

A Model of Chinese Capital Account Liberalisation

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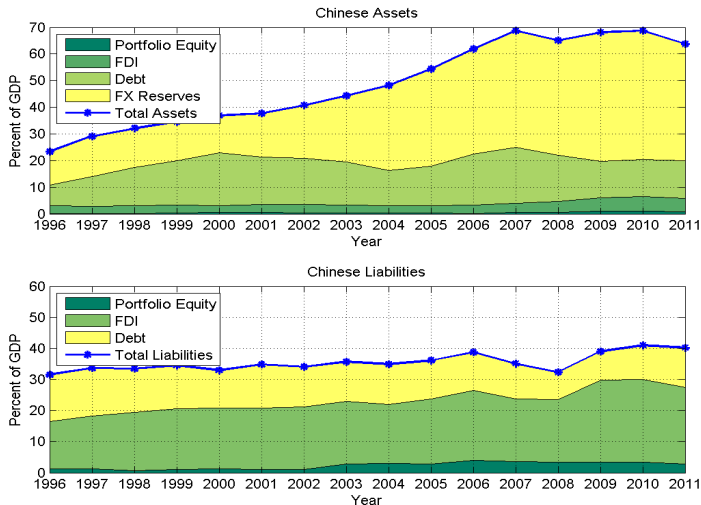
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Introduction

- China has been growing rapidly for the last 30 years, but limited capital account convertibility constrains China's involvement in international financial market.
- The Chinese government plans to speed up capital account liberalisation.
 - Foreign direct investment, outward direct investment.
 - Qualified foreign institutional investors (QFII).
 - Qualified domestic institutional investors (QDII).
- China's international balance sheet has a 'long debt, short equity' asymmetry.

Introduction

China's international balance sheet (Source: Lane & Milesi Ferretti (2007), CEIC)



Key questions

- What is the relationship between limited capital account convertibility in China now and its international balance sheet?
- How will the asset portfolio composition change after Chinese capital account liberalisation?
 - What are the consequences to the composition of China's international balance sheet?
- How do economic growth and the ongoing economic reform in China affect China's international balance sheet?

We answer these questions with a general equilibrium model with endogenous portfolio choice.

Findings

- After liberalisation, each country will increase holdings in other's equity.
- China will reverse its position in US bond holdings from long to short.
- Extended model with nominal rigidities yields quantitative predictions in line with empirical projections in the literature.
- As China grows and rebalances its economy with a higher share of labour in production, Chinese holdings of US equity will rise.

Empirical Literature on Chinese capital account liberalisation

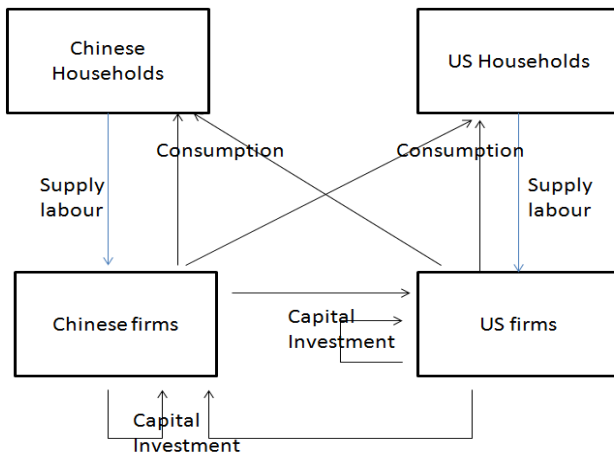
- Cross-country panel regressions.
- Ma and Zhou (2009): Driven by capital account liberalisation, gross international investment position (GIIP) in China will reach 150% GDP by 2015.
- He et al. (2012): Both inward and outward equity flows will increase significantly after capital account liberalisation.
- Bayoumi and Ohnsorge (2013): Chinese holdings of foreign assets will increase in the order of 15-25% GDP.

Model Overview

- A standard two country set-up similar to Coeurdacier, Kollmann and Martin (2010).
- Representative households and firms in each country.
- Differentiated goods with consumption and investment home bias.
- Endogenous capital accumulation.
- Equity and bond in each country, so 4 assets in total.
- Two asset market configurations: before/after Chinese capital account liberalisation.

