Monetary Policy

Part 2: Conventional Monetary Policy

Lecture 7: Solving the IS-MP-PC Model, Rational Expectations, Time-Inconsistency

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Outline

Part 1: Basic Macroeconomic Concepts

Part 2: Conventional Monetary Policy

- Lecture 5: Monetary Policy Framework: Optimal Rate of Inflation, Inflation Targeting
- Lecture 6: Monetary Policy Rules, The Complete IS-MP-PC Model
- Lecture 7: Solving the IS-MP-PC Model, Rational Expectations, Time-Inconsistency and Credibility

Part 3: Monetary Policy at the Zero Lower Bound on Nominal Interest Rate

Part 4: Monetary and Fiscal Interactions

Part 5: Financial Stability (if time permits)

Mock Exam

Learning Objective of Today‘s Lecture

1. Understanding how to solve a macroeconomic model
2. Understanding rational expectations and their implications
3. Understanding the impact of monetary policy and the stability properties of the IS-MP-PC model.
4. Understanding the time-inconsistency problem and why the credibility of central banks is very important.

Literature

Required reading

- Karl Whelan (2020). Lecture Notes on Macroeocnomics, Chapter 2 “Analysing the IS-MP-PC Model“ and Chapter 3 “The Taylor Principle“ pp. 25-36. https://www.karlwhelan.com/Macro2/Whelan-Lecture-Notes.pdf

Optional reading

- Clarida, Galí and Gertler (2000), “Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory”, *Quarterly Journal of Economics* 115(1): 147-180.
- Carl Walsh (2002), “Teaching Inflation Targeting: An Analysis for Intermediate Macro“, Journal of Economic Education, Fall 2002: 333-346. https://people.ucsc.edu/~walshc/MyPapers/walsh_jee.pdf
- Ed Balls and Anna Stanbury (2017), “Twenty years on: Is there still a case for Bank of England independence, VoxEU column, https://voxeu.org/article/twenty-years-there-still-case-bank-england-independence.

7.1 Solving the IS-MP-PC Model

IS-MP-PC Model

So far, we have used graphical analysis to shock dynamics and policy reactions. Solving the model algebraically has several advantages

1. We can quantify the impact of shocks and of policy reactions and analyze the timing of dynamics accurately
2. We can study how the dynamics depend on the structural parameters of the model (α, γ) and the policy parameter β_π
3. We can study stability properties of the model (the Taylor principle will be key for stability)
4. We can study how expectations are determined (under rational expectations, the Taylor principle and a fully credible central bank we will get $\pi_t^e = \pi^*$)

Recall the equations of the IS-MP-PC model

1. The Phillips curve: $\pi_t = \pi_t^e + \gamma\,(y_t - y^*) + \varepsilon_t^\pi$
2. The IS curve: $y_t = y_t^* - \alpha(i_t - \pi_t - r^*) + \varepsilon_t^y$
3. The MP curve: $i_t = r^* + \pi^* + \beta_\pi(\pi_t - \pi^*)$

Combining the IS and MP curve simplifies the model to two equations (this was particularly useful for graphical analysis, but we need to combine the equations also for solving the model)

1. The Phillips curve: $\pi_t = \pi_t^e + \gamma\,(y_t - y^*) + \varepsilon_t^\pi$
2. The IS-MP curve: $y_t = y_t^* - \alpha(\beta_\pi - 1)(\pi_t - \pi^*) + \varepsilon_t^y$

Model Solution – Some Preliminary Remarks

Our model (the version with PC and IS-MP curve) consists of the following elements:

- Endogenous variables: π_t, y_t
- Exogenous variables: y^*, π^*, ε_t^π, ε_t^y
- Expectation terms: π_t^e
- Structural parameters: α, γ
- Policy parameters: β_π

So far, in our system of equations π_t depends on y_t and y_t depends on π_t. Two cases for solving the model:

1. Taking *all* variables except for the endogenous variables as given, solving the model means that we want to express the two endogenous variables π_t and y_t in terms of all other model elements. In this way we can directly study the impact of exogenous variables on endogenous variables and the impact of changes in parameters.
2. A rational expectations solution would in addition solve for expectation terms. In this case, expectations are not taken as given, but are determined based on the model structure. Agents are assumed to know the model structure and to use it to form expectations. A rational expectations solution will express π_t and y_t only in terms of *exogenous* variables.

In both cases, once we have a solution for π_t and y_t we can infer i_t via the MP curve and r_t via the Fisher equation.

