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Exchange Rates and Global Imbalances: The Importance of Asset Valuation Effects and Interest Rate Changes

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Abstract

This paper analyzes two effects which might have an important impact on a reduction of global external imbalances. These are valuation effects on the one hand and interest rate effects on the other hand. We use a four-region model that is based on the models by Obstfeld and Rogoff (2005) and Oberpriller (2007) to analyze the difference in the occurring exchange rate changes with and without valuation and interest rate effects under two different scenarios of narrowing global imbalances. The outcome is a reduced need for real dollar depreciation because the United States will largely benefit from valuation gains on their foreign assets while the effect that stems from interest rate changes works in the opposite direction but is not as strong as the valuation effect. The magnitude of valuation and interest rate effects reduce the need for real exchange rate depreciation by two to four percentage points.

Key words: current account, exchange rates, valuation effects, global imbalances

JEL classification: F31, F32, F41

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1 Introduction

Since many years the current account deficit of the United States and its counterpart surpluses, mainly in Asia and more recently in the oil exporting countries have given reason for a controversial discussion. The problem labeled as global imbalances has given reason for concern (see, for example, Roubini and Setser (2004, 2005)) but is also seen as a development caused by rational worldwide savings and investment decisions (Bernanke (2005), Dooley et al. (2006) and Greenspan (2005)). The major question is whether the adjustment process will be gradual or abrupt, and which effects this will have on global exchange rates.

In a recent paper Oberpriller (2007) has extended the three-region model by Obstfeld and Rogoff (2005) by a fourth region to account for the recently grown importance of the oil exporting countries, especially of OPEC and Russia, as current account surplus providers. In the case of a sudden closing of the world's current account imbalances, the four-region model suggests a real depreciation of the U.S. dollar in the range of 26.6 to 50.9 percent against the currencies of Europe, Asia and OPEC. However, the analysis by Oberpriller (2007) does not include the valuation and interest rate effects that might accompany an unwinding of the U.S. current account deficit. The present paper fills this gap.

As Gourinchas and Rey (2005b) note in their prominent paper, the intertemporal approach to the current account does not fit the empirical data, because of the dynamics of the current account that are caused by capital gains or losses on the net foreign asset position.[1] While the intertemporal approach to the current account suggests that the United States will need to run trade surpluses to reduce the imbalances, the truth is that the "trade adjustment channel" is only one part of the story as there is also a possible "financial adjustment channel" through which adjustment could be smoothed (but possibly also be worsened).

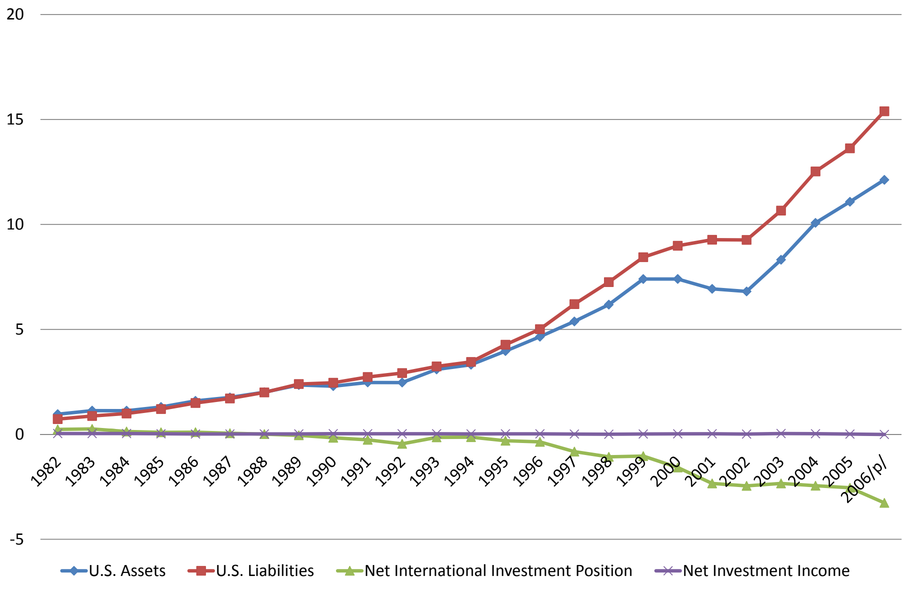
The "financial adjustment channel" has two possible sources: changes in the value of foreign assets and liabilities simply due to asset price changes but also due to nominal exchange rate changes. As almost all liabilities of the Unites States are denominated in dollar, while about 70 percent of U.S. assets are denominated in currencies other than the dollar,[2] a depreciation of the dollar leads to an increase in the value of U.S. assets but leaves the value of U.S. liabilities unaffected (both measured in dollar). In their analysis Gourinchas and Rey (2005b, p. 2) find that "historically, 31% of the international adjustment of the US is realized through valuation effects on average".

