

MACROECONOMICS

宏观经济学

期中练习册

第 1-7 章

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第1章 宏观模型

The Science of Macroeconomics

依据：Mankiw 9e Ch1；课程 Chapter 1 资料

1.1 模型如何解释经济

Models, variables and equilibrium

PRINCIPLE 先确定模型解释什么，再区分关系、条件与冲击。

宏观经济学 (macroeconomics) 研究总产出、物价、就业及其相互作用。**经济模型** (economic model) 通过明确的假设保留问题中重要的机制。模型不是对现实所有细节的复写；结论的适用范围由假设决定。

模型把由体系内部共同求出的量称为**内生变量** (endogenous variables)，把从体系外给定的量称为**外生变量** (exogenous variables)。参数 (parameters) 是规定关系形状的系数；外生量也可以在不同情境中变化，内生量也可能在某次比较中恰好不变。分类依据是“这个模型是否解释它”，而不是“这个量是否会变化”。

方程承担不同功能。恒等式 (identity) 由定义或核算必然成立；行为关系 (behavioral relation) 描述主体如何选择；技术关系 (technological relation) 描述投入如何产生产品；均衡条件 (equilibrium condition) 要求各主体选择相互兼容。市场出清 (market clearing) 是供需数量相等的均衡条件。

$$Q_D = D(P; Z_D), \quad Q_S = S(P; Z_S), \quad Q_D = Q_S.$$

先代入外生变量 Z_D, Z_S ，再用出清条件求价格 P ，最后代回求数量。不能把需求和供给函数本身当作“已经出清”。

1.2 比较静态与价格调整

Comparative statics and price adjustment

PRINCIPLE 区分曲线移动与沿曲线移动；每次只改变指定条件。

比较静态 (comparative statics) 比较一次外生冲击前后的均衡，不描述达到新均衡的逐日过程。其他条件不变 (ceteris paribus) 意味着没有被改变的外生量、参数和关系保持原状。

某商品自身价格变化产生沿需求曲线移动 (movement along a demand curve)；收入、偏好、替代品价格等变化使整条需求曲线移动 (demand shift)。替代品 (substitutes) 满足一方变便宜会减少另一方在给定价格下的需求；互补品 (complements) 则通常共同消费，价格效应方向不同。成本改变通常首先移动供给。

灵活价格 (flexible prices) 能调整以实现市场出清，是古典长期模型的常用设定；黏性价格 (sticky prices) 短期调整缓慢，例如工资合同或菜单成本限制调整。长期 (long run) 与短期 (short run) 在这里强调价格和要素是否完成调整，而不只是固定日历长度。

作图时先写轴、曲线和初始交点，再移动被冲击的曲线，保留另一条曲线，最后读出新价格与数量。图只画箭头而不解释冲击通过哪条关系传递，不足以构成机制答案。

1.3 英文概念与原理

English Definitions and Principles

1. Models, variables and equilibrium

Macroeconomics studies aggregate output, prices and employment. An economic model retains selected mechanisms under explicit assumptions. Endogenous variables are determined within the model; exogenous variables are supplied from outside it. Parameters specify the form of its relationships.

This classification depends on the model, rather than on whether a variable can change.

An identity holds by definition or accounting. A behavioral relation describes choices, a technological relation describes production, and an equilibrium condition makes different choices mutually consistent.

In a supply-and-demand model, substitute exogenous values first, impose market clearing, solve for the price, and substitute back for quantity.

2. Comparative statics and price adjustment

Comparative statics compares equilibria before and after an exogenous change, holding unspecified conditions fixed. A change in a good's own price is movement along demand; a change in income, preferences or a related price shifts demand. A cheaper substitute lowers demand for the original good. Cost shocks generally shift supply.

Flexible prices adjust to clear markets. Sticky prices adjust slowly because of contracts, menu costs or other frictions. The classical long run assumes sufficient adjustment; the short run can retain price rigidity.

A graph should label axes and curves, identify the initial equilibrium, shift the affected relation, and explain the resulting equilibrium changes.

M1-01 咖啡市场的均衡与变量

往年卷 A, Q1

equilibrium 均衡; endogenous 内生; exogenous 外生

The coffee market is described by

$$Q_D = 17 - 2P_C + 10P_T, \quad Q_S = 2 + 3P_C - 5P_E.$$

Here P_C, P_T, P_E are the prices of coffee, tea and electricity.

1. Find the equilibrium price and quantity when $P_T = P_E = 1$.
2. Identify the endogenous and exogenous variables.
3. Explain which equation is a behavioral relation and which condition closes the model.

The last part is a method extension.

M1-02 给定投入的生产模型

往年卷 B, Q1

production function 生产函数; parameter 参数

An economy has $Y = 100 + 4K + 9L$. Given $K = 200$ and $L = 500$, calculate output and identify the endogenous and exogenous variables. Explain the roles of 100, 4 and 9.

M1-03 替代品降价与市场图形

HW1: Mankiw 9e, Ch1 P&A 3

substitute 替代品; demand shift 需求曲线移动; comparative statics 比较静态

Use a supply-and-demand model for ice cream. Frozen yogurt, a substitute for ice cream, becomes cheaper. Draw the change in the ice-cream market and explain the effects on its equilibrium price and quantity. State what is held fixed.

第2章 数据与国民收入核算

The Data of Macroeconomics

依据: Mankiw 9e Ch2; 课程 Chapter 2 资料

2.1 从生产到支出和收入

Production, expenditure and income

PRINCIPLE GDP 只计本国当期最终生产; 生产、支出、收入是同一活动的不同核算面。

国内生产总值 (gross domestic product, GDP) 是一定时期内境内生产的最终产品和服务的市场价值。一定时期意味着流量 (flow), 不是某一时点存量 (stock); 境内强调生产地点; 当期强调不重复计二手物品的原生产; 最终产品 (final goods) 区别于用于继续生产的中间产品 (intermediate goods)。无市场价格的部分政府服务按成本估值。

每个企业的增加值 (value added) 等于产出价值减购入中间投入价值。全产业链增加值之和等于最终产品价值, 可避免重复计算 (double counting)。增加值最终分配为工资、资本报酬等收入, 所以总产出、总支出与总收入在一致核算下相等; 增加值不只是利润。

$$Y \equiv C + I + G + NX, \quad NX \equiv X - IM.$$

消费 (consumption, C) 是家庭对产品与服务的支出, 住宅购买通常归投资。投资 (investment, I) 是资本形成, 包括企业设备和建筑、住宅与库存增加 (inventory investment); 购买既有股票是金融资产交易, 不直接形成 GDP 投资。政府购买 (government purchases, G) 计政府购买产品和服务, 转移支付 (transfer payments) 不直接购买当期产品, 故不计入。净出口 (net exports, NX) 是出口减进口; 先计入 C, I, G 的进口须扣除, 才能留下境内产出。未售出当期产品计库存投资, 不能因为没有消费者付款而从生产中消失。

2.2 把数量变化与价格变化分开

Nominal GDP, real GDP and price indexes

PRINCIPLE 实际量固定价格，价格指数固定或重新赋予数量权重。

名义 GDP (nominal GDP) 使用当期价格；实际 GDP (real GDP) 用固定基期价格估值各期产量，因此主要反映数量变化。基期 (base year) 同时规定实际量的计价尺度和指数的归一化。

$$NGDP_t = \sum_j p_{jt} q_{jt}, \quad RGDP_t^{(0)} = \sum_j p_{j0} q_{jt}, \quad D_t = \frac{NGDP_t}{RGDP_t^{(0)}}.$$

GDP 平减指数 (GDP deflator) 用当期数量给价格赋权，覆盖境内生产；消费者价格指数 (consumer price index, CPI) 追踪固定消费篮子的成本，可包含进口消费品，不包含所有投资品。只有题目假定消费篮子与全部产出一致时，才能直接用产出表计算 CPI。

$$P_L = \frac{\sum p_1 q_0}{\sum p_0 q_0}, \quad P_P = \frac{\sum p_1 q_1}{\sum p_0 q_1}.$$

P_L 是固定基期数量的 Laspeyres 价格指数 (拉氏)； P_P 是当期数量的 Paasche 价格指数 (帕氏)，本题组的平减指数属于后者。基期为 1 与基期为 100 只差一个 100 倍因子。通货膨胀率 (inflation rate) 是 $P_t/P_{t-1} - 1$ ，不是指数本身。

生活成本 (cost of living) 是维持给定效用的最低支出。固定旧篮子忽略替代行为，可能高估这一支出增长，称替代偏差 (substitution bias)；采用当期篮子也不自动等于真实生活成本指数。商品质量和新品变化也可能造成测量困难。

2.3 链式增长与计量口径

Chain-weighted quantity growth

PRINCIPLE 先构造增长因子，再减 1；累计增长与年均增长使用不同公式。

相对价格改变时，用某一个遥远基期价格持续加权会产生问题。链式加权 (chain weighting) 对相邻时期更新价格权重。题目给两期数据并指定几何平均时，分别用两个时期的价格衡量数量变化：

$$Q_L = \frac{\sum p_0 q_1}{\sum p_0 q_0}, \quad Q_P = \frac{\sum p_1 q_1}{\sum p_1 q_0}, \quad Q_F = \sqrt{Q_L Q_P}.$$

$$g_{0 \rightarrow 1} = Q_F - 1, \quad CAGR = Q_F^{1/n} - 1 \quad (\text{间隔 } n \text{ 年时}).$$

Fisher 数量指数 (Fisher quantity index) 使用这两个增长因子的几何平均。若有逐年数据, 连乘相邻年份因子; 只有 2010 与 2015 两期时, 能按题设求五年总因子, 不能虚构中间年度的链式因子。不同指数不能先把增长率作算术平均再冒充几何平均。

2.4 从人口分类到就业指标

Employment and labor-force measures

PRINCIPLE 按人而非岗位计数; 每个比率的分子由统计定义决定。

就业者 (employed, E) 包括兼职与自雇; 失业者 (unemployed, U) 没有工作、能够工作并积极找工作。劳动力 (labor force, L) 是两者之和。非劳动力 (not in the labor force) 包括不参与者; 丧失信心者 (discouraged workers) 想工作但已停止积极找工作, 通常不计入官方失业。

$$L = E + U, \quad u = \frac{U}{L}, \quad LFPR = \frac{L}{\text{adult population}}.$$

失业率 (unemployment rate) 条件于已经参与劳动市场的人; 劳动参与率 (labor-force participation rate) 衡量成人中参与的比例。一个人做两份兼职仍是一名就业者; 成人总体的年龄和机构范围须按题目规定, 不能擅自把儿童纳入分母。

2.5 英文概念与原理

English Definitions and Principles

1. Production, expenditure and income

GDP is the market value of final goods and services produced within a country during a specified period. It is a flow. Domestic location, current production and final use delimit the measure. Value added equals output value less purchased intermediate inputs; summing value added avoids double counting and equals final output.

The expenditure identity is $Y = C + I + G + NX$. Consumption is household spending, apart from housing investment. Investment is capital formation, including equipment, structures, residential construction and inventory accumulation; purchases of existing securities are financial transactions. Government purchases exclude transfers.

Net exports equal exports minus imports: imported spending already counted in other categories must be removed from domestic production. Unsold current output enters inventory investment.

2. Nominal GDP, real GDP and price indexes

Nominal GDP uses current prices and quantities. Real GDP values current quantities at base-year prices. The deflator is their ratio and uses current output quantities as weights. CPI measures the cost of a fixed consumption basket, potentially including imports and excluding nonconsumer domestic output.

A Laspeyres price index uses base quantities; a Paasche index uses current quantities. A base of one or one hundred changes only normalization. Inflation is the proportional change in a price index. The true cost of living is minimum expenditure for unchanged utility.

