Policy bias in asset allocation between China and the US: A two-country general equilibrium analysis

Enrique Alberola Francesca Viani

Banco de España

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Motivation

- Marked increase in Chinese foreign exchange reserves over the last decade
  - From half trillion USD in 2004 to 2.5 USD trn in 2010
- As a result, a significant share of Chinese **financial wealth** has been invested in foreign bonds, especially US Treasuries

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- As a result, a significant share of Chinese **financial wealth** has been invested in foreign bonds, especially US Treasuries
- **Two** main **interpretations** for China's reserves growth and wealth allocation
  1. **Structural characteristics** of the Chinese economy determine wealth accumulation and value of the RMB
     - Chinese demand for foreign and US securities is the resultant of these factors
  2. Reserves accumulation is due to an ER **policy** that results in an **undervalued RMB**
     - Chinese policy **bias** the **allocation of financial wealth**, inflating the demand for US securities beyond what would be justified by risk-return considerations

The purpose of this paper

- Key policy concern: if the 2nd interpretation was right, policy bias in asset allocation might induce relevant distortions in intl prices
- **Common view**: removing policy distortions in asset allocation (investing Chinese wealth more in line with risk-return factors) could
  - reduce the **undervaluation** of the RMB
  - tilt **world demand** towards goods produced abroad
  - foster **growth** and **capital accumulation** in the US

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  - lower the ability of the US to finance its **external debt**
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- Could contractive financial shock offset expansive external demand shock?
- The purpose of **this paper** is to **study this trade-off** using a medium-scale dynamic general equilibrium model

Key features of the model

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- Framework from Sá and Viani (2010). Two countries (China and the US), each specialized in production of one good, each issues two types of assets (equity and bonds)
- Representative **portfolio holder** in each country, consumes choosing between Chinese and US-produced goods

$$\max . : E_t \sum_{s=t}^{\infty} \Phi^{s-t} \log (C_t)$$

$$s.t. : V_t = R_t V_{t-1} - P_t C_t + w_t - \tau_t$$

$$C_t = \left\{ (\rho)^{1/\theta} (C_{US,t})^{\frac{\theta-1}{\theta}} + (1-\rho)^{1/\theta} (C_{CH,t})^{\frac{\theta-1}{\theta}} \right\}^{\frac{\theta}{\theta-1}}$$

- US demand for Chinese goods falls with a USD depreciation

$$C_{CH,t} = (1-\rho) (e_t P_t)^{\theta} C_t.$$

- Represents agents (private consumers and public institutions) that hold financial wealth and diversify it (to some extent) between domestic and foreign assets

Asset prices and returns

- **Representative firm** in each country, produces national good using physical capital and labour, adjusts its stock of physical capital over time
- US (Chinese) **equity** is a claim to US (Chinese) firm's capital
  - a rise in its **price** tends to stimulate **investment** in physical capital
  - its return is the marginal product of capital plus capital gains

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- **Bonds** are issued by the US and the Chinese government; pay out one unit of the good produced in the country in which they are issued
- **Government** in each country can finance public expenditure and pay returns on bonds by issuing debt or by collecting taxes

$$G_t + B_{t-1} = P_t^B B_t + \left(1 - \alpha^E\right) \tau_t$$

- G_t and B_t are exogenous and constant over time. A reduction in the price of bonds, P_t^B, has an adverse **fiscal effect** on local consumers

Asset demand and policy bias

- Investors decide on the **geographical** and **asset composition** of their portfolio
  - α share of US wealth invested in Chinese assets (β allocated to equity)
  - $(1-\alpha)$ share of US wealth invested in US assets (γ to equity)

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- Assume US investors decide to allocate their wealth based on **expected returns** (*market component* of asset demand)

$$\beta_t = b^{\beta} E_t \left\{ \frac{r^E_{t+1}}{r^B_{t+1}} \right\} \quad ; \quad \gamma_t = b^{\gamma} E_t \left\{ \frac{r^{E\star}_{t+1}}{r^{B\star}_{t+1}} \right\}$$

$$\alpha_t = b^{\alpha} E_t \left\{ \frac{\gamma_t r^{E\star}_{t+1} + (1-\gamma_t) r^{B\star}_{t+1}}{\beta_t r^E_{t+1} + (1-\beta_t) r^B_{t+1}} \right\}$$

