2015/2016, 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
  - The implicit debt due to population ageing
  - (Un-)stable and (un-)sustainable public debts
  - Economic effects of public debts and deficits
  - The political economy of public debt

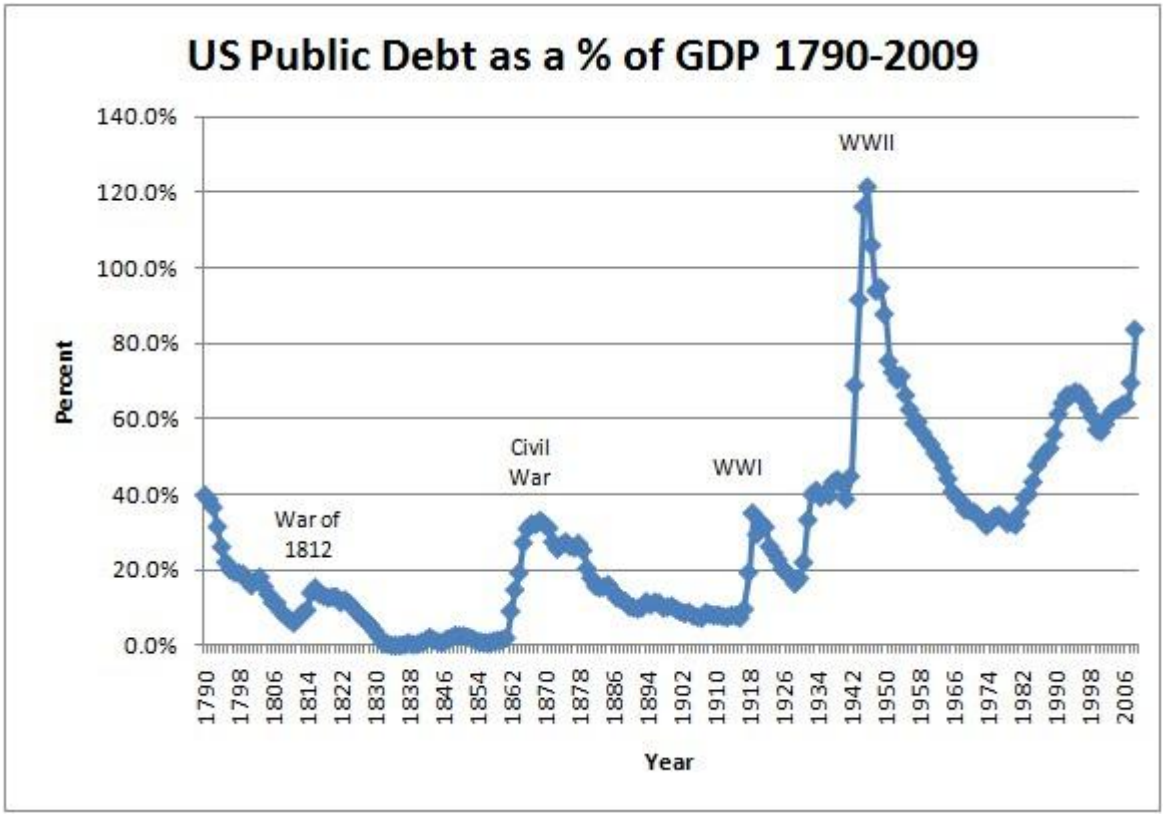
Structure lecture

- Inflation
  - Facts and figures; inflation and hyperinflation
  - The theory of time-inconsistent monetary policies
  - Empirical evidence
  - Solutions to the time-inconsistency problem
    - Rules
    - Central banker independency

