C=\frac{1-B_n}{\Sigma B}$** ,$B_n$:discount factor
  - **valuation** (fixed out,float in)
    - $V_t=PV_{float} - PV_{fixed}$

# Derivative3-2 Valuation of contingent claims

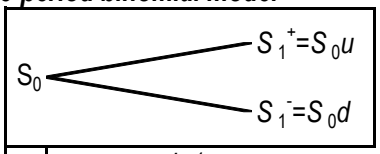
## binomial model-the expectations approach

### put-call parity for European options

a fiduciary call=a protective put

★ **$call + Ke^{-r\Delta t} = put + S_0$**

**one-period binomial model**




assume: ud=1

**expectation approach(risk-neutral)**

$\pi_u$:risk-neutral **probability** of an up move

★ $\pi_u = \frac{1+R_f - d}{u - d}$, $\pi_u+\pi_d=1$

**valuation(X:strike price)**

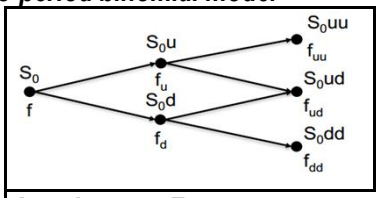
$C_u=max(0,S_u-X), C_d=max(0,S_d-X)$

$V_{call}=(\pi_u C_u+\pi_d C_d)\times(1+R_f)^{-T}$

**hedge rario(delta)**

★ $h=(C_u-C_d)/(S_u-S_d)=\Delta C/\Delta S$, **$\Delta C=\Delta\times\Delta S$**

**two-period binomial model**




**American vs. European**

$V_{American} > V_{European}$

at t moment:if $max(0,S_t-X)>C_t$,strike($t \in (0,T)$)

binomial interest rate tree

int.rates at each node are 1-year forward rates

**risk-nuetral probability:π=0.5**

interest rate option(M×N)

interest rate call option(cap=Σcaplet)

payoff=max(0,reference rate -exercise rate)×NP

interest rate put option(floor)

payoff=max(0,exercise rate - reference rate)×NP

# Black-Scholes-Merton Model

## continuous-time option pricing model

**assumptions**

P～lognormal;

**(CFA:logarithmic return is normal)**

P →continuous; σ:known&constant;

$R_{risk\text{-}free,continuous}$:known&constant;

mkt:frictionless; no cash flow;

European options.

**price of European option use BSM**

★ **$C_0=S_0N(d_1) - Xe^{-R_fT}N(d_2)$**

★ **$P_0=Xe^{-R_fT}N(-d_2) - S_0N(-d_1)$**

$P_0=C_0-S_0+Xe^{-R_f\times T}$

$d_{1,2}=\frac{ln(S_0/X)+R_fT\pm0.5\sigma^2T}{\sigma\sqrt{T}}$

$d_2=d_1-\sigma\sqrt{T}$

**features of BSM** PV of option payoff($C_0$)

leveraged stock investment

$C_0$:borrow money( **$XN(d_2)e^{-rT}$** )

to invest in stock( **$S_0N(d_1)$** )

$P_0$:short stock to buy the bond

**probability of strike=$N(d_2)=1-N(d_2)$**

**other options**

options on **dividend paying stock**

$C_0=S_0N(d_1)e^{-\delta T} - XN(d_2)e^{-R_f\times T}$

δ:dividend yield

$d_{1,2}=\frac{ln(S_0/X)+(R_f-\delta)T\pm0.5\sigma^2T}{\sigma\sqrt{T}}$

$d_2=d_1-\sigma\sqrt{T}$

options on **currencies**

$C_0=S_0N(d_1)$ **$exp(-R_{foreign}T)$** $- XN(d_2)exp(-R_{domestic}T)$

$R_{foreign}$:foreign $R_{risk\text{-}free}$,as a return

$R_{domestic}$:domestic $R_{risk\text{-}free}$,as a discount rate

# Option Greeks&Implied volatility

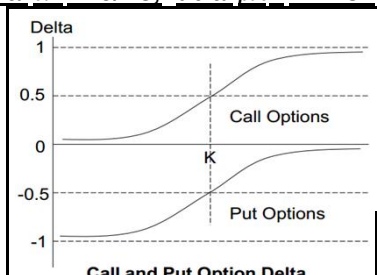
5 inputs of BSM model and sensitivity factors *European put θ may be negative

| sensitivity | input | Calls | Puts |
|---|---|---|---|
| **Δ:delta** | **$S_0$**:underlying asset price | +,Δ>0 | -,Δ<0 |
| **Λ:vega** | **σ**:volatility | +,Λ>0 | +,Λ:0 |
| **ρ:rho** | **$R_f$**:risk-free rate | +,ρ>0 | -,ρ<0 |
| **θ:theta** | **T**:time to expiration | θ<0 | θ<0 * |
| | **X**:strike price | - | + |

(time decay)

★ **delta(Δ=Δoption/Δunderlying)**

**$delta_{call}=\Delta C/\Delta S$; $delta_{put}=\Delta P/\Delta S=delta_{call}-1$**




**call: Δ∈(0,1);put:Δ∈(-1,0)**

long C,short P: Δ > 0

long P,short C: Δ < 0

call:Δ=N(d1);put:Δ=N(d1)-1

| | OTM | ATM | ITM |
|---|---|---|---|
| call | Δ=0 | Δ=0.5 | Δ=1 |
| put | Δ=0 | Δ=-0.5 | Δ=-1 |

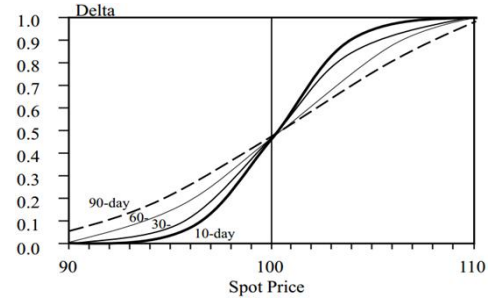
dynamic hedging($t \to T$ ⇒delta changes ⇒change NC)

**NS×ΔS-NC×ΔC=0** ⇒NS/NC=ΔC/ΔS=delta ⇒**NS=Δ×NC**

NS:num. of shares;

NC:num. of calls

$t \to T$,delta is unstable




rho(ρ)

$R_f$

impact<vega

implied volatility

use BSM

vega= ∂C/∂σ

**vega(call)=vaga(put)**

long:vega>0

theta(time decay)

**theta(call)=theta(put)**

**long:θ < 0**

gamma= ∂Δ/∂S

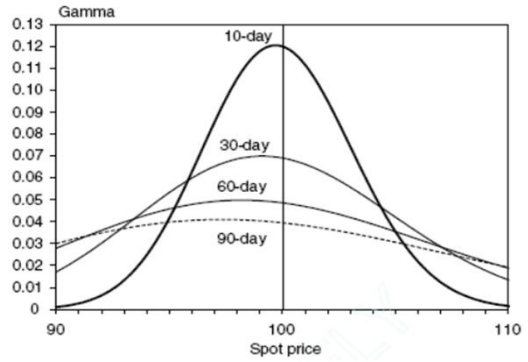
normal distibution

**Γ(call)=Γ(put)**

**long:Γ > 0**

**short:Γ < 0**

**gamma largest:ATM**




rebalance Δ-neutral portfolio more frequently

# Derivative3-3 Valuation of contingent claims

## binomial model-the no-arbitrage approach

hedge ration: $h=\Delta C/\Delta S$

**$\Delta C=h\times\Delta S$: 1 C requied h S to hedge**

no-arbitrage approach

construct a portfolio with no delta risk

call option

$C_0 - hS_0=PV[(C-) - (hS-)]=PV[(C+) - (hS+)]$

+:stock price up; -:stock price down

$$C_0=hS_0+PV[C^- - hS^-]=hS_0+PV[C^+ - hS^+]$$

↑↓compare $h=N(d_1)$, $C_0$=+stock - bond(or borrow money)

$$C_0=S_0N(d_1) - XN(d_2)exp(-R_fT)$$

put option

$P_0=hS_0+PV[(P-) - (hS-)]=hS_0+PV[(P+) - (hS+)]$

↑↓compare: $h=-N(-d_1)$, $P_0$=+bond - stock

$$P_0=XN(-d_2)exp(-R_fT) - S_0N(-d_1)$$

## Black option valuation model

option on futures

**underlying:futures**

$$C_0=exp(-R_fT)[FP\times N(d_1) - XN(d_2)]$$

$P_0=exp(-R_fT)[XN(-d_2) - FP\times N(-d_1)]$

$$d_{1,2}=\frac{ln(FP/X)\pm 0.5\sigma^2T}{\sigma\sqrt{T}}$$

$$d_2=d_1-\sigma\sqrt{T}$$

$C_0=max(0,PV(FP-X))$

call: long futures financed by bond

interest rate option

**underlying:forward rate or FRA rate**

strike int.rate are fixed in advance

$C_0=NP\times AP\times exp(-rN\times 30/360)[FP_{M\times N}N(d_1) - XN(d_2)]$

AP=accrual period=(N-M)×30/360

option on swaptions

right to enter into an IRS

with a pre-specified exercise swap rate

underlying:forward swap rate

payer swaption

$V_{payer}=NP\times AP\times PVA[R_{fixed}N(d_1) - R_XN(d_2)]$

receiver swaption

$V_{payer}=NP\times AP\times PVA[R_XN(d_1) - R_{fixed}N(d_2)]$

$R_{fixed}$:fixed swap rate starting when swaption expires

$R_X$:exercise rate; $PVA=\Sigma PV_{0,t_j}(1)$,(annuity)

# Derivatives strategies

## derivatives application

interest rate derivatives

futures

swap(D:duration)

D payer swap

=D floating rate note -D fixed bond

D receiver swap

=D fixed bond -D floating rate note

equity derivatives

futures&swap

currency derivatives

futures&swap

index derivatives

futures

synthetic stock index fund& synthetic cash

synthetic long/short asset

call - put= asset

put - call= -asset

synthetic call/put

call= asset + put

put= -asset + call

synthetic stock

= risk-free asset + stock futures

synthetic cash(earn risk-free rate)

= stock - stock futures

## ★ combination strategies

**collar** =stock+p-c=protective put-c=covered call+p

payoff=$S_T-S_0+max(0,(X_L-S_T))-P-max(0,(S_T-X_H))+C$

profit $_{max}=X_H-S_0-P+C$

loss $_{max}=S_0-X_L+P-C$

breakeven: $S_T=S_0+P-C$

limit the downside risk

as a cost,giving up the upside return

**straddle** =c+p,k=k($k\neq k$, **strangle**)

payoff=$max(0,(S_T-X))-C-max(0,(X-S_T))+P$

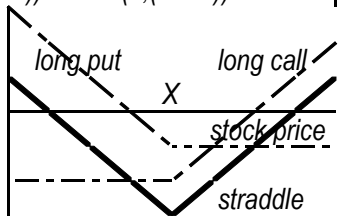
profit $_{max}\rightarrow+\infty$

loss $_{max}=P+C$

breakeven

$S_T=X+(P+C)$

$S_T=X-(P+C)$




# option strategies

## ★ simple strategies

**covered call** =S-C

payoff=$(S_T-S_0)-max(0,(S_T-X))+C$

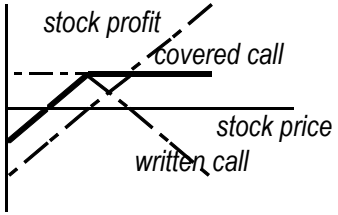
$S_T>X$,payoff $_{max}=X-S_0+C$

$S_T=0$,payoff $_{min}=C-S_0$

breakeven: $S_T=S_0-C$

caps the upside potential at X

delta $_{covered\ call}$=delta $_{stock}$ - delta $_{call}$




**protective put** =S+P

payoff=$(S_T-S_0)+max(0,(X-S_T))-P$

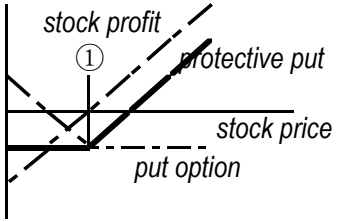
payoff $_{max}\rightarrow+\infty$

$S_T=0$,payoff $_{min}=X-S_0-P$

breakeven: $S_T=S_0+P$

①deductible=$S_0-X$

delta $_{protective\ put}$=delta $_{stock}$ + delta $_{put}$




cash secured put(-put,secured with depoisiting the amount(=exercise price))

