Kiel Institute for World Economics
Duesternbrooker Weg 120
24105 Kiel (Germany)

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International Exchange Rate Systems – Where do we Stand?

by

Horst Siebert

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Abstract: *This paper analyzes institutional arrangements for exchange rate systems and reviews what we know. It looks at the foreign exchange market, different balance of payment situations in which countries find themselves and the necessary exchange rate adjustments. It studies the options that are available to countries in choosing their exchange rate system (type of nominal anchor, nominal anchor versus real target and the degree of sovereignty to be given up) and reviews the historical experience for multilateral options. The actual system is a fragile low-inflation central bank dominated arrangement. Options for the future rest on quite a few idealistic ideas. In addition to choosing the exchange rate system, adopting the right exchange rate is also addressed.*

Keywords: Exchange rate systems/ Balance of payments situations/ External and internal equilibrium/ Choosing the exchange rate system/ Unilateral and multilateral arrangements/ Options for the future/ Universal money

JEL classification: E, E5, E42, E58, E61,F31, F32,F33.

Horst Siebert
Kiel Institute for World Economics
24100 Kiel, Germany
Telephone: +49/431/8814-567
Fax: +49/431/8814-568
E-mail: hsiebert@ifw.uni-kiel.de

The International Exchange Rate System – Where do we Stand?

Horst Siebert [1]

The exchange rate, i. e. the relative price of monies, represents an important economic variable affecting external and internal equilibrium of an economy. Therefore, the institutional arrangements of exchange rate systems play an important role. The nominal exchange rate is determined in the foreign exchange market (section 1). Countries are in different balance of payment situations, requiring different types of exchange rate adjustments (section 2). Several options are available in choosing the exchange rate system; they differ with respect to the type of nominal anchor, the type of goal (nominal anchor versus real target) and the amount of sovereignty to be given up (section 3). Countries have the option of a unilateral or multilateral strategy (section 4). We have quite a bit of historical experience for multilateral options (section 5). The actual system is a fragile low-inflation central bank dominated arrangement. The discussion on options for the future rests on quite a few idealistic ideas (section 6). Finally, the paper addresses specific policy issues such as choosing the right exchange rate (section 7).

1 The global foreign exchange market

The US dollar as the leading currency

In the international foreign exchange market, the US dollar is the dominating currency, the euro, newly established in 1999, coming in second place. Of the total transactions in the international currency markets, 89 percent have the US dollar on one side of the transaction, 37 percent the euro. The yen and the sterling follow with 20 respectively 17 percent. The daily average turnover on the foreign exchange market amounts to US$ 1.9 trillion (April 2004). This figure is adjusted for double counting; the gross turnover is US$ 2.7 trillion. Spot market transactions account for US$ 620 billion, outright forwards for US$ 208 billion, foreign exchange swaps for US$ 944 billion. The average daily turnover in the over-the-counter derivatives market is US$ 2.4 trillion. The by far most traded currency pair in 2004

[1] Revised version of chapter 6 of my forthcoming book "The World Economy. A Global Analysis" (Routledge). I appreciate assistance in the collection of data by Shafik Hebous and Oliver Hoßfeld.

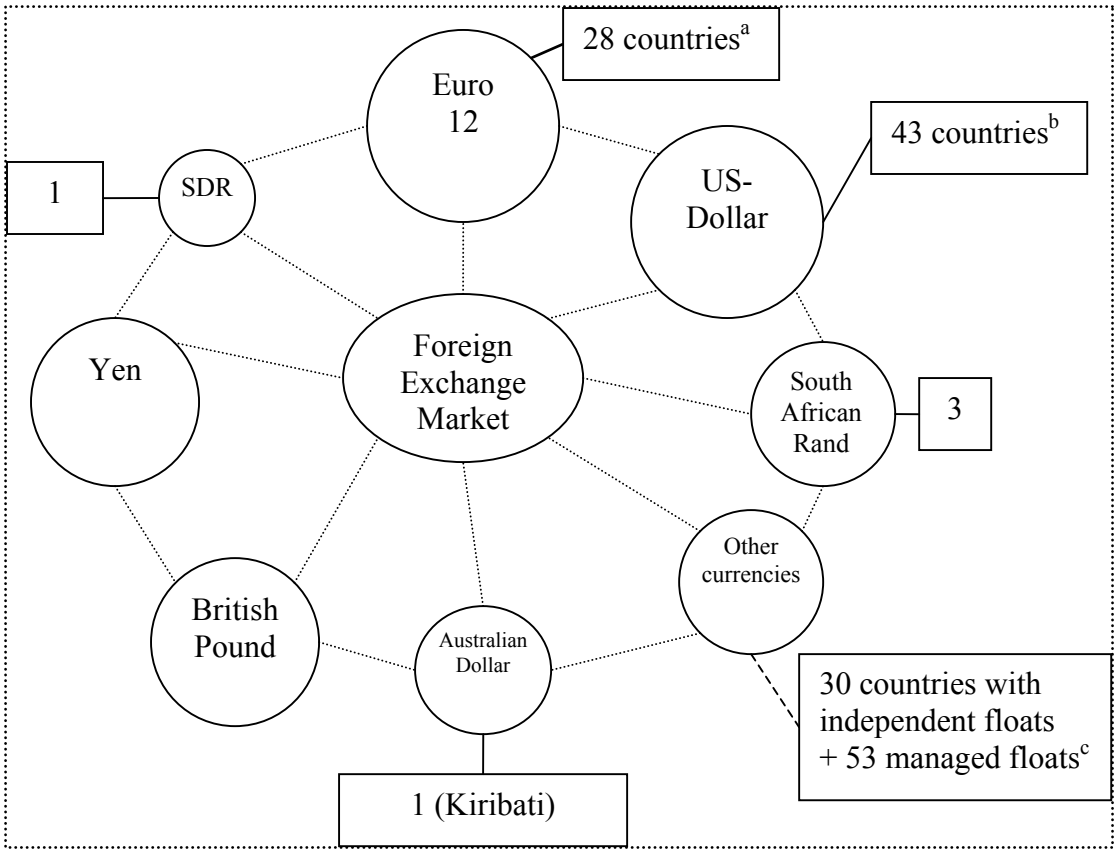
was the dollar/euro – amounting to 28 percent of global turnover; the dollar /yen accounted for 17 percent and the dollar/sterling for 14 percent (all data: Bank for International Settlements, March 2005). 31 percent of total turnover is done in the UK; this means that London has retained its historical position. The next rankings are the USA with 19 percent, Japan (8), Singapore (5), Germany (5) and Hong Kong (4).

Of the total reserve holdings of all central banks in 2004 that can be allocated to a currency (identified reserves), about 65.9 percent are held in US dollars, 24.9 percent in euros, 3.9 percent in Japanese yen and 3.3. percent in British pound (IMF 2005a, Table I.3). Total reserves including unaccountable reserves total US$ 2.4 trillion. Euro holdings only amount to a value of 626 billion US dollar. However, they have been constantly increasing and more than doubled since 1999. Yen and pound sterling holdings amount to less than 100 billion US dollar each.

Most currencies, including the major ones - the US dollar, the euro, the yen and the British pound - float against each other. The foreign exchange market can be viewed as a wheel of floating currencies to which the pegs and the managed floats are attached (Figure 1). Out of the currencies of the 184 member countries of the IMF and of three non-members[2], 43 currencies are pegged to the dollar (including managed floats) and 28 to the euro. Thirty other countries let their currencies float independently, 53 have a managed float. Every restriction of flexibility of a currency with respect to another one including dollarization has been considered a peg (but except managed floats). Most of the Asian countries use the dollar standard where their currencies are linked to the US dollar. Since mid-2005, China applies a basket for its renmimbi, reflecting the weight of its trading partners.

A few currencies are strictly fixed to another currency. This refers to the Hong Kong dollar, whose monetary base must be backed by US dollars at a fixed rate, and the Estonian kroon to the euro. The Estonian kroon also participates in the European Exchange Rate Mechanism II.

[2] The three non-members are Aruba, Hong Kong and the Netherlands Antilles



[a] Four of them within a currency board. Also included are the seven member countries of European Exchange Rate Mechanism II (Cyprus, Denmark, Estonia, Latvia, Lithuania, Malta, Slovenia). - [b] Two of them within a currency board, seven use the US dollar as only legal tender.- [c] Two more countries (Bhutan and Nepal) peg their currency to the Indian rupee, which itself is a managed float (and which is counted as one of the 53 managed floats here). A further country (Belarus) is pegged to the Russian rouble, which also is a managed float. One more country (Brunai) is pegged to the Singapore dollar (again a managed float). Seven other countries restrict the flexibility of their home currency against another basket of currencies.

Figure 1 The foreign exchange market

Source: Annual report on exchange arrangements and exchange restrictions, IMF (2005b).

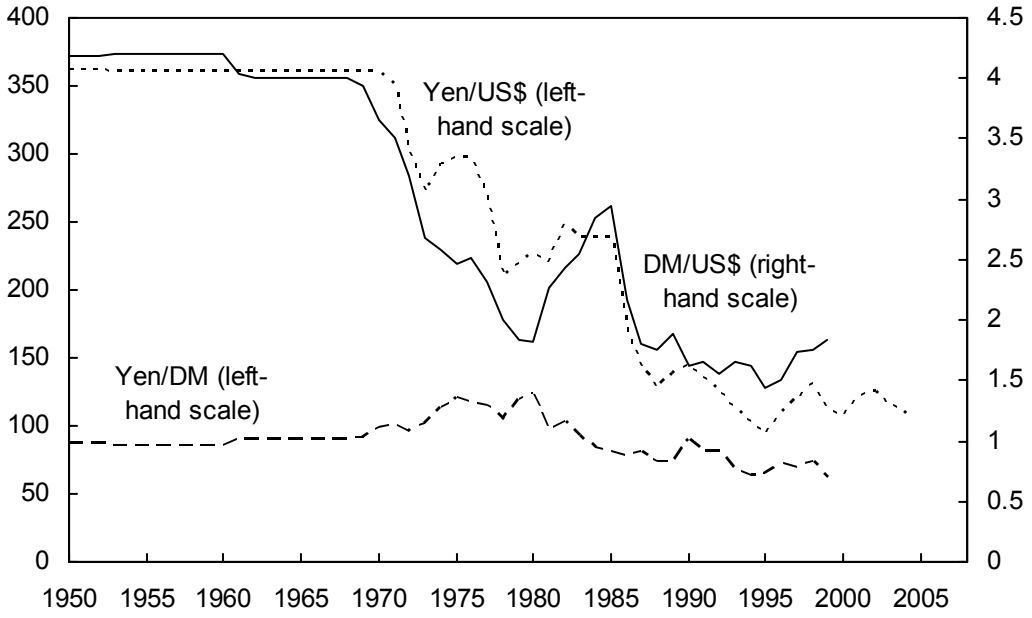
The three major currencies of the world: A historical review

