1 Nominal Exchange rate determination

1.1 ELASTICITIES APPROACH

The price of the foreign exchange, S(t), is determined by the demand for and supply of foreign currency

The demand for and supply of foreign currency are derived from the demand for and supply of imports and exports. Those in turn depend on domestic and foreign incomes (Y and Y*) and the relative price of domestic goods in terms of foreign goods, q (the terms of trade or real exchange rate).

\[ s: D(q, Y, ) = S(q, Y*) \]

D, S = demand and supply of imports

Main points:

1. A domestic currency devaluation (depreciation) - s goes up- improves the trade balance (TB) iff the sum of import and export elasticities exceeds unity (the Marshall-Lerner, M-L, condition).

J-curve: It is possible that short and long term elasticities differ. If the M-L condition is satisfied in the long run but not in the short run then we may observe a J-pattern following a devaluation: an initial deterioration of the TB followed by an improvement Long term elasticities tend to exceed short term due to:

a. Long term trade contracts (advance orders at a pre-specified price)

b. Learning about price changes

2. An increase in domestic income leads to a depreciation of the domestic currency and a deterioration of the TB. For instance, an acceleration of economic growth in Switzerland will depreciate the SF and improve the international competitiveness of Swiss products

3. The empirical evidence on the effects of a devaluation

A. On the trade balance. Must filter out the effects of the other determinants of the TB.
Testing strategy: $TB = f(Y, Y^*, \text{fiscal policy, ...})$.

Econometric estimation problems: Simultaneity. Relate the residuals of the estimated regression to the timing of the devaluation. Mixed findings.

Possible reasons for not observing an improvement in the trade balance following a devaluation:

a) The M-L condition is not satisfied

b) There is no associated real devaluation and hence no gain in international competitiveness (note that $q = SP^*/P$)

I. $p$ increases because of labor union pressures for salary compensation. As a result, the nominal devaluation does not translate into a real one

II. $p$ goes up either because productivity-efficiency worsens (complacency) or because the domestic firms raise prices to increase profits rather than market share (US auto industry)

III. $p^*$ decreases because foreign exporters lower their prices to maintain market share. A good example is the practice of Japanese companies exporting to the US in the late 80s (note, however, that profits get squeezed; also may run into problems with anti-dumping legislation)

c) there are offsetting developments in other variables that are not included in the regressions (for instance, a change in world interest rates)

B. On output. A devaluation seems to serve as a temporary output stimulus.

4. An important caveat: In general, we cannot ask questions like whether a weaker CHF improves the TB and stimulates the Swiss economy? This is not a well posed question because, under a flexible exchange rate system, the exchange rate is an endogenous variable which is simultaneously determined with the TB.

One needs to know the underlying shock that induced the exchange rate change in order to answer this question. For instance, was it due to fiscal expansion, or a change in monetary policy, or a change in productivity

Main shortcoming of the elasticities approach: ignoring capital movements (which dwarf trade flows nowadays). Trade flows are also too smooth in the short run to account for the observed large short term real (and nominal) exchange rate volatility. The theory may make more sense in the determination of the long term real exchange rate (Terms of Trade), $\bar{q}$.

$$
(1 + r)B_{-1} + \sum_{t=0}^{\infty} \left( \frac{1}{1 + r} \right)^t TB_t(\bar{q}) = 0, \quad TB_t = Y_t - C_t
$$

Prediction: Sustained trade deficits ("borrowing" from abroad) lead eventually to a currency depreciation in order to generate the future trade surpluses required to pay back the external debt
1.2 THE MUNDELL-FLEMMING (KEYNESIAN) MODEL

Main emphasis: How the policy mix affects the exchange rate, international trade competitiveness and aggregate economic activity

Fixed goods prices. IS-LM: The IS curve now includes imports and exports.

\[ Y + IM = C + I + G + EX \]

Monetary and fiscal policy affect the exchange rate through their effects on the domestic real interest rate relative to the foreign interest rate.

Interest Rate Parity (UIRP)

\[ \frac{1+i(t)}{1+i^*} = \frac{E_s(t+1)}{S(t)} \]

Takings logs

\[ i - i^* = s(t+1) - s(t) \]

Position of the IRP curve: higher \( s(t+1) \) or \( i^* \) shift the curve out

Short term effects of fiscal and monetary policy

Monetary Temporary monetary expansion: Lower interest rates, domestic currency depreciation, output expansion

Fiscal Temporary fiscal expansion: Higher interest rates, domestic currency appreciation, output expansion

Main shortcomings of the theory: Well known. The new Keynesian model offers a more satisfactory treatment. PierPaolo will deal with this.