## ★ spread strategies (all call/all put)

**bull** call/put **spresd** : **long low,short high**

payoff=$max(0,(S_T-X_L))-max(0,(S_T-X_H))-C_L+C_H$

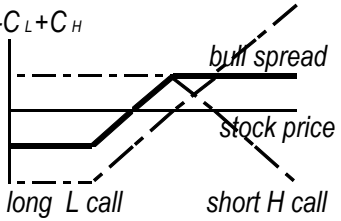
$S_T>X_H$,payoff $_{max}=X_H-X_L+C_H-C_L$

$S_T<X_L$,payoff $_{min}=C_H-C_L$

breakeven: $S_T=X_L+C_L-C_H$

limit the downside risk

as a cost,giving up the upside return




**bear** call/put **spread** : **long high,short low**

payoff=$max(0,(S_T-X_H))-max(0,(S_T-X_L))+C_L-C_H$

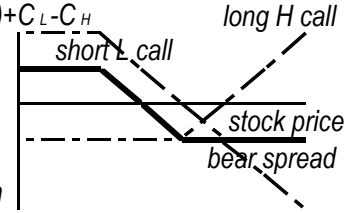
$S_T<X_L$,payoff $_{max}=C_L-C_H$

$S_T>X_H$,payoff $_{min}=X_L-X_H+C_L-C_H$

breakeven: $S_T=X_L+C_L-C_H$

limit the downside risk

as a cost,giving up the upside return




calendar spread

short a near-dated call,long a longer-dated one

time decay is more pronounced for a short-term option

## breakeven price analytics

calculate the breakeven price for the strategy

calculate breakeven price deviation $\%\Delta P=\frac{|BP-CP|}{CP}$

BP:breakeven price; CP:current price

calculate **annual breakeven volatility** $\sigma_{annual}=\%\Delta P\times(\frac{252}{TDUM})^{0.5}$

TDUM:trading days until maturity

# Alternative3-1 Private real estate investment

## private real estate investment

### forms of real estate

- first dimension:private/public
  - **private investments**
    - solely owned; partnerships;
    - commingled real estate funds(CREF)
  - **public market investments**
    - real estate investment trust( **REIT** )
    - real estate operating company( **REOC** )
    - mortgage-backed securities
- second dimension:debt/equity

### forms of real estate

- real estate characteristics
  - heterogeneity; high unit value;
  - active management; lack of liquidity;
  - high transaction(brokers,lawyers);
  - depreciation&desirability;
  - cost&availability of debt capital;
  - difficulty in determining price
- REITs' advantages
  - actively traded,more likely to reflect MV;
  - diversified real estate portfolio;
  - don't need property management

### property classifications

- **commercial** real estate property
  - **multi-family property;** **office;**
  - industrial/warehouse; **retail;**
  - hospitality; parking,restaurants,etc.
- **non-commercial** real estate property
- **unique** categories
  - farmland; timberland

#### office

- demand
  - employment growth
  - space used per employee
  - average amount of space per employee
- operating expenses
  - **gross lease** :operating exp. payed by owner
  - **net lease** :operating exp. payed by tenant
  - expenses reimbursement

#### multi-family

- demand
  - population growth
  - population demographics
  - propensity to rent in culture
  - cost of rent
  - interent rate
  - operating expenses

#### retail

- demand
  - trends in consumer spending
  - health of economy
  - job growth,population growth,saving rates
- unique aspect
  - **pay fixed+floating** (sales reach a certain level)

### valuations

- types of value
  - **market value; investment value;**
  - value in use; assessed value;
  - mortgage lending value
- highest and best

### reasons to invest

- current income; capital appreciation;
- inflation hedge; diversification;
- tax benefits

### **risks to invest**

- business conditions; cost&availability of capital;
- new property lead time(futures);
- unexpected inflation; demographic factors;
- lack of liquidity; environmental issues;
- availability of information;
- management expertise; leverage

### indices

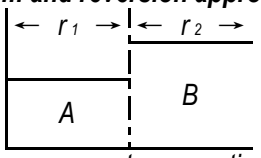
- quarterly data → lag actual transactions;smooth
- repeat-sale index&hedonic index(factor)

### ★ **income approach(vs DCF)**

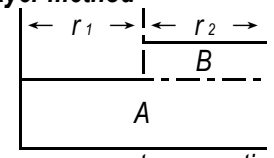
- **single-stage** (direct capitalization method)
  - **net operating income** (cash)(gross lease)
    - = rental income from fully occupied + other income =potencial gross income
    - - vacancy and collection loss =effctive gross income
    - - operating expense
  - capitalization rate **(cap rate)=discount rate - growth;** **$V=NOI_1/cap\ rate$**
  - stabilized NOI:remove temporary issues(renovation)
  - **gross income multiplier=sales price/gross income**
- **two-stage(DCF method)**
  - ★ direct income approach(TV approach)( **2nd stage:reversion or resale** )

$$MV=\sum \frac{NOI_i}{(1+r)^t}+\frac{MV_n}{(1+r)^n},\quad MV_n=\frac{NOI_{n+1}}{r-g}$$ r-g:terminal cap rate

  - limitations: difficult to selecting the appropriate cap rate
    - not applicable for owner-occupied propertys that provide other benefits
  - **2nd stage:not resale**
    - ★ **term and reversion approach**




    - ★ **layer method**




assume g=0,cap rate=r **$V=PV(A)\ by\ r_1+PV[PV(B)_{t,by\ r_2}]\ by\ r_2$**

### ★ **cost approach(vs asset-based)**

$V=$ replacement cost - dep .- obsolescence - curable (cost+PV(rent))+MV of land

(= replacement cost - weakness of target house (new house doesn't have)+ land )

obsolescence:functional/locational/economic

### ★ **sales comparison approach** (C:comparable; T:tatget; $n \geqslant 3$) **(price multiple)**

$$V=size_T \times \frac{\sum[(V_C + bad\ of\ C(T\ not\ have) - good\ of\ C(T\ not\ have))/size_C]}{n}$$

reconciliation of value(average of above)

land:highest and best

### financial ratios uesd to analysis--debt

- **debt service coverage ratio(DSCR)** (like interest coverage)

$$DSCR=\frac{first\text{-}year\ NOI}{debt\ service}$$, debt service:interest&principal

- **loan-to-value(LTV)** ratio(like D/A)

$$LTV=\frac{loan\ amount}{appraisal\ value}$$

## Alternative3-2 Publicly traded real estate securities

publicly traded real estate securities

- advantages
  - superior liquidity;
  - lower minimum investment;
  - limited liability;
  - access to premium properties;
  - active professional management;
  - protection(by SEC);
  - greater potential for diversification
  - exemption from taxation
  - predictable earning
  - high yield

  → REITs
- economic value determinants of REITs

| REITs | first | secend |
|---|---|---|
| shooping | national GDP growth | retail sales growth |
| office | | job creation |
| healthcare | | population growth |
| industrial | | retail sales growth |
| hotel | | job creation |
| storage | | population growth |

- **NAVPS in REIT valuation**
  - net asset value per share
  - **NAV=operating real estate +(cash+A/R) - debt**
    - operating real estate=$NOI_1$/cap rate
  - $NOI_1=NOI_0$ - **non-cash rents** + **full-year adjustment**
- **FFO&AFFO in REIT valuation**
  - funds from operations(FFO)
    - FFO= accounting net earnings + dep .+ deferred tax exp .
      ± losses/gains from sales and debt restructuring
  - adjusted funds from operations(AFFO)
    - also known as
      - cash/funds available distrubution(CAD/FAD)
    - **AFFO=FFO - non-cash(straight-line)rent adjustment**
      **- recurring maintenance-type CAPEX&lease**
  - P/FFO or P/AFFO multiples

## Private equity valuation

private equity valuation

- PE investment transaction
  - PE investor
  - private equity firm
  - portfolio company
- classifacation of PE
  - venture capital(VC)
  - buyout
  - special situations
- control mechanisms in PE transactions
  - compensation
  - tag-along,drag-along clauses
    - buy one,must to all SHDers
  - board representation
  - noncompete clauses(buyout)
  - priority in claims
  - required approvals
  - earn-outs
- PE fund structure
  - limited partnership
  - **economic terms** of a PE fund
    - **mgt fees** :basis as % of paid-in capital
    - transaction fees
    - **carried interest:usually 20%**
    - ratchet:allocation of equity
      - between PE&mgt
    - hurdle rate:above it,GP get carried interest
    - target fund size
    - vintage:year the fund start
    - term of the fund
  - **corporate governance terms** of a PE fund
    - key man clause
    - performance disclosure&confidentiality
    - clawback
    - tag-along,drag-along clauses
    - no-fault divorce(LPs can fire GP no reason)
    - removal for cause
    - investment restrictions
    - co-investment

PE: PE(1) PE(2) PE(3)

- distribution waterfall
  - deal-by-deal method
  - total return method
    - **1st:only after entire committed capital returned to LPs**
    - **2nd:excesss some minimum amount**

- exit
  - **IPO; secondary market sale; MBO; liquidation**
- **valuation** (PE ⇉portfolio company)
  - **VC valuation issues** (pre- and post-money valuation)
    - **for a single financing round** (price per share=invest/shares $_{PE}$=pre/share $_{pre}$)
      - **post=FV/(1+r)$^n$** → **pre=post - invest**
      - ↓ **f=invest/post**
      - **price per share=invest/shares $_{PE}$** ← **shares $_{PE}$= [shares $_{pre}$/(1-f) ]×f**
    - **for multiple financing rounds**
      - **post $_2$=FV/(1+r $_2$)$^n$** → pre $_2$=post $_2$ - invest $_2$
      - ⇩
      - pre $_1$=post $_1$ - invest $_1$ ← post $_1$=pre $_2$/(1+r $_1$)$^n$
      - ↓ $f_1$=invest $_1$/post $_1$
      - shares $_{PE,1}$= [shares $_{pre}$/(1-f $_1$) ]×f $_1$ → price per share $_1$=invest $_1$/shares $_{PE,1}$
      - ↓ $f_2$=invest $_2$/post $_2$
      - shares $_{PE,2}$= [(shares $_{pre}$+shares $_{PE,1}$)/(1-f $_2$) ]×f $_2$
      - ↓
      - price per share $_2$=invest $_2$/shares $_{PE,2}$
    - accounting for risk when valuing VC
      - adjusting r
        - r*=[(1+r)/(1-q)]-1
          - q:probability of failure in a year
      - adjusting TV
        - scenario analysis
  - **buyout valuation method**
    - payoff multiple=total payoff/total investment

| | | |
|---|---|---|
| | c | capital called down known |
| Σc | p | **paid-in capital** |
| p×% | m | **mgt fees** |
| | o | operating results known |
| Na $_{t-1}$+c-m+o | Nb | **NAV before distributions** |
| (Nb-Nb $_x$)×% | i | **carried interest** |
| | d | distributions(to LPs) known |
| Nb-i-d | Na | **NAV after distributions** |

Nb $_x$=max(committed c,Nb $_{t-1}$)

**PIC** =paid-in capital/committed capital
**DPI** =distributed/paid-in capital **realized**
**RVPI** =residual value/paid-in capital **unrealized**
**TVPI** =total value/paid-in capital **TVPI=DPI+RVPI**

*Alternative3-3 Commodities&commodity derivatives:an introduction*

*Commodities&commodity derivatives:an introduction*

- ***sectors***
  - *energy*
  - *grains*
  - *industrial(base) metals*
  - *livestock*
  - *precious metals*
  - *softs(cash crops)*
- ***backwardation***
  - *futures price<spot price*
- ***contango***
  - *futures price>spot price*
- *3 theories*
  - *insurance theory(backwardation)*
    - *producers as hedgers,short*
  - *hedging pressure hypothesis*
    - *producers and consumers*
    - *producers(backwardation)*
    - *consumers(contango)*
  - *theory of storage(contango)*
- ***total return=(spot return+roll return)+collateral return+rebalancing return***
  - *roll return>0,backwardation* ⇩ ⇩
  - *roll return<0,contango* *margin interest* *portfolio*

