Économie internationale 111 (2007), p. 9-27.

ÉCONOMIE INTERNATIONALE

CAN A CURRENCY BOARD OR A HARD PEG BE UNSTABLE? THE CASE OF CHINA

Patrick Artus[1]

Article received on April 3, 2007
Accepted on June 11, 2007

ABSTRACT. A currency board (an exchange rate regime where monetary policy depends on the evolution of foreign exchange reserves) is normally stabilizing. A loss of reserves, for instance, leads to an increase in interest rates that slows down production and improves the trade balance, resulting in an increase in foreign exchange reserves. The example of China, however, shows that a currency board or an exchange rates regime very close to a currency board can lead to dynamic instability, with an endless accumulation of foreign exchange reserves. We build a theoretical dynamic model that explains the fluctuations in exchange rate, prices, credit, interest rates and production to examine several processes that could explain this dynamic instability: rigidity of interest rates, absence of international mobility of capital (due for instance to capital controls) endogeneity of the supply of goods and stickiness of prices. The lack of financial liberalisation plays a central role in explaining the absence of stabilizing properties of the currency board in China.

JEL Classification: F33.
Keywords: Exchange Rate Regime; Capital Mobility.

RÉSUMÉ. L'objectif d'un *currency board* (régime de change où la politique monétaire dépend de l'évolution des réserves en devises étrangères) est normalement de renforcer la stabilité. Une perte de réserves conduit par exemple à une augmentation des taux d'intérêt qui ralentit la production et améliore la balance commerciale, d'où résulte une augmentation des réserves en devises étrangères. Le cas de la Chine montre cependant qu'un *currency board*, ou un régime de change proche, peut conduire à une instabilité dynamique avec accumulation illimitée de réserves en devises étrangères. La construction d'un modèle théorique dynamique qui explique les fluctuations des taux de change, des prix, du crédit, des taux d'intérêt et de la production permet d'étudier et de comprendre les mécanismes de cette instabilité dynamique : la rigidité des taux d'intérêt, l'absence de mobilité internationale du capital (du fait par exemple du contrôle sur les capitaux), l'endogénéité de l'offre de biens et la rigidité des prix. En Chine, le manque de libéralisation financière joue un rôle déterminant dans le fait que le *currency board* ne s'accompagne pas de la stabilisation escomptée.

Classification *JEL* : F33.
Mots-clés : Régime de change ; mobilité du capital.

1. Patrick ARTUS, Research Director, Ixis Corporate and Investment Bank – Group Caisse d'Epargne; Professor, Université Paris I Panthéon-Sorbonne and École polytechnique (partus@ixis-cib.com).

The currency board system is well known: by ensuring a strict link between credit or the money supply and foreign exchange reserves (Ponsot, 2000 and 2001; Desquilbet and Nenovsky, 2004), *i.e.* by recreating "the gold standard without gold" (Dornbusch and Giavazzi, 1999), it means that fixed exchange-rate systems are credible (de Haan, Berger and Van Frassen, 2001; Kydland and Wynne, 2002), and one can avoid self-fulfilling currency crises (Davies and Vines, 1995; Schwartz, 1993; Eichengreen, 1994; Funke and Hall, 1995; Williamson, 1995; Balino and Enoch, 1997; Hanke and Schuler, 1994); it also enables to achieve lower inflation (Ghosh, 1998; Ghosh, Gulde and Wolf, 2000; Gulde, Käkhönen and Keller, 2000).

The risks and costs are also well established: if discipline is not maintained, credibility is lost and a crisis breaks out, as in Argentina (Hanke, 2002); the currency board rules out any discretionary policy and any reaction to shocks (Carlson and Valev, 2001; Alesina and Barro, 2001); it can lead to a real over – or undervaluation of exchange rates (Bennett, 1994; Osband and Villanueva, 1992); lastly, it does not allow the central bank to play its role of Lender of Last Resort (Caprio, Dooley, Leipziger and Walsh, 1996).

There are more prerequisites for a currency board to be successful than the usual conditions required by an optimal currency area; if credibility is to be achieved, the level of foreign exchange reserves needs to be high enough, the financial system has to be well supervised, while there must not be any excessive fiscal deficit that could drive the central bank to monetise the public debt (Williamson and Santiprabhob, 1997; Larrain and Velasco, 1999; Frankel, 1999).

A currency board must thus, theoretically, and if the prerequisites are met, ensure the stability of the exchange-rate regime of the country that implements it.

The purpose of this paper is to study **the reasons why the stabilising properties of a currency board could disappear**. The starting point of our analysis is **the situation of China**. China is not officially part of a currency board with the dollar, but, in practice, **its exchange-rate regime is very similar to a currency board**. Nevertheless, **noticeable dynamic instability** can be seen in China, since there is steady growth in foreign exchange reserves, in the monetary base and credit. This seems to contradict the properties expected from a currency board or, if there is accumulation of foreign exchange reserves, the induced monetary expansion leads to a stimulation of real activity and price rises that hurt foreign trade and stop the accumulation of foreign exchange reserves, as well as a decline in interest rates and capital outflows that head in the same direction.

