Discussion of "International Risk-Sharing: Through Equity Diversification or Exchange-Rate Hedging" by C. Engel & A. Matsumoto

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Very nice paper!

What is it about?

Home equity bias can emerge endogenously with two key (realistic) ingredients

1) a 'sufficient' degree of price rigidities

2) Possibility for investors to hedge in the forward market (or take positions in nominal bonds denominated in different currencies)
Outline of the discussion

Give the intuitions and the key mechanisms in a similar version of EM two-period model

Relate the paper to some work I have done with P-O Gourinchas and in particular look at the empirical implications of EM’s paper

Discuss some caveats
Engel & Matsumoto two-period model

\[ U_i = E_0 \left[ \frac{C_i^{1-\sigma}}{1-\sigma} + \chi \log \left( \frac{M_i}{P_i} \right) \right], \quad \sigma \geq 1, \ i = H, F \]

\[ C_i = \left[ a^{1/\omega} (c_{ii})^{(\omega-1)/\omega} + (1-a)^{1/\omega} (c_{ij})^{(\omega-1)/\omega} \right]^{\omega/(\omega-1)} \]

\[ c_{ij} \text{ is country } i's \text{ consumption of the goods from country } j. \ (\omega = \text{CES}) \]

\[ P_H = \left[ a \left( p_H \right)^{1-\omega} + (1-a) \left( \frac{p_F}{s} \right)^{1-\omega} \right]^{1/(1-\omega)} \]

\[ P_F = \left[ (1-a) \left( sp_H \right)^{1-\omega} + a \left( p_F \right)^{1-\omega} \right]^{1/(1-\omega)}, \]

\[ s \text{ nominal exchange rate (} s \uparrow = \text{appreciation of Home currency). Home TOT } q \equiv \frac{sp_H}{p_F} \]

for \( i = H, F \) : \( c_{ii} + c_{ji} = y_i = A_il_i \)
Price setting and Price rigidities

Assume PCP (LCP yields similar results).

A (random) share $\tau$ of firms have preset prices, a share $(1-\tau)$ can adjust their prices following the shocks

$$p_i = \left[ \tau \left( \overline{p} \right)^{1-\lambda} + (1-\tau) \left( p_i^* \right)^{1-\lambda} \right]^{1/(1-\lambda)}$$

$$\text{rer} = \frac{s\hat{P}_H}{P_F} = \frac{(2a - 1)\left( \tau \hat{s} + (1-\tau)\hat{q}^* \right)}{\hat{q}}$$

where $q^* \equiv \frac{sP^*_H}{P^*_F}$ denotes TOT of firms adjusting prices
Asset markets

Assets are traded in period 0 before the realization of productivity shocks & monetary shocks (in period 1)

Equities

Claim to the profits. In a monopolistic competition framework, the (steady-state) profit share $\delta$ is equal to the inverse of the CES between goods within a given country $\lambda$

In the steady-state, a share $(1 - \delta)$ of output is distributed as labor income

Denote by $\gamma$ holding of Foreign shares ($(1 - \gamma) = \text{Holdings of Local Shares}$)

Bonds or Forward Position

Nominal bonds in each country pays one unit of the local currency in period 1.
Relative equity returns (profits)

\[ \hat{R}_e = q \frac{\hat{y}_H}{y_F} + \hat{\delta} = - (\theta - 1) (\tau \hat{s} + (1 - \tau) \hat{q}*) + \hat{\delta} \]

where \( \theta = \left[ \varpi (1 - (2a - 1)^2) + \frac{(2a-1)^2}{\sigma} \right] \geq 1 \)

Changes in the (relative) profit share [related to changes in mark-ups in presence of price rigidities \( \tau > 0 \)]

\[ \hat{\delta} = \frac{1 - \delta}{\delta} (\hat{q} - \frac{\bar{w}}{A}) = -\tau \left( \frac{1 - \delta}{\delta} \right) \hat{q}^* \]

