E C O N O M I C S B U L L E T I N

Capital Flow, Nontradable Consumption and Home Bias

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Abstract

This paper analyzes the relationship between net capital flow and home bias puzzle. The model suggests that both capital inflow and potential preference in home assets lead agents to allocate more in domestic and thus creates home bias phenomenon. Besides, the more nontradable consumption, the fewer portfolios would be allocated in home assets. It is controversial with nontradable goods theorem.

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1. Introduction

In international financial market, there exists one interesting phenomenon that domestic investors usually prefer to invest in home assets rather than in foreign assets. This peculiar phenomenon is referred to as "home bias puzzle". In the earlier 20th century, economists point that home bias puzzle might be due to international trade barriers or finance restrictions, such as tariffs, quotas or some limitations of capital mobility. However, this puzzle is still prevalent in the contemporary international financial market.

Kang and Stulz (1997) had suggested that both explicit barriers[1] and implicit barriers[2] might lead investors to allocate more in home assets but the explicit barriers did not explain well so far. Hence we plan to start this paper from the aspect of implicit barriers and try to emphasize investors' subjective prejudice in favor of their familiar home assets. We introduce the term of "propensity to home asset" into our utility setup to elucidate the potential preference in home assets.

In addition to focusing on the preference in domestic assets, we find out another interesting phenomenon that what matters on home bias puzzle might be a country's "net capital flow." Therefore we try to link the relationship between home bias puzzle and net capital flow in this paper as well. Table I reports the empirical relationship between net capital flow and home bias. It seems like that the more net capital flow; the more home bias puzzle exists.

[INSERT TABLE I ABOUT HERE]

Baxter, Jermann and King (1998) introduced nontraded goods and factors for explaining home bias puzzle but the nontradable goods theorem seemed like not perform well in their empirical results. Pesenti and Wincoop (1999) calculated the degree of home bias puzzle in many countries. Lewis (1999) linked the relationship between equity home bias and international consumption home bias and concluded home bias puzzle is closely related to consumption growth rate and risk sharing. Obstfeld and Rogoff (2000) applied transaction cost theorem to explain the puzzle and demonstrated why nontradables goods theorem could not have the excellent performance.

2. Theoretical Model

[1] Explicit barriers mainly include international trade barriers and finance restrictions mentioned above.
[2] Implicit barriers incorporate information asymmetry, political risk, legal institution, culture difference, and resident belief etc.

2.1 Model Setup and Solutions

Suppose the home country representative agent faces the following maximization problem in time t :

$$\underset{C_t^N, C_t^T, x_t}{Max}\ U(C_t^N, C_t^T, x_t)$$

$$s.t.\quad P_t Y_t + A_t R_t = P_t C_t^N + e_t P_t^* C_t^T + A_{t+1}$$

$$R_t = 1 + x_t r_t + (1 - x_t)(r_t^* + \dot{e}_t)$$

Where C_t^N and C_t^T present the nontradable consumption and tradable consumption respectively. Y_t and A_t present the income and asset-holding for investment. P_t, P_t^* and e_t present the domestic prices, foreign prices and relative exchange rate, respectively. $\dot{e}_t$ denotes the change rate of exchange rate. r_t and r_t^* denote the domestic asset rate of return and foreign asset rate of return respectively. x_t presents the portfolio investing in domestic assets. R_t presents the gross return. Finally, subscript, t presents in time t .

The discrete Bellman equation could be written as follows and where $V(\cdot)$ presents the value function. β denotes the personal subjective discount factor.

$$V(A_t, Y_t, P_t, e_t) = \max_{\{C_t^N, C_t^T, x_t\}} \{U(C_t^N, C_t^T, x_t) + \beta V(A_{t+1}, Y_{t+1}, P_{t+1}, e_{t+1})\} \qquad (1)$$

$$A_{t+1} = P_t Y_t + A_t R_t - P_t C_t^N - e_t P_t^* C_t^T \qquad (2)$$

For further explicit analysis, assume the utility function is Cobb-Douglas type and homogeneous with degree one and a function $f(x_t)$ as the potential **"**propensity to home asset**"**.

$$U(C_t^N, C_t^T, x_t) = \delta (C_t^N)^{\alpha} (C_t^T)^{1-\alpha} (1 + f(x_t)) \qquad (3)$$

Where α denotes the representative agent's preference in nontradable consumption and δ controls the magnitude of utility.

The Euler equations imply that the optimal home portfolio could be solved as follows:

$$x_{t+1} = \frac{\dfrac{\beta^{-1}(1+\theta_t)^{1-\alpha}(1+\pi_t)^{\alpha}[1+f(x_t)]}{1+f(x_{t+1})} - 1 - (r_{t+1}^* + \theta_{t+1})}{r_{t+1} - r_{t+1}^* - \theta_{t+1}} \qquad (4)$$

where inflation rate: $\pi_{t-1} \equiv \frac{P_t - P_{t-1}}{P_{t-1}}$ and change rate of exchange rate: $\theta_{t-1} \equiv \frac{e_t - e_{t-1}}{e_{t-1}}$.

