2014/2015, week 5

Debt policies and monetary policies

Mankiw, Chapter 19, except for 19.2

Romer, Chapter 11.7, 11.8

Structure lecture

- Public debt
  - Facts and figures about (statutory) public debt
  - Idem about the implicit debt due to population ageing
  - (Un-)stable and (un-)sustainable public debt
  - Economic effects of public deficits

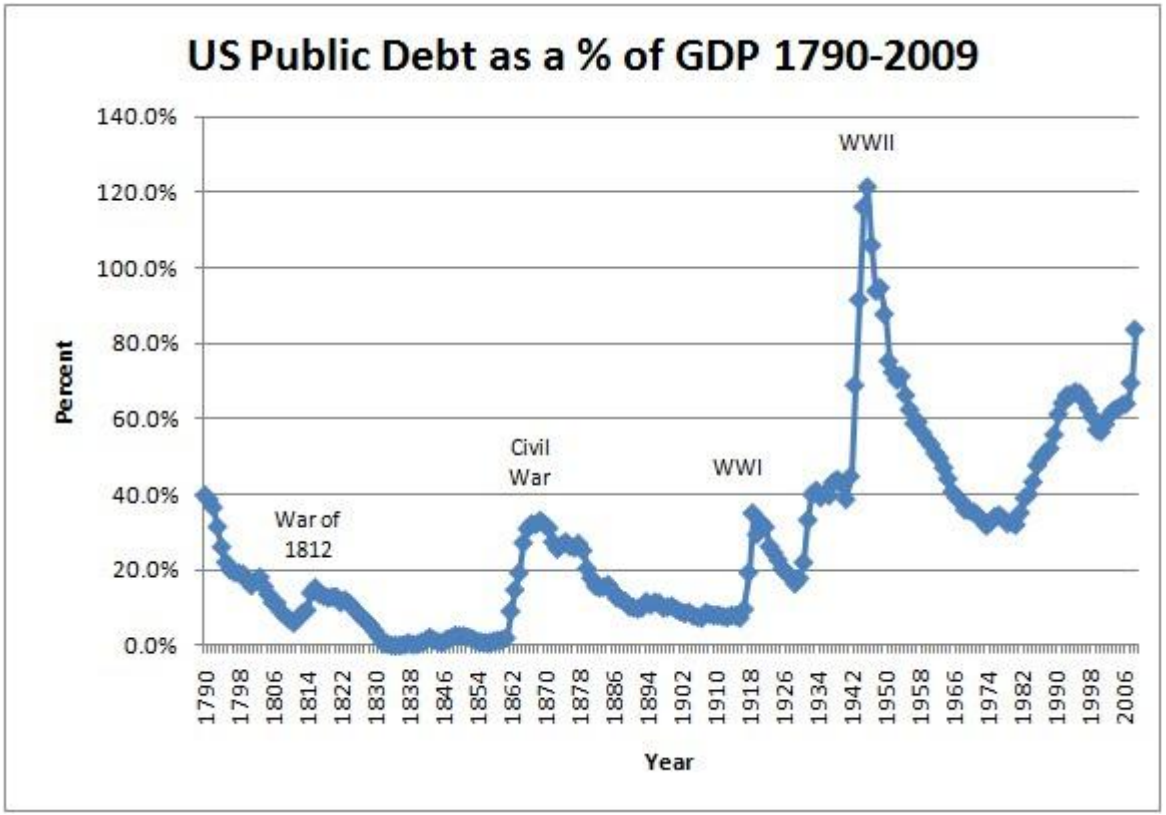
Structure lecture

- Inflation
  - Facts and figures about inflation and hyperinflation
  - The theory of time-inconsistent monetary policies
  - Empirical evidence on the theory

The public debt

Introduction

- History of public debt: US case



Introduction

- Public debt across countries (M, p. 543, 2011)

Public Debt of Countries Exceeding 0.5% of World, 2012 estimate (CIA World Factbook 2013)

