Macroeconomic imbalances in an open economy stock-flow consistent model

Dirk H. Ehnts*

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Abstract

The recent global financial crisis was preceded by macroeconomic imbalances between the US and China and also inside the euro area. In both cases fixed exchange rate regimes played a role. I use a stock-flow consistent model with an exchange rate rule to show how macroeconomic imbalances can be kept in check. I also show that expansionary fiscal policies can be used by countries with a sovereign currency. The use of nominal exchange rates for international adjustment of macroeconomic imbalances can be recommended.

Keywords: stock-flow consistent models, exchange rates, macroeconomic imbalances

JEL classification: F41, E12, ...

*Berlin School of Economics and Law, www.hwr-berlin.de, dirk@hwr-berlin.de.

1 Introduction

Macroeconomic imbalances have returned to the international policy agenda. They built up between China and the US and Germany and the countries at the euro zone's periphery.[1] Borio and Disyatat (2011) link the Great Financial Crisis (GFC) to sustained macroeconomic imbalances in the preceding years. They attack the view of the global - or, Asian - savings glut proposed by Bernanke (2005).

When the Great Financial Crisis hit the world economy governments rallied behind a fiscal stimulus programme. Following economics textbooks an increase in government spending was advocated. However, there were some voices that warned that not all countries could participate. Lin (2009, 1) writes that 'many emerging countries may not be in the position to afford counter-cyclical policies due to their lack of fiscal space or constraints on foreign exchanges'.

In this paper I want to examine whether macroeconomic imbalances can be tamed through the use of the nominal exchange rate. I also want to examine whether an increase in government spending in conjunction with a simple exchange rate rule allows for discretionary government spending or.

There already is a literature on open economy stock-flow consistent models: Godley and Lavoie (2006), Godley and Lavoie (2007b), Lavoie and Zhao (2010), Duwicquet and Mazier (2010), Barbosa de Carvalho (2012), Mazier and Tiou-Tagba Aliti (2012), Mazier and Saasaoui (2012) and Valdecantos Halporn and Zezza (2013).

2 The model

The model presents an open economy that features households, government and the external sector. Households engage in production and earn wages for offering their labour services. Government consists of a treasury and a central bank. The treasury issues bonds with which it finances its spending. The government has reserves of outside international money which are used for the purpose of foreign

[1] Note that these are not bilateral imbalances.

Table 1: Accounting (transaction) matrix

	1. HHs	2. Firms	3. Gov	Ext	$\sum$
1. Domestic consumption	-C	+C			0
1a. Exports		+EX		-EX	0
1b. Imports		-IM		+IM	0
2. Govt. expenditures		+G	-G		0
3. [Output]		[Y]			
4. Factor income (wages)	+WB	-WB			0
5. Taxes	-T		+T		0
6. Changes in money	-Δ H		+ Δ H		0
7. Changes in foreign wealth		-Δ F		+ Δ F	0
$\sum$	0	0	0	0	0

clearing.[2] The foreign sector is the mirror image of the domestic economy. The model builds on the simple SFC model from Godley and Lavoie (2007, ch. 3). The transaction matrix looks like this:

Households consume an amount of goods worth C, pay taxes T to the government and pile up savings in the form of money ΔH. They finance this with their wage income WB. Production is undertaken by firms that pay out wages WB to their workers. They produce all output Y, which is sold to consumers (C), government (G) and foreigners (EX) and diminished by the amount of imports ($-IM$) used in production. In the case of a current account that assumes a non-zero value the sector acquires or loses foreign wealth (-ΔF).

It is assumed that firms do not hold foreign wealth and instead exchange foreign currency for domestic currency at the central bank. The reason for this is that the firms pay their bills in dometic currency and have no use foreign currency. It is assumed that firms can always borrow foreign currency at the central bank, which therefore must be holding a positive amount of it. The balance sheet of the central bank mirrors the change in foreign wealth of the firms ($+\Delta F$). Since the central bank is part of the public sector the two are aggregated into one sector named government.

This is what the behavioral matrix looks like:

[2]Gold, the Bancor or special drawing rights (SDRs) could be used for this.

Table 2: Behavioral (transaction) matrix

	1. HHs	2. Firms	3. Gov	Ext	$\sum$
1. Consumption	-C_d	+C_s			0
1a. Exports		+EX_s		-EX_d	0
1b. Imports		-IM_d		+IM_d	0
2. Govt. expenditures		+G_s	-G_d		0
3. [Output]		[Y]			
4. Factor income (wages)	+W*N_s	-W*N_d			0
5. Taxes	-T_s		+T_d		0
6. Changes in money	-Δ H_h		+ Δ H_s		0
7. Changes in foreign wealth		-Δ F		+ Δ F	0
$\sum$	0	0	0	0	0

The model is defined by twentytwo equations. Total income Y consists of domestic consumption C_d, exports and government spending. Note that the construction of domestic consumption means that imports are not part of the equation.

$$y = c_d + x + g \tag{1}$$

The government levies taxes t on household income, i.e. the wage bill wb. This is done by a marginal tax which is fixed at rate $trate$.

