

Recession and rebalancing – An analysis of the credit crunch and global imbalances using a simple global model of the real side

Rudiger von Arnim*

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Abstract

This paper assesses how the current housing and credit crisis will impact US real activity, and how recession interacts with adjustment of global imbalances. A simple real-side model with decreasing returns to factors and non-clearing goods and labor markets is disaggregated into traded and non-traded sectors and three regions (US, EU, Asia). A three region model offers two degrees of freedom and six candidate variables for endogeneity in international accounts. Applying standard *income* and *elasticities* approaches as well as a less standard “*Bretton Woods II*” closure in simulations suggests external imbalances can be reduced in the current recession with a mix of fiscal expansion and *some* Asian real appreciation.

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1. Introduction

Aggressive monetary easing after the bursting *new economy* stock market bubble, recycling of Asian emerging economies as well as petroleum exporters trade surpluses into US financial assets and a wave of financial innovation fueled a liquidity boom that enabled US households to deepen consumption’s role as the dominant component of US effective demand, driving an ever larger trade deficit.

The “Greenspan put” supported asset prices, which in turn fueled further asset sales to, initially, private investors seeking a stake in returns to US productivity gains but increasingly and by now almost exclusively monetary authorities in various corners of Asia and oil rich regions. Securitization of mortgages and loans and thus their liquification ensured that the recovery was accompanied by buoyant financial conditions, epitomized by strong appreciation in housing prices. Households had been the motor of US growth for the past two decades, and mortgage equity withdrawals, cheap finance and predatory lending only reinforced the steep and unsustainable trend in private debt to income ratios. Collapsing real estate prices, subsequent

* The author is Assistant Professor of Economics at the University of Denver. Correspondence address: University of Denver, Economics Department, 2000 E. Asbury 2000 E. Asbury, Denver, CO 80208; E-mail: VONR605@newschool.edu. I am grateful to Lance Taylor for his advice and guidance. Without him there would not only be no CGE-modeling, but this one not either. Comments from Duncan K. Foley, Alex Izurieta, anonymous referees and participants at the U-Mass/Amherst-New School for Social Research Graduate Student Workshop 2007 and a seminar at the University of Utah are much appreciated. The standard disclaimer applies.

events in financial markets, particularly since the bankruptcy of Lehman brothers late in the summer of 2008, and a string of bad news on real activity lead to a December 2008 NBER announcement that the US recession began a year earlier, in December 2007. This paper assesses how the recession interacts with global re-adjustment between three large blocs; US, Asia, and Europe. It is not a simple endeavor to develop coherent causal storylines in a world with highly interdependent real and financial markets. What drives floating exchange rates remains a conundrum, as the US Dollar appreciated between the mid-Nineties and early 2002, evidently confuting both a Humean exchange rate response to trade as well as uncovered interest parity (UIP). The *reverse* of UIP, however, might fit the data better, and is consistent with carry trading and inflation targeting. As Salvatore (2005) points out, exchange rates appear furthermore to respond to political developments, among many other variables, and thus largely defy prediction. The difficulties economists have sorting through data generated by an increasingly complex, globalized world economy are bypassed by imposing causal schemes that help to explain correlations, and serve as basis for a discussion of the question how the unraveling might come about. The following paragraphs summarize widely discussed views, and motivate the modeling approach taken up below.

First, international financial arrangements matter. The *Deutsche Bank*-view (Dooley et.al. (2005)), often dubbed *Bretton Woods II*, claims that Chinese authorities need to maintain an undervalued exchange rate in order to provide employment opportunities in exporting sectors for vast amounts of rural surplus labor. The government accepts possible losses on reserve holdings following a revaluation in the future in order to reap real gains now: industrialization and development. While the story is plausible, it does by no means imply that US growth of (private) debt can continue forever. More generally, *Bretton Woods II* describes the international financial system that has emerged after the collapse of Bretton Woods (one) in the Seventies. The system relies on US Dollars as the unit of account. The provision of US Dollar denominated ‘riskless’ assets as international reserves requires the center country to run a balance of payments deficit. Crucially, *Bretton Woods II* is as much subject to Triffin’s dilemma as the original version; meaning international liquidity needs breed a Dollar devaluation, but a Dollar devaluation limits international liquidity provision.

US interest rate shocks and systemic financial events – i.e., the Volcker shock, contagion throughout the Asian financial crisis, and the current credit crisis – often have drastic

consequences for emerging markets. Calvo and Talvi (2006) suggest that a shock to global imbalances would lead to a soft landing in the US and a hard landing in the Global South due to a ‘flight to quality’ of global capital. US privilege appears not go that far, but there is no doubt that the recession would already be much more severe, had the US not enjoyed continued capital inflows. McKinnon (2005) aptly describes this world as being *trapped by the international Dollar standard*. Along similar lines, Eatwell and Taylor (2001, 2002) have argued that divergence between an increasingly globalized economy and only nationally regulated currencies and banking systems threatens global financial stability. Structure and closure of the model applied here aim to reflect this general problematic.

Second, domestic imbalances both in US and Asia matter. A series of papers have suggested that an important driver of global imbalances are US household saving- and investment characteristics.¹ Decompositions of net borrowing flows by sectors – public, corporate, household and foreign – show that the US’s external deficit correlates with excess expenditures of households. Once the music ends, as the ousted Chuck Prince put it,² not everybody will be able to find a chair, and behavior might change drastically, with global consequences. If consumption drives growth while real wages and incomes are stagnating, debt levels will rise. As it turned out, Asian central banks were happy to do the lending. Thus, this paper focuses on the US’s original problem, if not sin, which lies with *private rather than public* borrowing trends. Similarly, Mussa (2007) writes that “it is [...] important to emphasize that US fiscal consolidation is not the be-all and end-all of policies to address the US external deficit. In particular, the ‘twin deficits theory’ that asserts that the US external deficit is primarily the consequence of the US fiscal deficit is largely nonsense.”

