Intermediate Macroeconomics (UN3213)
Recitation 1

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Introduction

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Content of Recitations

What we'll cover in recitations includes but is not limited to:

- Review of material taught in the lectures (with examples and applications),
- A more in-depth look at some of the math involved in macroeconomic models,
- Discussion/solution of homework problems,
- Addressing any questions you have $\cdots$

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The New-Keynesian model

- The primary aim of the New-Keynesian model is to study how monetary policy affects real economic variables like output, employment, etc.
- *Micro-foundations*: A model of households and firms each solving their own optimization problems.
- The key feature of the NK model is that of **nominal price rigidity**, i.e. firms may not be able to freely adjust prices of goods they are selling
- Building blocks
  - Philips curve
  - IS (Investment-Savings) curve
  - Monetary policy rule

Setup and notation

- Two objectives of the central bank
  - Output stabilization (close to full employment level)
  - Price stabilization (target 2% level of inflation)
- Denote the central bank's target levels of inflation and output as $\bar{\pi}$ and $\bar{y}$.
- Deviations from target:
  $\hat{\pi} = \pi - \bar{\pi}$
  $\hat{y} = \frac{y - \bar{y}}{\bar{y}}$

  Also for expected inflation π^e, define
  $\hat{\pi}^e = \pi^e - \bar{\pi}$
- Successful conduct of monetary policy involves output and inflation staying close to target levels despite shocks to the economy.

Phillips curve

- A supply-side relation between inflation and output.

$$\hat{\pi} = \beta \hat{\pi}^e + \kappa \hat{y} + \epsilon^{CP}$$

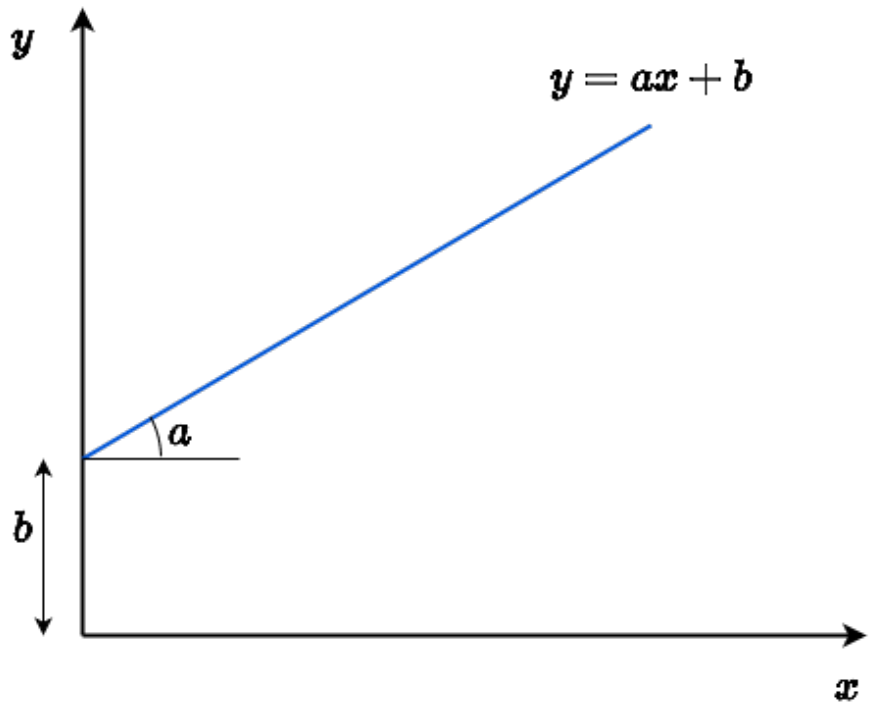
  where $\kappa, \beta > 0$.
- β is the subjective discount factor, the rate at which people discount their future (impatience)
  Lower β, more impatient.
- ϵ^{CP} are exogenous cost-push shocks (e.g. changes in the price of oil, disruptions in the global supply chain)
- Dependence on expected inflation arises due to the presence of nominal rigidities.
  - Firms anticipate inflation to go up in the future. But it may be costly to raise prices in future periods.