Prior to World War I, the British pound was the dominating currency of the world economy. Its decline in importance reflects the loss of the relative position of the British economy and the rise of other economic countries. Since the end of the Second World War, appreciations and depreciations of the three major currencies of the world today - the US dollar, the deutsche mark (and from 1999 the euro) and the yen - reflect fundamental changes in the three major economies in the last 55 years. These include differences in economic growth,

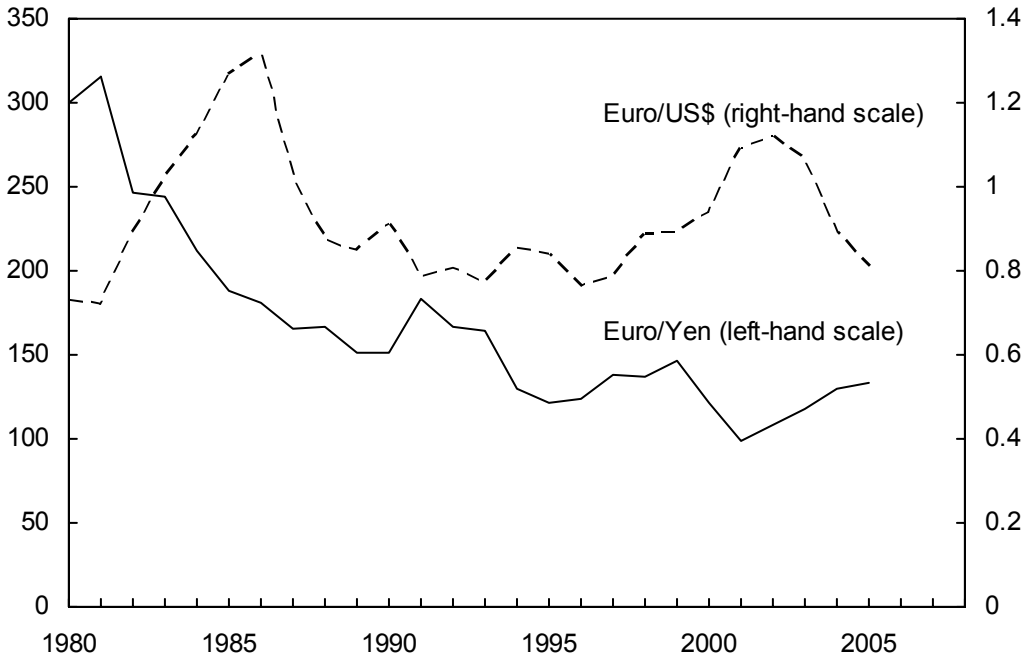
long-term shifts in comparative advantages and in trade flows, switches in capital flows as well as other phenomena such as asynchronous business cycles among the countries and differences in stabilization policies, i.e. in monetary, fiscal and wage policies. Moreover, institutional changes are relevant.

In the 1950s, 1960s and 1970s, the catching-up process of Germany, the European economies and Japan, all affected by World War II, and the growth of their exports worked towards an appreciation of the deutsche mark, other European currencies and the yen vis-à-vis the US dollar. During the 1950s and 1960s, the exchange rates between the US dollar and the deutsche mark and between the US dollar and the yen were revalued at certain intervals, but remained relatively stable due to the Bretton Woods system. From 1970, both currencies appreciated against the US dollar (Figure 2a). In the 1970s, Japan was exposed more intensively to the two oil crises than other countries, so that the yen had to depreciate temporarily vis-à-vis the deutsche mark. In the first part of the 1980s, the US dollar appreciated. After 1985, the deutsche mark and the yen gained value relative to the US dollar. In light of the IT boom in the US, the US dollar appreciated again. After 1980, the deutsche mark appreciated against the yen.

Taking the ECU as the predecessor of the euro and converting it into euros with the conversion rate of 1:1 at the start of the euro, the ECU/euro appreciated against the US dollar from the mid 1980s to 1995, then depreciated until 2000 and appreciated afterwards. The ECU/euro appreciated against the yen until 2000, then depreciated (Figure 2b).



(a) US$, deutsche mark and yen



(b) Euro [a], US dollar, and yen

Figure 2 US dollar, euro[a], deutsche mark and yen

[a] For the euro, the exchange rate of the ECU is used from 1978 to 1998 with the official conversion rate.

Source: IMF, *International Financial Statistics*, 2005

Will the euro drive out the dollar?

The leading position of the US dollar is not guaranteed in the future. At the beginning of the 20th century, the British pound was the dominating currency. In a slow process after 1914, the US dollar gained more and more importance. After World War II it had overtaken the pound. Factors having a positive effect on the international status of a currency are a large share in international output, trade and finance of the currency's country (or region in the case of the euro), deep and well developed financial markets, confidence in the currency's value and positive network effects of the currency. Chinn and Frankel (2005) study under which conditions the euro may overtake the US dollar. They extrapolate an empirical equation that they estimated for the period 1973-1998. Their result is that the euro will surpass the US dollar as leading international reserve currency if the UK and all the other EU members (of the EU-25) join the European Monetary Union by 2020; the euro then will overtake the US dollar a few years later.

2 External balance

Foreign currency market

Tthe exchange rate as the relative price of monies is determined by demand for and supply of a foreign money, let us say the US dollar. Let us define the exchange rate *e=€/$,* indicating how many euros you have to pay to buy one dollar. Assume the world consists of two regions only and let them be the US and the euro area. Then demand for and supply of US dollars reflect the demand for and supply of US dollar for goods and the demand for and supply of US dollar for capital flows. The result is the change in the foreign currency position

$$E^{\$} = D^{\$}(e) - S^{\$}(e) = IM^{EU} - IM^{US} + K_X{}^{EU} - K_X{}^{US} + \text{accumulation of reserves} \qquad (1)$$

where $E^{\$}$ is excess demand for US dollars, $D^{\$}$ and $S^{\$}$ demand for and supply of US dollars, IM^{EU} stands for European goods imports, IM^{US} for US goods imports, $K_X{}^{EU}$ denotes European capital exports and $K_X{}^{US}$ US capital exports. In the real world, the picture looks more complicated. Currencies are demanded for services like royalties and interest payments and for unilateral transfers. Consequently, IM^{EU} stands for the euro area's total demand for

US dollars in the current account. Likewise, IM^{US} is the US dollar supply (i.e. the US demand for euro) of all positions in the current account. Moreover, capital flows include all sorts of transactions; for instance market participants hedge positions and speculate with currencies. These transactions are part of the capital and financial account. Moreover, the real world is more complicated than a two-region case with two currencies. There are more currencies than the US dollar and the euro.

In addition to the demand for and the supply of foreign currencies for trade and capital flows, central banks tend to demand foreign currencies in order to build up their reserves. This means that they drive up the price of the reserve currency and lower the price of their own currency. Reserves may also be used to finance a deficit in the sum of the current and the capital and financial account.

Countries in different balance of payments conditions

Countries can be in different balance of payments situations. In the surplus-surplus category, where both the current and the capital account are in surplus, countries can use both types of surpluses to build up reserves (China, Korea, Japan, see table 1). Surplus–deficit countries use the current account surplus to finance the capital account deficit, i.e. the import of capital (Germany, euro area). The current account surplus may be large enough to accumulate reserves. Deficit-surplus countries finance the current account deficit with capital inflows. If capital inflows are strong enough, the country can even accumulate reserves. A deficit-deficit country has to finance the two deficits by the depletion of its reserves. For instance, Brazil lost reserves of 8 bill US dollars in 1997 prior to its 1999 currency crisis. Thailand lost US$ 9.9 billion in reserves in 1997, the year of its currency crisis.

Table 1 Countries in different balance of payment situations, 2004, (billion US$)

	Current account		Capital and financial account		Change in reserves[a]		Errors and omissions
Surplus-surplus countries							
China	surplus	68.6	surplus	110.7	accumulation	-206.1	26.8
Japan	surplus	172	surplus	17.7	accumulation	-160.8	-28.9
Korea	surplus	27.6	surplus	8.3	accumulation	-38.7	2.8
Surplus-deficit countries							
Germany	surplus	103.4	deficit	-121.8	reduction	1.8	16.6
Euro area	surplus	58.7	deficit	-2.4	reduction	15.5	-71.7
Deficit-surplus countries							
Australia	deficit	-40	surplus	41.9	accumulation	-1.1	-0.8
Portugal	deficit	-12.7	surplus	12.6	reduction	1.9	-1.8
USA	deficit	-665.9	surplus	611.2	reduction	2.8	51.9
UK	deficit	-41.9	surplus	25.9	accumulation	-0.4	16.4

[a] Technically, the accumulation of reserves has a negative sign in order to balance the balance of payments. A positive sign denotes a loss of reserves.

Source for data: IMF, *International Financial Statistics*, 2004.

External balance, the nominal and the real exchange rate

The nominal exchange rate is a price that helps to clear the foreign currency market. In principal, the exchange rate should adjust in such a way that an imbalance in the balance of payments is reduced. However, exports and imports in the current account, an important element in the excess demand for a currency, are not a function of the nominal exchange rate alone. Since the competitiveness of firms also depends on the relative price levels in the countries considered, it is the real exchange rate that determines the trade and the current account. The real exchange rate is defined as

$$e_R = eP^*/P \qquad (2)$$

where P^*, P are the respective national price levels being used as correction factors of the nominal exchange rate. The real exchange rate denotes the real price of products of the foreign country, i.e. of a country's export goods in terms of its imports. It has the dimension

$$\frac{Q}{Q^*} = \frac{€}{\$} \cdot \frac{\$}{Q^*} \; / \; \frac{€}{Q} \tag{3}$$

Therefore, it depicts the relation between the quantities of the domestic good (Q) and the quantities of the foreign good (Q^*), i.e. the ratio at which domestic goods can be exchanged for foreign goods. It tells us something about the purchasing power of the domestic good. Thus, the real exchange rate is a relative price. In the simple two-goods model, in which a country trades the domestic good Q for the foreign good Q*, the real exchange rate has the inverse dimension of the terms of trade (Q^*/Q), i.e. we have $e_R = 1/p$.[3]

Countries that want to remove a current account deficit have to perform a real devaluation. They offer more of their export good Q per unit of the foreign good Q*. Thus, they put a higher real value on their export good; domestic demand for export goods is reduced; domestic supply of exports is stimulated. From the point of view of the euro area as the domestic country, e_R would have to rise. The relationship between the real exchange rate and the current account is shown in Figure 3. A high real exchange rate, i.e. a depreciated currency, means that it is easier to export, and the country will have a surplus in the current account. With a real appreciation (i.e. e_R falls), the surplus will be reduced and eventually a deficit arises. Assume the US has a higher inflation rate ($\hat{P}^*$) than the euro zone ($\hat{P}$). This means we have $\hat{P} < \hat{P}^*$ instead of $\hat{P} = \hat{P}^*$ initially. Then e_R rises, and the euro area

[3] In an alternative interpretation, the real exchange rate is defined in terms of the prices P_T and P_{NT} of tradables (Q_T) and non-tradables (Q_{NT}):

$$e_R = eP_T/P_{NT} \tag{4}$$

where P_T is the price of tradables in foreign currency and P_{NT} is the price of non-tradables in domestic currency. The dimension is

$$\frac{Q_{NT}}{Q_T} = \frac{€}{\$} \cdot \frac{\$}{Q_T} \; / \; \frac{€}{Q_{NT}} \cdot \tag{5}$$

A real appreciation ($e_R < 0$) means that the price of non-tradables increases more than that of tradables. The economy will have an incentive to produce more non-tradables, and so a balance-of-payments surplus will be reduced.

experiences a real devaluation whereas in the US we have a real appreciation, crowding out its export sector.