Relative returns on labor

\[ \hat{R}_w = q \frac{\hat{y}_H}{y_F} - \frac{\delta}{1 - \hat{\delta}} = - (\theta - 1) (\tau \hat{s} + (1 - \tau) \hat{q}*) - \frac{\delta}{1 - \hat{\delta}} \hat{\delta} \]
Relative equity returns and relative returns on labor

\[
\hat{R}_e(s; \hat{q}^*) = - (\theta - 1) (\tau \hat{s} + (1 - \tau) \hat{q}^*) - \tau \frac{1 - \delta}{\delta} \hat{q}^*
\]

\[
\hat{R}_w(s; \hat{q}^*) = - (\theta - 1) (\tau \hat{s} + (1 - \tau) \hat{q}^*) + \tau \hat{q}^*
\]

Increase in Home money supply depreciates nominal exchange rate \((s \downarrow)\) and Home equity excess returns \(\hat{R}_e\) and Home relative labor income \(\hat{R}_w\) increase: expenditure switching effect of NOEM.

Increase in Home productivity depreciates flexible terms-of-trade \((\hat{q}^* \downarrow)\) and Home equity excess returns \(\hat{R}_e\) increase due to 1) more goods are produced 2) mark-ups increase for firms with preset prices. But effect on \(\hat{R}_w\) is ambiguous: firms with preset prices cut-off labor [if \(\tau\) large enough, \(\hat{R}_w \downarrow\)]
Backing out portfolios from Backus-Smith condition

\[ sP_H C_H - P_F C_F = (1 - 1/\sigma)\bar{r}er = (1 - 1/\sigma)(2a - 1)(\tau \hat{s} + (1 - \tau)\hat{q}^*) \]

\[ \delta(1-2\gamma)\hat{R}_e(\hat{s}; \hat{q}^*) + (1-\delta)\hat{R}_w(\hat{s}; \hat{q}^*) + 2f \hat{s} = (1-\frac{1}{\sigma})(2a-1)(\tau \hat{s} + (1-\tau)\hat{q}^*) \]

Must hold for any realization of \((\hat{s}; \hat{q}^*)\).

Equilibrium portfolios

\[ 1 - \gamma = \frac{1}{2} \left[ 1 - \frac{(1-\delta)(\theta-1)(1-\tau)-\tau}{\delta(\theta-1)(1-\tau)+(1-\delta)\tau} - \frac{(1-1/\sigma)(2a-1)(1-\tau)}{\delta(\theta-1)(1-\tau)+(1-\delta)\tau} \right] \]

\[ f = \frac{1}{2} \tau \left[ (1 - 1/\sigma)(2a - 1) + (1 - 2\gamma)(\theta - 1) \right] \]
Two extreme cases

- $\tau = 0$: Flexible prices = large foreign bias

$$1 - \gamma = \frac{1}{2} \left[ 1 - \left( \frac{1 - \delta}{\delta} \right) - \frac{1}{\delta} \left( 1 - 1/\sigma \right) \frac{2a - 1}{\theta - 1} \right]; f = 0$$

- $\tau = 1$: All firms have preset prices = full home bias

$$\gamma = 0$$

$$f = \frac{1}{2} \left[ (1 - 1/\sigma)(2a - 1) + (\theta - 1) \right] > 0$$
Diversification of equity portfolios as a function of price rigidities

\[ \text{Diversification } 1 - \gamma \]

\[ \sigma = 2; \ a = 0.85; \ \omega = 2 \]

\[ \sigma = 1; \ a = 0.85; \ \omega = 2 \]
More intuition...

Partial equilibrium portfolios (from Coeurdacier and Gourinchas (2008))

Those formulas hold independently of the shocks (in particular hold even in an environment with more shocks than assets)

In an equity-only model,

Calling $R_e$ Home equity excess return and $R_w$ Home excess return on human wealth

$$1 - \gamma = \frac{1}{2} \left[ 1 - \frac{1 - \delta}{\delta} \frac{\text{cov}(R_e, R_w)}{\text{var}(R_e)} + \frac{1}{\delta} \frac{1}{\sigma} \frac{\text{cov}(R_e, rer)}{\text{var}(R_e)} \right]$$