We construct a dynamic theoretical model of an economy in a currency board (in fixed exchange rates with monetary policy depending on compared trends in credit and foreign exchange reserves) to look at a few approaches that could explain this unique situation found in China:

– rigidity of interest rates, this could be a consequence of the fact that the credit market is not competitive, and interest rates do not react to changes in the central bank's interest rates;

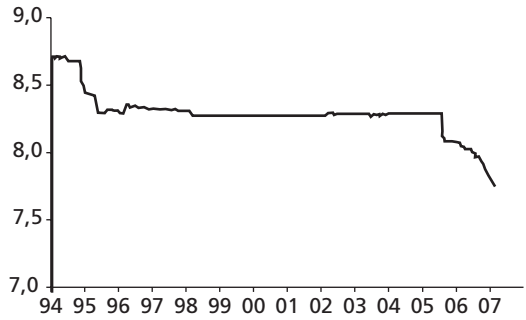
– lack of international capital mobility (in the case of China due to exchange control), which prevents capital flows from stabilising foreign exchange reserves;
– endogeneity of the supply of goods: it implies that, if there is accumulation of foreign exchange reserves and monetary expansion, the increase in the supply of goods prevents price rises and a deterioration in the trade balance;
– price stickiness that prevents monetary expansion (for example) from denting competitiveness.

Before moving on to a description of our model, let us look again at the case of China.

The exchange rate regime of China and its efforts

China has been, as is well known, in a quasi-fixed exchange-rate regime against the dollar since 1995 (FIGURE 1), after having rigidly pegged its currency to the dollar between 1995 and 2005. The 2.1% revaluation carried out in July 2005, followed by a progressive revaluation of the renminbi has not called into question the fixed exchange-rate regime.

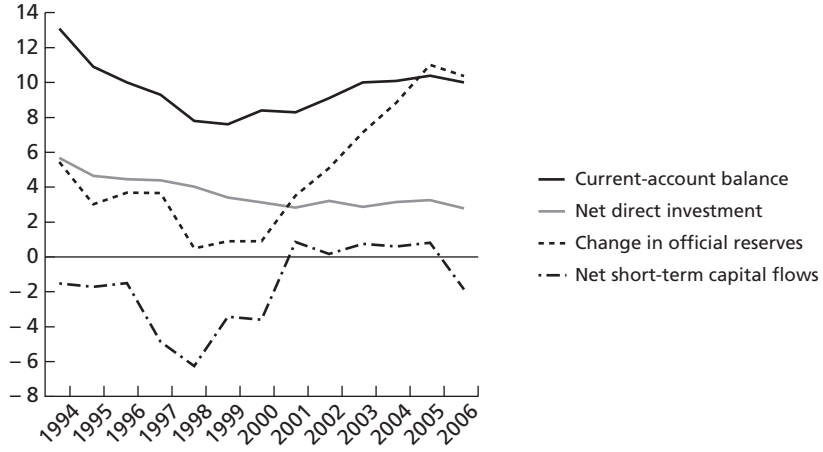
Figure 1 - Renminbi/US dollar



Sources: Datastream and IXIS CIB.

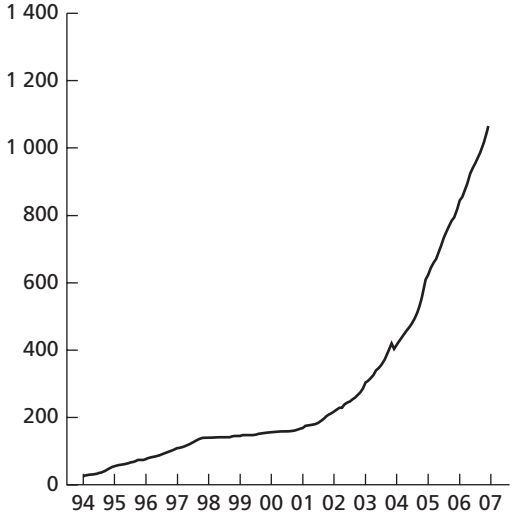
As is well established, because of the country's trade surpluses, foreign direct investment and short-term capital inflows, fixity has forced China since the beginning of the decade to **accumulate substantial foreign exchange reserves**, as they are needed to maintain the stability of the exchange rate (FIGURE 2a and FIGURE 2b).

Figure 2a - China: current account balance and capital flows (% of GDP)



Source: DRI.

Figure 2b - China: official reserves (US$ bn)



Source: DRI and IXIS CIB.

The size of China's foreign exchange reserves means that the accumulated reserves cannot be sterilised. There is therefore a large money **base growth** in China due to the accumulation of reserves (FIGURE 3a and FIGURE 3b).

Figure 3a - China: monetary base and official reserves (US$ bn)