A fixed basket can overstate its increase by ignoring substitution; current weights need not measure it exactly either.

3. Chain-weighted quantity growth

Chain weighting updates price weights across adjacent periods. With the two-period convention specified in the assignment, calculate quantity growth using each period's prices, then take the geometric mean of the two factors. Subtract one for cumulative growth.

Annual compound growth over n years is the factor raised to $1/n$, minus one. Without annual observations, intermediate annual links cannot be reconstructed.

4. Employment and labor-force measures

Employment includes part-time work and self-employment. Unemployment requires no job, availability and active search. The labor force is employment plus unemployment. Discouraged workers who stop active search are generally outside the official labor force.

The unemployment rate divides unemployment by the labor force; participation divides the labor force by the defined adult population. Multiple jobs still represent one employed person.

M2-01 名义量、实际量与两种价格指数

往年卷 A, Q2

nominal GDP 名义 GDP; real GDP 实际 GDP; GDP deflator GDP 平减指数; fixed basket 固定篮子

Assume the economy produces only goods A and B. Use the base year as the reference year.

Good	p_0	q_0	p_1	q_1
A	100	100	200	150
B	100	100	100	100

Calculate nominal GDP and real GDP in both years, the later-year GDP deflator and a fixed-base-quantity price index. Express each price index both with base 1 and with base 100.

M2-02 热狗、汉堡与链式实际增长

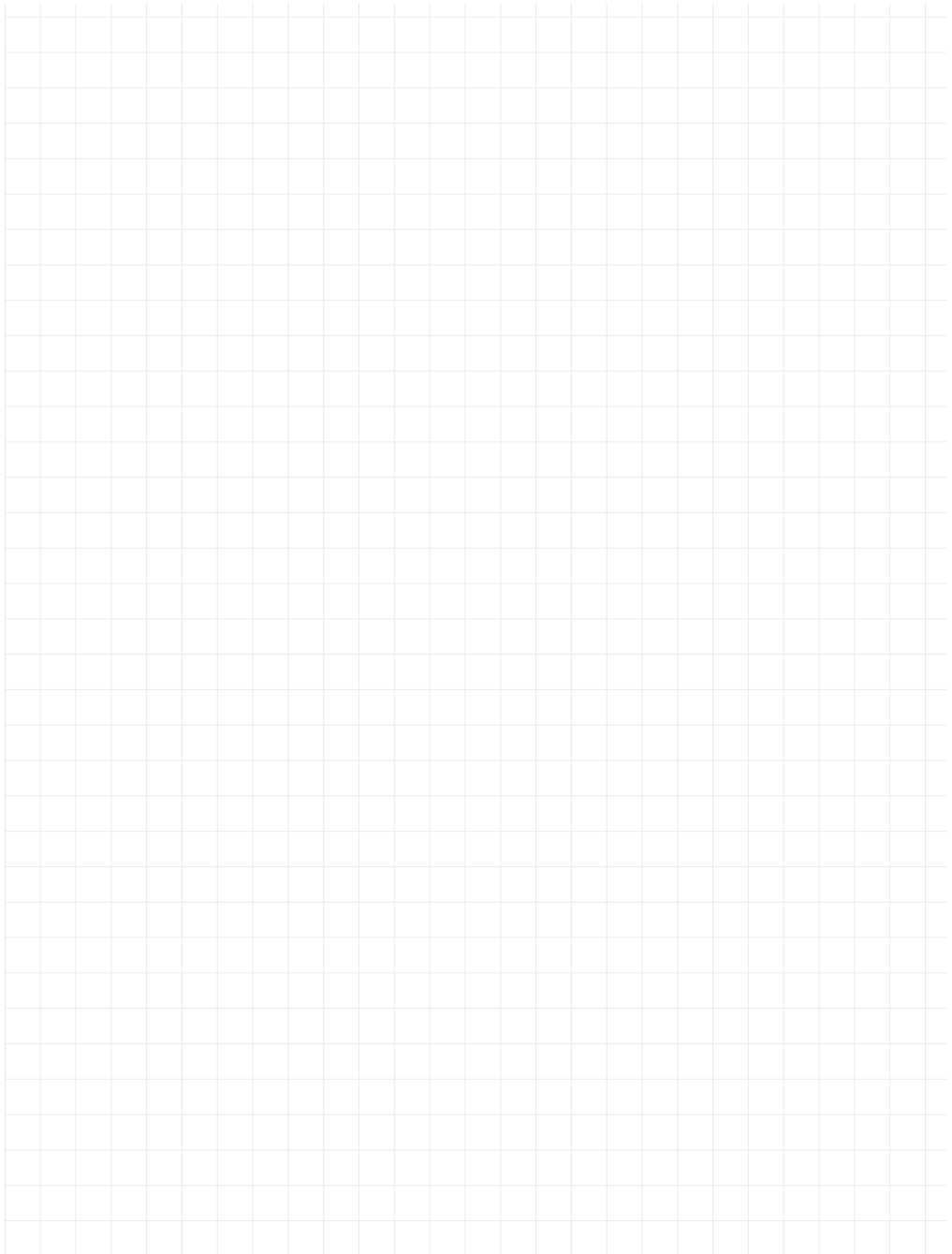
HW1: Ch2 P&A 7; (c) 为教师补充

Laspeyres 拉氏指数; Paasche 帕氏指数; chain-weighted 链式加权

The economy produces hot dogs and hamburgers.

Good	p_{2010}	q_{2010}	p_{2015}	q_{2015}
Hot dogs	2	200	4	250
Hamburgers	3	200	4	500

1. Compute nominal GDP, real GDP at 2010 prices, and the GDP deflator in each year.
2. Compute a CPI using the 2010 basket.
Find the percentage price change for each good and compare CPI inflation with deflator inflation.
3. Compute chain-weighted real GDP growth from 2010 to 2015 using the geometric mean of the two fixed-price quantity growth factors. This asks for total five-year growth.

M2-02 Working space

M2-03 替代行为与生活成本

HW1: Ch2 P&A 8

substitution bias 替代偏差; cost of living 生活成本

Abby consumes only apples and regards red and green apples as perfect substitutes. In year 1 their prices are 1 and 2, and she buys 10 red apples. In year 2 their prices are 2 and 1, and she buys 10 green apples.

Find the CPI, nominal spending, real spending at year-1 prices, and the implicit price deflator defined as nominal spending divided by real spending. Has the cost of obtaining ten apples increased?

M2-04 就业、劳动参与与失业率

HW1: Ch2 P&A 9(a,b)

labor force 劳动力; discouraged worker 丧失信心者; participation 劳动参与

In a population of 100, there are 25 full-time workers, 20 people with one part-time job, 5 with two part-time jobs, 10 unemployed people actively looking for work, 10 discouraged workers, 10 self-employed people, 10 retirees and 10 children.

Calculate employment, unemployment, the labor force, the unemployment rate, and the labor-force participation rate. Treat all nonchildren as the adult population.

M2-05 增加值法与重复计算

Mankiw 9e, Ch2 P&A 2

value added 增加值; intermediate good 中间产品; final good 最终产品

A farmer sells wheat to a miller for 1, the miller sells flour to a baker for 3, and the baker sells bread to a household for 6. Find the value added at each stage and the contribution to GDP. Explain why adding all three sales is incorrect.

M2-06 电脑交易如何进入 GDP

往年卷 A、B, Q3 合并

investment 投资; government purchases 政府购买; net exports 净出口

For each transaction, identify the affected components of $Y = C + I + G + NX$.

Assume the computer is newly produced in the current period.

1. A domestic firm buys a domestically produced office computer.
2. A domestic producer sells a computer to a foreign company.
3. The domestic government buys a domestically produced computer.
4. A domestic household buys an imported computer.

State the direct effect on domestic GDP, holding other transactions fixed.

第3章 国民收入与分配

National Income

依据：Mankiw 9e Ch3；课程 Chapter 3 资料

3.1 技术如何决定长期产出

Technology and long-run output

PRINCIPLE 先固定投入与技术，再由边际产量解释要素报酬。

生产函数 (production function) $Y = AF(K, L)$ 把资本 (capital, K)、劳动 (labor, L) 和生产率 (productivity, A) 转化为产出。人力资本 (human capital, H) 是通过教育、训练等形成的技能，可以作为独立投入；土地 (land, N) 也可进入函数。

边际产量 (marginal product) 是在其他投入固定时额外一单位投入带来的产出变化，因此用偏导数而非总产出除投入表示。竞争厂商使名义要素价格等于产品价格乘边际产量，除以产品价格后得到实际报酬。

$$MPL = \frac{\partial Y}{\partial L} = \frac{W}{P} = w, \quad MPK = \frac{\partial Y}{\partial K} = \frac{R}{P} = \rho.$$

W 是名义工资 (nominal wage), w 是实际工资 (real wage); R 为资本名义租金, ρ 为实际租金。资本租金不是本章储蓄投资市场的实际利率 r 的定义，相关题不能不加说明地把二者当同一个量。

规模报酬不变 (constant returns to scale, CRS) 要求所有投入同时乘 z 时产出也乘 z ；边际产量递减 (diminishing marginal product) 是其他投入不变、单独增加一种投入时其边际贡献下降。二者可以同时成立。

3.2 Cobb–Douglas 的份额与变化率

Cobb–Douglas shares and comparative changes

PRINCIPLE 指数决定收入份额和比例响应，但精确变化要用新旧值比。

$$Y = AK^\alpha L^{1-\alpha}, \quad MPK = \alpha \frac{Y}{K}, \quad MPL = (1-\alpha) \frac{Y}{L}.$$

$$\frac{MPK K}{Y} = \alpha, \quad \frac{MPL L}{Y} = 1 - \alpha.$$

收入份额 (income share) 是单位报酬乘投入总量, 再除总收入, 不是只用边际产量除产出。竞争定价和指数和为 1 共同保证要素支付恰好耗尽产出。

一般 $Y = A \prod X_j^{a_j}$, 指数和为 1 时 CRS, 各要素份额为 a_j 。若某投入从 X 增为 $(1+g)X$, 而目标量含 X^b , 精确增长因子为 $(1+g)^b$, 增长率为 $(1+g)^b - 1$; bg 只是小变化的一阶近似。

对人力资本例 $Y = K^{1/3} L^{1/3} H^{1/3}$, $MPL = Y/(3L)$, $MPH = Y/(3H)$ 。若熟练者提供一单位 L 加一单位 H , 不熟练者只提供 L , 工资比是 $(MPL + MPH)/MPL = 1 + L/H$ 。先描述工人提供什么服务, 再汇总其报酬, 才能避免把人力资本份额漏掉。

3.3 收入如何分为消费、储蓄与投资

Consumption, saving and investment equilibrium

PRINCIPLE 先用核算分解储蓄, 再让利率使投资等于储蓄。

可支配收入 (disposable income) 为 $Y - T$, 这里 T 是净税收。消费函数 (consumption function) $C = C_0 + c(Y - T)$ 中, C_0 为自主消费 (autonomous consumption), c 是边际消费倾向 (marginal propensity to consume, MPC), 表示多一单位可支配收入中用于消费的部分。

$$S_p = Y - T - C, \quad S_g = T - G, \quad S = S_p + S_g = Y - C - G.$$

$$Y = C + I + G \Rightarrow I = S \quad (\text{封闭经济}).$$

私人储蓄 (private saving) 是私人收入减税和消费; 政府储蓄 (public saving) 是税减政府购买, 负值为预算赤字 (budget deficit)。国民储蓄 (national saving) 是两者之和。实际利率 (real interest rate, r) 衡量跨期借贷的实际成本; 投资需求 (investment demand) 通常随 r 下降。