[1] Gourinchas and Rey (2005b, p. 1)
[2] See Gourinchas and Rey (2005a).

This estimated magnitude of the valuation effect goes along with the finding by Tille (2003).[3]

One prominent empirical finding for the United States is shown in figure 1 and has been labeled the "exorbitant privilege" of the United States. It is that the income balance of the United States has remained positive until the end of 2005, despite the mounting of net foreign debt since 1989 when the United States turned into a debtor position. The reason is that the average rate of return on U.S. foreign assets has systematically exceeded the average return that U.S. liabilities are offering.[4] This return differential is the reason why the net income payments received by the United States remained positive until the end of 2005. The return differential stems from two source, as Gourinchas and Rey (2005b) point out, namely a "return effect" and a "composition effect". The return effect means that within each asset class the return that U.S. investors make is higher than the return of foreign investors in the same asset class, the composition effect reflects the situation that the U.S. are investing into high-return assets, while their liabilities are low-return assets from the viewpoint of foreign investors holding assets in the United States.

Figure 1: U.S. Gross and Net Assets and Liabilities and Net Income Payments in Trillion $



Source: Bureau of Economic Analysis, 2007

[3] Tille (2005) also elaborates the wealth effects of changing exchange rates.

[4] See Cline (2005, pp. 48).

The present paper incorporates the valuation effect and the interest rate effect into the four-region framework derived by Oberpriller (2007) to account for the impact the existence of these effects will have on the real and nominal exchange rate changes that will accompany a closing of global imbalances. The valuation effect is captured by a revaluation of the foreign asset positions which result from the nominal exchange rate changes under the assumption that the national central banks target the GDP deflator while the current account of the United States is reduced. The interest rate effect will be incorporated by initially considering different interest rates, one that the U.S. has to pay on its liabilities and a higher one that the U.S. receives for its investments. The analysis will also consider the case in which the interest rate differential disappears in the process of narrowing the U.S. external deficit. The outcome of our analysis is a reduction in the real exchange rate depreciation of the dollar by two to four percentage points.

The remainder of the paper is organized as follows. In section 2, we show how to include valuation and interest rate effects into the model by Oberpriller (2007). Section 3 is devoted to the calibration and the simulation of the model and discusses results. Section 4 concludes. An appendix with tables is added.

2 The Model

The model we use to compute the effects of valuation gains and interest rate changes on real exchange rates and the terms of trade is based on Oberpriller (2007) who extends the three-region model by Obstfeld and Rogoff (2005) by adding the oil exporting countries (OPEC and Russia) as a fourth region. We will not repeat the model's equations here, they can be found in Oberpriller (2007). What we will show here is how to implement the valuation and interest rate effects into the four-region model. The formal derivation of the valuation effects and interest rate effects follows closely Obstfeld and Rogoff (2005).

Valuation Effects

H^i represent the gross assets, L^i the gross liabilities of country i, measured in U.S. dollars. Therefore the net foreign asset position can be written as

$$F^i = H^i - L^i, \quad (1)$$

and

$$f^i = \frac{H^i - L^i}{P_U Y_T^U} \tag{2}$$

is the net foreign asset position expressed as percentage of the United States' tradable GDP.

Following Obstfeld and Rogoff (2005) we assume that the central banks target the GDP deflator, in this case it is possible to show that[5]

$$P_U = \left(\frac{P_N^U}{P_T^U}\right)^{\gamma-1} \left[\alpha_U + \alpha_E \tau_{U,E}^{1-\eta} + \alpha_A \tau_{U,A}^{1-\eta} + \alpha_O \tau_{U,O}^{1-\eta}\right]^{\frac{\gamma-1}{1-\eta}}. \tag{3}$$

This expression can be substituted into equation (2) for all i. Now we consider how exchange rate changes affect the denominator of equation (2), therefore we define ω_j^i as the share of region i's gross foreign assets and λ_j^i as the share of region i's gross foreign liabilities denominated in the currency of region j, $j = U, E, A$.[6] We also define $\omega_U^i = \omega_{UH}^i + \omega_{UL}^i$, where ω_{UH}^i represents the high-return U.S. dollar assets and ω_{UL}^i the low-return U.S. dollar assets that region i has got in its portfolio. We assume that $E_{U,j}$ denotes the nominal dollar price of currency j $(j = E, A)$[7]. After changes in $E_{U,j}$, the new dollar values of net foreign assets (with values after the change denoted in primes) are

$$\begin{aligned} F^{U\prime} =& F^U + \left(\frac{E'_{U,E} - E_{U,E}}{E_{U,E}}\right)\left(\omega_E^U H^U - \lambda_E^U L^U\right) \\ &+ \left(\frac{E'_{U,A} - E_{U,A}}{E_{U,A}}\right)\left(\omega_A^U H^U - \lambda_A^U L^U\right), \end{aligned} \tag{4}$$

