



0 · Exam Map COURSE.JSON · SYLLABUS

ASSESSMENT	FORMAT / TIMING
Quiz MC · M3/6 · 40%	Group
Final MC · M8 · 45%	Final MC · M8 · 45%
Quizzes	Multiple choice · Modules 3 & 6
Group assignments	Essays or problem sets · Modules 2, 5 & 7
Final exam	Multiple choice · Module 8 · individual, cumulative

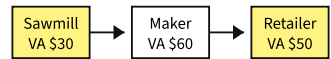
"Quizzes and the final exam are closed books. However, in addition to calculator, pencil, and paper, you can use hard copies of your formula sheet or notes." (BU.220.610 syllabus, Fall 2026)

1 · Measure the Economy M1 · CLASSIFY FIRST

NATIONAL ACCOUNTS
 $Y = C + I + G + NX$
Value added = sales - purchased inputs
GDP deflator = nominal GDP ÷ real GDP

ITEM	EXAM CLASSIFICATION
New capital, new housing, inventories	I
Shares / bonds	Saving, not I
Transfers	Not G purchases
Used good	No current GDP
Imports	In CPI; not GDP deflator

GDP is final production inside the country. Spending = income = value added; adding intermediate sales again double-counts. Inventory change makes the identity hold when sales surprise firms.



\$30 + \$60 + \$50 = final \$140

Figure 1.1 redrawn. Value added sums to the final price; intermediate sales are not added again.

LABOR MARKET
Labor force = employed + unemployed
searching
unemployment rate = unemployed ÷ labor force

EXAM BITE Discouraged workers leave numerator and denominator, so unemployment can fall with no new hiring.

RELEASE-READING CHECKS

Nominal GDP values current output at current prices; **real GDP** holds prices at the base year, so its change isolates quantities. A higher nominal figure alone does not prove more output. For a two-good table, multiply each current quantity by the requested year's price, sum, then form the deflator.

2 · Long-Run Supply M2 · FLEXIBLE PRICES

PRODUCTION
 $Y = F(K, L)$ · $\bar{Y} = F(\bar{K}, \bar{L})$
competitive hiring: $MPL = W/P$
At the five-to-ten-year horizon, factor supplies and technology pin output at **potential** $\bar{Y}$. Constant returns: scaling K and L together scales Y; each input separately has diminishing marginal returns. Fiscal changes reallocate a fixed total.

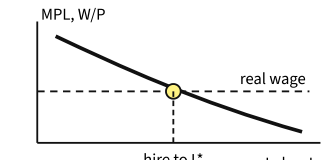


Figure 2.1 redrawn. Hire while $MPL \geq$ real wage; the crossing gives labor demand.

2b · Saving = Investment M2 · SOLVE R

CLOSED ECONOMY
 $C = C(\bar{Y} - T)$ · $I = I(r)$, slope < 0
 $S = \bar{Y} - C - G = (\bar{Y} - T - C) + (T - G)$
equilibrium: $S = I(r)$
1. Hold Y at $\bar{Y}$; compute disposable income and C.
2. Compute private, public, then national S.
3. Set S equal to I(r); solve the real rate.
4. State C, I, G composition; **Y stays $\bar{Y}$** .

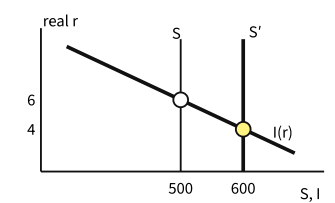


Figure 2.2 redrawn. G+ shifts saving 500 → 600; r 6% → 4%; investment crowds in.

SHOCK	S / I CURVE	R	I QTY
G↑ or T↓	S left	↑	↓
G↓ or T↑	S right	↓	↑
Business optimism	I right	↑	unchanged if S vertical

ASSUMPTIONS THAT CHANGE THE ANSWER

Flexible prices + full employment make factor supplies fixed and $Y = \bar{Y}$. Competitive firms take factor prices as given; $MPL = W/P$ determines labor demand. The saving line and vertical one in the basic model because $\bar{Y}$, T, G and $C(\bar{Y} - T)$ do not depend on r. If durable consumption responded to borrowing costs, saving could slope upward.