Solving the Model for Inflation

We have two equations (PC and IS-MP) in two unknowns π_t and y_t:

$$\pi_t = \pi_t^e + \gamma\,(y_t - y^*) + \varepsilon_t^\pi$$
$$y_t = y_t^* - \alpha(\beta_\pi - 1)(\pi_t - \pi^*) + \varepsilon_t^y$$

Writing the IS-MP equation in terms of the output gap, we can directly substitute it into the Phillips curve:

$$\pi_t = \pi_t^e + \gamma\left(-\alpha(\beta_\pi - 1)(\pi_t - \pi^*) + \varepsilon_t^y\right) + \varepsilon_t^\pi$$

Re-arranging yields:

$$\pi_t = \left(\frac{1}{1 + \alpha\gamma(\beta_\pi - 1)}\right)\pi_t^e + \left(\frac{\alpha\gamma(\beta_\pi - 1)}{1 + \alpha\gamma(\beta_\pi - 1)}\right)\pi^* + \frac{\gamma\varepsilon_t^y + \varepsilon_t^\pi}{1 + \alpha\gamma(\beta_\pi - 1)}$$

Defining

$$\theta = \frac{1}{1+\alpha\gamma(\beta_\pi - 1)}$$

We get

$$\pi_t = \theta\pi_t^e + (1-\theta)\pi^* + \theta(\gamma\varepsilon_t^y + \varepsilon_t^\pi)$$

Interpreting the Solution for Inflation

Solution for inflation

$$\pi_t = \theta\pi_t^e + (1-\theta)\pi^* + \theta(\gamma\varepsilon_t^y + \varepsilon_t^\pi), \quad \text{with } \theta = \frac{1}{1+\alpha\gamma(\beta_\pi - 1)}$$

Let's focus on the case $\beta_\pi > 1$ for now. It implies $0 < \theta < 1$.

- Inflation is between the public's inflation expectations and the inflation target
  - An increase in β_π increases the response of the central bank to inflation deviations from target. This decreases θ.
  - The more the central bank reacts to an increase in inflation, the more output is dampened and the closer is inflation to target.
- Demand and supply shocks affect inflation
  - Supply shocks have a direct effect on inflation that is dampened by the effects of the central bank reaction captured by θ.
  - The effect of demand shocks affects inflation with the factor γ (slope of the PC) and is also dampened by the central bank reaction captured by θ.
  - The larger is the central bank reaction, the smaller is θ and this decreases the effects of shocks on inflation.

Solving the Model for Output

Recall the IS-MP curve

$$y_t = y_t^* - \alpha(\beta_\pi - 1)(\pi_t - \pi^*) + \varepsilon_t^y$$

Re-writing the solution for inflation in terms of the inflation gap yields

$$\pi_t - \pi^* = \theta(\pi_t^e - \pi^* + \gamma\varepsilon_t^y + \varepsilon_t^\pi)$$

Substituting into the IS-MP curve

$$y_t = y_t^* - \alpha(\beta_\pi - 1)\big(\theta(\pi_t^e - \pi^* + \gamma\varepsilon_t^y + \varepsilon_t^\pi)\big) + \varepsilon_t^y$$

This can by simplified to

$$y_t = y_t^* - \theta\alpha(\beta_\pi - 1)(\pi_t^e - \pi^* + \varepsilon_t^\pi) + (1 - \theta\alpha\gamma(\beta_\pi - 1))\varepsilon_t^y$$

Interpreting the Solution for Output

Solution for output:

$$y_t = y_t^* - \theta\alpha(\beta_\pi - 1)(\pi_t^e - \pi^* + \varepsilon_t^\pi) + (1 - \theta\alpha\gamma(\beta_\pi - 1))\varepsilon_t^y$$

The term $-\theta\alpha(\beta_\pi - 1)$ is negative if $\beta_\pi > 1$.

- Output falls short of potential output if inflation expectations exceed the inflation target. The size of the effect increases with β_π.
- Intuition: An increase in inflation expectations leads to an increase in inflation, so that the central bank increases the nominal interest rate. If the Taylor principle is fulfilled, the real interest rate increases, so that output decreases via the IS curve.
- Inflationary shocks $\varepsilon_t^\pi > 0$ have a negative effect on output via the reaction of the central bank.

The term $(1 - \theta\alpha\gamma(\beta_\pi - 1))$is positive if $\beta_\pi > 1$ and the model parameters fall in a range that is empirically plausible (small α and γ)

- Demand shocks $\varepsilon_t^y > 0$ increase output.
- The increase in output decreases in β_π, i.e. the more aggressive the central bank reacts, the more demand shocks are dampened.