Country	Public Debt % of GDP
United States	73.60%
Japan	214.30%
China	31.70%
Germany	81.70%
Italy	114.60%
France	89.90%
United Kingdom	88.70%
Brazil	54.90%
Spain	85.30%
Canada	84.10%

Introduction

Country	Public Debt % of GDP
India	51.90%
Mexico	35.40%
South Korea	33.70%
Turkey	40.40%
Netherlands	68.70%
Egypt	85.00%
Greece	161.30%
Belgium	99.60%
Singapore	111.40%
Taiwan	36.00%
Argentina	41.60%
Indonesia	24.80%
Portugal	119.70%

Downgrade of US government debt: facts

- Standard & Poor's downgraded US government debt in 2011
  - From AAA (highest category) to AA+
- The Netherlands: AA+ (AAA)

Downgrade of US government debt: consequences

- How to interpret this result?
  - AAA: An obligor has EXTREMELY STRONG capacity to meet its financial commitments
  - AA+: An obligor has VERY STRONG capacity to meet its financial commitments. It differs from the highest rated obligors only in small degree

Population ageing

- Driving factors demographic and economic
- Demographic factors
  - Decrease in mortality rates (increasing life expectancy)
  - Decrease in fertility rates
- Economic factor
  - Share of health care spending in GDP increases over time (health care is a luxury good)

Hidden public debt

- For both reasons:
  - Primary public expenditure will increase more than revenues from taxes and social security contributions
  - Primary public deficits will increase
  - This implies a further increase of public debt
    - debt service, deficit, debt, debt service, and so on

Important definitions

- Change in public debt equals sum of primary deficit and debt service
  - $\Delta D = G - T + iD_{-1}$
  - Primary deficit: $G - T$
  - (Primary balance/surplus: $T - G$)
  - Debt service: iD_{-1}
  - Total deficit: $G - T + iD_{-1}$

Important definitions

- Assume Y (GDP), G and T grow at rate g
- Change in public debt ratio equals sum of primary deficit ratio and growth-corrected debt service ratio
  - $\Delta(\frac{D}{Y}) \sim \left(\frac{G-T}{Y}\right) + (i-g)\left(\frac{D}{Y}\right)_{-1}$