$$t = trate * wb \tag{2}$$

All income Y comes from wage income wb, since there are no interest-earning assets in this model.

$$wb = y \tag{3}$$

The amount of labour n used is equal to income y divided by productivity pr.

$$n = y/pr \tag{4}$$

The wage for one worker is equal to the total wage bill

$$wage = wb/n \tag{5}$$

The government deficit $gdef$ is equal to government spending g minus tax income t.

$$gdef = g - t \tag{6}$$

The current account equals exports x minus imports m.

$$cab = x - m \tag{7}$$

Real income yk equals real domestic consumption cdk plus real government spending gk plus real exports xk.

$$yk = cdk + gk + xk \tag{8}$$

Real disposable income ydk equals the wage bill wb minus taxes t divided by the constant domestic price level $pcons$.

$$ydk = (wb - t)/pcons \tag{9}$$

Disposable income yd equals real disposable ydk multiplied with the domestic consumer price level $pcons$.

$$yd = ydk * pcons \tag{10}$$

Imports m equal the real value of imports multiplied by the foreign prices and the exchange real rate.

$$m = mk * pf * xr \tag{11}$$

Domestic consumer prices consists of 90 percent of domestic good prices p and 10 percent of foreign goods prices times the real exchange rate.

$$pcons = 0.9 * p + 0.1 * pf * xr \tag{12}$$

Real imports mk equal the marginal propensity to import $mp1$ out of real disposable income ydk plus the marginal propensity to import $mp2$ out of last period's money holdings of households $h_d(-1)$ plus the marginal propensity to import $mp3$ times foreign prices pf divided by the domestic prices.

$$mk = mp1 * ydk + mp2 * hd_{-1}/pcons + mp3 * pf * xr/p \tag{13}$$

Real exports xk equal the marginal propensity to import $mp1$ out of foreign real disposable income yfk plus the marginal propensity to import $mp2$ out of last period's money holdings of foreign households $hf_d(-1)$ minus the marginal propensity to import $mp3$ times foreign prices pf divided by the domestic prices.

$$xk = mp1 * yfk + mp2 * hfd_{-1}/pfcons - mp3 * pf * xr/p \tag{14}$$

Real domestic consumption cdk equals parameter α_1 times real disposable income ydk plus parameter α_2 times last period's household wealth $hd_(- 1)$ divided by consumer prices $pcons$ minus parameter α_3 times parameter $mp3$ times foreign prices pf times the exchange rate xr divided by p

$$cdk = \alpha_1 * ydk + \alpha_2 * hd_(- 1)/pcons - \alpha_3 * mp3 * pf * xr/p \tag{15}$$

The domestic nominal values of consumption, government spending and exports equal their real value multiplied by the domestic producer goods price level.

$$cd = cdk * p \tag{16}$$

$$g = gk * p \tag{17}$$

$$x = xk * p \tag{18}$$

Domestic money held by domestic households equals last period's value plus disposable income minus domestic consumption minus imports.

$$hd = hd_{-1} + (yd - cd - m) \tag{19}$$

Foreign money held by domestic households equals last period's value plus exports minus imports.

$$hf = hf_{-1} + x - m \tag{20}$$

The domestic monetary aggregate equals last period's value plus the government deficit.

$$hs = hs_{-1} + gdef \tag{21}$$

The following three equations show the change relative debt positions of the three sectors private, public and external. It is divided by GDP.

$$gov = (t - g)/y \tag{22}$$

$$trade\_inv = (m - x)/y \tag{23}$$

$$sav = (yd - cd - m)/y \tag{24}$$

The following is the exchange rate rule used by the central bank. If the value of foreign reserves divided by the value of last period's imports is below two the exchange rate is devalued by 35 percent. If the ratio surpasses the value of three the exchange rate is revalued by 35 percent.

$$xr = xr_{-1} + (hf{-}1/m_{-1} < 2) * 0.35 + (hf_{-1}/m_{-1} > 3) * (-0.35) \tag{25}$$

Next to the equations the model uses a variety of parameters and initial values that can be found in the Annex.

Figure 1: Sectoral balances (left axis) and exchange rate (right axis) after a 10% rise in government spending in period 10

