Monetary Policy and Business Cycle

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Lecture IX

Monetary Policy in an Open Economy

Outline

- Introduction
- Control of inflation in an open economy
  - Purchasing power parity theory
  - Balassa-Samuelson effect
  - Expectations channel in an open economy
- Exchange rate
  - Indirect control
  - Direct control
- Summary

Introduction

- obvious implication of the switch from a closed-economy to an open-economy perspective is more complex structure of the monetary policy transmission process

- in addition to it, it opens new possibilities regarding the choice of monetary policy strategy
  - at the level of *final targets*, the central bank can target the price level with a fixed or a 'crawling' exchange rate target
  - at the level of *intermediate targets*, the central bank can target the exchange rate indirectly with the interest rates (based on the uncovered interest rate parity)
  - and finally, at the level of *operating targets*, the central bank can target the exchange rate directly (third operating target)

Control of inflation in an open economy

- exchange rate constitutes an important determinant of the price level in an open economy

- it affects inflation in two ways:
  - directly, via the purchasing power parity theory
  - indirectly, via the expectations channel

- *purchasing power parity theory* (PPP) is based on the *Law of One Price*, which states that, apart from tariffs and transaction costs, international commodity arbitrage will equalize the prices for tradable goods in all locations when quated in the same currency

- thus, for each good the domestic price is identical with its foreign price times the exchange rate

$$p_i = Sp_i^* \tag{1}$$

- assuming that the domestic price index $P = f(p_1, ..., p_n)$ and the foreign price index $P^* = f(p_1^*, ..., p_n^*)$ are made up of the same goods with same weights, the *Law of One Price* becomes a law of *price levels*, which is the absolute version of the PPP:

$$S = \frac{P}{P^*} \tag{2}$$

- however, in reality, the assumptions concerning the absolute version of the PPP are hardly met, as even for perfectly homogenous commodities, there are transaction costs, tariffs, and indirect taxes

- in addition, price indices differ from country to country ...

- focusing on changes in the exchange rate over time leads to the *relative version* of the PPP:

$$\Delta s = \pi - \pi^* \tag{3}$$

- that plays an important role in monetary policy:
  - proponents of a system of flexible exchange rate believe that country can choose its national inflation rate according to its specific preferences, and that flexible exchange rate passively compensates for the inflation differential
  - *example:* if the 'German' inflation was 2% and CNB's inflation target 3%, then the nominal exchange rate should in average depreciate by 1%
  - alternatively, many countries have adopted a fixed exchange rate target *vis-a-vis* the currency of a country with low inflation in order to import price stability
  - *example:* if the 'German' inflation was 2% and CNB fixed nominal exchange rate, then the Czech

inflation should on average equal the German one

- the experience with application of PPP (even the relative version) shows that the PPP does not hold completely; currencies with flexible exchange rates have experienced large deviations from relative PPP not only in the short-run but also in the medium-term

- such a deviations are measured by the real exchange rate that captures any change in relative prices of home and foreign goods

- for the absolute version of PPP, the real exchange rate is

$$Q = S\frac{P^*}{P} \tag{4}$$

  and when the absolute PPP holds the real exchange rate is always 1

- again, normally the relative version is used and changes in the real exchange rate are defined as

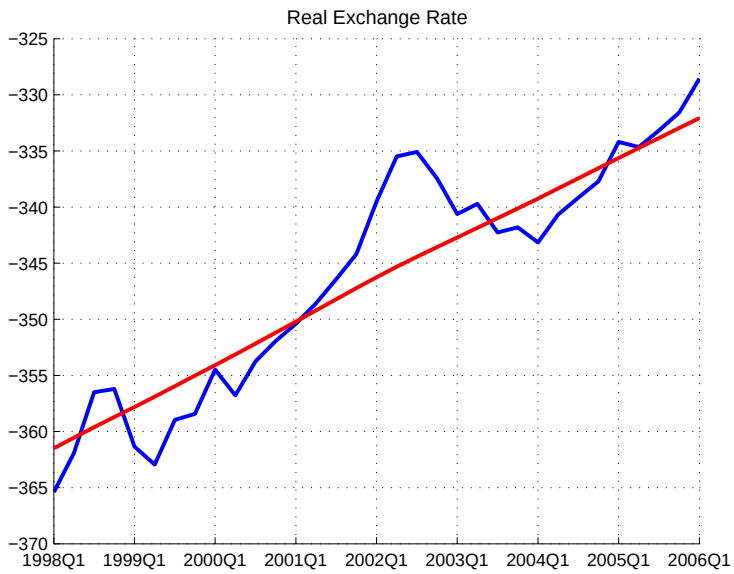
$$\Delta q = \Delta s + \pi^* - \pi \tag{5}$$

  and when the relative PPP holds the real exchange rate remains constant

- following figure shows that in reality the real exchange rate not only fluctuates from the short-term

perspective but also follows a clear deterministic trend

Real Exchange Rate



- whereas the short-term fluctuations are taken as an evidence for price stickiness (Obstfeld and Rogoff, 1996), the trend is caused by the convergence process, e.g. Ballasa-Samuelson effect