$$\begin{aligned} F^{E\prime} =& F^E + \left(\frac{E'_{U,E} - E_{U,E}}{E_{U,E}}\right)\left(\omega_E^E H^E - \lambda_E^E L^E\right) \\ &+ \left(\frac{E'_{U,A} - E_{U,A}}{E_{U,A}}\right)\left(\omega_A^E H^E - \lambda_A^E L^E\right), \end{aligned} \tag{5}$$

$$\begin{aligned} F^{A\prime} =& F^A + \left(\frac{E'_{U,E} - E_{U,E}}{E_{U,E}}\right)\left(\omega_E^A H^A - \lambda_E^A L^A\right) \\ &+ \left(\frac{E'_{U,A} - E_{U,A}}{E_{U,A}}\right)\left(\omega_A^A H^A - \lambda_A^A L^A\right), \end{aligned} \tag{6}$$

$$\begin{aligned} F^{O\prime} =& F^O + \left(\frac{E'_{U,E} - E_{U,E}}{E_{U,E}}\right)\left(\omega_E^O H^O - \lambda_E^O L^O\right) \\ &+ \left(\frac{E'_{U,A} - E_{U,A}}{E_{U,A}}\right)\left(\omega_A^O H^O - \lambda_A^O L^O\right). \end{aligned} \tag{7}$$

[5] See Oberpriller (2007, Appendix, p. 21).

[6] Where the European and the Asian currencies are composites.

[7] We assume that there are no assets or liabilities denominated in OPEC's currencies.

For the system to be closed the following two constraints must hold:

$$\omega_E^U H^U + \omega_E^E H^E + \omega_E^A H^A + \omega_E^O H^O = \lambda_E^U H^U + \lambda_E^E H^E + \lambda_E^A H^A + \lambda_E^O H^O \quad (8)$$

$$\omega_A^U H^U + \omega_A^E H^E + \omega_A^A H^A + \omega_A^O H^O = \lambda_A^U H^U + \lambda_A^E H^E + \lambda_A^A H^A + \lambda_A^O H^O \quad (9)$$

Substituting (8) and (9) into (7) it is possible to eliminate OPEC's asset shares:

$$\begin{aligned} F^{O\prime} =& F^O + \left(\frac{E'_{U,E} - E_{U,E}}{E_{U,E}}\right)\left(\lambda_E^U H^U + \lambda_E^E H^E + \lambda_E^A H^A - \omega_E^U H^U - \omega_E^E H^E - \omega_E^A H^A\right) \\ & + \left(\frac{E'_{U,A} - E_{U,A}}{E_{U,A}}\right)\left(\lambda_A^U H^U + \lambda_A^E H^E + \lambda_A^A H^A - \omega_A^U H^U - \omega_A^E H^E - \omega_A^A H^A\right) \end{aligned} \quad (10)$$

Finally, we know that

$$H^U + H^E + H^A + H^O = L^U + L^E + L^A + L^O. \quad (11)$$

Equations (4), (5), (6) and (10) provide the basic set-up for analyzing changes in the value of foreign assets and liabilities caused by nominal exchange rate changes which result under a monetary policy that targets the GDP deflator. The estimated values for nominal assets and liabilities are discussed in the calibration section of this paper.

Interest Rate Effects

As Obstfeld and Rogoff (2005, p. 120) point out, it is possible that in the process of U.S. current account adjustment, global interest rates will change, reflecting either "reequilibration of the global capital markets" or "a shift in the portfolio preferences of foreign investors such that, given the exchange rate of the dollar, higher dollar interest rates are necessary to persuade them to maintain their existing dollar denominated portfolio shares". Therefore, in the following we will examine how a change of the interest rate which the U.S. has to pay on its liabilities affects the simulation outcome.

As was already mentioned above, there are two different types of dollar assets: high-return and low-return assets. Initially all the debt issued by the U.S. pays a low-return of r^U, while the high-return dollar assets pay the same return as all assets denominated in other currencies, which is an interest rate of r^W, where $r^U < r^W$. As interest rate effects we consider the effect of a raise in r^U.

Since an increase in r^U that is going along with the dollar depreciation initially only affects short-term liabilities, while the interest rate on existing long-term liabilities remains unchanged, we will have to make a distinction between short-term and long-term U.S. liabilities. Here, again, we work with the figures used by Obstfeld and Rogoff

(2005) which are collected from U.S. treasury data for September 2004. According to this a share of 30 percent of all U.S. liabilities are of short-term-nature.[8]