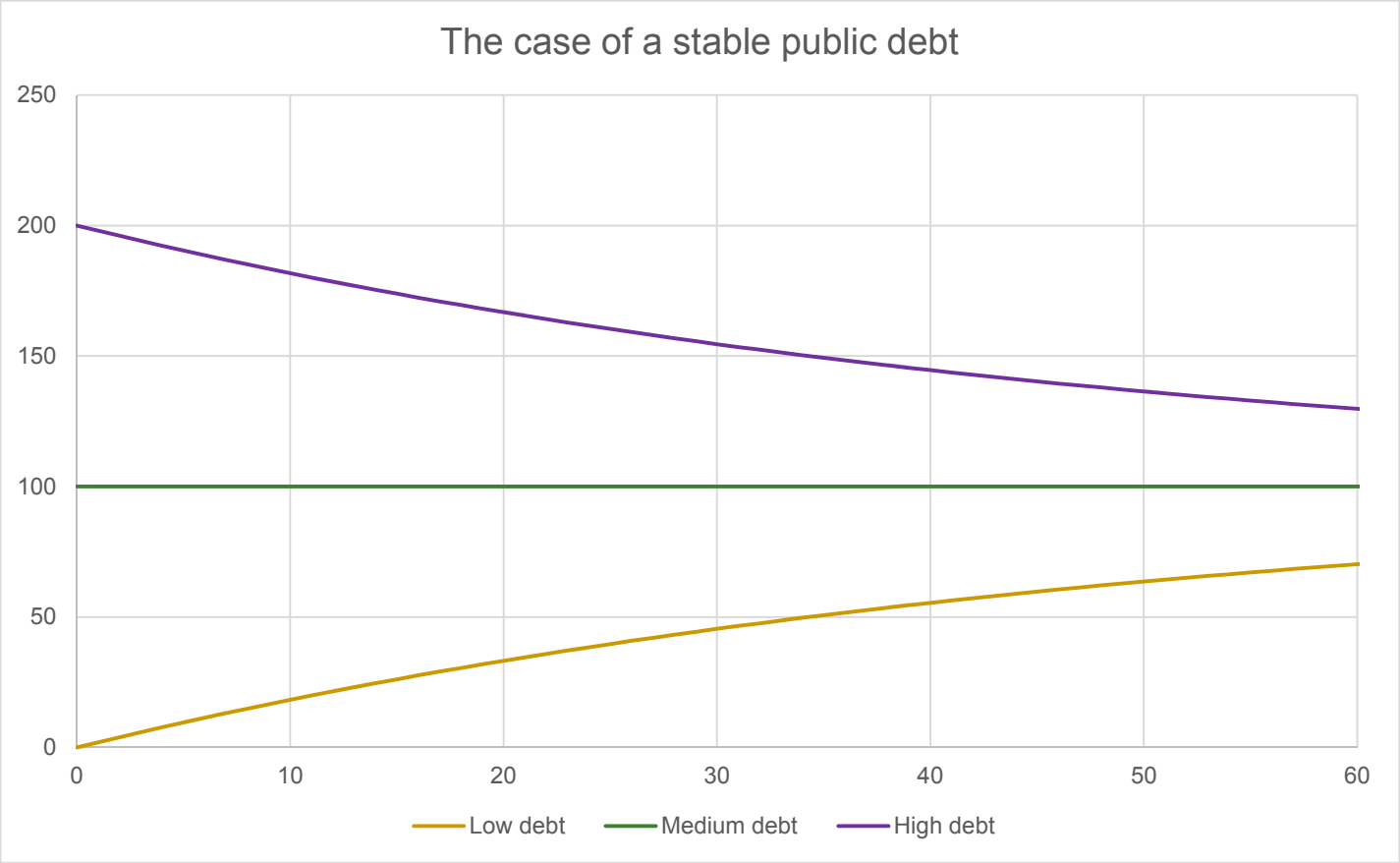
Important definitions

- The accumulation equation for the debt ratio is a first-order difference equation
  - $\left(\frac{D}{Y}\right)_t = (1 + i - g)\left(\frac{D}{Y}\right)_{t-1} + \left(\frac{G-T}{Y}\right)_t$
- Equilibrium value of debt ratio
  - $\left(\frac{D}{Y}\right)^* = \left(\frac{T-G}{Y}\right)_0 / (i - g)$