2.2 Capital Account and Capital Flow

Revisiting our budget constraint in section 2.1, it could be decomposed as:

$$[P_t Y_t + r_t x_t A_t - (x_{t+1}A_{t+1} - x_t A_t) - P_t C_t^N - e_t P_t^* C_t^T] + (r_t^* + \dot{e}_t)(1 - x_t)A_t = (1 - x_{t+1})A_{t+1} - (1 - x_t)A_t$$

The definition of net capital flow is the initial net foreign asset holding subtracting from the terminal net foreign asset holding. The capital account runs deficit if there exists net capital inflow and vice versa. Replacing the optimal portfolio solution into the definition of capital account (denoted as KA), we have:

$$KA \equiv (1 - x_{t+1})A_{t+1} - (1 - x_t)A_t = KA(r_t - \bar{r}_t^* - \theta_t, \cdots)$$

Assuming the total investment is positive, the net capital flow and capital account will run in opposite direction and thus we note a "minus" sign above $r_t - r_t^* - \theta_t$.

3. Utility Forms and Static Comparative

For clear and brief analysis, we assume that the optimal portfolio choice is bounded between zero and one and illustrate only the net capital flow running in deficit case.

3.1.1 Traditional Utility (Without Propensity to Home Assets)

Traditional utility without propensity to home assets implies that $f(x_t)$ is negligible; thus we have the optimal home portfolio solution as:

$$x_t = \frac{\beta^{-1}(1 + \theta_{t-1})^{1-\alpha}(1 + \pi_{t-1})^{\alpha} - 1 - (r_t^* + \theta_t)}{r_t - r_t^* - \theta_t} \tag{5}$$

3.1.2 Static Comparative

According to equation (5), the optimal home portfolio is a function of some important "rates" and we summarize its static comparative[3] as follows:(where above "plus" sign denotes positive correlation between the corresponding variable and home portfolio, and vice versa.)

$$x_t = x(\bar{\alpha}, \overset{+}{\beta}, \bar{\theta}_{t-1}, \overset{+}{\theta}_t, \bar{\pi}_{t-1}, \overset{+}{r}_t, \overset{+}{r}_t^*) \tag{6}$$

Equation (6) tells that there might exist more home bias puzzle if:

(A) Agents prefer tradable consumptions more than nontradable consumptions. It is consistent with Baxter, Jerman and King (1998) that less nontradable consumptions makes agents to hold more home assets.

[3] To save space, the detail of static comparative calculation is omitted here and could be upon request.

(B) Agents have higher discount factor.
(C) Home currency appreciated in last period.
(D) Expected home currency to depreciate in this period.
(E) Lower domestic inflation rate.
(F) Higher expected domestic and foreign assets rates of return.

3.2.1 Prefer-Home-Asset Utility (With Propensity to Home Assets)

Imaging some potential motives makes people prefer home assets rather than foreign assets; for instance, domestic agents usually familiar with domestic financial system transaction customs would be like to invest in home assets which they are familiar with. This might generate a potential force to usher agents in allocating wealth in familiar home assets. This could be attributed to one of the implicit barriers in Kang and Stulz (1997). We reflect this idea via the propensity to home assets in the utility setup and impose the restrictions:

$$0 \le f(x_t) < \infty$$
$$f'(x_t) > 0$$

3.2.2 Static Comparative

Based on the results of total differentials, the optimal portfolio is thoroughly dominated by net capital flow again and we summarize as follows:

$$x_t = x(\overset{-}{\alpha}, \overset{+}{\beta}, \overset{-}{\theta_{t-1}}, \overset{+}{\theta_t}, \overset{-}{\pi_{t-1}}, \overset{+}{r_t}, \overset{+}{r_t^*}, \overset{?}{x_{t-1}}) \tag{7}$$

Analogous to previous results, lower nontradable consumption, lower past period appreciation, lower inflation rate but higher discount factor, higher expected depreciation, and both higher home and foreign assets expected rates of return all lead to a more serious home bias phenomenon. Only the precedent portfolio influence is uncertain.