Rational Expectations Solution for Inflation

Solution for inflation so far took π_t^e as given:

$$\pi_t = \theta\pi_t^e + (1-\theta)\pi^* + \theta(\gamma\varepsilon_t^y + \varepsilon_t^\pi), \quad \text{with } \theta = \frac{1}{1+\alpha\gamma(\beta_\pi - 1)}$$

Let's assume that the model is an accurate description of reality. In this case it is plausible to determine expectations in the model itself.

We need to be precise regarding the timing of expectations. π_t^e means expectations about current inflation based on the information available in the previous period:

$$\pi_t^e = \pi_{t|t-1}^e = E_{t-1}\pi_t.$$

Find $\pi_{t|t-1}^e$ by taking the expected values conditional on information in $t-1$ and assuming that future shocks have expected value zero: $E_{t-1}\varepsilon_t^y = E_{t-1}\varepsilon_t^\pi = 0$

$$E_{t-1}\pi_t = E_{t-1}\left[\theta\pi_t^e + (1-\theta)\pi^* + \theta(\gamma\varepsilon_t^y + \varepsilon_t^\pi)\right]$$

$$\Leftrightarrow \pi_{t|t-1}^e = \theta\pi_{t|t-1}^e + (1-\theta)\pi^*$$

$$\Leftrightarrow (1-\theta)\pi_{t|t-1}^e = (1-\theta)\pi^*$$

$$\Leftrightarrow \pi_{t|t-1}^e = \pi^*$$

Rational Expectations Solution for Inflation

Plugging in $\pi_t^e = \pi^*$ into the solution for inflation yields:

$$\pi_t = \theta\pi^* + (1-\theta)\pi^* + \theta\left(\gamma\varepsilon_t^y + \varepsilon_t^\pi\right)$$

$$\pi_t = \pi^* + \theta\left(\gamma\varepsilon_t^y + \varepsilon_t^\pi\right)$$

This is the rational expectations solutions. The term model-consistent expectations rather than rational expectations might be an even more accurate description of the underlying assumptions.

Expectations are anchored at the inflation target: $\pi_t^e = \pi^*$. Inflation only deviates from target if unexpected shocks occur. Once shocks fade out, inflation is directly back at target.

- This is a strong result that implies a reduction in inflation volatility compared to adaptive expectations.
- Implies a reduction in output as well. Recall that monetary policy in this model affects first output via the IS equation and then inflation via the PC.
- With anchored inflation expectations, counter-clockwise inflation-output loops following demand shocks are avoided. Following supply shocks, inflation and output return much faster to steady state compared to adaptive expectations.
- These results can only be achieved if there is no uncertainty regarding the structural equations IS and PC, its parameters and exogenous variables and if there is no uncertainty regarding the policy equation MP and its parameters. This is a crucial assumption: Agents fully trust that the central bank will always set interest rates based on the MP curve and will not deviate.

Rational Expectations Solution for Output

Recall the solution for output

$$y_t = y_t^* - \theta\alpha(\beta_\pi - 1)(\pi_t^e - \pi^* + \varepsilon_t^\pi) + (1 - \theta\alpha\gamma(\beta_\pi - 1))\varepsilon_t^y$$

Plug in the rational expectation solution for inflation: $\pi_t^e = \pi^*$

$$y_t = y_t^* - \theta\alpha(\beta_\pi - 1)\varepsilon_t^\pi + (1 - \theta\alpha\gamma(\beta_\pi - 1))\varepsilon_t^y$$

Output deviates only from potential output as long as supply or demand shocks occur. Once shocks fade out, output is directly back at potential output.

If the central bank is able to anchor inflation expectations, business cycle volatility can be substantially reduced.

7.2 Unstable Solutions

The Taylor Principle

Recall the equations of the IS-MP-PC model

1. The Phillips curve: $\pi_t = \pi_t^e + \gamma\,(y_t - y^*) + \varepsilon_t^{\pi}$
2. The IS curve: $y_t = y_t^* - \alpha(i_t - \pi_t - r^*) + \varepsilon_t^{y}$
3. The MP curve: $i_t = r^* + \pi^* + \beta_\pi(\pi_t - \pi^*)$

- So far, we have assumed that the Taylor principle holds: $\beta_\pi > 1$.
- Now, we will study algebraically that the system of equations has a stable solution if $\beta_\pi > 1$ and we will also study what happens if the Taylor principle is not fulfilled.
- Recall from lecture 4 the empirical evidence by Clarida, Galí and Gerler on β_π:

	π^*	β	γ	ρ
Pre-Volcker	4.24	0.83	0.27	0.68
	(1.09)	(0.07)	(0.08)	(0.05)
Volcker-Greenspan	3.58	2.15	0.93	0.79
	(0.50)	(0.40)	(0.42)	(0.04)

- We will now see based on our model (which is a simplified version of that used by Clarida, Galí and Gertler) the implications for inflation.