3 · Money & Banks M3 · RATIOS FIRST

MONEY CREATION
B = currency + reserves
 $cr = \text{currency/deposits}$ · $rr = \text{reserves/deposits}$
 $m = (cr + 1)/(cr + rr)$ · **M = mB**
No banks: currency is M. With 100% reserves, deposits change money's form, not its amount. With fractional reserves, lending creates deposits. A bank run raises **cr** and often **rr**; both enlarge the denominator and shrink m even if B is unchanged.

Currency	M1 + checkable deposits	M2 + savings & small time
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broader → more store of value, less liquid

Figure 3.1 redrawn. Monetary aggregates broaden from currency to M1 to M2.

FED LEVER	FIRST MOVE	M
Open-market purchase	B↑ via reserves	↑
Open-market sale	B↓	↓
Reserve requirement↓	rr↓, m↑	↑
Discount rate↓	borrowed reserves↑	↑

BANK FRAGILITY
capital = assets - liabilities
Leverage = assets ÷ capital
Capital absorbs asset losses. High leverage means a small percentage loss can exhaust capital and force lending cuts or failure.

3b · Multiplier Routine M3 · NUMERICAL MCQ

- Identify whether B, cr or rr changes.
- Compute m from both ratios; do not use 1/rr when cash leakage exists.
- Use $\Delta M = m\Delta B$ only if cr and rr stay fixed.
- Sense-check: cr↑ or rr↑ must make m↓.

EXAM BITE A bond purchase changes the base; household and bank behavior determine how much M ultimately moves.

3c · Definitions That Flip MCqs M3 · FAST RECALL

Money is a **medium of exchange**, **store of value** and **unit of account**. Fiat money is accepted because others are expected to accept it; commodity money also has intrinsic use. The Fed controls the base directly, not the multiplier: households choose currency holdings and banks choose reserves subject to policy.

4 · Money, Prices & Rates M4 · LONG RUN

QUANTITY EQUATION
 $M \times V = P \times Y$
 $V = \text{nominal GDP} \div M$
 $\pi = \text{money growth} + \text{velocity growth} - \text{output growth}$
stable V: $\pi \approx \text{money growth} - \text{output growth}$

The identity becomes a theory only after assuming velocity is stable. In the long run Y is fixed at potential; given M, P adjusts. Higher P means lower M/P and, through IS-LM, higher r and lower Y demanded.

Identity MV=PY	Stable V M/P=Y	Long run M→P	Growth gM=gY
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Assumptions turn accounting into predictions

Figure 4.1 redrawn. MV = PY: identity first; stable velocity and potential output create predictions.

MONEY DEMAND & FISHER
 $(M/P)^d = L(i, Y)$: ↑Y raises demand; ↑i lowers it
 $i = r + \pi$ · long run: $\Delta i = \Delta \pi$

CHANGE	CHAIN
Expected inflation↑	i↑ → real money demand↓ → P today↑ if M, Y fixed
Unexpected inflation	Redistributes from fixed-rate lenders to borrowers
Deflation	Real burden of nominal debt↑

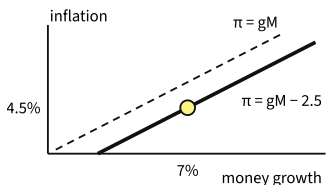


Figure 4.2 redrawn. With output growth 2.5% and stable V, inflation is 2.5 points below money growth.

INFLATION-COST CLASSIFIER

Expected inflation: shoelather costs, menu costs, noisy relative prices and tax distortions. **Unexpected inflation:** arbitrary redistribution on nominal contracts—borrowers gain and lenders lose when inflation is above what was built into a fixed nominal rate. **Deflation:** raises real debt burdens. **Hyperinflation:** commonly follows money creation used to finance government bills and undermines money as a unit of account.

5 · Keynesian Cross M5 · FIXED PRICES

GOODS MARKET
 $PE = C(Y - T) + I + G$ · equilibrium $Y = PE$
spending multiplier = $1/(1 - MPC)$
If $Y > PE$, unplanned inventories accumulate and firms cut production; if $Y < PE$, inventories fall and production rises. At a fixed r, ΔG is multiplied through repeated income and consumption rounds.

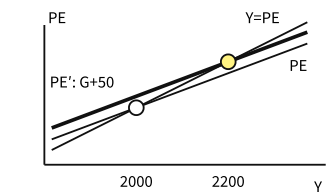


Figure 5.1 redrawn. G +50 lifts equilibrium income 200 when MPC = .75 and the multiplier is 4.

