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ASSET REVALUATION AND TRADE BALANCE UNDER LIABILITY DOLLARIZATION: THE CASE OF SOUTH KOREA

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For the US, recent research has found that exchange rate and asset price movements play an important role in foreign asset revaluation and international trade. This paper studies the impacts of exchange rate and asset price fluctuations on foreign asset revaluation and trade balance in South Korea. I find that asset revaluation in South Korea differs from that in the US because both Korea's foreign assets and liabilities are denominated in foreign currencies and are subject to exchange rate changes. Furthermore, as implied in recent work, external imbalance can help forecast exchange rates and portfolio returns, but now most of the forecasting power arises from trade imbalance, rather than asset imbalance.

Keywords: Intertemporal Approach, Current Account, Financial Account, Asset Revaluation
JEL classification: F31, F32, F36

1. INTRODUCTION

Conventional analyses of international adjustment have centered on the 'intertemporal approach to the current account.' This model implies that a country's current account deficits should be compensated by future trade surpluses via the depreciation of the home currency. While this trade channel accounts for some portions of the international adjustment, empirical tests of the model are frequently rejected by the data, mainly because the model predicts too little volatility in the current account (e.g., Sheffrin and Woo, 1990; Otto, 1992; Ghosh, 1995).[1] Much of the subsequent

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[1] For example, Sheffrin and Woo (1990) find rejections of the intertemporal current account model for Canada and the UK. Otto (1992) points out that the model does not fit for Canada and the US. Ghosh (1995) shows that the model is rejected for Canada and the UK. Also see Obstfeld and Rogoff (1996) for a summary

literature has tried to augment the basic model so that it captures more current account fluctuations (e.g., Bergin and Sheffrin, 2000; Gruber, 2004; Nason and Rogers, 2006).[2]

In recent work, Gourinchas and Rey (2007a) emphasize an additional adjustment channel operating through the financial account. For the US, two-thirds of external assets are denominated in foreign currencies, while more than 95 percent of external liabilities are in dollars. Thus, exchange rate fluctuations can generate substantial gains and losses on foreign assets with a minimal offsetting effect on liabilities (Tille, 2003, 2005). In particular, when the dollar depreciates, domestic investors who hold assets denominated in other currencies earn a capital gain, while the dollar value of liabilities remains roughly the same. The valuation effect of depreciating dollars is therefore equivalent to wealth transfer from foreign countries to the US, which helps stabilize external balance (Obstfeld, 2004). Gourinchas and Rey (2007a) estimate that the valuation adjustment channel accounts for approximately one-third of US external adjustment, providing a substantial supplement to the conventional trade channel.[3]

A country like the US is exceptional, however, in the composition of its international portfolio. Most economies like South Korea are unable to borrow abroad in their own currencies and therefore are constrained by 'liability dollarization.'[4] If both foreign assets and liabilities are denominated in foreign currencies, exchange rate movements will affect returns on both assets and liabilities. Thus, the valuation channel in economies with dollarized liabilities is likely to be different than that in the US. In particular, if this economy were a net debtor, valuation effects of the home currency's enduring depreciation would lower rates of return on the net foreign portfolio, thereby worsening the current account and increasing the external disequilibrium.

In this paper, I examine the dynamics of international adjustment for South Korea, which bears a sizable foreign-currency denominated debt, suffering from 'liability dollarization.' In particular, I investigate how the valuation and trade channels for Korea differ from those of the US; what magnitude and direction of the two channels are; whether they help stabilize external balance; whether they are useful for predicting future portfolio returns, exchange rate movements, and net export growth; and at what horizons the two channels operate.

of the intertemporal current account literature.

[2] For instance, Bergin and Sheffrin (2000) allow for variable interest rates and real exchange rates; Gruber (2004) introduces habit formation; and Nason and Rogers (2006) consider government spending shocks, world real interest rate shocks, and trading frictions in asset markets.

[3] Also see Lane and Milesi-Ferretti (2001, 2002, 2005), Coresetti and Konstantinou (2004), Obstfeld and Rogoff (2005), and Obstfeld and Taylor (2004) for relevant work on the external adjustment of the US and other industrial countries.

[4] Liability dollarization is referred to as the phenomenon that countries mainly borrow in major foreign currencies like the US dollar, the Euro, the Japanese yen. See Eichengreen and Hausman (1999) and Calvo and Reinhart (2002) for more information on liability dollarization.

This paper establishes four interesting results. First, to estimate the valuation and trade adjustments, I employ the 'intertemporal approach to the financial account' by Gourinchas and Rey (2007a), while accounting for 'liability dollarization.' I estimate the trade channel as the present value of expected future net export growth, and the valuation channel as the present value of expected future rates of return on net foreign assets. The valuation channel in Korea accounts for 4.9% of the cyclical external adjustment, while the trade channel amounts to more than 90%. Meanwhile, the two channels co-move positively, suggesting that the valuation channel contributes minimally to stabilizing the external balance. Because of liability dollarization and a net debtor position in Korea, the exchange rate works through asset returns to raise external disequilibrium. Therefore, strong trade adjustments are called for to sustain external balance in Korea. This contrasts with the US, in which the valuation channel profoundly helps restore the US external balance by absorbing about 30% of the total external adjustment (Gourinchas and Rey, 2007a).

Second, empirical tests in the literature on the conventional intertemporal current account model are frequently rejected. Gourinchas and Rey (2007a) point out that neglect of the asset valuation adjustment may largely account for the conventional model's rejection in US data. This paper uses a newly constructed dataset for Korea to test both the intertemporal current account model and the intertemporal financial account model. Empirical tests show that both models perform well for Korea. The results are robust when taking into account the potential structural breaks due to the capital liberalization and the financial crisis. These findings are quite remarkable, especially for the intertemporal current account model. Compared with the financial account model built only on an asset accumulation identity, the conventional current account model imposes strong cross restrictions on consumption behavior, and these restrictions might be rejected by the data. Nonetheless, for Korea, the conventional model still works fairly well. This is, at least potentially, consistent with the fact that trade adjustments account for most of the variations in current account imbalances.

Furthermore, as Gourinchas and Rey (2007a) suggest, external imbalances measured as deviations from the trends of net exports and net foreign assets should embed all relevant information necessary to forecast future portfolio returns, exchange rate movements and net export growth. The multi-step forecast analysis confirms the significant predictive power of the measure of external imbalances. Its forecasting power, however, arises mainly from deviations from the trend of net exports rather than net foreign assets, which may be due to the prominent trade adjustment in Korea.

Finally, this forecasting exploration also points out that the valuation channel through asset returns operates at shorter horizons (three quarters) than the trade channel (eight quarters or more), even though the latter dominates in magnitude throughout all horizons. Since the exchange rate plays dual roles in affecting asset returns and net exports, it works at short, medium, and long horizons, but it works best at medium horizons (four to five quarters). Incorporating these interesting features into the models of external adjustment would help better trace the dynamics of external adjustment.

The remainder of the paper is organized as follows. Section 2 outlines the theoretical framework of Gourinchas and Rey (2007a) that guides the empirical analysis. Section 3 summarizes the Korean data, and Section 4 presents the empirical methods and results. Section 5 concludes with a summary, policy implications, and directions for future research. Appendix provides a detailed description of the data sources and construction methodology.

2. EXTERNAL ADJUSTMENT: THEORETICAL FRAMEWORK

Gourinchas and Rey (2007a) have proposed the 'intertemporal approach to the financial account' to account for the importance of net foreign asset revaluations in the US external adjustment. To investigate the external adjustment in economies with dollarized liabilities, I exploit their theoretical framework with an allowance for 'liability dollarization.'

Start with the law of motion of net foreign assets, in the spirit of Gourinchas and Rey (2007a),

$$NA_{t+1} \equiv R_{t+1}(NA_t + NX_t), \tag{1}$$

where NX_t represents net exports, NA_t denotes net foreign assets at the beginning of the period, and R_{t+1} is the total return on the net foreign portfolio. As usual, net exports are defined as exports minus imports, $X_t - M_t$, and NA_t is gross foreign assets minus gross liabilities, $A_t - L_t$. This law of motion implies that net foreign assets are accumulated through net exports and the total return on net foreign assets. Incorporating the total return on net foreign assets can account for unrealized capital gains arising from asset price and exchange rate fluctuations, which are omitted in the Balance of Payments accounting system.[5]

To examine the further implications of Equation (1), divide through by total wealth W_t,

$$\frac{NA_{t+1}}{W_{t+1}}\frac{W_{t+1}}{W_t} = R_{t+1}\left(\frac{NA_t}{W_t} + \frac{NX_t}{W_t}\right). \tag{2}$$

[5] "All changes that do not reflect transactions are excluded from the current account, capital account and financial account. Specifically, valuation changes that reflect exchange rate or asset price changes for which there are no changes in ownership are excluded." (IMF, *Balance of Payments Manuel*, the fifth edition, paragraph 310)

Assume a balanced-growth equilibrium in which the export share X_t / W_t, import share M_t / W_t, gross foreign asset share A_t / W_t, liability share L_t / W_t, growth rate of total wealth W_{t+1} / W_t, and net foreign asset return R_{t+1} are stationary, with steady state values μ_{xw}, μ_{mw}, μ_{aw}, μ_{lw}, Γ and R, respectively. Meanwhile, the net foreign asset position and trade balance are not zero in steady state, i.e., $\mu_{xw} \neq \mu_{mw}$ and $\mu_{aw} \neq \mu_{lw}$.