在长期封闭经济中, Y 由供给决定, G, T 给定, 消费只依赖可支配收入时, S 不随 r 改变, 画为竖直供给。可贷资金市场 (loanable-funds market) 由 $I(r) = S$

决定均衡利率。函数若写 $I = a - br$ ，必须辨认 $r = 5$ 表示 5%，还是 $r = 0.05$ 表示 5%。

3.4 财政冲击与挤出的推理顺序

Fiscal shocks and crowding out

PRINCIPLE 不要从政策名称猜结果；计算消费、储蓄，再求新均衡。

在固定 Y 的模型中，改变 G 而不改 T ，消费不变， $\Delta S = -\Delta G$ 。利率上升使 $\Delta I = -\Delta G$ ，称投资挤出 (crowding out)。这是资源和均衡约束下的结论。

$$\Delta C = -c\Delta T, \quad \Delta S_p = -(1-c)\Delta T, \quad \Delta S_g = \Delta T - \Delta G, \quad \Delta S = c\Delta T - \Delta G.$$

只增税提高国民储蓄，但使私人储蓄下降；平衡预算扩张 (balanced-budget expansion) 满足 $\Delta G = \Delta T$ ，政府储蓄不变，却使国民储蓄减少 $(1-c)\Delta G$ 。

投资税收抵免 (investment tax credit) 降低合格投资的成本，移动投资需求。在题设固定储蓄下，总投资依然等于原储蓄，利率提高；若只有企业投资被刺激，住宅投资 (residential investment) 沿其需求曲线减少。若政策还改变税收和国民储蓄，必须按新题设再计算，不能同时坚持储蓄不变又让赤字变化。

3.5 英文概念与原理

English Definitions and Principles

1. Technology and long-run output

A production function maps capital, labor and other inputs into output, conditional on productivity. Human capital represents productive skills; land can be a separate factor. A marginal product is a partial derivative holding other inputs fixed. Competitive real factor prices equal marginal products.

The real capital rental price is not by definition the loanable-funds interest rate.

Constant returns to scale means scaling all inputs by the same positive factor scales output by that factor. Diminishing marginal product concerns increasing just one input while holding others fixed. A technology can have both properties.

2. Cobb–Douglas shares and comparative changes

For Cobb–Douglas production, multiplying a marginal product by the corresponding input gives its exponent times output. Thus exponents determine competitive factor-income shares. With exponents summing to one, factor payments exhaust output.

If a quantity depends on an input to power b , an input increase by factor $1 + g$ changes that quantity by factor $(1 + g)^b$. The approximation bg is not the exact percentage change.

In the three-factor human-capital model, a skilled worker receives both raw-labor and human-capital payments; this gives the wage ratio $1 + L/H$.

3. Consumption, saving and investment equilibrium

Disposable income is $Y - T$. In $C = C_0 + c(Y - T)$, autonomous consumption is C_0 and the marginal propensity to consume is c . Private saving is $Y - T - C$, public saving is $T - G$, and national saving is their sum, $Y - C - G$. A negative public saving is a budget deficit.

In a closed economy the resource identity requires investment to equal national saving. With fixed output and fiscal policy and consumption independent of interest, saving supply is vertical. The real interest rate adjusts investment demand to that supply. Its numerical units must match the investment equation.

4. Fiscal shocks and crowding out

With fixed output, a government-purchases increase reduces saving and crowds out investment. A tax increase lowers consumption by $c\Delta T$, private saving by $(1 - c)\Delta T$, and raises public saving by ΔT if purchases are fixed. National saving changes by $c\Delta T - \Delta G$.

A balanced-budget expansion leaves public saving unchanged but reduces national saving. An investment tax credit shifts investment demand; under fixed saving it raises the interest rate without changing total investment. A selective business credit crowds out residential investment.

Fiscal effects on saving must be included only when permitted by the specified model.

M3-01 三要素生产与收入分配

往年卷 A, Q4

constant returns to scale 规模报酬不变; marginal product 边际产量; factor share 要素份额

Let $Y = 20L^{0.5}K^{0.4}N^{0.1}$, with $L = K = N = 100$.

1. Calculate output.
2. Establish whether the technology has constant returns to scale.
3. Under competitive factor pricing, derive land's marginal product, real rental price, total income and income share.

M3-02 封闭经济的储蓄与挤出

往年卷 B, Q4

private saving 私人储蓄; public saving 政府储蓄; crowding out 挤出

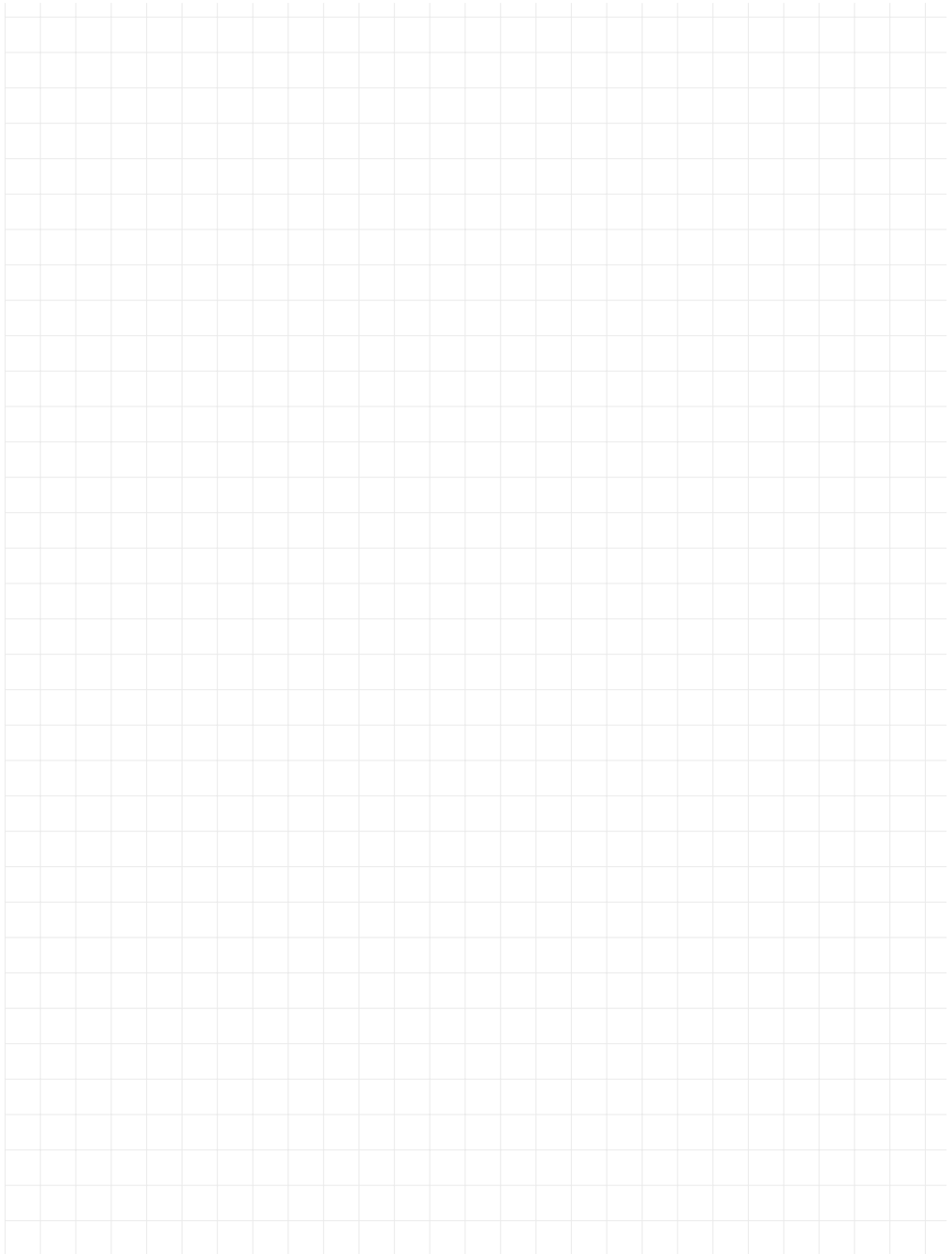
An economy has

$$Y = 6000, \quad C = 600 + 0.6(Y - T), \quad I = 2000 - 100r, \quad G = T = 500.$$

Here r is measured in percentage points: $r = 4$ means 4%.

1. Find consumption, private saving, public saving, national saving, investment and the equilibrium interest rate.
2. Let G rise to 1000, holding T and Y fixed.

Recalculate the above quantities and draw the loanable-funds adjustment.

M3-02 Working space

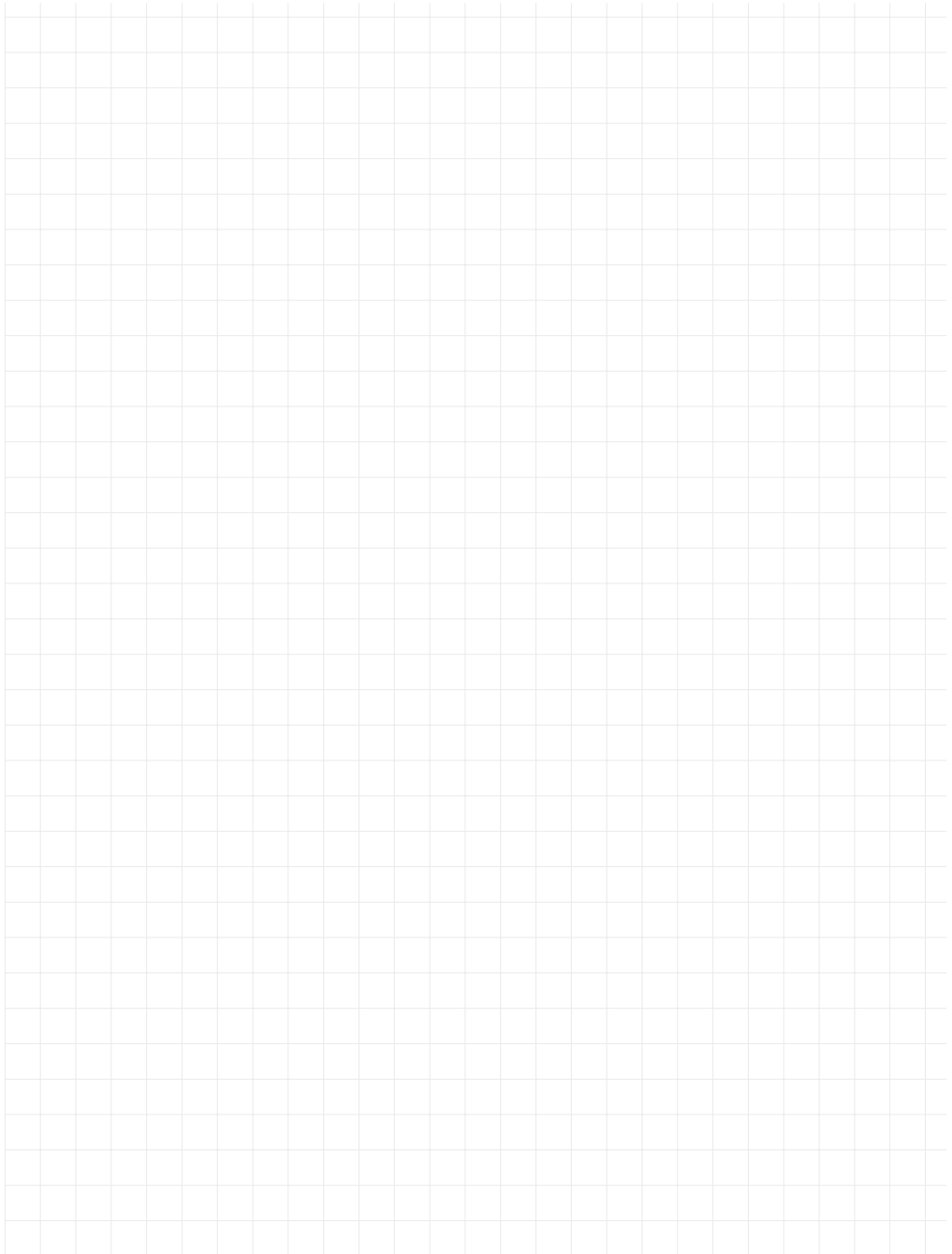
M3-03 Cobb–Douglas 的精确变化

HW1: Ch3 P&A 4

real wage 实际工资; real rental rate 资本实际租金; diminishing marginal product 边际产量递减

Let $Y = AK^{0.3}L^{0.7}$ and assume competitive factor markets. Find capital's and labor's income shares. Separately consider a 10% increase in labor, capital, or productivity A . For each shock, determine the exact percentage changes in output, the real wage and the real rental rate.