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

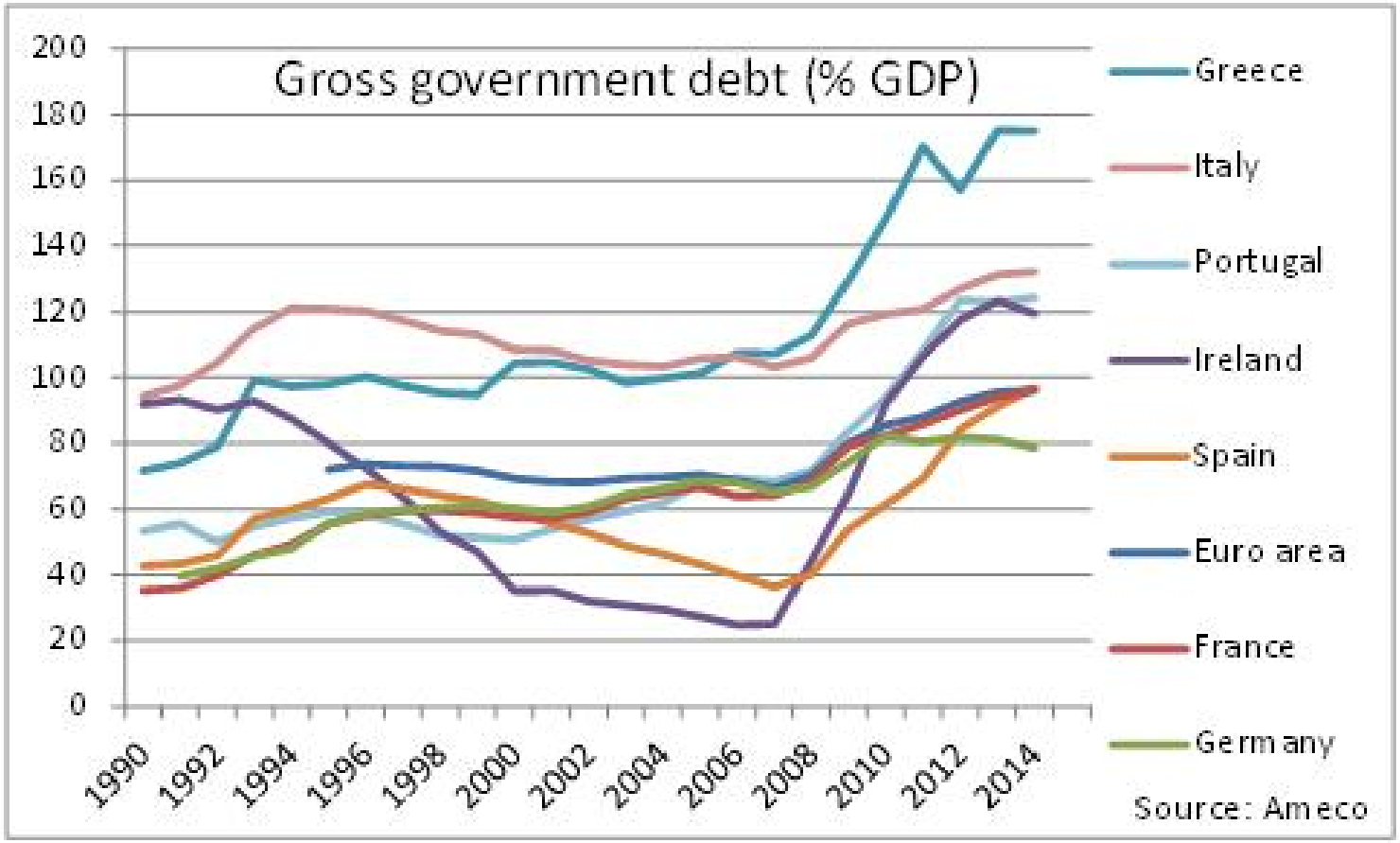
- Public debt across countries (M, p. 543, 2011)

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)

Development public debt in eurozone countries since the financial crisis



Downgrade of US government debt

- 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 factors
  - Share of health care spending in GDP increases over time
    - health care is a luxury good
- For more information on ageing and the economy, visit **www.edwesterhout.nl**