With our definition of ω_{UL}^{i} as the share of low-return U.S. dollar assets in the portfolio of region i, we can replace rF^{i} in Oberpriller (2007, Appendix) by

$$r^{W}H^{U}-r^{U}L^{U} \tag{12}$$

$$\left[\omega_{UL}^{E}r^{U}+\left(1-\omega_{UL}^{E}\right)r^{W}\right]H^{E}-r^{W}L^{E}, \tag{13}$$

$$\left[\omega_{UL}^{A}r^{U}+\left(1-\omega_{UL}^{A}\right)r^{W}\right]H^{A}-r^{W}L^{A}, \tag{14}$$

$$\left[\omega_{UL}^{O}r^{U}+\left(1-\omega_{UL}^{O}\right)r^{W}\right]H^{O}-r^{W}L^{O}. \tag{15}$$

When we consider an increase of the interest rate Δr^{U} and a share of short-term liabilities σ, the investment income accounts for the regions change to[9]

$$r^{W}H^{U}-\left(r^{U}+\sigma\Delta r^{U}\right)L^{U}, \tag{16}$$

$$\left[\omega_{UL}^{E}\left(r^{U}+\sigma\Delta r^{U}\right)+\left(1-\omega_{UL}^{E}\right)r^{W}\right]H^{E}-r^{W}L^{E}, \tag{17}$$

$$\left[\omega_{UL}^{A}\left(r^{U}+\sigma\Delta r^{U}\right)+\left(1-\omega_{UL}^{A}\right)r^{W}\right]H^{A}-r^{W}L^{A}, \tag{18}$$

$$\left[\omega_{UL}^{O}\left(r^{U}+\sigma\Delta r^{U}\right)+\left(1-\omega_{UL}^{O}\right)r^{W}\right]H^{O}-r^{W}L^{O}. \tag{19}$$

Synthesis of Valuation and Interest Rate Effects

While the original model by Oberpriller (2007) did not regard these valuation and interest rate effects and therefore did not have to distinguish between gross-asset and gross-liability positions, it is now necessary to look at assets and liabilities separately, because assets and liabilities can pay different interest rates. We, then, get the following post-change values for the assets and liabilities of the four regions:

$$H^{U\prime}=H^{U}+\left(\frac{E_{U,E}^{\prime}-E_{U,E}}{E_{U,E}}\right)\omega_{E}^{U}H^{U}+\left(\frac{E_{U,A}^{\prime}-E_{U,A}}{E_{U,A}}\right)\omega_{A}^{U}H^{U} \tag{20}$$

$$H^{E\prime}=H^{E}+\left(\frac{E_{U,E}^{\prime}-E_{U,E}}{E_{U,E}}\right)\omega_{E}^{E}H^{E}+\left(\frac{E_{U,A}^{\prime}-E_{U,A}}{E_{U,A}}\right)\omega_{A}^{E}H^{E} \tag{21}$$

$$H^{A\prime}=H^{A}+\left(\frac{E_{U,E}^{\prime}-E_{U,E}}{E_{U,E}}\right)\omega_{E}^{A}H^{A}+\left(\frac{E_{U,A}^{\prime}-E_{U,A}}{E_{U,A}}\right)\omega_{A}^{A}H^{A} \tag{22}$$

$$H^{O\prime}=H^{O}+\left(\frac{E_{U,E}^{\prime}-E_{U,E}}{E_{U,E}}\right)\omega_{E}^{O}H^{O}+\left(\frac{E_{U,A}^{\prime}-E_{U,A}}{E_{U,A}}\right)\omega_{A}^{O}H^{O} \tag{23}$$

[8] See Obstfeld and Rogoff (2005, p. 121).

[9] Obstfeld and Rogoff (2005) suggest: "One might also consider a formulation where $\Delta r^{U} = f\left(\Delta CA^{U}\right),\ f' > 0$. In this case adjustment could be quite painful if the f function is too rapidly increasing, L^{U} is too big, or σ is too big (or any combination of these three)."

$$L^{U\prime} = L^U + \left(\frac{E'_{U,E} - E_{U,E}}{E_{U,E}}\right)\lambda_E^U L^U + \left(\frac{E'_{U,A} - E_{U,A}}{E_{U,A}}\right)\lambda_A^U L^U \qquad (24)$$

$$L^{E\prime} = L^E + \left(\frac{E'_{U,E} - E_{U,E}}{E_{U,E}}\right)\lambda_E^E L^E + \left(\frac{E'_{U,A} - E_{U,A}}{E_{U,A}}\right)\lambda_A^E L^E \qquad (25)$$

$$L^{A\prime} = L^A + \left(\frac{E'_{U,E} - E_{U,E}}{E_{U,E}}\right)\lambda_E^A L^A + \left(\frac{E'_{U,A} - E_{U,A}}{E_{U,A}}\right)\lambda_A^A L^A \qquad (26)$$

$$L^{O\prime} = L^O + \left(\frac{E'_{U,E} - E_{U,E}}{E_{U,E}}\right)\lambda_E^O L^O + \left(\frac{E'_{U,A} - E_{U,A}}{E_{U,A}}\right)\lambda_A^O L^O. \qquad (27)$$

Adding these equations to the basic model set-up makes it possible to calculate the impact of valuation and interest rate effects on the outcome of the model by Oberpriller (2007).