Also give the usual first-order approximations.

M3-03 Working space

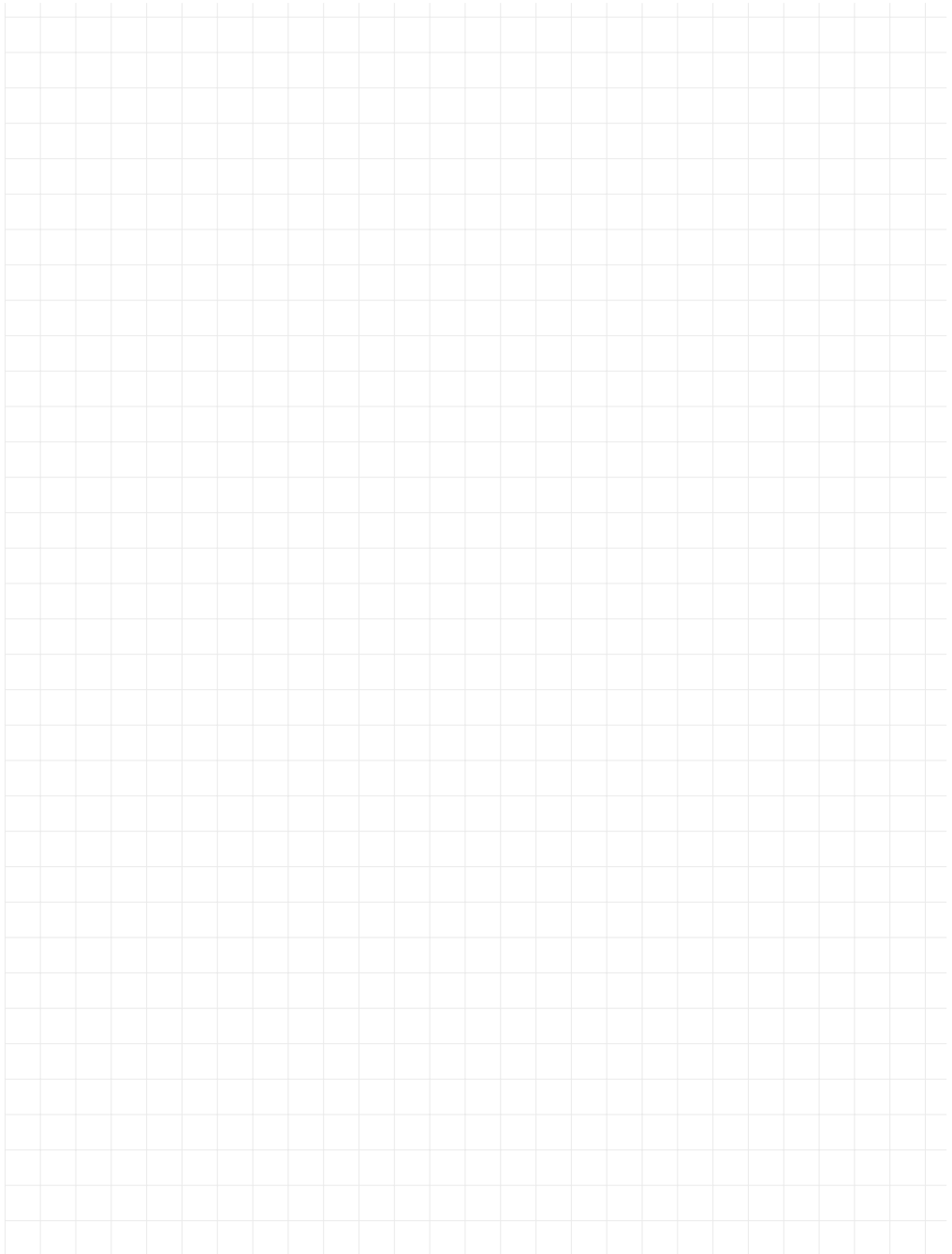
M3-04 人力资本与熟练劳动工资

HW1: Ch3 P&A 7

human capital 人力资本; skilled worker 熟练工人; wage premium 工资溢价

Consider $Y = K^{1/3}L^{1/3}H^{1/3}$, where H is human capital. Derive MPL and MPH and explain how increasing H affects each. Find the income shares of raw labor and human capital.

A skilled worker supplies one unit of raw labor and one unit of human capital, while an unskilled worker supplies only raw labor. Derive their wage ratio and its response to H . Explain what the model can and cannot establish about scholarships.

M3-04 Working space

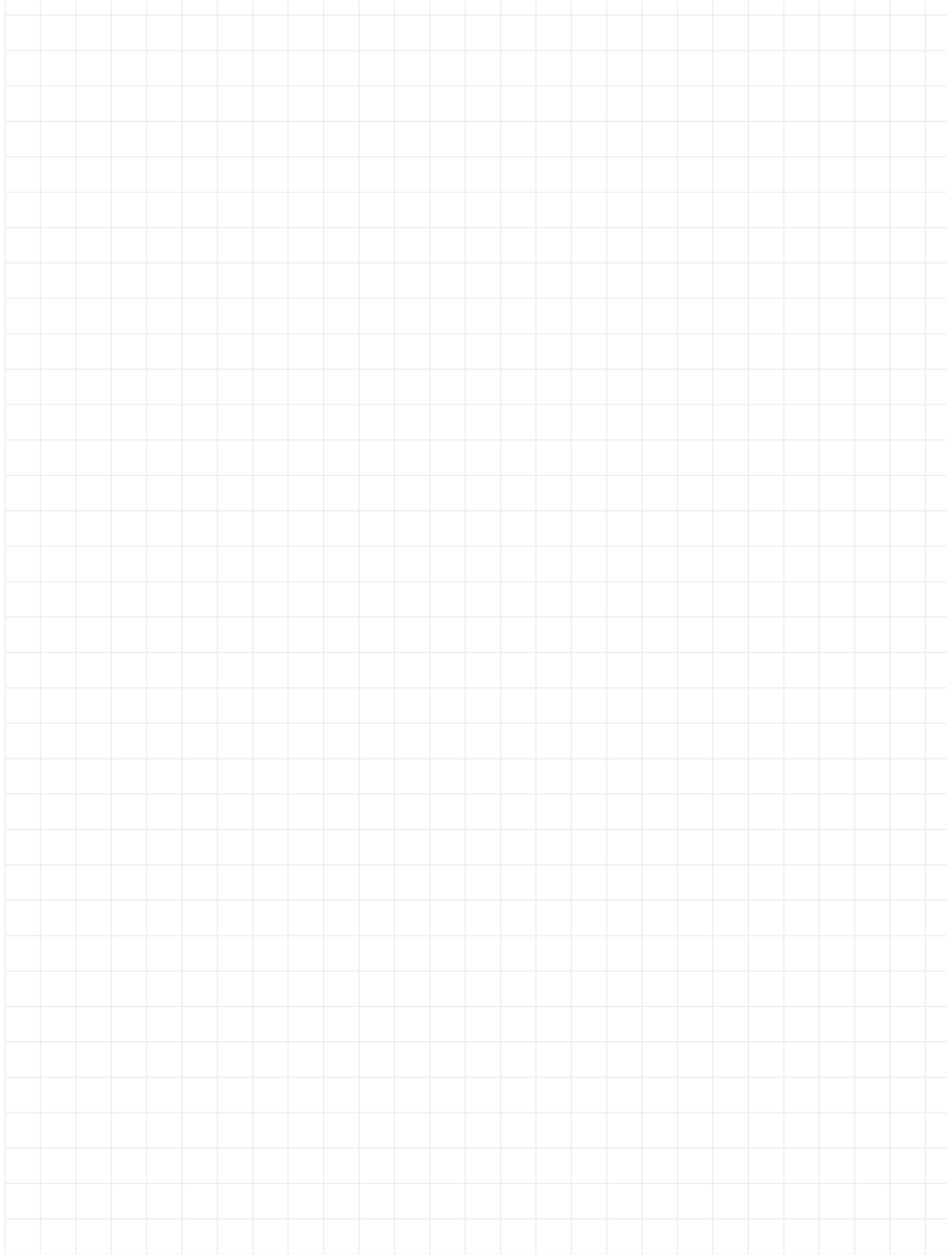
M3-05 投资税收优惠与住宅投资

HW1: Ch3 P&A 12

investment tax credit 投资税收抵免; business investment 企业投资; residential investment 住宅投资

In the closed-economy model with fixed national saving, total investment consists of business and residential investment. A tax credit raises business investment demand at every interest rate but does not directly affect residential investment demand.

Draw the loanable-funds market and determine the changes in the interest rate, total investment, business investment and residential investment.

M3-05 Working space

M3-06 税收与平衡预算的比较

Mankiw 9e, Ch3 P&A 8; 平衡预算为显式拓展

MPC 边际消费倾向; balanced budget 平衡预算

Suppose $MPC = 0.6$ and output is fixed. First let taxes rise by 100 billion with government purchases unchanged. Calculate changes in consumption, private saving, public saving, national saving and equilibrium investment. Then repeat when both taxes and government purchases rise by 100 billion.

Assume investment decreases with the real interest rate.