5b · Build IS & LM M5 · WORKHORSE

CURVE	MARKET / SLOPE / SHIFT
IS	Goods; downward: r↓ → I↑ → PE↑ → Y↑, G↑, T↓, confidence+ shift right.
LM	Money; upward: Y↑ → money demand↑ → r↑. M/P↑ shifts right/down.

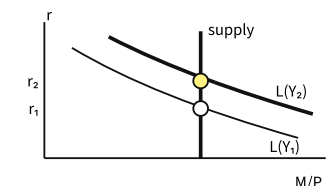


Figure 5.2 redrawn. Higher Y shifts money demand right; fixed M/P requires a higher r, so LM slopes up.

ALGEBRA PROTOCOL
1 build IS as $Y = a - br$
2 build LM as $Y = c + dr$
3 equate · solve r · substitute for Y
4 plug into both equations to check

EXAM BITE Draw before reading choices; move exactly one curve, then write the signs of Δr and ΔY .

CROSS VERSUS IS-LM

The Keynesian cross holds r fixed, so fiscal expansion receives the full spending multiplier. IS-LM lets r rise along LM: higher Y raises money demand, r rises and investment is crowded out, so ΔY is smaller. A tax change has a smaller direct effect than equal ΔG because only the MPC share of disposable-income change reaches consumption.

6 · Policy-Shock Decoder M5-M7 · DIRECTION MCQS

SHOCK	CURVE	SHORT-RUN R	Y
Pessimism	IS left	↓	↓
G↑ or T↓	IS right	↑	↑
M↑	LM right	↓	↑
Money demand↑	LM left	↑	↓
P↑	LM left via M/P↓	↑	↓

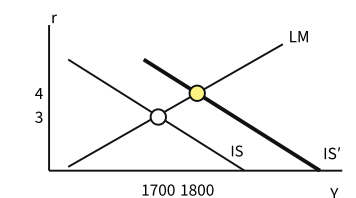


Figure 5.3 redrawn. G +40 shifts IS by 200, but crowding out leaves $\Delta Y = 100$ and raises r 3 → 4.

7 · AD-AS & Phillips M6-M7 · HORIZON

PRICE ADJUSTMENT
 $Y > \bar{Y} \rightarrow P$ rises · $Y < \bar{Y} \rightarrow P$ falls
 $Y = \bar{Y} \rightarrow P$ constant

AD slopes down: $P \uparrow \rightarrow M/P \downarrow \rightarrow LM$ left $\rightarrow r \uparrow \rightarrow I \downarrow \rightarrow Y \downarrow$. Fiscal or monetary expansion shifts AD right. Very short run: SRAS horizontal; long run: LRAS vertical at $\bar{Y}$. A demand shock self-corrects through P; an adverse supply shock creates **stagflation** and a policy trade-off.

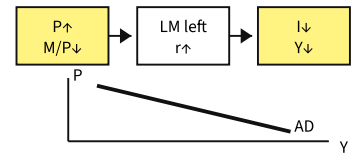


Figure 6.1 redrawn. The IS-LM chain produces downward-sloping aggregate demand.

LABOR-TO-INFLATION CHAIN
 $(Y - \bar{Y})/\bar{Y} \approx -\beta(u - u^n)$
 $\pi = \pi^n - \beta(u - u^n) + v$

A negative unemployment gap raises output and inflation. With adaptive expectations, inflation has inertia; credible lower expectations reduce the output cost of disinflation. Permanent unemployment below u^n is impossible once expectations adjust.

SUPPLY HORIZONS & EXPECTATIONS

When prices are fixed, firms meet demand and SRAS is horizontal. When prices are fully flexible, LRAS is vertical at productive capacity. Between them, sticky-price firms set from expected P while flexible-price firms react to demand, giving an upward-sloping SRAS. If expected P rises, SRAS shifts up.



8 · GDP Worked Drills

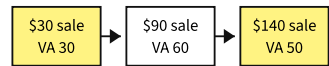
M1 · GUIDE VALUES

FURNITURE CHAIN: AVOID DOUBLE COUNTING

Sawmill sells lumber for **\$30**; maker sells table to retailer for **\$90**; retailer sells to household for **\$140**.

Final sale = \$140
VA: sawmill 30
maker 90-30 = 60
retailer 140-90 = 50
30+60+50 = \$140 GDP

Adding all transaction prices gives \$260 and is wrong because \$30 and \$90 are intermediate sales already embodied in the final price.