A quick refresher on plotting equations

Consider the linear equation

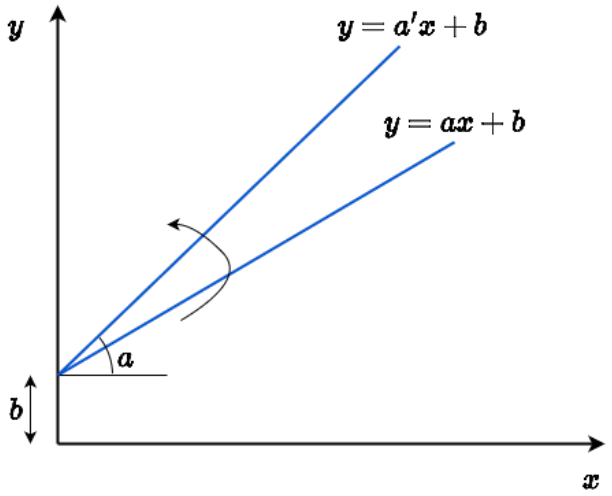
$$y = ax + b$$

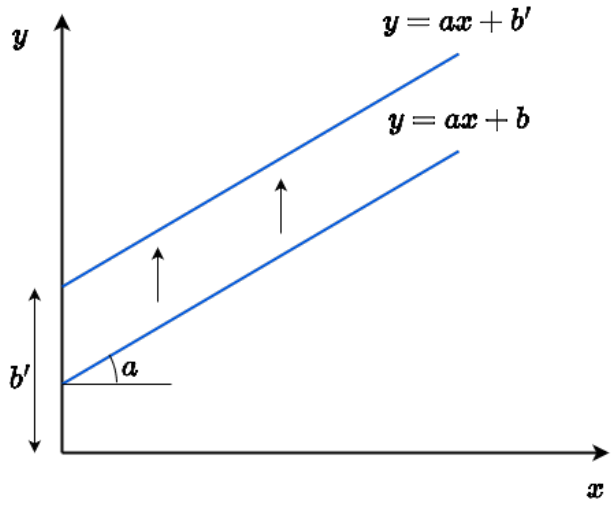
a is the slope and b is the intercept. An example with $a, b > 0$ looks as below



A quick refresher on plotting equations

An increase (decrease) in a leads to a steepening (flattening) of the line. An increase (decrease) in b leads to an upward (downward) shift.
Suppose $a' > a$ and $b' > b$



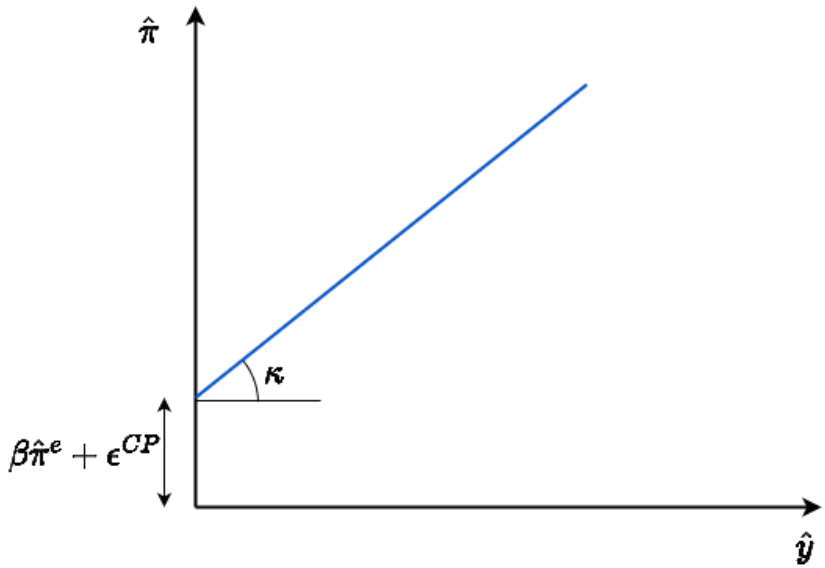


a and b are *parameters* in this equation.
The equation is being plotted in the (x, y) space. x and y are *endogenous variables* in this example.
Changes in x or y reflect movements *along* the curve, but do not change the position of the curve.

Plotting the Phillips curve

- Plotting the Phillips curve in $(\hat{y}, \hat{\pi})$ space:

$$\hat{\pi} = \kappa \cdot \hat{y} + (\beta \hat{\pi}^e + \epsilon^{CP})$$



- Changes in κ affect the slope
- Changes in expectations or ϵ^{CP} (cost push shocks) lead to shifts in the Phillips curve.