The Effect of β_π on θ

To keep things simple, we will study the case with adaptive inflation expectations:

$$\pi_t^e = \pi_{t-1}$$

The solution for inflation is given by (see slide 8):

$$\pi_t = \theta\pi_{t-1} + (1-\theta)\pi^* + \theta(\gamma\varepsilon_t^y + \varepsilon_t^\pi), \quad \text{with } \theta = \frac{1}{1+\alpha\gamma(\beta_\pi - 1)}$$

- β_π affects π_t via θ. So, let's study what different values of β_π imply for θ

- Case 1: Taylor principle fulfilled

  $\beta_\pi > 1$: This implies $1 + \alpha\gamma(\beta_\pi - 1) > 1$, so that $0 < \theta < 1$

- Case 2: β_π falls below 1, but is not extremely small

  $1 - \frac{1}{\alpha\gamma} < \beta_\pi < 1$: This implies $0 < 1 + \alpha\gamma(\beta_\pi - 1) < 1$, so that $1 < \theta < \infty$

- Case 3: β_π falls far below 1

  $\beta_\pi < 1 - \frac{1}{\alpha\gamma}$: This implies $1 + \alpha\gamma(\beta_\pi - 1) < 0$, so that $\theta < 0$

  This "pathological" case implies that an increase in inflation expectations leads to a decrease in inflation. We will not consider this case further.

Stability of Difference Equations

The solution for inflation is a difference equation. It takes the form

$$z_t = a + bz_{t-1} + \varepsilon_t$$

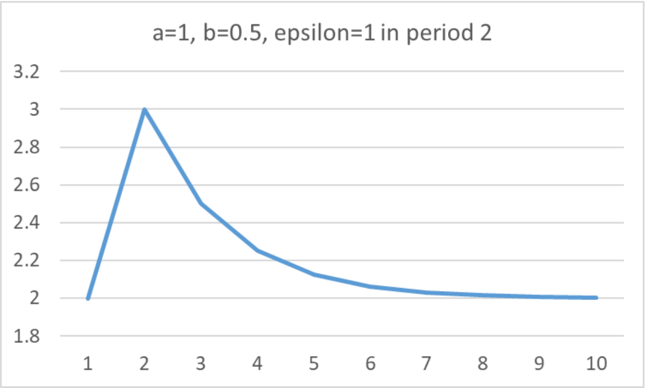
Stable Dynamics

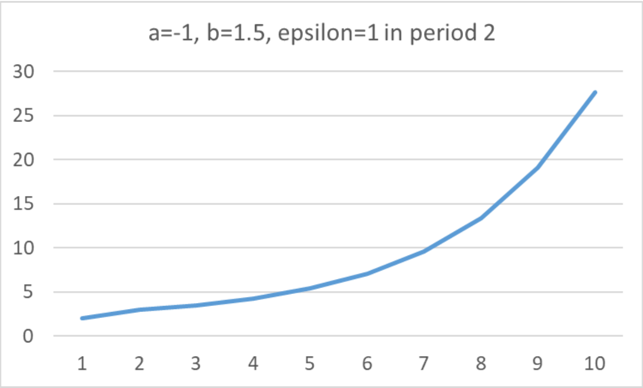
- If $0 < b < 1$, the equation yields dynamics that monotonically converge back to a long-run steady state following a shock ε_t
- The long-run steady state (when all shocks have faded out, set $\varepsilon_t = 0$) is given by $z = \frac{a}{1-b}$ (erase time subscripts and solve for z).

Exploding Dynamics

- If $b > 1$, the equation yields exploding dynamics following a shock ε_t. z does not go back to steady state.

You can simulate what happens to z_t for different values of b using Excel:





Try also what happens in case of $-1 < b < 0$ and $b < -1$.

The Effect of β_π on Inflation Dynamics

Case 1: $\beta_\pi > 1 \;\Rightarrow\; 0 < \theta < 1$

Inflation goes monotonically back to π^* following a demand or supply shock.

Intuition:

- A shock that raises inflation needs to be followed by an increase in the nominal interest rate that is larger than the increase in inflation, to increase the real interest rate.
- In this way output decreases via the IS curve, which in turn dampens inflation via the Phillips curve. The system is stable.