GDP = final \$140 = Σ value added

Figure 1.1 redrawn with the worked values. Buyer uses it to produce again? Treat it as intermediate.

NOMINAL, REAL, DEFLATOR

	LAST YEAR	THIS YEAR
Tea	200 at \$2	220 at \$2.50
Bikes	20 at \$150	25 at \$160

Nominal now = $220(2.50) + 25(160) = 4,550$

Real now at base prices = $220(2) + 25(150) = 4,190$

Deflator = nominal ÷ real [use course convention]

TRAP CPI uses a fixed consumer basket and includes imports; the GDP deflator covers current domestic production with changing weights.

Using the displayed definition, $4,550 \div 4,190 \approx 1.086$ (108.6 when an index is expressed with base 100). Nominal growth mixes price and quantity change; real growth uses base-year prices and isolates quantity. Keep the year labels on every multiplication.

THREE LEDGERS, ONE TOTAL

Spending approach: final C+I+G+NX. **Income approach:** payments to labor and capital. **Value-added approach:** each producer's sales minus purchased inputs. They must agree because one buyer's spending becomes a seller's revenue and income. Unsold current production is inventory investment, preserving the identity.

PROMPT DETAIL	DECISION
US-owned plant abroad	Not US GDP: domestic means inside borders
New house	Residential investment
Pension / unemployment benefit	Transfer, not G purchase

9 · Tax Cut → Real Rate

M2 · FULL CHAIN

Given: $\bar{Y}=4,000$; $G=900$; T falls 800→700; $C=200+0.7(Y-T)$; $I=1,000-40r$.

BEFORE
 $C = 200 + 0.7(3,200) = 2,440$
 $S = 4,000 - 2,440 - 900 = 660$
 $1,000 - 40r = 660 \rightarrow r = 8.5\%$

AFTER TAX CUT
 $C = 200 + 0.7(3,300) = 2,510$
 $S = 4,000 - 2,510 - 900 = 590$
 $1,000 - 40r = 590 \rightarrow r = 10.25\%$

Saving falls by $MPC \times \text{tax cut} = 0.7 \times 100 = 70$; equilibrium investment falls 660→590. Output stays 4,000. The tax cut changes composition, not long-run total output.

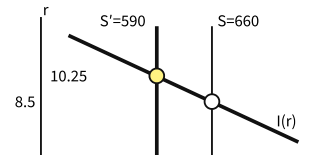


Figure 2.2 logic reversed. A tax cut reduces saving, raises r and crowds out investment.

FAST CHECKS

- ΔS from ΔT has the same sign and equals $MPC \times \Delta T$.
- If $S \downarrow$ while I slopes down, r must rise.
- Never claim Y changes in this long-run model.
- Business optimism shifts I right; with vertical S , quantity I remains S while r rises.

SECOND DRILL: SPENDING CUT

The guide's loanable-funds figure cuts G from **1,200** to **1,100**. With Y and C fixed, national saving rises from **500** to **600**. The supply line moves right; along downward-sloping $I(r)$, the real rate falls **6%**→**4%** and investment rises to **600**. This is crowding in.

SHOCK TEMPLATES

$G \downarrow 100 \rightarrow S \uparrow 100 \rightarrow r \downarrow \rightarrow I \uparrow 100$
 $T \uparrow 100 \rightarrow S \uparrow MPC \times 100 \rightarrow r \downarrow \rightarrow I \uparrow$
optimism → I demand right → $r \uparrow$; S quantity fixed

Why no ΔY? Flexible prices keep all K and L employed, so $Y=F(K,L)$. The real rate clears spending demand against that fixed supply. To change long-run Y , the prompt must change capital, labor or technology—not merely G , T or desired investment.

Factor-market cross-check: firms hire until $MPL=W/P$ and rent capital until its marginal product equals the real rental rate. Diminishing marginal product makes factor-demand curves slope down. In the guide's Figure 2.1, the real-wage line implies four workers are hired.

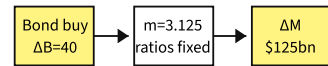
10 · Money Multiplier

M3 · FULL CHAIN

Given: $cr=0.25$; $rr=0.15$; Fed buys \$40bn of bonds from banks.

