



Currency intervention and consumer welfare in an open economy



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ABSTRACT

This paper investigates whether China can benefit from a trade surplus in one period, using it to pay off the debt in the next period by manipulating the exchange rates. If the marginal utility of income is nonincreasing in the exchange rate, then the equilibrium exchange rates that yield a trade balance in each period maximize the total utility over two periods, regardless of the interest rate. Numerical examples using the Cobb–Douglas and CES utility functions illustrate the main proposition.

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1. Introduction

Due to mounting currency reserves since the 1990s, China's currency policy has been under intense scrutiny. The People's Bank of China (PBC) closed the currency swap market,² and began to regulate renminbi on January 1, 1994 by moving the official rate to the then prevailing swap market rates (Goldstein & Lardy, 2009, page 6). According to the State Administration of Foreign Exchange of PBC, China's foreign exchange reserve, which excludes gold, was worth \$22 billion in 1993.

Since then China's foreign exchange reserve has increased steadily, reaching \$166 billion in 2000. However, during the first decade of this century, China's foreign exchange reserve rose dramatically to \$3.3 trillion as of December 2011. Such a meteoric rise in China's cumulative trade surplus has provoked much debate concerning China's currency valuation and misalignment. The common view is that "China has intentionally depressed the value of its currency, the renminbi (RMB), to gain unfair advantages in the global market" (Cheung, 2012).

Most major currencies, except renminbi, are freely floating vis-à-vis other currencies. There might possibly be some gains from currency intervention in the foreign exchange market. For example, Gylfason and Schmid (1983) show in a study of ten countries that devaluation has positive output effects. Currency devaluation temporarily raises a country's trade surplus. However, any foreign currency reserve so accumulated eventually must be used up, and sold at different exchange rates.

Ghosh (1997) argued that a sharp trader can make profits in currency trading by utilizing the forward contracts on foreign currency. Ghosh and Arize (2003) suggested the present value concept to compute profits from speculation. Jin and Choi (2013)

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² Goldstein and Lardy (2009, pp. 5–6) noted that before 1994, the swap market was sanctioned by the Chinese government to settle trade transactions. It helped the Chinese government find the equilibrium exchange rate.

noted that while some profits might be generated by slightly deviating from the equilibrium exchange rates, excessive hoarding of reserve assets can only result in huge losses.

The purpose of this paper is to investigate optimal currency pegging to a single currency. Section 2 considers the effect of yuan appreciation on a trade deficit. Section 3 investigates optimal currency pegging in a two-period framework. Section 4 compares stable exchange rates and yuan appreciation above the equilibrium rate for the case of Cobb–Douglas utility function, while Section 5 makes the same comparison for the CES utility function. Section 6 contains the concluding remarks.

2. Exchange rate and trade deficit

In this section we consider the effect of yuan appreciation on trade deficits and welfare to lay out the basis for optimal currency pegging that maximizes utility over two periods.

2.1. Effect of yuan appreciation on trade deficit

Let the exportable good C be the numéraire, i.e., its yuan price $b = 1$, and let ε denote the dollar price of yuan. The dollar price $b^* = \varepsilon$ of the exportable is equal to unity in the benchmark equilibrium. Let P be the yuan price of the importable good Z . The foreign price of the importable good $P^* = P\varepsilon$ is exogenous. Thus, the relative foreign price of the importable is $P^*/\varepsilon = P$, equal to the relative domestic price of the importable since there is no tariff.

Let x and q denote the physical volumes of exports and imports. The dollar value of imports is $qP^* = qP\varepsilon = Q\varepsilon$, where $Q(\varepsilon) = q(\varepsilon)P$ is the yuan value of imports. China's trade deficit in dollars is written as:

$$D = g(\varepsilon) = qP^* - \varepsilon x = Q(\varepsilon)\varepsilon - X(\varepsilon), \quad (1)$$

where $X = x\varepsilon$ is the dollar value of China's exports. Differentiating Eq. (1) with respect to ε gives

$$D_\varepsilon = Q + \varepsilon Q_\varepsilon - X_\varepsilon, \quad (2)$$

where subscripts denote partial derivatives.

Let $\eta_{X\varepsilon} \equiv (\partial X/\partial \varepsilon)(\varepsilon/X)$ and $\eta_{Q\varepsilon} \equiv (\partial Q/\partial \varepsilon)(\varepsilon/Q)$ denote elasticity of exports and imports with respect to the exchange rate ε , respectively. Eq. (2) can be rewritten as:

$$D_\varepsilon = -\eta_{X\varepsilon}(X/\varepsilon) - \varepsilon \eta_{Q\varepsilon}(Q/\varepsilon) + Q. \quad (3)$$

As the yuan appreciates, China's trade deficit is assumed to increase, i.e., $D_\varepsilon > 0$. When trade is balanced, $X = \varepsilon Q$, and

$$D_\varepsilon \frac{\varepsilon}{X} = 1 - \eta_{X\varepsilon} - \eta_{Q\varepsilon}.$$

Thus, China's trade deficit in dollars increases as yuan appreciates if

$$\eta_{X\varepsilon} + \eta_{Q\varepsilon} < 1. \quad (4)$$

Note that this is another way of expressing the Marshall–Lerner condition, which states that the U.S. trade balance in dollars improves as the yuan appreciates. It can be shown that China's trade deficit in yuan also increases under the same condition.³ We assume that the above condition holds. This implies $D_\varepsilon > 0$ and $f'(D) > 0$. We further assume that China's trade deficit rises at an increasing rate, $f''(D) < 0$, as shown in Fig. 1.

2.2. Production and consumption

Consider an open economy producing two goods over two periods. Let C_i and Z_i denote quantities of the exportable and importable that China produces in period i , $i = 1, 2$. The production possibility frontier is given by $C_i = F(Z_i)$. All resources are

³ Let $T = \frac{D}{\varepsilon} = \frac{\varepsilon Q - X}{\varepsilon} = Q - \frac{X}{\varepsilon}$ denote China's trade deficit in yuan. Differentiating T with respect to ε yields

$$T_\varepsilon = x\varepsilon^{-2} - x_\varepsilon/\varepsilon + Q_\varepsilon = \frac{x}{\varepsilon^2} (1 - \eta_{X\varepsilon} - \eta_{Q\varepsilon}).$$

Thus, a yuan appreciation increases China's trade deficit in yuan if

$$\eta_{X\varepsilon} + \eta_{Q\varepsilon} < 1.$$

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