3.2.3 A Two-Period Model Solution

Take a look at a simple two-period model for $t = 0,1$ and suppose the portfolio is zero at the beginning and the propensity to home assets is $f(x_1) = x_1$ at $t = 1$. Applying prior results, the close-form solution of optimal portfolio in time one becomes:

$$x_1 = \frac{-(1+r_1) + \sqrt{(1+r_1)^2 - 4(r_1 - r_1^* - \theta_1)[(1+r_1^* + \theta_1) - \beta^{-1}(1+\pi_0)^{\alpha}(1+\theta_0)^{1-\alpha}]}}{2(r_1 - r_1^* - \theta_1)} \tag{8}$$

3.2.4 Optimal Consumption Path

Based on the assumption of propensity to home assets, the optimal nontradable consumption path and the optimal tradable consumption path have the following forms:

$$\frac{\beta C_t^N}{C_{t-1}^N} = \frac{\sum_{v=t}^{\infty} \frac{P_v Y_v - P_v C_v^N - e_v C_v^T}{\prod_{s=1}^{v} R_s}}{\sum_{v=t-1}^{\infty} \frac{P_v Y_v - P_v C_v^N - e_v C_v^T}{\prod_{s=1}^{v} R_s}} \frac{r_t - r_t^* - \dot{e}_t}{r_{t-1} - r_{t-1}^* - \dot{e}_{t-1}} \frac{R_{t-1}}{R_t} \left(\frac{P_t}{P_{t-1}}\right)^{\alpha-1} \left(\frac{e_t}{e_{t-1}}\right)^{1-\alpha} \tag{9}$$

$$\frac{\beta C_t^T}{C_{t-1}^T} = \frac{\sum_{v=t}^{\infty} \frac{P_v Y_v - P_v C_v^N - e_v C_v^T}{\prod_{s=1}^{v} R_s}}{\sum_{v=t-1}^{\infty} \frac{P_v Y_v - P_v C_v^N - e_v C_v^T}{\prod_{s=1}^{v} R_s}} \frac{r_t - r_t^* - \dot{e}_t}{r_{t-1} - r_{t-1}^* - \dot{e}_{t-1}} \frac{R_{t-1}}{R_t} \left(\frac{P_t}{P_{t-1}}\right)^{\alpha} \left(\frac{e_t}{e_{t-1}}\right)^{-\alpha} \tag{10}$$

Both of them are purely dependent on future information set and could be viewed as the composites of the present values of future savings.

4. Calibrations

We provide some important calibration results of home portfolio in this section.

4.1 Nontradable Consumption Preference Effect

Figure 1 plots the nontradable preference effect. Suppose initial conditions are $\alpha = 0.5 \text{ or } 0.9, \beta = 0.9, \pi_0 = 0.02, \theta_0 = 0.01, r_0 = 0.05, r_0^* = 0.25$ and the growth rates are 0.18%, 0.05%, -0.11%, and -0.5% w.r.t. $\pi_t, \theta_t, r_t, r_t^*$, respectively. Investors are supposed with traditional utility and net capital flow runs in deficit. The less preference in nontradable consumption, the more home portfolio will be allocated. It provides a controversy with respect to the nontradable consumption theory but is consistent with Baxter, Jerman and King (1998).

[INSERT FIGURE 1 ABOUT HERE]

4.2 Net Capital Flow Effect

Suppose the initial conditions are $\alpha = 0.5, \beta = 0.8, \pi_0 = 0.02, \theta_0 = 0.03, r_t^* = 20\%$ and surplus runs with home return 40%, at growth rate 1.5%, and deficit runs home return 10%, at decreasing rate 0.4%. Under the propensity to home assets setup, the speed of home bias phenomenon runs much faster in surplus case than in deficit case. This result is very reasonable since both preference in home assets and capital flow help increase home portfolio

while net capital flow is surplus. We depict this effect in Figure 2.

[INSERT FIGURE 2 ABOUT HERE]

4.3 Preference in Home Assets Effect

In Figure 3, under continual deficit and $\alpha = 0.5, \beta = 0.9, \theta_t = 0.01, \pi_t = 0.02, r_t^* = 0.1$ as well as $r_t = 0.01$ conditions, home portfolio with propensity to home assets utility always stands higher and runs faster than with traditional utility. This might imply people with potential preference in home assets behave more serious home bias problem than those with neutral preference and thus enhance the importance of implicit barriers aspect.

[INSERT FIGURE 3 ABOUT HERE]

5. Conclusions

We examined the work of nontradable goods theorem for explaining home bias puzzle and concluded the net capital flow play the role. The net capital flow effect is elucidated through the traditional utility and the propensity to home assets utility. Potential preference in home assets has significant influence in generating home bias phenomenon.

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Table I

Home bias and Capital Flow

Table I reports some relationships between net capital flow and home bias phenomenon we observed.

1. Percentage invested at home is summarized from Pesenti and van Wincoop (1999).
2. Net capital flow is calculated from IMF, IFS database (1996).