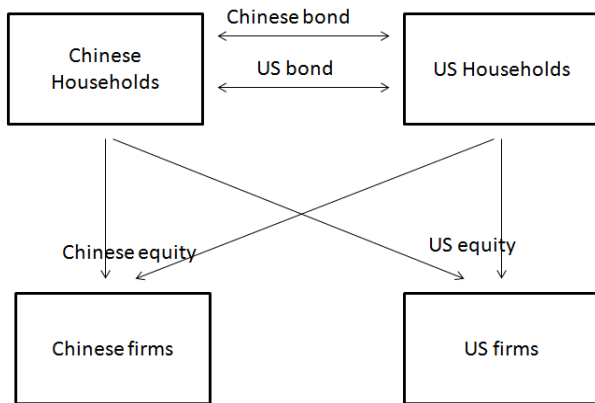
Model

Goods and Labour Market:



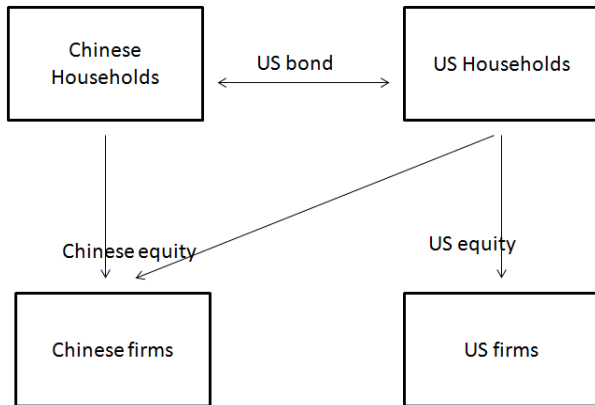
- Consumption and investment have home bias.

Asset Market after Chinese Capital Account Liberalisation:



- An equity pays dividend in each period.
- A bond pays one unit of that country's good in each period.
- Each country's equity is normalised to 1, bond has zero net supply.

Asset Market before Chinese Capital Account Liberalisation:



- Before liberalisation, Chinese bonds are not tradable internationally.
- Before liberalisation, Chinese households cannot buy US equities.

Shocks

- Firms produce with capital and labour:

$$y_{it} = \theta_{it} k_{it}^{\kappa_i} L_{it}^{1-\kappa_i}.$$

- Capital accumulation:

$$k_{it+1} = (1 - \delta)k_{it} + \chi_{it}l_{it}.$$

- θ_{it} and χ_{it} are TFP shocks and investment efficiency shocks (Justiniano et al. 2007) respectively, each following an AR(1) process.
- Financial market is incomplete before capital account liberalisation, and complete after.

Portfolio Solution

- We compute the optimal portfolio allocations in the steady state under both asset market configurations.

Calibration

Parameter	Value
Discount factor	$0.96^{1/4}$
Capital depreciation rate	0.025
Consumption home bias	0.75
Coefficient of relative risk aversion	2.5
Inverse of Frisch elasticity	1
Armington elasticity of substitution between home and foreign goods	1.1

Parameter	Value	Reason
US capital share in production	$\kappa_A = 0.35$	Standard value
Chinese capital share in production	$\kappa_B = 0.5$	Brandt et al. (2008)
US TFP in SS	$\bar{\theta}_A = 1$	Normalisation
Chinese TFP in SS	$\bar{\theta}_B = 0.13$	Zhu (2012)
NFA in SS	$NFA_A = 0$	Common in literature. Done robustness checks.

TFP Shocks

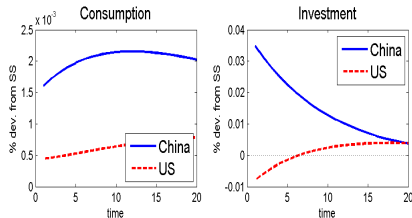
Parameter	Value	Reason
Persistence	$\rho_{\theta}^a = 0.75$	G7 data
s.d. of shock in US	$\sigma_{\theta A}^a = 1.2\%$	G7 data
s.d. of shock in China	$\sigma_{\theta B}^a = 1.7\%$	Shi, Wu and Xu (2012)
Corr. of shocks	$Corr(\epsilon_{At}^{\theta}, \epsilon_{Bt}^{\theta}) = 0.45$	Coeurdacier et al. (2012)

Investment Efficiency Shocks

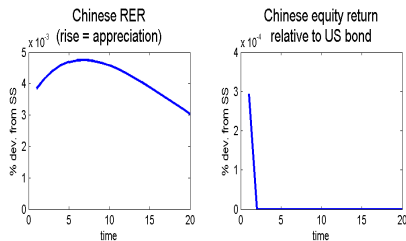
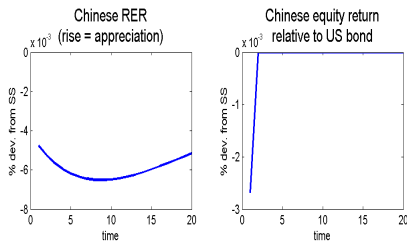
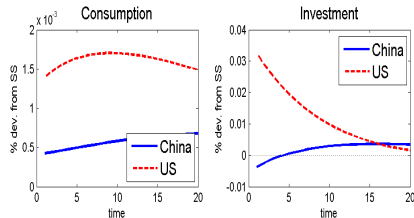
Parameter	Value	Reason
Persistence	$\rho_{\chi}^a = 0.79$	G7 data
s.d. of shock in US	$\sigma_{\chi A}^a = 1.73\%$	G7 data
s.d. of shock in China	$\sigma_{\chi B}^a = 1.73\%$	Done robustness checks.
Corr. of shocks	$Corr(\epsilon_{At}^{\chi}, \epsilon_{Bt}^{\chi}) = 0.2$	Coeurdacier et al. (2012)