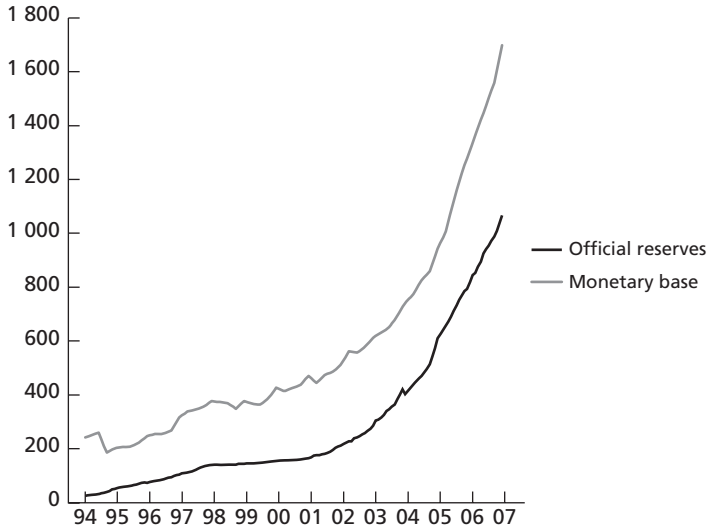
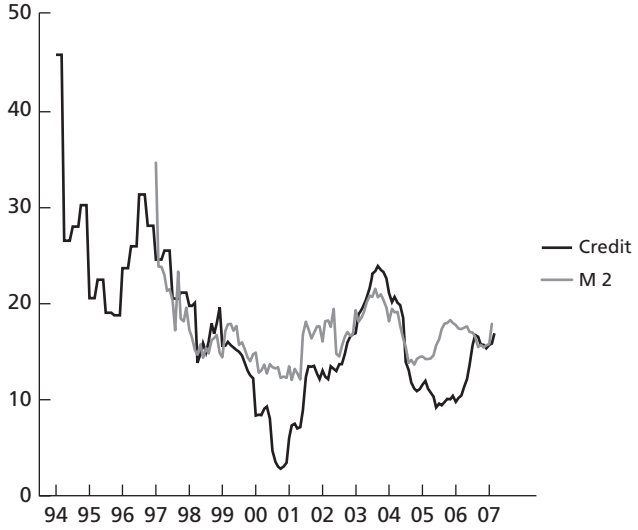


Figure 3b - China: monetary base and official reserves (Y/Y as %)

Source: Datastream, Central Bank of China and IXIS CIB.

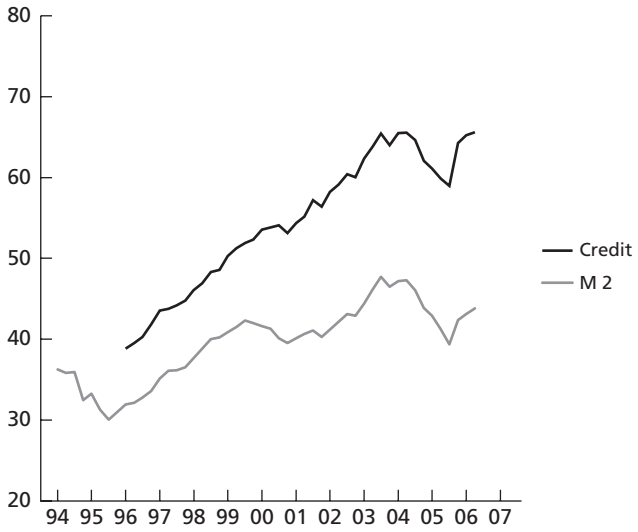
Rapid growth in the money base has obviously led to similar expansion in money supply and credit, even though the increase in credit has been affected by changes in regulations (liberalisation of the credit in 2002, rise in statutory reserves and restrictions on lending in 2004, in early 2005, and again in 2006 and 2007, FIGURE 4a and FIGURE 4b).

Figure 4a - China: credit and money supply (Y/Y as %)



Source: Datastream and IXIS CIB.

Figure 4b - China: credit and money supply (% of GDP)



Source: Datastream and Natixis.

The increase in liquidity in China is no linked to capital inflows, as in the case in other emerging countries (India, Korea…), because of the capital controls put in place in China. It is a direct consequence of the accumulation of foreign exchange reserves: the central bank increases the supply of central bank money as it accumulates more reserves; this is leading to an increase in bank liquidity, and hence in credit supply and in money supply.

The extremely high level of savings in China explains why the central bank has to accumulate such enormous reserves, because it is the main cause of the trade surplus of China (see FIGURE 2a).

How to characterize the exchange rate regime of China?

The renminbi is clearly pegged to the dollar, which implies, because of the trade surplus of China, the accumulation of foreign exchange reserves. There is no monetary independence in China; interest rates cannot differ very much from those on the dollar (see FIGURE 7 below). But the exchange rate regime of China has an additional feature: the strong link between foreign exchange reserves and money supply, which makes it very close to a currency board, although it is not officially one.

We can call this exchange rate regime a "hard peg" or a "quasi currency board". Normally, a currency board is used to protect a country against the loss of reserves that leads to a monetary contraction, in the case of China it consists in accumulating reserves and getting the money supply to grow (this is why we say it is an "upside down", quasi currency board).

The stabilising properties of the currency board should subsist, even in the case of an accumulation of reserves.

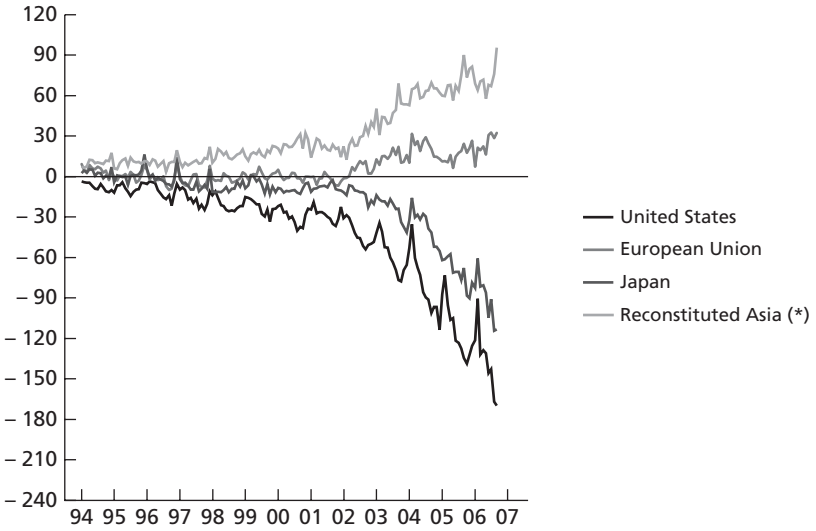
What is expected (by inverting the usual analysis)?