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- Assume portfolio shares of Chinese investors driven by both a *market component* and a *policy component* (the latter representing reserves motivated by (a) **liquidity purposes** and (b) the **valuation of the RMB**)

$$\alpha^\star_t = \underbrace{b^{\alpha\star} E_t \left\{ \frac{\gamma^\star_t r^E_{t+1} + (1-\gamma^\star_t) r^B_{t+1}}{\beta^\star_t r^{E\star}_{t+1} + (1-\beta^\star_t) r^{B\star}_{t+1}} \right\}}_{market\ component} + \underbrace{s^{\alpha\star}_t}_{policy} \quad ; \quad \gamma^\star_t = \underbrace{b^{\gamma\star} E_t \left\{ \frac{r^E_{t+1}}{r^B_{t+1}} \right\}}_{market\ component} + \underbrace{s^{\gamma\star}_t}_{policy}$$

Calibration

- Steady State represents **initial equilibrium with policy bias** (Chinese demand for US assets inflated for policy purposes)
- We calibrate the SS to match **portfolio shares** and **asset returns** observed in the data, and retrieve asset substitutability and policy bias from asset demands *

Parameter	Value	Source
Portfolio shares		
Share of US wealth in CH market α	0.1	Authors' calculations
Share of CH wealth in US market $\alpha^{\star}$	0.18	"
Equity share of US wealth in US market β	0.84	"
Equity share of CH wealth in CH market $\beta^{\star}$	0.84	"
Equity share of US wealth in CH market γ	0.99	"
Equity share of CH wealth in US market $\gamma^{\star}$	0.05	"
Rates of return		
Rate of return on US equity r^{E}	1.06	Datastream and Forbes (2010)
Rate of return on CH equity $r^{E\star}$	1.26	Datastream and Su et al (2011)
Rate of return on US bond r^{B}	1.02	Datastream
Rate of return on CH bond $r^{B\star}$	1.06	Datastream

Simulating the removal of policy distortions

- Simulate that Chinese wealth gets invested more in line with risk-return factors by **reducing policy component** of Chinese asset demands
- Magnitude of the reduction calibrated assuming that
  - Chinese Central Bank keeps some reserves "optimally" invested in US bonds, according to the **Greenspan-Guidotti rule**
  - the rest are **diversified** when policy distortions are removed

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- In particular, we simulate **two** alternative portfolio **diversification paths**
  - **Currency diversification**: CB diversifies currency composition of "excess" reserves according to the currency composition of China's Sovereign Wealth Fund (CIC) but keeps the asset class composition as in the initial regime
    - Chinese reserves: 66% in USD; CIC portfolio: 17% in USD
    - Chinese wealth invested in US assets would fall by 7.29% of US GDP