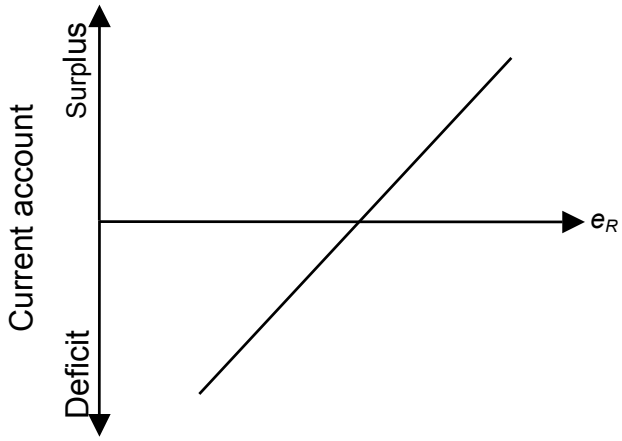


Figure 3 The real exchange rate and the current account

External and internal balance

While changes in the real exchange rate can bring the current account into balance, they also have an impact on aggregate demand and internal equilibrium. Consequently, the real exchange rate has to satisfy the condition that internal equilibrium is established. In a simple Keynesian approach, the equilibrium conditions can be illustrated by the curves of the goods market equilibrium, of asset market equilibrium and for a zero balance in the current account.

The curve of the goods market equilibrium GG must satisfy the goods market and the monetary equilibrium. If at a given equilibrium, a real depreciation occurs, exports will be stimulated and output Y will increase. Consequently, the curve of the goods market

equilibrium GG slopes upward.[4] The curve of the asset market or portfolio equilibrium AA must satisfy interest rate parity and monetary equilibrium. If at a given equilibrium output Y increases, transaction demand for money will rise, the interest rate will rise and this will lead to an appreciation. Consequently, the AA curve slopes downward. [5] If the current account has a zero balance and Y increases, import demand rises and in the new equilibrium the exchange rate has to depreciated. Consequently, the CA- CA curve has a positive slope. [6]

Policies affecting the external equilibrium will influence the internal equilibrium. For instance, an expansionary fiscal policy will shift the asset curve to the right since it will expand output. The new equilibrium will be at K' instead of K. If there was a deficit in K to start with, the deficit will be increased in K'.

Note, that in a more realistic approach, the internal equilibrium depends not only on the real exchange rate, but also on the real interest rate and the real wage rate. Moreover, in the Keynesian model the influence of the real exchange rate is only captured on the demand side. Supply side effects are not taken into consideration.

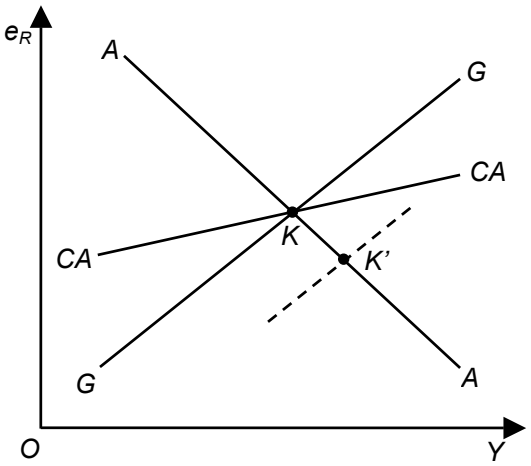


Figure 4 Internal and external equilibrium

[4] For simplification use the nominal exchange rate instead of the real exchange rate. From the equations $S(Y) = I(i) + G + X(e) - eIm^{\$}(Y,e)$ and $L(Y,I) = M$ we have after total differentiation $dY/de = \pi / (s+m + I_i L_Y/L_i) > 0$ for $\pi > 0$.

[5] Total differentiation of the interest rate parity $i=i^* + (e^e - e)/e$ * and the monetary equilibrium yields $di = - (e^{e/} e^2)$ and $L_y dY + L_i di=0$. Hence $dY/de = (L_i e^e / L_Y e^2) < 0$.

[6] The condition for a zero balance in the current account is $CA = X(e) - eIm^{\$}(Y,e)$. The slope is $de/dY = m/ \pi > 0$.

Global imbalances

The US current account deficit amounted to US$ 804.9 billion in 2005 and again sharply increased compared to the previous year value (US$ 668.1 billion). As a share of GDP, the US current account deficit rose from 5.7 percent in 2004 to 6.4 percent in 2005.

Such a high US current account deficit may be interpreted as having the positive aspect of representing demand for other countries' products since the US soaks in their goods. At the same time, such a deficit, financed by capital inflows and by Asian central banks' demand for US dollar reserves, is a fragile situation. If market participants are no longer willing to provide credit and if central banks stop acquiring dollar reserves or start selling them, adjustment becomes inevitable. The situation cannot persist forever; it entails the risk of an unwanted, abrupt and hefty decline in the US dollar. This would represent an economic earthquake for the world economy, causing massive repercussions. In such a scenario of a hard landing, the exports of other countries to the world's largest economy would largely collapse, which would put the exporting regions of the world into a severe recession. Moreover, wealth of holders of dollar assets will be destroyed.

A solution to this imbalance consists first in a controlled (not abrupt) devaluation of the US dollar, choking off US import demand and stimulating US exports. Note that in this scenario other countries receive a weaker demand stimulus and world growth would be lower. Since exports and imports are steered by the real exchange rate, the US would need a real dollar depreciation. And since the elasticity of exports and imports with respect to the real exchange rate is small for the US, a real depreciation of 20-40 percent may be necessary (Ahearne and von Hagen 2005). They also estimate that a nominal depreciation of 30 percent would bring a loss of wealth amounting to ten percent of the rest-of-the world's GDP, given US dollar holdings of US-$9.3 bill by the rest of the world.

As a second avenue, a reduction in the US budget deficit lowers domestic absorption and may eventually find its way into lower import demand. However, it does not represent a direct constraint on US import demand. Third, monetary policy plays a role in the adjustment process. An increase in the US interest rate keeps up external financing but reduces domestic US demand at the same time. One reason for the high external deficit was the easing of monetary policy after the stock market crash in 2000/2001 when the Fed set the interest rate at 1 percent. In mid 2005, the Fed has reversed its policy and raised the rate in a series of

steps to 5.25 percent (July 2006). Fourth, a higher savings rate in the US would help to alleviate the problem. Also, if the US would save energy or allocate the environmental costs of global warming to its energy users, it would reduce its current account deficit. Fifth, growth in Europe, being brought about by institutional reforms in innovation policy and human capital formation, labor markets and social security systems, would be a welcome stimulus for the US and for the world economy and would help to get the US out of its current account deficit.

Realistically, a combination of all these factors would facilitate to reduce the risk of a major disturbance of the world economy.

A sixth avenue of adjustment relates to the current account surplus countries in East and Southeast Asia of US$ 325 billion in 2004, of which Japan had a surplus of US$ 172 billion and China of US$ 69 billion. The oil-exporting countries exhibited a surplus of US$ 194 billion due to the high oil price; the euro area's surplus stood at only US$ 58.7 billion. It is argued that if the Asian countries would apply a free float instead of the US dollar standard, appreciating their currencies, US exports would be stimulated and Asian exports to the US be reduced. As a consequence, the burden of adjustment for the European countries would be lower. If the Asian countries leave their currencies unchanged or even let them depreciate, Europe will face a higher burden of adjustment because there is a stronger pressure for an appreciation of the euro. In a disequilibrium one of the relative prices of money has to adjust. Thus, Asian exchange rate policy determines whether Europe has to bear a larger adjustment burden.

Often, bilateral current account deficits of the US with the respective regions are used as arguments. Surprisingly, however, the 2004 US bilateral trade deficits, for which data are available (IMF 2005a) are not too different from those of other regions of the world. The US trade deficit with Japan amounted to US$ 65 billion, with China US$ 80 billion (and US$ 111 billion including Hong Kong), with the European Union US$ 87 billion and with the oil-exporting countries US$ 64 billion. This suggests that a unilateral appreciation of the renmimbi by China would not solve the US problem; rather a depreciation of the US dollar with respect to all the currencies seems necessary.

It is a highly debated question whether Asian countries, above all China, should appreciate their currencies (on China see Siebert 2006). One argument says that the Asian countries have excess savings (i.e. a savings glut) and that it is normal that they use them to build up financial wealth abroad. It is also pointed out that they have to built up wealth

abroad since they do not have appropriate public pension systems in place. Moreover, China uses accumulated foreign reserves to clean the balance sheets of its banks from the non-performing loans from time to time.

Of course, if savings in Asian countries were to fall, excess savings in the world would decline and the US would have to adjust. Finally, if the euro gains a stronger position as an international reserve currency and if Asian central banks would hold more euros, the euro would appreciate, taking away pressure from the US dollar. All these arguments show that the task to reduce the US current account deficit is a complex issue in which many aspects are relevant. To only look at the bilateral Asian surplus with the US is not sufficient.

3 Choosing the exchange rate system

The wish for stable exchange rates

Regarding money as an innovation which lowers transaction costs, the volatility of exchange rates reduces the intended reduction of transaction costs. Volatility of the exchange rate can mean different things: first, exchange rate movements can deviate in the short run (monthly, up to one year) from a long-term trend or a somehow defined frame of reference. Second, the exchange rate can follow a trend for some years and then switch to a different trend, changing for instance from appreciation to depreciation. Third, the exchange rate can change abruptly and to a large degree when a currency crisis occurs. All three types of volatility cause transaction costs. Whereas short-term deviations from a longer trend may be hedged to some extent, a trend reversal has the consequence that trade flows and direct investment flows have to adapt to the new currency relations. This means that product specialization, factor allocation and the sector structure of countries have to adjust. A currency crisis wipes out savings, destroys financial wealth, affects the balance sheets of banks and firms and ends up in a decline of GDP. The transaction costs arising from high volatility are the main reason why policy aims at stable exchange rates. The choice of an institutional arrangement for the exchange rate therefore is of major importance.

