

International Portfolios, Capital Accumulation and Foreign Asset Dynamics

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- **Equity home bias remains sizable expansion of foreign capital flows, during past 20 years**

For large OECD economies:

Foreign equity liabilities \approx 10%-20% of domestic capital stock

Conventional explanations of persisting equity home bias:

1) transaction costs, informational barriers
(e.g. Tille & van Wincoop, Coeurdacier & Guibaud, Van Nieuwerburgh & Veldkamp)

2) terms of trade responses to technology shocks provide international insurance, so that portfolio with home bias consistent with risk sharing (Helpman & Razin, 1978; Dellas, 1985; Cole & Obstfeld, 1991)

Problems with conventional explanations:

- **frictions would have to be large to fully explain equity home bias** (e.g. French & Poterba, Tesar & Werner)

- **would need that t.o.t. improve strongly after negative technology shock**

But: empirically, t.o.t. only weakly correlated with output

This paper:

- **portfolio choice in frictionless DSGE model of two-country world**
- **realistic equity home bias that does not depend on t.o.t. response to supply shocks: in model t.o.t. are a-cyclical**
- **model consistent with key macro facts, captures cyclical dynamics of foreign asset positions & capital flows**

Recent international DSGE portfolio literature:

Engel & Matsumoto (2005)

Devereux & Sutherland (2006)

Evans & Hnatkovska (2006)

Hnatkovska (2006)

Tille & van Wincoop (2006)

Coeurdacier & Guibaud (2005),

Kollmann (2006),

Heathcote & Perri (2007)

Coeurdacier, Kollmann, Martin (2007),

Collard, Dellas, Diba & Stockman (2007)

Pavlova & Rigobon (2006)

etc. etc.

KEY FEATURES THAT DISTINGUISH THIS PAPER FROM LITERATURE:

- **CAPITAL ACCUMULATION**

Financing physical investment is key role of international capital markets (Obstfeld & Rogoff, 1996).

Capital Accumulation key driver of trade balance (Summers, 1981), explains why net exports are countercyclical.

By contrast, prior DSGE portfolio literature: *Endowment economies*

THERE:

trade in financial markets solely for consumption smoothing & risk sharing

⇒ structure portfolio to sustain net imports when local production is low

net exports procyclical (under efficient risk sharing) = counterfactual

BY CONTRAST:

With capital accumulation, portfolios structured to finance imports in states of world where investment is high.

Heathcote & Perri (2007) also have K accumulation

- **SHOCKS to TFP & INVESTMENT EFFICIENCY**

Greenwood, Krusell & Hercowitz, 1997; Fisher, 2006; Justiniano & Primiceri, 2007 etc. show: investment efficiency shocks very important source of GDP fluctuations

INVESTMENT EFFICIENCY SHOCKS:

- **MAKE TERMS OF TRADE VOLATILE & ACYCLICAL (combined with TFP shock)**
- **MAKE NET EXPORTS COUNTERCYCLICAL**

- **ASSET STRUCTURE**

Two **BONDS** (denominated in Home & Foreign output)

Two **STOCKS**: shares in **CASH FLOWS** (=dividends) of Home/Foreign firm

Cash flow =

output – wage bill – investment spending

**(PRIOR DSGE PORTFOLIO LITERATURE:
Mostly just trade in STOCKS--no BONDS)**

TRADE IN BONDS HELPS GENERATE **EQUITY HOME BIAS**

Coeurdacier & Gourinchas (2008)

Coeurdacier, Kollmann & Martin (2007)

Other important features:

- **Labor income (Human capital = nontraded asset)**
- **Each country produces a distinct good; each country uses local and imported goods**
- **LOCAL BIAS in CONSUMPTION & INVESTMENT spending**

INTUITION FOR EQUITY HOME BIAS

Positive shock to Home real investment:
LOWERS Home *cash flow* (on impact)

RAISES demand for Home output, which
raises Home *wage income*

THUS: Home wage income (relative to
Foreign) and Home firm's (relative)
dividend move in **OPPOSITE** directions

⇒ **HEDGE THIS RISK BY HOLDING
LOCAL EQUITY**

Household uses BOND to hedge fluctuations in wages and dividends that are correlated with terms of trade

NB relative returns on Home-vs Foreign good bonds track t.o.t.

Use STOCKS to hedge fluctuations in wages and dividends that are ORTHOGONAL to terms of trade

Consider combination of shocks that raises Home physical investment, without affecting terms of trade. This:

- lowers Home relative dividend**
- raises Home relative output and wage**
- under full risk sharing, Home relative consumption unaffected**

Equity home bias then delivers efficient consumption.

Equity home bias is optimal when correlation between fluctuations in (relative Home vs Foreign) wages and dividends orthogonal to t.o.t. is **NEGATIVE: $Corr_{tot}(w, div) < 0$.**

Paper shows:

empirically, $Corr_{tot}(w, div) < 0$.