3 Calibration and Simulation

3.1 Model Calibration

We use the same parameter values as Oberpriller (2007). The biases in traded goods consumption and all other necessary parameter values are shown in the appendix, tables A.3 and A.4. The international foreign asset and liability positions as well as the interest rates are discussed below.

The International Foreign Asset and Liability Positions

For our simulations we take the nominal asset and liability values for each country according to Cavallo and Tille (2006) who derived their figures from Obstfeld and Rogoff (2005), then we adjusted them to include OPEC as fourth region, observing constraint (11). As Obstfeld and Rogoff (2005, p. 96, p. 118) state, it is very difficult to measure the currency denomination of the actual international asset and liability position for a country. Therefore, the values we are working with are only rough approximations and the changes we make to account for the fourth region to the data Obstfeld and Rogoff (2005) and Cavallo and Tille (2006) use, is leaving the outcome valid.[10] From Lane and Milesi-Ferretti (2006) we take as OPEC's assets 1.5 trillion and as liabilities 0.8 trillion dollar.[11] To include these numbers into the table of assets

[10]Even though Obstfeld and Rogoff (2005, p. 96) state: "These numbers are very rough approximations, based in some cases on fragmentary or impressionistic data, but portfolio shares can shift sharply over time, and so there is little point in trying too hard to refine the estimates." we will elaborate more on these figures in the following research on this topic.

[11]In fact these figures are 1.458 for the assets and 0.902 for liabilities. For matters of convenience we work with the figures described in the text.

and liabilities elaborated by Cavallo and Tille (2006, p. 39), we raised each region's asset position by the same amount of 0.267 trillion U.S dollar (which makes 0.8 trillion for OPEC's liabilities) and raised the liability positions of the United States by 0.346 trillion and the ones from Europe and Asia by 0.577 trillion U.S. dollar (which makes 1.5 trillion for OPEC's assets). This is done for the purpose of keeping the outcome as comparable as possible to the results derived by Obstfeld and Rogoff (2005).[12] The composition of high and low return assets was computed according to Cavallo and Tille (2006), but with minor adjustments to include OPEC and to fulfill constraint (11). The portfolio shares ω_j^i and λ_j^i are shown in table A.1 and the initial structure of assets and liabilities in table A.2 in the appendix.

Interest Rates and Interest Payments

For the simulations we need the net interest receipts received from the international investment position as a part of each region's current account, calculated according to equations (12)–(15). The values we used for our simulations are shown in table A.5 in the appendix. Two different interest rates were used: One low interest rate of 3,75% which the U.S. has to pay on its liabilites (and therefore the lenders only get this interest rate on this part of their assets – following Cavallo and Tille (2006) we call them low return assets), and a higher interest rate of 5% which is used for all other assets and liabilities (high return assets). Due to the fact that the U.S. owned assets pay a higher return than the liabilities of the U.S., initially the United States are not paying net interest despite the fact that they are a net debtor. This is in line with past observations, however, it should be noted that according to the Bureau of Economic Analysis (2007), in 2006 the U.S. had a negtive income on their net international investment position for the first time.

3.2 Simulation Outcome

We simulated two different scenarios to see the impact of valuation and interest rate effects accompanying a reduction of the world's current account imbalances. The first is the "Global Rebalancing"-scenario in which the current accounts of all four regions go immediately to zero (scenario I). The second scenario is one in which all current accounts go to zero except for the deficits between each region (U,E,A) and OPEC, as it is imaginable that the current account surplus of OPEC is more persistent (scenario

[12] Obstfeld and Rogoff (2005) do not show in detail how they calculate interest payments. See Oberpriller (2007, p. 10) for the difference in the results.

II). The simulation outcomes for the two scenarios are shown in tables 1 and 2, where the real and nominal exchange rates are defined such that an increase reflects a depreciation of the first country's currency against the currency of the second country and an increase in the terms of trade reflect a deterioration for the first country. Column one shows the baseline case without valuation or interest rate effects.