1.3 ASSET BASED MODELS

Forward looking prices

\[ s(t)=V[K(t), E_s(t+1)] \]

1.3.1 THE MONETARY APPROACH

The demand for and supply of foreign currency are derived from the demand for and supply of domestic and foreign money (\( s \) is now the relative price of monies rather than goods).

\[ s(t) : M(t)/p(t) = F(i(t), y(t)) \]

The relevant fundamentals are the determinants of the supply of and demand for money

Important assumptions:

- All prices are flexible (Aggregate Supply is vertical).
• Domestic and foreign goods are perfect substitutes (PPP): \( p(t) = s(t) p^*(t) \) or \( \hat{p}_t = \hat{s}_t + p^*_t \) holds

• Domestic and foreign assets are perfect substitutes (IRP): \( \frac{1 + i(t)}{1 + i^*(t)} = \frac{E_t S(t+1)}{S(t)} \)

Implications:

• \( M \uparrow, S \uparrow \) (depreciation)

• \( i \uparrow, S \uparrow \) (depreciation)

• \( y \uparrow, S \downarrow \) (appreciation)

Comparison to the predictions of the Keynesian model (IS-LM).

\( i \uparrow, S \downarrow \) (appreciation)

Understand the source of disagreement:

i: Fisher equation: \( i = r + E \pi \)

Sources of variation in i. Real vs nominal. The role of inflation and inflationary expectations

Derivation of a forward looking expression for \( S(t) \).

\[
M(t) = P(t) Y^\alpha \exp(-b_i(t))
\]

Combine the above equation with the foreign country counterpart + PPP + IRP to get:

\[
(1 + b)s(t) - bE_t s(t + 1) = k(t) \quad k(t) = m(t) - m^*(t) - \alpha(y(t) - y^*(t))
\]

where \( s, m, y \) represent the log of the corresponding variable.

TWO solutions

Solving first order difference equations

a) Bubble: the solution to the homogeneous part \( (1 + b)s(t) - bE_t s(t + 1) \)

In general, any current exchange rate that satisfies the condition

\[
s(t) = \frac{b}{1 + b} E_t s(t + 1) \Rightarrow s(t) = A(0)(\frac{b}{1 + b})^t
\]

is a valid solution

Price bubble: If the only reason that today’s price is high is because the future price is expected to be high (and not because of fundamentals) then we have a bubble. We typically set the initial condition of this difference equation to eliminate the bubble, \( A(0) = 0 \)
To gain a better understanding of bubbles consider the IRP

\[
\frac{1 + i(t)}{1 + i^*_t} = \frac{E_t S(t + 1)}{S(t)}
\]

For any \(i(t)\) and \(i^*(t)\), the value of the current exchange rate is undetermined unless we fix a value for the future exchange rate. For an arbitrary expectation, we get an arbitrary current spot rate!

The CHF these days. Is it a bubble?

Econometric tests of bubbles. Omitted variables

b) Particular solution (fundamentals) Postulate that the current spot rate is determined by its fundamentals, \(k(t)\), so that \(s(t) = A + Bk(t)\) or, equivalently,

\[
s(t) = \frac{1}{1 + b} E_t \sum_{j=0}^{\infty} \left( \frac{1}{1 + b} \right)^j k(t + j)
\]

Two ways of testing the model

1. Estimation of this equation together with the stochastic equation (process) for the fundamentals For instance, \(k(t) = c \ast k(t) + u(t)\)

Test the model using cross equation restrictions.

A diversion into the econometrics of CROSS EQUATION RESTRICTIONS under rational expectations

2. Variance bounds test: conditional variance of \(s(t)\) should be bounded above by conditional variance of \(k(t)\)

Policy implications:

1. Monetary policy affects the nominal exchange rate but not int’l trade competitiveness \((q)\).
2. Both current and expected future developments matter

Main shortcoming: a) The real exchange rate \((q = S p^*/p)\) is not constant (PPP does not hold) in the short run.

b) IRP does not seem to hold either.

1.4 DISEQUILIBRIUM MONETARY MODEL

(Dornbusch but actually already in Friedman 1953!)

The assumptions are the same as above with an important exception: Goods prices are taken to be flexible only in the long run but sticky in the short run.
Figure 1: PPP

Figure 7.1: Dollar-Sterling PPP Over Two Centuries

Figure 7.2: Consumer Price Inflation Relative to the U.S. Versus Dollar Exchange Rate Depreciation, 29-Year Average, 1970-1998
Effects of monetary expansion. Use

\[ M(t)/p(t) = F(i(t), y(t)) \]

and

\[ \frac{1 + i(t)}{1 + i^*(t)} = \frac{E_t S(t + 1)}{S(t)} \]

Exchange rate overshooting.