$\Delta B = +\$40\text{bn}$ reserves
 $m = (1+0.25)/(0.25+0.15)$
 $= 1.25/0.40 = 3.125$
 $\Delta M = 3.125 \times 40 = +\$125\text{bn}$

The answer assumes cr and rr stay fixed. If banks hold the new reserves idle, the effective multiplier is smaller. If the question changes cr or rr , recompute m ; it is not a base-only question.



$cr \uparrow$ or $rr \uparrow \rightarrow \text{denominator} \uparrow \rightarrow m \downarrow$

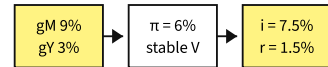
Money-creation chain redrawn from Figure 3.1 and the Module 3 worked example.

11 · Inflation & Fisher

M4 · FULL CHAIN

Given: money growth 9%; output growth 3%; stable velocity; long-run real rate 1.5%.

$\pi = 9 - 3 = 6\%$
 $i = r + \pi = 1.5 + 6 = 7.5\%$



State the velocity assumption before arithmetic

Figure 4.2 redrawn with the guide's worked values.

TRAP If velocity rises, inflation exceeds money growth minus output growth. The assumption earns the logic.

BALANCE-SHEET AND EXPECTATION CHECKS

Bank capital = assets-liabilities; **leverage** = assets/capital. If a bank has high leverage, a modest asset-value loss can erase capital, force lending cuts and transmit distress to firms. Reserves are not capital: reserves support settlement and withdrawals; capital absorbs losses.

A run raises household cash holdings ($cr \uparrow$) and can make banks hold extra reserves ($rr \uparrow$). Both reduce m , so M contracts even with an unchanged base. Conversely, a base expansion does not guarantee the textbook ΔM if either behavioral ratio moves.

12 · Solve IS-LM

M5 · 4-STEP ROUTINE

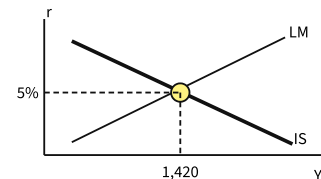
Given: $C=80+0.75(Y-T)$, $T=200$, $I=300-25r$, $G=250$, $M/P=920$, $L=Y-100r$.

1 · BUILD IS
 $Y=80+0.75Y-150+300-25r+250$
 $0.25Y=480-25r$
 $Y=1,920-100r$

2 · BUILD LM
 $920=Y-100r \rightarrow Y=920+100r$

3 · EQUATE, 4 · SUBSTITUTE
 $1,920-100r=920+100r \rightarrow r=5\%$
 $Y=920+500 = 1,420$

Check both curves: IS gives $1,920-500=1,420$; LM gives $920+500=1,420$.



IS and LM both pass through $(Y=1,420, r=5\%)$. Always substitute into both.

13 · Fed Easing: Then Prices

COURSE WORKED EXAMPLE

IS: $Y=2,400-100r$
LM₁: $Y=1,600+100r \rightarrow r=4, Y=2,000$
LM₂: $Y=1,800+100r \rightarrow r=3, Y=2,100$

Potential is 2,000, so output is 5% above potential. Prices rise, M/P falls and LM returns until $Y=2,000, r=4$. Long-run legacy: a higher price level; Y and r unchanged.

FINISH LINE After every policy shock, compare Y with Y . If unequal, price adjustment is not finished.

FISCAL EXPANSION WITH CROWDING OUT

Given: $C=60+0.8(Y-250)$, $I=240-20r$, $G=300$, $M/P=700$, $L=0.5Y-50r$. Then:

IS: $Y=2,000-100r$
LM: $Y=1,400+100r$
 $\rightarrow r=3, Y=1,700$

Raise G to 340: IS becomes $Y=2,200-100r$. Equating with unchanged LM gives $r=4, Y=1,800$. The Keynesian-cross shift is $40 \times [1/(1-.8)]=200$, but equilibrium Y rises only 100 because r rises and crowds out investment.

CHECK	BEFORE	AFTER G+
IS	$2000-100(3)=1700$	$2200-100(4)=1800$
LM	$1400+100(3)=1700$	$1400+100(4)=1800$
Direction	—	$r \uparrow, Y \uparrow$

14 · Confidence Boom

M6 · HORIZON DISCIPLINE

Given: $MV=PY$; $M=500$; $V=4$; $\bar{Y}=1,000$; $P=2$. Optimism raises V to 4.4.