第4章 货币体系

The Monetary System

依据：Mankiw 9e Ch4；课程 Chapter 4 资料

4.1 从货币职能到两种总量

Money, bank deposits and the monetary base

PRINCIPLE 公众现金与银行准备金不同；货币供给与货币基础也不同。

货币（money）是通常被接受用于交易的资产，具有交换媒介（medium of exchange）、计价单位（unit of account）与价值储藏（store of value）职能。商品货币（commodity money）有自身非货币用途；法定货币（fiat money）依靠制度接受而非商品内在价值。

本题组采用简化的货币供给（money supply） M ：公众持有的通货（currency, C_u ）加可用于支付的银行存款（deposits, D ）。银行准备金（reserves, R ）是银行保留的基础货币，不能再作为公众存款之外的货币额重复加入 M 。

$$M = C_u + D, \quad B = C_u + R, \quad cr = \frac{C_u}{D}, \quad rr = \frac{R}{D}.$$

货币基础（monetary base, B ，部分课件记 H ）包括公众现金与银行准备金。现金存款比（currency-deposit ratio, cr ）取决于公众；准备金存款比（reserve-deposit ratio, rr ）取决于规则和银行行为。实际 rr 可含超额准备金（excess reserves），不必等于法定最低比率。

资产负债表（balance sheet）满足资产等于负债加权益。银行资产包括准备金、贷款、债券；存款是银行对客户的负债。银行放贷并记入客户存款可增加存款货币，但没有凭空增加央行基础货币。

4.2 乘数从何而来

Deriving the money multiplier

PRINCIPLE 用同一个存款基数分别表达货币与基础，再取比。

$$M = (1 + cr)D, \quad B = (cr + rr)D \Rightarrow M = mB, \quad m = \frac{1 + cr}{cr + rr}.$$

货币乘数 (money multiplier, m) 是这两个总量的比例。在固定比率下, $\Delta M = m\Delta B$; 若公众或银行改变比率, 就必须先更新 m 。

$$\frac{\partial m}{\partial rr} < 0, \quad \frac{\partial m}{\partial cr} = \frac{rr - 1}{(cr + rr)^2} < 0 \quad (rr < 1).$$

全额准备金 (100-percent-reserve banking) 对应 $rr = 1$; 部分准备金 (fractional-reserve banking) 对应 $rr < 1$ 。更多基础货币留作准备金或公众现金, 会减少给定基础所支持的存款。

题目常给 $a = C_u/M$, 而非 cr 。由 $D = (1 - a)M$ 得 $cr = a/(1 - a)$ 。全部货币都是现金时 $D = 0$, cr 不定义, 应直接使用 $M = B = C_u$ 。

4.3 政策操作与银行资本

Policy operations and bank capital

PRINCIPLE 先识别基础货币还是乘数改变, 再单独分析损失由谁承担。

公开市场操作 (open-market operations) 是央行买卖证券: 买入投放基础货币, 卖出回收。央行对银行贷款增加通常也扩张基础; 准备金付息 (interest on reserves) 若使银行提高 rr , 会降低乘数。银行恐慌 (bank panic) 可使公众提高 cr , 即使基础不变也造成货币收缩。央行影响 B 和激励, 但不能脱离公众、银行行为独自精确确定 M 。

银行资本 (bank capital) 或所有者权益 (equity) 是资产扣负债的剩余, 吸收资产损失。股东借给银行的钱仍是借款负债, 不会因为贷款人也是股东而变成权益。

$$E = A - L_b, \quad \ell = \frac{A}{E}, \quad \frac{\Delta E}{E} = \ell \frac{\Delta A}{A} \quad (\text{负债固定}).$$

杠杆 (leverage) 放大资产变化对权益的百分比影响。贷款违约 (loan default) 损失率若给在贷款部分, 必须先乘贷款额, 不能直接乘全部资产; 权益耗尽意味着原股东的缓冲消失, 不等于存款已自动按比例减少。

4.4 英文概念与原理

English Definitions and Principles

1. Money, bank deposits and the monetary base

Money serves as a medium of exchange, unit of account and store of value. Commodity money has nonmonetary uses; fiat money is accepted through institutions. In the simplified model, money supply is public currency plus deposits. Bank reserves are not added again to that total.

The monetary base is public currency plus bank reserves. The public chooses its currency–deposit ratio, while banks and regulations determine the reserve–deposit ratio, potentially including excess reserves. A bank balance sheet satisfies assets equals liabilities plus equity.

Deposits are bank liabilities; reserves, loans and bonds are assets. Deposit creation and base-money creation are distinct.

2. Deriving the money multiplier

Expressing both aggregates in terms of deposits gives $M = (1 + cr)D$ and $B = (cr + rr)D$. Their ratio is the multiplier. Fixed ratios imply $\Delta M = m\Delta B$; changing ratios require recomputation. Higher reserve holdings lower the multiplier, and a higher currency ratio does so when $rr < 1$.

The currency share of money, $a = C_u/M$, differs from the currency–deposit ratio: $cr = a/(1 - a)$. If there are no deposits, this ratio is undefined and the definitions directly give $M = B$. Full reserves and fractional reserves refer to $rr = 1$ and $rr < 1$.

3. Policy operations and bank capital

An open-market purchase adds base money; a sale removes it. Central-bank lending also affects the base. Interest on reserves can induce higher reserve ratios, and a bank panic can raise the public currency ratio, lowering the multiplier. Monetary outcomes therefore depend on both policy and private behavior.

Bank capital or equity is the residual of assets over liabilities and absorbs losses. Owner-provided loans remain liabilities. Leverage is assets divided by equity. With liabilities fixed, percentage equity changes equal leverage times percentage asset changes.

Apply a loan-default rate to loans, rather than to total assets, before calculating the equity effect.

M4-01 Wiknam 的银行体系与公开市场操作

HW1: Ch4 P&A 4; 往年卷 B, Q5

monetary base 货币基础; reserve 准备金; deposit 存款; money multiplier 货币乘数

The public holds 1000 in currency and 4000 in deposits.

Banks hold a reserve–deposit ratio of 0.25 and have no equity or nondeposit borrowing in this simplified aggregate balance sheet.

1. Calculate bank reserves and loans, the money supply, the monetary base, the currency–deposit ratio and the money multiplier.
2. How much government debt should the central bank buy or sell to raise the money supply by 500, holding both ratios fixed?

M4-02 货币政策与公众、银行行为

HW1: Ch4 P&A 2; 往年卷 A, Q5、Q6(b)

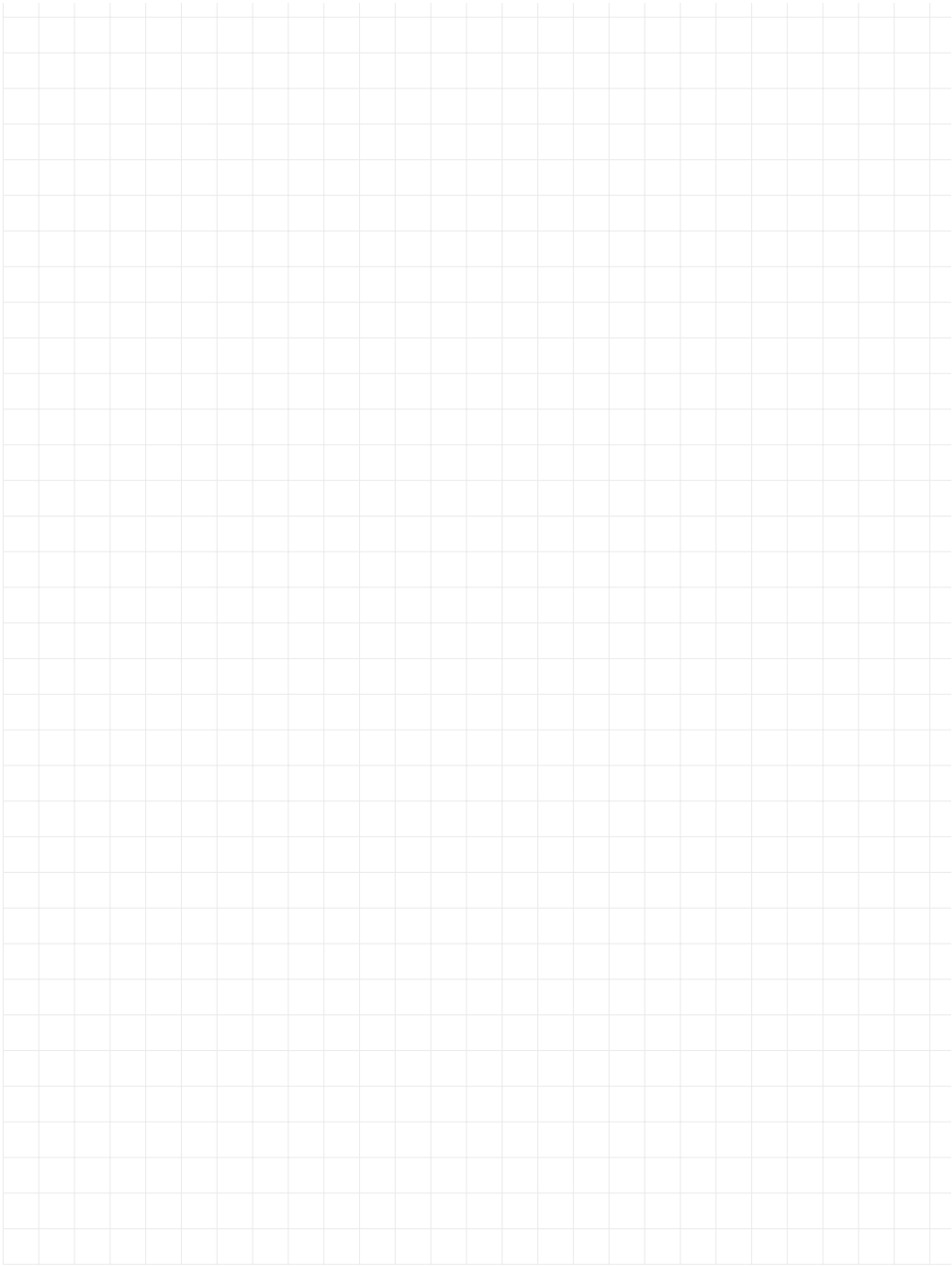
open-market purchase 公开市场购买; interest on reserves 准备金利息; currency ratio 现金存款比

Use $M = B(1 + cr)/(rr + cr)$, with $0 < rr < 1$.

For each event, trace the effect on B , the multiplier and M , holding all unspecified factors fixed:

1. The central bank purchases government bonds.
2. Higher interest on reserves induces banks to raise rr .
3. Central-bank lending through a term-auction facility falls.
4. An ATM computer virus induces the public to raise cr .
5. Newly printed currency is distributed to the public; assume cr, rr remain fixed after adjustment.
6. A tax on checks induces greater use of currency.
7. Evaluate: "The central bank alone determines the money supply."

M4-02 Working space



M4-03 相同货币基础为何对应不同货币供给

Mankiw 9e, Ch4 P&A 3

100-percent-reserve banking 全额准备金银行制度; fractional reserves 部分准备金

The monetary base is 1000.

Find money under each separate scenario:

1. All money is held as currency.
2. All money is deposits and banks hold 100-percent reserves.
3. All money is deposits and $rr = 0.2$.
4. The public holds equal amounts of currency and deposits, and $rr = 0.2$.

In each scenario, how much must the base rise to raise money by 10%, assuming the scenario's ratios remain fixed?

M4-04 银行恐慌与现金比例的换算

Mankiw 9e, Ch4 P&A 5

bank panic 银行恐慌; currency share 现金在货币中的比重

Panicia has a monetary base of 1000. Initially one third of money is currency, and banks keep one third of deposits as reserves. During a panic, the currency share of money rises to one half, while rr remains one third. Find initial and final money.

How much should the central bank purchase in an open-market operation to restore initial money under the new ratios?

M4-05 银行资产负债表与杠杆

Mankiw 9e, Ch4 P&A 9; 杠杆比较取自 P&A 8

bank capital 银行资本; equity 所有者权益; leverage 杠杆

A bank has equity 2000, borrowing from its owner 4000, and deposits 14000. It holds government bonds 7000, loans 10000 and reserves 3000. Construct its balance sheet and compute leverage. Then 5% of loans become worthless, with no change in liabilities: find assets, equity and their percentage losses.

As a separate comparison, a bank has leverage 20: what happens to equity when total asset value rises 2%, or falls 5%?