Certainly a strong opinion, but principally reasonable, for two reasons. First, the flows of funds constraint always has to be satisfied. Given investment, an increase in external borrowing correlates either with a decrease in private saving or a decrease in public saving, or a combination thereof. As mentioned before, such correlation does not imply causation, but if blame is to be attributed, it is net borrowing of households that increased dramatically in the mid

¹ See Barbosa et.al. (2005), Barbosa et.al. (2007), Papadimitriou et.al. (2006), Godley and Zezza (2006) and Godley et.al. (2005).

² The former Citigroup CEO said in an interview with the Financial Times, that “[w]hen the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you’ve got to get up and dance. We’re still dancing.” See Financial Times (July 9 2007), “Citigroup chief stays bullish on buy-outs.”

to late-Nineties – at a time when the government managed a surplus. To be sure, Bush’s tax cuts did not help. As Frankel (2006) reminds us, the reason for their regressivity was to increase saving among the wealthy, increasing loanable funds and subsequently physical investment. However, with firms still earning the returns to computerization, all those loanable funds were not channeled into accumulation, Ramsey-style, but consumption, Minsky-style. Second, the link between government and external deficits supposedly works through the interest channel. Salvatore (2006) shows how increased public borrowing pushes up interest rates, which trigger capital inflows, a commensurate appreciation of the exchange rate, and, eventually, a deteriorating trade deficit. The argument, if ever valid, misses the peculiarities of the international environment during the build-up of global imbalances. Asian Dollar reserve accumulation and recycling of oil exporter’s revenues pushed up bond and equity prices, and depressed interest rates. The inverted yield curve showed the difficulties the Fed had in increasing the relevant rates at the medium to long end of the curve. While the model applied here does not include interest rates, specifying savings- and investment functions as well as government policy in all three regions provides some insights.

Lastly, Ben Bernanke has contended that imbalances are largely driven by global excess saving, saying “that over the past decade a combination of diverse forces has created a significant increase in the global supply of saving – a global saving glut – which helps to explain both the increase in the US current account deficit and the relatively low level of long-term real interest rates in the world today” (Bernanke (2005)). There is no disagreement on the data – where to situate causality is the question. Obviously, priors matter. Principally, the savings-glut hypothesis fits well into modern open-economy macroeconomics, where payments imbalances are an optimal result of given intertemporal preferences. Individuals in Asia want to save more, individuals in the US want to consume more, and the whole exchange is the best possible, because otherwise nobody would do it. Deep financial markets are the efficient means to achieve such consumption smoothing. The perspective adopted here is that agents are not rational. Rather, Tom’s, Dick’s and Harry’s expectations have always included the next credit card, and that even a major stock market crash will not affect him (or her) negatively. More specifically, governments play an important role in shaping international economic transactions.

In anticipation of results, **(1)** savings- and investment balances in US and Asia have to shift for global rebalancing, but **(2)** the increase in savings in the US should be undertaken by the

private sector, while a decrease in *public* savings – deficit spending – should be launched to cushion possibly large output losses. (Analog, though for different reasons, the increase in absorption in Asia should come from the public sector.) There is some agreement on (1), see, for example, Salvatore (2007) and Rogoff (2007). Agreement on (2) has been much more elusive, but a global recession might bring many around. Importantly, (3) the real transfer necessary for adjustment can be made without large exchange rate changes. McKinnon (2007) made this point, and the analysis here principally confirms it, even if his focus is on an increase in public saving. Accounting for unemployment and a deepening recession force an increase in private saving, and make public dissaving necessary. Conversely, real appreciation in Asia by itself is unlikely to *trigger* significant adjustment, and the many calls for such action from Treasury and Think Tanks (i.e., Lardy (2007)) might best be left unheeded. Still, (4) the model applied here shows that *some* real and broad appreciation of Asian currencies would support effecting the transfer.

2. A simple model

One sector, one country

The structure of the model is simple, so that the exposition here is kept brief, and confined to a one-sector, one-country open economy without a government or domestic intermediates.

[**Table 1 about here**]

Table 1 lays out a SAM with the relevant accounting. Along the first column costs of domestic firms are decomposed into factor costs and imports, the former the total of wage bill wL and profits rK and the latter imports fX valued at foreign prices in domestic currency, eP_f . f is the import-output coefficient, which is a function of the real exchange rate. Following standard bookkeeping practice, the first column total PX is equal to the first row total, which aggregates production across buying agents. In the second column, households allot real GDP V valued at the GDP deflator Q to consumption PC and private saving S . Nominal GDP QV is equal to the sum of row 2, GDP at factor cost. Investment PI figures in the material balance in row 1 and balances in the flows of funds with total saving, which are the sum of private saving and foreign saving S_F , the negative of the current account $PE - eP_f fX$. Evidently, macroeconomic equilibrium is attained when saving equals investment. Costs are the sum of factor and import bill,³ and

³ Domestic production X is a composite of home value added V and imports and is therefore higher than in national income accounts. The assumption is that all imports pass through domestic firms.

assuming that in the short run real value added is proportional to real output, $V=(I-f)X$, the cost decomposition gives P as a weighted average of factor and import costs,⁴

$$P = (1-f)Q + fe. \quad (1)$$

The import coefficient f itself is a function of the real exchange rate,

$$f = f_c \left(\frac{e}{P} \right)^{-\sigma}, \quad (2)$$

where f_c is the base year ratio of imports to sectoral output, and σ the import price elasticity.