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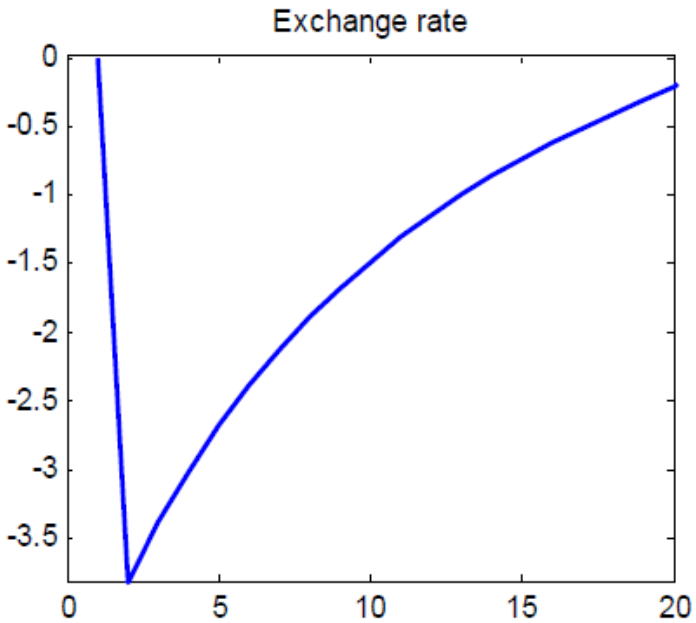
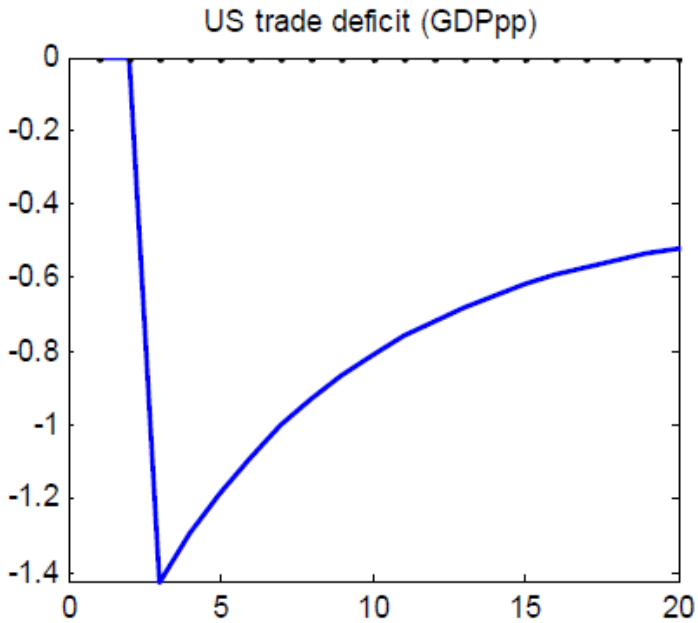
    - Chinese wealth invested in US assets would fall by 7.29% of US GDP
  - **Currency and asset class diversification**: both currency and asset class composition diversified according to CIC's portfolio
    - Reserves: 100% in bonds; SWFs portfolio: 29% in bonds
    - Chinese wealth invested in US bonds would fall by 5.17% of US GDP