– The induced money supply growth (sharp rise in the money supply) should lead to a decline in interest rates, hence capital outflows that would lead to the end of the accumulation of reserves;

– growth in the money supply and credit should drive domestic demand upwards, result in inflation and the appearance of an external deficit that would also stop the accumulation of reserves.

However, these stabilising developments are not occurring in China. Since 2001, there have been short-term (financial) capital inflows and not capital outflows (see FIGURE 2a) that are combining with foreign direct investment. China posts growing trade surpluses with most regions (except Asian emerging countries, FIGURE 5), and overall, its accumulation of foreign exchange reserves has not slowed down at all.

Figure 5 - Trade balance with China (US$ bn per year)



(*) China, Korea, Thailand, Indonesia, Philippines, Singapor, Hong Kong, Malaysia.

Sources: Datastream, IMF, DRI and IXIS CIB.

Even though growth is robust (FIGURE 6a), there is no inflation at all (FIGURE 6b).

Figure 6a - China: growth and industrial production (Y/Y as %)

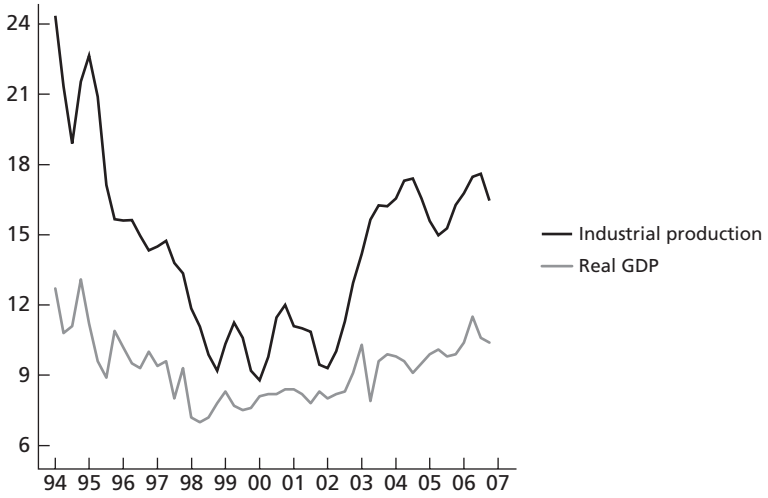
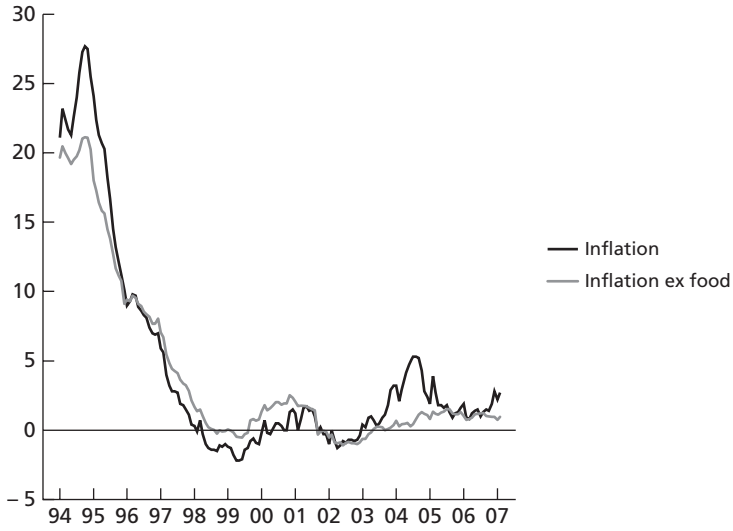


Figure 6b - China: inflation and core inflation

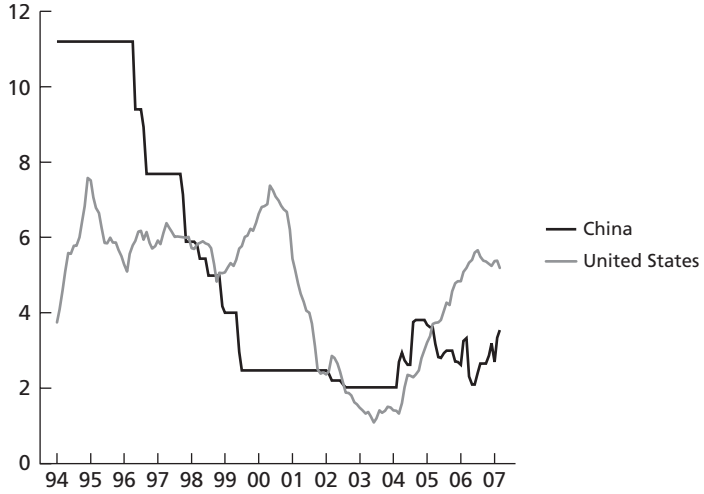


Sources: Datastream and IXIS CIB.

We therefore need to explain why the stabilising characteristics of a currency board do not appear in the case of China. We consider four groups of causes that could explain this situation of China and they shape our theoretical modelling.

Cause # 1: The rigidity of (administered) interest rates prevents interest rates from falling sufficiently in comparison with other currencies' rates (FIGURE 7).

Figure 7 - 1-year interest rate



Sources: Datastream and IXIS CIB.

Cause # 2: Capital controls ban exports of capital by Chinese savers.