Baxter & Jermann

VW & Warnock
In a bond (or forward)-equity model, $R_f = \hat{s}$ return on the forward position

\[
1 - \gamma = \frac{1}{2} \left[ \left(1 - \frac{1 - \delta}{\delta} \right)^{\beta_{w,e}} + \frac{1 - \frac{1}{\sigma}}{\delta} \beta_{rer,e} \right]
\]

\[
f = \frac{1}{2} \left[ \left(1 - \frac{1}{\sigma} \right) \beta_{rer,f} - (1 - \delta) \beta_{w,f} \right]
\]

\[
\beta_{w,i} = \frac{cov_{R_j}(R_i, R_w)}{var_{R_j}(R_i)} ; \quad \beta_{rer,i} = \frac{cov_{R_j}(R_i, rer)}{var_{R_j}(R_i)}
\]

$\beta_{x,i}$ = covariance-variance ratio of returns of asset $i$ with $x$ conditionally on the return of the other asset

With forwards, the conditional covariance of equity returns with labor returns matters! Can be potentially very different from the unconditional one.
In Engel & Matsumoto

\[ 1 - \gamma = \frac{1}{2}[1 - \frac{1-\delta}{\delta} \beta_{w,e} + \frac{1-1}{\delta} \beta_{rer,e}] ; f = \frac{1}{2} \left[ (1 - \frac{1}{\sigma}) \beta_{rer,f} - (1 - \delta) \beta_{w,f} \right] \]

\[ \beta_{rer,e} = \frac{-(2a-1)(1-\tau)}{\delta(\theta-1)(1-\tau) + (1-\delta)\tau} < 0; \text{ small if price rigidities large enough} \]

\[ \beta_{rer,f} = \tau(2a - 1) > 0; \text{ large if price rigidities large enough.} \]

Note that what is essential is $\beta_{rer,e}$ close to zero (variations in RER are captured by returns on the forward positions) [cf. Van Wincoop and Warnock (2008)]

\[ \beta_{w,e} = \frac{(\theta-1)(1-\tau) - \tau}{(\theta-1)(1-\tau) + (1-\delta)\tau} < 0 \text{ if price rigidities large enough} \]

Note that the unconditional covariance can be positive if monetary shocks 'important enough'.
Let the data speak

(preliminary results from Coeurdacier and Gourinchas (2008))

\[ \hat{r}_{er} = \alpha + \beta_{rer,e} \hat{R}_e + \beta_{rer,b} \hat{R}_f + u_{rer} \]
\[ \hat{R}_w = \alpha + \beta_{w,e} \hat{R}_e + \beta_{w,b} \hat{R}_f + u_w \]

Compute US versus the rest of the world (other G7 countries in our exercise) and run the following regressions for the US (taking differences with a GDP weighted sum of the rest of the world)

\[ \hat{r}_{er} = 0.003 \hat{R}_e + 0.967 \hat{R}_f \quad ; \quad R^2 = 0.98 \]
\[ \hat{R}_w = -0.374 \hat{R}_e + 2.101 \hat{R}_f \quad ; \quad R^2 = 0.87 \]

Note that \( \beta_{w,e} = -0.374 \) while the unconditional \( \beta_{w,e}^{unc} = 0.29 > 0 \)
Potential Caveats

Is it price rigidity after all?


Does EM mechanism survive in a production economy? With optimal monetary policy (or monetary policy that stabilizes the price level)?

Do people hedge non-tradable risk? Scarce evidence. Need good micro data. Have participants in equity markets a meaningful share of revenues as labor income?
Potential Caveats

What about forward/bond positions? EM argues that their derived position imply mostly a long-position in local currency. Inconsistent with valuation effects (see Gourinchas and Rey (2007)). Bond puzzle?

Too much risk-sharing. The Consumption-Real Exchange Rate Anomaly. In EM (as most of the literature), consumption is tightly linked to the real exchange rate. Data are inconsistent with this prediction (see Obstfeld (2007)).

**Wanted:** A model with endogenous portfolios but incomplete markets where incompleteness really matters for consumption allocations and relative prices adjustment.