Currency diversification

USD-RMB exchange rate and US trade deficit

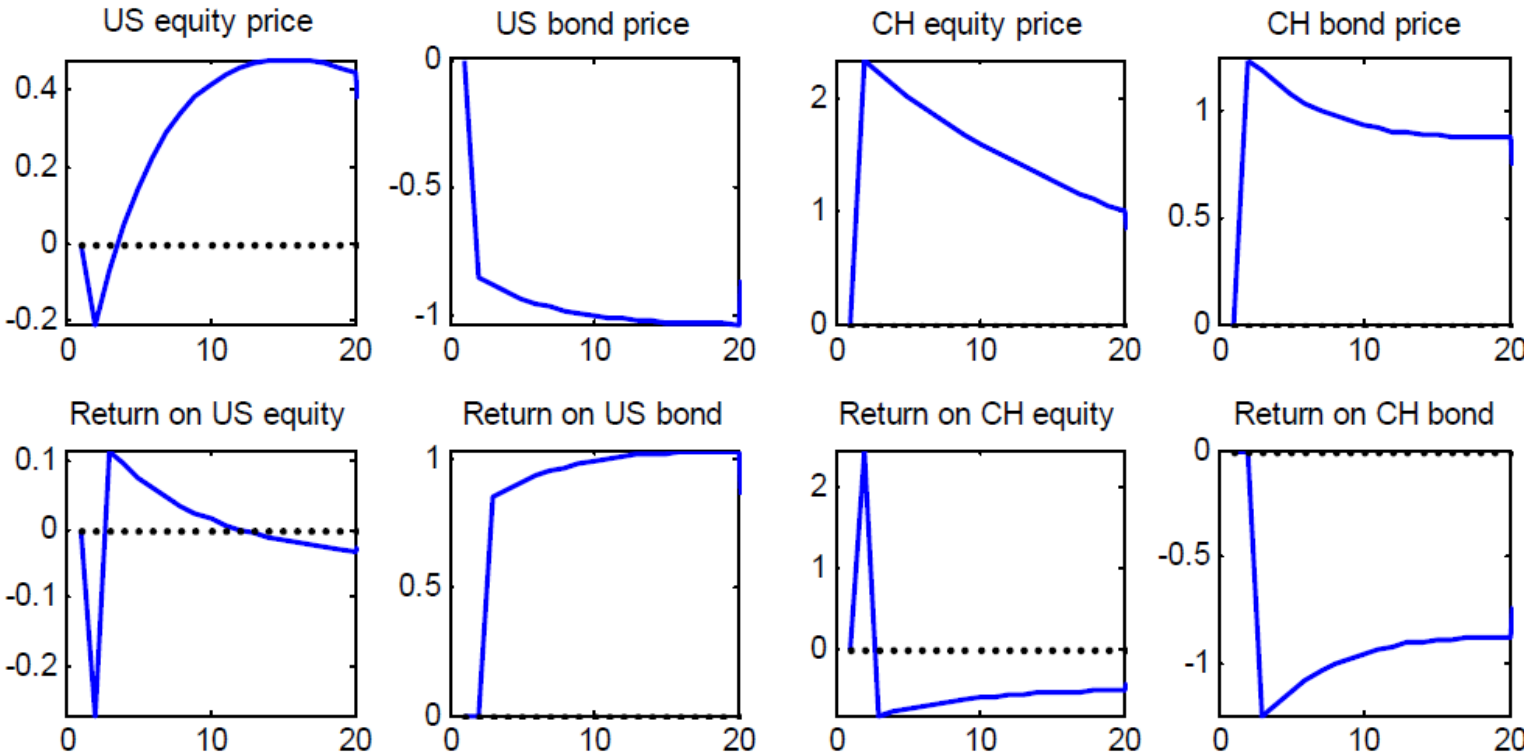




- Reduction in demand for US assets causes a significant USD depreciation and reduction in US trade deficit