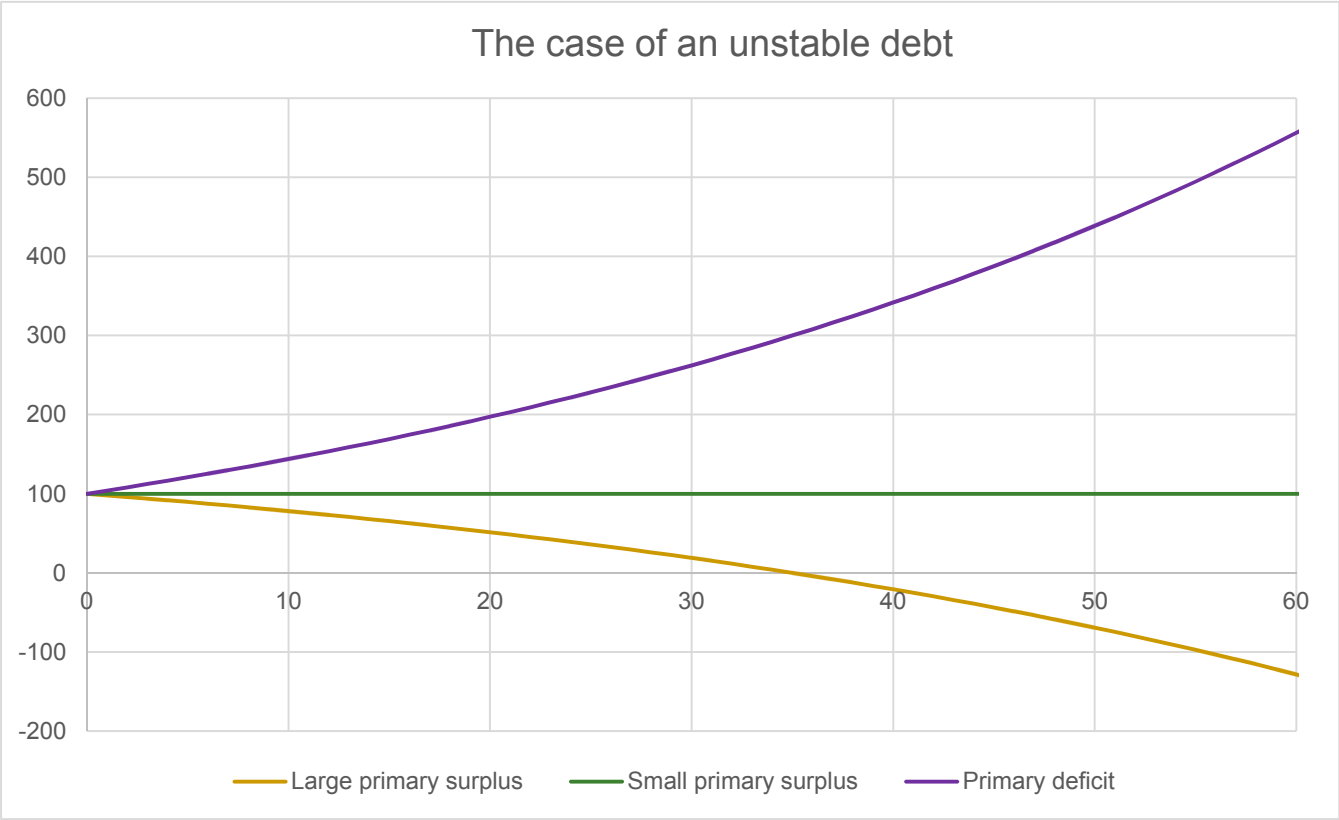
Important definitions

- If $i < g$ ($i > g$), the debt ratio is stable (unstable)
- If $i > g$ and $(\frac{D}{Y})_0 = \left(\frac{T-G}{Y}\right)_0 / (i - g)$, the debt is sustainable
- If $i > g$ and $(\frac{D}{Y})_0 > \left(\frac{T-G}{Y}\right)_0 / (i - g)$, the debt is unsustainable

Stable public debt



Unstable public debt



Important definitions

- For the case $i > g$, $(\frac{D}{Y})_0 > \left(\frac{T-G}{Y}\right)_0 /(i-g)$, define s, the sustainability gap:
- $\left(\frac{D}{Y}\right)_0 = \left(\left(\frac{T-G}{Y}\right)_0 + s\right)/(i-g)$, or
- $s = \left(\frac{D}{Y}\right)_0 (i-g) - \left(\frac{T-G}{Y}\right)_0$

Effects of a larger public deficit

- Keynesian view: IS/LM model
  - Higher deficit shifts the IS curve → Output ↑, Interest rate ↑
  - Effect of higher public spending can exceed effect of lower taxes (difference between spending multiplier and tax multiplier)

Effects of a larger public deficit

- After some time, the Phillips curve will shift (see week 2's lecture)
  - In the end, output will have returned to its original value, whereas prices will have increased