The basic choices

In establishing an exchange rate system, a country has several options. To restrain trade and capital flows is not an appropriate solution; then the country renounces on the gains from trade and capital flows. A first viable option relates to the nominal anchor. The country can choose the price level as its nominal anchor or the exchange rate. If it chooses the price level, it can direct its own autonomous monetary policy and can enjoy seignoriage. Given the monetary policy of other countries, the movement in the exchange rate reflects economic processes. The price levels at home and abroad affect trade flows, influencing the demand for and the supply of foreign currency. They also impinge on inflationary expectations, which in turn change capital flows. All this feeds into the exchange rate. Consequently, once the price level has been chosen, the country is no longer free in its exchange rate. If, as an alternative, the country chooses an exchange rate as its nominal anchor, for instance in a hard peg, it is no longer free in its price level. If its price level changes with a higher rate than abroad, real appreciation will hurt its exports and, since such a situation is not sustainable, eventually capital will flow out for fear of depreciation. Again, given monetary policy in other countries, the country that chooses the exchange rate can no longer determine its price level autonomously. Thus, there is an interdependence between the two potential nominal anchors. You cannot have both at the same time.

In any case, choosing a nominal anchor does not imply that an internal and external balance is guaranteed without conditions. It is real prices that have to bring about internal and external equilibrium. These are the real exchange rate as the relative price between export and import goods or tradables versus non-tradables, the real interest rate and the real wage rate.

A second option refers to the choice of nominal anchors versus a real target. A country cannot choose real prices; real prices are established by markets, responding to specific economic situations in order to restore equilibrium in the markets. In the real target approach, the nominal exchange rate is seen as a policy instrument that affects internal equilibrium, i.e. output and employment (Corden 2002, p.26). The country does not explicitly choose an exchange rate target (or an inflation target) but uses the nominal exchange rate to bring about internal equilibrium.

An example is the Swedish policy in the 1980s prior to the 1992 crisis. Trade unions pushed up the nominal wage rate so that the real wage increase was higher than productivity growth for the given price level. The ensuing cost increase would have made firms

uncompetitive. This would have implied unemployment. In order to prevent this, the currency was devalued bringing about a rise in the price level. This then meant a fall in the real wage. Another example of this approach is the IMF policy applied in the 1970's, 1980's and also in the 1990's in the case of balance of payments problems and currency crises: conditionality for credits included a recommendation to devalue (besides reducing public budget deficits). Lowering the deficit means to trim down absorption and nominal devaluation stands for changing the relative price between tradables and non-tradables in favor of the tradables in order to enhance the incentive to produce tradables. This then stimulates exports and helps to come closer to an external balance. Apparently, this approach, rooted in the Keynesian model, is not possible with a fixed exchange rate as the nominal anchor.

Both examples are somewhat exceptional. In Sweden, devaluation was used as a correction of the trade union's wage policy, playing with the money illusion of trade union members. In the end, the perceived wage increases did not occur in real terms. Devaluation so to say corrected an institutional deficiency. In the case of the IMF, the approach was applied when the balance of payments or currency crisis had already broken out. These two examples do not suggest that the real target approach is too promising.

Yet in other examples the approach has more relevance. Thus, countries may use an undervalued currency as an instrument to stimulate exports and thus to promote economic growth as was the case with the German mark in the Bretton Woods system and as today is reproached to China with respect to the renmimbi. An under-valuation stimulates exports and reduces imports and initiates and fuels sectoral change through a decentralized market process. It is a policy instrument that is not directly visible to the voter. Problems associated with this approach are an over-expansion of the export sector that eventually has to be corrected with high adjustment costs. There is a misallocation of resources. Moreover, the country will import inflation. Finally, such a policy may lead to depreciation spiral if other countries use the same strategy. A specific case is the anchor currency (see below).

A third alternative is between a unilateral and a multilateral approach. In a unilateral option, the country chooses an exchange rate approach, given the monetary and financial policies used elsewhere. It takes the international environment as given. This is an option that small countries can follow. In the multilateral approach, a country joins a rule system such as the gold standard or the Bretton Woods system. It binds itself accepting a set of rules; possibly it can influence these rules. The multilateral system is supposed to provide monetary

and financial stability for a group of countries or internationally. The opportunity costs of this approach are that the individual country cedes sovereignty, as it applies to the European Monetary Union. Whereas in these institutional arrangements the nominal exchange rate is fixed or placed into a band, the real exchange rate has to bring about equilibrium in the internal and the external balance.

Crucial interdependencies

In choosing the exchange rate, the policy maker must be aware of several interdependencies given by the markets. These interdependencies can be considered as constraints for the choice of currency system.

First, there is an interdependence in the price levels. Differences in price levels will be evened out through trade in the long run, and they show up in exchange rate changes (purchasing power parity). Second, there is an interdependence in the interest rates. Differences in interest rates will be leveled out through capital flows, real interest rate differences through the mobility of real capital (and price changes), nominal interest rate differences through portfolio flows subject to exchange rate expectations (interest rate parity). Third, there is an interdependence between the price level and exchange rate expectations. Given capital mobility, this interdependence has been summarized as the impossible trinity – to simultaneously have fixed exchange rates, capital mobility and a monetary policy dedicated to domestic goals.

Fourth, there is an interdependence between the nominal and the real exchange rate. A nominal devaluation will not be successful if its effect is eaten up by an increase in the price level. Then a real appreciation undoes the nominal depreciation. A devaluation tends to be followed by a price effect. Less goods are imported and more are exported. If this feeds into wage demands, a cost push inflation will follow. Thus conditions, for instance with respect to a competitive environment, must prevail that keep prices from rising.

Fifth, there is an interdependence between the real exchange rate, the real interest rate and the real wage rate. If the real exchange rate is sluggish, a higher real interest rate can force the country to adjust, albeit with a cut in real output. An example would be a member country of a monetary union experiencing an asymmetric negative supply or demand shock. If the required real appreciation cannot happen due to sticky prices of the non-tradables, capital may leave the country so that the real interest rate has to rise in order to hold the capital. This, however, would aggravate the problem and force the country to adjust.

Similarly, rigid wages may imply a higher real interest rate, i.e. a higher real rate of return also forcing the country to adjust; a higher rate of return becomes necessary (if capital has the exit option) because higher real wages squeeze profits. Or a rise in the real wages not covered by productivity growth would lead to a loss of competitiveness and to current account deficit, eventually requiring a real depreciation.

The limits of intervention

A central bank can intervene in the foreign currency market in order to defend an exchange rate. However, there are limits. In the case of a run on the currency (or an undesirable depreciation), the central bank can sell foreign reserves thus driving up the demand for the currency. This implies that the money supply declines and the interest rate rises. A higher interest rate affects investment and aggregate demand; thus there are costs to defending an exchange rate. In order to prevent the interest rate effect, the decline in the money supply may be sterilized if the central bank buys domestic bonds, thus withdrawing liquidity from the non-banking sector. In full sterilization, the money supply, the interest rate and the exchange rate remain unchanged. This type of intervention has its limit when the central bank runs out of international reserves. As a matter of fact, when the loss of reserves gets known, this may intensify the process of loosing reserves (Corden 2002). Note, however, that the exchange rate is affected in models that explain the exchange rate via the bond market.

If a central bank wants to prevent the appreciation of its currency, it can buy foreign reserves by selling domestic currency. This increases the money supply which then would lead to inflation. The interest rate falls. In order to avoid these effects, the central bank can sell domestic bonds in order to mop up the excessive money supply. This strategy finds its limit in that the central bank accumulates domestic liabilities which makes its position more risky.

The criterion of credibility

An important element of choosing an anchor is credibility. If the chosen anchor is not credible, monetary stability is not established. Then inflationary expectations and expectations of a depreciation start to creep into the system, and eventually market participants anticipate the impact of these expectations.

At the core of credibility is the independence of the central bank: Money must be de-politicized. If it is not, politicians will make use of the central bank, either in monetizing

public debt or, if this is judged as foul, in framing it to keep interest rates low so that the actual burden of public debt is not too heavy. Long-term opportunity costs are neglected.

A specific case: The anchor currency

A leading currency or an anchor currency is a special case. [7]It comes into existence if a country has a high share of world output, trade and capital flows. Another important condition is that the currency is stable. This means that the leading currency covers a large part of transactions taking place in the world (US dollar).[8] Such a currency has the prospect of being accepted in many countries (dollar standard, dollarization). The anchor country enjoys several advantages: It has lower transaction costs because many transactions are done in its currency. It also has the advantage of seigniorage since foreign central banks and market participants hold its currency. Moreover, the country's financial industry benefits from the currency position. Finally, it does not have to intervene in the foreign exchange market to keep a specific value of its exchange rate. This means that it can use its monetary policy for internal goals without worrying about its balance of payments deficit (or its exchange rate). It does not bear the burden of financing its balance of payments. On the side of disadvantages, the competitiveness of the anchor country's industry may be negatively affected, since demand for the anchor currency as an international reserve tends to increase, letting the currency appreciate.

The anchor country may be tempted to strategically play with the external value of its currency, for instance riding out of international debt through depreciation. This would mean that wealth abroad is destroyed. The leading currency country also can follow a policy of benign neglect, not worrying too much about the impact of monetary policy on others (Bundesbank in Europe, Fed). However, the authorities of the anchor currency cannot overstretch this role since they risk to eventually loose the role as anchor. it can be argued that the anchor currency of the world, the US dollar, can follow a strategy of benign neglect, in which the authorities of the leading currency country do not worry too much about the

[7] The theoretical problem is that not all of the *n* countries of the world can choose the exchange rate as a nominal anchor. Formally, this can also be described as the problem of the *n* - 1 exchange rates. For *n* countries with *n* currencies, every single country has *n* - 1 exchange rates. At least one of the currencies (of the *n*th country) must take the role of the 'numeraire'. As a result, one currency has to be the anchor in a system of fixed exchange rates. In the system of Bretton Woods, the dollar was the anchor; in the European Exchange Rate System, it was the deutsche mark.

[8] The deutsche mark in the European Exchange Rate Mechanism may be interpreted as a standard for a specific region of the world .

external value of the currency. The goal then is to use the currency to enjoy gains through seigniorage, through capital gains by a future devaluation of the US dollar (albeit at the cost of losing credibility) and to see the (low) external value as a stimulus for growth. ("The dollar is your problem and our currency").

4 Unilateral exchange rate strategies: approaches for individual countries

In the following we distinguish between approaches that individual countries can follow and multilateral institutional arrangements that several countries or, in the extreme, the world economy can strive for. In this section, we look at options for individual countries.

Countries can choose from a menu card of quite different exchange rate policies ranging from a free float to using a foreign currency as legal tender (dollarization). These different options can be arranged in a continuum being defined by different shades of monetary sovereignty and dependency (Figure 5). Some of the approaches only represent nuances of one another.