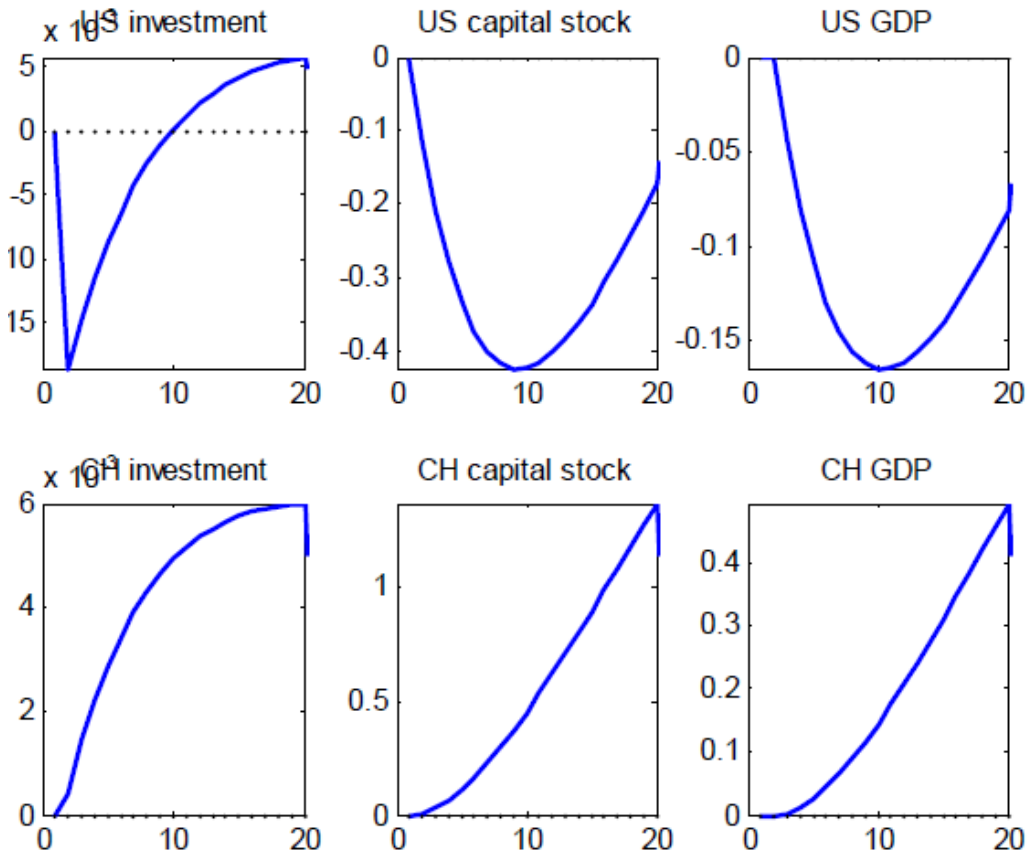
Asset prices and returns

Currency diversification



Investment, capital and GDP

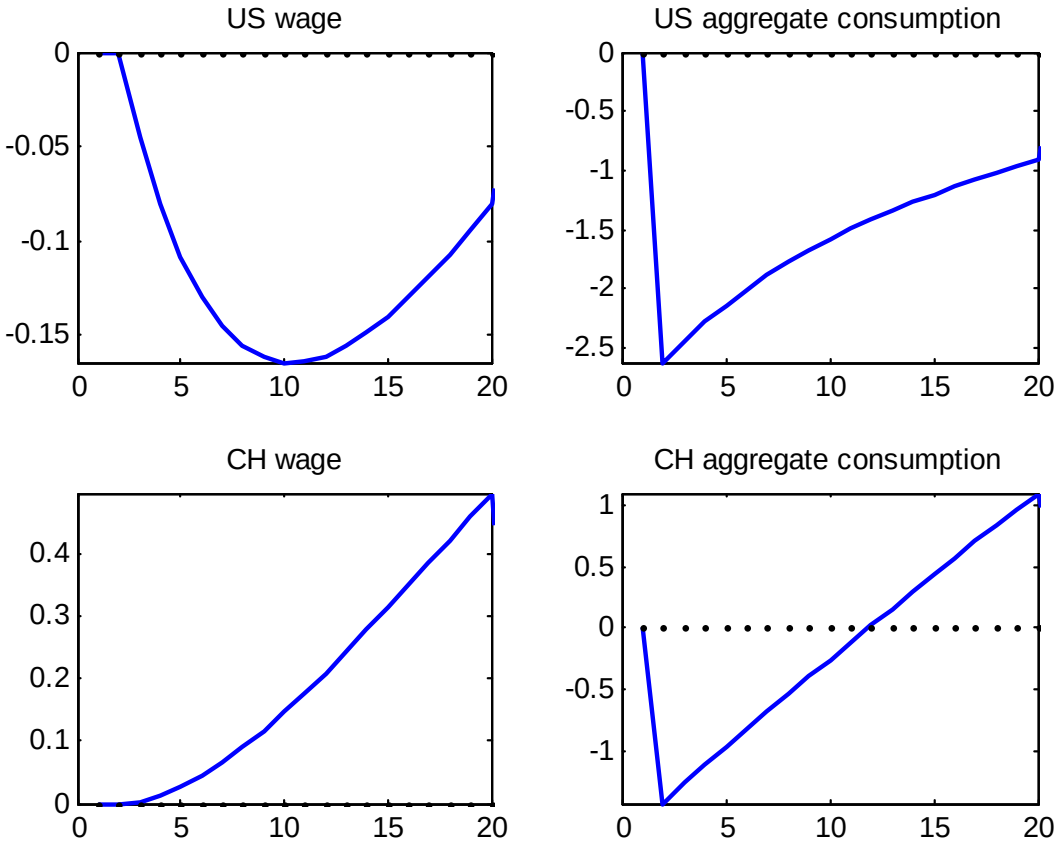
Currency diversification



- Fall in equity prices determines reduction in US investment and economic activity