Effects of a larger public deficit

- Mundell-Fleming model
  - Higher deficit shifts the IS* curve → Exchange rate appreciates (e ↑), output does not change, composition output does change

Effects of a larger public deficit

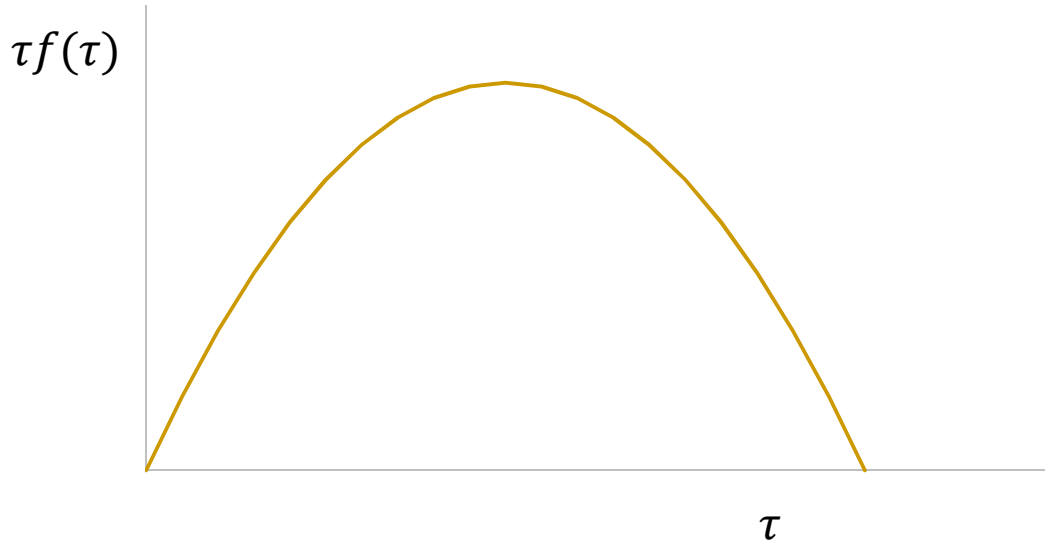
- If the deficit increase takes the form of a tax cut
- Supply-side economics:
  - Taxes distort economic decisions
  - Labour income tax can reduce labour supply (a consumption tax as well)
  - Ronald Reagan presidency

Supply-side economics

- Some argue that lower tax rates may increase tax revenues (‘Reaganonomics’)
- This requires that the economy is on the right-hand side of the Laffer curve
- Under the Reagan presidency, the public deficit increased

The Laffer curve

Tax revenues as a function of the tax rate



Ricardian equivalence

- Consumption based on lifetime income (lifecycle hypothesis)
- The effect of a tax cut today will be higher taxes in the future (unless government spending would be reduced)
- Hence, the household needs to save for the future tax rise
- The extra saving equals the amount of the tax cut

Ricardian equivalence

- Ricardian equivalence named after David Ricardo
- Concept of Ricardian equivalence revived after work by Robert Barro
- Implication is that a tax cut today will have no effect upon planned expenditure and thus output
- The tax multiplier, if Ricardian equivalence applies, is thus nil

Why Ricardian equivalence may fail to apply

- Myopia
  - People may be irrational
- Borrowing constraints
- Future generations
  - Bequests
  - Negative bequests not possible
- Heterogeneity
  - Tax rise may fall on other people's children
  - Tax rise may fall on firms

Why do people leave bequests?

- Barro: altruism
- Strategic bequest motive:
  - to get their children's attention
- Bernheim, Shleifer and Summers (1985):
  - The more wealthy the parent, the more often the children visit the parent
  - The relationship breaks down in case of wealth that cannot be bequeathed (like pension wealth)

Why not balanced budget policies?

- Balanced-budget policies would impose a cost upon too high (inefficient) public spending
- Idea popular under right-wing economists, like James Buchanan and Martin Feldstein
- The case of the Netherlands:
  - It may be useful to have a constraint, not necessarily a balanced-budget constraint

Why not balanced budget policies?