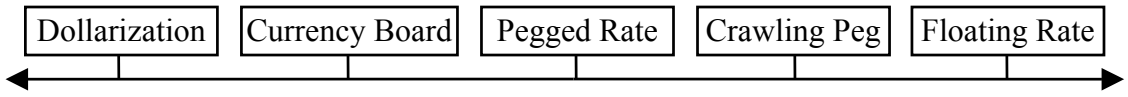


Figure 5 Different unilateral exchange rate systems

Floats

In a free float, the currency of a country is determined exclusively by the currency market. Neither the monetary authorities do intervene in the foreign exchange market nor does economic policy attempt to influence the external value of a country's money in international negotiations or through communication policy.

A managed float is characterized by interventions of the central banks supplying a country's currency or buying it up in order to influence the exchange rate. For instance, the

central bank offers the currency in the foreign exchange market in order to reduce its price. Or it buys up its currency, given up accumulated international reserves, in order to stabilize or augment the currency's external value.

A unilateral target zone attempts to keep the exchange rate in a band. Such an approach comes close to a free float if the band is very wide and if the wide band has a very short memory so that older dates do not have an influence. However, it belongs to the category of pegs and can even be a hard peg if the band is tiny and the memory is long. It is not sufficient for a target zone to officially declare its existence. Credibility is crucial. If market participants do not have sufficient confidence in the band, the currency will shoot beyond the limits of the band.

Pegs

In a peg a country ties its currency to the currency of another country (single peg) or to several currencies (basket peg). 43 countries have pegged their currencies to the US dollar, 28 to the euro. Most Asian countries have implicitly pegged their currencies to the US dollar (Asian dollar standard, McKinnon 2005).

The advantage of pegs is that producers and consumers face stable currency prices, relevant for their trade, assuming the peg can deliver stable expectations. In a peg, a country follows an exchange-rate-oriented monetary policy, which means it chooses the exchange rate as a nominal anchor. This implies that monetary policy has to influence the domestic price level in such a way that the exchange rate remains stable. Following the equation of purchasing power parity, $\hat{e} = \hat{P} - \hat{P}^*$, the policy aims at an exchange rate change $\hat{e} = 0$. If the currency of the foreign country is used as an anchor, the rate of change of the foreign country's price level P* is regarded as the point of reference, i.e. $\hat{P} = \hat{P}^*$. The domestic price level P follows the foreign price level. In the pre-euro era, Austria, Belgium and the Netherlands were examples of such an exchange-rate-oriented monetary policy, holding their currencies in a constant ratio to the deutsche mark. An exchange-rate-oriented monetary policy is normally only carried out by smaller countries. Larger economies prefer to determine their price levels themselves. If larger economies pursue an exchange-rate-oriented monetary policy, at least one country has to provide a stable currency as a nominal anchor (anchor currency).

A peg will not succeed if the follower is unable to keep the change of its price level in line with the leading country, i.e. if $\hat{P} > \hat{P}^*$. Then, its rate of return falls, capital leaves the country and the currency has to be devalued. Moreover, other aspects of economic policy, for instance the countries' fiscal policies, have to be in line. Thus, in the pre-euro era Austria's wage policy prevented price increases that would have led to inflationary pressure on the exchange rate.

In a basket peg, a country ties its currency to the currencies of its main trading partners, often in proportion to their absorption of the country's exports. For instance, China uses such a basket peg since 2005.

A crawling peg is applied when it is expected that the inflation rate in a country will tend to be higher than abroad over a longer period of time. Then the exchange rate is brought in line with the inflation differential, normally with a pre-announced rate of change of the exchange rate $\hat{e}^P$. It may be used when a country wants to get out of a hyper inflation or after a currency reform. For instance, the post-communist countries Poland and the Czech Republic applied the approach in the early and mid 1990s. It is chosen, when a stringent stabilization policy which would be necessary for a constant exchange rate is unlikely to be kept up. Credibility of the pre-announced rate is crucial. This approach runs into problems, if the pre-announced rate $\hat{e}^P$ is smaller than the price differential $\hat{P} > \hat{P}^*$. Then the system does not hold.

Whereas in a regime with pre-announced changes in the exchange rate the adjustment of the exchange rate takes place automatically, it is adjusted on an ad-hoc basis in an adjustable peg. In a multilateral context the Bretton Woods system can be characterized as an adjustable peg.

In a truly fixed peg, the currency is definitively linked to another currency. No changes are made in the exchange rate.

Currency boards and dollarization

A currency board is a special form of an exchange-rate-oriented monetary policy. In such an approach, the domestic currency has to be covered completely by foreign currency reserves at a given rate. The central bank binds itself to provide domestic money only to the extent that foreign monetary reserves are available. To gain credibility in such a policy, the foreign currency can be authorized as legal tender in contracts. In a currency board, the

domestic currency has to be as stable as the foreign currency, or it is driven out of the market. Argentina had followed this approach since 1991; it had to give up the policy of a currency board in 2001. Hong Kong uses a currency board tying the Hong Kong dollar to the US dollar. Estonia also has pursued a currency board approach since 1992.

The approach of the currency board can only be chosen by small countries. They follow another country completely in their monetary policy. They use the other currency as an anchor, because they cannot provide monetary stability themselves. Thus, they import the stability of the anchor currency as Argentina did in 1991 after its inflation rate had soared to four digits. The country completely renounces an own independent monetary policy and gives up seignorage.

An important condition for a currency board is that the internal markets of the currency board country, including the labor market, are flexible. The country must be able to digest external shocks by price adjustments, i.e. by a real depreciation. This is especially important if the country is very sensitive to external shocks. For instance, a currency is difficult to sustain if the country is a resource exporter and if resource prices are volatile internationally. The currency board country will also run into difficulties if the foreign currency chosen appreciates. This will make the country's exports uncompetitive. A related problem arises for investment, if the central bank of the chosen currency raises the interest rate, in order to choke off excess demand. The currency board country thus suffers through the business cycle of its currency provider. Moreover, serious problems will arise if the anchor country's performance differs from the currency board country's most important export markets. Institutional arrangements are necessary to ensure that the currency board system is not disturbed by a banking crisis or by an overexposure to public debt, neither through the federal government nor the provinces.

In dollarization, the foreign currency is used as legal tender in day–to-day operations. The country no longer issues its own money; it does not have a central bank.

Which currency regime for which country?

It has been argued in the literature that countries can only choose the corner solutions, either a free float or hard peg. Solutions in between would not be viable in the end, it is suggested. Against this bipolar view, an analysis of existing exchange rate systems shows that indeed a multitude of approaches have been used in the world economy. These approaches may be appropriate under given conditions and they tend to be stable for some time. They run into

problems if credibility is lost and expectations of a depreciation start to creep in. Thus, countries can choose their own exchange rate system (Frankel 1999). As stated in the title of Frankel's article, "No single currency regime is right for all countries or at all times".

5 Multilateral approaches: the historical experience

In a multilateral approach, the spotlight is not on the option of a single country, but instead on the monetary stability of a group of countries or of the international monetary system. Such approaches represent an institutional framework, i.e. a set of rules, on which a group of countries agree. The countries joining such a rule system cede sovereignty to a multilateral system, giving up their monetary authority or parts of it. Their benefit consists in having a stable monetary environment with more or less stable exchange rates. This is especially relevant for export-oriented economies. We have empirical experience with four approaches, the gold standard, the period of egotistic approaches with monetary disintegration, Bretton Woods and flexible exchange rates.

The gold standard

The gold standard was established in the 19th century. In 1821, the obligation was introduced for the Bank of England to redeem bank notes into gold coins. In the Bank Charter Act of 1844, the obligation of redeeming was guaranteed by cover clauses. Later on, other countries joined the gold standard, like Germany (1871), the US (1879) and Japan (1897).

To redeem the bank notes into gold meant that the central banks had to exchange the money in circulation for gold at any time at a legally fixed ratio. As a result, gold became a means of international payments and constant exchange rates existed. Let us argue in terms of actual currencies, dollars and euros. Since the currencies had fixed ratios to a unit of gold (Q^G), i. e. €/Q^G and \$/Q^G, the ratio between the currencies €/\$ was fixed as well. The decisive task for the central banks was to credibly stick to the official parity between gold and the domestic currency. Therefore, it was important to keep sufficient gold reserves. This was guaranteed if the balance of payments was in equilibrium.

Figure 6 can be used to explain the effects of the gold standard in the 19th century. Suppose, for instance, that the US dollar declined in value, e.g. because of a rising supply of

US dollars shifting the supply curve to the right. Starting from an equilibrium point *E*, with flexible exchange rates a new equilibrium *E'* would be reached by the devaluation of the US dollar.

But this cannot happen in a gold standard. If the dollar is sufficiently devalued, the market participants will be able to use the low-valued US dollars to buy gold in the US, transport it to Europe and change it into high-valued euros. Because of these transactions, there is additional demand for US dollars in terms of gold exports *AB* from the US; this means a US capital export. The exchange rate *e* cannot sink under the so-called 'lower gold point'. Then it would be worth exporting gold from the US. The lower gold point depends on the costs of transportation, insurance and interest payments: it indicates the lowest possible exchange rate. The upper gold point has a corresponding effect: if the exchange rate increases, i.e. if the euro is devalued, from a certain threshold onwards it is worth changing dollars into euros; arbitrageurs would buy gold with the euros purchased in Europe and transfer it to the US.

If the appropriate institutional rules for a gold currency are chosen, the exchange rate will find its equilibrium between the upper and the lower gold point. Thus, the exchange rate is stable within a small band. The arrangement includes self correction. Through the outflow of gold, the money supply is reduced so that the price level in the US will fall. In Europe, the money supply increases and the price level rises. Adjustment is symmetric. When a country loses reserves, another country gains them.

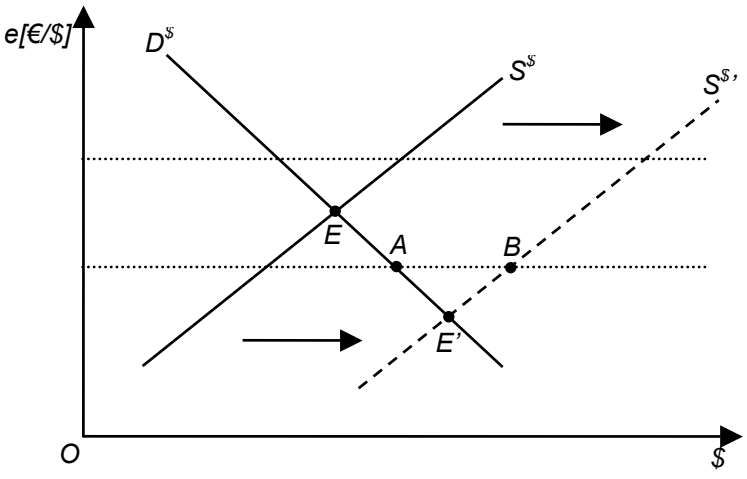


Figure 6 Exchange rates within a band

The system collapsed at the beginning of the First World War in 1914 when countries had to expand their expenditures for military purposes. Only the US remained on the gold standard, albeit with many restrictions. The other countries went back to individual exchange rates. Attempts to revive the gold standard after World War I failed (see below). It is now agreed that a gold standard does not represent a viable alternative today. One argument is that countries could not follow their own independent monetary policy. Stabilization policy would also not be possible. The other argument is that such a system would give huge windfall profits to gold producers like Russia and South Africa. Finally, a gold standard only guarantees a stable price if the relative price of gold to a basket of goods remains constant. If more gold is discovered, the relative price of gold to a basket of good would fall, implying an increase in the price level. It is also not recommendable to peg a currency to a commodity basket.[9]

Monetary disintegration in the interwar period

The period between the two world wars was characterized by disintegration of the monetary-financial system. Germany experienced a hyper-inflation in 1923. It had to pay high costs of reparations due to the treaty of Versailles and the government was heavily indebted. Government expenditures were financed by the printing press. From August 1922 to November 1923 the price level rose by a factor of $1.02 \cdot 10^{10}$.