In addition, the long-run growth rate of total wealth is assumed to be lower than the equilibrium rate of return on net foreign assets, i.e., $\Gamma < R$, so that the steady state ratio of net exports to net foreign assets is $NX / NA = \Gamma / R - 1 < 0$. This assumption is consistent with the fact that net exports and net foreign asset positions tend to be negatively correlated in steady state.[6] Specifically, net creditors should run trade deficits while net debtors should run trade surpluses to attain external balance in the long run (Gourinchas and Rey, 2007a).

As in Gourinchas and Rey (2007a), let $\varepsilon_t^z \equiv \ln(\widetilde{Z}_t / \overline{Z}_t)$, where $\widetilde{Z}_t = Z_t / W_t$ and $\overline{Z}_t$ is the equilibrium value of $\widetilde{Z}_t$. Let $\hat{r}_{t+1} = \ln(R_{t+1} / \overline{R}_{t+1})$ and $\varepsilon_{t+1}^w = \ln(\Gamma_{t+1} / \overline{\Gamma}_{t+1})$, where $\overline{R}_{t+1}$ and $\overline{\Gamma}_{t+1}$ are the equilibrium values of total rate of return and growth rate of wealth at time *t*, respectively. We assume that ε_t^z, $\hat{r}_{t+1}$ and ε_t^w are stationary and small: $\left|\varepsilon_t^z\right|$, $\left|\hat{r}_{t+1}\right|$ and $\left|\varepsilon_{t+1}^w\right| << 1$. Define $nx_t =| \mu_x | \varepsilon_t^x - | \mu_m | \varepsilon_t^m$. It is a linear combination of the cyclical components of exports and imports, ε_t^x and ε_t^m, with the weights μ_x and μ_m,

$$\mu_x = \frac{\mu_{xw}}{\mu_{xw} - \mu_{mw}}, \ \mu_m = \frac{\mu_{mw}}{\mu_{xw} - \mu_{mw}}. \tag{3}$$

Also, $na_t =| \mu_a | \varepsilon_t^a - | \mu_l | \varepsilon_t^l$ is a linear combination of the cyclical components of assets and liabilities, with the weights μ_a and μ_l,

$$\mu_a = \frac{\mu_{aw}}{\mu_{aw} - \mu_{lw}}, \ \mu_l = \frac{\mu_{lw}}{\mu_{aw} - \mu_{lw}}. \tag{4}$$

Define $nxa_t \equiv nx_t + na_t =| \mu_x | \varepsilon_t^x - | \mu_m | \varepsilon_t^m + | \mu_a | \varepsilon_t^a - | \mu_l | \varepsilon_t^l$. This measure of external imbalance represents the deviations from the trends of net exports (the flow) and net foreign assets (the stock).

[6] See Lane and Milesi-Ferretti (2001, 2002) for empirical support.

Under these assumptions, the log-linearization of Equation (2) yields:

$$na_{t+1} \approx \frac{1}{\rho} na_t + (\hat{r}_{t+1} - \varepsilon^w_{t+1}) - (\frac{1}{\rho} - 1) nx_t, \tag{5}$$

where the growth-adjusted discount factor, $\rho \equiv \Gamma / R = 1 + \frac{\mu_{xw} - \mu_{mw}}{\mu_{aw} - \mu_{lw}}$, $0 < \rho < 1$. If we solve forward the budget constraint (Equation (5)) and impose a no-ponzi condition, we find[7]

$$\begin{aligned} nxa_t &\approx -\sum_{j=1}^{+\infty} \rho^j E_t r_{t+j} - \sum_{j=1}^{+\infty} \rho^j E_t \Delta nx_{t+j}, \\ &\equiv nxa_t^r + nxa_t^{\Delta nx}, \end{aligned} \tag{6}$$

where $\Delta nx_{t+1} \equiv | \mu_x | \Delta \varepsilon^x_{t+1} - | \mu_m | \Delta \varepsilon^m_{t+1} - \varepsilon^w_{t+1}$.

Equation (6) implies that the external imbalance nxa_t should be equal to the present value of expected net export growth and expected rates of return on the net foreign portfolio. This equation is the key to the intertemporal approach to the financial account proposed by Gourinchas and Rey (2007a). It emphasizes the two channels through which external adjustment can take place - one is expected net export growth ($nxa_t^{\Delta nx}$), which is the traditional trade channel; another is predictable returns on the net foreign portfolio (nxa_t^r), called the valuation channel.

The US holds foreign assets in foreign currencies and liabilities in domestic currency. The total real rate of return on net foreign assets measured in domestic currency is therefore given by:

$$r_t = | \mu_a | (\tilde{r}_t^a + \Delta e_t) - | \mu_l | \tilde{r}_t^l - \pi_t, \tag{7}$$

where r_t is the gross rate of return on the net foreign portfolio in real domestic terms, $\tilde{r}_t^a$ and $\tilde{r}_t^l$ denote the gross nominal rates of return on foreign assets and liabilities in local currency, μ_a and μ_l are the weights on foreign assets and liabilities, respectively, and e_t represents the log of the financially weighted exchange rate.[8]

[7] We impose expectations because Equation (1) is an identity and Equation (6) must hold along every sample path under our assumptions.

[8] The financially weighted exchange rate is constructed using the weights on foreign assets and liabilities in major currencies. Gourinchas and Rey (2007a) use time-varying FDI asset historical position country weights to construct this multilateral exchange rate. They also use fixed equity asset or debt asset weights for

Returns are adjusted for domestic inflation π_t.[9] Thus, changes in exchange rates (Δe_t) play a role in affecting the dollar value of returns on gross foreign assets ($\tilde{r}_t^a + \Delta e_t$), while leaving the dollar value of returns on liabilities ($\tilde{r}_t^l$) unaffected.

South Korea, however, suffers from liability dollarization. Both foreign assets and liabilities are denominated in foreign currencies and therefore are subject to exchange rate fluctuations. As Gourinchas and Rey have suggested, their approach could also be applied to this context. Allowing for liability dollarization, I construct the total real rate of return on net foreign assets measured in domestic currency as:

$$\begin{aligned} r_t &= |\mu_a| \sum_i (\tilde{r}_{i,t}^a + \Delta e_{i,t}^a) - |\mu_l| \sum_j (\tilde{r}_{j,t}^l + \Delta e_{j,t}^l) - \pi_t, \\ &= |\mu_a| \tilde{r}_t^a - |\mu_l| \tilde{r}_t^l + |\mu_a| \Delta e_t^a - |\mu_l| \Delta e_t^l - \pi_t, \end{aligned} \tag{8}$$

where i and j denote different currencies in foreign assets and liabilities, respectively. Δe_t^a and Δe_t^l are exchange rate depreciations constructed using the currency compositions of foreign assets and liabilities, respectively.

Equation (8) implies that the currency compositions and the relative weights of foreign assets and liabilities govern the exchange rate's impact on the net foreign portfolio return, and hence drive the magnitude and direction of the valuation adjustment channel. This constitutes the key difference between the US and an economy with substantial dollarized liabilities.

Based on Equations (6) and (8), I estimate the valuation and trade channels using the present value model and vector autoregressions (VAR). This empirical investigation is discussed in Section 4.2. Moreover, Equation (6) indicates that the measure of external imbalance nxa_t should predict future returns on the net foreign portfolio r_{t+j}, future net export growth Δnx_{t+j}, or both. Further details on predictability are presented in Section 4.3.

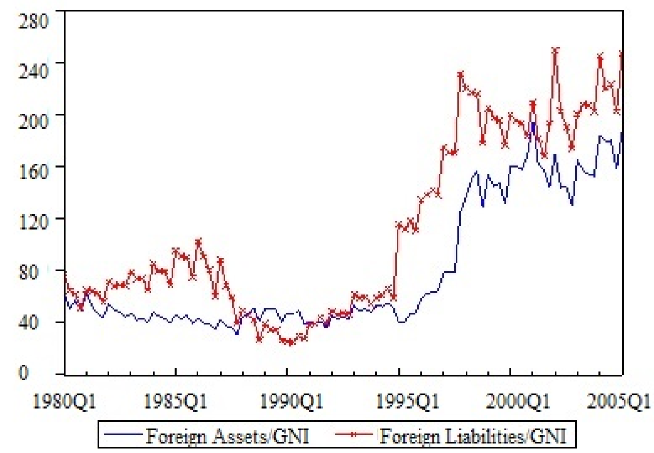
3. DATA

The dynamics of external adjustment depend on the following key variables: net exports, net and gross foreign asset and liability positions at market value and rates of return on foreign assets and liabilities. To construct these variables for Korea, I follow the classification and methodology used by Gourinchas and Rey (2007a) as closely as possible. Thus the differences reported below are mainly attributed to the setting of

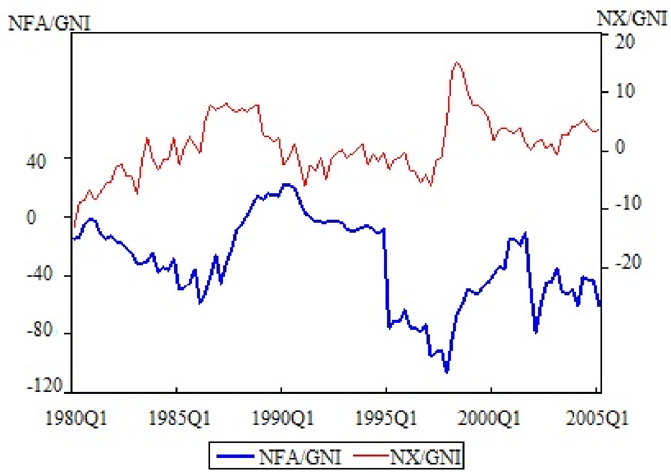
robustness check.

