Aalto University
School of Business

31E2300
MACROECONOMICS: POLICY

THE THREE EQUATION MODEL IN ACTION

ANOTHER EXAMPLE: POSITIVE PERMANENT AS SHOCK

Adjustment to a positive, permanent aggregate supply shock:

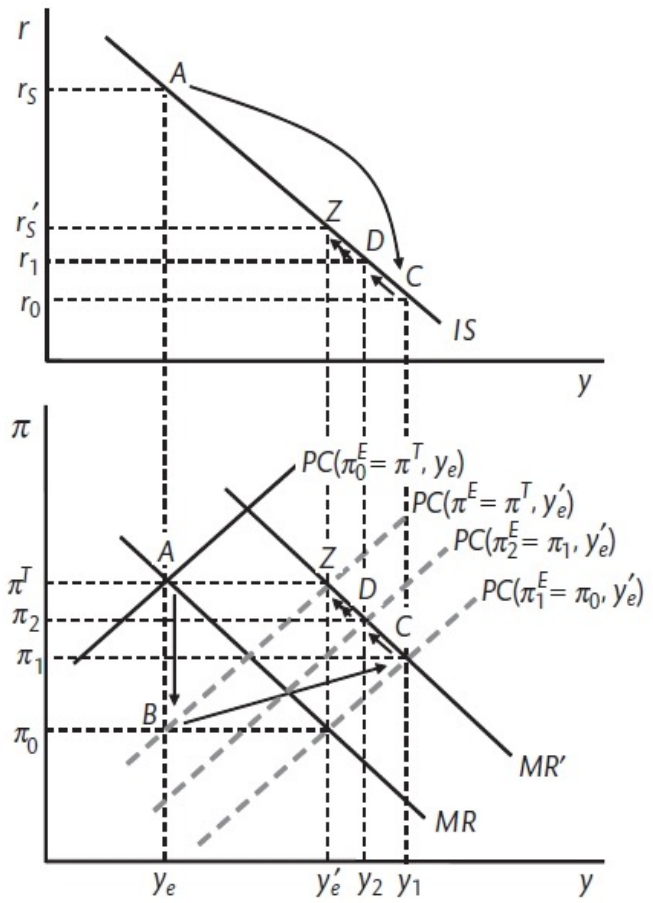


Figure 3.14 The adjustment of the economy to a positive permanent aggregate supply shock.

AS Shock: Shift in WS or PS Curves (see Ch.2)

Equilibrium output increases from y_e to $y_e{}'$.

The PC Curve shifts down to $\mathrm{PC}\,(\pi_0^E = \pi^T, y_e{}')$ due to this change in y_e.

Current output does not change immediately (still at y_e), while inflation falls to π_0; Economy moves from A to B.

What do the **impulse response functions** look like?

QUESTION

DOES IT MAKE SENSE TO TREAT COVID AS A NEGATIVE (TEMPORARY?) AS SHOCK AND, IF SO, WHAT WOULD THE 3-EQUATION MODEL PREDICT?

ANOTHER EXAMPLE: THE DEFLATION TRAP

- Recall the Fisher equation from Ch. 1: $i = r + \pi^E$
- *The Zero Lower Bound (ZLB) on* i *states that* $\min i = 0$ *, which implies that* $\min r \geq -\pi^E$.
- If expected inflation is -1%, the minimum *r* attainable is 1%.
- *KEY INSIGHT:* r *cannot be reduced below 1% to achieve* y_e*, the ZLB is hit and the economy is stuck at a depressed level of output (*y_0*).*

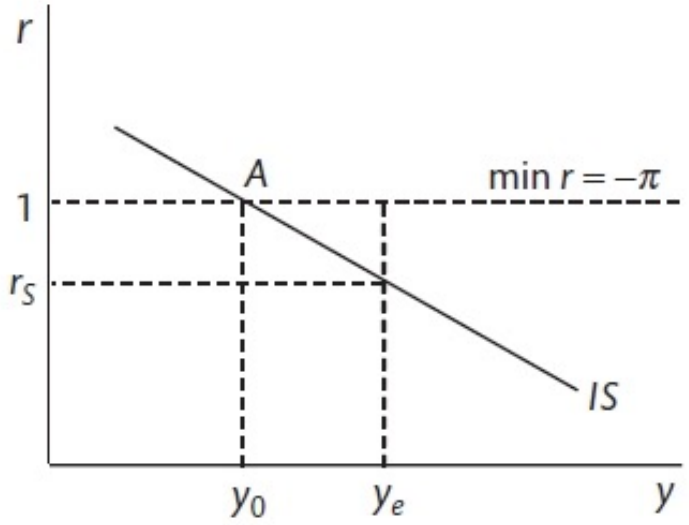


Figure 3.12 The zero lower bound on the nominal interest rate.