*Portfolio3-1 Portfolio management process,asset allocation&risk management*

## Portfolio management process&IPS

- *portfolio perspective*
  - *Harry Markowitz:Modern Portfolio Theory(MPT)*
  - *some pricing model(pricing return rate):CAPM,APT,ICAPM*
- ***portfolio management(steps)***
  - ❶ ***the planning step(CFA II)***
    - ①*identify investor's objective&constraints*
      - ***risk objective***
        - *specific factors that affect* ***ability***
          - *required spending needs; long-term wealth target;*
          - *financial strengths/liabilities; health/age.*
        - *specific factors that affect* ***willingness***
          - *return objective; habit;*
          - *historical trading; character*
      - ***return objective***
        - *measurement(absolute R,relative R,nominal R,etc.)*
        - *desied return(wish)&required return(must be)*
      - ***investment constrains***
        - *liquidity; time horizon; tax concerns;*
        - *legal&regulatory factors; unique circumstances.*
    - ②*creating* ***IPS***
      - ***main roles:*** *be implemented by investment advisers*
        - *promote long-term discipline for port.decisions*
        - *help protect short-term shift in strategy*
      - ***elements:*** *a client description; objectives&constrains;*
        - *purpose of IPS(policies,objective,goals,limitations);*
        - *identification of duties&responsibilities;*
        - *calendar schedule; asset allocation ranges;*
        - *guidelines for adjustment&rebalancing*
      - *3 approaches of investment strategy*
        - *passive/active/semiactive investment*
    - ③*forming capital mkt expectations(CME)*
      - *long run forecast of risk&return for various asset classes*
    - ④*creating* ***strategic*** *asset allocation(just weighting)*
  - ❷ ***the execution step***
    - ***tactical*** *asset allocation*
    - *security selection/composition*
  - ❸ ***the feedback step***
    - *monitoring&rebalance*
    - *performance evaluation*
- *management investment portfolio*
  - *update IPS at least annual&when great event*

## an introduction to multifactor models(=regression models)

★ ***arbitrage pricing theory*** *(equilibrium-pricing model,no ε)*

- ***assumptions***
  - *a* ***fator(RP)*** *model describes asset returns;*
  - *investor can form* ***well-diversified portfolio*** *(WDP);*
  - ***no arbitrage opportunities*** *among WDP.*
- *exactly formula(* ***λ asset not exist*** *)*
  - $E(R_p)=R_f+\beta_{p,1}(\lambda_1)+\beta_{p,2}(\lambda_2)+\ldots+\beta_{p,k}(\lambda_k)$
    - *pure factor portfolio for factor j:E(r)=$r_{free}+\lambda_j$*
    - *parameters:$R_f$, factor risk-premiums $\lambda_j$*
- *assumptions for arbitrage opportunities*
  - *extreme long/short are permitted*
  - *all arbitrage opportunities would be exploited*

★ ***multifactor model*** *(regression models,ε)*

- ***macroeconomic factor models***
  - $R_i=E(R_i)+b_{i1}F_{GDP}+b_{i2}F_{QS}+\varepsilon_i$
    - *$E(R_i)$:expected return for asset i*
    - *$F_{GDP}$:surprise in GDP rate*
    - *$F_{QS}$:surprise in credit quality spread*
    - *$\varepsilon_i$:firm-specific surprise(out of model)*
    - ***surprise=actual value - expected value***
  - ***slope coefficients:factor sensitivity***
- ***fundamental factor models***
  - $R_i=a_i+b_{i1}F_{P/E}+b_{i2}F_{SIZE}+\varepsilon_i$
    - $b_{ij}=\dfrac{\Delta\text{attribute value (asset } i \text{ - average)}}{\sigma(\text{attribute value})}$
    - *$a_1$:no economic interpretation(or average level )*
  - ***slope coefficients:standardized β***
  - *exception:dummy variables → b → b=0 or 1*
- *statistical factor models*
  - *factor analysis models&principal components models*
  - ***advantage*** *:minimal assumptions*
  - ***disadvantage*** *:no economic interpretation*
- *mixed factor models*

| | APT | Multifactor models | CAPM |
|---|---|---|---|
| characteristics | cross-selection | time-series | |
| assumptions | no arbitrage opportunities, far more flexible than CAPM | regression | a lot |
| intercept | risk-free rate | expected return | |
| conclusions | multiple risk factor | | only mkt premium |

## application

- ***return attribution*** *(α)*
  - ***active return(α)=$R_{portfolio}$ - $R_{benchmarck}$***
  - *first component*
    - ***factor tilts (asset allocation)***
    - ***factor return=$\Sigma(\beta_{pk}-\beta_{bk})\times\lambda_k$***
      - *$\beta_{pk}$:for the kth factor in the active portfolio*
      - *$\beta_{bk}$:for the kth factor in the benchmark*
      - *$\lambda_k$:factor premium for factor k*
  - *second component*
    - ***security selection (asset selection)***
    - *security selection return=α - factor return*
- ***risk attribution*** *(tracking error/volatility)*
  - *the standard deviation of α($s_\alpha$,not $\sigma_\alpha$)*
    - ***active risk=$s_\alpha$*** *(Rp-Rb)*
  - ***information ratio=α/$s_\alpha$***
  - ***active risk squared***
    - ***=active factor risk+active specific risk***
- *portfolio construction*
  - *passive management*
    - *can use multifactor models to match an index*
  - *active management*
    - *use β to evaluate portfolio manager*
  - ***Carhart four-factor model(four factor model)***
    - $R=R_f+\beta_1 R_{MRF}+\beta_2 R_{SMB}+\beta_{3R_{HML}}+\beta_4 R_{WML}$

Portfolio3-2 Portfolio management process,asset allocation&risk management

## measuring and managing market risk

- value at risk,VaR($ or %)
  - a time period,x%,min loss → VaR
- estimating VaR
  - **analytical method(parameter method)**
    - or variance-covariance method
    - **VaR(X%)= | E(R)-z(X%)*σ |**
      - **$VaR(x\%)_{J\ days} = VaR(x\%)_{1\ day} \times J^{1/2}$**
    - advantages
      - **easy** to calculate&understand;
      - allow modeling the correlation of risk;
      - applied to shorter/longer time period.
    - disadvantages
      - assumes **normal distribution** of return;
      - many assets leptokurtosis(fat tails);
      - hard to estimate **σ** in very large portfolio.
  - **historical method**
    - advantages
      - easy to calculate&understand;
      - do not assume a return distribution;
      - can be applied to different time period.
    - disadvantages
      - history → future
  - **Monte Carlo method**
    - advantages&disadvantages
      - any assumptions;
      - output only as good as input assump.
- **advantages of VaR**
  - simple concept; easily communicated;
  - provides a basis for risk comparison;
  - facilitates capital allocation decisions;
  - used for performance evaluation;
  - reliability can be verified;
  - widely accepted by regulators.
- **limitation of VaR**
  - subjective; failure to take into account liquidity;
  - underestimate the frequency of extreme events;
  - sensitivity to correlation;
  - vulnerability to trending or volatility regimes;
  - misunderstanding the meaning of VaR;
  - oversimplification;
  - disregard of right-tail events.

- extensions of VaR
  - **conditional VaR(CVaR,or ES)**
  - **incremental VaR(IVaR,Δ)**
  - **marginal VaR(MVaR)**
    - $IVaR \approx MVaR_i \times W_i$
  - relative VaR
    - ex ante tracking error
- other key risk measures
  - sensitivity
    - equity:β; option:Δ,Γ,vega
    - fixed:duration,convexity
    - advantage
      - address some shortcomings of position size measures
    - limitations
      - do not often distinguish assets by σ,less comparable.
  - scenario risk measures
    - **historical scenarios**
    - **hypothetical scenarios(HY)**
    - advantage
      - do not need to rely on history
      - no assumption of $N(\mu,\sigma^2)$
      - can be tailored
      - allow liquidity into consideration
    - limitations
      - history → future; difficult to estiablish
      - HY may incorrectly specify
      - HY can be difficult to creat

- applications of risk measures
  - **banks** :liquidity gap(working capital);
    - VaR;economic capital
  - **asset managers** :position limit;
    - redemption risk;tracking error;
    - HF:gross exposure;leverage
  - **pension fund**
    - surplus at risk(SAR),glide path
  - **insurers**
    - economic capital
    - asset&liability matching
- using constraints in mkt management
  - risk budgeting
  - position limits
  - liquidity limits
  - stop-loss limits
  - risk measures and capital allocation

Economic analysis,active management and trading

## algorithmic trading and high-frequency trading

- **execution algorithms** (how to trade)
  - VWAP; implementation shortfall; market participation
- **high-frequency trading algorithms** (how/when/what to trade)
  - data
    - market data; quote event;
    - trade event; news event
  - HFT-statistical arbitrage
    - pairs trading spread trading
    - index arbitrage mean reversion
    - basket trading delta neutral strategies
  - latency
    - stimulus and response
  - application areas
    - liquidity aggregation&smart order routing
    - real-time pricing of instrument(millisecond)
    - trading on news
    - genetic tuning
  - risk management
    - turned off pre-trade risk management to latency → risk ↑
  - regulatory
    - insider trading; wash trading;
    - front running orders; trade collusion;
    - painting the tape;
    - fictitious order
      - quote stuffing,layering,,spoofing
- impact on securities markets
  - positive
    - liquidity&effectiveness ↑
  - negative
    - fear of unfair advantage
    - market movement ↑
    - gaming the market
    - increased risk profile
    - algorithms gone wild

confidence intervals

| | CI | VaR |
|---|---|---|
| ±1.00σ | 68% | 16.0% |
| ±1.65σ | 90% | 5.0% |
| ±1.96σ | 95% | 2.5% |
| ±2.33σ | 98% | 1.0% |
| ±2.58σ | 99% | 0.5% |

Portfolio3-3 Economic analysis,active management and trading

economics and investment markets

framework for the analysis of financial markets

present value model

$$P_{i,t}=\sum \frac{E_t[\widetilde{CF}_{i,t+s}]}{(1+I_{t,s}+\theta_{t,s}+\rho_{i,(t,s)})^s}$$

P:value of I at time t; $\widetilde{CF}_{i,t+s}$:uncertain,nominal CF paid s period;

$E_t[\widetilde{CF}_{i,t+s}]$:expectation based on today's information;

I:YTM on a real default-free investment today;

θ:expected inflation rate between t and t+s;

ρ:RP of CF of asset i,s period in the future

present value model(complete formula)

$$P_{i,t}=\sum \frac{E_t[\widetilde{CF}_{i,t+s}]}{(1+I_{t,s}+\theta_{t,s}+\pi_{t,s}+\gamma_{i,(t,s)}+\kappa_{i,(t,s)}+\varphi_{i,(t,s)})^s}$$

**I** :$R_f$; **θ** :inflation; **π** :uncertain inflation;

**γ** :credit spread; **κ** :equity spread; **φ** :liquidity spread

**the discount rate on real default-tree bonds(TIPS)**

**I** marginal utility of consumption of investors diminishes

**inter-temporal rate of substitution** , $m=u_t/u_0$, always m<1

$m=u_t/u_0$, always m<1,m is a random variable( ∵ $u_t$ is random)

good state of the economy → lower m( ∵ future,richer)

price of bond=m, return on bond=one-period risk-free rate= **I=1/E(m) - 1**

**m ↑ ⇒$u_t$ ↑ ⇒$u_0$ ↓ ⇒invest$_0$ ↑ ⇒P ↑ ⇒I ↓**

uncertainty&risk premium

**P=E(P)/(1+I)+cov(P',m)** ; in general, **cov(P',m)<0**

economy goes bad, **cov(P',m)>0 (fight to quality)**

**economy ↑ ⇒I ↑ ; $\sigma_{GDP}$ ↑ ⇒I ↑**

**short-term nominal interest rate(T-bills)**

**θ** influenced by:

inflation environment; economic activity;

central bank's policy rate(Taylor rule:policy rate=$I_I$+0.5($I_I$-$I_I$*)+0.5(Y-Y*)

$I_I$*:target rate of inflation; Y*:potential real GDP(log)

**yeild curve and business cycle(non-short-term treasury bond)**

**π** **break-even inflation rates(BEI), π ∝ GDP,$\sigma_{GDP}$**

**BEI=θ+π=R zero-coupon default-free bond (nominal-real)**

yield curve

**level,slope,curvature**

shape of yield curve

upward sloping;downward sloping;hump;flat

an inverted yield curve →a predictor of recession

**credit premiums and business cycle(corporate bond)**

**γ** **credit spread=R corporate bond -R government bond**

**CS=EL=PD×LGD=PD×(1-RR)** ; (risk-netrual)

recovery rates tend to be high:

secured as opposed to unsecured debt holders

economy is expanding

industry sector and credit quality

**ratings:lower,more sensitive**

**sectors:cycle,more sensitive**

company-specific factors: **high D/E,more sensitive**

sovereign credit risk

**equities and equity risk premium(equity)**

**κ** difficult to argue

bad consumption hedge(ρ(κ,C)>0)

investment strategy

**growth/small stock > value/big stock**

**commercial real estate**

**φ** both bond-like and stock-like

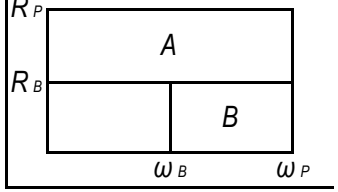
**GDP ↑ ,price ↓ ⇒φ ↓**

analysis of active portfolio management

value added(active return)

