Financial Dollarization in a Two-Country World

Juan Carlos Aquino

Banco Central de Reserva del Perú

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2. Previous studies.

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2. However, financial (deposits) dollarization remains "high".
3. Several studies have tried to find determinants for deposits dollarization, one of the most important being those due to Ize and Levy-Yeyati (2003).
4. It would be interesting to introduce such an idea into the DSGE paradigm.

Previous studies

Because of the well known balance-sheet effect, this literature became relevant. Two approaches asses the problem and perform a policy analysis:

1. Dancourt, Florian and Trelles (2004): PROS: semi-structural Neo-Keynesian model, incorporates rational expectations and an endogeouns extent of financial dollarization. CONS: it only isolates the portafolio problem in a similar fashion to Ize and Levy-Yeyati (2003).

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2. Castro, Morón and Winkelried (2004): PROS: small open economy model under microfoundations and rational expectations, welfare analysis. CONS: they only work for a given extent of financial dollarization. Thus a lower extent of financial dollarization is desirable but not endogeneous.

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4. Two-country framework: foreign assets come from the rest of the world.
5. Welfare analysis.
6. Individual portfolio decissions: second order moments matter!!!

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5. Central Banks follow a interest-rate rule.
6. The objetive is to derive a CAPM-like formula reflecting financial dollarization in the spirit of Ize and Levy-Yeyati (2003).
7. Currently, fiscal aspects are not covered.

Key ingredients

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1. Budget constraint.
2. An optimality condition (indeed, two conditions).

Home individual problem

Find $\{C_{h,t+j}, B_{h,t+j}, B^*_{h,t+j}, M_{h,t+j}/P_{t+j}, L_{h,t+j}\}_{j=0}^{\infty}$ to

$$\max U_{ht} = E_t \left\{ \sum_{j=0}^{\infty} \tilde{\theta}_{t+j} \left[\exp(\gamma_{t+j}) \frac{C_{h,t+j}^{1-\rho} - 1}{1-\rho} \right. \right.$$

$$\left. \left. \ldots + \frac{\chi}{1-\epsilon} \left(\frac{M_{h,t+j}}{P_{t+j}} \right)^{1-\epsilon} - \frac{\kappa}{\mu+1} L_{h,t+j}^{\mu+1} \right] \right\}$$

subject to

$$\int_0^1 P_{zt} C_{zht} dz + M_{ht} + S_t B^*_{ht} + B_{ht}$$

$$\leq M_{h,t-1} + S_t (1 + i^*_{t-1}) B^*_{h,t-1} + (1 + i_{t-1}) B_{h,t-1} + PR_{ht} + W_t L_{ht}.$$

This procedure can also be derived for foreign individuals.

On the budget constraint

After some algebra

$$C_{ht} + \frac{M_{ht}}{P_t} + A_{ht} \\ \leq \Pi_t^{-1} \frac{M_{h,t-1}}{P_{t-1}} + R_{Xt} \lambda^*_{h,t-1} + R_{2t} A_{h,t-1} + \frac{PR_{ht}}{P_t} + \frac{W_t}{P_t} L_{ht}.$$

- $A_{ht} \equiv B_{ht} + S_t B^*_{ht}$ (real net assets),
- $\lambda^*_{ht} \equiv S_t B^*_{ht} / P_t$ (net real dollar-denominated bond holdings),
- $R_{2t} = (1 + i_{t-1}) \Pi_t^{-1}$ (home real return, numeraire),
- $R_{1t} = (1 + i^*_{t-1}) \frac{S_t}{S_{t-1}} \Pi_t^{-1}$ (foreign real return), and
- $R_{Xt} = R_{1t} - R_{2t}$ (exceeding return).

Now, find $\left\{ C_{h,t+j}, A_{h,t+j}, \lambda^*_{h,t+j}, M_{h,t+j}/P_{t+j}, L_{h,t+j} \right\}_{j=0}^{\infty}$.

Portfolio choice: optimality condition

Correlations must necessarily be zero:

$$E_t\{\exp(\gamma_{t+1})C_{h,t+1}^{-\rho}R_{X,t+1}\} = 0 \qquad \text{(home)}$$

and

$$E_t\{Q_{t+1}^{-1}\exp(\gamma_{t+1}^{*})C_{f,t+1}^{-\rho}R_{X,t+1}\} = 0. \qquad \text{(foreign)}$$

The two previous equations are non-arbitrage conditions, since there is no incentive to change portfolio composition towards the another asset. After some algebra

$$E_t\{[\exp(\gamma_{t+1})C_{h,t+1}^{-\rho} - Q_{t+1}^{-1}\exp(\gamma_{t+1}^{*})C_{f,t+1}^{-\rho}]R_{X,t+1}\} = 0, \qquad (1)$$

therefore, differential of marginal utilities must necessarily be uncorrelated to exceeding return. Notice that <u>no approximation</u> has been performed yet.