- Higher risk premium in interest rate (risk of bankruptcy)
- Reinhart and Rogoff (2010):
  - Too high debt will lower economic growth
- Loss of political influence in international affairs

Why not balanced-budget policies?

- Stabilization of the economy (business cycle)
  - Through automatic stabilizers
  - Discretionary policies
- Tax smoothing
  - Reduces the welfare loss of taxation
  - Budget deficits in case of war
  - What about population ageing?
- Intergenerational risk sharing

Price inflation

Price inflation: facts and figures

- Often low, but also quite often high or very high
- During the seventies, double-digit inflation rates in the industrialized world (Figure 11.6, p. 564)
- The Netherlands were no exception

Price inflation: facts and figures

- Hyperinflation (>40% a year) is more of a problem and is universal
- Reinhart and Rogoff (2009)
- Data on inflation in many countries in the world dating back to 1800

Price inflation: facts and figures

Country	(1)	(2)	(3)	(4)
Nigeria	22.6	9.4	72.9%	1995
Indonesia	18.6	9.6	939.8%	1966
Russia	35.7	26.4	13,534.7%	1923
Germany	9.7	4.3	2.22E10%	1923
Hungary	15.7	3.6	9.63E26%	1946
Argentina	24.6	15.5	3,079.5%	1989

- (1): Share of years in which inflation exceeded 20%
- (2): Share of years in which inflation exceeded 40%
- (3): Maximum annual inflation
- (4): Year of peak inflation

Why price inflation?

- The intriguing question is: why do countries produce so much inflation? Inflation is costly. What are the motives?
- Especially intriguing with the Phillips curve in mind:
  - It is vertical in the long run

The theory of time-inconsistent monetary policies

- Kydland and Prescott (1977): the inability of policymakers to commit themselves to a low-inflation policy produces sub-optimally high inflation

- Stylized model based on the following assumptions:
  - Monetary policies have real effects
  - Inflation expectations affect the level of output
  - Absent any surprise inflation, output is below the level that is socially optimal: $y^n < y^*$
    - Interpretation of the latter assumption

The theory of time-inconsistent monetary policies

- Aggregate supply curve:
  - $y = y^n + b(\pi - \pi^e) \qquad b > 0$
  - y is the log of output
  - y* is log of structural output
  - π is the rate of inflation
  - π^e is the expected rate of inflation

- Interpretations:
  - Lucas supply curve
  - Nominal contracts

The theory of time-inconsistent monetary policies

- Social welfare *loss* function:
  - $L = \frac{1}{2}(y - y^*)^2 + \frac{1}{2}a(\pi - \pi^*)^2 \qquad a > 0$
- Inflation is considered an instrument of monetary policies

The case of rules

- In the case of rules, the central banker commits himself to producing inflation as announced
  - $\pi^e = \pi$
  - $\rightarrow y = y^n$ (aggregate supply curve)
  - $\rightarrow L = \frac{1}{2}(y^n - y^*)^2 + \frac{1}{2}a(\pi - \pi^*)^2$
- Minimizing the loss function implies that the inflation rate equals its target level
  - $\pi = \pi^*$
  - $y = y^n$

The case of discretion

- In the case of discretion, the central banker cannot commit himself to producing inflation as announced
- First step of the game
  - Central banker announces monetary policies; the public forms inflationary expectations
- Second step of the game
  - Given these expectations, the central banker minimizes the social welfare loss function
- We solve the model by backward induction