THE DEFLATION TRAP IN THE 3-EQUATION MODEL (FOLLOWING PERMANENT NEGATIVE AD SHOCK)

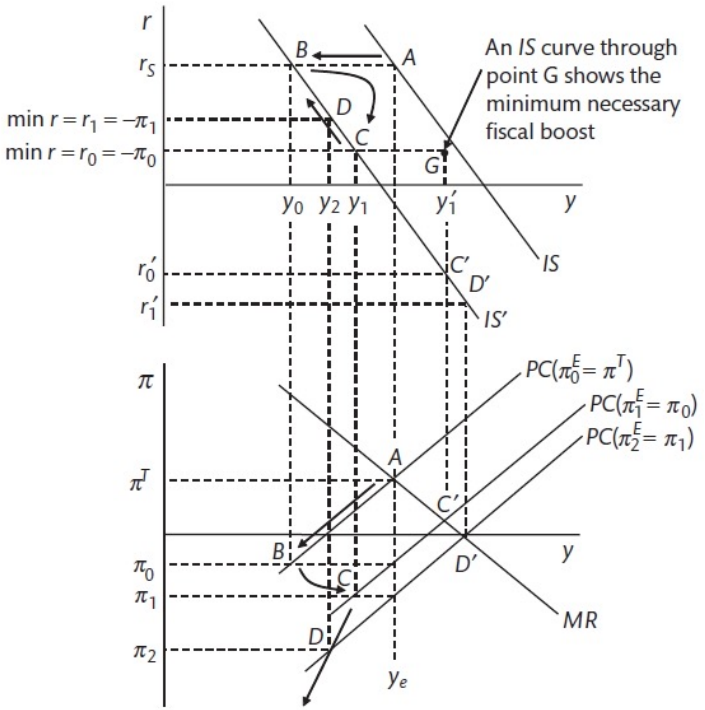


Figure 3.13 How a large negative permanent aggregate demand shock can lead to the economy entering a deflation trap.

Period 0:

- Large & permanent negative AD shock: The IS shifts to IS'.
- Inflation is now negative (Deflation), as the economy moves to point 'B'.
- Given the forecasted PC ($\pi_1^E = \pi_0$), the CB would like to choose optimal point C' on the MR, which requires setting $r_0{}'$.
- However, $r_0{}'$ is below the minimum that can be achieved by setting a zero nominal int. rate, so the CB can only set the minimum $r_0 = -\pi_0$.

Period 1:

- The lower r_0 increases y, but y is <u>still below equilibrium</u> at point C
- Thus, inflation falls further to π_1 and the CB forecasts the next period's PC to be PC ($\pi_2^E = \pi_1$)
- Given this PC, the ideal point for the CB is D', which requires setting $r_1{}'$.
- However, the minimum attainable real int. rate is $r_1 = -\pi_1$.
- Thus the economy ends this period with lower inflation at π_1, lower output y_1, and a higher real int. rate $r_1 = -\pi_1$.

THE DEFLATION TRAP IN THE 3-EQUATION MODEL (FOLLOWING PERMANENT NEGATIVE AD SHOCK)