After World War I many countries tried to reestablish the gold standard. In 1925 the UK followed, pegging the pound to gold at its pre-war parity. Since the UK had a higher price level in 1925 than before World War I, it moved into the gold standard with an over-valued exchange rate. This reduced its competitiveness and led to a depression in the UK. Choosing the pre-war parity meant a real appreciation of the pound with a negative effect on the economy.

In order to make it possible for smaller countries to participate in the gold standard, they were permitted in the conference of Genova in 1922 to hold reserves (instead of gold) of

[9] In a commodity basket currency the value of money is pegged to a basket of commodities. The value of money is determined by the production costs of goods. A possible form of this type of money would be that money is convertible into commodities. If the price of a commodity rises above its value in the basket, market participants could get the commodity from the staple at a pre-announced index price. The monetary authority must prevent such a case to arise. Problems of such a currency approach are stapling costs of the monetary authority and relative price shifts. Similar arguments hold against a resource basket.

those countries whose reserves consisted of gold only. This implied that the UK de facto was the bank of other countries. Due to its economic weakness, however, the UK could not play this role. With low reserves it could not withstand a run of other countries on its reserves. The system did not have a lender of last resort. In 1931, the UK gave up the gold standard after smaller countries had left it already in 1929 and 1930.

This was preceded by the stock exchange boom in 1928 in New York, which absorbed financial means and reduced means available on the bonds market. Capital flows that financed countries like Germany ran dry. Since these countries could not find finance, they stopped to service debt. The world financial system received a serious blow.

With the Great Depression in the most important countries, a grave disintegration of the international monetary system and of the world trade order set in. Countries went into a downward spiral of competitive devaluations in order to regain competitiveness. Thus, when the US returned to the gold standard in 1934, they defined a new parity of gold with $US 35 per ounce, whereas they had left the standard in 1933 with US$ 20.67 per ounce. This was a substantial devaluation. Other countries like France attempted to defend their exchange rate by imposing tariffs and trade restrictions. Besides cumulative depreciations the 1930s were characterized by strong interventions into the system of international exchange. The interwar period has shown that an institutional framework for the international monetary system is a significant precondition for a prosperous international division of labor.

The Bretton Woods system

In 1944, 44 countries reached an agreement on the post-war international monetary system in Bretton Woods, New Hampshire, USA. Like GATT, which was established in 1948, the Bretton Woods exchange rate system was created in order to establish a stable institutional environment during the period of reconstruction after the Second World War. While GATT aimed at a rule-based system for trade, Bretton Woods attempted to establish stable exchange rates. The system came into force in 1946. The anchor currency was the US dollar. The central banks (not individuals and private banks) could change their dollar reserves into gold at the US central bank, at fixed exchange rates. In order to join the International Monetary Fund, each country had to establish a parity to the US dollar (or to gold). The governments had to keep the exchange rates of their currencies within a margin of +1/-1 percent. Since

each currency's exchange rate was fixed to the dollar, cross rates (for instance between the deutsche mark and the British pound) were fixed as well.

Central banks had to intervene to keep the exchange rate in the predetermined range. Consequently, central banks needed reserves. Only in the event of fundamental imbalances were exchange rate adjustments allowed to leave that fixed margin: international agreement was required for this. Temporary deficits in the balance of payments were to be balanced by loans from the International Monetary Fund. In contrast to the gold standard, monetary adjustment was asymmetric. If a country gained reserves this did not mean that other countries lost reserves. This is due to fact that reserves were provided by the anchor country (on the position of a reserve country, see below).

Initially, the Bretton Woods system was characterized by a dollar shortage. Countries in Europe and Japan desperately needed dollars to pay for imports. Eventually, these countries became competitive and earned dollars through their exports. Most of them then had current account surpluses. The constant exchange rate had the negative effect that they imported inflation from abroad. From time to time, they had to appreciate their currency. This used to be a major affair; consultation was necessary and a political agreement had to be reached for appreciations over 5 percent. Moreover, the exchange rate had become a political price for the export industry. Prior to an immanent appreciation, "hot money" would flow in; alas, the volume of speculation was low relative to speculative money flows in later periods, for instance in the devaluation of the British pound in 1992.

The Bretton Woods system collapsed in 1971 when the convertibility of the US dollar into gold was given up; the US did no longer sell gold to foreign central banks. A band of 4.5 percent on both sides was introduced which was given up for completely flexible rates in 1973. The US, under the pressure of high budget deficits as a consequence of the Vietnam War, was no longer willing to provide a stable anchor, i.e. a stable leading currency. The system had moved to a situation of the dollar glut.

It is now agreed that a return to Bretton Woods type system is impossible due to the role of portfolio flows. Capital mobility now plays a compeletely different role than in the 1950's and the 1960s when the capital accounts were not yet liberalized and currencies were only made convertible in cautious steps by allowing first convertibility for foreigners and eventually later on for residents.

The experience of the flexible exchange rate system

When floating exchange rates were introduced after the Bretton Woods system was given up, it was expected that flexible exchange rates would insulate countries against monetary and other shocks and thus contribute to stability. The price of this system was expected to be a greater variance in the exchange rate. It is now agreed that day-to-day volatility has increased since the times of Bretton Woods. Not surprisingly, also the month-to-month volatility of bilateral exchange rates has increased sharply, which can be illustrated with the help of the following two currency pairs: deutsche mark against US dollar and yen against US dollar.[10] For the deutsche mark against US dollar pair, month-to-month exchange rate volatility in the flexible exchange rate system is about 4.5 times as high as in the Bretton Woods system. For the yen - US dollar pair month-to-month volatility increased even more, by a factor of 14.

Also the variability of the exchange rate for longer periods has increased compared to Bretton Woods. In the period from January 1980 to December 2005 the ECU/euro depreciated by 21.1 percent against the US dollar and 144 percent against the yen. In the same period, the US dollar depreciated by 102 percent against the yen. However, this longer-run variability does not mean volatility in the sense of fluctuations; the change in the exchange rate reflects long-run trends. The larger changes in the exchange rates are the other side of insulating countries against external shocks. Another observation is that the current account deficit of the anchor currency (and some other countries) have increased. Moreover, countries tend to accumulate more reserves in order to withstand a storm against their currency.

By and large, the flexible rates have insulated national economies in the industrial countries against foreign shocks.[11] In evaluating the system of flexible exchange rates, it is fair to note that this system has experienced major shocks including two oil crises and the rise of oil prices in the early 2000s, the fall of the iron curtain and German unification, many currency crises including the Asian crisis, the Reagan expansion and the Japanese bubble. Exchange rate changes have helped in the adjustment to these shocks that had a different nature than in the time of Bretton Woods due to the high mobility of portfolio capital. We can state that flexible exchange rates have helped to absorb these shocks. For instance, the

[10] Exchange rate volatility between countries i and j is calculated as the standard deviation of the first difference of the log of the exchange rate: $Volatility_{ij} = STDEV\left[d\left(\log\left(e_{ij}\right)\right)\right]$. For the Bretton Woods system the volatility is calculated from January 1957 to December 1970. For the flexible exchange system the sample January 1975 to December 2005 is used.

[11] In emerging markets, currency pegs(including crawling pegs) and the precautionary accumulation of reserves could not prevent major currency crises.

Reagan stimulus of the US economy in the early 1990s led to a stark appreciation of the US dollar. However, this appreciation stimulated foreign exports and reduced US exports, thus self-correcting the shock. The system of floating rates has stabilizing properties.

Floating rates shifted the relative weight between monetary policy and fiscal policy, giving monetary policy greater relevance in fighting inflation. Flexible exchange rates make fiscal policy less efficient in fighting unemployment if we use a Mundell- Fleming model. When the exchange rate is constant, fiscal expansion leads to a rise in national output and employment and to an increase in the interest rate. While this reduces investment as a secondary effect, it induces capital inflows. The balance of payments improve. Thus fiscal policy can reach two targets, internal (more employment) and external equilibrium. Two objectives are in harmony. With flexible rates, the increase in the interest rate leads to an appreciation, dampening the expansionary effect of fiscal policy. In contrast, flexible rates make monetary policy more efficient since monetary expansion reduces the interest rate which then requires a deprecation due to capital outflows. The depreciation is an additional stimulus for exports. Under constant exchange rates, however, monetary policy reduces the interest rate, driving out capital and aggravating the goal conflict between more employment and external equilibrium. Thus, moving from constant rates to floating rates limits the power of the finance ministers whereas it increases the influence of central bankers.

Of course, Mundell- Fleming is a rather simple model, since it does not include variable prices, inflationary expectations and changes in the exchange rate expectations due to fiscal policy. Moreover, the long-run effect of government debt is neglected. In the Reagan presidency, fiscal expansion lead to the expectation of an appreciating dollar which then stimulated capital flows to the US and appreciated the dollar. This overshooting, however, must eventually be corrected.

The system of floating rates goes together with lower inflation rates. Unfortunately, a reduction of unemployment in the major continental European countries cannot be observed. To reach this target, one needs real exchange rate changes, including flexible real wages.

6 Multilateral approaches: Available options and idealistic ideas

We have empirical evidence on multilateral exchange rate regimes including the reasons why they eventually failed such as the gold standard. This experience is the basis from which new approaches can be attempted (Figure 7). One such approach is the European Monetary Union.

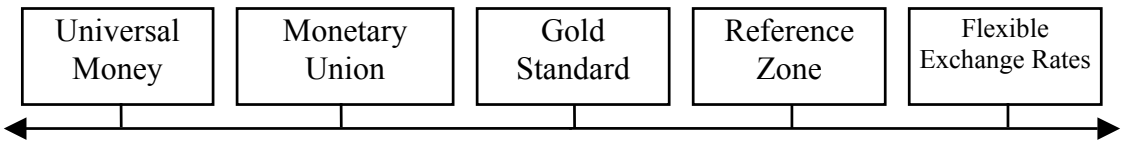


Figure 7 Multilateral exchange rate systems

The low-inflation central bank dominated exchange rate system

The actual monetary system is a hybrid system with several elements. Looking at the three major currencies, the foreign exchange markets determine the exchange rates; there are no exchange rate targets. Swings in the exchange rate like in the DM-US dollar rate or the euro-dollar rate occur and are only corrected over time. The exchange rate responds to asymmetric business cycles in the major regions, to differences in growth prospects as well as in economic policies.

