**中国财政发展协同创新中心2023—2024学年第二学期**

**《宏观经济学》随堂考试试卷**

2024年5月31日

Please simulate the following China-US two country fixed exchange rate SFC model:

First, you are required to use **real world data**.

Second, you are required to design **two shock scenarios** to show that reductions or increases in foreign exchange reserves, as a result of foreign exchange interventions by the central bank to keep the exchange rate fixed, have no effect on the money supply.

Third, you can present your results either by graph (prefer) or by numerical value (in the form of table).

Fourth, you are required to give **an explanation of your results,** such as the mechanism of this model.

Please send the **code file** and **graph or table** to huiqing\_li@cufe.edu.cn

The GDP identity:

* $Y\$=C\$+G\$+X\$-IM\$     \left(1\right)$
* $Y¥=C¥+G¥+X¥-IM¥     \left(2\right)$

The wealth identity and tax:

* $ΔV\$=Y\$-T\$-C\$+CG\$     \left(3\right)$
* $ΔV¥=Y¥-T¥-C¥+CG¥     (4)$
* $T\$=θ\$Y\$     (5)$
* $T¥=θ¥Y¥     (6)$

With the two countries forming a single system, exports now become endogenous. Exports by each country are thus equal to imports by the other, converted to a common rate of exchange. Imports are determined in each country by the relevant income and price elasticities, with lowercase boldface letters denoting logs.

* $X\$=IM¥/xr\$     (7)$
* $X¥=IM\$xr\$     \left(8\right)$
* $im\$=μ\_{0\$}+μ\_{1\$}y\$+μ\_{2\$}xr\$     \left(9\right)$
* $im¥=μ\_{0¥}+μ\_{1¥}y¥+μ\_{2¥}xr¥     \left(10\right)$

The consumption and the supply of Treasury bills:

* $C\$=α\_{1\$}Y\$\left(1-θ\$\right)+α\_{2\$}V\$\_{-1}       \left(11\right)$
* $C¥=α\_{1¥}Y¥\left(1-θ¥\right)+α\_{2¥}V¥\_{-1}     (12)$
* $ΔB\$\_{s}=G\$-T\$     \left(13\right)$
* $ΔB¥\_{s}=G¥-T¥     (14)$

The array of asset demands for $ residents, where all asset demands are valued in $ currency:

* $\begin{array}{c}\frac{B\$\$\_{d}}{V\$}=λ\_{10\$}+λ\_{11\$}.r\$-λ\_{12\$}.r¥     (15)\end{array}$
* $\begin{array}{c}\frac{B\$¥\_{d}}{V\$}=λ\_{20\$}+λ\_{21\$}.r\$-λ\_{22\$}.r¥     (16)\end{array}$
* $\frac{H\$\_{d}}{V\$} =λ\_{30\$}-λ\_{31\$}.r\$-λ\_{32\$}.r¥    (17B)$

The array of asset demands for $¥$ residents, where all asset demands are valued in ¥ currency:

* $\frac{B¥¥\_{d}}{V¥}=λ\_{10¥}-λ\_{11¥}r\$+λ\_{12¥}r¥     (18)$
* $\frac{B¥\$\_{d}}{V¥}=λ\_{20¥}+λ\_{21¥}r\$-λ\_{22¥}r¥     (19)$
* $\frac{H¥\_{d}}{V¥}=λ\_{30¥}-λ\_{31¥}r\$-λ\_{32¥}r¥$ $(20B)$

 Tobin adding-up constraints apply once again. To obtain solutions to the whole model, Equations (17B) and (20B) are dropped, and the demand for cash is written as:

* $H\$\_{d}=V\$-B\$\$\_{d}-B\$¥\_{d}    (17)$
* $H¥\_{d}=V¥-B¥¥\_{d}-B¥\$\_{d}     (20)$

In order to keep interest rates fixed, the central bank must exchange bills for cash, and vice versa, on demand, making the supply of both cash and bills endogenous:

* $H\$\_{s}=H\$\_{d}     (21)$
* $H¥\_{s}=H¥\_{d}     (22)$
* $B\$\$\_{s}=B\$\$\_{d}     (23)$
* $B¥¥\_{s}=B¥¥\_{d}     (24)$

Hence, the supply of domestic bills to their own CB is also endogenous:

* $Bcb\$\_{s}=Bcb\$\_{d}     (25)$
* $Bcb¥\_{s}=Bcb¥\_{d}    (26R)$

The redundant equation, which ensures that the amount of domestic bills supplied to the ¥ central bank is the amount demanded.

If governments are to hold exchange rates fixed, they must, given any interest rates, be willing to buy or sell bills on any scale whatever at the chosen exchange rate. That is, among the other demand-determined asset supply functions, we have:

* $B\$¥\_{s}=B\$¥\_{d}xr\$    (27)$

We further recall that the $ currency is the international currency, so that the $ central bank does not hold any foreign reserves. This implies that changes in US central banks’ stocks of domestic Treasury bills are equal to changes in the liabilities of each central bank:

* $ΔBcb\$\_{d}=ΔH\$\_{s}     (28)$

The balance sheet constraint of the ¥ central bank, need to take into account possible changes in these foreign reserves:

* $ΔBcb¥\_{d}=ΔH¥\_{s}-ΔBcb¥\$\_{s}xr\$     (29)$

The supply of foreign reserves to the ¥ central bank equal the gap between total supplies and supplies that meet domestic and US demand.

* $Bcb¥\$\_{s}=B\$\_{s}-B¥\$\_{s}-B\$\$\_{s}-Bcb\$\_{s}     \left(30\right)$

The supply of China bills to the ¥ central bank equal the gap between total supplies and supplies that meet domestic and US demand.

* $Bcb¥\_{s}=B¥\_{s}-B¥¥\_{s}-B\$¥\_{s}     \left(31\right)$

Knowing that the change in the value of these foreign reserves measured in ¥ currency depends both on the addition to foreign reserves measured in dollars and to a possible revaluation of the dollar, so that the value of the foreign reserves of the ¥ country measured in domestic currency is:

* $Bcb¥\$\_{d}=Bcb¥\$\_{s}xr\$     (32)$