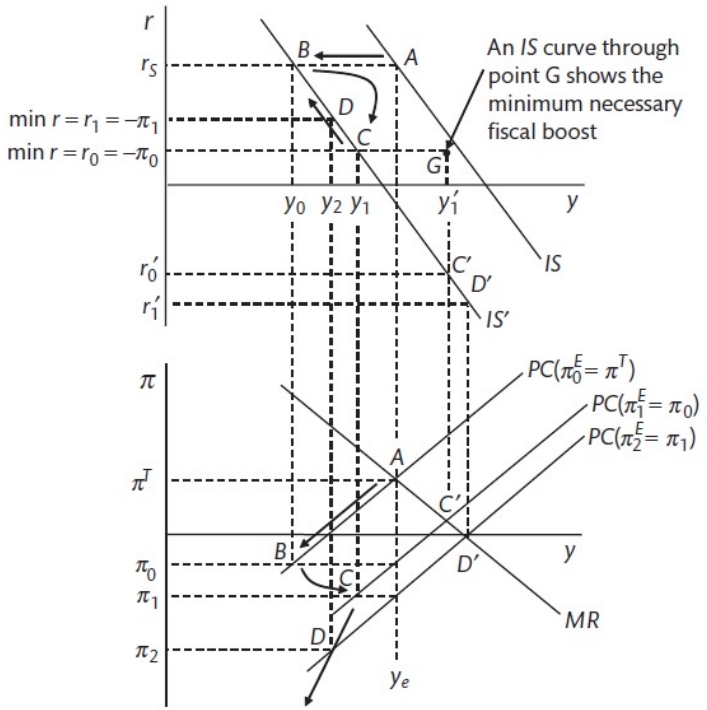


Figure 3.13 How a large negative permanent aggregate demand shock can lead to the economy entering a deflation trap.

Period 2 onwards:

- The higher interest rate r_1 dampens demand, output and inflation both fall to y_2 and π_2 respectively (point 'D').
- The economy enters a Deflation Trap: In each future period, inflation falls further, causing r to increase and output to fall continuously.
- Conventional (int. rate based) monetary policy is ineffective in reverting the economy back to its medium-run equilibrium.

SOLUTIONS TO ZLB PROBLEMS

1. Shifting the IS rightwards (through point 'G') after the initial AD shock.
    - e.g. Increase in autonomous consumption or investment; Fiscal Policy.
    - CB can then achieve desired point C' by setting r_0.

2. Creating more positive inflation expectations.
    - If inflation expectations are less negative (π^E higher), then $\min r$ is lower and the PC curve shifts up.
    - Conventional MP now works to bring the economy back to equilibrium.

3. Unconventional Monetary Policy (Ch. 7)

A WORD OR TWO ABOUT EXPECTATIONS

- Expectations are formed by households, firms and the state. Expectations influence consumption, investment, wage-setting and policy decisions.

- How is this reflected in 3-Equation Model?

  i. IS Curve

  Tobin's Q: Firms and equity markets form expectations of future profits

  Permanent Income Hypothesis: Households form expectations over their future income.

  ii. PC Curve

  Wage setters form inflation expectations (π_t^E)

  iii. MR Curve

  Policy maker(s) forecast inflationary expectations, position of IS curve.

RISK VESUS UNCERTAINTY (VERSUS AMBIGUITY?)

- Expectations are a vital part of economic life, but are more complicated, many would now argue, than standard calculation of expected value.
- Risk is when *"well-behaved probabilities," objective or subjective, can be attached to the full set of future outcomes.* Economic models have this property, but does life?
- This doesnt mean such models are simple.