第5章 通货膨胀

Inflation

依据：Mankiw 9e Ch5；课程 Chapter 5 资料

5.1 数量方程如何连接货币与物价

The quantity equation and inflation

PRINCIPLE 恒等式加上速度与产出假设，才得到货币增长的通胀结论。

货币流通速度（velocity of money, V ）为名义支出与货币量之比，表示一单位货币平均支持多少次支出。由定义得到数量方程（quantity equation）：

$$MV = PY, \quad V = \frac{PY}{M}.$$

$$g_M + g_V \approx \pi + g_Y, \quad (1 + g_M)(1 + g_V) = (1 + \pi)(1 + g_Y).$$

第一行本身是恒等关系。数量论（quantity theory of money）进一步假定速度相对稳定、长期实际产出由技术和要素决定。此时货币水平提高推高物价水平；持续更快的货币增长在其他增长条件不变时带来更高通胀。对数变化可精确相加，普通离散百分比的相加则是近似。

实际货币余额（real money balances） M/P 是货币购买力。若需求为 kY ，均衡 $M/P = kY$ 给出 $V = 1/k$ 。货币需求（money demand）是希望持有的货币存量，不是希望赚到的收入，也不是全部财富。

货币中性（monetary neutrality）是长期名义货币变化不改变实际配置的命题；古典二分法（classical dichotomy）把实际变量和名义变量的长期决定分开。二者不说明短期黏性价格下同样成立。

5.2 利率、通胀与持币成本

Interest rates, inflation and money demand

PRINCIPLE 先区分名义与实际，再区分预期与事后。

名义利率 (nominal interest rate, i) 以货币计量收益; 实际利率 (real interest rate, r) 以商品购买力计量。Fisher 关系 (Fisher relation) 比较同一笔资金的名义和实际增长:

$$1 + r = \frac{1 + i}{1 + \pi}, \quad r \approx i - \pi.$$

$$i \approx r + \pi^e \quad (\text{事前定价}), \quad r^{ex\ post} \approx i - \pi \quad (\text{事后实现}).$$

预期通胀 (expected inflation, π^e) 决定合同签订时预期的实际成本; 实际发生的通胀决定事后实际收益。Fisher 效应 (Fisher effect) 是实际利率固定时, 预期通胀上升使名义利率约一比一提高。

持有不付息货币放弃了债券名义利息, 所以名义利率是持币的机会成本 (opportunity cost)。一般实际余额需求 $L(i, Y)$ 对 i 递减、对收入递增。均衡为 $M/P = L(i, Y)$; i 上升使需求下降, 给定 M 时需要 P 上升。预期变化可立即改变当前物价水平, 物价跳升的百分比不等于之后每期的通胀率。

5.3 购买力、税收与通胀成本

Purchasing power, taxes and inflation costs

PRINCIPLE 税后先得到名义金额, 再除价格增长因子, 最后计算收益率。

固定名义付款的实际价值是 A/P ; 年金 (annuity) 是合同规定的一系列付款, 不会自动随物价调整。指数化 (indexation) 把付款与物价等指标挂钩, 可保护约定购买力。

$$1 + r_{after} = \frac{1 + (1 - \tau)i}{1 + \pi} \quad (\text{税只征于名义收益、无其他现金流}).$$

名义资本利得 (nominal capital gain) 可能仅补偿物价上涨, 若税制仍按名义收益征税, 实际亏损也可能伴随纳税。预期外通胀 (unexpected inflation) 还会改变固定名义债权债务的实际价值, 在借款人与贷款人之间重新分配购买力。

鞋底成本 (shoeleather costs) 是为减少持币而频繁交易的资源成本; 菜单成本 (menu costs) 是调整价格的成本; 相对价格扭曲 (relative-price distortions) 来自不同价格调整不同步; 计量混乱 (confusion and inconvenience) 来自货币计价尺度不稳定。这些是不同机制, 答题应指出题目情境对应哪一种, 而非只说“通胀不好”。铸币税 (seigniorage) 是发行货币取得的资源, 通胀税 (inflation tax) 强调通胀侵蚀持币者购买力, 二者相关但不是每种情况下数值完全相同。

5.4 英文概念与原理

English Definitions and Principles

1. The quantity equation and inflation

Velocity is nominal expenditure divided by money, so $MV = PY$ is an identity. Quantity theory adds assumptions of stable velocity and supply-determined long-run output. Conditional on other growth rates, faster money growth then raises inflation.

Log changes add exactly; ordinary discrete percentage rates add only approximately, with the product equation retaining cross terms.

Real balances are purchasing power held as money. Equilibrium with demand kY implies $V = 1/k$. Money demand concerns desired asset holdings, not income or total wealth. Monetary neutrality concerns real allocations in the long run; the classical dichotomy separates real and nominal determination under those assumptions.

2. Interest rates, inflation and money demand

Nominal interest measures money returns; real interest measures purchasing-power returns. Exactly, $1 + r = (1 + i)/(1 + \pi)$, with $r \approx i - \pi$ as an approximation. Expected inflation enters ex ante contract pricing, while realized inflation determines ex post returns.

With fixed real interest, the Fisher effect raises nominal interest roughly one-for-one with expected inflation.

Nominal interest is the opportunity cost of non-interest-bearing money. Real-balance demand generally decreases with i and increases with real income. With fixed money, lower desired real balances require a higher price level. A current level jump must be distinguished from an ongoing inflation rate.

3. Purchasing power, taxes and inflation costs

A fixed nominal payment has real value A/P . An annuity is a contractual payment stream; indexation links payments to a price index. When taxes apply to nominal gains, taxes may be due even if the investment loses purchasing power. Compute after-tax nominal wealth first, deflate it, and only then calculate the real return.

Unexpected inflation redistributes purchasing power under fixed nominal debt.

Shoeleather costs are resources spent economizing on money; menu costs are resources used changing prices. Uneven adjustment distorts relative prices, and unstable monetary units create inconvenience. Seigniorage is resources obtained by issuing money; the inflation tax describes the erosion of money holders' purchasing power.

Their precise numerical relationship depends on the setting.

M5-01 数量方程与 Fisher 关系的判断题

往年卷 A、B, Q6(a); 卷 B, Q6(b)

velocity 货币流通速度; Fisher equation Fisher 方程; real interest 实际利率

On Vulcan, velocity is constant, real output grows by 4%, money grows by 10%, and the nominal interest rate is 9%.

Evaluate and explain:

1. "The real interest rate is 5%." Use the course's growth-rate approximation, then check with exact discrete rates.
2. "Faster money growth always implies higher inflation."

M5-02 货币需求、速度与长期通胀

Mankiw 9e, Ch5 P&A 2

real money balances 实际货币余额; money demand 货币需求

Real money demand is $(M/P)^d = kY$. Initially k is constant, money grows by 12% and real output by 4%. Find velocity and approximate inflation. Explain what happens to inflation if output growth rises, and if velocity instead grows at rate $g_V > 0$.

M5-03 预期通胀引起的物价水平跳升

Mankiw 9e, Ch5 P&A 3

expected inflation 预期通胀; opportunity cost 机会成本

Money demand is $(M/P)^d = 0.2Y/\sqrt{i}$, with i in decimals. Initially $i = 0.04$, $Y = 1000$ and $M = 1200$.

1. Derive velocity and find the initial price level.
2. Expected inflation rises by 5 percentage points while the real interest rate stays fixed.

Find the new nominal rate, velocity and price level if money stays fixed.

3. What money supply keeps the price level at its initial value?

M5-03 Working space

M5-04 名义收益税与固定年金的购买力

Mankiw 9e, Ch5 P&A 7(b,d), 量化整理

nominal capital gain 名义资本利得; annuity 年金; purchasing power 购买力

1. An investor begins with wealth of 1000000, earns a nominal capital gain of 50000, faces 10% inflation, and pays a 20% tax on the nominal gain. Compute tax, end-of-period nominal wealth, real wealth in beginning-period prices, and the after-tax real return.

Compare with the pretax real return.

2. A fixed nominal annuity is unchanged while the price level triples. What happens to the purchasing power of each payment?

第6章 开放经济

The Open Economy

依据：Mankiw 9e Ch6；课程 Chapter 6 资料

6.1 开放经济的两条流量记录

Trade flows and international financial flows

PRINCIPLE 商品流与资本流是同一资源差额的两面。

开放经济 (open economy) 参与国际贸易与金融交易。净出口 (net exports) 或贸易余额 (trade balance) 为出口减进口：正值为贸易顺差 (trade surplus)，负值为贸易逆差 (trade deficit)。

$$Y = C + I + G + NX \Rightarrow S - I = NX, \quad S = Y - C - G.$$

$S - I$ 是净资本流出 (net capital outflow)：国内储蓄超过国内投资的部分净用于购买国外资产。负值表示国内投资依靠净外国融资。实际国际收支的经常账户 (current account) 还可包含跨境要素收入与转移，本章简化模型主要用 NX 表示外部资源余额。

小型开放经济 (small open economy) 规模不足以改变世界利率，完全资本流动 (perfect capital mobility) 且资产风险和预期汇率等差异被抽去时， $r = r^*$ 。因此本国储蓄不必等于本国投资。先算本国储蓄，再按世界利率算投资，差额才是净出口。

6.2 汇率报价与相对价格

Exchange-rate conventions and relative prices

PRINCIPLE 先写单位，再写公式，最后判断升贬值。

名义汇率 (nominal exchange rate) 是两种货币的交换比率。本册默认 e 为每单位本币可换多少外币，其单位为外币/本币； $e \uparrow$ 表示本币名义升值 (appreciation)。若题目报本币/外币，则它等于 $1/e$ ，数字方向相反。

实际汇率 (real exchange rate, ε) 是本国产品相对外国产品的价格：

$$\varepsilon = \frac{eP}{P^*}, \quad e = \varepsilon \frac{P^*}{P}, \quad \frac{\varepsilon_1}{\varepsilon_0} = \frac{e_1}{e_0} \frac{P_1/P_0}{P_1^*/P_0^*}.$$

eP 将本国产品价格转换为外币，除以外国价格后得到商品相对价格。 $\varepsilon \uparrow$ 是本币实际升值，本国产品相对贵，出口吸引力下降、进口吸引力上升，所以标准设定下 $NX(\varepsilon)$ 向下倾斜。

购买力平价 (purchasing-power parity, PPP) 在产品可比、可贸易且忽略运输壁垒等条件下，预测共同货币计价价格一致，即 $eP = P^*$ 、 $\varepsilon = 1$ 。非贸易品、质量差异和贸易成本使严格 PPP 不必成立。名义升值能与实际贬值同时出现，必须同时考虑两国物价。

6.3 统一的比较静态顺序

A unified policy-transmission sequence

PRINCIPLE 先决定 $S - I$ 是否变，再决定是供给移动还是净出口需求移动。

$$\boxed{Y, T \rightarrow C} \rightarrow S = Y - C - G, \quad r^* \rightarrow I, \quad S - I \rightarrow NX(\varepsilon) \rightarrow \varepsilon.$$

国内财政扩张 (fiscal expansion) 减少储蓄，净资本流出供给左移，引起实际升值与净出口下降；世界利率固定时，本国利率与投资不变。外国大国投资刺激则提高世界利率，使本国投资下降、 $S - I$ 增加、实际贬值和净出口增加。必须先分析大国如何改变世界均衡，再分析小国接受什么价格。

进口偏好或关税 (tariff) 首先移动 $NX(\varepsilon)$ 。如果储蓄、投资不变，最终净出口必须仍等于原 $S - I$ ，由汇率调整抵消直接贸易需求变化。关税可能减少进出口总量，却不在这个模型中改变贸易差额。

纯名义货币冲击在古典长期模型中不改 S, I, NX, ε ，而通过 $M/P = L(i, Y)$ 改变 P ，再由 $e = \varepsilon P^*/P$ 改变名义汇率。每次比较都需说明保持不变的关系；不同冲击的小问如果题目要求独立比较，必须恢复初始值。

6.4 英文概念与原理

English Definitions and Principles

1. Trade flows and international financial flows

Net exports are exports minus imports; a positive balance is a trade surplus and a negative one a deficit. The resource identity implies $S - I = NX$. Saving not invested domestically finances net foreign asset purchases, called net capital outflow.