IS curve

- A demand-side relation between consumption and (expected) inflation
- Captures the consumption-saving trade-off of households

$$\frac{c - \bar{y}}{\bar{y}} = -\gamma(\hat{i} - \hat{\pi}^e) + \epsilon^d$$

  where $\gamma > 0$ is the intertemporal elasticity of substitution
- i is the nominal interest rate, and $\bar{i}$ is its baseline level. $\hat{i} = i - \bar{i}$

  Real interest rate: How much a dollar of savings is worth next year (in terms of what can be bought with it). $r = i - \pi^e$
- Note the national income accounting identity

$$y = c + \underbrace{I + g + nx}_{=0 \text{ by assumption}}$$

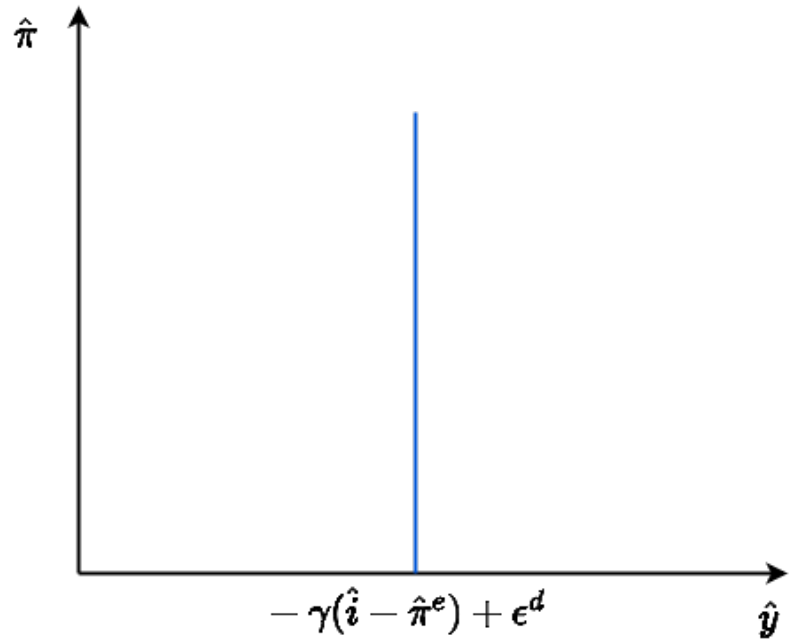
  This is also the goods market clearing condition. Substitute into IS equation.

$$\hat{y} = -\gamma(\hat{i} - \hat{\pi}^e) + \epsilon^d$$

Plotting the IS curve

We want to plot the IS curve in the $(\hat{y}, \hat{\pi})$ space.

- $\hat{y}$ does not depend on $\hat{\pi}$. Therefore it is constant.
- The output gap is positive if $\epsilon^d > \gamma(\hat{i} - \hat{\pi}^e)$
  The output gap is negative if $\epsilon^d < \gamma(\hat{i} - \hat{\pi}^e)$