Macroeconomic shocks

Technology

$$\begin{aligned} Y_{ht} &= \exp(\phi_t) L_{ht}^{\alpha}, \\ Y_{ft} &= \exp(\phi_t^*) L_{ft}^{\alpha}. \end{aligned}$$

Taylor rule

$$\begin{aligned} 1 + i_t &= (1 + i_{t-1})^{\nu} \Pi_t^{\tau} [Y_{ht}^{GAP}]^{1-\tau} \exp(\omega_t), \\ 1 + i_t^* &= (1 + i_{t-1}^*)^{\nu} \Pi_t^{*\tau} [Y_{ft}^{GAP}]^{1-\tau} \exp(\omega_t^*). \end{aligned}$$

Confidence, technology and monetary policy shocks are summarized by

$$\varepsilon_t \equiv [\varepsilon_t^d \;\; \varepsilon_t^{d*} \;\; \varepsilon_t^s \;\; \varepsilon_t^{s*} \;\; \varepsilon_t^{mp} \;\; \varepsilon_t^{mp*}]'$$

such that

$$\Sigma \equiv E_{t-1}[\varepsilon_t \varepsilon_t'] = diag(\sigma_d^2, \sigma_{d*}^2, \sigma_s^2, \sigma_{s*}^2, \sigma_{mp}^2, \sigma_{mp*}^2).$$

Devereux and Sutherland (2008)

Standard log-linear approach implies the *Uncovered Interest Parity*

$$E_t\{\hat{r}_{1,t+1}\} = E_t\{\hat{r}_{2,t+1}\}.$$

Intuition: up to a first-order approximation, only expected returns matter. Thus the two asset types are perfect substitutes and any composition is valid.

Since second moments matter, a second order approximation is required

$$\begin{aligned} E_t\left[\hat{r}_{x,t+1} + \frac{1}{2}(\hat{r}^2_{1,t+1} - \hat{r}^2_{2,t+1}) + (\gamma_{t+1} - \rho\hat{c}_{h,t+1})\hat{r}_{x,t+1}\right] &= 0 \\ E_t\left[\hat{r}_{x,t+1} + \frac{1}{2}(\hat{r}^2_{1,t+1} - \hat{r}^2_{2,t+1}) + (\gamma^*_{t+1} - \rho\hat{c}_{f,t+1} - \hat{q}_{t+1})\hat{r}_{x,t+1}\right] &= 0. \end{aligned}$$

Which are the advantages?

Expected exceeding return

First, notice that the two previous equations imply that, up to a second order approximation

$$
\begin{aligned}
E_t[\hat{r}_{x,t+1}] &= -\frac{1}{2}E_t(\hat{r}^2_{1,t+1} - \hat{r}^2_{2,t+1}) \\
&\quad +\frac{1}{2}E_t\{[\rho\left(\hat{c}_{h,t+1} + \hat{c}_{f,t+1}\right) + \hat{q}_{t+1} - \left(\gamma_{t+1} + \gamma^*_{t+1}\right)]\hat{r}_{x,t+1}\}.
\end{aligned}
$$

Furthermore, up to a first order approximation,

$$E_t[\hat{r}_{x,t+1}] = 0$$

and $\hat{r}_{x,t+1}$ can only be expressed in period t as the combination of i.i.d. shocks (no additional information can be exploited).

Orthogonality condition

Second, after some algebra

$$E_t\{[\gamma_{t+1} - \rho\hat{c}_{h,t+1} - (\gamma^*_{t+1} - \rho\hat{c}_{f,t+1} - \hat{q}_{t+1})]\hat{r}_{x,t+1}\} = 0.$$

This latter equation approximates

$$E_t\{[\exp(\gamma_{t+1})C^{-\rho}_{h,t+1} - Q^{-1}_{t+1}\exp(\gamma^*_{t+1})C^{-\rho}_{f,t+1}]R_{X,t+1}\} = 0.$$

Log-linearized budget constraint is a key element of the model.
Standard log-linear approximation yields

$$\hat{a}_{ht} = \frac{1}{\beta}\hat{a}_{h,t-1} + \underbrace{\frac{\overbrace{\lambda_h^*}^{\lambda}}{\beta Y_h}\hat{r}_{xt}}_{\xi_t} + \frac{A_h}{\beta Y_h}\hat{r}_{2t}$$

$$+\hat{y}_{ht} - \frac{C_h}{Y_h}\hat{c}_{ht} - \frac{M_h/P}{Y_h}[(\hat{m}_{ht} - \hat{p}_t) - (\hat{m}_{h,t-1} - \hat{p}_{t-1}) + \hat{\pi}_{t-1}],$$

where $\hat{a}_{ht} = \frac{A_{ht}-A_h}{Y_h}$, $\hat{a}_{ft} = \frac{A_{ft}-A_f}{Y_f}$, $\hat{r}_{xt} = \hat{r}_{1t} - \hat{r}_{2t}$ and. For the foreign economy, this expression is obtained in an similar fashion.
Since behaves as an i.i.d shock $\hat{r}_{xt}$ then takes the form of a shock to the contraint.