A current account can contain income and transfers beyond trade, which this simplified model abstracts from.

A small open economy cannot affect the world interest rate. Under perfect capital mobility and the model's asset assumptions, domestic real interest equals r^* . Domestic saving need not equal domestic investment: calculate saving from income and fiscal policy, investment from the world rate, and net exports as the difference.

2. Exchange-rate conventions and relative prices

The default nominal quote is foreign currency per unit of home currency, so a rise in e is nominal home appreciation. The reciprocal quote reverses numerical directions. The real exchange rate is eP/P^* , the relative price of home goods in foreign-good units.

A higher real rate makes home goods relatively expensive and lowers net exports in the standard model.

Purchasing-power parity predicts $eP = P^*$ for comparable tradable baskets under restrictive arbitrage assumptions. Trade costs and nontradable or different goods can prevent strict parity. Real exchange-rate changes combine nominal exchange and relative price changes, so nominal and real movements can differ.

3. A unified policy-transmission sequence

Determine consumption and saving first, investment at the world rate second, and then net exports and the real exchange rate. Domestic fiscal expansion lowers saving and net exports and causes real appreciation, with investment fixed.

Foreign large-country investment incentives raise the world rate, lower home investment and cause real depreciation and higher net exports.

Trade-preference changes and tariffs shift net-export demand. With unchanged saving and investment, the exchange rate adjusts while equilibrium net exports remain fixed. A pure long-run monetary shock changes prices and nominal exchange rates while leaving the real allocation unchanged.

Separate policy experiments must reset to the initial equilibrium when specified.

M6-01 小型开放经济的完整数值解

往年卷 A, Q7

small open economy 小型开放经济; trade balance 贸易差额; real exchange rate 实际汇率

The economy satisfies

$$Y = 500, \quad G = T = 100, \quad C = 25 + 0.75(Y - T),$$

$$I = 100 - 5r, \quad NX = 50 - 50\varepsilon, \quad r = r^* = 5.$$

Interest rates use percentage-point units. Calculate consumption, saving, investment, net exports and the real exchange rate. Then separately consider (a) $G = 125$ with other initial exogenous values unchanged; (b) a rise in r^* to 10 with G restored to 100.

Explain the causal sequence in each case.

M6-01 Working space

M6-02 外国投资刺激如何传入本国

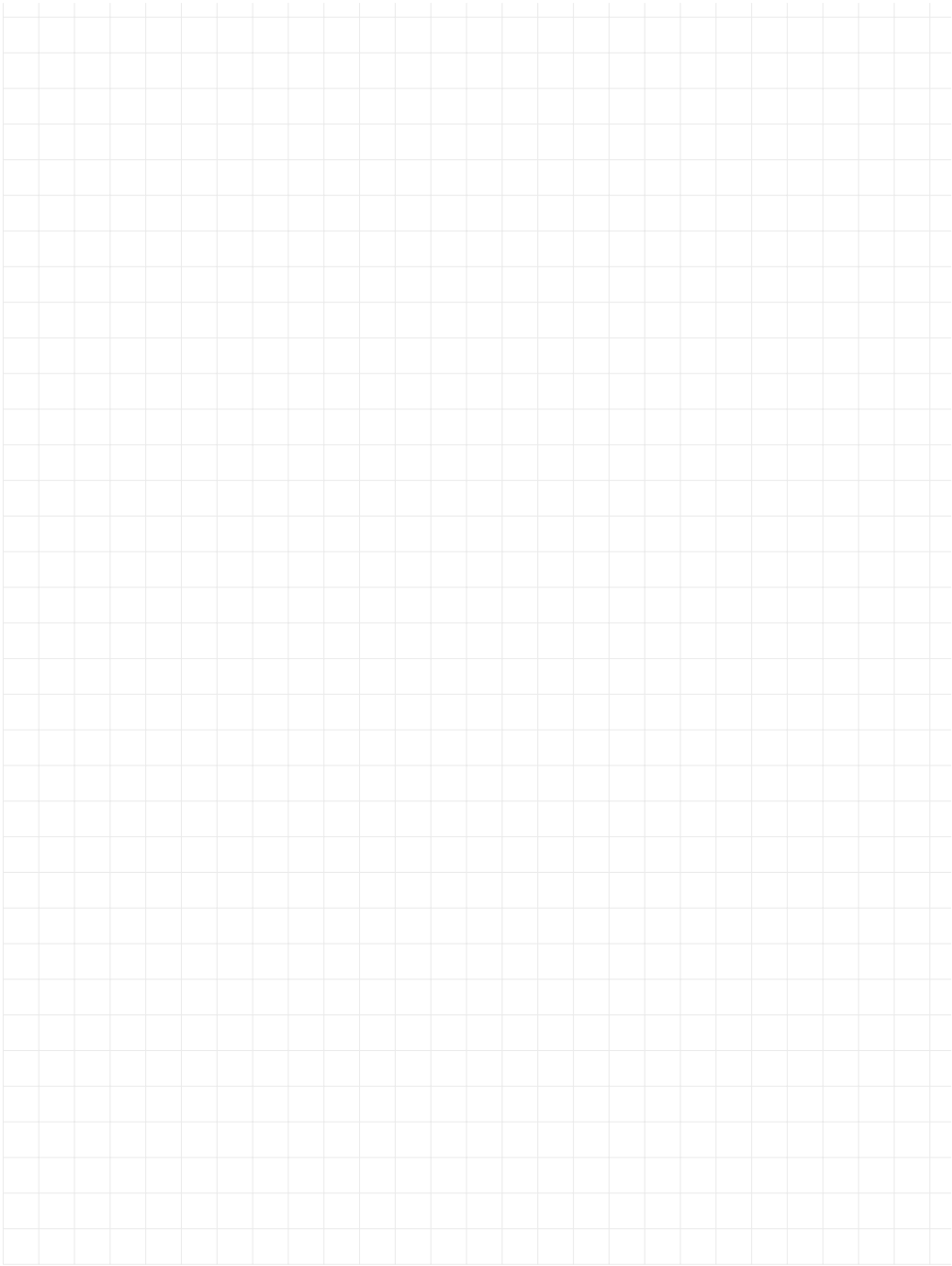
往年卷 B, Q7; Mankiw 9e, Ch6 P&A 9

world interest rate 世界利率; net capital outflow 净资本流出

Several large foreign economies introduce investment tax credits. Analyze the world loanable-funds market and then a small open home economy. Hold world saving and the home economy's own saving and investment schedules fixed.

Draw the relevant shifts and explain the effects on r^* , home investment, net capital outflow, the real exchange rate and net exports.

M6-02 Working space



M6-03 五类冲击的统一开放经济框架

Mankiw 9e, Ch6 P&A 1

nominal exchange rate 名义汇率; monetary neutrality 货币中性

For a small open economy, separately analyze each event. State changes in $S, I, S - I, NX, \varepsilon$; discuss the nominal rate e where relevant.

Define e as foreign currency units per unit of home currency, so $\varepsilon = eP/P^*$.

1. Households consume less at each disposable income.
2. A domestic investment tax credit raises investment demand.
3. Households prefer more imported goods at every real exchange rate.
4. The money supply doubles in the long run, with money demand and real fundamentals fixed.
5. Real money demand rises, with money supply and real fundamentals fixed.

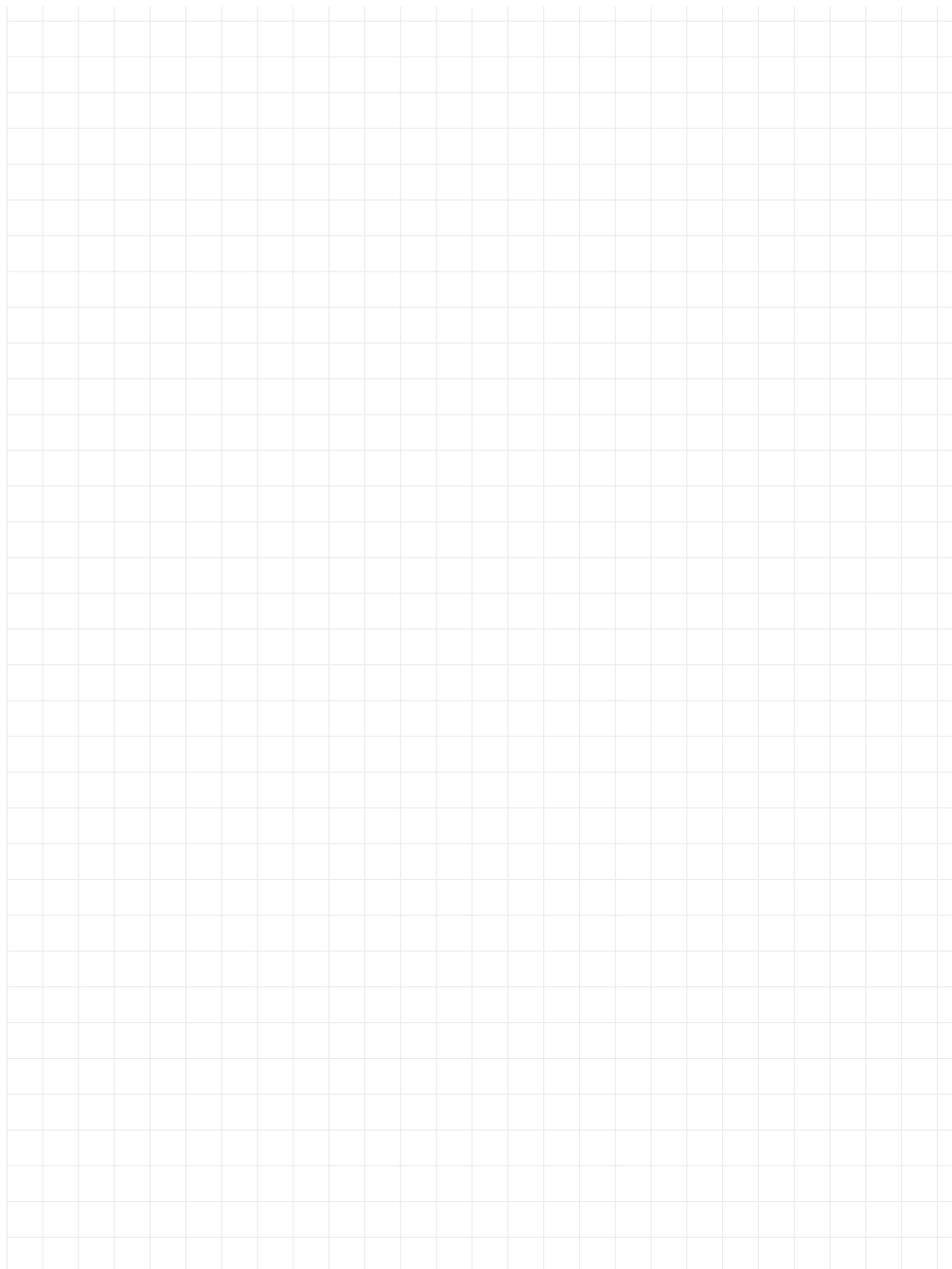
M6-03 Working space

M6-04 进口关税为何不必减少贸易逆差

Mankiw 9e, Ch6 P&A 6

tariff 关税; protectionism 贸易保护; appreciation 升值

In the classical small-open-economy model, the government imposes a tariff on imports. Assume saving, investment and the world interest rate are unchanged. Draw the net-exports market and determine the effects on the real exchange rate, net exports and trade volumes. Explain who may benefit and who may lose.