Case 2: β_π falls below 1, but is not extremely small $\;\Rightarrow\; 1 < \theta < \infty$

Inflation goes to plus (minus) infinity following a positive (negative) demand or supply shock.

Intuition:

- Following a shock that raises inflation, the nominal interest rate is not raised enough to increase the real interest rate. The real interest rate decreases instead.
- In this way output increases via the IS curve, which in turns increases inflation via the Phillips curve. The initial increase in inflation is amplified.
- The real interest rate decreases further, increasing further output, increasing further inflation, …

The Taylor Principle and General Expectation Formation

Do these findings only hold for adaptive expectations? No.

- For the solution of inflation we can see that whenever $\theta > 1$, the inflation reaction to π_t^e is larger than one and the one to the central bank's inflation target is negative:

$$\pi_t = \theta\pi_t^e + (1-\theta)\pi^* + \theta(\gamma\varepsilon_t^y + \varepsilon_t^\pi)$$

- If people know that changes in expected inflation are translated more than one-for-one into changes in actual inflation this gives rise to self-fulfilling inflationary spirals. Consider a non-fundamental shock to inflation expectations (called a sun-spot shock in the literature). Inflation will increase even more than the shock, leading to further increases in inflation expectations, leading to further increases in inflation, ...
- Clarida, Galí and Gerlter (2000) simulate a series of such sun-spot shocks (positive and negative shocks, so that inflation does not explode)

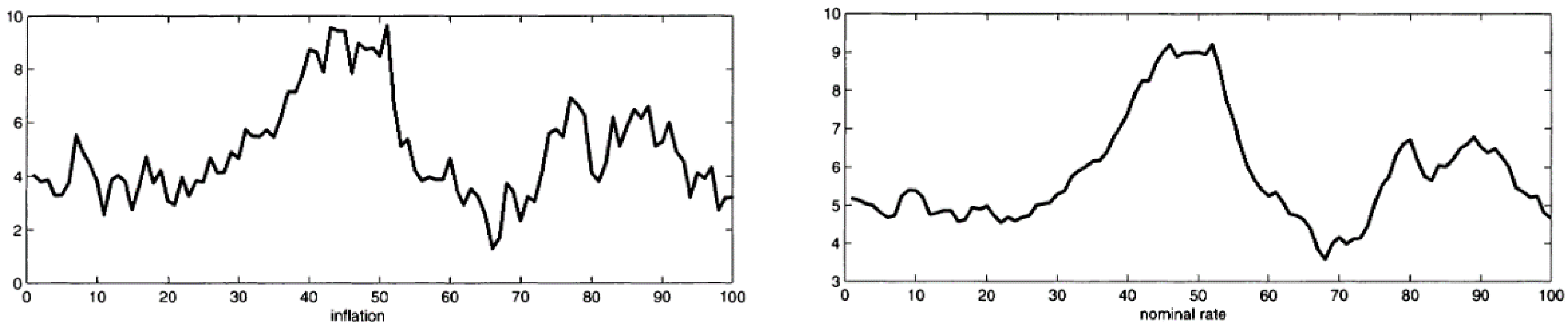


FIGURE V
Simulated Sunspot Fluctuations under Pre-Volcker Rule

- By way of contrast, self-fulfilling fluctuations cannot arise if $0 < \theta < 1$. Because β_π is above unity in this regime, short-term real rates cannot adjust to accommodate sunspot shifts in inflationary expectations. Under this type of regime the monetary policy rule in place is not, in itself, a source of macroeconomic instability.

7.3 Time Inconsistency

Time-Inconsistency

We have seen that under rational expectations a central bank that follows an MP curve that fulfills the Taylor principle can anchor inflation expectations at the inflation target.

- This is achieved under a strong assumption: the central bank is able to convince the public that it will always stick to the announced monetary policy rule

What happens if the central bank cannot establish credibility?

- This case seems to be quite relevant as policy announcement are generally time-inconsistent. Policy makers can undertake discretionary policy changes after private agents have formed their expectations.
- Once inflation expectations have been formed, it is not optimal for the central bank to stick to the MP curve anymore. By lowering the interest rate, the central bank can increase output via the IS curve. Given inflation expectations, the increase in inflation will be modest.
- Examples:
  - Upcoming election: the government pressures the central bank to increase output
  - Potential output, y_t^*, is below efficient output, y_t^e, ($y_t^e = y_t^* + \omega$ and $\omega > 0$). Recall from the WS-PS-model that mark-ups in the labor and the product market lead to a long-run output level that is inefficiently low. Further, distortionary taxed might lead to inefficiently low output.