Consumption is equal to expenditures after saving, so that real consumption becomes a function of relative prices and output,

$$C = \frac{(1-f)(1-s)Q}{(1-f)Q + fe} X, \quad (3)$$

which is modeled as a standard Linear Expenditure System (LES) in the multi-sector version.

Saving is a function of distribution. $\psi = wL/QV$ is the wage share, and the profit share

$\pi = 1 - \psi$. The macroeconomic savings propensity follows from the accounting identity

$$s = s_w \psi + s_\pi \pi \text{ as}$$

$$s = s_\pi - (s_\pi - s_w) \psi. \quad (4)$$

Investment increases with capacity utilization and the current rate of profit. Using the accounting definition for the profit share $r = \pi u = \pi(V/K)$, the investment function can be written as

$$I = i_0 + (i_1(1-\psi) + i_2) \frac{V}{K}; \quad (5)$$

and output follows from aggregate demand as

$$X = C + I + E = F[Q, e](I + E), \quad (6)$$

where $F[Q, e] = \frac{fe+(1-f)Q}{fe+(1-f)sQ} > 1$ is the multiplier, decreasing in s and f , the ‘‘propensities to leak,’’

and furthermore in e , but increasing in Q .

The price of value added Q is modeled as a CES-unit cost function for value added. Dual to it is a CES-production function that smoothly combines labor and capital with the elasticity of

⁴ The foreign output price is here normalized to unity, $P_f=1$.

substitution θ . The derivative of the cost function with respect to factor prices gives conditional factor demand functions,

$$Q = (\alpha w^{1-\theta} + \beta r^{1-\theta})^{\frac{1}{1-\theta}}, \quad (7)$$

$$\frac{L}{V} = \alpha \left(\frac{w^*}{Q} \right)^{-\theta}, \quad (8)$$

and analog for capital, which implies a trade-off between employment and real wages.⁵

Expanding equation (8) by w/Q gives the wage share as $\psi = \alpha(w/Q)^{1-\theta}$. The propensity to spend out of wage income is higher than that out of capital income, meaning total saving responds negatively to wage increases, $\frac{\Delta s[w,r]}{\Delta w} < 0$, as long as $\theta < 1$.

Model closure

Goods markets do not clear.⁶ With demand-driven macro adjustment, investment is not driven by savings, but follows from an investment function (equ. 5 above) with a standard accelerator and a Neo-Kaleckian response to redistribution. *Ceteris paribus*, an increase (decrease) in the profit share (wage share) provides incentives for investment; as long as investment responds more strongly to increases in profits than saving, effective demand is characterized as profit-led. See the contributions in Setterfield (2002); Barbosa and Taylor (2007) estimate such a model and find that the US is indeed profit-led. In a model without asset markets or at least an interest rate, this Kaleckian formulation connects investment to profitability. Prices of goods are driven by costs, see equation (1). The factor cost index is a geometric average of wage and profit rate, and output prices a simple average of factor costs and import prices.

Second, labor markets do not clear. Employment varies with activity, but inversely with the real wage. Analog, capital is subject to diminishing returns. In contrast to labor markets, however, it is the factor return – profit rate r from K 's Shephard's Lemma – that varies with activity. The money wage is set institutionally, leaving Q pro-cyclical. Resulting counter-cyclical

⁵ This trade-off is contradicted by the data. A Phillips-curve or some other construct that produces a positive co-movement between real wages and activity fits data better. Nevertheless, deriving conditional demand functions from CES-aggregations is probably the single most important exercise in standard CGE-models, and even though output and import demands do not rest on optimizing “first principles” it grants a degree of comparability to the relevant models. However, in simulations below, the focus *cannot* be on real wages, productivity and distribution, but only on GDP, and external and public balances.

⁶ See Taylor and Lysy (1978) for the original discussion on macro-closures; as well as Taylor (2004), chapter 5, and Rattso (1982) in this journal.

real wages allow for job growth in an expansion. Furthermore, with two sectors the degree of factor mobility becomes relevant. Capital is assumed perfectly immobile in the short run, but labor perfectly mobile. (A real depreciation shifts production towards tradables and consumption towards non-tradables. Hence, the more flexible labor markets, the smoother is transition, and the smaller is the real depreciation necessary for adjustment.) The baseline *domestic* causal configuration can be summarized as

$$r_{ci} = r[X_{ci}; \bar{K}_{ci}] \text{ and} \tag{10}$$

$$L_{ci} = L_{ci}[X_{ci}; \bar{w}_c], \tag{11}$$

where $c = US, EU, AS$ is the index of countries and $i = T, NT$ the index of sectors. A bar defines a variable as exogenous.

Internationally, balance of payments adjustment requires reduction *and* shift of expenditures. Real depreciation increases traded goods prices ($\Delta P_T > \Delta P_{NT}$), so that consumption shifts towards non-traded goods, whereas production shifts towards traded goods. However, international goods arbitrage does not lead to price equalization across borders, because domestic output prices are anchored by domestic factor costs. Given base year data determines the degree to which import price changes can pass through to output prices. Partial pass-through, in turn, is the driving force behind inflation differentials across countries, and thus determines real exchange rate changes.