Ballasa-Samuelson effect

- an explanation for long lasting deviations from the relative PPP is described as the Ballasa-Samuelson effect that refers to changes in the *trend in productivity*

- it starts with the assumption that the overall domestic price index is a weighted average of the price indices for tradable and non-tradable goods

$$P = \alpha P_T + (1 - \alpha) P_N \tag{6}$$

- the PPP holds for the tradable part of the price index $P_T = SP_T^*$ and there exists an equilibrium (steady state) relative price between the tradable and non-tradable goods $\beta = \frac{P_N}{P_T}$

- substituting $P_N = \beta P_T$ into (6) yields

$$P = [\alpha + (1 - \alpha)\beta] P_T \tag{7}$$

- then the domestic price level for tradable goods can be written as $P_T = \frac{P}{\gamma}$ where $\gamma = \alpha + (1 - \alpha)\beta$

- the same applies to the foreign price levels: $P_T^* = \frac{P^*}{\gamma^*}$ where $\gamma^* = \alpha^* + (1 - \alpha^*)\beta^*$

- if the two definitions of the price indexes for tradable goods at home and abroad are incorporated

in the PPP equation, the nominal exchange rate is obtained as

$$S = \frac{P}{P^*}\frac{\gamma^*}{\gamma} \tag{8}$$

or formulated in growth rates as

$$\Delta s = (\pi - \pi^*) + (\hat{\gamma} - \hat{\gamma}^*) \tag{9}$$

- the rates of change $\hat{\gamma}$ and $\hat{\gamma}^*$ express the real economic effect on:
  - exchange rate, when the exchange rate is flexible
  - domestic inflation, when the exchange rate is fixed, e.g. $\Delta s = 0$
- in practice, they depend on factors α and β:
  - shifts in the ratio of tradable goods in the consumer basket towards the steady state ratio
  - shifts in the relative price of tradable to non-tradable goods towards the steady state relative price
- changes $\hat{\gamma}$ and $\hat{\gamma}^*$ can thus be triggered by shifts in demand (preferences), changes in factor endowments and, mostly used, differences in productivity trends

- regardless what is the true reason of the $(\widehat{\gamma} - \widehat{\gamma}^*)$ existence, it has strong implication for monetary policy in an open economy
  - it does not hold any more that the positive inflation differential is on average accompanied with an exchange rate depreciation if there exist fundamental factors that move the real exchange rate, e.g. the relative price of domestic goods to foreign goods
  - if for instance the inflation differential between Czech economy and Germany is 1% and there is evidence that the real exchange rate appreciates (e.g. the relative price of domestic goods to foreing goods is growing) by 3%, then the nominal exchange rate should on average appreciate by 2% and not depreciate by 1% as would indicate the pure version of PPP
  - consequently, an attempt to protect the nominal exchange rate from appreciation represents an inconsistent monetary policy with potential of enormous central bank losses (will be discussed below)
  - more evidently, if the central bank under similar circumstances, fixes the nominal exchange rate, it must expect the domestic inflation to be 5% and not simply 2% as predicted by pure version of PPP

  - and if the central bank tries to use domestic interest rates to bring the domestic inflation to lower level it violates the fixed exchange rate regime immediately ...

- *the expectation channel* is in an open economy extended for the expectations of the future exchange rate, as the exchange rate (thanks to the PPP) is an important determinant of inflation

- in the past, many countries have tried to influence inflation expectations with announcements of exchange rate targets
  - in the 1980s, many economists thought that a central bank could use a fixed exchange rate as a commitment technology, so that private inflation expectations (influencing wage setting) would be lower (Giavazzi and Pagano, 1988)
  - in fact, in many macroeconomic stabilisation programmes in the 1980s and 1990s an exchange rate anchor was used (Bofinger, 1996)

- however, this mechanism also reveals a possible weakness of an exchange rate target
  - if the negotiating parties feel the exchange rate target to be not very credible, the result will fairly soon be a real appreciation and loss of international competitiveness

- the greater the probability that sooner or later the central bank will give in and seek to remedy the situation by devaluation, the less the unions will be prepared to allow corrections to the wage level
- then the central bank either allows for the exchange depreciation (losing its credibility completely) or the adjustment will require for relatively high loss in output - the central bank lets the economy undergo a recession to break the inflation expectations (remember Lecture VI - 'credibility' gain)

- there are many examples of the breakdown of exchange rate pegs because of an unsustainable real appreciation; a prominent example in Europe is the exit of the Italia lira from the EMS in September 1992