$R_A=R_P-R_B=\Sigma\Delta\omega_i R_{Ai}$

$R_A=A+B=\Sigma\omega_P(R_P-R_B)+\Sigma(\omega_P-\omega_B)R_B$




Sharpe ratio

$$SR_P=\frac{R_P-R_F}{\sigma(R_P)}$$

**SR is unaffected by ±cash**

★ constructing **optimal portfolios(SR max)**

| | |
|---|---|
| $SR_P^2=SR_B^2+IR^2$ | $SR_P^2=SR_B^2+TC^2(IR^*)^2$ |
| $\sigma_{R_A}=\frac{IR}{SR_B}\sigma_{R_B}$ | $(\sigma_{R_A}=\frac{TC\times IR^*}{SR_B}\sigma_{R_B})$ |

$\sigma^2(R_P)=\sigma^2(R_B)+\sigma^2(R_A)$; $\omega=\sigma^*_A/\sigma_A$

IC&TC

**IR=TC×IC× √ BR**

**IC:information coefficient**

IC=correlation(RA/σ, μ/σ);(=cor(real,guess))

**TC:transfer coefficient**

TC=correlation(μ/σ, Δωσ);(=cor(guess,do))

size active weights(optimal active)

$\mu_i=IC\times\sigma_i\times S_i$

IC:expected IC

$\sigma_i$:separate for individual security

$S_i$:correct magnitude(+ or -)

$$\Delta\omega^*_i=\frac{\mu_i}{\sigma^2_i}\frac{\sigma_A}{\sqrt{\Sigma\frac{\mu^2_i}{\sigma^2_i}}}=\frac{\mu_i}{\sigma^2_i}\frac{\sigma_A}{IC\ \sqrt{BR}}$$

**basic fundamental law**

expected active portfolio return

$E(R_A)=\Sigma(\Delta\omega_i\mu_i)$(=IC √ BR×$\sigma_A$, optimal)

**IR*=IC× √ BR**

**full fundamental law**

**constraints to TC(TC<1)** :regulation,cost,etc.

**IR=TC×IC× √ BR**

**E($R_A$)=TC×IC× √ BR×$\sigma_A$**

ex post performance measurement

realized information coefficient($IC_R$)

**E($R_A$ | $IC_R$)=TC×$IC_R$ √ BR×$\sigma_A$**

**$R_A$=E($R_A$ | $IC_R$)+Noise**

**cor($R_A$,E($R_A$ | $IC_R$))=TC, $r^2=R^2=TC^2$**

applications of fundamental law

global equity strategy(TC)

selection&constraints

fixed-income strategy(IC,BR)

increasing in BR → decreasing IC

practical limitations

independence of investment decisions

**overestimate own IC;**

different sector,different IC

$$BR=\frac{N}{1+(N-1)\rho}$$


***Products&risk models***

- *fixed-income product*
  - *bond basics*
  - *treasury bonds*
  - *corporate bonds*
  - *MBS*
  - *valuation of bonds*
  - *risk metrics*
  - *rating agencies*
- *derivative*
  - *forward mkt and futures mkt*
  - *forward and futures prices*
  - *interest rate futures*
  - *hedging strategies using futures*
  - *swap mkt*
  - *properties of stock options*
  - *trading stratrgies involving options*
  - *exotic options*
  - *option valuation*
  - *risk metrics-Greek letters*
- *central counterparties*
  - *introduction*
  - *exchanges,otc der.,DPCs and SPVs*
  - *basic principles of central clearing*
  - *risks caused by CCPs:risks faced by CCPs*
- *risk measurement and management*
  - *measures of financial risk*
  - *putting VaR to work*
  - *quantifying volatility in VaR models*
  - *expected and unexpected loss*
  - *country risk*
  - *operational risk*
  - *stress test*

- fixed-income product
  - bond basics
    - risk-free rate
      - treasury rates
      - libor
      - repo rates
    - compounding frequencies
      - simple interest
      - compounding interest
    - bond
      - **coupon rate**
      - **face value**
      - **maturity**
      - **yield to maturity**
    - bond pricing
  - risk metrics
    - one-factor risk metrics
      - **duration**
        - **Macaulay duration**
        - **modified duration(MD)**
        - **dollar duration(DD)**
        - **DV01**
          - **hedge ratio**
        - **effective duration**
      - **convexity**
        - **effective convexity**
      - **portfolio duration & convexity**
    - multi-factor risk metrics
      - key-rate shifts
      - **key rate 01s**
      - **key rate duration**

$$HR = \frac{\text{DV01(per \$100 of initial position)}}{\text{DV01(per \$100 of hedging instrument)}}$$

$DD(0)+N*DD(H)=0$

- corporate bonds
  - role of corporate trustee
  - different coupon payment
    - zero,straight,floating
  - different types of corporate bonds
    - mortgage bonds
    - collateral trust bonds
    - equipment trust certificates
    - debenture bonds
    - guaranteed bonds
  - zero-coupon corporate bonds
    - **original issue discount(OID)**
  - corporate bond retirements
    - call provision
    - sinking-find provisions
    - maintenance and replacement funds
    - tender offers
  - corporate bond credit risk
    - credit default risk
    - credit-spread risk
    - issuer default rate & dollar default rate
    - recovery rate
  - high-yield bond(issuers)
    - original issuers
    - fallen angels
    - restructurings and leverage buyouts
  - paymenr features
    - deferred-interest bonds
    - step-up bonds
    - payment-in-kind(PIK)bonds
  - **spread of a bond**
  - callable and puttable bond

- MBS
  - mortgage loan
    - agency or conforming loans
    - non-agency or non-conforming loans
  - fixed rate mortgage payments
    - **interest and principal**
  - prepayment option
    - valuable when rates have fallen
    - **single monthly mortality rate(SMM)**
    - **constant prepayment rate (CPR)**
    - **conditional prepayment rate**
  - mortgage-back-securities mkt
    - mortgage pass-through
    - mortgage servicers
    - mortgage guarantors
    - weighted-average coupon or WAC
    - weighted-average maturity or WAM
  - agency mortgage pools trade
    - specified pools mkt
    - to be announced(TBA)
  - dollar rolls
  - prepayment components
  - valuing MBS
    - Monte Carlo methodology
  - zero-volatility spread(Z-spread)
  - option-adjusted spread(OAS)

- treasury bonds
  - treasury mkt(quoted price)
    - **T-bills & T-bonds**
  - quotation of treasury bonds
    - **accrued interests**
    - day count conventions
    - **clean price**
    - **dirty price**
  - treasury STRIPS

- valuation of bonds
  - **spot rate,forward rates,discount factor**
  - **par rate**
  - **bond replication**
    - same CFs,same price
  - **pricing bond using:**
    - **discount factors**
    - **spot rates**
    - **forward rates**
  - **pricing of annuity and perpetuity**
    - **perpetuity:c/y**
  - **yield to maturity**
    - yield curve(Forward > Spot > YTM)
  - reinvestment risk
  - interest rate risk
  - **decomposition of P&L**
    - **carry-roll-down**
    - **rate change**
    - **spread change**

- rating agencies
  - S&P vs. Moody
  - sovereign rating
    - political stability
    - social & eco. Coherence
    - integration into global
  - opinion about creditworthness
  - transition matrices
  - through-the- cycle
  - at-the-point approach
  - ratings change impact bond prices
  - external and internal ratings

*derivative 2-1*

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## forward mkt and futures mkt

- *forward(otc)*
- *futures*
  - *standardized*
  - *daily settlement*
- *market participants*
  - *hedgers*
  - *speculators*
  - *arbitrageurs*
  - *market maker*
- *commodity forward contract*
  - *storage costs*
  - *lease rate*
  - *convenience yields*
  - *commodity spread*
- *financial forward contract*
  - ***forward interest agreement(FRA)***
- *trading manner of a futures*
  - *close out*
  - *physical delivery*
  - *cash settlement*
  - *exchange for physicals*
- *crush spread & crack spread(soybean)*
- *specification of futures*
  - *assets*
  - *contract size*
- *margin requirement*
  - *initial margin*
  - *maintenance margin*
  - *variation margin*
- *trading order*
  - *mkt,limit*
  - *stop,stop-loss*
  - *stop-limit*
- *clearing house*

## forward and futures prices

- ***cost of carry model(TVM)***

$$F_0 = S_0 e^{(r+u-q-y)T}$$

- ***interest rate parity***

$$\text{Forward} = \text{Spot}\left(\frac{1+r_{DC}}{1+r_{FC}}\right)^T$$

$$\text{Forward} = \text{Spot} \times e^{(r_{DC}-r_{FC})T}$$

- *foreign exchange risk*
- *net exposure position*
  - *positive:A > L*
- *on-balance-sheet hedge*
- *hedge off-balance-sheet*
- *normal & inverted futures mkt*
- *contango & backwardation(F,S)*
- ***valuing the forward contract***

$$f = (F_0 - K)e^{-rT}$$

## interest rate futures

- ***T-bond*** *futures* ***(long-term)***
- *cheapest-to-deliver bond*
  - ***cost=quoted bond price-(QFP*CF)***
- ***Eurodollar*** *futures* ***(short-term)***
  - *three-month,$1m*
  - ***P=1m*(1-0.25(100-FQ)%)***
  - *P=1m*(1-0.25libor)*
  - *long:* ***FQ*** *1bp ↑ ,* ***EuroD $25*** *↑*
- *difference between forwad&futures price*
  - ***ρ(S,r) >0*** *,futures more attractive*
- ***Eurodollar futures vs. FRA***

$$\text{Forward Rate} = \text{Futures rate} - \frac{1}{2}\sigma^2 T_1 T_2$$

## hedging strategies using futures

- *short hedge&long hedge*
- ***strip*** *hedge&* ***stack(&roll)*** *hedge*
- ***minimum variance hedge ratio***

$$HR = \rho_{S,F}\frac{\sigma_S}{\sigma_F}$$

  - *effectiveness of the hedge*
    - *coefficient of determination:* ***R*R=ρ*ρ***
- ***using stock index futures to change a stock portfolio's beta***

$$\text{number of contracts} = \beta_{\text{portfolio}} \times \frac{\text{portfolio value}}{\text{value of futures contract}}$$

$$\text{number of contracts} = (\beta^* - \beta) \times \frac{\text{portfolio value}}{\text{value of futures contract}}$$

  - ***β(S)*V(S)+N*β(H)*V(H)=β(T)*V(S)***
  - ***N*β(H)*V(H)=(β(T)-β(S))*V(S)***
- *tailing the hedge*
  - *HR*(P(S)/P(F))*
- ***basis risk*** *:* ***Spot-Futures***
  - *different assets*
  - *different maturity*
- *cross hedging*
  - *long the basis(short Futures)*
  - *short the basis(long Futures)*

## swap mkt

- *swaps*
  - *interest rate swap*
  - *currency swap*
- ***comparative advantage*** *argument*
- *valuing interest rate swap with bonds*
  - ***V(swap)=V(fixed)-V(float)***
  - *D(swap)=D(fixed)-D(float)*
- *valuing currency swap with bonds*

## properties of stock options

- *basics*
  - *call&put,European&American*
- *moneyness*
  - *ITM,ATM,OTM*
- *intrinsic value&time value*
  - *IV:C=max(S-X,0)*
  - *IV:P=max(X-S,0)*
- *six factors that affect on option's price*
  - ***(S,X,T,σ,r,D)*** *(Euro C&P,Ame C&P)*
- ***upper and lower bonds for option prices***

| Option | Proxy | Min Value | Max Value |
|---|---|---|---|
| European call | c | $\max(0, S_0 - Xe^{-rT})$ | $S_0$ |
| American call | C | $\max(0, S_0 - Xe^{-rT})$ | $S_0$ |
| European put | p | $\max(0, Xe^{-rT} - S_0)$ | $Xe^{-rT}$ |
| American put | P | $\max(0, X - S_0)$ | X |

- ***put-call parity***

$$C + Ke^{-rT} = p + S_0$$

$$S - X \le C - P \le S - Xe^{-rT}$$

$$p + S_0 = c + D + Xe^{-rT}$$

$$S_0 - X - D \le C - P \le S_0 - Xe^{-rT}$$

## trading stratrgies involving options

- *simple strategies*
  - ***covered call*** *=S-C*
  - ***protective put*** *=S+P*
- ***spread strategies*** *(call/put)*
  - ***bull*** *call/put* ***spresd*** *:long low,short high*
  - ***bear*** *call/put* ***spread*** *:long high,short low*
  - ***butterfly spread*** *:4call/put*
  - *calendar spread*
  - *diagonal strategies*
- ***combination strategies***
  - ***collar*** *=stock+put-c*
  - ***straddle*** *=c+p,k=k(k ≠ k,* ***strangle*** *)*
  - ***strip*** *=2p+c,k=k*
  - ***strap*** *=p+2c,k=k*