The complete model features intermediates and a government. The latter is conceived to borrow just as much as necessary in order to finance its expenditures, a quite realistic assumption at least in the short run all too often forgotten by CGE-modelers.

Income and elasticities approach, and Bretton Woods II

Let's consider a few more details on the international closure applied between the three regions. First, a note about data, accounting and calibration appears in order. The Social Accounting Matrix (SAM) is fed by GTAP v6.0 database with a base year of 2000. The base year aggregation presents composite regions with the USA, UK, Spain and Portugal as the dominant deficit countries; Japan, China and other Emerging Asian economies with competitive exchange rates the most important surplus countries, and the EU and remaining developing countries the more passive middle. Oil exporters are separately accounted for, but without their small domestic

economies.⁷ The base year data is calibrated to fit the headline figures of the first quarter of 2006, representing the last quarter of positive growth in US residential investment, and as such arguably the peak of the (real-side) expansion. The figures are necessarily ballpark, but should give a fair representation of the relative sizes of the involved domestic production and international trade flows. See Table 2 for the SAMs, and von Arnim (2007) for more detail on data and calibration.

[**Table 2 about here**]

The accounting broadly follows Godley's scheme to arrange SAMs in a multi-country model side by side and “flip” cross-border transactions across SAMs, currency-converted and summing to zero.⁸ Note the accounting of payments flows financing trade deficits and the oil-exporting row. First, the US as the issuer of the single reserve asset is the epicenter of excess saving. Whatever happens globally, it happens through the accounts of Wall Street and Treasury bankers. The *exorbitant privilege* to borrow in own currency belongs to the single hegemon, despite recent and still small shifts in reserve allocation towards the Euro. The oil region appears essentially as a balance of payments row, the international head of an economy without a rump. As petroleum transactions are commonly conducted in US Dollars, the oil-row's trade flows are quoted in Dollars.

In a model with one or two countries with one bilateral nominal exchange rate and one current account, either the former or the latter can be endogenized. Following the *income approach to the balance of payments*, the nominal exchange rate can be taken as exogenous, leaving trade to follow incomes and relative prices. Suppose the exchange rate is exogenous and trade flows respond freely to relative price changes. The current account then is a function of the real exchange rate,

$$CA = PE\left[\frac{e}{P}\right] - ef\left[\frac{e}{P}\right]X, \quad (12)$$

⁷ The US-profile – industrialized country with a sizeable current account deficit – is augmented by UK, Portugal, Spain, Austria, Luxembourg and Australia. The characteristics of the Asia-region are (1) a current account surplus, (2) an undervalued exchange rate either due to a fixed or managed peg or other reasons, and (3), a massive reserve build-up. The EU closes the accounts as the *rest of the world*. Oil-exporters match three characteristics: (1) large export share of petroleum and related products, (2) a current account surplus, driven by those exports, and (3) an economy heavily reliant on commodity exports with relatively little domestically created value added. The list comprises 28 countries, most importantly Russia alongside OPEC-members.

⁸ See Godley and Lavoie (2007) as well as Taylor (2004) for examples.

and the question typically asked is whether a depreciation leads to an improvement in the balance of payments. Marshall-Lerner conditions can be derived, and effects of a devaluation on output and income distribution can be analyzed. Alternatively, along the lines of the *elasticities approach to the balance of payments*, trade is assumed balanced or fixed, or is forced to balance, providing an estimate of exchange rate changes necessary to bring that about. The nominal exchange rate e then becomes the variable that equilibrates demand-driven trade flows against a set trade balance,

$$e = e[fX, PE, \overline{CA}], \quad (13)$$

where a typical question is by how much e would have to change in order to achieve $\overline{CA} = 0$.

[**Table 3 about here**]

Adding a third region grants a second degree of freedom. Without asset markets in the model, some assumptions have to be made about capital accounts in order to balance international payments. Table 3 lays out three asset markets, read along the rows and all reported in US Dollars. Each region's two principle agents, the private and public sector, add along their respective columns to net lending balances, which in turn sum to current accounts. Each government issues a reserve asset, $\Delta R^{\$}$ in Asia,⁹ which is held exclusively domestically, $\Delta R_{P3}^{\$}$. Europe, on the other hand, issues an asset, ΔR^E that is bought by private agents domestically and abroad in the US. US treasuries are demanded by the same private agents in the West and by government in Asia, $\Delta R_{P1}^{\$} + \Delta R_{P2}^{\$} + \Delta R_{G3}^{\$}$. Two assumptions are implicit. First, EU governments do not pursue active reserve policies, and due to capital controls private agents in Asia are limited to invest in domestic debt instruments. Asia's balance of payments follows directly,

$$e_{13}CA_3 = \Delta R_{G3}^{\$}; \quad (14)$$

substituting row 2 in the European column sum gives

$$e_{12}CA_2 = \Delta R_{P2}^{\$} - e_{12}\Delta R_{P1}, \quad (15)$$

and the US's balance of payments follows as

$$CA_1 = -(e_{12}CA_2 + e_{13}CA_3). \quad (16)$$

⁹ Currency symbols are chosen merely for convenience. The Asian currency reflects a composite, including Chinese Yuan, Korean Won and others; and analog for Dollar and Euro. All entries are in US Dollars. e_{12} is the US/EU-rate, e_{13} the US/Asia-rate; the EU/Asia-rate follows directly as the ratio e_{13}/e_{12} .