Control of the exchange rate

- open economy framework rises also the question, to which extent the exchange rate can be controled by the central bank, e.g. to which extent the exchange rate can be used as an itermediate (or even operating target) in order to meet the final target of price stability

- if the central bank views the exchange rate as an intermediate target it can target the exchange rate *indirectly* with short term money market rates, using the interest rate parity theory as the theoretical basis for this approach

- the uncovered interest rate parity (UIP) can be written as follows (exchange rate in logs):

$$E_t s_{t+1} - s_t = i_t - i_t^* \tag{10}$$

  and simply states that any positive interest rate differential (if there is no risk premium) must be equal to expected depreciation of the nominal exchange rate, otherwise an arbitrage opportunity exists

- although there exists enormous literature proving the "non-performance" of the UIP, the practical experiences of many central banks show that the central bankers should never forget about this very relationship

- although UIP has been tested mainly for flexible exchange rates, its economic rationale and performance can be demonstrated much better for a regime of fixed exchange rates
  - such an arrangment is typically characterized by a 'large country' in which the central bank sets the short-term interest rates independently (for instance the Bundesbank in 1970s and 1980s)
  - all other countries behave as 'small countries', which means that their central banks have to adjust their domestic short-term rates pasively if they want to keep the exchange rate stable
  - thus, for a satellite central bank the UIP relationship sets highly stringent limits
  - under the EMS, for instance, a country like France or Italy could not afford to reduce its short-term rates under the German level; two attempts by the Banque de France to lower its rate to less than the German level (February 1981 and June 1993) immediately led to a strong speculative attack
  - similarly, the attack against British pound in 1992 was caused by unwillingness of the Bank of England to follow the Bundesbank and rise its short-term rates
- in sum, for fixed rate systems UIP seems to be a very important relationship and there is no reason

to assume that under the flexible exchange rate the situation will be different

- in opposite to indirect control, a direct control of the exchange rate is rather hypothetical possibility

- however, with no doubts central bank can operate on the exchange rate market and by bying and selling foreign assets it can directly influence the exchange rate of its currency

- thus, foreign exchange rate interventions can be regarded as an instrument comparable to open-market operations used in order to target the short-term money market rate

- nevertheless, there are two basic distinctions:
  - first, if the central bank tries to avoid a *depreciation* of its currency, it faces 'hard' limit given by the amount of foreign reserves (in case of *appreciation* such a hard limit is absent)
  - second, a central bank's interventions on the foreign exchange market have a direct impact on its domestic operating target
    - purchases of foreign exchange are associated with an increase in the monetary base (interest rate decline) and *vice versa*

  - however, a central bank can try to sever this link by opposite variation of the monetary base, e.g. by so called *sterilization*
  - the latter implies that in the case of an increase in the monetary base (decline in interest rate) induced by intervetions, the central bank reduces its credits to the domestic banking sector
  - so, sterilization can be defined as a policy that keeps either the monetary base or the money market interest rate constant
  - thus, in principle, it may seem possible for the central bank to target the exchange rate and the money market rate simultaneously
- however, even such a dual strategy is limited ...
  - there still exists the 'hard' limit on the depreciation side
  - and an additional limitation of sterilization can be caused by its costs (on the appreciation side)
- when sterilization reaches large amounts, the costs of it may become quite high, especially when the interest rate paid for the sterilization becomes higher than the interest payments obtained from the foreign reserves

- as foreign reserves are mainly invested in short-term money market instruments, the relevant interest rate is the short-term rate abroad
- sterilisation (negative credite to the banking system) is renumerated with the domestic money market rate
- thus, the interest costs of sterilization per unit of domestic currency depend mainly on the differential between these two rates

$$C^{IS} = i - i^* \tag{11}$$

- for the total costs of sterilization, however, the valuation gains or losses of the assets have to be taken into account

$$C^{TS} = i - i^* + \Delta s \tag{12}$$

- thus, if the central bank tries to prevent the exchange rate from appreciation in a situation where the domestic interest rate is higher than the foreign rate (or there exists a tendency towards appreciation thanks to the fundamentals), it will not be able to defend its currency for long ...
- in addition, allowing for the exchange rate appreciation after a period of interventions and sterilizations rises the valuation costs dramatically

Summary

- regardless of chosen monetary policy strategy, the performance of any central bank in an open economy is framed by several relationships

- a central bank must be always aware
  - that the nominal exchange rate (and foreign inflation) influence domestic inflation (PPP)
  - that there exists long-term deviation from the PPP theory caused by the convergence of the economy towards its steady state
  - that its interest rate are related towards the foreign interest rates via the UIP condition
  - and that the exchange rate interventions are not a systematic tool for monetary policy conduct

- a most important lesson that follows is
  - the central bank can not choose its inflation target, interest rate and exchange rate independently
  - these variables are mutually related
  - and one of them must always be *endogenous*