Cause # 3: Monetary expansion stimulates the accumulation of productive capital, resulting in excess production capacity that prevents prices from rising and favours exports; the rapidity of growth attracts foreign direct investment (FIGURE 8a, FIGURE 8b and FIGURE 8c).

Cause # 4: Disguised unemployment in the countryside, internal migration (FIGURE 9a), excess production capacity (FIGURE 9b) and the very high level of productivity gains prevent price rises.

Figure 8a - China: total investment rate (% of GDP)

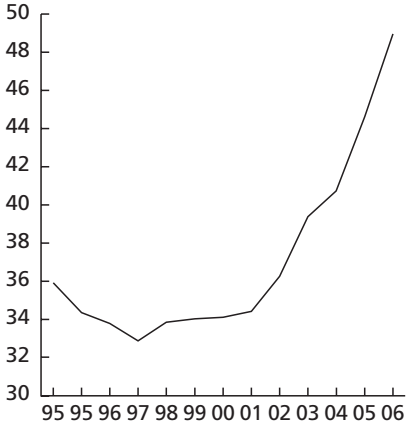


Figure 8b - China: inflation and exports (Y/Y as %)

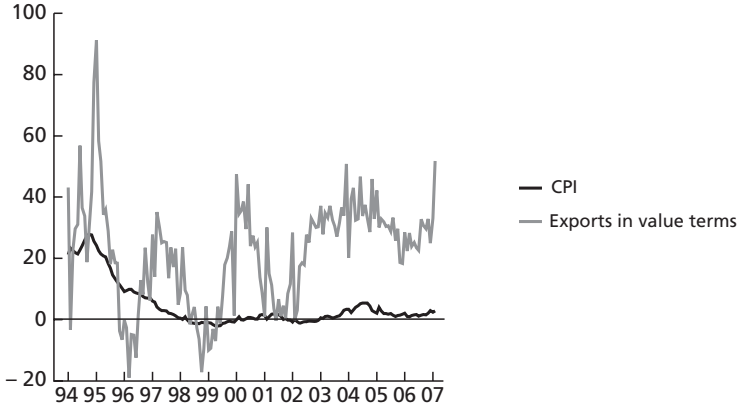
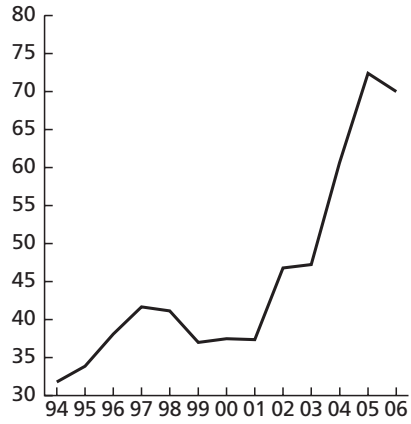


Figure 8c - China: net direct investment (US$ bn)



Sources: Datastream and IXIS CIB.

Figure 9a - China: rural and urban population (% of total population)

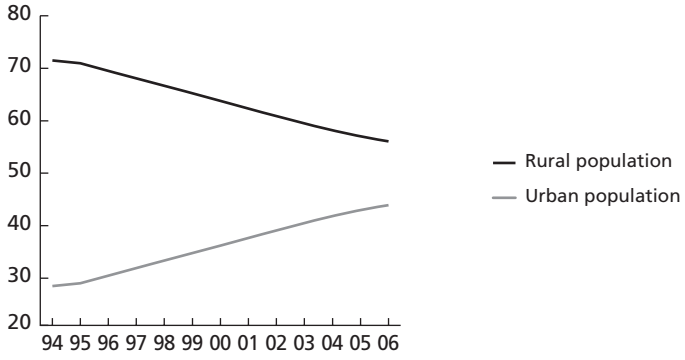
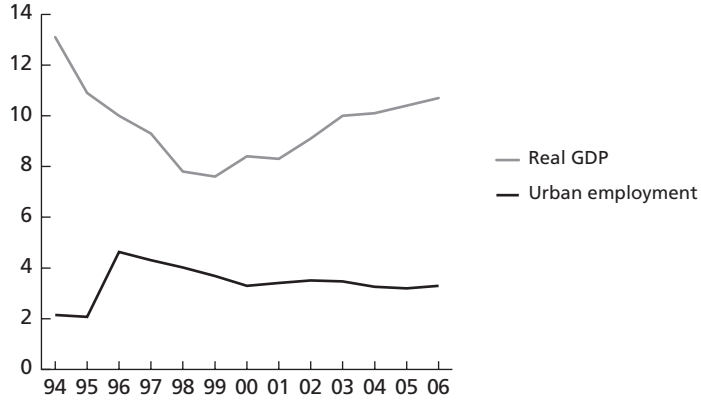


Figure 9b - China: growth and urban employment (%)



Sources: Datastream and IXIS CIB.

The possibility that a monetary expansion leads to a decrease in prices because of its effect on corporate investment and capital accumulation can seem a bit extreme, but this mechanisms seems actually to be at work in China. This is due to the fact that, as we have seen above, the low level of interest rates compared to growth rates generates a powerful incentive to borrow; also that corporate profits increase extremely rapidly, which is due both to strong growth and the relatively slow increase in unit labour costs because of the increase in labour supply documented above.

The "normal" currency board model

This is a model where the currency board ensures the stability (the credibility) of the fixed exchange-rate system. We are referring here to the "Chinese model": the accumulation of foreign exchange reserves leads the authorities to cut interest rates, paving the way for capital outflows, and resulting in price rises that hurt foreign trade, while both developments hamper the accumulation of reserves.