Table 1: Simulation Outcome in the Global Rebalancing Scenario

Log-change $\times$ 100	without valuation or interest rate effects	with valuation effects	with interest rate effects	with valuation and interest rate effects
Real exchange rate				
United States / Europe	29.9	24.6	32.2	27.1
United States / Asia	34.8	28.3	37.6	31.4
United States / OPEC	50.9	48.2	53.3	50.7
Europe / Asia	4.9	3.7	5.4	4.3
Europe / OPEC	21.0	23.5	21.1	23.5
Asia / OPEC	16.1	19.8	15.7	19.3
Terms of trade				
United States / Europe	14.3	11.8	15.4	13.0
United States / Asia	14.7	12.0	15.8	13.2
United States / OPEC	10.6	9.0	11.4	9.8
Europe / Asia	0.4	0.2	0.4	0.3
Europe / OPEC	-3.6	-2.8	-3.9	-3.1
Asia / OPEC	-4.0	-3.0	-4.4	-3.4
Nontradable Prices				
United States (P_N^U)	-18.2	-15.2	-19.7	-16.7
Europe (P_N^E)	18.7	15.3	20.2	16.8
Asia (P_N^A)	25.5	20.4	27.5	22.7
OPEC (P_N^O)	48.1	47.7	49.7	49.4
Nominal exchange rate				
United States / Europe	31.3	25.8	33.8	28.4
United States / Asia	36.5	29.7	39.4	32.9
United States / OPEC	52.4	49.4	54.9	52.1
Europe / Asia	5.2	3.9	5.6	4.5
Europe / OPEC	21.1	23.6	21.1	23.6
Asia / OPEC	15.9	19.7	15.5	19.2

Column two of table 1 shows that the valuation effect reduces the real depreciation of the dollar against the European and Asian currencies by 5.3 and 6.5 percentage points while the interest rate effect (column three) demands a depreciation which is 2.3 and 2.8 percentage points higher than in the case that does not include these effects. The valuation effect leads to a reduction of the depreciation of the U.S. dollar against OPEC's currencies by 2.7 percentage points, while the interest rate effect demands a 2.4 percentage points higher depreciation than in the baseline case. Taking both effects into account, the model predicts a real depreciation of the dollar against the European currencies by up to 27.1 percent, against Asia by up to 31.4 percent and against OPEC by up to 50.7 percent. This is a reduction compared to the situation without these effects by 2.8 percentage points, 3.4 percentage points and 0.2 percentage points, respectively.

Table 2: Simulation Outcome in Scenario II (Rebalancing between U, E, A)

Log-change × 100	without valuation or interest rate effects	with valuation effects	with interest rate effects	with valuation and interest rate effects
Real exchange rate				
United States / Europe	30.9	25.7	33.2	28.2
United States / Asia	35.0	28.6	37.7	31.6
United States / OPEC	26.6	23.8	29.4	26.7
Europe / Asia	4.1	2.9	4.6	3.5
Europe / OPEC	-4.3	-2.0	-3.8	-1.5
Asia / OPEC	-8.4	-4.8	-8.3	-4.9
Terms of trade				
United States / Europe	15.2	12.8	16.3	13.9
United States / Asia	15.0	12.3	16.2	13.6
United States / OPEC	9.8	8.1	10.6	8.9
Europe / Asia	-0.2	-0.4	-0.2	-0.3
Europe / OPEC	-5.5	-4.7	-5.7	-5.0
Asia / OPEC	-5.2	-4.2	-5.6	-4.6
Nontradable Prices				
United States (P_N^U)	-16.3	-13.3	-17.7	-14.8
Europe (P_N^E)	21.8	18.5	23.2	20.0
Asia (P_N^A)	27.6	22.6	29.6	24.9
OPEC (P_N^O)	17.5	17.1	19.7	19.3
Nominal exchange rate				
United States / Europe	32.4	27.0	34.8	29.6
United States / Asia	36.6	30.0	39.5	33.1
United States / OPEC	27.8	24.8	30.7	27.8
Europe / Asia	4.3	3.0	4.8	3.6
Europe / OPEC	-4.6	-2.2	-4.0	-1.7
Asia / OPEC	-8.8	-5.2	-8.8	-5.3

The outcome of our scenario II case, where OPEC's current account surplus of roughly 6 percent of U.S. tradable GDP is divided into current account deficits for the United States, Europe and Asia of 2 percent each, is shown in table 2. The magnitude of the valuation and the interest rate effect is almost the same as in scenario I. While the valuation effect reduces the real exchange rate depreciation by 5.2 to 6.4

percentage points, the interest rate effect increases the real exchange rate deprecation between 2.3 and 2.8 percentage points. The simulation of the model in the case of scenario II predicts a real exchange rate depreciation of the dollar against the European currencies of up to 28.2 percent, against the Asian currencies of up to 31.6 and against OPEC's currencies of up to 26.7 percent. This is a reduction compared to the situation without these effects by 2.7 percentage points, 3.4 percentage points and 0.1 percentage points, respectively.

In both scenarios (I&II) the changes in the terms of trade of the U.S. vis-a-vis Europe, Asia and OPEC as well as the prices of nontraded goods in the U.S. behave as expected, meaning that the valuation effect – which works in favor of the U.S. – lowers the pressure of adjustment happening through these channels, i.e. reduces the change in the terms of trade and in the price of nontradables compared to the situation where no valuation effects are regarded. The interest rate effect – which works against the U.S. – increases the pressure and therefore increases the changes in the terms of trade and in the nontraded goods prices compared to the baseline situation with no valuation and interest rate effects.