[9] Assume that returns are used to finance domestic consumption and investment, etc.

liability dollarization, rather than how the data are classified and constructed. The sample runs from 1980:Q1 through 2005:Q1. A description of the data sources and construction methodology is presented in the data appendix.



(a) Foreign Assets, Foreign Liabilities/GNI



Source: Author's calculation based on the IMF-International Financial Statistics and the Bank of Korea.

(b) Net Exports, Net Foreign Assets/GNI

Figure 1. Korea Foreign Assets, Foreign Liabilities, Net Exports and Net Foreign Assets (% of Gross National Income, 1980:Q1-2005Q1)

3.1. Korea's External Accounts

We first take a look at the evolution of Korea's gross external assets and liabilities at market value. The measures shown in Figure 1(a) are expressed as fractions of Korea's Gross National Income (GNI), and they incorporate quarterly international financial transactions and valuation changes in external portfolios. Before 1994, Korea's gross external assets were relatively stable and accounted for roughly 45% of GNI, and liabilities amounted to about 60% of GNI. Both increased sharply after 1994, nearly doubling GNI around 2001. This upsurge was largely associated with the worldwide upward trend of asset cross-holdings in recent years.

Figure 1(b) portrays the constructed net foreign asset positions and net exports relative to GNI for Korea. Notably, as the Korean financial crisis occurred in 1997:Q4, the Korean won depreciated about 40% against the US dollar and other strong currencies. Meanwhile, Korea's net foreign debt plunged to over 100% of GNI. With sizable liabilities denominated in foreign currencies, the Korean won depreciation increased the burden of foreign borrowing and worsened Korea's net foreign asset position. These external imbalances were alleviated via the trade channel. As we notice, Korea's net exports exhibited a dramatic bounce from 1997:Q4, peaking at 15% of GNI in 1998:Q2. For the US, the picture is quite different. A depreciation in the US dollar would have improved the US net foreign asset position and supplemented the trade adjustment (Gourinchas and Rey, 2007a).

3.2. Rates of Return on Korea's Foreign Assets and Liabilities

Rates of return on net foreign assets constitute a main difference between the US and South Korea. As noted in Section 2, under liability dollarization, the total real rate of return on net foreign assets measured in domestic currency is defined as:

$$r_t = |\mu_a|\,\tilde{r}_t^{\,a} - |\mu_l|\,\tilde{r}_t^{\,l} + |\mu_a|\,\Delta e_t^a - |\mu_l|\,\Delta e_t^l - \pi_t .$$

The financially-weighted exchange rate depreciations (Δe_t^a and Δe_t^l) are constructed using time-varying country weights of Korea's debt assets and liabilities, respectively. They exhibit substantial volatility of 5.8% and 5.5%, respectively, but they are not serial-correlated.

The rates of return on assets (r_t^a) and liabilities (r_t^l) are constructed as the weighted averages of four subcomponents: direct investment, equity, debt, and other investment.[10] Tables 1a and 1b report the quarterly real rates of return on different

[10] Other investments include short-term bank loans and trade credits, etc.

foreign assets and liabilities for Korea, as well as the corresponding sample weights.[11]

Table 1a. Rates of Return on Korea's Foreign Assets and Liabilities

	r_t	r_t^a	r_t^l	r_t^{af}	r_t^{lf}	r_t^{ae}	r_t^{le}	r_t^{ad}	r_t^{ld}	r_t^{ao}	r_t^{lo}
Mean (%)	-5.07	0.12	0.70	1.18	2.63	2.08	2.63	0.17	0.45	0.05	0.09
Std.Dev. (%)	17.83	1.82	5.82	9.83	21.79	8.49	21.79	1.76	3.04	1.69	2.77
Autocorrelation	0.07	0.13	0.10	-0.07	0.01	-0.05	0.01	0.24	0.15	0.20	0.10

Notes: Sample is 1980Q1 to 2005Q1. r_t is the real rate of return on net foreign assets, r_t^a and r_t^l are the real rates of return on gross foreign assets and liabilities, respectively. r_t^{af} , r_t^{ae} , r_t^{ad} and r_t^{ao} are the real rates of return on direct investment, equity, debt and other investment for the asset side, respectively. Notations for the liability side are symmetric. All returns are quarterly and adjusted for domestic inflation rate.

Table 1b. Sample Weights of Korea's Foreign Assets and Liabilities

μ^{af}	μ^{ae}	μ^{ad}	μ^{ao}	μ^{lf}	μ^{le}	μ^{ld}	μ^{lo}
5.49%	0.22%	2.82%	91.47%	13.33%	8.58%	14.08%	64.01%

Notes: μ^{af}, μ^{ae}, μ^{ad}, μ^{ao} are the average shares of direct investment, equity, debt and other investment to gross foreign assets over 1980:Q1-2005:Q1. Notations for the liability side are symmetric.

Several features are interesting. First, the real rate of return on the net foreign portfolio (r_t) is quite volatile, but not persistent. The second feature concerns the excess return on the foreign portfolio, defined as the foreign asset return minus the corresponding liability return. Interestingly, the average quarterly return of gross foreign liabilities (0.70%) is larger than that of gross foreign assets (0.12%). The difference, 0.58% quarterly, or equivalently 2.32% annually, is quite considerable. The same pattern exists in the subcomponents of returns. The rates of return on the liabilities of direct investments, equity, debt, and other investments exceed the returns on the corresponding asset subcomponents. Third, the cross-holdings of direct investments and other investments of bank loans and trade credits account for 97% of gross assets, and they amount to 77% of gross liabilities.

Finally, the fact that Korea bears negative excess return on its foreign portfolio, in

[11] To better parallel the statistics released by the IMF and the Bank of Korea, here I report the returns measured in the US dollar, which are converted from the calculated returns measured in the Korean won, using the end of period Korean won per US dollar from the IMF. Our empirical results in Section 4 are robust to both measures of rates of return.

conjunction with its net debtor position, indicates that Korea has negative investment income on average. This adversity in the net foreign portfolio requires strong net export growth to attain external balances in Korea. In contrast, the US, a net debtor since the mid 1980s, has remained a recipient of positive income flow due to large excess returns on its foreign portfolio. Thus, the valuation channel helps restore the US external balance (Gourinchas and Rey, 2007a).

4. EMPIRICAL METHODS AND RESULTS

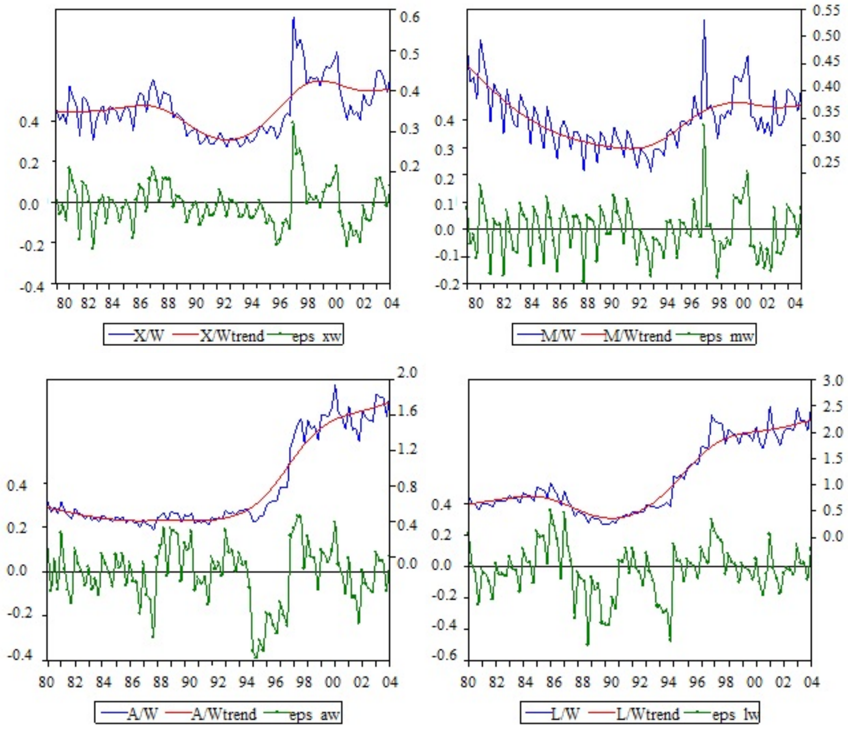
The intertemporal approach to the financial account implies that the measure of external imbalance nxa can be decomposed into a trade channel through net export growth and a valuation channel via asset return movements (see Equation (6)). Also, the external imbalance should have predictive power for future net foreign asset returns, future net export growth, or both. The empirical investigation starts with estimating Korea's external imbalances, and then examines the dynamics of trade and valuation channels, as well as predictability.