TFP Shocks

Chinese TFP shock

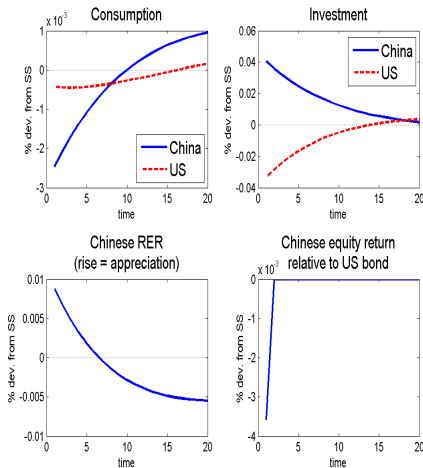


US TFP shock

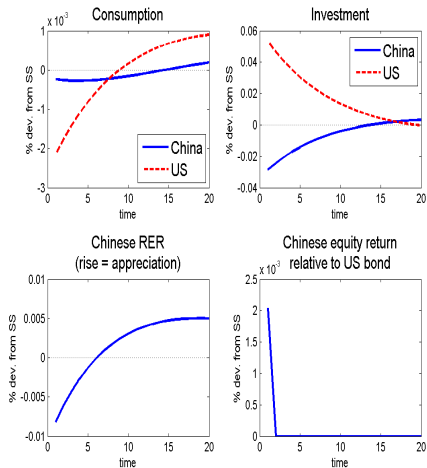


Investment Efficiency Shocks

Chinese investment efficiency shock



US investment efficiency shock



Portfolio Allocation before Liberalisation

- If only TFP shocks are present, Chinese residents would long Chinese equities and short US bonds.
- If only investment efficiency shocks are present, Chinese residents would long US bonds and short Chinese equities.
- For any given volatility of the TFP shocks, a rise in volatility of investment efficiency shocks increases Chinese holdings of US bonds.
- For a wide range of volatility of the investment efficiency shocks, the SS portfolio before liberalisation implies a 'long debt, short equity' asymmetry in China's international balance sheet.

Portfolio Allocation before Liberalisation

Before Chinese capital account liberalisation:		
SS Portfolio	Chinese holdings of Chinese equity	US holdings of US equity
Share	89%	100%
After Chinese capital account liberalisation:		
SS Portfolio	Chinese holdings of Chinese equity	US holdings of US equity
Share		

% of Chinese GDP	Before Liberalisation	After Liberalisation
US holdings of Chinese equity	39%	
Chinese holdings of US bond	39%	
US holdings of Chinese bond	0	
Chinese holdings of US equity	0	
GIIP	78%	

Portfolio Allocation after Liberalisation

Portfolio Allocation after Liberalisation

- Complete market means perfect risk-sharing (locally).
- Equities and bonds to hedge real exchange rate risk and wage income risk.
- Bonds hedge real exchange rate fluctuations perfectly.
- Equities hedge wage income risk.
 - Relative wage income and relative dividend are negatively correlated. This leads to home equity bias.
- Equilibrium bond position reflects balance of two effects:
 - 1 An optimal hedge for real exchange rate risk,
 - 2 and a hedge for the implicit real exchange rate exposure arising from equilibrium equity holdings and wage income. (Coeurdacier and Gourinchas, 2010)

Portfolio Allocation after Liberalisation

Before Chinese capital account liberalisation:		
SS Portfolio	Chinese holdings of Chinese equity	US holdings of US equity
Share	89%	100%
After Chinese capital account liberalisation:		
SS Portfolio	Chinese holdings of Chinese equity	US holdings of US equity
Share	56%	80%

% of Chinese GDP	Before Liberalisation	After Liberalisation
US holdings of Chinese equity	39%	161%
Chinese holdings of US bond	39%	-192%
US holdings of Chinese bond	0	-291%
Chinese holdings of US equity	0	63%
GIIP	78%	707%

Characteristics of SS portfolios:

- Portfolio exhibits equity home bias all the time.
- Home bias falls after capital account liberalisation, consistent with empirical findings. (eg. Sorensen et al. 2007)
- For China, both outward and inward equity flows rise. Result echoes with empirical prediction in He et al. (2012).
- GIIP in China will rise substantially, consistent with Ma and Zhou (2009).
- Chinese holdings of US bonds reverse from a long position to a short position.