The nominal exchange rate changes that go along with changes in the terms of trade and the prices of the nontradable goods within each region under the assumption that national central banks target the GDP deflator are shown in the six bottom rows of tables 1 and 2. They deviate not very much from the size of the real exchange rates. The nominal exchange rate depreciation of the dollar vis-a-vis the European and the Asian currencies is almost the same in both scenarios. When valuation and interest rate effects are included the dollar depreciates (in nominal terms) by 28.4 (29.6) percent against the European currencies, by 32.9 (33.1) percent against the Asian currencies and by 50.7 (26.7)percent against the OPEC currencies (scenario II figures in brackets).

An interesting feature of the comparison of both scenarios is the difference it makes for the real (and nominal) exchange rates for Asia and Europe vis-a-vis OPEC. Under the "Global Rebalancing"-scenario the European and the Asian currencies depreciate quite sharply by 23.5 percent and 19.3 percent, respectively, while in the case of scenario II both currencies have to appreciate against OPEC's currencies. Even though the appreciation in this case is quite small (1.5 percent in the case of the European currencies and 4.9 percent for the the Asian currencies), it is interesting that the direction of the exchange rate change is different in both cases. The reason is that in scenario II the increase in nontradable prices in OPEC is only half the size than in scenario I, while the changes in the terms of trade against OPEC and the prices of nontradables in Europe and Asia stay almost constant in the two scenarios.

4 Conclusion

The present paper has shown how to incorporate valuation and interest rate effects into the four-region framework by Oberpriller (2007) which is based on the three-region model by Obstfeld and Rogoff (2005). Valuation effects refer to the change in the gross and net foreign asset position measured in U.S. dollar, caused by a nominal exchange rate change under the assumption of GDP deflator targeting by the central banks. Interest rate effects result from an interest rate differential between the interest rate the United States have to pay on their liabilities and the interest rate they receive for their assets and from the elimination of the interest rate differential in the process of a narrowing of global imbalances. Both effects have been simulated for the “Global Rebalancing”-scenario (scenario I) and for a scenario in which all current accounts go immediately to zero except each regions deficit against OPEC (scenario II).

The outcome can be split into a “positive” effect caused by valuation effects and a “negative” one caused by a vanishing interest rate differential. The effect of revaluating foreign asset positions leads to a smaller real depreciation of the U.S. dollar by 2.7 to 6.5 percentage points, while the effect of the vanishing interest rate differential leads to a higher real depreciation of the dollar in the range of 1.3 to 2.8 percentage points, both compared to the situation without valuation and interest rate effects, analyzed by Oberpriller (2007).

Therefore, the findings of this analysis are in line with the results derived by Obstfeld and Rogoff (2005)[13] who predict a reduced real depreciation of the dollar against Europe of 3.6 and against Asia of 3.5 percent in the “Global Rebalancing”-scenario. The present analysis predicts a slightly smaller effect on the dollar exchange rate against the European currencies and almost the same effect on the dollar exchange rate against the Asian currencies.

An analysis according to the method of Cavallo and Tille (2006), who look at the dynamic impact of valuation effects by conducting the simulations over a time horizon with more than one period to account for the periodical effect of valuation gains on the current account for the United States within our four-region framework is left for future research.

[13] See table A.6 in the appendix for their results.

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Appendix

Table A.1: Initial Portfolio Shares

United States	Europe	Asia	OPEC
$\omega_E^U = 0.4050$	$\omega_E^E = 0.5700$	$\omega_E^A = 0.2000$	$\omega_E^O = 0.4391$
$\omega_A^U = 0.1930$	$\omega_A^E = 0.1100$	$\omega_A^A = 0.0000$	$\omega_A^O = 0.0769$
$\omega_{UH}^U = 0.4020$	$\omega_{UH}^E = 0.0700$	$\omega_{UH}^A = 0.1000$	$\omega_{UH}^O = 0.0572$
$\omega_{UL}^U = 0.0000$	$\omega_{UL}^E = 0.2500$	$\omega_{UL}^A = 0.7000$	$\omega_{UL}^O = 0.4268$
$\lambda_E^U = 0.0000$	$\lambda_E^E = 0.8000$	$\lambda_E^A = 0.3650$	$\lambda_E^O = 0.3750$
$\lambda_A^U = 0.0000$	$\lambda_A^E = 0.0000$	$\lambda_A^A = 0.3396$	$\lambda_A^O = 0.0000$
$\lambda_U^U = 1.0000$	$\lambda_U^E = 0.2000$	$\lambda_U^A = 0.2954$	$\lambda_E^O = 0.3750$

Source:
Own calculations based on Cavallo and Tille (2006) and Lane and Milesi-Ferretti (2006).