US: -.21; JA: -.42; GE: -.48 (1972-2003)

Model here reproduces

$Corr_{tot}(w, div) < 0$

OTHER MAIN CONTRIBUTION:

**PAPER GOES BEYOND ANALYSIS OF
EQUITY HOME BIAS: ANALYZES
PORTFOLIO DYNAMICS**

**DOCUMENTS FACTS ABOUT
INTERNATIONAL CAPITAL FLOWS**

**SHOWS THAT MODEL CAPTURES THOSE
FACTS**

Stylized Facts about external positions:

1) Valuation adjusted current account is volatile, has low serial correlation and is countercyclical (Kollmann, 2006)

2) Change in net equity position is negatively correlated with change in net bond position, at market prices

3) Net equity outflows are negatively correlated with net bond outflows

The model

World with two ex ante symmetric countries,
two tradable goods, $i=1,2$.

Country i produces good i , y_i .

Preferences: $E_t \left\{ \frac{1}{1-\sigma} (C_{i,t})^{1-\sigma} - \frac{1}{1+\omega} (L_{i,t})^{1+\omega} \right\}$.

$$C_{i,t} = [a^{1/\phi} (c_{i,t}^i)^{(\phi-1)/\phi} + (1-a)^{1/\phi} (c_{j,t}^i)^{(\phi-1)/\phi}]^{\phi/(\phi-1)}, j \neq i$$

$0.5 < a < 1$ (home bias).

$c_{j,t}^i$: good j purchases by country i .

$$\text{CPI: } P_{i,t} = [a(p_{i,t})^{1-\phi} + (1-a)(p_{j,t})^{1-\phi}]^{1/(1-\phi)}$$

Technology:

Output of country i : $Y_{i,t} = \theta_{i,t} (L_{i,t})^{1-\kappa} (K_{i,t})^\kappa$

Capital accumulation: $K_{i,t+1} = (1-\delta)K_{i,t} + \chi_{i,t} I_{i,t}$

$\chi_{i,t} > 0$: shock to investment efficiency

(Greenwood, Hercowitz & Krusell; Fisher; Justiniano & Primiceri etc)

$I_{i,t}$: real investment spending

$$I_{i,t} = [a_I^{1/\phi_I} (I_{i,t}^i)^{(\phi_I-1)/\phi_I} + (1-a_I)^{1/\phi_I} (I_{j,t}^i)^{(\phi_I-1)/\phi_I}]^{\phi_I/(\phi_I-1)}$$

$$\frac{1}{2} < a_I < 1$$

Assets:

2 stocks shares in dividend stream of two firms

2 bonds (consols) denominated in good 1 or 2

Dividend of country i firm: $d_{i,t} = \kappa p_{i,t} Y_{i,t} - P_{i,t}^I I_{i,t}$

κ : capital share; $\kappa > I/Y$

Support efficient allocation, up to first order (linear) approximation

Solve for equilibrium portfolios using

Devereux & Sutherland (2006) method:

Taylor expansion of decision rules for asset holdings.

Steady state ('zero-order') portfolio has to satisfy *static* budget constraint:

$$P_{i,t}C_{i,t} = W_{i,t} + Sd_{i,t} + (1-S)d_{j,t} + b(p_{i,t} - p_{j,t})$$

$W_{i,t}$: country i Wage income

S : locally held equity share

b : holdings of bond denominated in local good

Relative budget constraint

$$P_{H,t}C_{H,t} - P_{F,t}C_{F,t} = W_{H,t} - W_{F,t} + 2(S - \frac{1}{2})(d_{H,t} - d_{F,t}) + 2b(p_{i,t} - p_{j,t})$$

In linearized terms:

$$\begin{aligned} (1 - \frac{\bar{I}}{\bar{Y}}) \widehat{P_{H,t} C_{H,t}} - \widehat{P_{F,t} C_{F,t}} &= (1 - \frac{\bar{I}}{\bar{Y}}) (1 - \frac{1}{\sigma}) \underbrace{(2a - 1)}_{\widehat{RER_t}} \widehat{q_t} \\ &= (1 - \kappa) \widehat{W_t} + (\kappa - \frac{\bar{I}}{\bar{Y}}) 2(S - \frac{1}{2}) \widehat{d_t} + 2b \widehat{q_t} \end{aligned}$$

$$\widehat{W_t} \equiv \widehat{W_{H,t}} - \widehat{W_{F,t}}, \quad \widehat{d_t} \equiv \widehat{d_{H,t}} - \widehat{d_{F,t}}$$

$$\widehat{q_t} = \widehat{p_{H,t}} - \widehat{p_{F,t}} : \text{terms of trade}$$

Portfolio (S,b) has to such that this condition
Holds for any realization of technology shocks.