The additional element to a free float is that the central banks in the three major regions or countries, the Fed, the ECB and the Bank of Japan, have by and large followed a policy to bring down inflationary expectations since the early 1980s and to keep the inflation rate low. This also holds for the Bank of England. In this environment, the Fed has a leadership role, setting the stage for inflation in the world economy. None of the other larger central banks will tend to exceed the implicit inflation target of the Fed, i.e. allow a higher inflation rate than in the US. However, it can also be argued that the Bundesbank with the pre-euro system

around the DM and now the ECB represent a check on the Fed's behavior. The ECB has a more ambitious price stability target than the Fed, one aspect being that the new institution and the new currency have to establish reputation and confidence. Thus, the Fed is not completely free in choosing its inflation target; it is restrained. In this concert of central banks, the Bank of Japan has not been concerned with inflation since 1990. It has been pumping liquidity into the Japanese system in order to fight deflation. It could even intervene to bring down the value of the yen. Under these conditions there somehow is a nominal anchor for the world economy, consisting in low inflationary expectations and in a low inflation rate. This low inflation system is a central bank created system. It is a soft system, however with implicit and explicit rules.

Formally, the exchange rate is the policy domain of national policy makers, not the central banks in most countries. Governments have the right to determine the exchange rate regime. For instance in the euro area, the European Council, the central decision-making body of the EU, has the right to conclude formal agreements on exchange rate systems with non-EU members (by unanimity) and it may (by qualified majority) formulate the general orientation for exchange rate policy (Article 111 EU Treaty). The ECB would be involved by recommendation or by consultation. The Eurosystem conducts foreign exchange operations according to Article 105 and consistent with the provisions of Article 111 of the EU Treaty. In the US, the Treasury, in consultation with the Federal Reserve System, has responsibility for setting US exchange rate policy, while the Federal Reserve Bank New York is responsible for executing foreign exchange market interventions. In Japan exchange rate policy has been assigned, by law, to the Ministry of Finance and not to the Bank of Japan.

Political exchange rate decisions or orientations can, however, be incompatible with an independent central bank. Actually, exchange rates are *de facto* determined by the markets, given the monetary policy of central banks. Interventions are used from time to time, for instance to smoothen or even to influence the exchange rates. An example is the 1987 Louvre Accord in which an attempt was made to appreciate the yen and the deutsche mark. Central banks can lean against the wind, however they cannot establish an exchange rate that runs counter to economic fundamentals. Once they have decided in favor of a price level as their nominal anchor, the exchange rate is determined. In times of an immanent crisis, such as September 11, 2001, they can provide liquidity in order to prevent uncertainty from arising. Yet another example of this nature is the rescue of the investment fund Long Term Capital

Management in 1998 which the Federal Reserve Bank of New York organized in order to prevent a crisis.

The exchange rates seems to be on slack reins, changing a lot. However, exchange rates are not completely free nor erratic. They are determined by the inflation rates in the major regions of the world, due to the stability target of the three central banks. If these stability targets were given up, the system would most likely degenerate. It is a fragile system.

Apparently, there are corrective mechanisms in the system. If countries are in synchronous boom, high interest rates dampen economic activity (due to monetary freining). If a country's or a region's boom is asymmetric to other countries or regions, high interest rates (due to monetary freining) and appreciation (due to a positive business cycle outlook and capital inflows) dampen economic activity and appreciation spreads the boom to other countries.[12] If countries are in a synchronous recession, low interest rates stimulate economic activity. If a country's or a region's recession is asymmetric to other countries or regions, it has more leeway in its monetary policy. Low interest rates (due to monetary expansion) and depreciation encourage economic activity.

This system has some similarity to the McKinnon proposal (1982). According to this concept, exchange rates can be stabilized by a coordination of national monetary policies. The world quantity of money should increase according to the quantity rule of money. If a currency gets under pressure to depreciate, then monetary expansion of this country has to be reduced, whereas a currency with a tendency for an appreciation would need a more generous monetary expansion.

Macroeconomic coordination

Game theory tells us that countries can have benefits from macroeconomic coordination. For instance, fiscal policy may be more effective if undertaken jointly. Therefore global macroeconomic coordination between the major currencies, the US-dollar, the euro and the Yen, is proposed. Such a coordination is also suggested as an important role for the IMF in order to reduce the current imbalances (discussion in the spring meeting of 2006). However, the political economy of macroeconomic coordination has its flaws. A crucial issue is which model is to be used in order to determine the policy instruments. In the public discussion,

[12] Note, however, that capital inflows keep the boom alive for some time, providing fresh capital. The capital flow view does not always go together with the trade flow view. For instance, capital inflows may reverse in a recession and aggravate the recession.

often a simple Keynesian demand management approach is applied, for instance pushing for a coordinated demand package between the United States, Europe and Japan as in the second part of the 1980s to put the Japanese and German economy under steam. This seems to be a rather simple or even naive approach. Moreover, structural questions such as how countries should react to an oil price shock, who has to raise energy prices, and which policy instruments to use against unemployment remain unanswered (flexible wages as in the US versus a rigid labor market as in the European social model of the three large continental countries). Furthermore, countries have different policy goals and they may be in different political cycles. Finally, macroeconomic coordination may be used to politically put the blame on the other country; it may also be used to shift the burden of adjustment on the other country. Exchanging information on policy instruments to be applied in individual countries is helpful (barometric coordination). An institutional rule-system when public goods are involved as in trade (WTO) and the prevention of currency crises (IMF) is appropriate.

Multilateral target zones

In multilateral reference zones or target zones, the exchange rate is allowed to only fluctuate within a band. The exchange rate should only deviate from the (real) equilibrium exchange rate within a limited range. Coordination of monetary and stabilization policies has to ensure that the limits of the range of fluctuations are not surpassed. As long as monetary policy and the other fields of economic policy of the countries involved do not contradict the credibility of the band, the exchange rate can be kept in the target zone. But as soon as the markets doubt the credibility of the band, such a system has a destabilizing effect.

If the limit of the band is reached, the central banks have to intervene. Consider an initial equilibrium E in Figure 6 and let the supply of the foreign currency ($) increase; for example, because of an excessively rising money supply in the US. The supply curve of US dollar shifts to the right. This means that, without an intervention, the US dollar currency will be devalued and the euro will be revalued (point *E'*). Such a devaluation of the US dollar can be avoided if the central banks intervene by demanding additional foreign money to the extent of line *AB* in exchange for domestic money. zones: [13]

[13] The European Exchange Rate Mechanism, a forerunner of the euro, can be interpreted as a system of reference zones. The intention was to keep the exchange rate within a band. It was a distinct combination of interest rate parity, which determined the capital flows, and of purchasing power parity, which defined the expectations for the exchange rate. This system managed to keep the exchange rates stable during 1987–1992. When the exchange reached the band, the central bank of the currency endangered with depreciation had to intervene. It could receive a credit line from other central banks. However, it proved that real economic changes

Two major problems arise with reference zones:

- Who has to intervene at the limits? If the ECB supplies euros and buys US dollar in order to defend the exchange rate, this means that the money supply of the ECB is *de facto* steered by a foreign central bank, the Fed. If the foreign central bank expands its money supply excessively and the foreign currency is threatened with devaluation, then the ECB would have to supply euros accordingly. But, in the end, this would imply that the ECB would be heteronymous in its monetary policy. The way out of this dilemma is that the intervention has to be undertaken by the central bank whose currency is under pressure. This was the basic rule of the European Exchange Rate Mechanism. It is unlikely that such a system which requires to cede monetary sovereignty can be agreed upon.

- How to determine the reference standard of the real equilibrium exchange rate? On a theoretical level, an equilibrium exchange rate has to be established *ex ante*. In this respect, a model has to be available that includes all relevant definitions of the equilibrium exchange rate and also identifies the factors that could change the expectations of market participants. On a practical level, a political agreement of the sovereign states has to be achieved in order to determine the equilibrium exchange rate.

Monetary union

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had to lead to an adjustment of the exchange rates when they did not affect all countries in the same way and when changes were adequately strong. German reunification was such an asymmetric shock. Real interest rates in Germany rose because of investment opportunities in Eastern Germany and because of a higher national debt. The other countries suffered an unwanted real appreciation. This added to problems already existing. For instance, Italy saw an increase in the wages and in prices of non-tradables, but prices of tradeables could not rise and profits of its export industry were squeezed. This was a distortion in favor of non-tradables. For these reasons, the exchange rates had to be adjusted. Italy and the UK left the European Exchange Rate Mechanism in 1992 (September 16), the Italian lira devaluating by some thirty percent, the British pound by 32 percent. (Italy returned later). For the UK, a too high entry rate had been chosen in 1990, so that the British currency was overvalued. The Spanish pesata, the Portuguese escudo and the Irish pound were devalued. For the remaining currencies, the band of ±2.25 percent was raised to ±15 percent in 1993. The lira and the peseta then stayed at their devalued level.

In a monetary union, a common money is established whose supply is steered by a common central bank. In the euro area, the money supply process has been de-nationalized and put into the hands of a European institution. At the same time, the money supply process remains de-politicized as during the Bundesbank times since the ECB is independent.

While the nominal exchange rate is constant (since there is only a single currency instead of several ones), real exchange rate changes are needed in order to restore internal and external equilibrium. In the case of an economic shock asymmetric to a member country, a hierarchy of adjustment mechanisms can set in (Mundell 1961). First, capital and labor can leave the region, increasing the per capita income and employment for those that remain. Second, since cross-border labor mobility is low in Europe, a real depreciation in the crisis country is necessary. This is brought about by a fall in the price of non-tradables and by lower land prices and wages. Third, if the real exchange rate cannot perform the task of adjustment because wages are sticky, transfers between member states become necessary. Without them, economic divergence, for instance in unemployment, becomes too large.

The dream of a universal money

Mundell (2003) pushes the idea of a global universal money, a monetary union between the US dollar, the euro and the yen. He suggests six steps to develop such a common money in the dollar, euro and yen area: (1) decide on a common price index, (2) set an inflation target, (3) set an upper and lower limit for the exchange rate, (4) establish a joint monetary committee to decide on monetary policy, (5) make an arrangement for sharing seigniorage and (6) close the exchange rate margins (p. 28). Once such a system is in place, the final step would be introduce the INTOR, a new world currency. The INTOR would be backed by the weighted average of the three currencies for which the exchange rate have been fixed and of gold.