Table A.2: Asset and Liability Positions in the 4-Region Simulation (in Trillion U.S. Dollar)

	Assets	Liabilities	Net
United States			
Total	8.510	11.347	-2.837
– dollar	3.421	11.347	-7.926
– euro and yen	5.089		5.089
High-return assets			
– dollar	3.421		3.421
– euro	3.447		3.447
– yen	1.642		1.642
Low-return assets (dollars)		11.347	11.347
Europe			
Total	11.270	11.577	-0.307
– dollar	3.606	2.315	1.291
– euro and yen	7.664	9.261	-1.597
High-return assets			
– dollar	0.789	2.315	-1.526
– euro	6.424	9.261	-2.837
– yen	1.240		1.240
Low-return assets (dollars)	2.818		2.818
Asia			
Total	11.270	8.827	2.443
– dollar	9.016	2.604	6.412
– euro and yen	2.254	6.223	-3.969
High-return assets			
– dollar	1.127	2.607	-1.480
– euro	2.254	3.222	-0.968
– yen	0.000	2.998	-2.998
Low-return assets (dollars)	7.889		7.889
OPEC+Russia			
Total	1.500	0.800	0.700
– dollar	0.726	0.500	0.226
– euro and yen	0.774	0.300	0.474
High-return assets			
– dollar	0.086	0.500	-0.414
– euro	0.659	0.300	0.359
– yen	0.115	0.000	0.115
Low-return assets (dollars)	0.640		0.640

Source:
Own calculations based on Cavallo and Tille (2006) and Lane and Milesi-Ferretti (2006).

Table A.3: Biases in Traded Goods Consumption

Region	Parameter (new/old)	Value	Bias towards traded goods from
U.S.	α_U	0.7	U.S. (home bias)
U.S.	α_E	0.085	Europe
U.S.	α_A	0.17	Asia
U.S.	α_O	0.045	OPEC
Europe	β_E	0.7	Europe (home bias)
Europe	β_U	0.09	U.S.
Europe	β_A	0.18	Asia
Europe	β_O	0.03	OPEC
Asia	χ_A	0.7	Asia (home bias)
Asia	χ_U	0.1245	U.S.
Asia	χ_E	0.1245	Europe
Asia	χ_O	0.051	OPEC
OPEC	δ_O	0.1	OPEC (home bias)
OPEC	δ_U	0.2	U.S.
OPEC	δ_E	0.35	Europe
OPEC	δ_A	0.35	Asia

Table A.4: Parameter Values

Parameter	Value	Description
η	2	Elasticity of substitution for traded goods
θ	1	Elasticity of substitution for nontraded and traded
γ	0.25	Share of traded goods in consumption
σ_{UE}	1	U.S. real tradable output relative to Europe's tradable output
σ_{UA}	1	U.S. real tradable output relative to Asia's tradable output
σ_{UO}	3	U.S. real tradable output relative to OPEC's tradable output
σ_{NU}	3	real nontradable output relative to real tradable output in U.S.
σ_{NE}	3	real nontradable output relative to real tradable output in Europe
σ_{NA}	3	real nontradable output relative to real tradable output in Asia
σ_{NO}	1	real nontradable output relative to real tradable output in OPEC

Table A.5: Current Account Positions and Net Interest Payments (in trillion and in percent of U.S. tradable GDP)

	in trillion dollar		in % of U.S. tradable GDP	
	CA	rF	ca	rf
United States	-0.550	0.00000	-0.200	0.0000
Europe	0.092	-0.04950	0.033	-0.018
Asia	0.275	0.02475	0.100	0.009
OPEC	0.183	0.02475	0.066	0.009

Table A.6: Simulation Outcomes Obstfeld/Rogoff with and without Valuation and Interest Rate Effects (Rebalancing between U, E, A)

Log-change $\times$ 100	O/R without valuation or interest rate effects	O/R with valuation effects	O/R with interest rate effects	O/R with valuation and interest rate effects
Real exchange rate				
United States / Europe	33.7 (33.2)	28.6 (27.8)	(35.7)	30.1 (30.3)
United States / Asia	40.7 (41.0)	35.2 (34.2)	(43.9)	37.2 (37.2)
United States / OPEC				
Europe / Asia	7.0 (7.7)	6.7 (6.4)	(8.2)	6.3 (6.8)
Europe / OPEC				
Asia / OPEC				
Terms of trade				
United States / Europe	16.5 (16.3)	14.0 (13.8)	(17.5)	15.1 (15.0)
United States / Asia	16.5 (16.7)	14.5 (14.0)	(17.9)	15.3 (15.2)
United States / OPEC				
Europe / Asia	0.0 (0.4)	0.5 (0.2)	(0.4)	0.2 (0.2)
Europe / OPEC				
Asia / OPEC				
Nontradable Prices				
United States (P_N^U)	(-18.2)	(-14.9)	(-19.7)	(-16.4)
Europe (P_N^E)	(22.8)	(19.4)	(24.3)	(21.1)
Asia (P_N^A)	(33.36)	(28.2)	(35.5)	(30.4)
OPEC (P_N^O)				