M6-04 Working space

M6-05 墨西哥旅行与实际汇率

Mankiw 9e, Ch6 P&A 10

PPP 购买力平价; depreciation 贬值; relative price 相对价格

The peso-dollar exchange rate changes from 10 to 15 pesos per US dollar. During the same period, US prices rise by 25% and Mexican prices double. Calculate the change in the relative price of US goods in terms of Mexican goods.

For a US traveler, how does the dollar cost of the Mexican basket change, and how does that change compare with the US price level?

第7章 失业与劳动力市场

Unemployment and the Labor Market

依据：Mankiw 9e Ch7；课程 Chapter 7 资料

7.1 从状态转移推导自然失业

Worker flows and the natural rate

PRINCIPLE 稳态是流入等于流出，不是没有失业，也不是没有人换工作。

失业可看作劳动者在就业与失业两个状态间流动。离职率（job-separation rate, s ）以就业者为分母，找到工作率（job-finding rate, f ）以失业者为分母。在固定劳动力 $L = E + U$ 、转移率作用于期初状态的离散模型中：

$$U_{t+1} = U_t + sE_t - fU_t = sL + (1 - s - f)U_t,$$

$$u^* = \frac{s}{s + f}, \quad u_t - u^* = (1 - s - f)^t(u_0 - u^*).$$

稳态（steady state）条件 $sE = fU$ 比较的是**人数流量**。自然失业率（natural rate of unemployment）是相应制度与行为条件下的长期正常失业水平，包含求职匹配等持续过程；降低 s 或提高 f 会降低双状态模型的稳态失业。

当 $|1 - s - f| < 1$ 时偏离稳态会收敛；若 $s + f < 1$ ，收敛不发生正负交替。这个动态式依赖同一期转移的时序设定，不能在已经算了离职后再对新增失业者重复应用期初找工作率。

7.2 摩擦、工资刚性与就业数量

Friction, wage rigidity and employment

PRINCIPLE 先判断工资是否阻止出清，再由劳动需求确定实际雇佣。

摩擦性失业（frictional unemployment）来自寻找合适工作与匹配所需的时间，即使岗位与工人总量足够也可能存在。结构性失业（structural unemployment）在本章主要与岗位供给不足、工资高于出清水平等持续性障碍相关。最低工资（minimum wage）、工会（union）议价与效率工资（efficiency wages）可

能使实际工资保持在均衡以上；效率工资是企业主动付高工资以改善生产率、留任或激励的机制，不是政府规定工资。

竞争劳动需求 (labor demand) 来自 $w = MPL$ 。给定工资后反解企业愿雇多少人，再与劳动供给比较。有约束力的最低工资 (binding minimum wage) 必须高于原出清工资。

$$L_D = L_D(w), \quad L_{employed} = L_D(\bar{w}),$$

$$U = L_S - L_D(\bar{w}), \quad u = \frac{U}{L_S} \quad (\text{固定参与}).$$

工资上涨不保证总劳动收入 (total labor income) wL 上升，因为就业会下降。用生产函数求新产出，再用收入份额检查 wL ，可减少代数错误。没有题目额外假设时，不能把工资造成的未就业者都自动当作退出劳动力。

7.3 行业流动与保留工资

Sectoral mobility and reservation wages

PRINCIPLE 受保护部门的工资改变会影响未受保护部门，不能只看留任者。

劳动力流动 (labor mobility) 在工人可自由选择行业时倾向于使可比工作的工资相等。工会提高某行业工资可能减少该行业需求，被排出的工人转入另一行业，压低另一行业工资。

保留工资 (reservation wage) 是劳动者愿意接受工作的最低工资。如果吸收所有剩余工人需要把工资降到这一水平以下，那么该部门只能按保留工资下的需求雇佣，其余人未就业。统计上是否计入失业仍须看是否积极找工作及题目定义。求解顺序是：受限部门需求 → 剩余劳动供给 → 另一部门工资 → 检查保留工资是否约束。

7.4 英文概念与原理

English Definitions and Principles

1. Worker flows and the natural rate

Separation rates apply to employed workers and finding rates to unemployed workers. With a fixed labor force and transitions from beginning-of-period states, unemployment follows $U_{t+1} = sL + (1 - s - f)U_t$. Steady state equates person flows, $sE = fU$, giving $u^* = s/(s + f)$.

The natural unemployment rate is the long-run normal rate under given institutions and behavior, rather than zero unemployment. Deviations converge when $|1 - s - f| < 1$. Transition timing matters: do not apply a beginning-state probability again to workers newly entering a state in the same period.

2. Friction, wage rigidity and employment

Frictional unemployment reflects time spent searching and matching. Structural unemployment involves persistent obstacles or insufficient jobs, including wages above market-clearing levels in this chapter's model. Minimum wages, unions and efficiency wages can generate wage rigidity.

Efficiency wages are voluntarily high firm wages intended to improve productivity or incentives.

Competitive labor demand satisfies real wage equals marginal product. A binding wage floor lies above the clearing wage; employment is then demand at that floor, and unemployment is excess labor supply under fixed participation. Higher pay per employed worker need not raise total labor income because employment falls.

3. Sectoral mobility and reservation wages

Labor mobility tends to equalize comparable sector wages. A union wage can reduce employment in its sector and displace workers into another, lowering that sector's wage. A reservation wage is the minimum acceptable wage. If full absorption would require a lower wage, the other sector employs only demand at the reservation wage.

Solve the constrained sector first, then the residual labor market, and finally check whether the reservation wage binds.

M7-01 宿舍配对中的稳态流量

Mankiw 9e, Ch7 P&A 2

steady state 稳态; transition probability 转移概率

In a dormitory, 10% of students in relationships break up each month and 5% of single students enter a relationship each month. The population is fixed. Let u be the single fraction. Find the steady-state single fraction and explain the flow-balance condition.

Treat the rates as individual transition probabilities in the stylized model.

M7-02 从失业动态到自然失业率

Mankiw 9e, Ch7 P&A 3; 数值与时序为方法拓展

job separation 离职; job finding 找到工作; natural unemployment 自然失业率

In each month, a fraction s of employed workers lose their jobs and a fraction f of unemployed workers find jobs.

Labor force L is constant; transition probabilities apply to beginning-of-month states.

1. Derive the law of motion for U_t and the steady-state unemployment rate.
2. Derive $u_t - u^* = (1 - s - f)^t(u_0 - u^*)$ and a convergence condition.
3. For $L = 10000$, $s = 0.02$, $f = 0.18$, $u_0 = 0.20$, find first-month unemployment, steady-state unemployment and u_t .

M7-02 Working space

M7-03 劳动需求与最低工资

往年卷 A, Q8; Mankiw 9e, Ch7 P&A 5

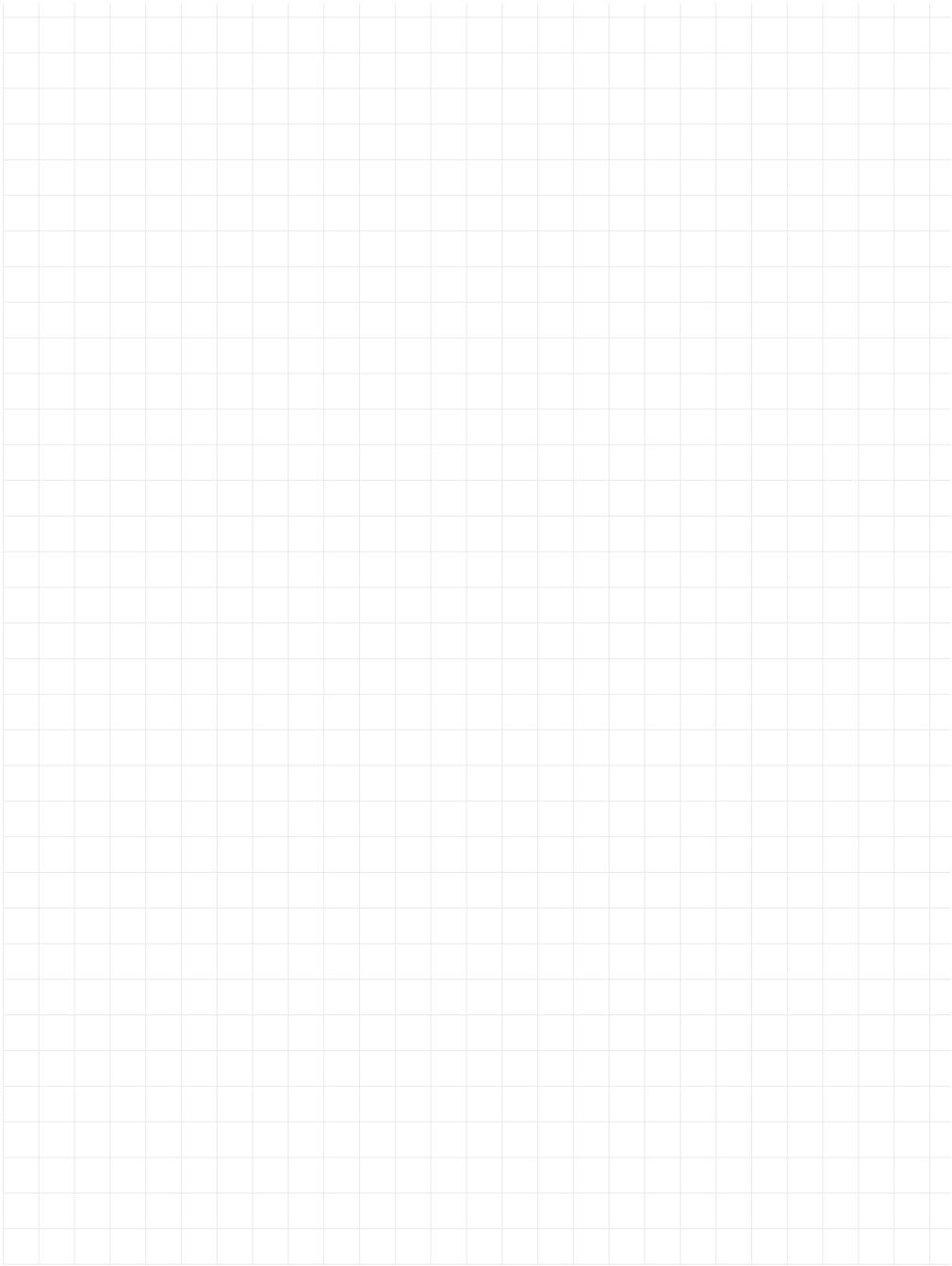
labor demand 劳动需求; binding minimum wage 有约束力的最低工资; labor income 劳动收入

Let $Y = 5K^{1/3}L^{2/3}$. Firms are competitive, capital is fixed at 27000, and labor supply is fixed at 1000.

1. Derive labor demand as a function of real wage w .
2. Find competitive employment, output, the real wage and total labor income.
3. A minimum real wage of 11 is imposed.

Find employment, unemployment, the unemployment rate, output and total labor income. Compare with the competitive outcome.

M7-03 Working space



M7-04 工会、跨行业流动与保留工资

往年卷 B, Q8; Mankiw 9e, Ch7 P&A 7

union 工会; reservation wage 保留工资; labor mobility 劳动力流动

Labor demands in manufacturing and services are $L_m = 200 - 6W_m$ and $L_s = 100 - 4W_s$. There are 100 workers who can move between sectors.

1. Find the common competitive wage and employment in each sector.

2. A manufacturing union sets $W_m = 25$.

Find employment there and the service wage if all remaining workers enter services.

3. Now suppose workers will not accept a wage below 15. With the union wage still 25, find employment in both sectors and unemployment.

M7-04 Working space