Setting Up the Time Inconsistency Problem

Let's simplify the Phillips curve and the IS curve as much as possible by setting some parameters to one and leaving out shocks:

$$\pi_t = \pi_t^e + y_t - y^*$$

$$y_t = y_t^* - \alpha(r_t - r^*)$$

Timing:

1. The central bank announces that it will follow an MP-curve with Taylor principle
2. The public forms inflation expectations: $\pi_t^e = \pi^*$
3. The central bank sets r_t (or i_t to achieve a certain r_t). It follows from the IS curve that in doing so, the central bank controls the output gap $y_t - y_t^*$ and thereby via the PC curve the inflation rate, for any given expected inflation rate.

We assume that the central bank aims at minimizing the social loss function:

$$SL_t = (y_t - y_t^e)^2 + \kappa\pi_t^2, \qquad y_t^e = y_t^* + \omega \text{ and } \omega > 0$$

y_t^e: efficient output. The results in the following can be obtained for any choice of output that is larger than y_t^*, so that for example an upcoming election might be also a valid motivation for this problem.

The "Cheating" Solution

Rewriting the social loss function by writing it in terms of the output gap:

$$SL_t = (y_t - y_t^* - \omega)^2 + \kappa\pi_t^2$$

Substitute in the Phillips curve $\pi_t = \pi_t^e + y_t - y^*$ yields a loss function just in terms of inflation (and predetermined inflation expectations):

$$SL_t = (\pi_t - \pi_t^e - \omega)^2 + \kappa\pi_t^2$$

Taking the first order condition yields:

$$\frac{\partial SL_t}{\partial \pi_t} = 2(\pi_t - \pi_t^e - \omega) + 2\kappa\pi_t = 0$$

The first term captures the decrease in SL_t by increasing output, while the second term captures the increase due to higher inflation (depends on how inflation averse the society is)

Assume for simplicity that the central bank targets $\pi^* = 0$, so that $\pi_t^e = 0$. Then the solution for inflation (rewrite the FOC) and output (plug in the solution for inflation in the PC) is (the superscript "C" denotes that this is the "cheating" solution):

$$\pi_t^C = \frac{\omega}{1+\kappa}, \quad y_t^C = y^* + \frac{\omega}{1+\kappa}$$

Time Inconsistency of the Rule-Based Solution

Recall the "cheating" solution:

$$\pi_t^C = \frac{\omega}{1+\kappa}, \quad y_t^C = y^* + \frac{\omega}{1+\kappa}$$

For comparison the rule-based equilibrium is:

$$\pi_t^R = \pi_t^e = \pi^* = 0, \quad y_t^R = y^*$$

One can compute the social loss for both solutions by plugging them into

$$SL_t = (y_t - y_t^* - \omega)^2 + \kappa\pi_t^2$$

This yields after some tedious algebra the following welfare gain from cheating:

$$SL_t^R - SL_t^C = \frac{\omega^2}{1+\kappa}$$

The greater the difference ω between potential and desired output, the greater is the temptation to create surprise inflation to increase output. The stronger the social aversion to inflation (κ), the smaller is the gain from surprise inflation.

If ω is sufficiently large, the policymaker has no incentive to actually implement $\pi_t = \pi^* = 0$, but will deviate from the rational expectation solution.

A promise of the central bank to maintain $\pi_t = \pi^* = 0$ is not credible. It is time-inconsistent.

Inflation Bias

Will the "cheating" solution be implemented?

- No, rational agents know that the announcement of a policy rule is time-inconsistent and account for it when forming inflation expectations.
- Neither the "cheating" nor the rule-based solution will be the outcome.
- Rational agents will form their expectations on the basis of the first order condition that the central bank has formed based on the social loss function as they know that this is the true target of the central bank that it has incentives to stick to:

$$2(\pi_t - \pi_t^e - \omega) + 2\kappa\pi_t = 0$$

Rewriting yields

$$\pi_t - \pi_t^e - \omega + \kappa\pi_t = 0$$

Taking expectations yields:

$$\pi_t^e - \pi_t^e - \omega + \kappa\pi_t^e = 0$$

Solving for π_t^e:

$$\pi_t^e = \frac{\omega}{\kappa}$$

Plugging this back into the FOC yields the time-consistent rational expectations equilibrium:

$$2\left(\pi_t - \frac{\omega}{\kappa} - \omega\right) + 2\kappa\pi_t = 0 \qquad \Leftrightarrow \quad \pi_t = \frac{\omega}{\kappa}$$