*derivative 2-2*

*exotic options*

- *standard and nonstandard Ame. options*
  - *Bermudan option(certain dates)*
- *compound options*
  - *options on options*
- *forward start options*
- *chooser option*
- ***barrier options***
  - *up in+up out=option*
  - *down in+down out=option*
- *binary options*
  - *cash-or-nothing:QN(d2)e^(-rT)*
  - *asset-or-nothing:S(0)N(d1)e^(-rT)*
- ***lookback options***
  - *floating lookback call:S(T)-S(min)*
  - *floating lookback put:S(max)-S(T)*
  - *fixed lookback call:S(max)-K*
  - *fixed lookback put:K-S(min)*
- *shout options*
- *Asian options:S=S(ave)*
- *volatility and variance swaps*
- *static options replication*

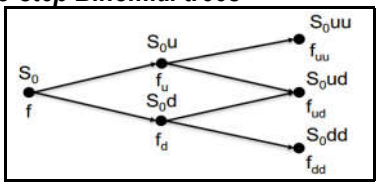
*option valuation*

- ***Binomial trees***
  - *risk-neutral valuation*
  - ***assumption***
    - *Stock:geometric Brownian motion*
    - *risk neutral*
    - *ud=1*
  - ***one-step Binomial trees***

$$u = e^{\sigma\sqrt{\Delta t}};d = e^{-\sigma\sqrt{\Delta t}}$$

$$p = \frac{e^{r\Delta t} - d}{u - d} \text{ or } p = \frac{e^{(r-q)\Delta t} - d}{u - d}$$

  - ***two-step Binomial trees***




  - *American options(put)*
- ***Black-Scholes-Merton model***
  - ***assumption***
    - *P ~ lognormal*
    - *P → continuous*
    - *R(f):known&constant*
    - *σ:known&constant*
    - *mkt:frictionless*
    - *no cash flow*
    - *European options*
  - ***price of European call option***

$$c = SN(d_1) - Ke^{-rT}N(d_2)$$

$$c = Se^{-qT}N(d_1) - Ke^{-rT}N(d_2)$$

  - ***price of European put option***

$$p = Ke^{-rT}N(-d_2) - SN(-d_1)$$

$$p = Ke^{-rT}N(-d_2) - Se^{-qT}N(-d_1)$$

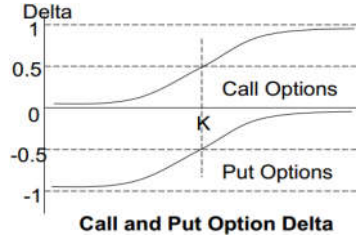
  - *the early exercise of American options*

*risk metrics-Greek letters*

***delta*** Δ, ***gamma*** Γ, ***vega*** Λ, ***theta*** θ, ***rho*** ρ

*delta=* ***(C1-C0)/(S1-S0)*** *;stock：* ***Δ=1***

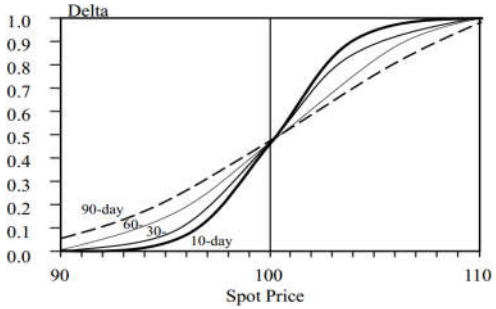
- ***slope*** *of option pricing function*
- *call:* $\Delta \in (0,1)$*;put:* $\Delta \in (-1,0)$
- ***long C,short P:*** $\Delta > 0$
- ***long P,short C:*** $\Delta < 0$




**Call and Put Option Delta**

*call:* ***Δ=N(d1)*** *;put:* ***Δ=N(d1)-1***

*CDF of a normal distribution*




*t → T， delta is unstable*

*call:ATM,Δ=0.5;OTM,Δ=0;ITM,Δ=1*

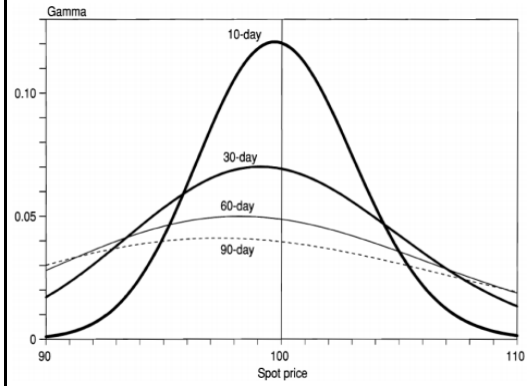
***forward Δ=1*** *or* ***e^(-qT)***

***futures Δ=e^(rT)*** *or* ***e^((r-q)T)***

*Δ=0:delta neutral position*

*gamma=* $\partial\Delta/\partial S$

- *normal distibution*
- ***gamma(call)=gamma(put)***
- ***long:Γ > 0;short:Γ < 0***




***gamma neutral position***

***option →Γ,stock →Δ***

*ΔC=delta*ΔS+0.5*gamma*(ΔS)^2*

*vega=* $\partial C/\partial\sigma$

- ***vega(call)=vaga(put)***
- ***vega(LT) > vaga(ST)***

*theta(time decay)*

- ***theta(call)=theta(put)***
- ***long:θ < 0***

*rho(sensitivity to the interest rate)*

- ***max:ITM > ATM > OTM***

張子涔

- central counterparties(CCP,after the crisis)
  - introduction
    - OTC(risk)
    - CCP(central clearing of all standardized OTC der.)
      - **reducing counterparty risk**
      - **improving mkt transparency**
      - **reducing mkt interconnectedness**
    - advantages
      - setting standards for clearing menbers
      - multilateral **netting**
      - collecting and maintaining margin
      - **mutualization** of losses among clearing menbers
      - enhanced trade **liquidity** &reduced overall mkt disruptions
    - drawbacks
      - the potential failure of a CCP
      - **moral hazard** problem
      - increased costs arising from tying up funds as initial margin
      - **adverse selection**
  - risks caused by CCPs:risks faced by CCPs
    - major risks
      - **default risk**
      - model risk
      - liquidity risk
      - operational risk
      - legal risk
    - default correlation ≥OTC
    - lesson learned
      - operational risk
      - variation margin(often&quickly)
      - automated payments

- exchanges,otc der.,DPCs and SPVs
  - derivatives:bilaterally(OTC) or exchanges
  - **exchanges**
    - 3 primary functions
      - product standardization
      - trading venue
      - reporting servives
    - counterparty risk mitigants
      - **clearing**
      - **margining**
      - **netting**
    - clearing(3 forms)
      - **direct clearing**
      - **clearing ring**
      - **CCP**
  - **OTC**
    - advantage:customization
    - disadvantage: **counterparty risk**
    - OTC derivatives
      - **ineret rate** ,foreign exchange,equity,
      - commodity,credit
  - controlling counterparty risk
    - special purpose vehicles( **SPV** )
      - bankruptcy remote
    - derivatives product companies( **DPC** )
      - AAA
      - monolines insurance
    - credit derivatives product companies( **CDPC** )

- basic principles of central clearing
  - functions
    - **novation**
    - netting
    - margining
    - managing **auction** process,
    - loss **mutualization**
  - conditions needed for CCP
    - product standardization
    - lower complexity
    - high liquidity
  - participants
    - members
  - number of CCPs
  - types of CCPs
    - utility-driven CCP
    - profit-driven CCP
  - failure of a CCP
  - advantages of CCPs
    - **transparency**
    - **offsetting**
    - loss **mutualization**
    - **legal and operational efficiency**
    - liquidity
    - default management
  - disadvantages
    - moral hazard
    - adverse selection
    - separation of cleared&non-cleared products
    - **procyclicality of margin requirement**

risk measurement and management 2-1

measures of financial risk

coherent risk measure

**monotonicity** :R1 ≧ R2,ρ(R1) ≦ ρ(R2)

**subadditivity** :ρ(R1+R2) ≦ ρ(R1)+ρ(R2)

**positive homogeneity** :β ＞ 0,ρ(βR)=βρ(R)

**translation invariance** :ρ(R+c)=ρ(R)-c

mean-variance framework

Value at Risk

max loss,target horizon,confidence level

disadvantages

worst conditions,tail loss

not sub-additive

**VaR(X%)= | E(R)-z(X%)*σ |**

stock:VaR(X%)=V*z(X%)*σ, **1.65,95%** ; **2.33,99%**

square root rule

$$\mathrm{VaR}(X\%)_{J\text{-days}} = \mathrm{VaR}(X\%)_{1\text{-days}} \times \sqrt{J}$$

**trend → positive correlation(ρ ＞ 0) → VaR ↑**

**mean reversion → negative(ρ ＜ 0) → VaR ↓**

conditional VaR(expected shortfall,ES)

**ave(worst 100*(1-α)% of losses)**

putting VaR to work

**linear derivatives** (F,f,stock)

tiny changes,delta → constant

VaR of linear derivatives(Δnormal approximation)

$$\mathrm{VaR}_{\text{Linear Derivative}} = \Delta \times \mathrm{VaR}_{\text{Underlying Risk Factor}}$$

eg.ΔC=Δ*ΔS, **VaR(ΔC)=VaR(Δ*ΔS)=Δ*VaR(ΔS)**

**delta-normal approach**

linear approximation,underlying factor is normal

ΔP=-D*P*Δy, $\mathrm{VaR}(dP) = |-D^{*}P| \times \mathrm{VaR}(dy)$

ΔC=delta*ΔS, $\mathrm{VaR}(df) = |\Delta| \times \mathrm{VaR}(dS)$

**nonlinear derivatives** (bond,option)

**delta-gamma approximation**

ΔP=-D*P*Δy+0.5*C*P*(ΔS)^2

ΔC=delta*ΔS+0.5*gamma*(ΔS)^2

$$\mathrm{VaR}(dP) = \left|-D^{*}P \times \mathrm{VaR}(dy) + \frac{1}{2}(C \times P) \times \mathrm{VaR}(dy)^2\right|$$

$$\mathrm{VaR}(df) = \left|\Delta \times \mathrm{VaR}(dS) + \frac{1}{2}\Gamma \times \mathrm{VaR}(dS)^2\right|$$

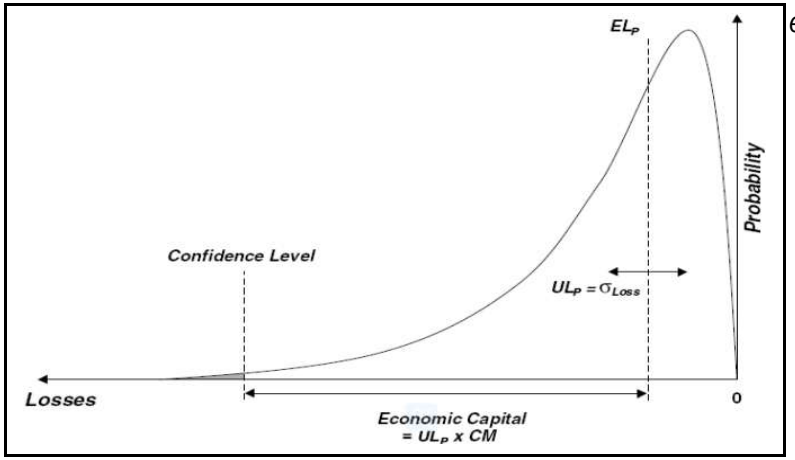
**full revaluation method** (accurate but computationally)

historical simulation

bootstrap simulation

Monte Carlo simulation

scenario analysis




expected and unexpected loss

credit risk

3 drivers

**PD** ,probability of default:%

**EA** ,exposure amount:$

**LR** ,loss rate:%

expected losses, **EL**

**EL=PD*EA*LR**

unexpected loss,UL

$$UL = EA \cdot \sqrt{PD \cdot \sigma_{LR}^2 + LR^2 \cdot \sigma_{PD}^2}$$

**σ*σ(PD)=PD(1-PD)**

quantifying volatility in VaR models

reasons for fat tails

σ,μ of the distribution changes over time

volatility is time-varying

regime-switching volatility model

constant mean,different volatility

historical-based approach

**parametric model**

**nonparametric approach**

historical simulation method

**hybrid approach**

**λ^(i-1)*((1-λ)/(1-λ^k))**

**implied volatility-based approach**

uses derivative pricing model

advantages

forward-looking

reacts immediately to changing mkt

**disadvantages**

**model dependent**

multivariate density estimation(MDE)

