Foreign Portfolios and Domestic Business Cycles with Heterogeneous Agents

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Introduction

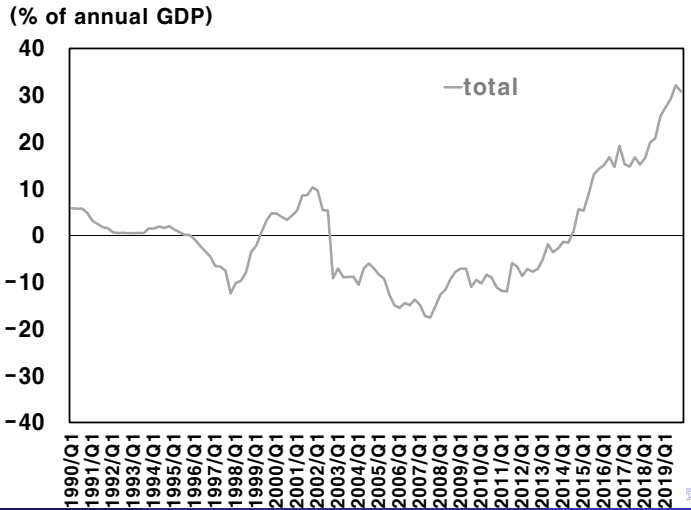
Research question:
US interest rates and the US dollar are on the rise again, what does this imply for emerging markets business cycles and inequality?

This paper provides a new perspective and quantification::

- New decomposition of foreign asset portfolios.
- Estimate a Small Open Economy - HANK model on macro/micro data.
- Allow for a broader set of foreign asset return shocks and heterogeneity in exposures.

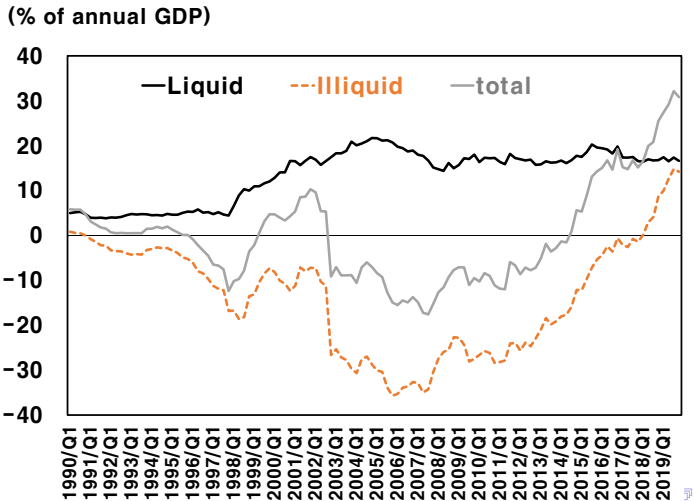
Flow of Funds Data

Net Position of Korean Economy



Flow of Funds Data

Net Positions by Liquidity



Introduction

Key Question: How important are foreign return/demand shocks for domestic outcomes in SMOEs? Does the composition of foreign portfolios matter?

Additional Question: Are HANK insights about policy transmission robust to SMOE setting?

- Monetary Policy
  - **Importance of indirect effects**
  - **Importance of fiscal policy**
- Fiscal Policy
  - **Bond rate elasticity**

Introduction

This paper: Builds and estimates a SMOE-HANK model for South Korea.

- **South Korea** is a very open economy (export/GDP around 40 percent).
- **South Korea**'s net foreign asset position is approx. zero. However, sizable savings in liquid bonds, while the illiquid investment position is negative.
- **Flexible** nominal exchange rate.
- **Sensitive to** variations in foreign demand for South Korean goods.
- **Sensitive to** shocks in international capital markets (East Asian crisis):
  1) Liquid bond returns
  2) Illiquid capital return

Summary of key results: Transmission of Foreign Shocks

Liquid Bond Return

- Domestic economy little affected by foreign return shocks to liquid assets
- Foreign savings provide insurance via income effects

Illiquid Capital Return

- Domestic economy strongly affected by foreign return shocks to illiquid assets
- Foreign financing amplifies investment response

Foreign Demand

- Foreign demand shocks transmit via wages

Summary of key results: Policy Transmission in SMOE-HANK

Monetary Transmission

- Indirect effects are still key
- Transmission also goes through net exports

Fiscal Transmission

- Interest rate responds little to foreign asset position / government debt
- Smaller Laffer curve to exploit

Literature

Small open economy NK models: Kollmann, 2002, Corsetti and Pesenti, 2005, Gali and Monacelli, 2005, Monacelli, 2005, Lubik and Schorfheide, 2007, Adolfson et al 2007, Christiano, Trabandt and Walentin, 2011

HANK: Auclert, 2019, Broer et al, 2020, Bayer et al, 2019, Gornemann et al, 2016, Kaplan, Moll and Violante, 2018, Luetticke, 2021, McKay and Reis, 2016, Ravn and Sterk, 2017, 2021, Werning 2016.

Estimated HANK models: Challe et al, 2017 Auclert et al, 2019, Bayer et al, 2021, Liu and Plagborg-Möller, 2021.

(SM)OE HANK: Sunel, 2012, de Ferra, Mitman and Romei, 2020, Ghiagheddu, 2020, Guo, Ottonella and Perez, 2020, Auclert et al, 2021, Zhou, 2021, Aggarwal et al, 2022, Bayer et al, 2022, Chen et al, 2022.