4.1. The Measure of External Imbalances: *nxa*

External imbalance, $nxa_t = |\mu_x|\varepsilon_t^x - |\mu_m|\varepsilon_t^m + |\mu_a|\varepsilon_t^a - |\mu_l|\varepsilon_t^l$, is a linear combination of detrended (log) exports (ε_t^x), imports (ε_t^m), foreign assets (ε_t^a) and liabilities (ε_t^l) relative to gross national income. I first test for unit roots in X_t / W_t, M_t / W_t, A_t / W_t, and L_t / W_t. Both Augmented Dickey Fuller tests and Phillips-Perron tests suggest that these series are nonstationary and of integrated order one.[12] Then, I estimate the trends of these series using the Hodrick-Prescott (HP) filter.[13] The variables ε_t^z are the cyclical components, reflecting the fluctuations around the trends. I also detrend the return R_t and the growth rate of wealth Γ_t. Figure 2 illustrates the estimated values for the trend and cyclical components of these series. It shows that the cyclical components capture the twists and turns in the actual series very well.

[12] These unit root test results are available upon request.

[13] I set the HP smoothing parameter as 1600, rather than 2400000 in Gourinchas and Rey (2007a) because the Korean dataset is only 25 years long. But the empirical results are also robust to various smoothing parameters. I also apply the cointegration methodology to construct the measure of external imbalances. The two measures of Korea's external imbalances are close in magnitude and are highly correlated. These results are available upon request.



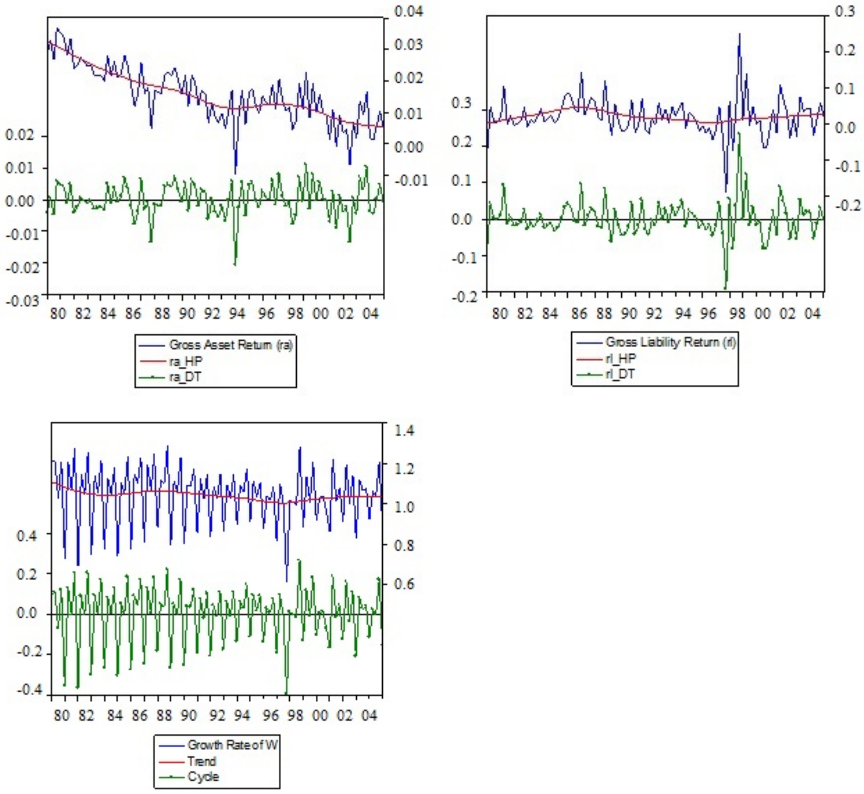
Notes: Top Two panels for Korea exports X/W (left) and Korea imports M/W (right); bottom two panels for Korea gross foreign assets A/W (left) and Korea gross foreign liabilities L/W (right). Each panel shows the series Z/W, the trend component from HP filter using smoothing parameter=1600 (right-axis), and the cyclical component (left-axis) eps_zw=ln(Z/W)-ln(Z/W trend). Sample: 1980:Q1-2005:Q1.

Figure 2a. Cycle and Trend Components of X/W, M/W, A/W and L/W

The weights, μ_x, μ_m, μ_a and μ_l and the discount factor, ρ, are constructed using the definitions in Equations (3), (4), and (5):

$$\mu_x = \frac{\mu_{xw}}{\mu_{xw} - \mu_{mw}},\ \mu_m = \frac{\mu_{mw}}{\mu_{xw} - \mu_{mw}},\ \mu_a = \frac{\mu_{aw}}{\mu_{aw} - \mu_{lw}},\ \mu_l = \frac{\mu_{lw}}{\mu_{aw} - \mu_{lw}}, \rho = 1 + \frac{\mu_{xw} - \mu_{mw}}{\mu_{aw} - \mu_{lw}},$$

where μ_{xw}, μ_{mw}, μ_{aw} and μ_{lw} are calculated as the average of the trend components of exports, imports, gross foreign assets and liabilities relative to gross national income, respectively. These average trend components are used as proxies for the corresponding weights in steady state. With these weights, the discount factor in steady state can be obtained using $\rho = 1 + \frac{\mu_{xw} - \mu_{mw}}{\mu_{aw} - \mu_{lw}}$, $0 < \rho < 1$, as defined in Equation (5).



Notes: Top Two panels for Korea gross asset return (left) and Korea gross liability return (right); bottom panel for Korea growth rate of gross national income. Each panel shows the series, the trend component from HP filter using smoothing parameter=1600 (right-axis), and the cyclical component (left-axis). Sample: 1980:Q1-2005:Q1.

Figure 2b. Cycle and Trend Components of R^a, R^l, and W_{t+1}/W_t

Table 2 records the relevant weights and discount factor for Korea.[14] The signs of the weights indicate that Korea runs trade surpluses (μ_x, $\mu_m > 0$) in the long run, while experiencing steady state net debtor position (μ_a, $\mu_l < 0$). The discount factor in steady state is 0.975, implying that $\frac{\mu_{xw}-\mu_{mw}}{\mu_{aw}-\mu_{lw}} < 0$. This is consistent with the fact that net exports

[14] I also calculate the relevant weights relative to Korean household net worth (household assets less liabilities), based on the Flow of Funds from the Bank of Korea. The empirical results in Section 4 are robust for these measures.

and net foreign asset position are negatively correlated in the long run. Thus, I use this discount value as the benchmark for further analysis.[15]

Table 2. Estimates of Relevant Weights and Discount Factor

μ_{xw}	μ_{mw}	μ_{aw}	μ_{lw}	μ_x	μ_m	μ_a	μ_l	ρ
0.356	0.348	0.802	1.11	46.17	45.17	-2.59	-3.59	0.975

Notes: μ_{xw}, μ_{mw}, μ_{aw}, μ_{lw} are the average of the trend components of exports, imports, gross foreign assets and liabilities relative to gross national income over 1980:Q1-2005:Q1. $\mu_x, \mu_m, \mu_a, \mu_l$ are constructed according to Equation (4) and (5). The growth-adjusted discount factor $\rho = 1 + \frac{\mu_{xw} - \mu_{mw}}{\mu_{aw} - \mu_{lw}}$.

I then construct nxa and normalize it by the weight on exports ($|\mu_x|$):

$$nxa_t = \varepsilon_t^x - 0.978\varepsilon_t^m + 0.056\varepsilon_t^a - 0.078\varepsilon_t^l.$$

Figure 3 depicts the normalized external imbalance, nxa_t, for Korea over 1980:Q1 -2005:Q1. The external imbalance exhibits large volatility of 8.76% and high serial correlation of 0.655. It captures the swings in Korea's net foreign assets and net exports shown in Figure 2(b). First, we observe a positive deviation from the trend in the second half of 1980s, which was associated with a strong growth in net exports. Second, a substantial deterioration of net foreign assets as well as net exports around 1995 and 1996 drove the external imbalance far below its long-run equilibrium. Large negative external imbalances have occurred since 1995, which might be a strong indicator of the burst of the subsequent financial crisis in 1997:Q4. Third, we notice a dramatic improvement in the external accounts after 1998:Q1, as a result of the recovery from the financial crisis. The positive external imbalance has gradually fallen back to its equilibrium level and fluctuated around its equilibrium ever since.

[15] Gourinchas and Rey (2007a) use ρ =0.95 as the benchmark for the US. For comparison purpose, I also include ρ =0.95 as a robustness check. The empirical results in Section 4 are robust to various discount values between 0.94 and 0.98.