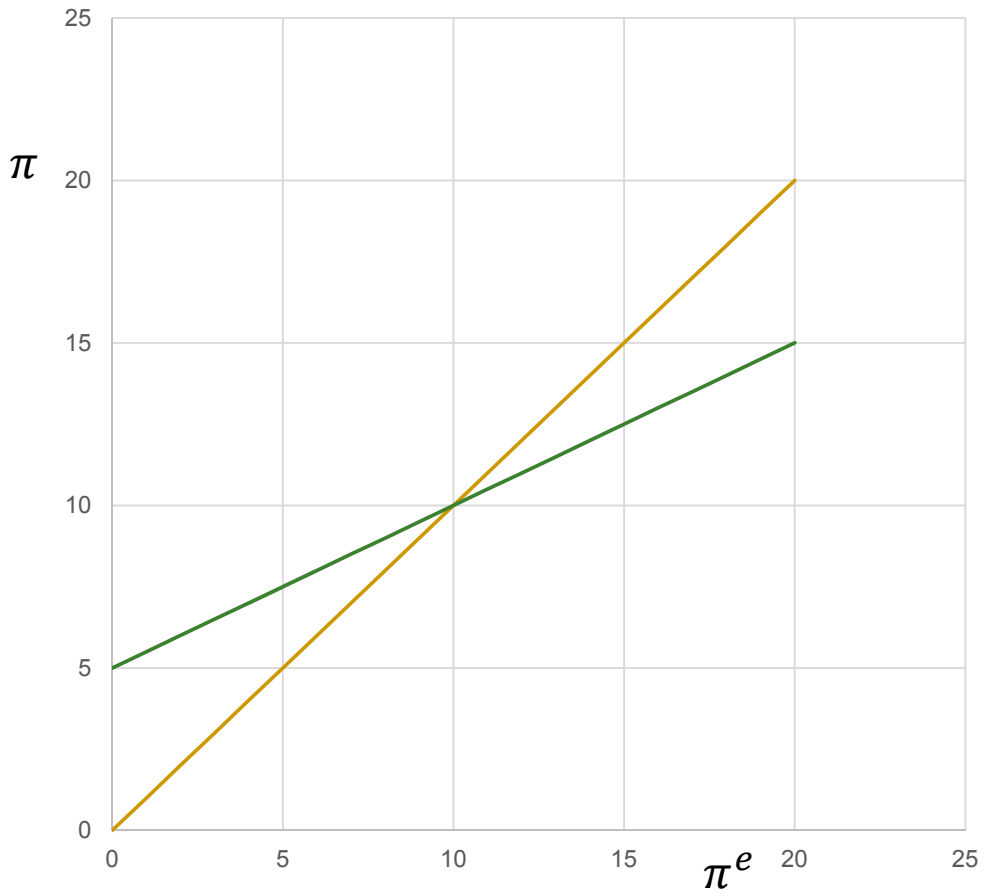
Game between central banker and the public

- Solution of the second step of the game
  - $\frac{dL}{d\pi} = 0 \rightarrow \frac{\partial L}{\partial y}\frac{dy}{d\pi} + \frac{\partial L}{\partial \pi} = 0 \rightarrow [y^n + b(\pi - \pi^e) - y^*]b + a(\pi - \pi^*) = 0$
  - $\rightarrow (b^2 + a)\pi + b(y^n - y^*) - b^2\pi^e - a\pi^* = 0$
  - $\pi = \frac{b^2\pi^e + a\pi^* + b(y^* - y^n)}{a + b^2}$
  - $\frac{d\pi}{d\pi^e} = \frac{b^2}{a+b^2} < 1$
  - Intercept $\frac{a\pi^* + b(y^* - y^n)}{a+b^2} > 0$

Game between central banker and the public

- Solution of the first step of the game
  - $\pi^e = \pi \rightarrow \pi = \pi^e$
  - $\frac{d\pi}{d\pi^e} = 1$
  - Intercept 0

The case of discretion



Rules versus discretion

- $\pi = \pi^e = \pi^* + \frac{b}{a}(y^* - y^n)$

- $\pi > \pi^*$: inflation is higher than socially optimal
- $y = y^n$: output equals the level absent surprise inflation

- This reminds us of the long-run Phillips curve:
  - No trade-off between output and inflation