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 → 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
  - $\Delta\left(\frac{D}{Y}\right) \sim \left(\frac{G-T}{Y}\right) + (i-g)\left(\frac{D}{Y}\right)_{-1}$

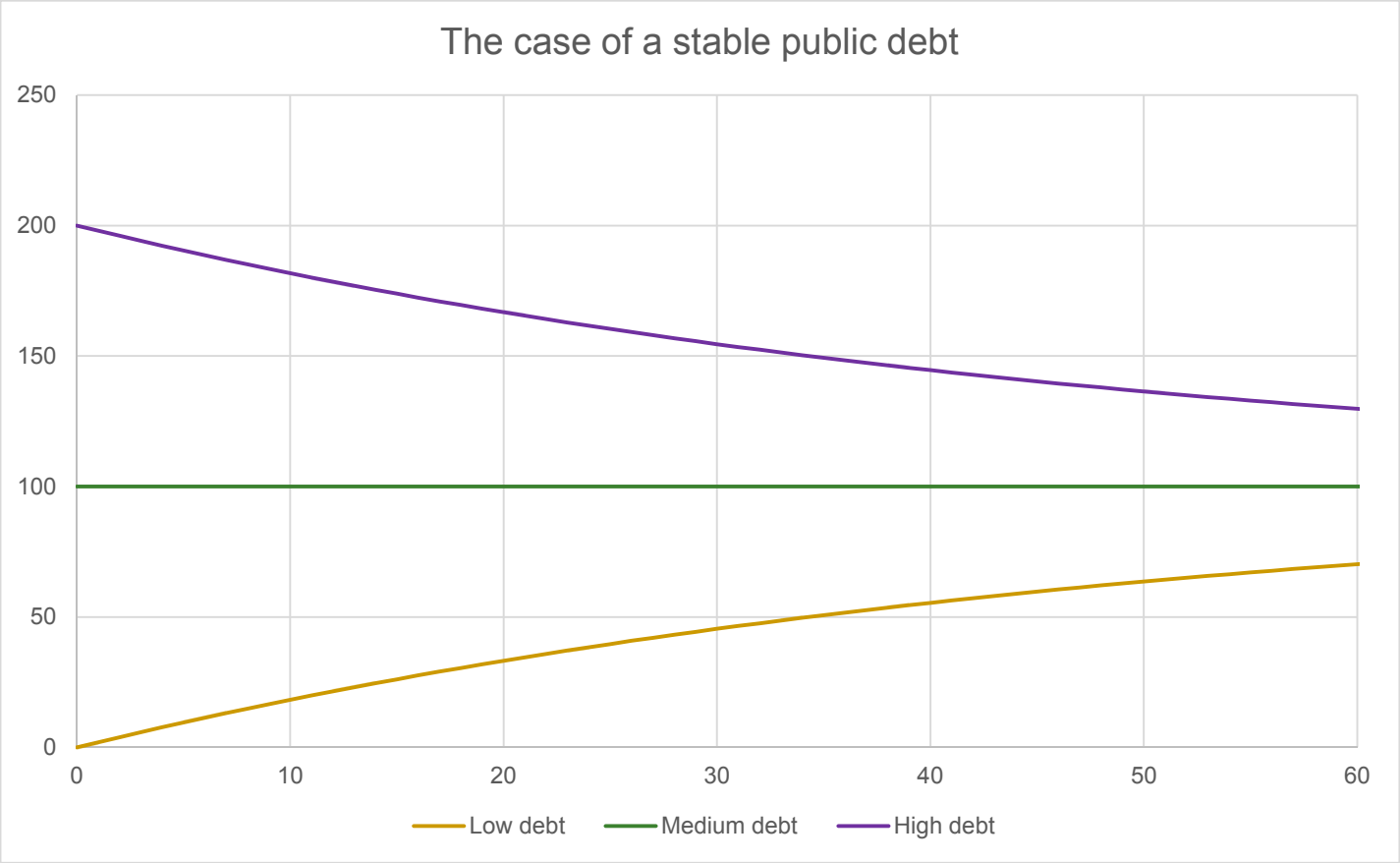
Important definitions

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

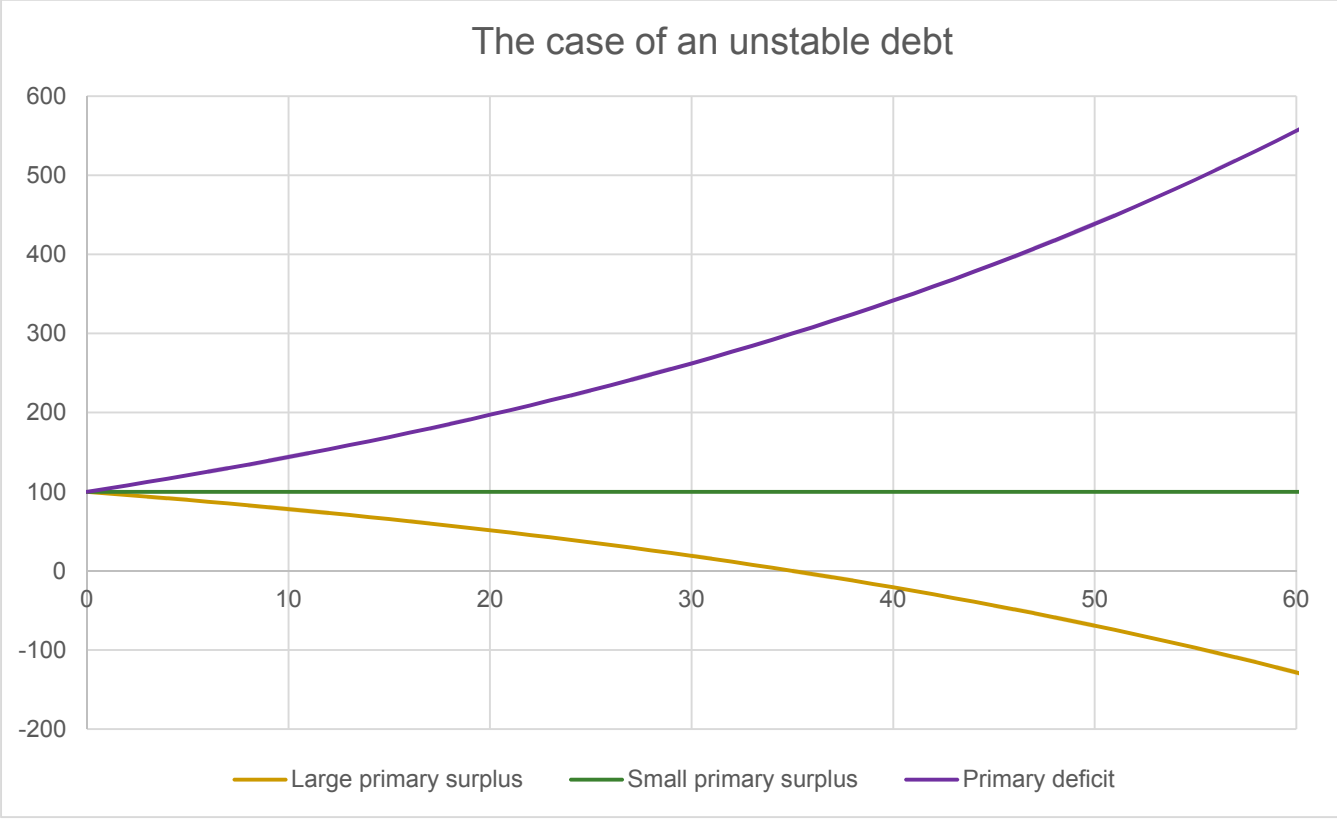
Important definitions

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

Stable public debt



Unstable public debt



Important definitions

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

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) – the Haavelmo effect

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

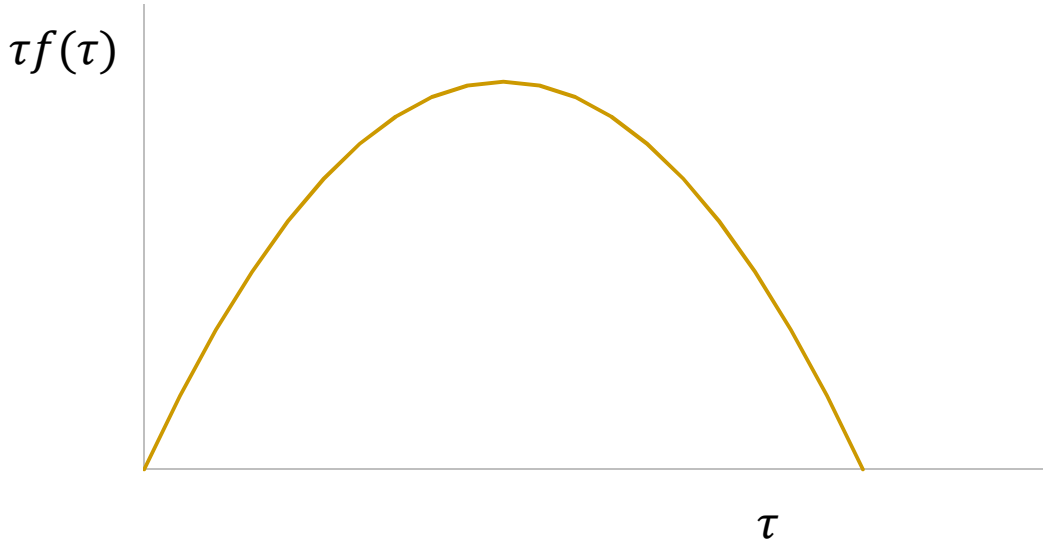
- If the deficit increase takes the form of a tax cut
- Supply-side economics:
  - Taxes distort economic decisions
  - Labour income tax can reduce labour supply
    - a consumption tax may have a similar effect
  - Ronald Reagan presidency

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

High public debt

- A high level of public debt
  - May fuel inflationary expectations
    - Nominal versus inflation-linked bonds
  - May raise the probability of default
    - Increase the risk premium in the interest rate
  - May lower investment and the rate of economic growth (see Reinhart and Rogoff, 2010)

The political economy of public debt

- Policymakers may produce public debt for none of the above reasons, but because they cannot resist the temptation to engage in high spending
- Idea popular under right-wing economists, like James Buchanan and Martin Feldstein
- Hence, the virtue of balanced-budget policies
  - They impose a cost upon too high (inefficient) public spending
- The case of the Netherlands:
  - It may be useful to have a constraint, not necessarily a balanced-budget constraint

The political economy of public debt

- 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 discretionary 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 of time-inconsistent monetary policies
  - Assumes that, absent any surprise inflation, output is below the level that is socially optimal: $y^n < y^*$
  - y^n is log of structural output
  - y^* is log of socially optimal level of output

The theory of time-inconsistent discretionary monetary policies

- Aggregate supply curve:
  - $y = y^n + b(\pi - \pi^e) \qquad b > 0$
  - y is the log of output
  - y^n 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 discretionary monetary policies