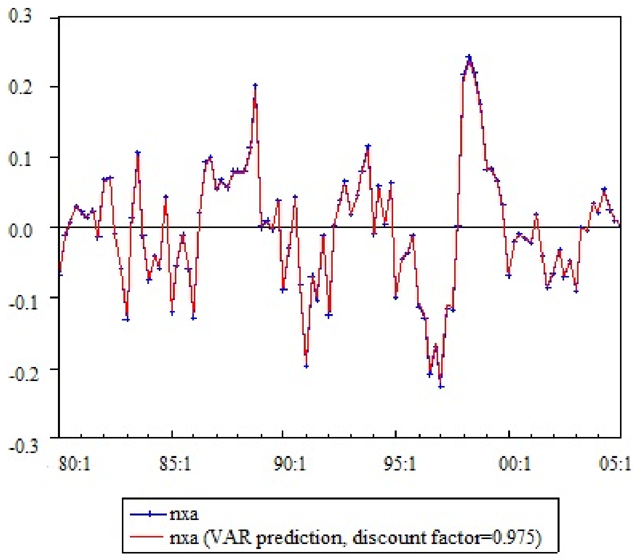


Figure 3. Korea External Imbalances *nxa*

4.2. Estimation of Valuation and Trade Channels

Now we turn to the estimation of valuation and trade channels in Korea's external adjustment. Based on the key Equation (6), the valuation and trade channels can be estimated using a reduced form VAR representation, in the spirit of Campbell and Shiller (1987):

$$\begin{bmatrix} r_t \\ \Delta nx_t \\ nxa_t \end{bmatrix} = \begin{pmatrix} c_1 \\ c_2 \\ c_3 \end{pmatrix} + \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} r_{t-1} \\ \Delta nx_{t-1} \\ nxa_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix}, \tag{9}$$

or in a compact notation,

$$z_t = c + Az_{t-1} + \varepsilon_t, \quad \text{where } z_t = (r_t, \Delta nx_t, nxa_t)'. \tag{10}$$

This can be generalized to higher orders of VAR by stacking p-th order into a first-order companion form. Then we can express the conditional expectation as,

$$E_t(\hat{z}_{t+i}) = A^i \hat{z}_t, \quad \text{where } \hat{z}_t = z_t - (I - A)^{-1} c.$$

Substituting into Equation (6), we obtain:

$$s'_{nxa}\,\hat{z}_t = -s'_r \sum_{j=1}^{+\infty} \rho^j A^j \hat{z}_t - s'_{\Delta nx} \sum_{j=1}^{+\infty} \rho^j A^j \hat{z}_t,$$

$$s'_{nxa}\,\hat{z}_t = -s'_r \rho A (I-\rho A)^{-1}\hat{z}_t - s'_{\Delta nx}\rho A(I-\rho A)^{-1}\hat{z}_t, \tag{11}$$

where s_k is an indicator column vector that selects the variable k in the vector $\hat{z}_t$. Equation (11) implies that the valuation and trade channels can be constructed as

$$nxa_t^r = -s'_r \rho A(I-\rho A)^{-1}\hat{z}_t, \quad nxa_t^{\Delta nx} = -s'_{\Delta nx}\rho A(I-\rho A)^{-1}\hat{z}_t. \tag{12}$$

According to the Akaike information criterion, I work with a VAR (1) to estimate nxa_t^r, $nxa_t^{\Delta nx}$, and $nxa_t^{predict} = nxa_t^r + nxa_t^{\Delta nx}$, using the external imbalance nxa_t, the rate of return on net foreign assets r_t, and net export growth Δnx_t. All variables are normalized by the weight on exports $|\mu_x|$, and they span the period of 1980:Q1-2005:Q1.

Figure 3 compares the actual external imbalance nxa_t with the model prediction $nxa_t^{predict}$ estimated by the VAR for the benchmark discount factor $\rho = 0.975$.[16] We observe a near perfect fit of the model prediction and the actual series. The model successfully predicts the magnitude and the direction of fluctuations in the external imbalance. This good performance of the model is confirmed by the statistical test on the cross-equation restrictions implied by Equation (11).

Specifically, Equation (11) constitutes a present value test on:

$$s'_{nxa} = -s'_r \rho A(I-\rho A)^{-1} - s'_{\Delta nx}\rho A(I-\rho A)^{-1},$$

or linearly,

$$s'_{nxa} I + (s'_r + s'_{\Delta nx} - s'_{nxa})\rho A = 0. \tag{13}$$

To test whether Equation (13) holds, I perform a Wald test, as in most of the previous literature. Table 3 presents the estimates of the left-hand side of (13), as well as the Wald statistic and its p-value. For the VAR (1) with the benchmark discount factor $\rho = 0.975$, the estimates are all close to their theoretical values of zero. With three linear restrictions (13) and over the entire sample, the Wald statistic is 0.69 and the p-value is 0.87. Thus, the unrestricted VAR satisfies the cross-equation restrictions implied by the intertemporal financial account (IFA) model. Taking into account the

[16] The results are also robust for a VAR (2) and various discount values between 0.95 and 0.99.

potential structural breaks due to the capital liberalization and the financial crisis, I also implement the test over two subsamples: 1980:Q1-1994:Q4 and 1995:Q1-2005:Q1. The present value tests are not rejected, and the results are not heavily influenced by these sample changes.

Table 3. Present Value Tests

IFA model	80:1~05:1	80:1~94:4	95:1~05:1	ICA model	80:1~05:1	80:1~94:4	95:1~05:1
R-vector				R-vector			
r	-0.08	-0.23	-0.23	no	-0.06	-0.01	-0.29
	(0.31)	(0.50)	(0.25)		(0.08)	(0.10)	(0.14)
Δnx	0.00	-0.01	0.02	Ca	0.06	-0.07	0.07
	(0.02)	(0.02)	(0.02)		(0.05)	(0.06)	(0.07)
nxa	0.01	0.02	-0.01				
	(0.02)	(0.02)	(0.01)				
Wald-stat	0.69	1.20	1.47	Wald-stat	2.10	1.14	4.70
p-value	0.87	0.75	0.69	p-value	0.35	0.57	0.10

Notes: The entire sample is 1980:Q1 to 2005:Q1; the two subsamples are 1980:Q1 to 1994:Q4 and 1995:Q1 to 2005:Q1. Present value tests use VAR(1) and $\rho = 0.975$. Robust standard errors are in parentheses. For the IFA model, i.e., the intertemporal financial account model shown in Section 2, $R \equiv s'_{nxa} I + (s'_r + s'_{\Delta nx} - s'_{nxa})\rho A$, where A is the coefficient matrix of the VAR. For the ICA model, i.e., the intertemporal current account model with a constant interest rate, $R \equiv s'_{ca} I + (s'_{no} - s'_{ca})\rho A$; no denotes log of net output (output net of investment and government purchases); Ca denotes log of net output minus log of consumption.

Given the good performance of the model prediction, next we examine the relative importance of the valuation channel nxa_t^r and the trade channel $nxa_t^{\Delta nx}$. Figure 4 portrays the decomposition of the actual external imbalance nxa_t into the two channels nxa_t^r and $nxa_t^{\Delta nx}$, estimated according to Equation (12) for the benchmark discount factor $\rho = 0.975$. It reveals a different picture than that of the US. First, the trade channel closely tracks the swings in the actual external imbalance in Korea, such as the boom in the second half of the 1980s and the deterioration around 1997. The differences between the two series are small in magnitude. Second, the movements in the valuation channel are much smaller in magnitude than those of the actual external imbalance. Furthermore, the trade channel and the valuation channel co-move positively, suggesting that the valuation channel contributes minimally to stabilizing the external balance. Most of the restoring adjustment is governed by the trade channel in Korea.

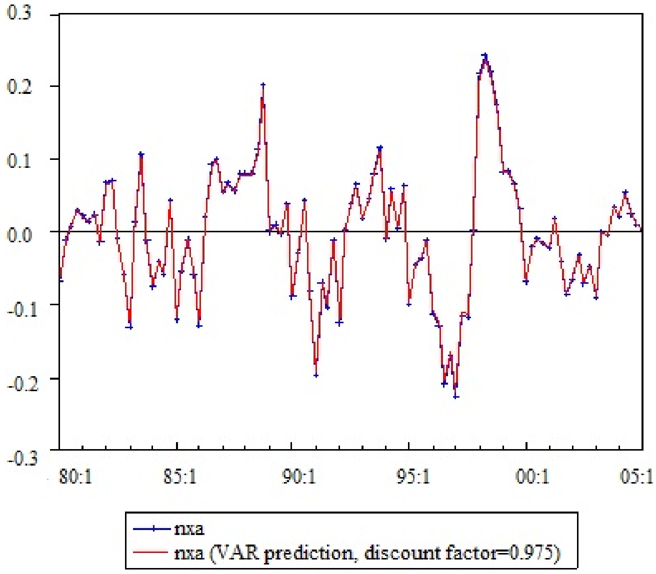


Figure 4. Korea Valuation and Trade Channels

For a closer look at the relative importance of the two channels, I decompose the variance of the actual external imbalance nxa_t into the variances of the two channels nxa_t^r and $nxa_t^{\Delta nx}$. Since nxa_t^r and $nxa_t^{\Delta nx}$ are correlated, the variance decomposition is not unique. Following Gourinchas and Rey, I implement the decomposition as follows. From the key Equation (6),

$$\mathrm{var}(nxa_t) = \mathrm{cov}(nxa_t, nxa_t^{predict}) = \mathrm{cov}(nxa_t, nxa_t^r) + \mathrm{cov}(nxa_t, nxa_t^{\Delta nx}),$$

equivalently,

$$1 = \frac{\mathrm{cov}(nxa_t, nxa_t^{predict})}{\mathrm{var}(nxa_t)} = \frac{\mathrm{cov}(nxa_t, nxa_t^r)}{\mathrm{var}(nxa_t)} + \frac{\mathrm{cov}(nxa_t, nxa_t^{\Delta nx})}{\mathrm{var}(nxa_t)} \equiv \beta_r + \beta_{\Delta nx}. \tag{14}$$

The terms $\mathrm{cov}(nxa_t, nxa^r)/\mathrm{var}(nxa_t)$ and $\mathrm{cov}(nxa_t, nxa^{\Delta nx})/\mathrm{var}(nxa_t)$ are estimated as the OLS regression coefficients of nxa_t^r and $nxa_t^{\Delta nx}$ on nxa_t independently. As Gourinchas and Rey emphasize, the sum of β_r and $\beta_{\Delta nx}$ can differ from 1 if the volatility of the $nxa_t^{predict}$ relative to that of the actual nxa_t differs from the theoretical value of unity. Table 4 reports the estimated coefficients, β_r and $\beta_{\Delta nx}$, as well as the relative volatility of $nxa_t^{predict}$ to nxa_t ($\sigma_{nxa^{predict}} / \sigma_{nxa}$) for various discount values. It reveals the relative importance of the two channels and illustrates how well the model prediction captures the fluctuations in the data.