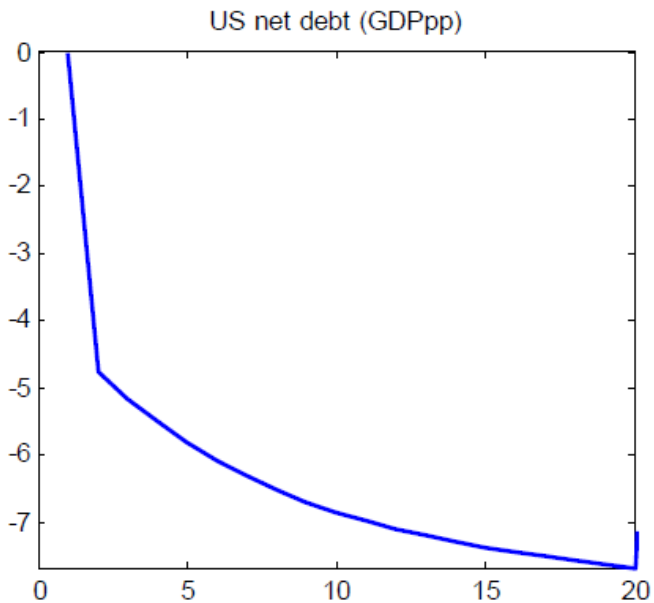
Wages and consumption

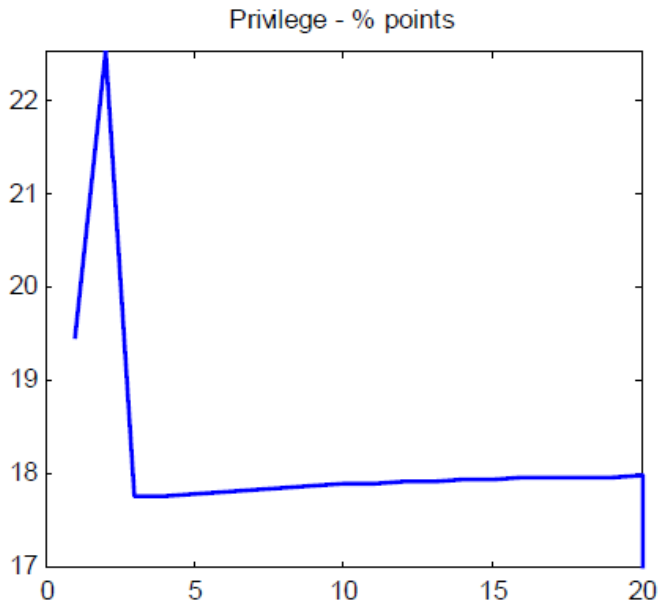
Currency diversification



- Fall in US asset prices reduces US wages and has negative fiscal effect on US consumers

External debt





- Might removal of policy bias increase the sustainability of US external debt through the reduction in the US trade deficit?
- US can sustain a **lower** debt due to **rise in returns to be paid on outstanding stock of debt** and to **reduction in "privilege"** (excess returns the US gets on its foreign assets with respect to what it pays on its liabilities)

Removing the policy bias

- **Currency diversification**
  - Consistently with the common view, **USD depreciates** and **US trade deficit falls significantly**
  - Still reduction in trade deficit due mainly to fall in US consumption and investment, rather than to GDP growth stimulated by foreign demand
  - Indeed, **rise in returns** on US equity and bond could have a **contractionary effect** on investment, capital accumulation and **economic activity in the US**
  - US external debt would be significantly reduced *

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  - Indeed, **rise in returns** on US equity and bond could have a **contractionary effect** on investment, capital accumulation and **economic activity in the US**
  - US external debt would be significantly reduced *
- **Currency and asset class diversification**
  - Could **limit** in principle the rise in US equity returns and the contraction of economic activity
  - Still simulations indicate that this contraction could be only **slightly lower** than in the previous path
  - Stronger negative **fiscal effect** due to lower demand for US bonds *

Concluding

- Possible presence of **policy bias** in intl allocation of Chinese wealth at the center of policy debate
- Our DGE analysis indicates that
  - investing Chinese wealth more in line with risk-returns considerations could reduce the undervaluation of the RMB with a positive effect on the US trade deficit
  - still the rise in interest rates in the US could have a contractive effect on economic activity
- The research agenda
  - Extension to three areas to include the **rest-of-the-world** and capture the dynamics induced by a **full reserves diversification**
  - Present work is simulating the decision of diversifying existing reserves, not the resolution to **stop accumulating reserves**. Model in differences to evaluate the **full impact** of **abandoning the dollar peg**