estimating volatility

historical standard deviation approach

exponential smoothing methods

**EWMA** $\sigma_n^2 = \lambda\sigma_{n-1}^2 + (1-\lambda)u_{n-1}^2$

**GARCH** $\sigma_n^2 = \gamma V_L + \alpha u_{n-1}^2 + \beta\sigma_{n-1}^2$

**persistence=α+β**

子 張
沐 涔

*risk measurement and management 2-1*

张子涔沐

## country risk

- *sources of country risk*
  - ***economic growth life cycly***
    - *early stages of economic growth,more risk*
  - ***political risk***
    - *chaos of democracy:more continuous risk*
    - *authoritarian:discontinuous*
    - *corrupt,as a cost*
    - *physical conflicts*
  - ***legal risk***
  - ***economic structure***
- *risk services' limitations*
  - *scores are not standardized*
  - *ranking than measuring*
- *sovereign default risk*
- *local currency defaults*
- *consequences of default*
  - *reputation loss*
  - *capital mkt turmoil*
  - *real output*
  - *political instability*
- *factors determining sovereign default risk*
  - *degree of indebtedness*
  - *pensions/social service commitments*
  - *revenues/inflows to government*
  - *stability of revenues*
  - *autocracies more than democracies*
  - *implicit backing from other entities*
- *sovereign ratings*
  - *not change quickly enough*
  - *rating process*
    - ***notch-up*** *approach:* ***foreign*** *currency rating*
    - ***notch-down*** *approach:* ***local*** *currency rating*
  - *criticized*
    - *upward biased*
    - *herd behavior*
    - *take too long to change rating*
    - *vicious cycle*
  - *reasons for rating agencies fail*
    - *information problem*
    - *cannot afford to hire too many analysts*
    - *revenue bias*
    - *conflict of interest*
- *sovereign default spread*
  - *advantages*
    - *more granular&dynamic*
  - *weaknesses*
    - *more volatile*
    - *affected by liquidity risk*
- *credit default swaps(* ***CDS*** *)*
  - *physical settlement*
  - *cash settlement*
  - *narrowness of the mkt*

## operational risk

- *internal processes,people,system*
- *7 categories of operational risk*
  - ***without*** *reputation&strategy*
- *approaches to measuring*

| | Top-Down Approaches | Bottom-I[ Approaches |
|---|---|---|
| Sophistication | Simple | Complex |
| Data Requirement | Non-intensive | Intensive |
| HFLS vs. LFHS | Undifferentiated | Differentiated |
| Diagnostic Ability | No | Yes |
| Perspective | Backward-looking | Forward-Looking |

  - *loss* ***frequency*** *distribution*
    - *number of losses,* ***Poisson distribution***
  - *loss* ***severity*** *distribution*
    - *loss severity distribution,lognormal*
  - *data issues*
- *operational risk regulatory capital*
  - ***basic indicator approach*** *(BIA),* ***3 years,α=15%***

$$K_{operational,BIA} = \frac{\sum_{i=last\ three\ years} (GI_i \times \alpha)}{3}$$

  - ***standerdized approach***

$$K_{operational,SA} = \frac{\left\{\sum_{i=last\ three\ years} \max\left[\sum GI_{line1-8} \times \beta_{line1-8}, 0\right]\right\}}{3}$$

  - ***AMA*** *approach,* ***1 year,99.9%confidence level***

## stress test

- *3 steps*
  - *create a set of extreme mkt scenarios*
  - *determine the prices changes to instruments,*
    - *determine change in portfolio value*
  - *summarize the result*
- *advantages*
  - *complements VaR*
- *disadvantages*
  - *highly subjective*
- *unidimensional & multidimentional scenarios analysis*
- *prospective & historical scenarios*
- *event-driven & portflio-driven scenarios*

market risk(3-1) VaR

張子涔

**estimating mkt risk measures** (VaR>0)

- data
  - profit/loss data
    - $P/L_t = P_t + D_t - P_{t-1}$
    - $PV(P/L_t) = \frac{(P_t + D_t)}{(1+d)} - P_{t-1}$
    - $FV(P/L_t) = P_t + D_t - (1+d)P_{t-1}$
  - loss/profit data(VaR/ES)
    - $L/P_t = -P/L_t$
  - arithmetic return
    - $r_t = (P_t + D_t)/P_{t-1} - 1$
  - **geometric return(~N(μ,σ²))**
    - $R_t = \ln(\frac{P_t + D_t}{P_{t-1}})$
- parametric VaR
  - normal VaR
    - $VaR = (\mu - z_\alpha \sigma)P_{t-1}$
      - 1.65,95%; 2.33,99%
  - lognormal VaR
    - $VaR = (1 - \exp(\mu - z_\alpha \sigma))P_{t-1}$
- **conditional** VaR, **CVaR**
  - (expected shortfall,ES)
  - $ES = E(loss_i \mid loss_i > VaR_c)$
    - more i,bigger ES
- **coherent risk measures**
  - $M_\phi = \int_0^1 \phi(p) q_p dp$
    - φ(p)=weighting function specified by user
    - eg. $ES = \varphi(p) = \begin{cases} 0 & p<\alpha \\ 1/(1-\alpha) & p>=\alpha \end{cases}$ if
- **quantile-quantile plots**

**non-parametric approaches**

- estimation of HS VaR&ES
  - basic historical simulation
  - bootstrapped HS
  - discrete confidence intervals
    - solu1:linear interpolation
    - solu2:kernel method
  - curves&surfaces
    - VaR curve:unsteady
    - ES curve:smoother
- **blames for traditional HS**
  - scare of data(solu:bootstrapped)
  - holding period ↑ →# of observations ↓
    - VaR:1day,1week or 1year
  - window ↑ →little relevance for current
  - past →future(solu:stress test)
  - slices of data
  - long-run data
    - irrelevance&ghost effect
  - **ghost effect**
    - insensitive
    - too insensitive
    - sudden to fall
- **weighted historical simulation**
  - **BRW** (age-weighted HS)
    - $\omega_1 + \omega_2\lambda + \ldots + \omega_n\lambda^{(n-1)} = 1$
    - $\omega_i = \frac{\lambda^{i-1}(1-\lambda)}{1-\lambda^n}$ i=1,yesterday
    - λ close to 1(small λ,decay fast)
    - attractions
      - a nice generation of traditional HS
        - (HS:λ=1)
      - a large loss will receive a higher weight
      - reduce ghost effects
      - allow us to let sample period grow
      - **reduce the effective sample size** (30 enough)
  - **Hull&White** (volatility-weighted HS )
    - $\frac{r^*_{t,i}}{\sigma_{T,i}} = \frac{r_{t,i}}{\sigma_{t,i}}, \left(\left(\frac{r}{\sigma}\right)_T = \left(\frac{r}{\sigma}\right)_t\right)$ (base:historic σ,r,today σ)
  - correlation-weighted historical simulation
  - filtered historical simulation(GARCH)
  - neural network approaches

advantages

- intuitive&simple
- no parametric assumptions
- accommodate any type of position
- no need for Cov. Matrices
  - no curses of dimensionality
- data are(often) readily available
- combine them with parametric

disadvantages

- depend on historical data
- have difficulty handling shifts

problems from long window

- aged data
- longer:ghost effects to disappear
- news will be drowned out by olds
- collection

**VaR mapping**

- fixed income
  - principal mapping
  - duration mapping
  - cash flow mapping
- linear derivatives
  - long forward(foreign currency) =long foreign currency spot +long foreign currency bill +short U.S.dollar bill
- options(use BSM)
  - long option=longΔasset +short(ΔS-c)bill

**backtesting VaR** (VaR_95%,p=5%)

- exceptions(loss>VaR)
  - too many:model underestimates risk
  - too few:excess allocation of capital across units
- model backtesting with **exceptions**
  - **exceptions follow binomial**

| | eg. | VaR_95%(daily) |
|---|---|---|
| $f(x) = C_T^x p^x (1-p)^{T-x}$ | mean(u) | 252×(1-95%) |
| | stdev(s) | √(5%×95%×252) |
| $z = \frac{x - pT}{\sqrt{p(1-p)T}} \approx N(0,1)$ | 95%_CI | u±1.96s |
| | 99%_CI | u±2.58s |

    - type1&type2 error
  - **Kupiec VaR backtest**
    - $H_0$ :accurate model
    - $H_a$ :inaccurate model
    - test ststistic:
      - $LR_{uc} = -2ln[(1-p)^{T-N}p^N]$
        - p:probability of exception,p=1-c
        - N:num. of exceptions; T:num. of samples
    - **LR>3.84** ,reject $H_0$
      - interval ↓ as confidence level ↑
      - high confidence level→exceptions are very rare
  - **Basel rules for backtest**
    - mkt VaR:confidence level_99%;past year(252 days)

| zone | green | yellow | | | | | red |
|---|---|---|---|---|---|---|---|
| num. of exceptions | 0-4 | 5 | 6 | 7 | 8 | 9 | 10+ |
| increase in K(%) | 0 | 40 | 50 | 65 | 75 | 85 | 100 |

      - capital=VaR×(3+K)×8%
    - causes for exceptions
      - basic integrity of the model
      - model accuracy
      - intraday trading
      - bad luck
  - **Christoffersen test**
    - test:bonch or wrong VaR
- conclusions
  - horizon should be short(daily VaR,observations ↑ )
  - confidence level(VaR,not backtest) not too high
  - high power(1-type2)

*market risk(3-2)  VaR*

*risk measurement for the trading book*

- *for bank:*
  - *trading book*
    - *for trading_* ***mkt risk*** *_FV,book to mkt*
  - *banking book*
    - *HTM_* ***credit risk*** *_accrued/historical cost*
- ***VaR implementation***
  - *time-varying σ ⇨VaR(t) ⇨horizon ↑ ,accuracy ↓*
    - *σ generated by stochastic jumps*
  - *recognize σ(t) in VaR measures*
    - *or will underestimate risk*
  - *time-varying correlations(ρ(t))*
  - *num. of exceptions is small,but great loss*
    - *severity if losses in the tail ↴*
  - *not subadditive → spectral risk(Σw i loss i)*
- ***integrating liquidity into VaR models***
  - *exogenous liquidity*
    - *liquidity-adjusted VaR(LVaR)*
  - *endogenous liquidity*
    - *depend on trade sizes*
- *integrated risk measurement*
  - *unified approach*
    - *consider all risk categories simultaneously*
  - *compartmentalized approach*
    - *calculate for individual risk types(Basel)*
- *risk aggregation(top-down,bottom-up)*
- *B/S management*
  - *eco.boom ⇨relax VaR ⇨expand ⇨more risk*
  - *eco.bust ⇨VaR constraint ↑ ⇨leverage&liquidity ↓*

※ *risk measures*

$$VaR_\alpha(L) = inf\{l: F_L(l) \geq \alpha\}$$

$$ES_\alpha = \frac{1}{1-\alpha}\int_\alpha^1 VaR_\alpha(L)du = E(L|L \geq VaR_\alpha)$$

- *spectral risk measures(Σw i loss i)*

$$SRM = \int_0^1 w(u)VaR_u(L)du$$

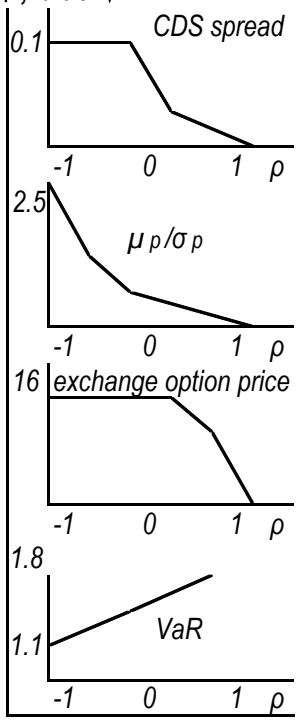
- *upper partial moments*

$$UPM(1, VaR_\alpha) = (1-\alpha)(ES_\alpha - VaR_\alpha)$$

*correlation*

***some correlation basics***

***ρ ↑ ,value ↓***




*wrong way risk(ρ(bad thing1,bad thing2) ↑ )*

***quanto option*** *(fixed ex.rate)*

*Ame. investor* →→$→→ *Jap. r stock*

←ex.rate←

*ρ(r stock Jap. ,yen)small,quanto high*

*eg.r stock ↑ ,yen ↓*

***correlation swap***

***1.correlation swap***

*fixed rate payer* →→*fixed ρ*→— *fixed rate receiver*

←*realized ρ*←

***2.buying correlation(ρ ∝σ)***

*P/L=V call on index -V call on stock*

*buy call index* → *investor* → *sell option stoc*

*index:ρ ↑ ↑ →σ ↑ ↑ →V call ↑ ↑*

*stock:ρ ↑ →σ ↑ →V call ↑*

***3.two swaps(ρ index >ρ component )***

| | | | |
|---|---|---|---|
| *receive var++* | → | *variance swap on an index* | → *pay fix* |
| *receive fix* | → | *variance swap on components* | → *pay var+* |