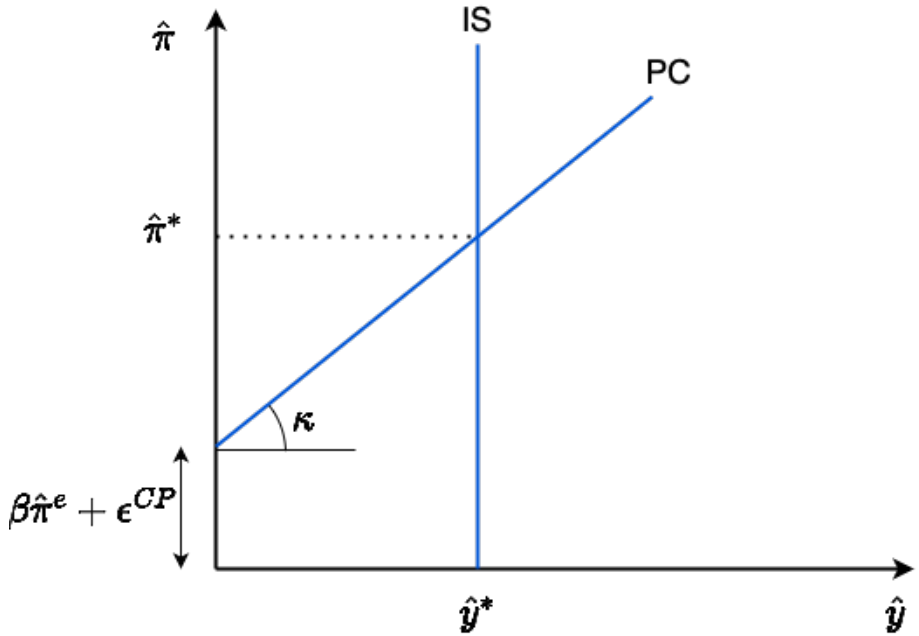
Summarizing

The IS and PC curves constitute two equations in the $(\hat{y}, \hat{\pi})$ space.

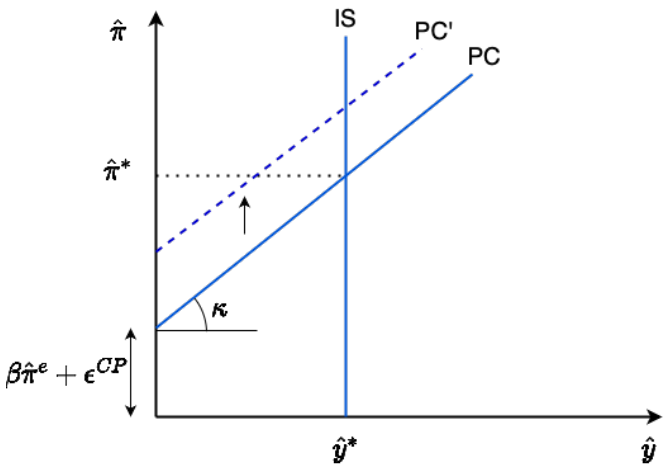
$$\hat{\pi} = \beta \hat{\pi}^e + \kappa \hat{y} + \epsilon^{CP}$$

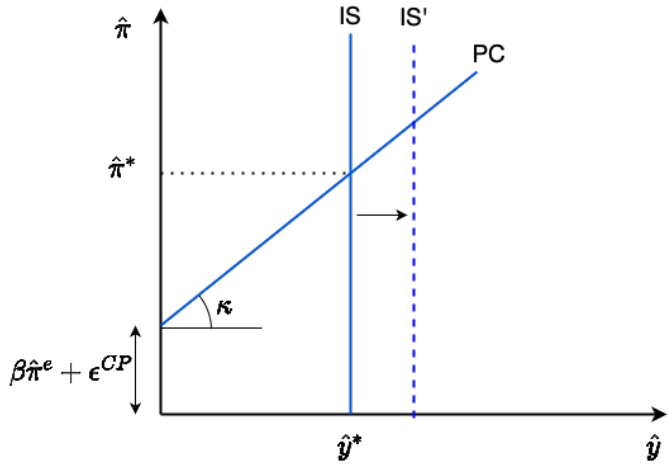
$$\hat{y} = -\gamma(\hat{i} - \hat{\pi}^e) + \epsilon^d$$

Given a level of nominal interest rate i, can plot the two together to solve for equilibrium values of $\hat{y}, \hat{\pi}$



Effect of shocks





Effects of

- A positive cost push shock: Higher inflation and unchanged output, (e.g. stagflation of the 1970s),
- A positive demand shock: Higher inflation and higher output.

Optimal monetary policy

- The IS and PC curves constitute a system of two equations with three unknowns, $\hat{y}, \hat{\pi}, \hat{i}$.

$$\hat{\pi} = \beta \hat{\pi}^e + \kappa \hat{y} + \epsilon^{CP}$$

$$\hat{y} = -\gamma(\hat{i} - \hat{\pi}^e) + \epsilon^d$$

- If the central bank specifies a monetary policy, i.e. a value for $\hat{i}$, this allows us to solve for values of $\hat{y}, \hat{\pi}$.
- When expectations are anchored ($\pi^e = \bar{\pi}$) and there are no shocks ($\epsilon^{CP} = \epsilon^d = 0$), setting $\hat{i} = 0$ ensures $\hat{\pi} = \hat{y} = 0$ (no trade-off between output and price stabilization)
- A policy trade-off in response to cost push shocks, but none in response to demand shocks.