Extension with Nominal Rigidity

Production Sector

- Introduce decentralised firms in each country with monopolistic competition.
- Introduce nominal rigidity through staggered price-setting a la Calvo (1983).

Monetary policy

- Assume the following interest rate rule:

$$R_{it+1}^b = \beta^{-1} \left(\frac{p_{it}}{p_{it-1}} \right)^{\varphi_{i\pi}} m_{it},$$

where m_{it} is an AR(1) shock.

- He and Pauwels (2008) study the implicit monetary policy stance in China and argue that it can be modelled as a quasi-policy rule with significant inflation feedback.

Extension with Nominal Rigidity

Before Chinese capital account liberalisation:		
SS Portfolio	Chinese holdings of Chinese equity	US holdings of US equity
Share	90%	100%
After Chinese capital account liberalisation:		
SS Portfolio	Chinese holdings of Chinese equity	US holdings of US equity
Share	82%	89%

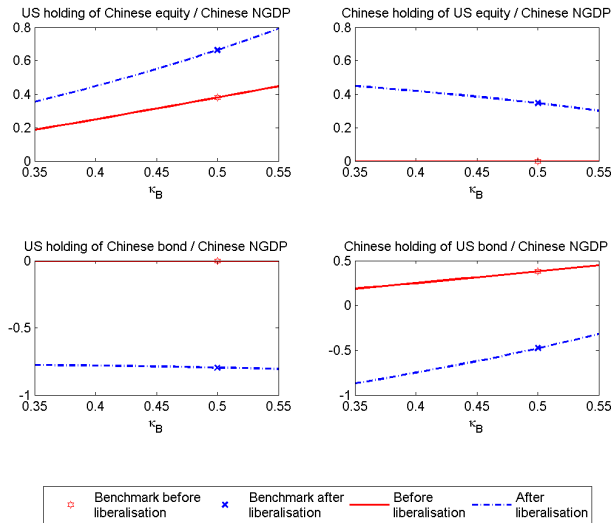
% of Chinese GDP	Before Liberalisation	After Liberalisation
US holdings of Chinese equity	38%	66%
Chinese holdings of US bond	38%	-48%
US holdings of Chinese bond	0	-80%
Chinese holdings of US equity	0	35%
GIIP	76%	229%

Experiments:

- ① A rise in labour share in Chinese production.
 - Brandt et al. (2008) estimate that the capital share in production in China, κ_B , is about 0.5, much larger than G7 average of 0.35.
 - A shift in Chinese production towards service could increase the labour share.
- ② China experiences a sustained rise in relative productivity.
 - Zhu (2012) estimates relative TFP in China is 13% of the US.
 - Through institutional reforms and policy changes that reduce distortions and better align economic incentives, China's TFP may catch up gradually.

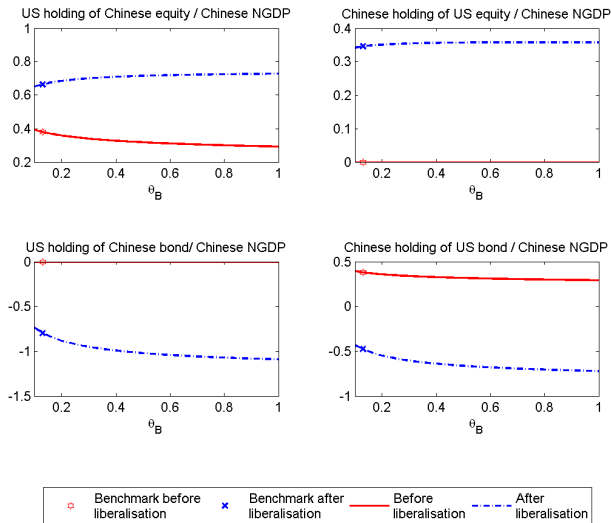
Comparative Statics

Experiment 1: Internal rebalancing in China.



Comparative Statics

Experiment 2: Rise in TFP in China.



Conclusions

- We have built a theory-based model of portfolio choice and study asset allocation before and after capital account liberalisation in China.
- Model replicates the asymmetric international balance sheet in China and predicts a less asymmetric structure after liberalisation.
- China will increase equity holdings of the rest of the world and reduce US bond holdings.
- Ongoing economic rebalancing and productivity growth help rebalancing China's international balance sheet.