Start: $Y=500 \times 4 \div 2 = 1,000$
Short run, P fixed: $Y=500 \times 4.4 \div 2 = 1,100$
Long run, $Y=\bar{Y}$: $P=500 \times 4.4 \div 1,000 = 2.2$
Output first rises 10% above potential. Then prices rise until output returns to potential. Final effect: P 10% higher; no lasting output gain.

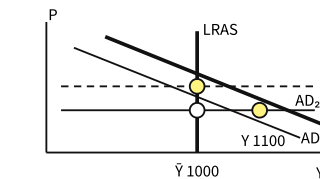


Figure 6.2 logic reversed. Boom: $A \rightarrow B$ at fixed P , then $P \uparrow$ moves along new AD back to $\bar{Y}$.

15 · Demand vs Supply Shock

M6 · CHOOSE POLICY

SHOCK	P	Y	DIAGNOSIS
AD left	↓ after adjustment	↓ first, then $\bar{Y}$	Same-direction P/Y initially
Adverse supply	↑	↓	Stagflation
Accommodate supply shock	stays high	returns $\bar{Y}$	AD right; accepts price rise

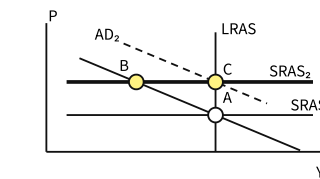


Figure 6.3 redrawn. Supply shock $A \rightarrow B$; accommodation restores Y at C but keeps the higher P .

SELF-CORRECTION AFTER A DEMAND SLUMP

AD shifts left and the economy first moves from A to B at the old fixed price level: $Y < \bar{Y}$. The price-adjustment rule then makes P fall. Lower P raises M/P , shifts LM right, lowers r and raises investment. The economy moves down along the new AD curve until Y returns to $\bar{Y}$ at C , with a lower price level.

Why policy is easier for demand shocks: P and Y move in the same direction, so shifting AD back can address both. An adverse supply shock raises P while lowering Y . Expanding AD restores output only by validating the higher price level; keeping AD fixed restrains prices at the cost of a longer slump.

16 · Hot Labor Market

M7 · FULL CHAIN

Given: $\pi = 2.5\%$; $\beta = 0.4$; $u^0 = 4.5\%$; u falls to 3.5%; no supply shock.

$u - u^0 = 3.5 - 4.5 = -1$ point
 $\pi = 2.5 - 0.4(-1) = 2.9\%$
growth $\approx 3 - 2(-1) = 5\%$

This is demand-pull inflation. If it raises next year's expected inflation, the Phillips curve shifts up and the same u produces higher inflation.

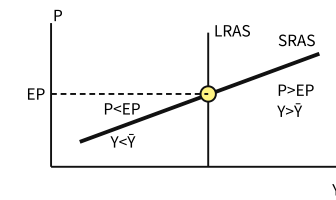


Figure 7.1 redrawn. SRAS crosses LRAS where P equals expected P ; surprises create output gaps.

17 · Method Chooser & Traps

ALL MODULES

IF THE QUESTION GIVES...	USE
Transactions / prices / quantities	GDP identity, value added, real vs nominal
$Y, C, G, T, I(r)$	$S=I$; solve long-run r
cr, rr , base change	$m=(1+cr)/(cr+rr)$; ΔM
money/output growth	$MV=PY$ growth; then Fisher
$C, I(r), G, M/P, L(r, Y)$	Build IS and LM; equate
Shock plus horizon	IS-LM first; then compare Y with $\bar{Y}$ and adjust P
u, u^0, π, β, v	Okun + Phillips; preserve signs

- Movement ≠ shift:** changing an axis variable moves along; changing an exogenous determinant shifts.
- Long run: fiscal policy changes r and composition, not $\bar{Y}$.
- Money growth causes long-run inflation only with stable V and capacity-determined Y .
- IS fiscal expansion raises r ; LM monetary expansion lowers r .
- Demand shocks move P and Y together initially; supply shocks move them oppositely.

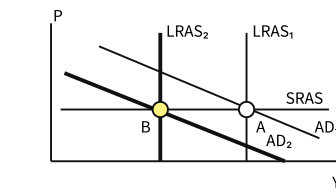


Figure 7.2 redrawn. The 2020 shutdown shifted both AD and productive capacity left; output fell without ordinary spare capacity.