- The short run exchange rate jumps above its long run value.
- "Excessive" nominal and real exchange rate volatility
- In the short run, the real exchange rate (the terms of trade) moves in tandem with s because \( P \) and \( P^* \) are sticky in the short run.
- In the long run good prices are flexible so \( q \) returns to its earlier value.

Interesting implications:

- a) The policymakers can use monetary policy to induce temporary change in international trade competitiveness \( (q) \) by manipulating the nominal exchange rate, \( s \).
- b) An increase in the nominal interest rate is associated with a currency appreciation.
- c) Unlike the IS-LM (Mundell-Fleming) model the effects of monetary policy are short lived.

Strengths: It matches the stylized fact that almost all of the short run variation in real exchange rates is due to variation in the nominal rate.

Weaknesses: It has difficulty accounting for the fact that deviations from PPP are long lived. It predicts a transitory, short lived change in \( q \).

Overvalued (undervalued) currencies

Definition: A currency is said to be overvalued (undervalued) when it is stronger (weaker) compared to what is implied by PPP. Note that in this model overvalued means less competitive

1.5 EQUILIBRIUM MONETARY MODEL

(Stockman, 1980)

Everything is as in the monetary model except for the fact that it assumes that domestic and foreign goods are not perfect substitutes. The emphasis is on real -mostly supply -(rather than monetary) shocks
Equilibrium in the goods market

\[ q = \frac{u_y}{u_x} \]

Definition of \( q \): \( q = S(t)P^*(t)/P(t) \)

Equilibrium in the money market

\[ M(t)/p(t) = F(i(t), y(t)) \]

Using the definition of \( q \) and the prices from the money market equilibrium gives

\[ S(t) = \frac{M(t)}{M^*} \frac{F(i^*(t), y^*(t))}{F(i(t), y(t)[t])} \frac{u_y}{u_x} \]

The implications with regard to the effects of changes in \( M \), and i are the same as in the monetary model.

The effect of \( M \) on \( s(t) \) may be ambiguous if inflation redistributes international income and preferences are non homothetic (transfer problem). Nevertheless, monetary policy cannot be used to manipulate \( q \).

The effects of \( Y \) on \( s \) are ambiguous: income effect (money market) pushes \( s(t) \) down; The elasticity of substitution between domestic and foreign goods effect pushes \( s(t) \) up.

Interesting points:

- The concept of international competitiveness is meaningless.
- The correlation between changes in the nominal and real exchange rate is not unique. Its sign depends on the type of shock that hits the various markets.
- In any case correlation does not imply causality.
- Nevertheless, we know that this correlation has on average been strongly positive.
- Government expenditure (or taste) shocks: Expansionary fiscal policy leads to appreciation.

Evaluation: Can account for high persistence in real exchange rates with supply shocks. However, in order to account for great volatility of nominal exchange rate relative to inflation rates with supply shocks it needs \( var(p) < var(s) \) (large elasticity of substitution compared to the elasticity of the demand for money with regard to income).

But this requires \( Cov(s, output) > 0 \) which does not seem plausible.

Nontradeables do not help to account for these failures.

The model does a better job when demand shocks (preferences or government expenditure shocks) are introduced.
1.6 PORTFOLIO BALANCE

Assumption: Domestic and foreign assets are imperfect substitutes (differences in riskiness). IRP does not hold

The demand for and supply of foreign currency are derived from the demand for and supply of all domestic and foreign assets (not just money); S is now the relative price of assets

The effectiveness of official intervention. Non sterilized intervention: involves change in the money supply vs Sterilized intervention: involves swap of domestic + foreign bonds with no change in money

If assets denominated in different currencies are imperfect substitutes then sterilized intervention ought to work

It usually does not

Sterilized intervention as a signal of future intentions. Credibility

1.7 NEW THEORIES: A SHIFT AWAY FROM MACRO-DETERMINANTS TOWARDS MICRO-DETERMINANTS

a) The dynamics of trading behavior.

The relationship between volume and price changes, thickness of markets, heterogeneous sentiments. Trading patterns, procession of information FX markets

1. Huge trading volume

2. Inter-dealer trading is very high (80

3. Low transparency of order flows (no disclosure requirement) Trades between FX dealers and their customers are not observed by others

Customer bases introduce a source of private info at the dealer level. There is also public info about order flows that comes from trading through brokers (1/3 of total volume)

Dealers: Risk averse speculators + information intermediaries

Role of inventory adjustment: The hot potato hypothesis Implications for informational role of orders

Does heavy trading indicate much or little information being processed?