Equations (14) and (15) grant two degrees of freedom, and (16) constrains accounts to add up. Six variables are candidates for endogeneity – three bilateral exchange rates and three trade balances – for two degrees of freedom. Let’s look at the three relationships from an *income approach*. All exchange rates are policy variables, and all three current accounts are determined by trade flows following income and relative prices. (Strictly speaking, two CA’s are endogenous, and the third closes accounts.) Alternatively, looked at from an *elasticities approach*, two current accounts can be set exogenously. Two endogenous bilateral rates imply the third; and the ‘closing’ current account ensures that things add up. Both approaches are used for simulations below, and complement analysis with what I call the *Bretton Woods II* closure.

The *Bretton Woods II* closure reflects realities of recent international financial arrangements. Put simply, neither Europe nor US are claiming a degree of freedom between the three major blocs, leaving Asia to use both. Thus, Asia’s current account surplus CA_3 is driven by reserve accumulation, $\Delta R_{G3}^{\$}$. One could say that *finance rules trade*. Second, Europe’s current account surplus determines the flows of finance between EU and US, in the sense that *trade rules finance*. Third, US’s current account deficit CA_1 follows residually as the borrower of last resort. As mentioned above, the modeler imposes causal storylines in order to make sense of a complex world. Given the nominal peg of China and crawling pegs of other Asian currencies vis-à-vis the US Dollar it seems natural to fix e_{13} . Neither Europe nor the US conduct exchange or capital market policies, leaving the second degree of freedom up for grabs.

Essentially, as will be seen in the discussion of simulations below, controlling net exports through reserve accumulation and undervaluation of the exchange rate limits the variation of real value added in Asia, and transfers the burden of international adjustment in absorption to Europe.

3. Simulations

US consumption crunch and Asian deficit spending

The Case-Shiller house price index, published by Standard & Poor’s, has seen phenomenal increases from a trough in the mid-1990ies. The ratio of Case-Shiller house prices to an index of housing costs suggests a return to fundamentals could imply house price falls in excess of 30%.¹⁰ Indeed, by September 2008 the index had fallen more than 17% over a year, and has dropped

¹⁰ “Owner’s equivalent rent” is an index (component of the CPI and calculated by the BLS) of housing costs that includes a survey of owner occupied homes and the prices they think could be captured if the property were rented. See as well Figure 1, Panels [A] and [B] for time series.

23% from its peak in May of 2006. How does this wealth effect impact private consumption demand? Menegatti and Roubini (2007) discuss evidence on pass-through of changes in wealth to consumption, and find the wealth effect to range between 3% and 10%. Fed Governor Mishkin (2007) argues that evidence on *housing* wealth effects particularly for the US is inconclusive, but suggests that they could be larger than equity wealth effects – simply because a lot more people own houses than stocks, and their consumption behavior might vary more strongly with income and wealth changes.

[**Figure 1 about here**]

Assuming the value of outstanding (household) real estate falls by 30%, roughly \$6.3 trillion of wealth will be lost; based on 2007:Q2 Federal Reserve balance sheets. Stipulating that households pass 5% thereof through to consumption, demand decreases by \$315 billion, which represents roughly a 5% adverse consumption shock.¹¹ See Table 4 for results. With the rise in the savings propensity, value added in the US falls. Due to the *Bretton Woods II* closure, the negative impact of the demand shock on Asia is contained. Indeed, all hinges on Asian external lending. Continued Asian reserve accumulation in combination with slowing US demand requires Europe to act as the “consumer of last resort.” The Asian real exchange rate is barely affected, given the peg to the Dollar, whereas Europe’s real exchange rate appreciates noticeably, turning a current account surplus of 1.7% relative to GDP to a (very small) deficit. Importantly, EU GDP contracts more sharply than US GDP. How to interpret this simulation? First, Europe is less willing than the US to take on the burden of consuming for the world. Second, it is less suited to do so, because it does not (yet) offer a world reserve assets for the surplus region to hold. Third, a transfer of the debt bubble from US to EU financial markets is very unlikely in current circumstances. Hence, this simulation does not point towards adjustment, but suggests that continued Asian export targeting policies are likely to increase structural imbalances in the world economy.

If Asia were to loosen her grip on external demand, and instead increase domestic demand, some rebalancing can be achieved. Simulation (2) shows results from a combination of

¹¹ The shock is implemented by calibrating savings parameters with a 5% lower base year consumption level, essentially increasing the aggregate savings rate. The procedure should sit well with a ‘traditional’ wealth effect, according to which households will save more, if falling asset prices or inflation devalue their wealth. Here, however, households give up to finance consumption directly out of wealth, *and on top of that might change their savings behavior* – leaving these estimates arguably on the optimistic side.

shocks; (a) consumer recession in the US and (b) an increase in government spending in Asia. International closure here follows the traditional income approach to the balance of payments, with three bilateral exchange rates as policy variables and three endogenous current accounts. (Note that an increase in US savings due to recession and decrease in Asian savings due to government deficit spending represent a transfer of real resources.) The domestic demand increase in Asia is slightly inflationary. In combination with a fixed exchange rate inflation leads to some real appreciation, particularly because government spends only in the non-traded sector. Despite the loss in export revenue – CA_3 decreases by 40% – GDP expands. US and EU contract; US quite sharply. Fiscal expansion in these two regions should provide a buffer against the negative impact of rebalancing, and simulations (5) and (6) below return to the issue. Let's first have a look at the potential for rebalancing from exchange rate appreciation in Asia.