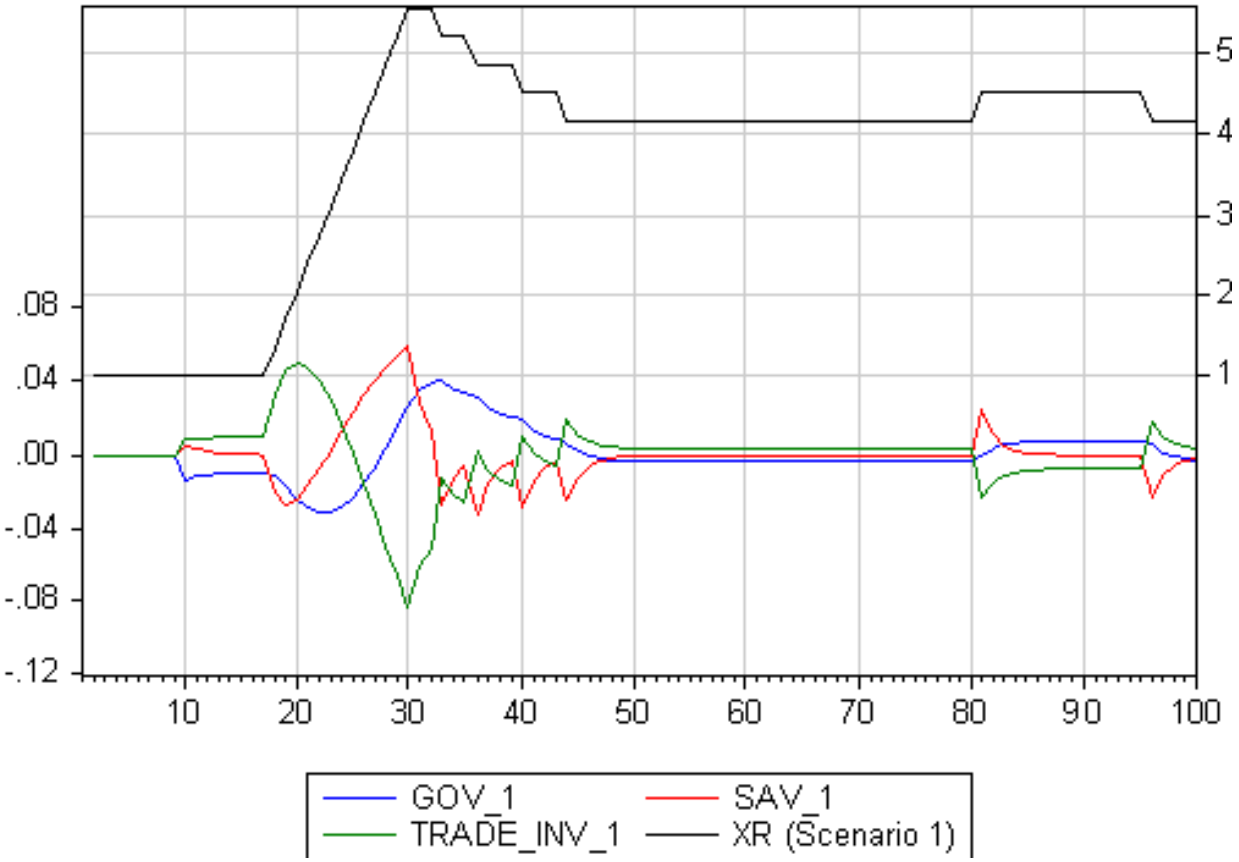

Figure 1 shows the results of a 10% rise in government spending in period 10 on the three sectoral balances and the exchange rate. After the policy change the government sector moves to a deficit position (blue line). The private sector sees its savings rise in the beginning (red line). However, a current account deficit arises and drains holdings of foreign reserves (green line). Finally, around period 17, foreign reserves fall under twice the value of last period's imports and the exchange rate adjustment is triggered.

As a result, the import bill increases and exports increase because the purchasing

power of foreign income has increased. The reason is the fall in the exchange rate. The quantity of imports starts falling, but no as fast as the imports prices increase. For the next 20 periods the exchange rate is devalued every period until finally the current account deficit turns into a surplus and foreign reserves are on the rise again. Savings in the private sector increase and the government deficit comes down as a result of the increase in incomes and taxes.

In period thirty the exchange rate stops falling and the current account starts to reverse as foreign products are now relatively cheap. Foreign reserves are still rising while the current account is in surplus, hitting three times imports in period 34. The exchange rate revalues by 35 percent and this makes imports cheaper instantly. The current account surplus rises again, then levels off as the quantity of imports rises.

Around period 50 the economy reaches a locally stable steady state with a small current account deficit, a private sector deficit and a balanced current account. This holds until foreign reserves fall below the threshold in period 80. At period 100 a symmetric situation is reached with a small current account surplus and a balanced government budget while the private sector is increasing its wealth.

3 Conclusion

Under the assumptions two results were established. First, macroeconomic imbalances can be kept in check by adjustment of the exchange rate. Second, governments do have the power to use discretionary government spending even in the face of macroeconomic imbalances. Since the assumptions are compatible with most developing countries that keep their exchange rate fixed against the US-dollar, that have considerable foreign reserves in the form of low yielding US-dollar denominated assets and no significant amount of foreign debt, the lessons of the model might have some relevance for the real world.

Annex

```
series cd = 13.8
series m = 8
series x = 7
series g = 30
series y = cd+x+g
series wb = y
series trate = 0.5
series t = trate*wb
series pr = 1
series n = y/pr
series wage = wb/n
series gdef = g - t
series cab = x -m series p=1
series pf=1
series xr=1
series cdk = cd/p
series mk = m/(xr*pf)
series xk = x/p
series gk = g/p
series yk=cdk+xk+gk
series pcons=0.9*p+0.1*pf*xr series alpha1 = 0.6
series alpha2 = 0.4
series mp1 = 0.25
series mp2 = 0.05
series mp3 = -1
series alpha3 = 1
series hd = 10
series hf = 20
series hs = 20
series yfk = 20
series pfcons =1
series hfd=20
series xr0=xr
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