Unemployment and optimal currency intervention in an open economy ☆

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ABSTRACT

This paper investigates whether China, with unemployed resources, can benefit from a trade surplus in one period and a deficit in the next by manipulating the yuan's peg. A country may be tempted to stimulate its economy temporarily by devaluation, but any surplus so generated subsequently must be expended with inescapable reverse output effect. It is shown that under reasonable conditions, nonintervention is the optimal policy and the optimal exchange rates are the equilibrium rates that yield a trade balance in each period. Numerical examples using the Cobb–Douglas utility function 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. According to the State Administration of Foreign Exchange of the People's Bank of China (PBC), China's foreign exchange reserve, which excludes gold, was $22 billion in 1993. China's foreign exchange reserve has increased steadily since, to $3.8 trillion as of March 2014. This dramatic rise in China's cumulative trade surplus has provoked much debate concerning China's currency valuation and misalignment. The common view is that China intentionally has depressed the value of its currency, the renminbi (RMB), to gain unfair advantages in the global market. (Cheung, 2012; Cheung, Chinn, & Fujii, 2009).

Most major currencies except the renminbi are floating freely vis-à-vis other currencies. It has been argued that China may be deliberately depressing the yuan in the hope of stimulating domestic production. In the celebrated Mundell (1963)–Fleming (1962) model, currency devaluation affects a country's balance of payments, thereby influencing production and unemployment. In a study of ten countries, Gylfason and Schmid (1983) showed that devaluation has positive output effects. However, any foreign currency reserve so accumulated must eventually be used up, which yields the reverse output effect.

In an open economy, the government may be more interested in the output effect of currency devaluation. For instance, Helpman (1976) considered a single-period framework with a nontraded good and showed that devaluation increases employment, while Cuddington (1981) investigated the contemporaneous effect of devaluation. More recently, Batra and Beladi (2013) suggested that

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☆ The usual caveats apply.
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both China and Japan kept their currency values low relative to those of other nations such as the United States and Europe in order to lower unemployment below a target rate.[1] Jin and Choi (2013, 2014) noted that while in the short run some profits might be generated by slightly deviating from the equilibrium exchange rates, in the long run excessive hoarding of reserve assets can only result in huge losses to the PBC's balance of payment account.

The purpose of this paper is to investigate whether a Keynesian open economy with unemployment can gain by devaluing its currency and temporarily maintaining a trade surplus, which reduces unemployment.[2] However, these macroeconomic models employ a single homogeneous good.[3] In order to consider currency devaluation and output effects, we consider an open economy that produces two tradable goods. In a stationary equilibrium, neither a permanent trade surplus nor a deficit is sustainable. Thus, any cumulative trade surplus eventually must be spent. If a trade surplus has a positive output effect in one period, the resulting trade deficit has a reverse output effect in the next period.

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. Section 5 offers the concluding remarks.

2. Production, consumption and trade deficit

In this section we first consider the effect of yuan appreciation on trade deficits and welfare in order to lay the basis for optimal currency pegging that maximizes utility over two periods. 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. Since there is no tariff, the relative foreign price of the importable is $P^*/\varepsilon = P$, equal to the domestic price of the importable.

Next, we consider the Keynesian model of a small open economy with unemployment. The country produces two goods over two periods. Let C and Z denote quantities of the exportable and importable that China produces. Money wage and interest rate are fixed. To lay the basis for analyzing the welfare effects of free trade for a small country with unemployment,[4] we adapt Batra and Beladi (1990) with the following assumptions:

(i) China's production functions of the exportable, $C = F(K_C, L_C)$, and the importable, $Z = G(K_Z, L_Z)$, are monotone increasing and concave. The supply curves $C(b)$ and $Z(P)$ are positively sloped.

(ii) The yuan price b of good C is fixed by China's exporters, and the exportable is the numéraire, $b = 1$. The dollar price of good Z, P*, is set by U.S. exporters. Exchange rate pass-through is perfect, and the yuan price of good Z is $P = P^*/\varepsilon$.[5]

(iii) The domestic wage and rent are fixed and do not respond to random changes in domestic and foreign prices.

(iv) Perfect competition prevails in product markets, but resources are not fully employed in the factor markets.

2.1. Yuan profit maximization

Domestic outputs of the traded goods are given by $C = F(L_C, K_C)$ and $Z = G(L_Z, K_Z)$, where L_j and K_j denote labor and capital employed in sector $j, j = 1, 2$. For convenience, we suppress the time subscript i, and consider optimal production when the wage rate and rent are fixed and unemployment exists in both the capital and labor markets.

Let ε be the dollar price of the yuan. Yuan price of the numéraire is $b = 1$, and the dollar price of the exportable is $b^* = b\varepsilon$. Since the dollar price of the importable P* is fixed, the yuan price of the importable is $P = P^*/\varepsilon$. Appreciation of the yuan lowers the domestic price of the importable P.

Chinese producers maximize yuan profits. Note the relationships between yuan and dollar prices: $b\varepsilon = b^*$ and $P\varepsilon = P^*$. If the exchange rate (or dollar price of yuan) rises, it has no effect on the yuan price of the exportable $b = 1$, but reduces the yuan price of the importable, $P = P^*/\varepsilon$.

Yuan profit of the export sector is:

$$\Pi_C = bF(K_C, L_C) - wL_C - rK_C, \tag{1}$$

where w and r are the yuan wage rate and rent, respectively. First order conditions are:

$$bF_{LC} - w = 0, \quad bF_{KC} - r = 0, \tag{2}$$