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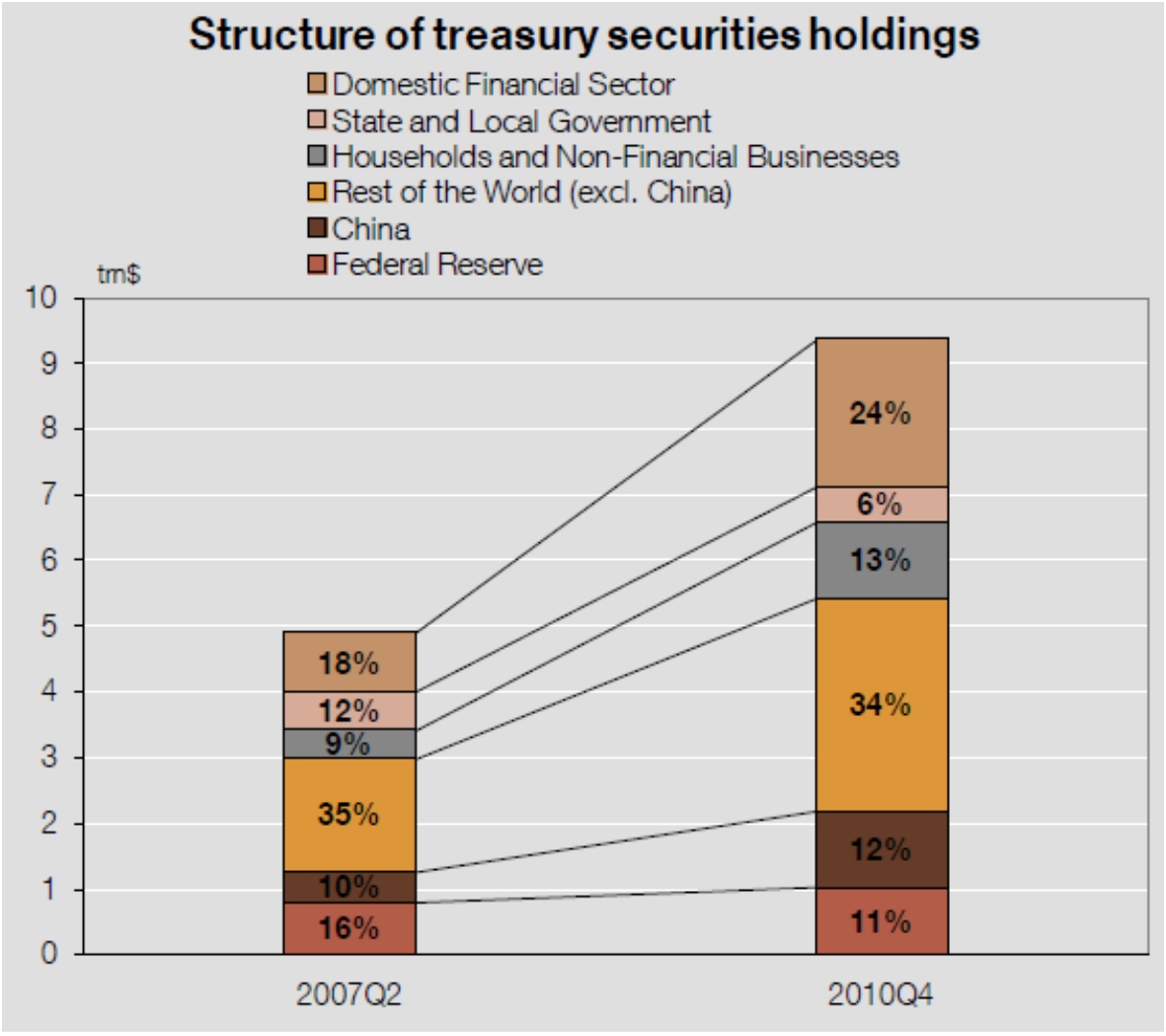
Holders of US public debt



Firms and equities

- US firms' problem

$$\max_{\{L_s, I_t, K_{t+1}\}} E_t \sum_{s=t}^{\infty} \left(\prod_{j=t+1}^{s} \Omega_{j,j+1} \left(A_s K_s^{\eta} (L_s)^{1-\eta} - w_s L_s - P_s I_s \left(1 + \phi \frac{I_s}{K_s} \right) - \delta P_s K_s \right) \right)$$

$$s.t. : K_{s+1} - K_s = I_s$$

$$I_t = \left[\rho^{1/\theta} (I_{US,t})^{\frac{\theta-1}{\theta}} + (1-\rho)^{1/\theta} (I_{ROW,t})^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

- Equity supply and returns

$$q_t = P_t \left(1 + 2\phi \frac{I_t}{K_t} \right)$$

$$r_t^E = \frac{q_t + \eta A_t K_t^{\eta-1} (1-\alpha^E)^{1-\eta} - \delta P_t + \phi P_t \left(\frac{I_t}{K_t} \right)^2}{q_{t-1}}$$