Table 4. Variance Decomposition of nxa_t for Various Discount Values

	Discount Factor (ρ)				benchmark
	0.94	0.95	0.96	0.98	0.975
$\beta_{\Delta nx}$ (%)	84.06	86.34	88.69	93.62	92.36
β_r (%)	4.38	4.51	4.64	4.92	4.85
Total of β (%)	88.44	90.85	93.33	98.54	97.20
$\beta_{\Delta nx} / \beta_r$	19.18	19.15	19.11	19.03	19.05
$\sigma_{nxa^{predict}} / \sigma_{nxa}$ (%)	88.45	90.85	93.33	98.54	97.20

Note: Sample is 1980:Q1 to 2005Q1.

For the benchmark value $\rho = 0.975$, the valuation channel nxa_t^r and the trade channel $nxa_t^{\Delta nx}$ account for 4.9% and 92.4% of the variance of the actual external imbalance nxa_t, respectively. The sum of the two components explains about 97.2% of the fluctuations in the actual external imbalance. With different discount values ρ between 0.94 and 0.98, the variance of nxa_t explained by the valuation channel ranges from 4.4% to 4.9 %, while the trade channel ranging from 84.1% to 93.6%, about 19 times larger.

These results are quite interesting and have important implications for the intertemporal current account (ICA) literature. The conventional ICA model implies that the current account should incorporate all relevant information necessary to forecast net output changes.[17] However, many previous present value tests on the conventional ICA model are rejected by the data for the US, the UK, and Canada, mainly because the model fails to capture the volatile current account behavior.[18] Most recent literature has augmented the basic model to incorporate other variables or assumptions to generate

[17] Net output is output minus investment and government purchases.

[18] See Sheffrin and Woo (1990) for Canada and the UK, Otto (1992) for Canada and the US, Ghosh (1995) for Canada and the UK, and Obstfeld and Rogoff (1996) for a summary of the intertemporal current account literature.

more volatility.[19]

Given the fact that the trade channel substantially helps restore external balance in Korea, the conventional ICA model may also fit well for Korea. To address this question, I implement present value tests on the ICA model as in Sheffrin and Woo (1990) using the Korean current account and net output data. The results are reported in Table 3 to compare with the intertemporal financial account (IFA) model. For Korea, the ICA model is not rejected in the Wald test over 1980:Q1-2005:Q1, with a p-value of 0.35 for the discount value of 0.975. This result is also robust to the two subsamples, 1980:Q1-1994:Q4 and 1995:Q1-2005:Q1. Thus, the cross-equation restrictions implied by the ICA model are satisfied even after allowing for the potential structural breaks. Figure 5 illustrates Korea's current account and its forecast series based on the ICA model. We note that the predicted series generally track the fluctuations in the actual series of the current account. It is quite remarkable that the ICA model performs so well for Korea, consistent with the fact that most of the external adjustment is governed by the trade channel rather than the valuation channel in Korea.

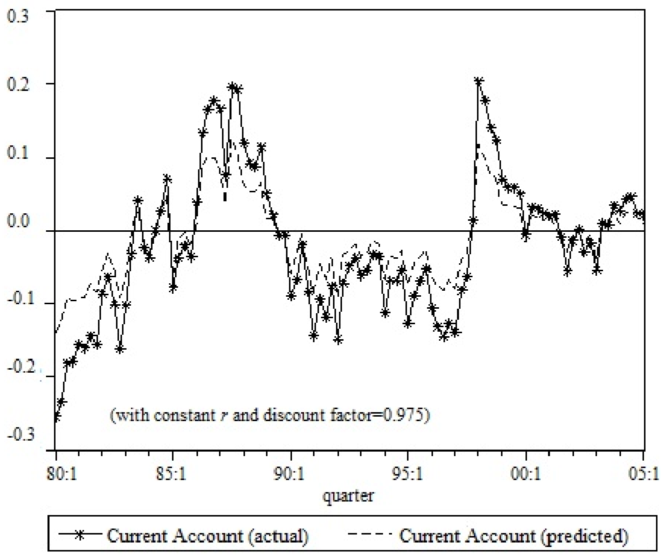


Figure 5. Korea Intertemporal Current Account Model

Furthermore, these findings accord well with the view of Obstfeld and Rogoff (2005a,b) regarding current account sustainability. Obstfeld and Rogoff (2005b)

[19] See Bergin and Sheffrin (2000), Gruber (2004), and Nason and Rogers (2006).

emphasize that a narrowing of global current account imbalances must ultimately be achieved via more balanced trade, because trade accounts represent the largest part of the current account. Their views are consistent with the survey by Edwards (2004) concerning current account reversals in emerging markets. As the current account restores balance, the level of trade largely determines the magnitude of the requisite exchange rate adjustments. In addition, Rey (2006) and Bahmani-Oskooee *et al*. (2012) provide further evidence of a significant relationship between trade and exchange rate adjustments at the country level and the industry level, respectively.

4.3. Predictability of Returns, Exchange Rates and Net Exports

As we show in Section 2, the key Equation (6) has important implications for forecasting. The external imbalance nxa_t should predict future net foreign portfolio returns, future net export growth, or both. Since exchange rates influence both portfolio returns and net exports, external imbalances should also help predict exchange rates. This section explores whether asset returns, exchange rates, and net exports are predictable, which components of nxa_t contribute to the predictive ability, and at what horizons they operate.

4.3.1. Short-Horizon Forecast

To investigate the short-run forecasting power of external imbalance nxa for future net foreign portfolio returns r and exchange rate movements Δe, I estimate the following regression, as in Gourinchas and Rey (2007a):

$$y_t = \alpha + \beta nxa_{t-1} + \gamma F_{t-1} + v_t, \tag{15}$$

where y_t represents r_t or Δe_t, and F_t includes other control variables that may contain predictive power.

Table 5 Panels A-C present the main results of the short-horizon forecast, revealing the predictive ability of the external imbalance nxa. Panel A suggests that the external imbalance nxa exhibits significant predictive power for the net foreign portfolio return r one quarter ahead. The negative sign of the coefficient implies that with current trade deficits or net debt positions below equilibrium, external balances can be restored through higher future net foreign asset returns, in line with the intuition of Equation (6). The predictive power is economically large. A one-standard deviation increase in the external imbalance nxa predicts a 560 basis-point decline in the net foreign portfolio return next quarter.

Table 5. Short-run Forecast of Quarterly Portfolio Returns

	Panel A: Real Rate of Return on Net Foreign Assets			Panel B: Equity Excess Return		
Regression #	(1)	(2)	(3)	(1)	(2)	(3)
nxa_{t-1}	-0.64**			-0.77**		
(s.e)	(0.18)			(0.20)		
xm_{t-1}		-0.67**	-0.65**		-0.78**	-0.73**
		(0.18)	(0.20)		(0.21)	(0.21)
al_{t-1}			-0.03			-0.08
			(0.08)			(0.09)
$\overline{R}^2$	0.09	0.09	0.08	0.12	0.11	0.11

Panel C: FDI-weighted depreciation rate Δe_t

Regression #	(1)	(2)	(3)	(4)	(5)	(6)	(7)
nxa_{t-1}	-0.23**				-0.21**		
(s.e)	(0.07)				(0.07)		
xm_{t-1}		-0.23**	-0.21**			-0.23**	-0.21**
		(0.07)	(0.07)			(0.07)	(0.07)
al_{t-1}			-0.04				-0.04
			(0.03)				(0.03)
$i_{t-1} - i_{t-1}^*$				0.46	0.67	0.47	0.43
				(0.64)	(0.63)	(0.61)	(0.62)
$\overline{R}^2$	0.09	0.08	0.08	0.00	0.09	0.08	0.08

Notes: Sample is 1980:Q1 to 2005:Q1. The regression is $y_t = \alpha + \beta nxa_{t-1} + \gamma F_{t-1} + v_t$, where y_t is the total real rate of return on net foreign asset (r_t) in Panel A, the equity excess return ($r_t^{ae} - r_t^{le}$) in Panel B, and FDI-weighted depreciation rate (Δe_t) in Panel C. Constant terms in the regressions are suppressed in the tables. Robust standard errors are in parentheses. * (**) indicates the estimated coefficient is significant at the 5% (1%) significance level.

To further assess the relative importance of trade and valuation channels in forecasting, I use nxa 's cyclical components xm and al as regressors instead. Define $xm_t = \varepsilon_t^x - \varepsilon_t^m$ and $al_t = \varepsilon_t^a - \varepsilon_t^l$. Neither xm nor al contain the possible measurement errors in the weights μ_x, μ_m, μ_a and μ_l. The trade component xm represents the deviation of net exports from the trend. It embeds information about the trade accounts, but little about the portfolio positions. In contrast, al, the deviation of net foreign assets from the trend is mainly associated with the portfolio positions. For Korea with dominant trade adjustments, the predictive power of external imbalance nxa should be driven by its trade component (xm), rather than its asset component (al).

We note that the coefficient of the trade component xm is -0.67 and the adjusted $\overline{R}^2$ is 0.09, close to those for the external imbalance nxa. Also, including the asset component al does not affect the predictive power of the trade component. The trade component dominates the asset component in forecasting the rate of return on net foreign assets at short horizons. This is consistent with our previous finding of strong trade adjustments in Korea.