e.g. The Bank of England Fan Chart

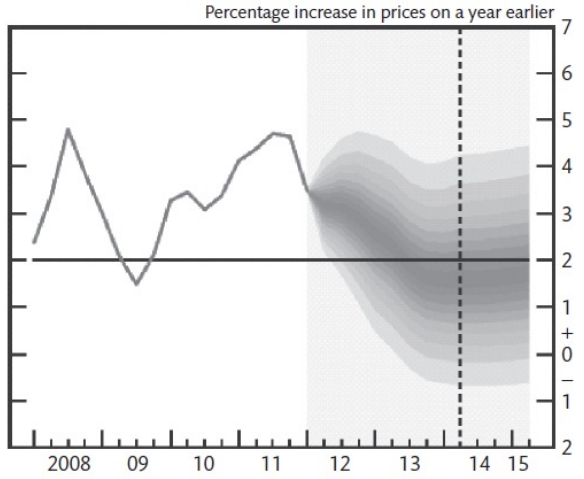
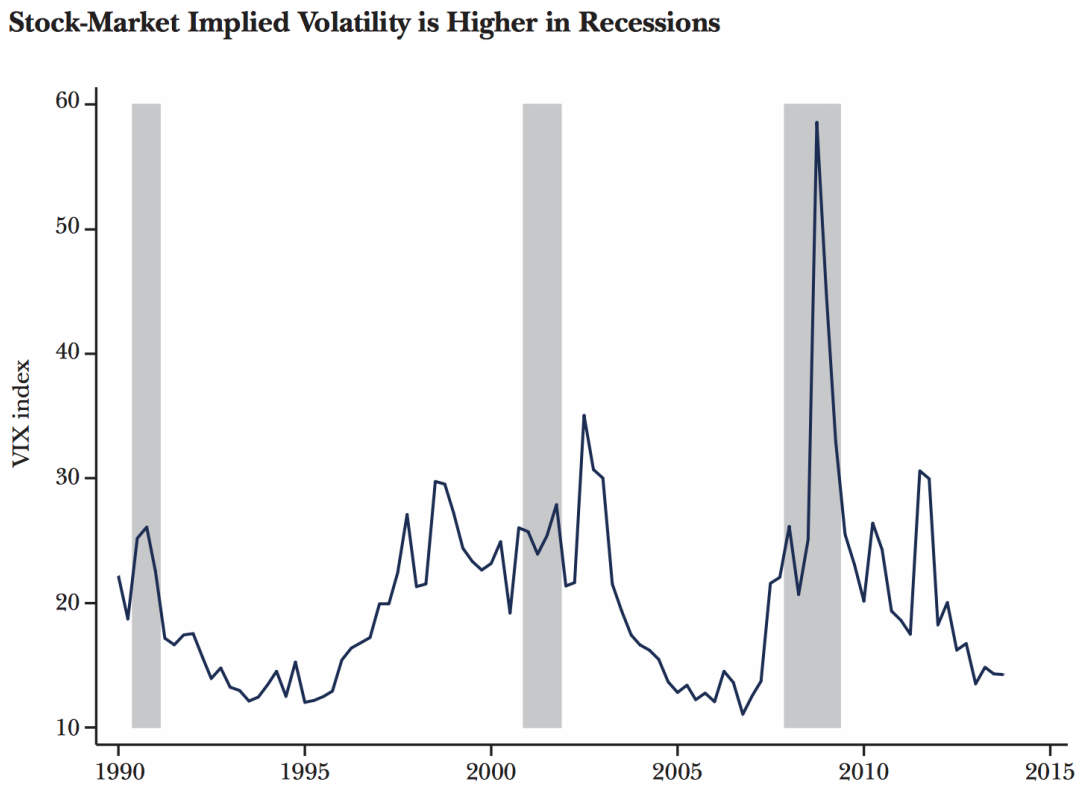


Figure 4.1 Bank of England's CPI inflation projection based on market interest rate expectations and £325 billion asset purchases.

RISK VESUS UNCERTAINTY (VERSUS AMBIGUITY?)

- According to Keynes and/or Hayek, an environment is uncertain if it is impossible to assign probabilities and/or the full set of outcomes isn't knowable.
- Experimentalists/behavioralists have attempted to capture this with the notion of "ambiguous" or "non-additive" probabilities. Review the Ellsberg Paradox. (It is now common to measure not just risk aversion but ambiguity aversion too.)
- How might uncertainty matter? We're reasonably confident, for example, that increased uncertainty is associated with stock market volatility.

BLOOM (JEP, 2014)



The point is not that stock values are (just) lower in a recession but rather that the stock market is also more volatile.

What are the implications for, say, the q-theory of investment?

INTRODUCING CENTRAL BANK CREDIBILITY

Anchoring Inflation Expectations:

- *Central bank communication* is used to keep inflation expectations (π^E) anchored at the inflation target (π^T).
- If the inflation target is perfectly credible and π^E is anchored, then an inflation shock will only last for one period.
- There is costless disinflation (unemployment does not rise): The PC reverts back to the one indexed by π^T in the next period.

Modelling CB credibility (χ):

- PC: $\pi_t = [\chi\pi^T + (1-\chi)\pi_{t-1}] + \alpha(y_t - y_e)$ where $\pi_t^E = \chi\pi^T + (1-\chi)\pi_{t-1}$
- Expected Inflation is a weighted average of the inflation target and lagged inflation.