We write our model as follows:

Dynamics of foreign exchange reserves

$$\dot{R} = r^* + \alpha(\bar{e} - p) + f(r - r^*) \qquad \alpha, f > 0 \tag{1}$$

R is the logarithm of foreign exchange reserves (in foreign currencies, in real terms); r^* is the foreign (dollar) interest rate; r the interest rate in China; $\bar{e}$ the fixed Renminbi/US$ exchange rate (a rise in $\bar{e}$ corresponds to a depreciation in the RMB); p is the logarithm of prices in China. China's foreign exchange reserves increase in line with the interest payments received on reserves, with competitiveness (the net exports); with capital inflows in China, $f(r - r^*)$, which vary in line with the interest rate differential between China and the rest of the world.

Demand for credit in China

It grows in line with production, and decreases in line with the real interest rate:

$$c = y - \beta(r - \dot{p}) \qquad \beta > 0 \tag{2}$$

c is the logarithm of real credit, $\dot{p} = \frac{dp}{dt}$ inflation in China; y is the production logarithm.

Inflation in China

$$\dot{p} = \theta(y - z) \qquad \theta > 0 \tag{3}$$

Inflation grows in line with the gap between demand and the supply of goods and services; z is the supply logarithm.

Demand (production)

It grows in line with real credit and with the real exchange rate (net exports), and decreases in line with the real interest rate:

$$y = -\gamma(r - \dot{p}) + \delta c + \varepsilon(\bar{e} - p) \qquad \gamma, \delta, \varepsilon > 0 \qquad \delta < 1 \tag{4}$$

The monetary rule related to the currency board regime simply says that the interest rate rises (declines) if credit increases more (less) than foreign exchange reserves, *i.e.*:

$$r = A(c - R) \qquad A > 0 \tag{5}$$

Hence, after resolution:

$$\begin{cases} y\big(1-\gamma\theta-\delta(1+\beta\theta)+A(\beta+\gamma)\big) = (AR-\theta z)(\gamma+\beta\delta)+\varepsilon(1+\beta A)(\bar{e}-p) \\ \dot{p}\big(1-\gamma\theta-\delta(1+\beta\theta)+A(\beta+\gamma)\big) = \theta AR(\gamma+\beta\delta)+\theta\varepsilon(1+\beta A)(\bar{e}-p)-\theta z\big(1-\delta+A(\beta+\gamma)\big) \end{cases} \tag{6}$$

We have:

$$\begin{cases} r(1+\beta A) = A\big((1+\beta\theta)-R-\beta\theta z\big) \\ c(1+\beta A) = y(1+\beta\theta)+\beta(AR-\theta z) \end{cases} \tag{7}$$

If the level of foreign exchange reserves increases (R is the logarithm of the level of reserves), there is a fall in interest rate r and a growth in credit c.

We also have:

$$y(1-\gamma\theta) = (\delta-\gamma A)c+\gamma AR-\gamma\theta z+\varepsilon(\bar{e}-p) \tag{8}$$

An increase in credit (c is the logarithm of real credit) on the one hand leads to growth in demand (term δ); and, on the other hand, leads to a rise in the interest rate (term $-\gamma A$); a rise in foreign exchange reserves R drives down the interest rate. (7) and (8) lead to (6): the rise in foreign exchange reserves results in growth in real credit and drives down the interest rate, leading to an increase in production and inflation.

Lastly, we have:

$$\dot{R}(1+\beta A) = r^*(1-f)(1+\beta A)+\alpha(1+\beta A)(\bar{e}-p)+Ayf(1+\beta\theta)-AfR-\beta\theta Afz \tag{9}$$

A rise in y, a fall in R or in z (supply of goods) drives interest rate r upwards, attracts capital ($f(r-r^*)$) and drives foreign exchange reserves upwards ($\dot{R} > 0$).

Hence, by denoting $\Delta = 1-\gamma\theta-\delta(1+\beta\theta)+A(\beta+\gamma)$

$$\begin{aligned} \dot{R}(1+\beta A)\Delta = {} & \Delta r^*(1-f)(1+\beta A)+(1+\beta A)(\bar{e}-p)\big[\alpha\Delta+\varepsilon Af(1+\beta A)\big] \\ & -AfR\big(\Delta-A(1+\beta\theta)(\gamma+\beta\delta)\big)-Af\theta z\big(\beta\Delta+(1+\beta\theta)(\gamma+\beta\delta)\big) \end{aligned} \tag{10}$$

An ambiguity appears, *prima facie*, in the effect of foreign exchange reserves on the accumulation of reserves. If R increases, the interest rate directly declines, and this leads to capital outflows; but production grows, and on the contrary leads to a rise in the interest rate.

If : $$\Delta - A(1+\beta\theta)(\gamma+\beta\delta) > 0 \tag{10'}$$

a rise in foreign exchange reserves, when taking into account all its effects, leads to a decline in interest rates. A rise in the price p reduces reserves both by hurting foreign trade, and by reducing production and therefore the interest rate.