$$(1 - \frac{\bar{I}}{\bar{Y}})(1 - \frac{1}{\sigma})(2a - 1)\hat{q}_t = (1 - \kappa)\hat{W}_t + (\kappa - \frac{\bar{I}}{\bar{Y}})2(S - \frac{1}{2})\hat{d}_t + 2b\hat{q}_t$$

Consider combination of $\hat{Y}_t \equiv \hat{Y}_{H,t} - \hat{Y}_{F,t}$ & $\hat{I}_t \equiv \hat{I}_{H,t} - \hat{I}_{F,t}$
 such that $\hat{q}_t = 0$: $0 = (1 - \kappa)\hat{Y}_t + 2(S - \frac{1}{2})(\kappa\hat{Y}_t - \frac{\bar{I}}{\bar{Y}}\hat{I}_t)$.

That combination of shocks must satisfy:

$$\hat{Y}_t = \frac{\bar{I}}{\bar{Y}}(2a_I - 1)\hat{I}_t \Rightarrow \kappa\hat{Y}_t - \frac{\bar{I}}{\bar{Y}}\hat{I}_t = \frac{\bar{I}}{\bar{Y}}(\underbrace{\kappa(2a_I - 1) - 1}_{<0})\hat{I}_t.$$

At constant t.o.t, an increase in country H physical investment **LOWERS** the dividend of stock H. But relative Home wage **INCREASES!**

$$0 = \underbrace{(1-\kappa)\frac{\bar{I}}{Y}(2a_I-1)}_{>0}\hat{I}_t + 2(S-\frac{1}{2})\frac{\bar{I}}{Y}\underbrace{(\kappa(2a_I-1)-1)}_{<0}\hat{I}_t$$

This gives equilibrium S (locally held equity)

$$S = \frac{1}{2}\left[1 + \frac{(2a_I - 1)(1 - \kappa)}{1 - (2a_I - 1)\kappa}\right]; \quad \frac{1}{2} < S < 1$$

S only depends on capital share κ and on local bias in investment spending a_I . S does NOT depend on preference parameters

S increasing in local spending bias: strong support in data.

**By contrast, in model without bonds,
households use stocks to
hedge terms of trade risk
⇒ equity portfolio highly sensitive to
substitution elasticity between local and
imported goods**

**With trade in bonds:
EQUITY HOME BIAS does NOT depend on
preferences**

Equivalent expression for S:

$$(1 - \frac{\bar{I}}{\bar{Y}})(1 - \frac{1}{\sigma})(2a - 1)\hat{q}_t = (1 - \kappa)\hat{W}_t + (\kappa - \frac{\bar{I}}{\bar{Y}})2(S - \frac{1}{2})\hat{d}_t + 2b\hat{q}_t$$
$$\Rightarrow 0 = (1 - \kappa)[\hat{W}_t - E(\hat{W}_t | \hat{q}_t)] + (\kappa - \frac{\bar{I}}{\bar{Y}})2(S - \frac{1}{2})[\hat{d}_t - E(\hat{d}_t | \hat{q}_t)]$$

$$S = \frac{1}{2} + \frac{1}{2} \underbrace{\frac{1 - \kappa}{\kappa - I/Y}}_{> 0} \frac{-Cov_q(\hat{W}_t, \hat{d}_t)}{Var_q(\hat{d}_t)}$$

$$S > \frac{1}{2} \Leftrightarrow Cov_q(\hat{W}_t, \hat{d}_t) < 0$$

$Cov_q()$: covariance between components of relative wage incomes & dividends orthogonal to t.o.t. (q)

Empirically: $Cov_q(\hat{W}_t, \hat{d}_t) < 0$

Predicted cyclical properties and data

	<u>Shocks to:</u>			<i>Data (G7)</i>
	θ_H, θ_F , χ_H, χ_F	θ_H, θ_F	χ_H, χ_F	
<i>Standard deviations (%)</i>				
<i>GDP</i>	1.86	1.65	0.87	2.07
<i>Net exports</i>	1.04	0.24	1.03	1.14
<i>Terms of trade</i>	1.93	0.86	1.74	3.77
$\Delta(\text{Net Foreign Assets})$	2.20	1.39	1.70	3.23
$\Delta(\text{Net Foreign Bonds})$	5.30	3.71	3.78	2.20
$\Delta(\text{Net Foreign Equity})$	3.12	2.32	2.08	2.97
<i>Correlations with domestic GDP</i>				
<i>Net exports</i>	-.07	.08	-.13	-.39
<i>Terms of trade</i>	-.22	-.54	-.07	.08
$\Delta(\text{Net Foreign Assets})$	-.26	-.31	-.19	-.22
<i>Autocorrelations</i>				
$\Delta(\text{Net Foreign Assets})$.10	-.02	.20	-.01
<i>Steady state equity portfolio</i>				
<i>S</i>	.79	.79	.79	