Modelling:

CB Credibility (χ) and the adjustment to an inflation shock:

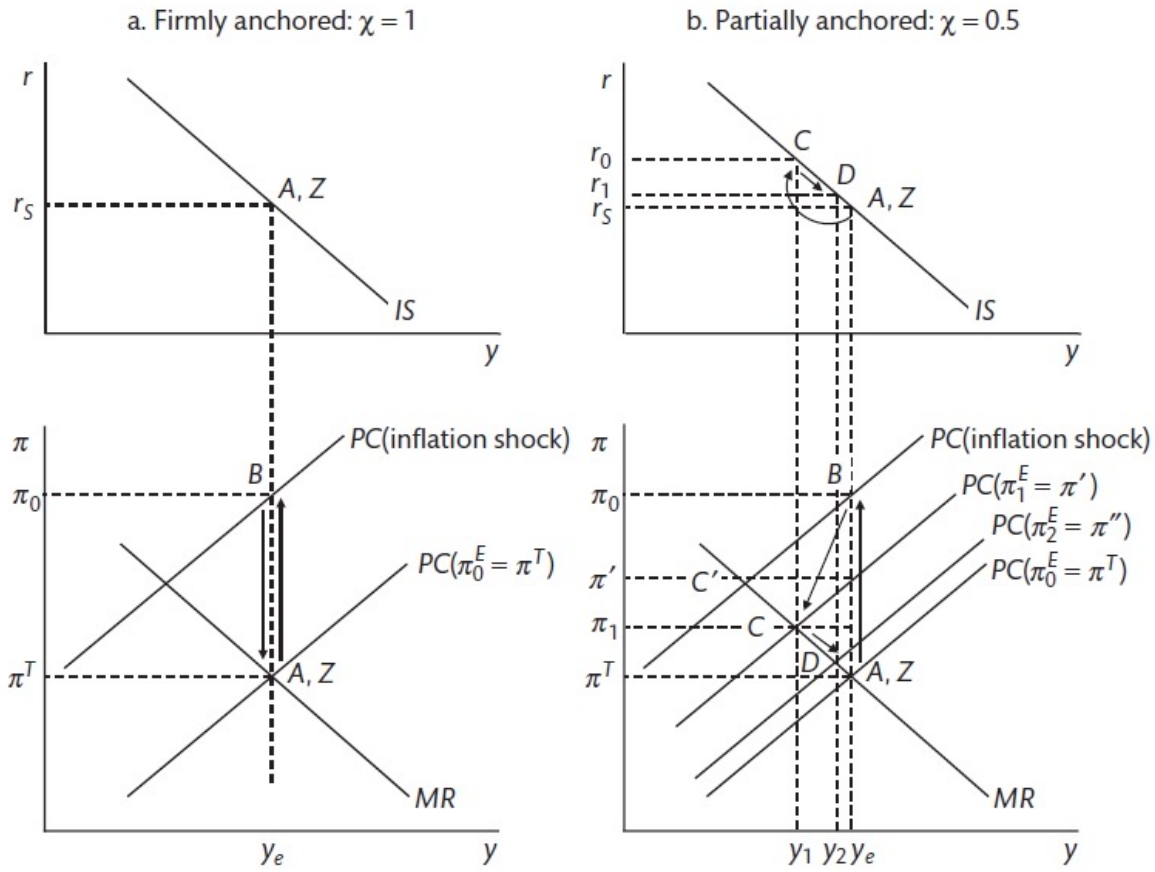


Figure 4.6 Varying the level of central bank credibility, using the example of an inflation shock:
a. Firmly anchored: $\chi = 1$
b. Partially anchored: $\chi = 0.5$.

Modelling:

CB Credibility (χ) and the adjustment to an inflation shock :

$\chi = 0$: Fully Backward-looking

- After a π shock, CB needs to raise r → some periods with $y_t < y_e$.

$\chi = 1$: Firmly anchored at π^T

- Only 1 period effect of π shock → PC reverts to PC ($\pi_0^E = \pi^T$) → CB does not need to change r → $y_t = y_e$ (Disinflation is costless)

$\chi = 0.5$: Partially anchored at π^T

- After a π shock, CB needs to raise r, but to a lesser extent than $\chi = 0$ → fall in output is lower, adjustment to equilibrium quicker
- PC shifts down to PC ($\pi_0^E = \pi'$) instead, economy moves to point C