Exchange rate revaluation in Asia

Chinese and other Asian monetary authorities or state-controlled institutions are actively accumulating US treasuries, many at truly astonishing rates. Mid 2008, Chinese Dollar reserves stood well above \$1 trillion, and could be as high as \$1.5 trillion.¹² The many interventions target exchange rates. The Chinese Yuan, for example, is allowed to fluctuate within a narrow band on a daily basis. That trading band has been widened, first to 0.3% and more recently to a whopping 0.5%. The resulting nominal appreciation of the Chinese Yuan from the hard peg of 8.28 CNY per US Dollar, at which the currency was held between 1995:Q2 and 2005:Q2, to 6.84 CNY per US Dollar in 2008:Q3 appears as a step towards rebalancing. In real effective terms, however, the Chinese currency is virtually unchanged relative to its low 2002:Q1, and has only since early 2005 appreciated by about 5% annually.¹³ How would further guided appreciation affect global imbalances?

[**Table 4 about here**]

Simulation (3) shows results of under the *income approach*. Here, e_{12} is set to follow from the ratio of the other two bilateral rates. Both are assumed to depreciate by 10% against Asian currency. Thus, Asia does loosen her policy grip, and the external surplus decreases to 3.6% of GDP, versus 4.2% initially. However, the loss of export markets triggers as well a

¹² For the sake of brevity, I will not discuss Asian Dollar reserve accumulation in detail. Brad Setser at the Council of Foreign Relations has gained some fame making sense of an immensely complicated data salad.

¹³ See Panels [C] and [D] of Figure 1 for time series and sources.

contraction, making this an unattractive policy option in Asia. Moreover, overall external imbalances do not improve significantly. The next simulation (4) is based on the *elasticities approach*, where I set the level of two current accounts exogenously, and two bilateral rates adjust to attain these. By how much would e_{13} and e_{23} have to depreciate in order to accommodate a 50% reduction in the level of CA_3 and CA_1 ? Thus, the third exchange rate (e_{12}) and third current account (CA_2) follow residually. Results in Table 4 indicate that adjustment induced by large relative price changes is very volatile. Adjustment does not come with changes in domestic savings and investment balances – as in simulation (2) – but from income changes following very large trade flow changes. The necessary increase in US savings stems from a substantial gain in real income, and the necessary decrease in surplus’ countries savings stems from a substantial contraction. It seems unlikely that this scenario is feasible. Yes, the US’s economy is famously flexible, but there does not seem to be a burning desire on the part of Germans, Koreans and Japanese to drive Suburban XL Hybrids. Indeed, both size of income changes and structural reality of world markets suggest that such a turnaround would require many, many years. (It would as well require some other country to provide liquidity to the world.)

Comparing these simulations clarifies a couple of things. Shifts in domestic S and I place the burden of adjustment on the US – the transferor – whereas shifts in relative prices place the burden on Asia – the transferee. The former appears much more likely, or even feasible, because ‘reasonable’ relative price changes (and the concomitant income changes) are insufficient to trigger the transfer necessary for rebalancing. With this in mind, the crucial question is what governments can do, and how that could aid global rebalancing and limit GDP losses.

Recession, Asian appreciation and fiscal expansion

The endogenous investment decrease in simulation (1) due to the accelerator is a bit more than 2%, which is ‘not enough.’ Over the post WWII period in the US, investment contracted on average 6% from (own) peak to trough. Third quarter 2008 data suggest that large parts of Europe are already in recession, and that Asia is as well contracting. Hence, in the following two simulations I assume a global adverse shock of 5% to (autonomous) investment in combination with US consumer recession. Furthermore, let’s take the guided appreciation of the Asian currency vis-à-vis the US Dollar as given, and consider whether (global) fiscal expansion can put a floor under GDP losses. The public expenditure packages on the table at the time of this

writing are about \$500 billion in the US, \$250 billion in the EU and \$500 billion in China, representing roughly 3%, 1.5% and about 5% of GDP. In the following two simulations, I assume that the model's three G 's are increased by these percentages relative to GDP.

Thus, the set of shocks in simulation (5) is a 5% consumption decrease in the US, a global shock to autonomous investment of 5%, nominal appreciation of Asian currency against US Dollar of 10% and global fiscal expansion as outlined. Additionally, it is assumed that Asia "allows" a reduction of the external surplus, implemented by a 10% decrease in CA_3 . Simulation results show that despite a relatively large domestic stimulus in Asia, continued export targeting, even though at a reduced rate, transfers the burden of adjustment to Europe. Recall that in *BWII* closure US/EU-rate e_{12} adjusts endogenously to satisfy the international accounting constraint, so that the 'passive middle' experiences real exchange appreciation. External demand contracts and GDP declines with it. A stimulus of 1.5% of European GDP is not enough to balance the drop in export demand, given the unfavorable Asian exchange policy. Nevertheless, a switch in demand from traded to non-traded goods and from external to domestic sources leads to some global rebalancing (see CA/GDP-ratios).

The set of shocks in simulation (6) is the same as in (5), except for Asia's current account CA_3 . Here I apply the *income approach*. The key difference is that Asia does not any longer target exports – and it shows. CA_3/GDP_3 falls from 4.2% to 2.2%, all the while the strong domestic stimulus buffers the region from a serious GDP contraction. US's external imbalance improves as well, as deficit relative to GDP decreases from 5.4% to 4.6%. The nominal exchange rate shock in simulation (6) to e_{13} of 10% implies a 10% rise of e_{23} , because the EU/Asia-rate follows residually. The US/EU-rate does not change; therefore EU's CA_2 – exports largely to the US – is unaffected.