The results are robust for the addition of the lagged net portfolio return, domestic and weighted foreign dividend-price ratios,[20] domestic output growth, and oil price changes. They contain little forecasting power for the net foreign portfolio return one quarter ahead.[21]

Further investigation pertains to how well our preceding results hold for other measures of portfolio returns. Since the degree of leverage of the net foreign portfolio may be mismeasured, I also consider several partial but less noisy alternatives, as in Gourinchas and Rey (2007a): the excess equity return (equity asset returns less equity liability returns $r^{ae} - r^{le}$) in Panel B. We observe similar results: the external imbalance also reveals strong forecasting power for the alternative measure of portfolio returns one quarter ahead. The coefficients bear the predictive signs implied by the key Equation (6). As expected, the deviation of net exports from the trend xm accounts for substantial predictive power of nxa, while the deviation of net foreign assets from the trend al contributes little. Similar results in Panels A and B also indicates that the degree of leverage of the net foreign portfolio, μ_a and μ_l, are well measured.

Given the predictability of foreign portfolio returns, we next ask whether the predictability comes from the rate of depreciation Δe_t, because the exchange rate is one of the most influential factors in foreign portfolio returns. I focus on the financially-weighted nominal exchange rate, constructed using the time-varying country weights for Korea's direct investments abroad.[22] Panel C of Table 5 reports the estimates for the exchange rate predictability one quarter ahead.

We note that the coefficient on the lagged external imbalance nxa_{t-1} is statistically significant and exhibits a negative sign. This is interesting because for Korea with a net debt position ($|\mu_a| < |\mu_l|$), Equations (6) and (8) imply that the external imbalance nxa and the rate of depreciation Δe should be positively correlated. This means a large negative external imbalance predicts a subsequent appreciation of domestic currency to

[20] The weighted foreign dividend price ratio is constructed as the weighted average of dividend yield over seven major markets: the US, the UK, Germany, France, Japan, Hong Kong, and Canada, with the weights reflecting Korea's equity asset holdings in these markets.

[21] Results for the robustness check are not reported due to space constraints and are available upon request.

[22] I also use time-varying country weights for Korea's debt assets to construct the financially-weighted exchange rate. The forecasting results are robust to this alternative definition.

help mitigate the burden of foreign-currency denominated debt and hence to increase the value of net foreign assets. On the other hand, a large negative external imbalance can also be restored by future net export growth. This trade adjustment, however, requires the home currency to depreciate. As the trade channel dominates the asset valuation channel in Korea, the sign of the exchange rate effect is then determined by the trade channel. This contrasts with the US, wherein the dollar depreciation following a large negative external imbalance can improve both its net foreign asset position and net exports (Gourinchas and Rey, 2007a).

Furthermore, the predictive power of the external imbalance nxa for the financially-weighted exchange rate is driven by its trade component (xm), confirming our preceding findings. The results are robust for the addition of the lagged exchange rate and three-month interest rate differential ($i - i^*$), where the foreign interest rate i_t^* is constructed using the time-varying weights for Korea's short-term bond holdings.

4.3.2. Long-Horizon Forecast

According to Equation (6), the external imbalance nxa should have predictive power on any combination of net foreign asset returns r and net export growth Δnx at long horizons. We want to investigate how the predictive ability of nxa varies over different horizons and at what horizons the valuation and trade channels operate.

Following Gourinchas and Rey, I regress h-horizon average returns (net export growth, or exchange rate changes), $y_{t,h} = (\sum_{i=0}^{h-1} y_{t+i})/h$, on the lagged external imbalance nxa_{t-1}, along with other control variables F_{t-1}:

$$y_{t+k} = \alpha + \beta nxa_{t-1} + \gamma F_{t-1} + v_t. \tag{16}$$

As a sensitivity analysis, I also use nxa's cyclical components xm and al as regressors, along with other control variables:

$$y_{t+k} = \alpha + \beta_1 xm_{t-1} + \beta_2 al_{t-1} + \gamma F_{t-1} + v_t. \tag{17}$$

Table 6 Panels A-C summarize the results for the long-horizon forecast in regressions (16) and (17) between one to 20 quarters. I compare the coefficients of the lagged external imbalance nxa_{t-1} and the lagged deviation of net exports from the trend xm_{t-1} to find out how the trade component of the external imbalance performs over time. In addition, the adjusted $\overline{R}^2(1)$ and $\overline{R}^2(2)$ describe the explanatory power of regressions (16) and (17), respectively, suggesting how the forecasting power of valuation and trade channels evolves over various horizons.

Table 6. Long Horizon Forecast

Panel A: Dependent variable: Real rate of return on net foreign assets ($r_{t,h}$)

	Forecasting Horizons *h* (quarters)							
	1	2	3	4	8	12	16	20
nxa_{t-1}	-0.64**	-0.67**	-0.69**	-0.59**	-0.15	0.04	0.02	-0.00
(s.e)	(0.18)	(0.17)	(0.17)	(0.15)	(0.12)	(0.07)	(0.08)	(0.06)
$\overline{R}^2$ (1)	0.09	0..20	0.29	0.25	0.02	0.00	-0.01	-0.01
xm_{t-1}	-0.65**	-0.71**	-0.74**	-0.66**	-0.23	-0.02	-0.05	-0.04
(s.e)	(0.20)	(0.17)	(0.16)	(0.14)	(0.11)	(0.06)	(0.07)	(0.05)
$\overline{R}^2$ (2)	0.08	0.20	0.30	0.26	0.06	0.02	0.06	0.00

Panel B: Dependent variable: Net Export growth ($\Delta nx_{t,h}$)

	Forecasting Horizons *h* (quarters)							
	1	2	3	4	8	12	16	20
nxa_{t-1}	-15.94**	-12.63**	-11.12**	-9.39**	-7.34**	-4.69**	-2.88**	-1.31**
(s.e)	(3.71)	(2.48)	(1.78)	(1.76)	(0.77)	(0.41)	(0.30)	(0.36)
$\overline{R}^2$ (1)	0.19	0.30	0.40	0.43	0.68	0.64	0.48	0.26
xm_{t-1}	-14.51**	-11.56**	-10.12**	-8.68**	-6.77**	-4.46**	-3.42**	-1.72**
(s.e)	(3.85)	(2.30)	(1.41)	(1.40)	(0.66)	(0.42)	(0.26)	(0.32)
$\overline{R}^2$ (2)	0.19	0.30	0.40	0.44	0.68	0.64	0.58	0.39

Panel C: Dependent variable: FDI-weighted depreciation rate ($\Delta e_{t,h}$)

	Forecasting Horizons *h* (quarters)							
	1	2	3	4	8	12	16	20
nxa_{t-1}	-0.23**	-0.29**	-0.24**	-0.21**	-0.12**	-0.05**	-0.03*	-0.02
(s.e)	(0.06)	(0.05)	(0.06)	(0.06)	(0.04)	(0.02)	(0.02)	(0.02)
$\overline{R}^2$ (1)	0.09	0.20	0.35	0.36	0.24	0.07	0.03	0.03
xm_{t-1}	-0.21**	-0.21**	-0.23**	-0.21**	-0.12**	-0.06**	-0.04*	-0.03
(s.e)	(0.05)	(0.04)	(0.05)	(0.05)	(0.03)	(0.02)	(0.02)	(0.02)
$\overline{R}^2$ (2)	0.08	0.20	0.34	0.35	0.24	0.06	0.03	0.03

Notes: Sample period 1980:Q1 to 2005:Q1. The first block of each panel presents the regression $y_{t+k} = \alpha + \beta nxa_{t-1} + \gamma F_{t-1} + v_t$. The second block presents the regression $y_{t+k} = \alpha + \beta_1 xm_{t-1} + \beta_2 al_{t-1} + \gamma F_{t-1} + v_t$, but only reports the coefficients on xm_{t-1} . y_t is the total real rate of return on net foreign asset (r_t) in Panel A, the equity excess return ($r_t^{ae} - r_t^{le}$) in Panel B, and FDI-weighted depreciation rate (Δe_t) in Panel C. Newey-West Robust standard errors are in parentheses. * (**) indicates the estimated coefficient is significant at the 5% (1%) significance level.

From Panel A for the real rate of return on net foreign assets, we observe that the coefficient on nxa_{t-1} enters with the predicted negative sign and remains significant between one to four quarters, but tapers off after eight quarters. The coefficient on xm_{t-1} is close to that on nxa_{t-1}, implying that the forecasting power of the external imbalance mainly arises from the deviations of net exports from the trend. The adjusted $\overline{R}^2(1)$ reaches a maximum of 0.29 at a three-quarter horizon, and then declines to zero at 12 quarters. The adjusted $\overline{R}^2(2)$ from the regression using xm and al shows a similar pattern. These findings indicate that the valuation adjustment via asset returns works best at short horizons (three quarters) and diminishes after two years.

Interestingly, Panel B for net export growth illustrates a different picture. Both $\overline{R}^2(1)$ and $\overline{R}^2(2)$ achieve a maximum of 0.68 at eight quarters. It is suggested that the trade adjustment through net export growth operates best at long horizons (two years and more). This accords with the well-known J-curve effect of net exports, which indicates the delayed response of net exports to home currency depreciations (e.g., Magee, 1973; Bahmani-Oskooee, 1985).[23] Moreover, comparing the magnitude of coefficients and $\overline{R}^2$ in Panels A and B indicates that the trade adjustment dominates the valuation adjustment throughout all horizons, especially at longer horizons.