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

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

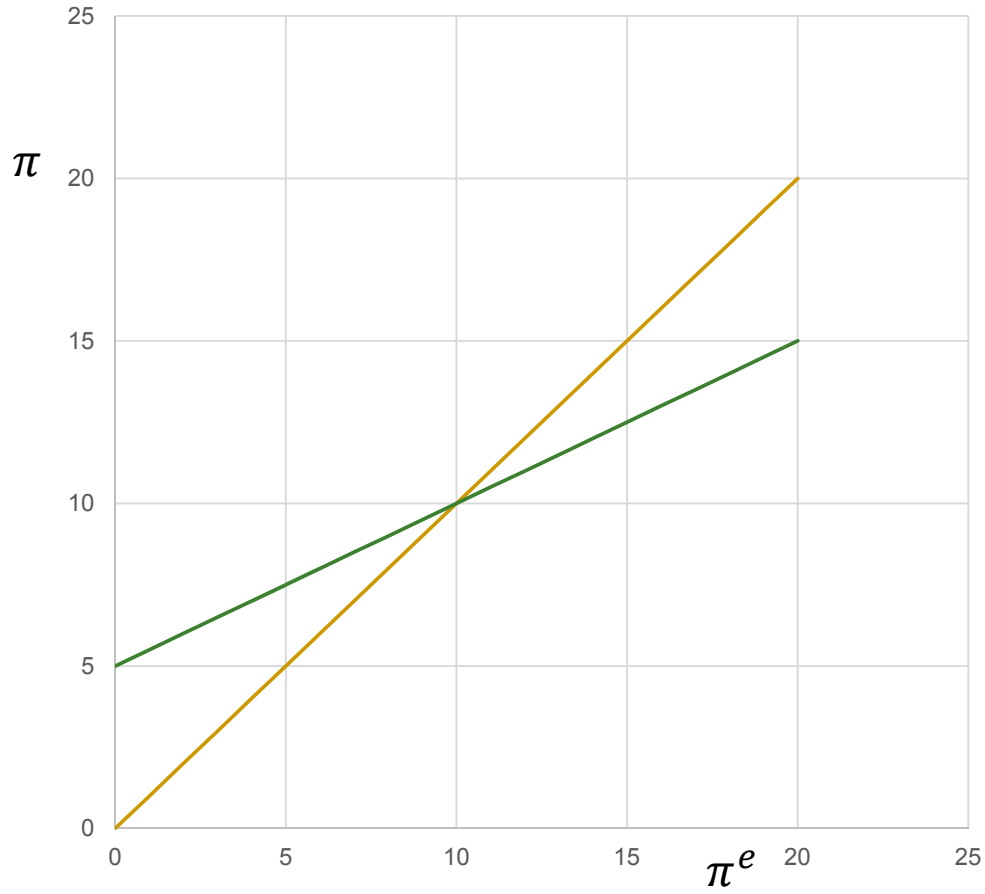
Game between central banker and the public

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



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)
  - $\rightarrow L = \frac{1}{2}(y^n - y^*)^2 + \frac{1}{2}a(\pi - \pi^*)^2$
- Result is that the inflation rate equals its target level and output equals structural output
  - $\pi = \pi^*$
  - $y = y^n$

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 structural output

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

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

- 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 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?
- Policies that are ex ante optimal do not coincide with policies that are ex post optimal
  - Ex ante: $\pi = \pi^*$
  - Ex post: $\pi = \pi^* + \frac{b}{a}(y^* - y^n)$
- Another example is that of 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

Solution to the time inconsistency problem

- Rules (rather than discretion)
  - Central banker cannot deviate from rule, even if this ex post suboptimal
  - Similar in case of a capital income tax: the tax cannot be raised ex post, even if this would be optimal ex post
  - Disadvantage of rules is loss of flexibility
- Delegation to a central banker who is more inflation-adverse than society
  - Requirement: the central banker has to be independent

Empirical evidence

- Researchers measure central banker independency by focussing on certain features 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)
- The case of the ECB

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-linked bonds

- Issued by the UK, the US, and some Eurozone countries
  - France, Italy, Germany, Spain
  - Not the Netherlands
- Inflation-linked bonds
  - Reduce inflation risk, for debt holders and debt issuers
  - Have lower interest rate than nominal bonds on account of inflation risk premium
  - Today's inflation