Unfortunately, it is not as simple as suggested. One decisive issue is that each central bank stands ready to buy the other currency at its lower limit. This, however, would imply for instance that the ECB would have to buy dollars when the Fed increases its money supply. The ECB would have to expand the money supply. It would have to import inflation and would be at the mercy of the Fed's monetary policy. The other decisive issue is that an unstable money is such an important policy instrument with such a significant impact on the

citizens of a country, that governments are reluctant to give up money as a policy instrument. An example is the potential risk of citizens losing their savings by depreciation.

Looking at such a dream it is good to remind ourselves which conditions must be satisfied to have a stable international money.

- The price levels must move with the same speed. If the price level in one country increases at a higher rate, its currency will devalue. Commodity arbitrage implies that purchasing power reigns in the long run. Since the price level depends on the money supply, a first condition is that the money supplies expand at about the same speed, correcting for differences in the expansion of the production potential of the countries and some other factors. It is a fact that the link between some monetary aggregates measuring the money supply and the price level becomes weaker, but in the end inflation continues to be a monetary phenomenon. If the link would indeed disappear completely, other monetary instruments such as the interest rate must be used to make sure that the price levels move in line.

- Exchange rates are not only influenced by commodity arbitrage, but are also influenced by capital flows, among them not only foreign direct investment but also short-term movements of portfolio capital. Capital flows are influenced by many factors, most importantly by exchange rate expectations. These are affected by interest rate differences, by inflationary expectations, changes in relative wage costs, budget deficits and the solidity of public finance. To harmonize expectations on exchange rate changes requires to harmonize these factors.

- Historically it has not been possible to have a stable money if the fiscal situation of the state was in disarray.

- If we want to have stable nominal exchange rates, we put more adjustment needs on the real exchange rate,. i.e. the relative price between non-tradables and tradables or between export goods and import goods. Such adjustments are harder to perform. Whenever the nominal and the real exchange rate diverge with a current account deficit accumulating, a currency crisis is immanent.

In the face of these conditions for a universal money, it is necessary to remind ourselves that monetary and financial disturbances had their root in policy failures. Too often the triggers for exchange rate volatility are political ones reflecting economic policy conditions, above all failed stabilization policy, fiscal disorder and misguided monetary policy. Exchange rate movements thus can be interpreted to represent a barometer of fundamental disturbances. It is a realistic assessment of the possibilities for the stabilization of exchange rates to emphasize national responsibility. The scenario then is as follows. Each country aims at monetary stability at home. It basically expands its money supply according to the growth of the national production potential or according to an inflation target satisfying monetary stability. Then, the price level remains stable in each country. Consequently, the exchange rates do not change as far as monetary policy is affected. However, stability orientation of monetary policy alone is insufficient to keep exchange rates stable. Fiscal policy and the whole economic policy, including wage setting also have to be oriented towards stability. Moreover, the country's time preference rate, the ageing process of population and technological progress all affect price level stability.

Thus, a solution can only consist in each individual country's keeping its own house in order and maintaining a stable domestic price level. Then, exchange rates will generally remain stable. This approach should be complemented by some minimum agreement on prudential rules for the financial sector in order to shield the overall system against instability and contagion. Summing up these points, the strategy for a stable money is: Stability begins at home. Each country must attempt to have a stable money. If that is the case, a stable international monetary system will follow.

7 Choosing the right exchange rate

An important question for exchange rate systems is how the equilibrium exchange rate can be determined. A less ambitious question is whether a mismatch of currencies exists that has to be corrected. Of course, once an equilibrium exchange rate can be defined, misalignment can be interpreted as a deviation from the equilibrium rate. These questions are relevant when a country wants to enter a currency union or another multilateral exchange rate system. Thus, the UK reentered the gold standard in 1925 with an overvalued rate; it also joined the European Exchange Rate Mechanism in 1990 with an overvalued currency. East Germany

was united with West Germany in 1990 at an overvalued exchange rate. It also has been discussed whether Germany joined the European Monetary Union at an overvalued exchange rate. In all these cases, overvaluation will dampen economic activity and put a severe adjustment burden on the economy in the long run.

Selecting the right exchange rate is not only a question of choosing the correct nominal rate. The price levels also play a role since it is the real rate exchange rate that determines internal and external equilibrium. The choice of the correct exchange rate is a thorny question for the profession, and usually economists fall back on purchasing power parity. The empirical validation of purchasing power parity has its problems, especially if the level of the exchange rate is to be determined. The real exchange rate is not only influenced by trade flows but also by capital flows. External balance in the current account and portfolio balance are relevant aspects for misalignment. For countries with a current account deficit over many periods such as the US, foreign debt and interest payments rise. When the debt burden is sufficiently high, devaluation is required to pay interest. In the longer run, the foreign debt/GDP ratio must be stable at a tolerable level (Stein 2001). For countries with a current account and a capital account surplus, there is a limit in the benefit of collecting international reserves. After all, these reserves are only paper, and the reserve currencies may depreciate. In order to determine the misalignment, we need a model of the real exchange rate and its determinants as well as the impact of the real exchange rate on internal and external equilibrium. Such a model also must include a forecast, since the real exchange rate changes over time with non-monetary factors, such as preference shifts between countries for products, changes in time preference, technological progress, and institutional innovations in the governance of the economy.

The Balassa-Samuelson effect

One aspect for such a model linked to a long-run trade flow view is the Balassa-Samuelson effect (Balassa 1964; Samuelson 1964). It starts from the empirical observation (or assumption) that productivity levels and productivity growth are different in the tradable and in the non-tradable sector (Table 2). Typically industrial products are assumed to be tradable whereas services are considered as non-tradable. In addition, international differences in productivity levels and productivity growth should be more pronounced in the tradable sector than in the sector of non-tradables services. To simplify, assume productivity in the non-tradable sector is the same in developed and developing countries and that in the tradable

sector productivity is low in (low-income) developing countries and high in (high-income) developed countries. In order to simplify further consider labor productivity only. Prices of tradables must be the same due to Jevons' law of one price and purchasing power parity. Non-tradables are labor- intensive whereas tradables are intensive in other factors. Three implications follow.

Table 2 Assumptions of the Balassa-Samuelson effect

	Low income countries	High income countries
Non-tradable sector	Same labor productivity as in high income country	Same labor productivity as in low-income country
Tradable sector	Low labor productivity	High labor productivity

Lower price level in developing countries. Since the labor force in developing countries has a lower productivity in the tradable sector than in developed countries, wages in the tradable sector are lower than in developed countries. The same wages, however, are paid in the non-tradable sector. Consequently, the aggregate price level, defined as a weighted average of the prices of tradables and non-tradables, is lower in developing countries.

Real appreciation in countries catching up. If in countries catching up productivity growth in the tradable sector is assumed to be higher than in the labor-intensive non-tradable sector, the prices of tradables rise less than that of non-tradables, implying a real appreciation. This means that catching up countries get more competitive with respect to tradables over time.

Higher inflation rate in countries catching up. Since the price level of a country is defined as a weighted average of the prices of tradables and non-tradables, catching up countries tend to have a higher inflation rate than developed countries. This is due to the fact that wage increases in the tradable sector (due to productivity growth) spread to the sector of non-tradables with a lower productivity increase. This effect is relevant for currency unions. In the European Monetary Union, countries of the periphery with higher growth rates have a higher inflation rate than the core countries. This also will apply to the new EU members (that became members in 1994) once they have joined EMU. Since the ECB is oriented at the overall price level of the euro area, the attempt to keep the price level low seems to hurt the core countries.

Meanwhile it is questionable, whether the underlying observation of lower productivity growth in the non-tradable sector is justified. In a service economy, capital-intensive technological progress in important service sectors such as banking, insurance, communication and IT is high. Besides, the lines between tradables and non-tradables are becoming more blurred.

Determining the exchange rate empirically

To indicate a mismatch between currencies or to know where the equilibrium exchange rate exactly is, one can apply the trade flow view and look at purchasing power parity. Looking at the price levels of two countries and the level of the exchange rate may not lead to convincing results since it is really the price levels of tradables that count. Moreover, we should look at producer prices. But even when these producer price levels for tradables and the exchange rate are in line, capital flows may influence the exchange rate following the capital flow view. Such an influence may be temporary, i.e. it may last for some years and may be corrected after a while (overshooting). Possibly, we can indicate a band for the "right" exchange rate, but unfortunately, we do not exactly know how wide the band is.

As an example, Stein (2001) constructs a model that includes the current account and the net asset position or foreign debt. A real depreciation improves the current account. Productivity growth increases the trade surplus and appreciates the currency. Interest rate parity determines the optimal portfolio, for simplification as i=i* as in Mundell-Fleming. The current account balance drives the net asset position, a current account deficit leading to an increase in debt. This in turn requires higher interest payments which then mandates a depreciation in order to earn the foreign currency needed to meet the interest payment. Thus, there is loop in the model that connects the net asset position to the current account and to the real exchange rate.

A similar concept is used in a model in which debt influences the price level (IMF 2003, p.33). In this approach, an intertemporal budget constraint of the consolidated public sector is introduced, including outstanding government debt, the nominal stock of money, the primary surplus in the current account (current account surplus excluding debt service) and the price level. In a money-dominated system, the price level is determined by the money supply; then the primary balance must adjust to maintain the government's solvency. In a fiscal-dominant regime, the primary surplus is considered as given. Then the price level is the only

instrument that can make sure that the equation is satisfied. In such a regime, the price level is determined in such a way that the intertemporal budget constraint is satisfied.

In contrast to these approaches for deficit countries, Wang (2004) empirically determines the real effective exchange rate of China, using a nonlinear least square approach. His result are three relevant factors:

- The relative productivity of tradable versus non-tradable goods affects the exchange rate. Theory predicts that a higher productivity growth in the tradable sector reduces the price of tradables relative to non-tradables (numerator in the definition of the real exchange rate becomes smaller): This means a real appreciation. Applying this approach to China for the period 1987-2003 and using the ratio of the consumer price index (containing many non-tradables) and the producer price index (containing mostly tradables) yields a coefficient of 1.12 in the regression analysis (Wang Table 4.1). A one percent increase in relative productivity growth would lead to a real appreciation of slightly more than one percent.

- The net foreign asset position also influences the exchange rate. An increase in foreign assets means an increased demand for a foreign currency. It can also be argued that the country that accumulates reserves can afford a trade deficit in the future. For China, a one percent increase in the ratio of net foreign assets to GDP leads to an appreciation of 0.9. Both lines of argument go in favor of an appreciation.

- As a third factor, openness plays a role. Whereas trade obstacles tend to reduce the demand for a foreign currency, making an economy more open increases the demand for foreign currency and leads to a depreciation. Measuring a openness by the ratio of exports and imports to GDP, a one percent increase in openness leads to a 0.3 percent decline in the value of the currency.

Wang then compares the exchange rate predicted by the model with the actual rate. His approach demonstrates how difficult it is to determine the correct exchange rate *ex ante.* This is one of the reasons why the concepts for exchange rate policies based on the idea of an equilibrium exchange rate (Williamson 1983) are not very promising.

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