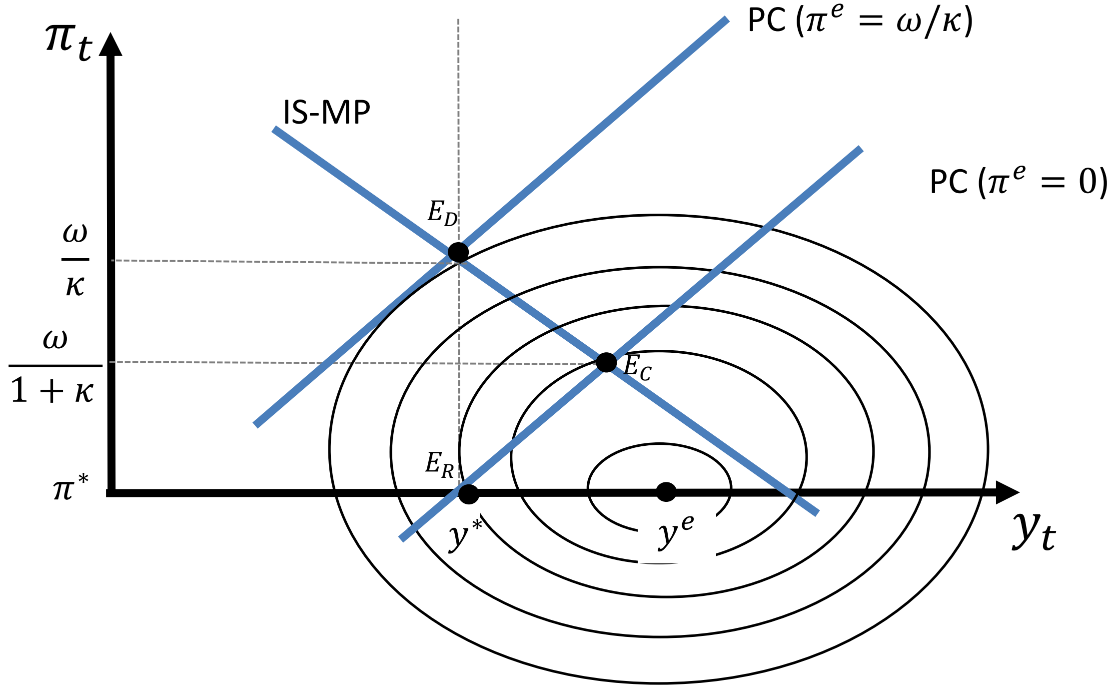
Plugging $\pi_t = \pi_t^e = \omega/\kappa$ into the PC yields $y_t = y^*$

Comparing the Solutions

- The central bank is not successful in increasing output above potential, but an inflation bias of ω/κ compared to the rule-based rational expectations equilibrium of $\pi_t = \pi^* = 0$ occurs.
- Despite inflation being permanently above target, output equals potential output as the inflation bias is fully anticipated.
- Clearly, this outcome is worse than the rule-based rational expectations equilibrium. The social loss in the time-consistent equilibrium with discretionary policy is:

$$SL_D = \omega^2 + \omega^2/\kappa$$

- The first term arises from potential output being below efficient output. This loss cannot be eliminated by the central bank. The second term captures the loss arising from the inflation bias. It could be eliminated if the central bank was able to credibly promise not to deviate from the policy rule.