Country	Percentage invested at home (%)	Net capital flow (millions of US dollar)	Net capital flow (US Dollar/per person)
US	90	217,900	820.84
German	88	63,010	769.35
UK	78	-25,150	-427.72

Figure 1
Preference in Nontradable Consumption Effect

Figure 1 is under the conditions $\beta = 0.9, \pi_0 = 0.02, \theta_0 = 0.01, r_0 = 0.05, r_0^* = 0.25$ and $\alpha = 0.5 \; or \; 0.9$, and growth rates 0.18%, 0.05%, -0.11%, and -0.5% w.r.t. $\pi_t, \theta_t, r_t, r_t^*$ as well as net capital flow runs in deficit. Agents with less preference in nontradable consumption behave more home bias phenomenon than agents with higher preference in nontradable consumptions.

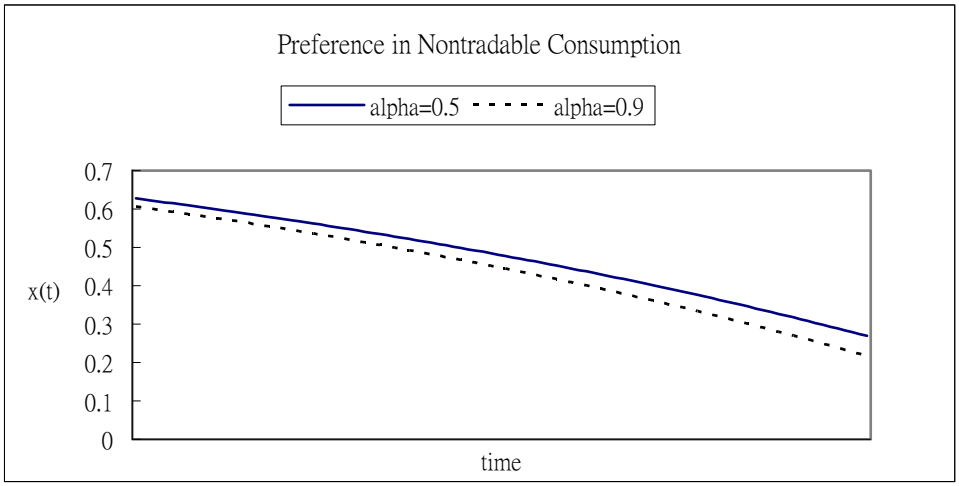

Figure 2

Net Capital Flow Effect

Figure 2 plots the net capital flow effect that under the propensity to home assets utility setup, the speed of home portfolio in surplus case runs faster than in deficit case. The initial conditions are $\alpha = 0.5$, $\beta = 0.8, \pi_0 = 0.02, \theta_0 = 0.03, r_t^* = 20\%$. Surplus case begins with initial home return 40%, at growth rate 1.5% and deficit case starts with initial home return 10%, at decreasing rate 0.4%.

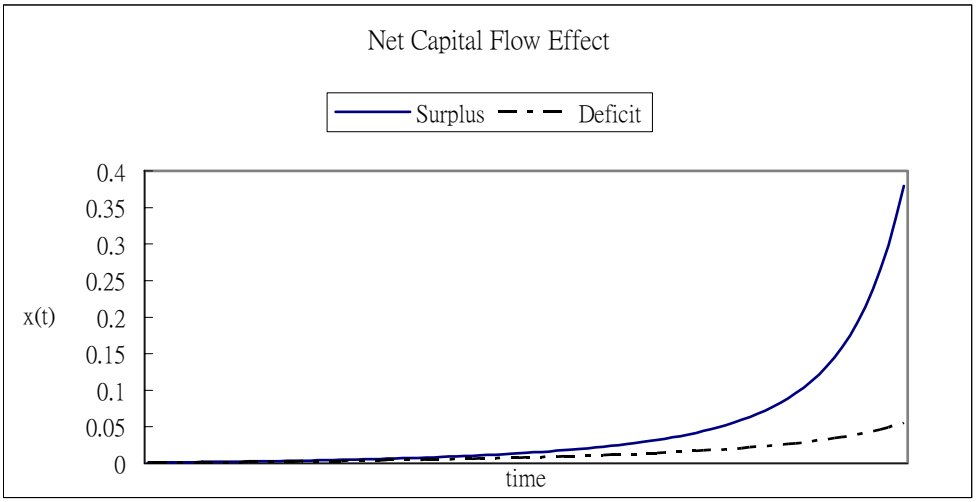

Figure 3

Preference in Home Assets Effect

While running continual deficit, home portfolio with potential preference in home assets model always stands and grows higher and faster than with traditional utility model. The conditions are $\alpha = 0.5, \beta = 0.9, \theta_t = 0.01, \pi_t = 0.02$, $r_t^* = 0.1$, and $r_t = 0.01$ at decreasing rate of 0.5% in each period.