As a divergence from the long-term equilibrium, **the dynamics in (p, R)** is written:

$$\begin{cases} \Delta\dot{p} = -\theta\varepsilon(1+\beta A)p + \theta A(\gamma+\beta\delta)R \\ \Delta\dot{R}(1+\beta A) = -\big(\alpha\Delta + \varepsilon A f(1+\beta A)\big)(1+\beta A)p - Af\big(\Delta - A(1+\beta\theta)(\gamma+\beta\delta)\big)R \end{cases} \quad (11)$$

The characteristic polynomial of (11) is:

$$P(x) = x^2 + \frac{x}{\Delta}\left[\theta\varepsilon(1+\beta A) + \frac{Af}{1+\beta A}\big(\Delta - A(1+\beta\theta)(\gamma+\beta\delta)\big)\right] + \frac{\theta A}{\Delta}\big(\varepsilon f + \alpha(\gamma+\beta\delta)\big) \quad (12)$$

If the dynamics (p, R) is to be overall stable (two negative own values), it is necessary that $P(0) > 0$ and $P'(0) > 0$.

This shows that if:

$$\begin{cases} \theta\varepsilon(1+\beta A) + \dfrac{Af}{1+\beta A}\big(\Delta - A(1+\beta\theta)(\gamma+\beta\delta)\big) > 0 \\ A > 0 \end{cases} \quad (13)$$

the dynamics is overall stable.

If (10′) is verified (a rise in foreign exchange reserves, when all its effects are taken into consideration, drives down the interest rate), it is then sufficient if $A > 0$, *i.e.* the interest rate rule corresponding to a currency board (decline in the interest rate if credit increases more slowly than foreign exchange reserves) is applied if there is to be dynamic stability.

The long-term stationary equilibrium, lastly, is written:

$r = A(c - R)$	**(interest rate rule)**	(14a)
$y = z$	**(price stability)**	(14b)
$r^*(1-f) + \alpha(\bar{e} - p) + fr = 0$	**(stability in official reserves)**	(14c)
$c = z - \beta r$	**(demand for credit)**	(14d)
$z = -\gamma r + \delta c + \varepsilon(\bar{e} - p)$	**(determination of demand)**	(14e)

hence:

$$\begin{cases} r\big[\alpha(\gamma+\beta\delta) + \varepsilon f\big] = -z\alpha(1-\delta) - \varepsilon r^*(1-f) \\ \varepsilon(\bar{e}-p)\big[\alpha(\gamma+\beta\delta) + \varepsilon f\big] = z\varepsilon f(1-\delta) - \varepsilon r^*(1-f)(\gamma+\beta\delta) \end{cases} \quad (15)$$

A rise in supply (z) leads (if $1 - \delta > 0$) to excess of supply of goods, hence necessarily a fall in interest rate r and a real depreciation in the currency $\bar{e} - p$ that boost demand.

If international capital mobility is significant (f is high, $f > 1$, the impact of capital flows dominates), a rise in the foreign interest rate r^* (which results in capital outflows) leads to a rise in the domestic interest rate r (to curb capital outflows), and accordingly results in a contraction in demand that imposes a real depreciation (rise in $\bar{e} - p$) in order to rebalance the product market.

Lastly, we have from (14a) $R = c - \frac{r}{A}$, or $AR = Az - r(1 + \beta A)$, or alternatively:

$$AR = z\left[\alpha(1-\delta) + A\left(\alpha(\beta+\gamma) + \varepsilon f\right)\right] + (1+\beta A)\varepsilon(1-f)r^* \tag{16}$$

A positive supply shock (rise in z) leads, in the long term, to an increase in production and, therefore, a rise in credit, also a fall in the interest rate and, thus, necessarily a rise in foreign exchange reserves R. If $f > 1$ (high international capital mobility), a rise in the foreign interest rate r^* leads to a rise in the domestic interest rate r and, therefore, necessarily an increase in $c - R$ and, therefore, a fall in foreign exchange reserves.

An initial depreciation in the currency (rise in $\bar{e}$) has, as its only long-term effect, an equal rise price p, and this leaves the rest of the equilibrium unchanged.

What factors could prevent the stabilising role of the currency board from appearing?

Starting off from the previous analysis, we are going to examine the factors that, at first sight, could prevent the currency board regime from being stable and, therefore, credible.

Rigidity of interest rates

We naturally draw on the Chinese situation. In a "pure" currency board regime, the interest rate varies to stabilise the ratio between credit and foreign exchange reserves. Let us suppose that this is not the case and that $A = 0$ (rigidity of interest rates).

The dynamics is then written:

$$\begin{cases} \dot{R} = r^*(1-f) + \alpha(\bar{e} - p) \\ \dot{p}\left(1 - \gamma\theta - \delta(1+\beta\theta)\right) = \theta\varepsilon(\bar{e} - p) - \theta z(1-\delta) \end{cases} \tag{17}$$

The dynamics of prices (of the real exchange rate) is stable, and leads to:

$$\varepsilon(\bar{e} - p) = z(1-\delta) \tag{17'}$$

hence:

$$\dot{R} = r^*(1-f) + \frac{\alpha}{\varepsilon} z(1-\delta) \tag{17''}$$

If $f > 1$ (high international capital mobility), a rise in the global interest rate r^* or a fall in the supply of z leads to a perpetual loss of reserves. **There is no longer any dynamic stability.**

Lack of capital mobility

It can result from **capital controls,** and implies $f = 0$. The dynamics is then written:

$$\begin{cases} \Delta\dot{p} = \theta AR(\gamma + \beta\delta) + \theta\varepsilon(1+\beta A)(\bar{e} - p) - \theta z\left(1 - \delta + A(\beta+\gamma)\right) \\ \dot{R}(1+\beta A) = r^*(1+\beta A) + \alpha(1+\beta A)(\bar{e} - p) \end{cases} \tag{18}$$

and remains stable (see (13)). Even without capital movements, dynamic stability is ensured by foreign trade.