An increase in US private savings is unavoidable in order to improve hard hit balance sheets, *and* is necessary for rebalancing. Public deficit spending can cushion the negative impact on GDP. Higher government expenditures in the non-traded sector lead to some real appreciation, which is why further nominal appreciation in Asia is necessary for the transfer to pan out. In summary, the unfortunate reality of financial crisis and recession present an opportunity for global rebalancing that should not be passed on.

4. Conclusions

In the real world, timing is crucial. The fiscal stimuli will be too late to avoid contractions, and the simple, static model applied here is not able to take that into account. The model does suggest, however, what course of action could help to avoid a severe global recession and at the same time support correction of external imbalances – assuming that authorities in all major economies are able to limit financial contagion and avoid further systemic financial events.

First, China must rebalance demand towards domestic sources. The proposed government expenditure program hints in the right direction, and simulation results indicate that such a program would help to support growth even in the face of exchange appreciation. Some further exchange rate realignment should help to reduce global imbalances, but does not present a solution by itself. Crucially, exchange appreciation should occur broadly and not only against the US Dollar. Second, Europe's – as of yet – careful approach to fiscal expansion reflects the political straightjacket of the Maastricht Treaty. Simulations show that a continuation of *Bretton Woods II* spells doom for German exports, making reflationary policies all the more important. Beyond that, Europe has particularly high stakes in reform of the international financial system. Third, the US should institute public expenditure increases sufficient to limit GDP losses. The need for infrastructure investment presents an opportunity to weather collapse in the construction sector, and to improve the situation in the labor market. Simulations show that government *dissaving* is essential to avoid a protracted recession, given the expected – and indeed necessary – change in household savings behavior.

Lastly, it is not clear where lack of cooperation between major economic blocs could lead, but it is unlikely to be a smooth reduction of external imbalances in the near future. US household balance sheets have seen a turning point, and in order to avoid catastrophe public balance sheets might have to take on substantially more debt for a number of years – but *Bretton Woods II* cannot continue indefinitely. What will replace *Bretton Woods II*, when it ends?

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6. Tables and Figures

	Costs	Households	Investment	Exports	Sum
Production		PC	PI	PE	PX
Factor income	$wL + rK$				QV
Flows of funds		S	$-PI$	S_f	0
Foreign income	$eP_f fX$				$eP_f fX$
Sum	PX	QV	0	PC	

Table 1: Symbolic, simplified Social Accounting Matrix (SAM) for a one-country, one-sector economy without government and domestic intermediates.

	Priv	Gov	Priv	Gov	Priv	Gov	Sum
US	$\Delta R_{P1}^{\$}$	$\Delta R^{\$}$	$\Delta R_{P2}^{\$}$	0	0	$\Delta R_{G3}^{\$}$	0
Europe	$e_{12} \Delta R_{P1}^E$		$e_{12} \Delta R_{P2}^E$	$e_{12} \Delta R^E$			0
Asia					$e_{13} \Delta R_{P3}^{\yen}$	$e_{13} \Delta R^{\yen}$	0
Sum	CA_1		$e_{12} CA_2$		$e_{13} CA_3$		

Table 3: Balance of Payments-Accounting. Each country's row summarizes a market for the domestic "treasury," issued by the government. Superscripts note origin (asset issuer and denomination) and subscripts destination (asset holder).

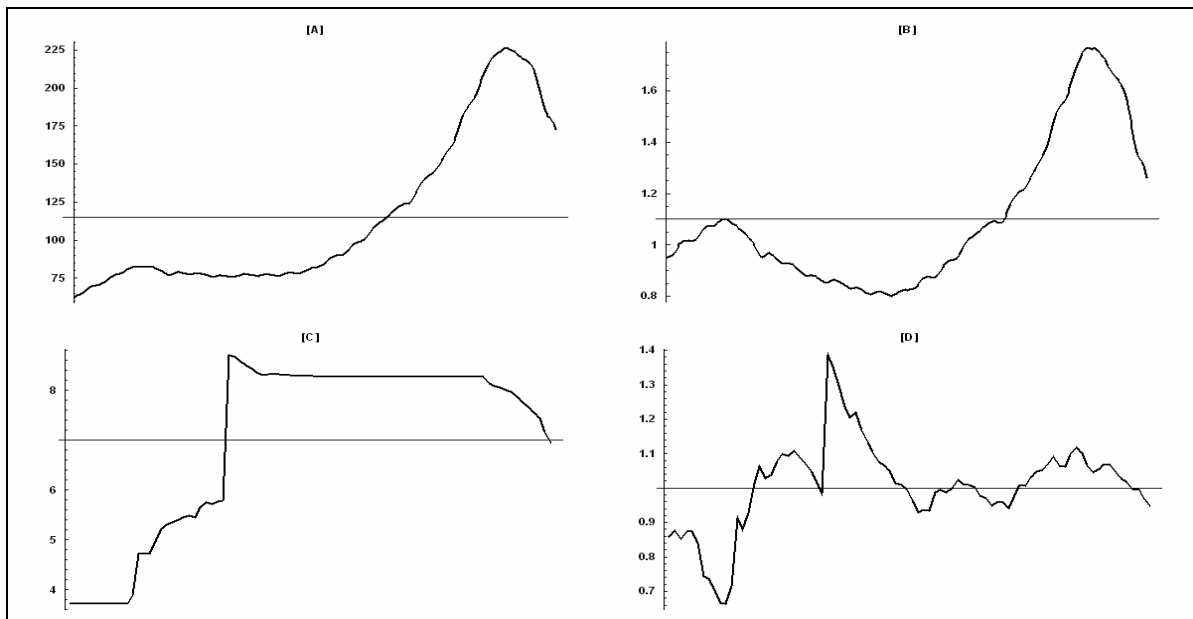


Figure 1: Panel [A] shows Case-Shiller house price index (CSXR Composite 10), CS , from 1987:01-2008:09; Source: Standard and Poor's. Panel [B] shows CS (rebased) relative to an index of *owner's equivalent rent* (BLS, sub-index of CPI) over the same time period. Panel [C] shows the Chinese currency price of one US Dollar, 1987:Q1-2008:Q2. Panel [D] shows a rebased index of China's real effective exchange rate over the same period; Source for [C] and [D]: IMF IFS. Horizontal axes are at simple averages.