***loss of hedge fund***

- *2005*
  - *strategy*
    - ***-equity tranche(insurance)***
      - *receive high spread*
    - ***+mezz tranche(insurance)***
      - *pay low spread*
  - *in fact:ρ ↓ (paper loss)*
    - ***V equity ↓ ⇒spread of equity ↑***
    - ***V mezz ↑ ⇒spread of mezz ↓***
- *2007-2009*
  - *strategy*
    - *+equity tranche*
      - ***ρ ↑ ,V equity ↑***
    - ***PD ↑ &ρ ↑ ⇒V equity ↓***

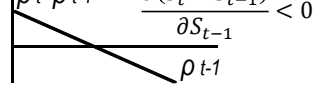
*ρ within sectors is higher than between sectors*

*time horizon ↑ ⇒PD ↑*

*mkt ↑ ⇨ρ ↑ ;mkt ↓ ⇨ρ ↑ ↑*

***empirical properties of correlation***

- *equity correlation behaviors*
  - *in recessions,ρ ↑ ,σ ρ ↑*
  - ***positive relationship:ρ &σ ρ***
  - *ρ:a strong mean reversion of 77.51%*




  - *ρ:autocorrelation of 22.49%*
  - ***before recession:Δσ ρ ↓***
- *bond correlations&PD correlations*
  - *similar to equity*
    - *Johnson SB distribution*
  - *ρ bond distribution:more normal shape*
    - *generalized extreme value distribution*
      - *(GEV)*

***statistical correlation models***

- *limitation of* ***Pearson correlation*** *(ρ,Cov.)*
  - *linear dependencies*
  - *zero correlation ⇏independence*
  - *linear correlation measures only if*
    - *joint distribution of x is elliptical*
      - *normal,t(fixed μ,σ²,skew)*
  - *variances of sets X&Y have to be finite*
    - *σ≠0,∞*
  - *not invariant to transformations*

***Spearman's rank correlation***

- *order X; Y respect to X*
- *d i =X order -Y order*

$$\rho_S = 1 - \frac{6\sum_{i=1}^n d_i^2}{n(n^2-1)}$$

***Kendall's τ***

- *order X; Y respect to X*
- *concordant(rank x i ):x i ≷y i ,x j ≷y j*
- *neither concordant nor discordant*
  - *rank:x i =y i ,x j =y j*
- *discordant:other*

$$\tau = \frac{n_c - n_d}{n(n-1)/2}$$

***financial correlation modeling(copulas)***

$$C_{GD}[Q_i(t), \cdots, Q_n(t)] = M_n\left[N^{-1}(Q_1(t)), \cdots, N^{-1}(Q_n(t)); \rho_M\right]$$

| default time | $CDP_B$ $Q_B(t)$ | $CDP_C$ $Q_C(t)$ |
|---|---|---|

↓ *map* ↓

*NORM.S.INV(probability)*

*C GD :Gaussian default time copula*

*Q i (t):cumulative default prob. of asset i at time t*

*M n :joint,n-variate cumulative standard normal distribution*

*ρ M :n*n symmetric,positive-definite correlation matrix of M n*

## empirical approaches to risk metrics&hedges

DV01-neutral hedge

$\Delta P=-D\times P\times\Delta y+0.5\times C\times P\times\Delta y^2\approx -DD\times\Delta y$

hedge: $DD_0\Delta y+DD_H\Delta y=0$

drawbacks:

assume $\Delta y_H=\Delta y_0=\Delta y$

one-to-one relationship not always exist

regression hedge($\Delta y_H\neq\Delta y_0$)

$x_H\times DD_H\times\Delta y_H=x_0\times DD_0\times\Delta y_0$

assume $\Delta y_H=1bps,\Delta y_0=\Delta$ bps

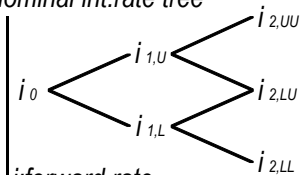
$x_H\times DD_H=x_0\times DD_0\times\Delta$

hedger=underlying

principal components analysis(PCA)

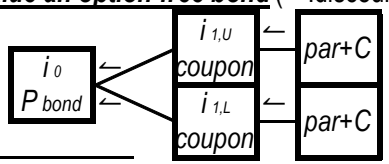
## science of term stucture models

binominal int.rate tree

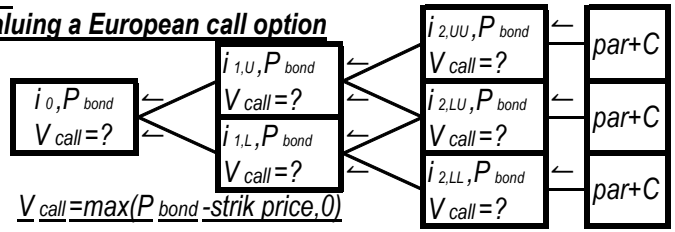



i:forward rate

**value an option-free bond** (←:discount)



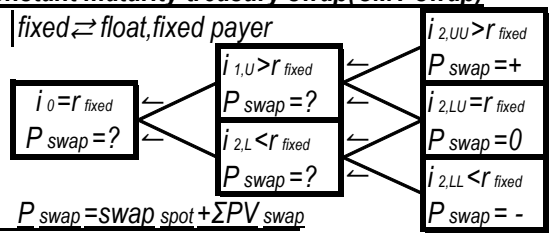

**valuing a European call option**




$V_{call}=max(P_{bond}-strik\ price,0)$

**constant maturity treasury swap(CMT swap)**

fixed⇄float,fixed payer




$P_{swap}=swap_{spot}+\Sigma PV_{swap}$

**BSM not apply to fixed income**

BSM assumes:

price $_{underlying}\in[0,+\infty)$

risk-free rate is constant

volatility is constant

**bonds with embedded options**

$V_{callable}=V_{pure}-V_{call}$

$V_{putable}=V_{pure}+V_{put}$

## evolution of short rates,shape of term structure

Jensen's inequality

**Jensen's inequality**

$$E\left[\frac{1}{1+r}\right]>\frac{1}{E(1+r)}$$

certainty>uncertainty

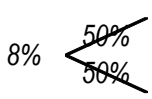
convexity effect

can measured by J inequality

maturity&volatility ↑ ⇒convexity ↑

risk premium(RP)

calculate price&return with RP




$$P=\frac{\left[\frac{1}{1.1+RP}+\frac{1}{1.06+RP}\right]\times 0.5}{1.08}$$

$$R=\frac{\left[\frac{1}{1.1}+\frac{1}{1.06}\right]\times 0.5-P}{P}$$

**Vasicek model** (mean-reversion)

dr=κ(θ-r)dt+σdw, equilibrium model

κ:speed of reversion

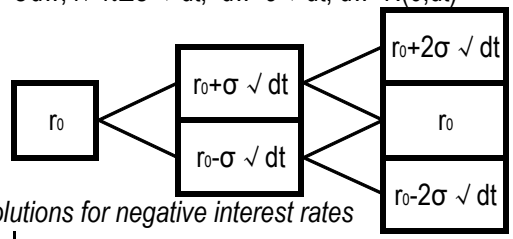
θ:long-run value of int. rate

r:current int.rate

## art of term structure models:drift,volatility and distribution

**model 1** (volatility)

$dr=\sigma dw$, $r_1=r_0\pm\sigma\sqrt{dt}$, $dw=\varepsilon\sqrt{dt}$, $dw\sim N(0,dt)$



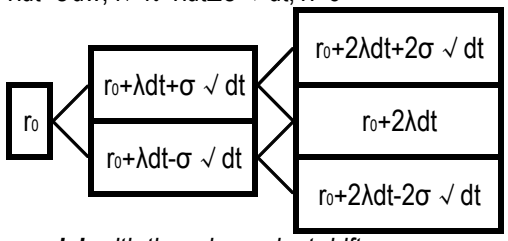

solutions for negative interest rates

use distributions(non-negative)

force negative interest rates =0

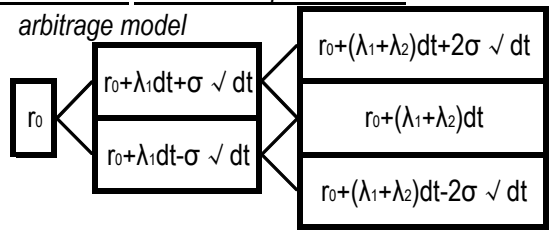
**model 2** (trend+volatility)

$dr=\lambda dt+\sigma dw$, $r_1=r_0+\lambda dt\pm\sigma\sqrt{dt}$, $\lambda=c$




**Ho-lee model** with time-dependent drift

arbitrage model




model 3

$dr=\lambda(t)dt+\sigma(t)dw$

$dr=\lambda(t)dt+\sigma exp(-\alpha t)dw$

Cox-Ingersoll-Ross model

$dr=\kappa(\theta-r)dt+\sigma\sqrt{r}dw$

lognormal model(nodel 4)

$dr=ardt+\sigma rdw$

model 4 with deterministic drift

$d[\ln(r)]=a(t)dt+\sigma dw$

model 4 with mean reversion

$d[\ln(r)]=\kappa(t)[\ln\theta(t)-\ln(r)]dt+\sigma(t)dw$

**OIS discounting**

treasury rates lower than $R_{free}$

demand ↑ ,capital low,tax-free

**overnight indexed swap**

A ---fixed(OIS rate)→ / ←float(eff. fed. rate)-- B

risk:default;overnight

3 month LIBOR-OIS spread

normal conditions:10 bps

in Oct.2008:364 bps

V=NDV-CVA+DVA±FVA

NDV:no default value

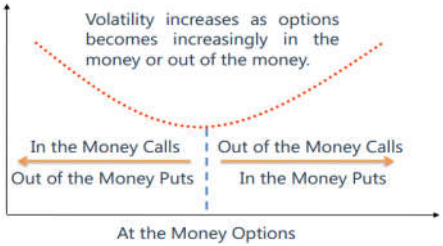
CVA:PV of counterparty default risk

**volatility smile**

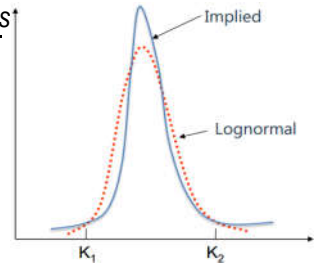
implied volatility:use BSM,cpt σ

x:strike price,y:σ

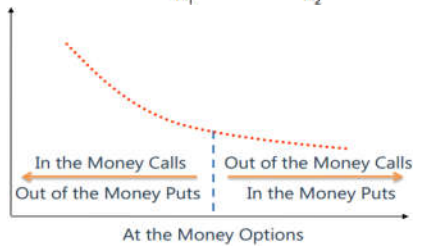
**foreign currency option**




reasons




**equity options**



*Credit risk 3-1*

## credit risk measurement 3-1( **PD** )

- basic approaches
  - experts-based(rating)
  - statistical-based(Merton,LDA,logistic)
  - heuristic&numerical
  - structural(eco.&fina.assump.)
  - reduced-form(statistically)
- rating system
  - role in CR mgt.
    - experts-based approaches
    - foundation of CR mgt.
    - ordinal measure
    - supports credit pricing&capital provisions
    - support decision
  - features of good rating system
    - measurability(PD)&verifiability(backtest)
    - objective&homogeneity
    - specificity(only default)
  - rating agencies(not directly comparable)
    - Moody's:issues rating
    - S&P:issuer FITCH:issuer
    - rating to PD & transition matrix
  - measurement of PD — $CDP=\sum_{all}$
    - **CDP:cumulative DP**
    - **MDP:marginal DP** $MDP=\Delta CDP$
    - **FP:forward prob.** (old MDP)
    - **SR:survival rate** SR=1-CDP
    - **ADR:annualized default rate**
      - **1-CDP=(1-ADR)^t;=exp(-ADR×t)**
  - internal rating

- **measurement from mkt price(bond)**
  - credit risk(only)
    - accurate(1year,zero-coupon,all data)

| risk | no risk |
|---|---|
| $P=\frac{1}{1+YTM}$ | $=\frac{PD\times RR+(1-PD)\times 1}{1+R_f}$ |

$$PD=\frac{1}{1-RR}\times\frac{YTM-R_f}{1+YTM}=\frac{1}{LGD}\times\frac{CS}{1+YTM}$$