Endogeneity of the supply of goods

We have supposed until now that the supply of goods z was exogenous. We are going to suppose here that it decreases in line with the real interest rate:

$$z = \bar{z} - \varphi(r - \dot{p}) \qquad \varphi > 0 \tag{19}$$

hence alternatively:

$$z(1+\varphi\theta) = \bar{z} - \varphi r + \varphi\theta y \tag{20}$$

The supply of goods decreases in line with the interest rate (as a rate cut stimulates capital accumulation), and grows in line with production y (this can also represent the interest there is in accumulating capital when demand is robust). (20) implies:

$$\dot{p}(1+\varphi\theta) = \theta(y - \bar{z}) + \theta\varphi r \tag{20'}$$

and this adds dependence of inflation on the interest rate.

The resolution leads to (by omitting the exogenous variables):

$$\begin{cases} r(1+\varphi\theta+\beta A) = Ay\Big(1+(\beta+\varphi)\theta\Big) - A(1+\varphi\theta)R \\ c(1+\varphi\theta+\beta A) = y\Big(1+(\beta+\varphi)\theta\Big) + \beta AR \end{cases} \tag{21}$$

then:

$$\tilde{\Delta}y = AR(\beta\delta+\gamma+\chi\varphi\theta) + \varepsilon(1+\varphi\theta+\beta A)(\bar{e}-p) \tag{22}$$

with: $\tilde{\Delta} = (1+\varphi\theta-\chi\theta)(1+\varphi\theta) - \delta\Big(1+(\beta+\varphi)\theta\Big) + A\Big(\beta+\gamma+\varphi\theta(\beta+\gamma)\Big)$

and: $\dot{p}(1+\varphi\theta)(1+\varphi\theta+\beta A) = \theta y\Big(1+\varphi\theta+\beta A+\varphi A\Big(1+(\beta+\varphi)\theta\Big)\Big) - \theta\varphi\beta A(1+\varphi\theta)R$ (23)

The fact that inflation rises in line with the interest rate because of the reaction by supply leads to the conclusion that a rise in foreign exchange reserves, for a given level of production, drives down inflation by driving the interest rate downwards.

We lastly have:

$$\dot{R}(1+\varphi\theta+\beta A) = \alpha(1+\varphi\theta+\beta A)(\bar{e}-p) + fAy\Big(1+(\beta+\varphi)\theta\Big) - Af(1+\varphi\theta)R \tag{24}$$

The dynamics can become unstable if the effect of reserves R on inflation $\dot{p}$ becomes negative.

The coefficient of R on $\dot{p}$ is written:

$$W = \frac{\theta\Big(1+\varphi\theta+\beta A+\varphi A\Big((1+\varphi)\theta\Big)\Big)}{(1+\varphi\theta)(1+\varphi\theta+\beta A)}\frac{A(\beta\delta+\gamma+\chi\varphi\theta)}{\tilde{\Delta}} - \frac{\theta\varphi\beta A}{1+\varphi\theta+\beta A} \tag{25}$$

W becomes negative without ambiguity if φ is high: the reaction by the supply of goods to the interest rate, if it is strong enough, leads to dynamic instability: the increase in foreign exchange reserves drives down the interest rate, hence a rise in the supply of goods, as well as a fall in prices that improves the trade balance and increases even more the foreign exchange reserves.

Price stability

We suppose that $\theta = 0$, $\dot{p} = 0$ for instance (as in the case of China), because internal migration increases the supply of goods at the pace of growth in demand, and prevents prices from rising.

With a fixed price, the dynamics of reserves leads to $\dot{R}$ depending on:

$$-AfR\left(\Delta - A(\gamma + \beta\delta)\right) = -AfR\left(1 - \delta + A\beta(1-\delta)\right) < 0$$

As long there is capital mobility ($f > 0$), the fixity of prices does not prevent dynamic stability. There needs to be both lack of capital mobility ($f = 0$) and fixity of prices ($\theta = 0$) for there to be instability, since then neither capital flows, nor the trade balance can play their role any longer.

Conclusion: causes of instability that definitely correspond to China's situation

The dynamic stability that is normally ensured by the implementation of a currency board disappears, as seen above:

– if interest rates on credits are sticky (as is normal since then the very principle of the currency board is no longer ensured);

– if the supply of goods reacts sufficiently to changes in real interest rates to ensure that the effect of changes in foreign exchange reserves on inflation is inversed, and this could be the case in China with the link between growth in the money base and excess investment;

– if there is both lack of international capital mobility and price stickiness and, therefore, no developments that would inverse the direction of the variation in foreign exchange reserves. This can be the case in China due to capital controls (the lack of convertibility of the RMB for individuals) and the fact that inflation does not move in line with internal migration and excess production capacity.

The lack of financial liberalisation (rigidity of interest rates and capital controls) therefore does play a role in making the Chinese "quasi currency board" unstable.

But would liberalize the capital account a good idea for China? The idea is that, with interest rates under their equilibrium level, and with an excess of domestic liquidity, the suppression of capital controls would lead to an outflow of capital that would reduce the need to accumulate more foreign exchange rate reserves.

The Chinese authorities are actually moving in that direction, by making it easier for Chinese banks, companies and institutional investors to invest abroad. In principle, this is a sensible policy; in practice, it is not very efficient for two reasons: the appreciation of the currency and the very fast increase in domestic stock market prices push the Chinese to keep investing their savings on the domestic markets.

P.A.

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