	US						Sum	EU		
	Cost	Priv	Gov	Exp	Inv	For		Cost	Priv	Gov
1 Prod.	11,932	10,383	2,765	2,006	3,298		30,384	9,750	6,373	2,142
2 Labor	9,492						9,492	6,054		
3 Capital	6,113						6,113	5,640		
4 Gov		2,075					2,075		1,930	
5 S-I		3,148	-690		-3,298	1,035	0		3,391	-212
6 Capital-flows						-200				
7 flows						-350				
8 OIL	165			-98		-485		255		
9 Trade-flows	1,584									
10	759									
11	339			-339						
12				-1,241				1,241		
13								2,199		
14								565		
15										
16				-329						
17										
Sum	30,384	15,606	2,075	0	0	0		25,704	11,694	1,930

	EU, ctd.				ASIA						
	Exp	Inv	For	Sum	T	Priv	Gov	Exp	Inv	For	Sum
1	4,459	2,979		25,704	8,189	4,238	1,135	2,167	2,717		18,445
2				6,054	4,801						4,801
3				5,640	3,639						3,639
4				1,930		1,006					1,006
5		-2,979	-200	0		3,196	-128		-2,717	-350	0
6			200								0
7										350	0
8	-195				255			-91			0
9	-1,584										0
10								-759			0
11											0
12											0
13	-2,199										0
14								-565			0
15					751			-751			0
16					329						0
17	-481				481						0
	0	0	0		18,445	8,440	1,006	0	0	0	

Table 2: Three region Social Accounting Matrix (SAM). The left-most part describes US, the middle SAM EU, which is continued in the bottom part of the table, and the right-most SAM describes Asia. Asia's column sums include international accounts, which sum to zero across all regions. Along rows, the SAM shows the material balance (1), wage income (2), profit income (3), government income (4) and the savings-investment balance in the flows of funds, row (5). Rows (6) through (8) show 'international flows of funds,' which finance current accounts. Row (8) accounts as well for oil exporting countries (and their imports). Row (9) through (17) record trade flows.

	Sim #	Closure	Region	CA/ GDP	S[G]/ GDP	Real GDP	eP*/P	Real Wages	Infla- tion (P)
US consumer recession	(1)	BW II	US	-4.2%	-5.4%	-5.0%	5.6%	3.6%	-2.0%
			EU	0.0%	-2.9%	-6.3%	-4.5%	6.8%	-8.6%
			AS	4.1%	-1.5%	0.4%	-0.8%	-0.3%	0.8%
US consumer recession & Asian deficit spending	(2)	Income	US	-4.6%	-5.7%	-6.8%	2.0%	5.1%	-4.3%
			EU	1.1%	-2.1%	-1.5%	0.0%	1.6%	-1.6%
			AS	2.4%	-4.0%	3.5%	-1.5%	-2.6%	1.9%
Revaluation of CNY against US and EU	(3)	Income	US	-5.3%	-4.3%	0.7%	1.1%	-0.5%	0.8%
			EU	1.9%	-1.7%	0.8%	0.5%	-0.8%	1.0%
			AS	3.6%	-1.8%	-2.1%	-1.6%	1.9%	-2.7%
Halving current accounts in US and Asia	(4)	Elasti- cities	US	-1.9%	-1.5%	21.2%	31.6%	-13.4%	23.2%
			EU	-0.3%	-3.4%	-11.0%	-14.0%	12.4%	-17.7%
			AS	2.5%	-2.6%	-8.8%	-17.2%	8.3%	-13.0%
Recession, appreciation and fiscal expansion, 1	(5)	BW II	US	-3.9%	-6.7%	4.2%	8.9%	-3.0%	5.3%
			EU	0.3%	-3.8%	-3.6%	-6.0%	3.7%	-6.6%
			AS	3.2%	-5.0%	9.0%	-4.1%	-6.9%	6.7%
Recession, appreciation and fiscal expansion, 2	(6)	Income	US	-4.6%	-7.4%	0.3%	2.6%	-0.2%	0.9%
			EU	1.7%	-2.8%	2.7%	0.4%	-2.7%	2.9%
			AS	2.2%	-5.6%	5.5%	-3.4%	-4.1%	2.4%

Table 4: Simulation results. The first two columns show current account and government deficit relative to GDP, respectively. Base year current account to GDP ratios are -5.4%, 1.7% and 4.2% for US, EU and Asia. Base year government deficit to GDP ratios are -4.4%, 1.8% and 1.5% for US, EU and Asia. All other variables are shown in growth rates. Nominal and real exchange rates are trade weighted indexes. A rise implies a depreciation. “BWII” refers to simulations with the Bretton Woods II closure; “Income” refers to the income approach to the BOP; “Elasticities” the elasticities approach.