    - approximate(non-zero coupon)
      - **CS=PD×LGD**
  - credit risk&liquidity risk
    - accurate

$$PD=\frac{1}{1-RR}\times\left(1-\frac{1+R_f+LS}{1+YTM}\right)$$

    - approximate
      - YTM=Rf+PD×LGD+LS

- **measurement from mkt price(equity)**
  - **Merton model** (capital structure)
    - shareholder
      - E=call
      - $E=Call=VN(d_1)-De^{-rt}N(d_2)$
    - bondholder
      - D+put=debt $_{risk\text{-}free}$;D=V-E
      - $D=De^{-rt}N(d_2)+VN(-d_1)$
    - **distance to default:$d_2$**
      - $d_2=\frac{\ln(V/Ke^{(-rt)})}{\sigma\sqrt{t}}-0.5\sigma\sqrt{t}$
    - **PD=1-N($d_2$)=N(-$d_2$)**
    - risk-neutral:$R_{free}$;real-world:asset drift
  - **Moody's KMV model**
    - **distance of default:DD=** $\frac{A-K}{\sigma_A}$
    - **$\sigma_A$:σ(%)×A;PD=N(-DD)**
    - **LT/ST < 1.5:** K=ST+0.5LT
    - **otherwise:** K=0.7ST+0.7LT

- **exponential distribution** (λ=hazard rate)
  - **CPD(t* < t)=1-exp(-λt);SR=exp(-λt)**
  - **λ×LGD ≈CS**
  - $P(t^* < t+\tau \mid t < t^*)=P(t^* < \tau)$

- **single factor model** (asset return)
  - ROA=α,if α < $\frac{-E}{V}$,default
  - **unconditional default:α~N(0,1)**
    - $\alpha=\beta m+\sqrt{1-\beta^2}\varepsilon$
    - $E(\alpha)=0;Var(\alpha)=\beta^2+1-\beta^2=1$
    - $R_{mkt}$:m~N(0,1)
    - $R_{stock}$:ε~N(0,1);Cov(m,ε)=0
    - **PD=P(α < R)**
  - **conditional(particular value m)**
    - $\alpha_i=\beta_i\bar{m}+\sqrt{1-\beta_i^2}\varepsilon_i$ **α~N(βm,1-β^2)**
    - PD= $p=\phi\left(\frac{k_i-\beta_i\bar{m}}{\sqrt{1-\beta_i^2}}\right)\ i=1,2,\ldots$

- other model
  - linear discriminant analysis
    - Altman's Z-score(Z=2.675)
  - logistic regression model
    - Y~Bernoulli
    - $g(\pi_i)=\log\frac{\pi_i}{1-\pi_i}=\beta_0+\sum_{j=1}^{p}\beta_j\cdot x_{ij}$
  - cluster analysis&principal component
  - cash flow simulation model
  - heuristic methods&numerical methods

- concentration risk(x default)
  - $C_N^X p^X(1-p)^{N-X}=\frac{N!}{X!(N-X)!}p^X(1-p)^{N-X}$

## credit risk identification

- classifications&drivers
  - default&recovery&exposure
- key indicators
  - expected loss **EL=PD×LGD×EAD**
  - **unexpected loss(credit VaR)**
    - **UL=WCL-EL(C&O:99.9%)**
  - concentration risk
- decision&analyst
  - consumer:credit score
  - nonfinancial firm:earning&profit&CF
  - financial firm:capital/asset,qualitative
  - sovereigns:more subjective

## credit risk measurement 3-2( **exposure** )

- exposure metrics
  - current
    - current exposure
  - future positive
    - **expected exposure**
    - **expected positive exposure(EPE)**
  - counterparty's point of view
    - negative exposure
      - negative expected exposure(NEE)
      - expected negative exposure(ENE)
  - high-pencentile(VaR)
    - potential future exposure( **PFE** )/peak exposure
    - maximum PFE
  - **roll-over**
    - effective EE & effective EPE

- **credit value adjustment(CVA)**
  - basic measurement
    - standard equation for CVA

$$\textbf{CVA}=\Sigma PVEL = (1-\text{Rec})\sum_{i=1}^{m}\text{DF}(t_i)\text{EE}(t_i)\text{PD}(t_{i-1},t_i)$$

    - CVA as a spread(EE → constant)
      - **CVA=credit spread ×EPE**
  - incremental CVA(new trade)
  - marginal CVA(component)

- WWR&RWR
  - **wrong-way risk(WWR)**
    - PD ↑ EAD ↑ →CVA ↑
  - **right-way risk(RWR)**
    - PD ↑ EAD ↓ →CVA ↓

- **stress testing counterparty exposure**
  - stress test on a loan portfolio( **PD** )
    - stressed EL
      - $EL_S=\Sigma PD_S\times EAD\times LGD$
    - stress loss=$EL_S$-EL
  - stress test on derivative portfolio( **PD&EAD** )
    - stressed EL
      - $EL_S=\Sigma PD_S\times \alpha \times EAD_S\times LGD$
    - stress loss=$EL_S$-EL
  - stressed **CVA** &stress loss on CVA
    - $CVA_S=\Sigma(LGD\times\Sigma(EE_S\times PD_S))$
    - stress loss=$CVA_S$-CVA
  - **DVA(BCVA)** &stressed DVA
    - **$DVA=LGD\times EE\times PD\times S_1-LGD_I\times NEE\times PD_I\times S_2$**

$$\text{BCVA}=\sum_{n=1}^{N}\text{LGD}_n\cdot\sum_{i=1}^{m}\text{EE}_n(t_i)\cdot\text{PD}_n(t_{i-1},t_i)\cdot S_I(t_{i-1}) - \sum_{n=1}^{N}\text{LGD}_I\cdot\sum_{i=1}^{m}\text{NEE}_n(t_i)\cdot\text{PD}_I(t_{i-1},t_i)\cdot S_n(t_{i-1})$$

  - common pitfalls in stress testing CCR
    - stressing current exposure
    - how to aggregated for portfolio
    - exposure is highly nonlinear

## credit risk measurement 3-3( **portfolio credit VaR** )

- **default correlation(PD=π)**

$$E(X_i)=\pi_i \quad i=1,2$$
$$E(X_1X_2)=\pi_{12}$$
$$V(X_i)=\pi_i(1-\pi_i) \quad i=1,2$$
$$\text{Cov}(X_1,X_2)=\pi_{12}-\pi_1\pi_2$$
$$\rho=\frac{\pi_{12}-\pi_1\pi_2}{\sqrt{\pi_1(1-\pi_1)}\sqrt{\pi_2(1-\pi_2)}}$$

- **portfolio credit VaR**
  - default correlation impact
    - **ρ only impact to UL**
    - **ρ=1,EL=EAD×PD×LGD**
    - **ρ=0,EL=N×π×LGD**
  - marginal contribution to portfolio UL

## credit risk management 4-1( **mitigating approaches** )

- netting
  - types of netting
    - close-out netting:default → netting
    - novation netting:a replacement contract(new,netting payment)
  - influence factor

| influence factor | positive | negative |
|---|---|---|
| correlation | × | ✓ |
| initial MtM | × | ✓ |

  - **netting factor= $\frac{\textbf{EPE(netting)}}{\textbf{EPE(without netting)}}=\frac{\sqrt{n+n(n-1)\rho}}{n}$**

- **collateralization**
  - provision
    - haircut
    - threshold
      - only incremental amount need coll.
    - minimum transfer
    - independent amount(initial margin)

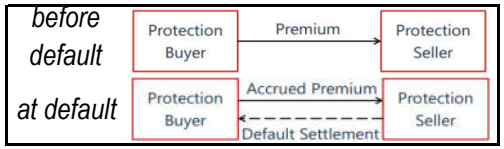
- central counterparties(CCP)
  - clearing members
    - general clearing member(GCM)
      - eg.securities agency
    - individual clearing menber(ICM)
    - non-clearing member(NCM)
  - initial margin
    - determined by
      - **volatility of the trade**
      - **tail risk(mkt variables)**
      - **dependency(ρ)**
    - VaR approaches(WCL)
  - **loss waterfall**
    - initial margin of defaulter
    - reserve fund of defaulter
    - first loss equity of CCP
    - remaining CCP reserve fund
    - addition capital from surviver
    - capital of CCP
    - liquidity support or CCP fails

- **other mitigation clause**
  - close-out(immediate closing all)
  - walkaway feature
  - acceleration clause(accelerate given an event)
  - termination
    - break clause/liquidity put(long term contract)
    - additional termination event

Credit risk 3-3

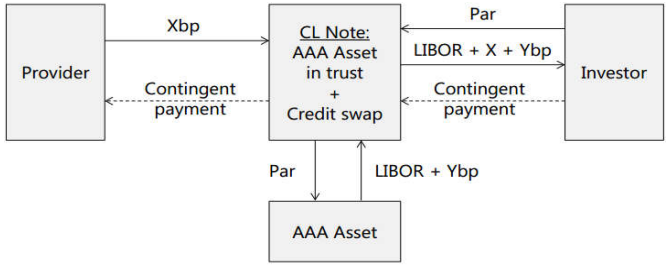
## credit risk management 4-2( **credit derivatives** )

- ***credit default swap(CDS)***
  - characteristic




  - ***settlement***
    - cash
      - liquidity:par-MV
      - ill-liquidity:fixed
    - physical
      - cash of par,assets transfer
  - basket CDS
    - Nth to default CDS
      - ***first-to-default***
      - ***second-to-default***
      - ***subordinated basket(below)***
      - ***senior basket(above)***
    - correlation impact in Nth-to-default swap
      - ***ρ ↑ ,first-to-default ↓ ,N-to-default ↑***
      - ***ρ ↓ ,first-to-default ↑ ,N-to-default ↓***
      - ***ρ=1,first-to-default=N-to-default***
- ***total return swap(TRS)***
  - hedge against
    - 1.default 2.credit deterioration
    - 3.maket risk


- ***credit linked note(CLN)***




## credit risk management 4-3( **securitization** )

- securitization&structured product
  - structured finance
    - ***ring-fencing(insulate)***
    - ***securitization(true sale)***
  - securitization
    - SPV
      - amortizing structure
      - revolving structures(credit card)
      - master trust(defferent product)
    - tranching(for investor)
      - ***waterfall(cashflow)***
  - structured product
    - covered bond(remain on BS)
    - CDO(loan,bond)
      - ***cash CDO***
      - ***synthetic CDO(like CLN)***
      - ***singel-tranche CDOs***
- performance analysis
  - CPR&PSA
    - ***constant prepayment rate(CPR)***

$$CPR = 1 - (1 - SMM)^{12}$$

    - ***public securities association(PSA)***
      - 100%-PSA
        - CPR 0% increase by 0.2% reach 6% in month 30
- ***credit scenario analysis***
  - mezz:high PD-equity;low PD-senior

| ρ≡,PD ↑ | V | VaR |
|---|---|---|
| senior | ↓ | ↑ |
| equity | ↓ | ↓ |

| PD≡,ρ ↑ | V | VaR |
|---|---|---|
| senior | ↓ | ↑ |
| equity | ↑ | ↑ |

- credit enhancement
  - ***internal credit enchancement***
    - subordination
    - overcollaterlization
    - direct equity issue(hold equity)
    - holdback(buy pool at a discount)
    - cash collateral account
    - excess spread
    - margin step-up
  - ***external credit enchancement***
    - insurance,wraps,guaranties
    - letter of credit
    - credit default swap
    - put option on assets
- subprime securitization
  - ***1*** .borrower& ***originator***
    - predatory lending
  - ***2*** . ***originator*** &arranger
    - mortgage fraud
  - ***3*** . ***arranger*** &3rd-parties
    - adverse selection
  - 4.servicer& ***borrower***
    - moral hazard
  - 5. ***sevicer*** &3rd-parties
    - moral hazard
  - ***6*** .investor&asset ***manager***
    - principal-agent problem
  - ***7*** .investor&credit rating
    - model error

## credit risk management 4-4( **retail credit risk** )

- retail credit risk
  - home mortgage
  - home equity loans…
- nature of retail credit risk
  - single customer,well-diversified port.
  - EL rate can be built into price
  - corp.&comm. credit portfolio concentrations,grographical
- ***dark side of retail credit risk***
  - lack of historical data(innovation)
  - economic environment
  - social and legal system
  - operational issue
- ***key variables in mortgage credit assess***
  - ***document type***
    - full doc
    - stated income(employ,Y;income,N)
    - no income/no asset(source of income,Y)
    - no ratio
    - no doc
  - ***FICO(above 660)***
  - ***DTI:debt to income***
  - ***LTV:loan to value(collateral)***
  - ***payment type***
- credit scoring model
  - credit bureau scores(FICO)
  - pooled models(by outside vendors)
  - custom models(in house)
- cutoff scores
  - scorecard performance
    - cumulative accuracy profile,CAP
    - accuracy ratio,AR

singel-tranche CDOs