The time-inconsistency of discretionary monetary policies

- Reason is the inability of the central banker to commit to a certain monetary policy
- After expectations have been formed, the central banker has an incentive to renege on its announcement
- The public anticipates this and sets expectations higher
- Ultimately, due to the inability to commit, the rate of inflation will be sub-optimally high
- Indeed, monetary policy that is optimal ex ante, will not be optimal ex post: the time inconsistency of optimal policies

Time-inconsistent policies

- Kydland and Prescott (1977) call their theory that of the time-inconsistency of optimal policies. Why?
- Child-parent relationship
  - Child not going to have a candy if (s)he is not silent
  - After the period in which the child ought to be silent, the parent argues why not give the child a candy, the period has finished
  - Child will anticipate this and will not be silent
- A capital tax
  - Investors will not be taxed
  - After entrepreneurs have invested, the government may break its promise and tax capital, which is a lumpsum (non-distortionary) tax
  - Entrepreneurs will anticipate this and will not invest

Rules versus discretion

- $\pi = \pi^e = \pi^* + \frac{b}{a}(y^* - y^n)$

- $\pi > \pi^*$: inflation is higher than socially optimal
- $y = y^n$: output equals the level absent surprise inflation

- The cases of rules and discretion
  - Differ in terms of inflation
  - Share the result for output
  - Differ in the implied level of social welfare

Rules versus discretion

- Social welfare loss under rules
  - $L_{RULES} = \frac{1}{2}(y^* - y^n)^2$
- Social welfare loss under discretion
  - $L_{DISCRETION} = \frac{1}{2}\left(1 + \frac{b^2}{a}\right)(y^* - y^n)^2 > L_{RULES}$

The role of reputation

- In reality, the assumption of rational expectations may be too strong
- Instead, the public may have to learn about the central banker's preferences
- How? By observing actual monetary policies
- This gives the central banker a motive to pursue low-inflation policies; this gives it a reputation as an inflation fighter
- This in turn implies low inflationary expectations, which ease monetary policymaking

Solutions to the time inconsistency problem

- Rules (rather than discretion)
  - Disadvantage: rules may be very bad in certain circumstances
- Delegation to a very inflation-adverse central banker
  - Requirement: the central banker has to have independency
  - This solution has some realism
  - Disadvantage: preferences of independent central banker who is very inflation-adverse and society may deviate too much

Empirical evidence

- Theory: The higher the degree of central bank independency, the lower the (average) rate of inflation
- CB independency difficult to measure. Researchers therefore use data on aspects of independency, like:
  - Rules for appointment and dismissal of the governor and the board of the central bank
  - Rules that establish the government's ability to control the central bank's decisions
  - The attendance of government representatives on the board of the central bank
- Some empirical evidence in support of theory
  - Alesina and Summers (1993), Grilli, Masciandaro and Tabellini (1991)

Caveats

- The government may choose the level of central bank independency and the central banker's preferences simultaneously
  - High degree of independency may be correlated with central bankers who are not too much inflation-averse
- Central bank independency and inflation may both be related to a third variable, e.g. inflation preferences of society
- The empirical relationship is rejected for non-industrialized countries

Inflation in the seventies

- Due to time-inconsistent monetary policies?
  - Changes in inflation not correlated with institutional changes
  - Changes in inflation may be driven by other factors:

- Romer is sceptical of all explanations
  - Fundamental problem in economics that we do not have the required data to establish whether a view is correct or incorrect

Price-indexed bonds

- Issued by the UK, the US and several other countries, not the Netherlands
  - Reduces inflation risk for debt holders and debt issuers
  - Reduces the inflation risk premium and thus interest outlays
  - May reduce expected inflation (time-inconsistent monetary policies)
  - Provides data on inflation expectations
  - Increases the stability of the debt ratio
  - Decreases the stability of the deficit ratio (Fiscal Compact)