Balance of payments dynamics

$$
\begin{aligned}
F_t \quad = \quad & \left[r_t^E \gamma^{\star}_{t-1} + r_t^B \left(1 - \gamma^{\star}_{t-1}\right) \right] F_{t-1} + TD_t - (1-\alpha^E) n (1-\alpha_{t-1}) V^P_{t-1} \cdot \\
& \cdot \left[\frac{r_t^{E\star} e_{t-1}}{e_t} \gamma_{t-1} + \frac{r_t^{B\star} e_{t-1}}{e_t} \left(1 - \gamma_{t-1}\right) - r_t^E \gamma^{\star}_{t-1} - r_t^B \left(1 - \gamma^{\star}_{t-1}\right) \right]
\end{aligned}
$$

- Dynamics of US net debt
  - net debt next period equals the return the US pays on its existing stock of external net debt plus the trade deficit
  - recall US "exorbitant privilege": the US pays less on its foreign liabilites than it gets on its foreign assets (Gourinchas and Rey, 2005)
  - last term captures the effect of changes in the "privilege" (changes in returns on US assets and liabilities), and embeds valuation effects stemming from exchange rate adjustments

Why do we need two types of households?

- From portfolio investors' Euler equation

$$1 = \beta E_t R^P_{t+1} \underbrace{\frac{P_t C^P_t}{P_{t+1} C^P_{t+1}}}_{\Omega_{t,t-1}} \Rightarrow \Omega^{SS} = \frac{1}{\beta R^P}$$

- Firms must discount future profits using the stochastic discount factor (SDF) of consumers who manage them. From firms' optimality conditions

$$1 = E_t \left\{ \Omega_{t,t+1} \left(\frac{q_{t+1} + \eta A_{t+1} K^{\eta-1}_{t+1} - \delta P_{t+1} + \phi P_{t+1} \left(\frac{I_{t+1}}{K_{t+1}} \right)^2}{q_t} \right) \right\} \Rightarrow \Omega^{SS} = r^E$$

- If there were only portfolio investors, for the model to be internally consistent asset returns would have to be equalized in Steady State
- To avoid this feature, we introduce entrepreneurs who manage national firms. Their SDF is used by firms to discount future profits

Calibration

Other parameter values

Asset substitutability		
Between US and CH assets $b^{\alpha}, b^{\alpha\star}$	0.008	Authors' calculations
Between US equity and bond $b^{\beta}, b^{\gamma\star}$	0.8	"
Between CH equity and bond $b^{\beta\star}$	0.7	"
Between CH equity and bond b^{γ}	0.83	"
Other parameters		
Home bias in goods $\rho, \rho^{\star}$	0.7	Obstfeld and Rogoff (2005)
Capital share $\eta, \eta^{\star}$	0.39	OECD National Accounts
Elasticity of subst. between goods θ	0.97	Hooper and Marquez (1995)
Depreciation rate δ	0.05	Meredith (2007)
Installation cost of capital ϕ	6	Ghosh (2007)
US net debt to GDP ratio F/Y	0.1	OECD EO and DOTS
US consumption to GDP ratio C/Y	0.9	"
Relative size of US population n	0.23	OECD EO
Share of entrepreneurs $\alpha^{E}, \alpha^{E\star}$	0.2	
Relative wealth of entrepreneurs	0.2	

Currency diversification

TABLE 2
Path 1. Currency diversification – Main results

Variable	Short-run impact	Long-run response
Exchange rate (p deviation from SS)	-3.81	-0.22
US net debt (GDPpp)	-4.74	-7.66
US trade deficit (GDPpp)	-1.42	-0.50
Exorbitant privilege (pp)	17.75	17.97
Return effect	8.93	8.82
Composition effect	9.29	8.68

Currency and asset class diversification

TABLE 3

Path 2. Currency and asset-class diversification – Main results

Variable	Short-run impact	Long-run response
Exchange rate (p deviation from SS)	-3.83	-0.60
US net debt (GDPpp)	-4.77	-7.34
US trade deficit (GDPpp)	-1.43	-0.60
Exorbitant privilege (pp)	17.58	17.79
Return effect	8.98	9.30
Composition effect	8.59	8.48