Finally, we turn to the financially-weighted exchange rate in Panel C. Since the exchange rate affects both rates of return and net export growth, it should be predictable at short, medium and long horizons. The $\overline{R}^2(1)$ achieves a maximum of 0.36 at four to five quarters, in between that of rates of return (three quarters) and net export growth (eight quarters). Similar to the previous findings, the deviation of net exports from the trend accounts for most of the forecasting power of the external imbalance for exchange rate movements.

This long-run exercise reveals how the valuation and trade channels in Korea interact with each other through the link of exchange rates over time. At horizons shorter than two years, the transmission mechanism of the exchange rate can occur through asset returns. Nonetheless, the exchange rate mainly works by impacting relative prices of goods throughout all horizons. This expenditure-switching mechanism in goods trade is of importance, and current account sustainability would largely count on trade adjustment in Korea.

[23] For relevant work on the J-curve phenomenon, see Bahmani-Oskooee and Brooks (1999), Bahmani-Oskooee and Kantipong (2001), Bahmani-Oskooee and Goswami (2003), Bahmani-Oskooee and Ratha (2004a), Bahmani-Oskooee *et al*. (2005), Bahmani-Oskooee *et al*. (2006), Bahmani-Oskooee *et al*. (2008), and Bahmani-Oskooee and Cheema (2009) among others. Bahmani-Oskooee and Ratha (2004b) provide a comprehensive literature review on testing the J-curve.

5. CONCLUSION

While recent research has found evidence of large stabilizing valuation effects for the US, this paper points to South Korea as a different case of an economy with liability dollarization. The pivotal difference pertains to the currency composition of external assets and liabilities.

For South Korea, this paper demonstrates that asset valuation adjustment is positively correlated with trade adjustment, and hence it contributes minimally to stabilizing external balance. Meanwhile, the exchange rate works through asset returns to increase the external disequilibrium. For instance, a negative shock to the current account leads to a depreciation of home currency in the short run. This depreciation lowers the rates of return on net foreign assets and worsens the current account. To restore external balance, strong net export growth is needed.

Furthermore, this paper uses a new dataset for Korea to test both the intertemporal financial account model (IFA) and the conventional intertemporal current account model (ICA). The IFA model builds on an intertemporal budget constraint and allows for variable asset returns, while the ICA model impose strong assumptions on consumer preferences and these might be rejected by the data. In this respect, the IFA model is more general. It is quite remarkable that both tests are not rejected by the Korean data. The fact that trade effects account for most of the external adjustment is potentially consistent with the good performance of the ICA model for Korea. This result suggests that the currency composition of the external portfolio and the patterns of valuation and trade adjustments may play an important role in the intertemporal models of external adjustment.

Our findings also point to the importance of current account sustainability through trade adjustment in an economy with liability dollarization. Current account balances are still relevant, even after allowing for asset revaluations in external adjustment. Meanwhile, deviations from the trend of net exports contain most of the information necessary to forecast returns on the external portfolio, exchange rate movements and net export growth. This result reveals that the trade imbalance is a strong indicator for ensuing economic fluctuations. For policy purposes, current account sustainability should remain noteworthy.

Another policy implication of external adjustment concerns the transmission mechanism of monetary policy. For an economy with liability dollarization, monetary policy working through impacts on asset returns tends to be destabilizing. Monetary authorities need to rely on affecting relative prices of goods (home goods relative to foreign goods, traded goods relative to non-traded goods). This would be much easier to handle than through financial markets and would generate less destabilizing effects on market expectations (Obstfeld 2004). Recently, US and European central banks have implemented quantitative easing policies through asset-buying to boost the economy after the recent global financial and debt crises. Both the US and major European countries whose currencies are key currencies do not suffer from severe liability dollarization. Massive liquidity injections could be effective in unfreezing credit markets and arrested the worst of the crisis in a short period of time in these countries. However, this might not be the case for Japan, which bears dollarized liabilities. Japan has been encountering deflation for more than a decade. With the goal of beating deflation and stabilizing the domestic economy, the Bank of Japan has recently carried out a more aggressive monetary easing policy through its asset-buying and loan program, in addition to zero interest rates. This has been followed by a sharp depreciation of yen. Given that Japan is a net creditor with sizable foreign assets and liabilities denominated in foreign currencies and therefore subject to exchange rate fluctuations, the valuation effects of the depreciation of yen would slightly increase rates of return on the net foreign portfolio, but the impacts would be limited. [24] Meanwhile, this monetary easing policy through impacts on financial markets tends to have destabilizing effects on market expectations. Therefore, policies that address deeper structural problems in the economy such as the rapidly aging population or the hollowing out of the manufacturing sector are essential to boost the domestic economy.

Although this empirical investigation helps explain several features of external adjustment, it takes as a given the currency composition of the external portfolio. It leaves open the underlying mechanism that drives agents' optimal portfolio choices. One major challenge for future research on models of external adjustment concerns endogenizing this optimizing behavior. In addition, the methodology we apply allows for the persistent non-zero trend of the net foreign asset position and the trade balance, but it would be meaningful to examine the determinants of long-run equilibria of these external accounts from a theoretical perspective in future work.

APPENDIX

Data Sources and Construction Methodology

Data on Korea net and gross external asset and liability positions are available from the International Financial Statistics (IFS) and the Bank of Korea (BOK) on a yearly basis since 1980. As in IFS, I classify external assets as Direct Investment (outward), Portfolio Investment (equity securities, debt securities), Other Investment (trade credits, loans, etc.), and Reserve Assets. Symmetrically, external liabilities include Direct

[24] Japan’s net foreign asset positions have been positive since 1970, except for the period of 1979-1992 (Source: the World Bank). According to Lane and Shambaugh (2009), about 73 percent of foreign assets were denominated in foreign currencies, while roughly 50 percent of foreign liabilities were in foreign currencies during the period of 1990-2004.

Investment (inward), Portfolio Investment (equity securities, debt securities), and Other Investment.

I construct the quarterly external asset and liability positions, following the methodology of Gourinchas and Rey (2007b). I interpolate the end of year international investment position (IIP) data, using the quarterly flows of the financial account and the estimates of quarterly valuation changes.

The updating process for some asset or liability Z is then given by

$$Z_t = Z_{t-1} + FZ_{q,t} + VZ_{q,t},$$

where Z_t denotes the end of period t position, $FZ_{q,t}$ represents the quarterly flow of financial transactions for asset Z reported in the Balance of Payments (BOP), and $VZ_{q,t}$ reflects market valuation changes or a change of coverage during the quarter. The variation of the asset position from one period to another reflects flows of financial transactions and reserve assets in the BOP, and valuation changes due to price and exchange rate fluctuations and other adjustments during the period. $VZ_{q,t}$ can be estimated by $r^z_{q,t} Z_{q,t}$, where $r^z_{q,t}$ is the quarterly rate of return (measured in the Korean won) on asset Z between period t and $t-1$.

For Korea, both foreign assets and liabilities are denominated in foreign currencies and therefore are subject to exchange rate fluctuations. The total real rate of return on the net foreign portfolio measured in domestic currency is defined as:

$$r_t = |\mu_a| \tilde{r}_t^a - |\mu_l| \tilde{r}_t^l + |\mu_a| \Delta e_t^a - |\mu_l| \Delta e_t^l - \pi_t,$$

where r_t is the gross rate of return on the net foreign portfolio in real domestic terms, $\tilde{r}_t^a$ and $\tilde{r}_t^l$ denote the gross nominal rates of return on foreign assets and liabilities in local currency, μ_a and μ_l are the weights on foreign assets and liabilities, respectively, Δe_t^a and Δe_t^l are exchange rate depreciations constructed using the currency compositions of foreign assets and liabilities, respectively. Returns are adjusted for domestic inflation π_t.

As in Gourinchas and Rey (2007b), the gross nominal rates of return on foreign assets ($\tilde{r}_t^a$) and liabilities ($\tilde{r}_t^l$) in local currency are constructed as the weighted averages of four subcomponents:

$$\tilde{r}_t^a = \mu_t^{af} r_t^{af} + \mu_t^{ae} r_t^{ae} + \mu_t^{ad} r_t^{ad} + \mu_t^{ao} r_t^{ao},$$
$$\tilde{r}_t^l = \mu_t^{lf} r_t^{lf} + \mu_t^{le} r_t^{le} + \mu_t^{ld} r_t^{ld} + \mu_t^{lo} r_t^{lo},$$

where r_t^{af}, r_t^{ae}, r_t^{ad}, and r_t^{ao} are the gross nominal rates of return on direct investment, equity, debt and other investment on the asset side, μ_t^{af}, μ_t^{ae}, μ_t^{ad}, and μ_t^{ao} are the corresponding weights. Notations for the liability side are symmetric. For outward direct investment, I use the weighted average of total returns on the stock market indices in major countries, with weights reflecting Korea foreign direct investment in each country. For inward direct investment, I use the total returns on Korea stock market. Similarly, the return on equity assets is the weighted average of total returns on the major stock market indices, while the country weights are constructed according to Korea's holdings of foreign equities in these stock markets. The total returns on debt assets and liabilities are the weighted averages of total quarterly returns on 10-year government bonds and the three-month interest rates on government bills, allowing for different currency weights and maturity structures of debt assets and liabilities, respectively. Finally, I use three-month interest rates to compute the total returns on 'other investment' of assets and liabilities.

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