Log-linear budget constraints

For home home economy,

$$\begin{aligned}\hat{a}_{ht} &= \frac{1}{\beta}\hat{a}_{h,t-1} + \xi_t + \frac{A_h}{\beta Y_h}\hat{r}_{2t} \\ &+\hat{y}_{ht} - \frac{C_h}{Y_h}\hat{c}_{ht} - \frac{M_h/P}{Y_h}[(\hat{m}_{ht} - \hat{p}_t) - (\hat{m}_{h,t-1} - \hat{p}_{t-1}) + \hat{\pi}_{t-1}].\end{aligned}$$

Since $n\lambda_h^* + (1-n)\lambda_f^* = 0$ then, for foreign economy

$$\begin{aligned}\hat{a}_{ft} &= \frac{1}{\beta}\hat{a}_{f,t-1} - \frac{n}{1-n}\frac{Y_h}{Y_f}\xi_t + \frac{A_f}{\beta Y_f}\hat{r}_{2t} \\ &+\hat{y}_{ft} - \frac{C_f}{Y_f}\hat{c}_{ft} - \frac{M_f/P^*}{Y_f}[(\hat{m}_{ft} - \hat{p}_t^*) - (\hat{m}_{f,t-1} - \hat{p}_{t-1}^*) + \hat{\pi}_{t-1}^*].\end{aligned}$$

A two-step procedure

Devereux and Sutherland (2008) suggest the following two-step procedure:

1. Treat ξ_t as exogenous and solve the non-portfolio equations of the model

$$A \begin{bmatrix} S_{t+1} \\ E_t X_{t+1} \end{bmatrix} = B \begin{bmatrix} S_t \\ X_t \end{bmatrix} + C_1 \xi_t + C_2 Z_t, \text{ and} \tag{2}$$

$$Z_t = D Z_{t-1} + \varepsilon_t, \tag{3}$$

$$\varepsilon_t \sim (0, \Sigma). \tag{4}$$

   The solution takes the state-space form

$$S_{t+1} = E S_t + F_1 \xi_t + F_2 Z_t,$$
$$X_t = G S_t + H_1 \xi_t + H_2 Z_t.$$

2. Provided that $\xi_t \equiv \lambda \hat{r}_{xt}$, find the value of λ that solves the portfolio equation (1).

Endogenous financial dollarization

It is easy to show that

$$\lambda = \frac{\tilde{D}_3 \Sigma \tilde{R}_2'}{(\tilde{R}_1 \tilde{D}_3 - \tilde{D}_2 \tilde{R}_2) \Sigma \tilde{R}_2'}. \tag{5}$$

Therefore, financial dollarization depends on uncertainty about the economy, summarized in Σ.

Preliminary results: sensitivity analysis

Consider a baseline parametrization (Castillo, Montoro and Tuesta, 2009). Then

$\frac{C_h}{Yh}$	$\frac{C_f}{Y_f}$	$\frac{M_h/P}{Y_h}$	$\frac{M_f/P^*}{Y_f}$	$\frac{A_h}{Y_h}$	$\frac{A_f}{Y_f}$	$\frac{\lambda_h^*}{\beta Y_h}$	$\frac{\lambda_f^*}{\beta Y_f}$
0,96	0,96	0,34	0,34	0,00	–0,37	0,00	0,24

,

and

Inflation (weight)	Interest rate smoothing $\nu =$				
$\tau =$	0,5	0,6	0,7	0,8	0,9
0,3	n.a.	n.a.	–0,69	–0,64	–0,62
0,4	n.a.	–0,72	–0,64	–0,62	–0,61
0,5	–0,77	–0,65	**–0,61**	–0,60	–0,60
0,6	–0,67	–0,61	–0,59	–0,58	–0,59
0,7	–0,61	-0,58	–0,57	–0,56	**–0,57**

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3. Link between real and financial dollarization can be quantified.
4. Dollarization cannot be "decomposed".

Concluding remarks

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   - Here: non-portfolio (1), portfolio (2) $\Rightarrow$ dollarization (0).
   - Extension: non-portfolio (2), portfolio (3) $\Rightarrow$ dollarization (1).

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5. Thanks!!!