Implications for Central Bank Design

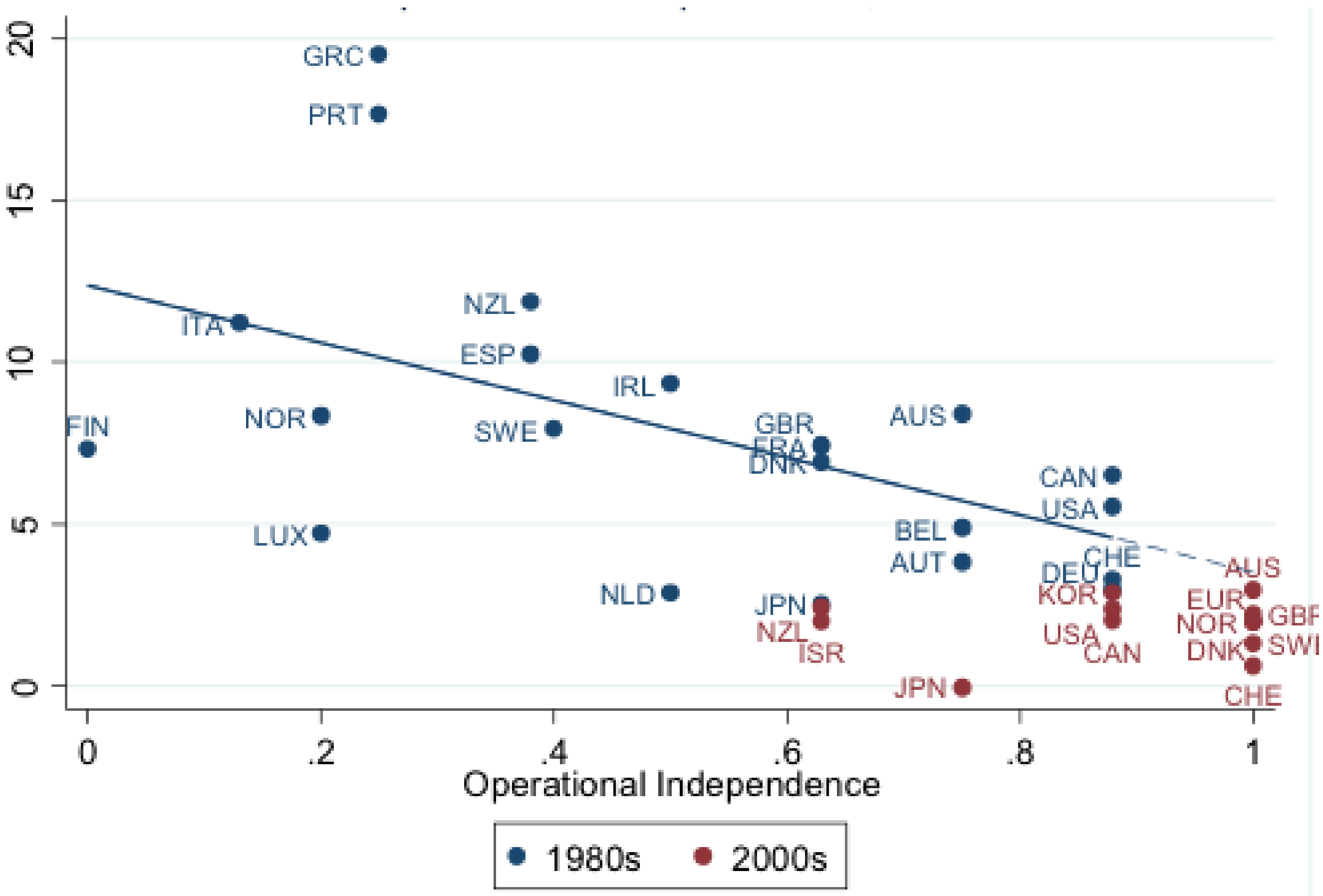
Our analysis shows that credibility is important for good monetary policy.

How to establish credibility:

- Repetition: building reputation through repeatedly avoiding the temptation of creating surprise inflation.
- Central bank independency: Delegation monetary policy to an independent central bank avoids incentives to generate surprise inflation in the short run. Long terms of office avoid that central bankers can be pressured by politicians to increase output or finance fiscal deficits.
- Delegation to conservative central bankers: if the central banker has a larger preference for inflation stabilization than is socially optimal this generates a counterweight to efficient rather than potential output entering the social loss function.
- Writing an inflation target into the central bank law
- Punishment of the central bank's chairman if the inflation target is not achieved. The compensation of the central bank governor might depend on the distance of actual inflation to the inflation target or the central bank might need to justify deviations from target to the public.

Central Bank Independence and Inflation

Inflation and operational independence of central banks



Source: Balls and Stansbury (2017).

Summary

- For a stable model solution, the Taylor principle needs to be fulfilled. Otherwise, the model does generate instable dynamics following shocks.
- Solving the model, i.e. expressing all endogenous variables in terms of exogenous variables, requires some assumption regarding expectation formation (unless expectations are assumed to be exogenous).
- Two popular expectation assumptions:
    - Rational expectations: agents know the model and use the model to form expectations. A better name is model-consistent expectations.
    - Adaptive expectations: agents use the previous period observation as expectation for the future
    - There are many other expectation formations possible and this is a very active area of research. Examples: Learning models, rational inattention models, near-rational expectations (Woodford), …
- Shocks have much smaller effects under rational expectations compared to adaptive expectations.
- Under rational expectations inflation expectations equal the inflation target in the IS-MP-PC model. This result is based on the strong assumption that the announced monetary policy rule is credibly followed.
- Without full credibility (time-inconsistency) there is an inflation bias, but output cannot be increased systematically.
- To establish credibility, central bank independence is highly important.