Empirics

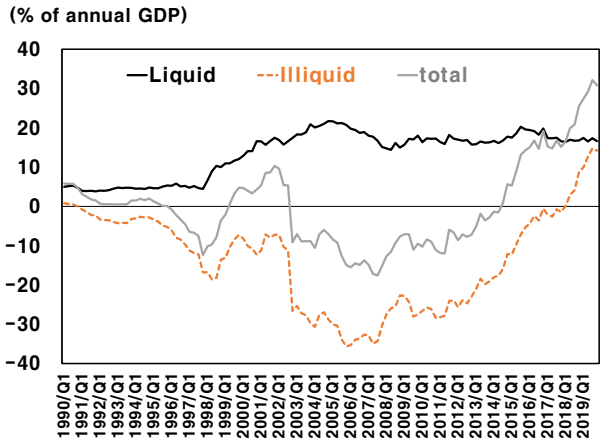
A New Perspective on Foreign Asset Portfolios

Classification of Financial Instruments in Flow of Funds

Classification of Financial Instruments

Liquid instruments	Gold and SDRs, Cash and Deposits, Bonds (government, corporate, etc), Loans (short term, government), FX reserves
Iliquid instruments	Insurance and Pension, Long-term Bonds (ABS, external, derivatives-linked), Loans (long term), Equities and Investment Funds shares, Financial Derivatives, Trade Credits Foreign Direct Investment, etc

Flow of Funds Data: Net Positions by Liquidity

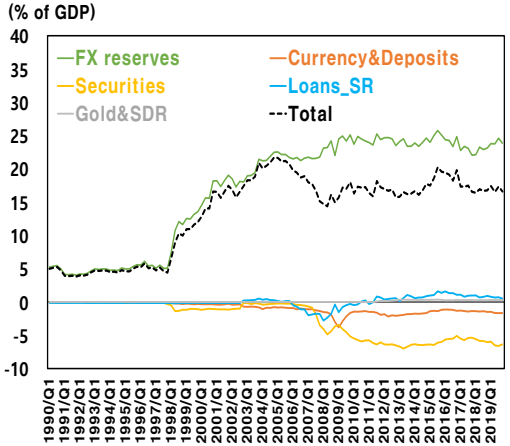


Net Liquid to GDP: 13.6%
Net Illiquid to GDP: -13.7%

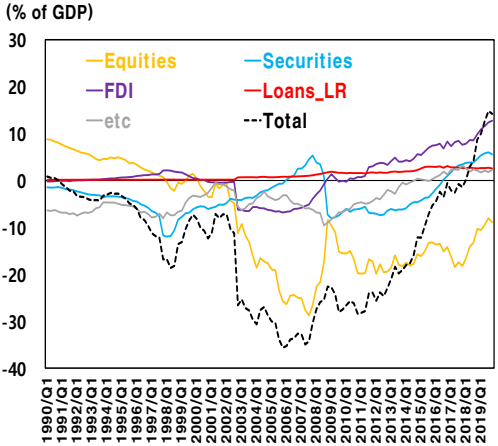
Flow of Funds Data

Net Positions by Instrument

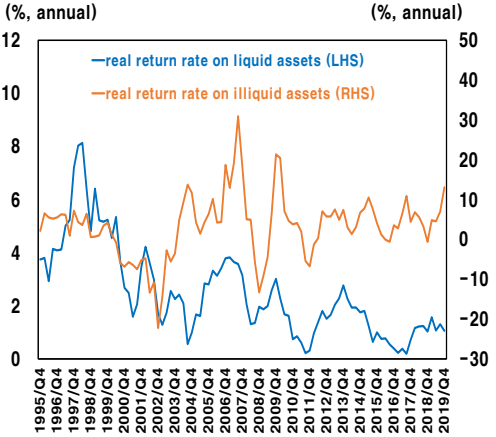
(Liquid Net Positions)



(Illiquid Net Positions)



Return rates



Notes on Return rates of assets

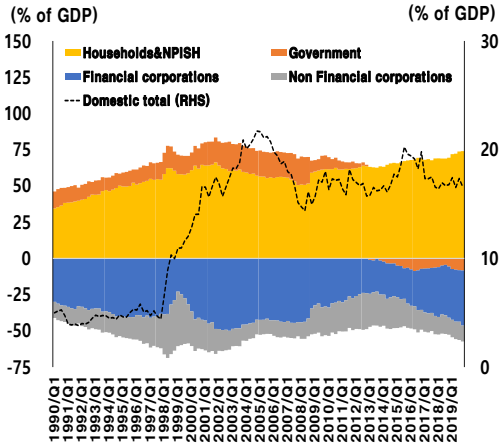
Components of Return Rates by Liquidity

Liquid assets	National Housing Bond Rate (5-yr) Government Loan Rate, Corporation Bonds Rate (O.T.C, 3-yr, AA-)
Iliquid assets	Equity Return Rate, FDI Abroad Return Rate, Loan to Corporation Rate

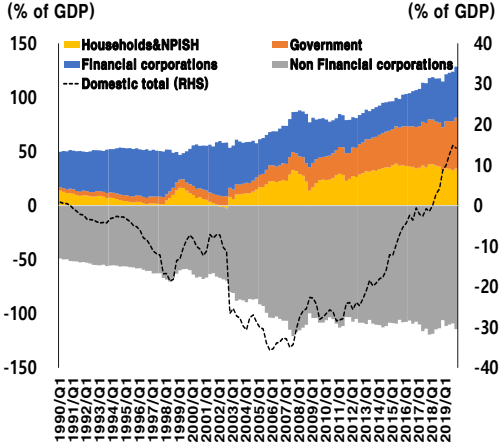
Flow of Funds Data

Net Positions of Domestic Economy by Sector

(Liquid Net Positions)



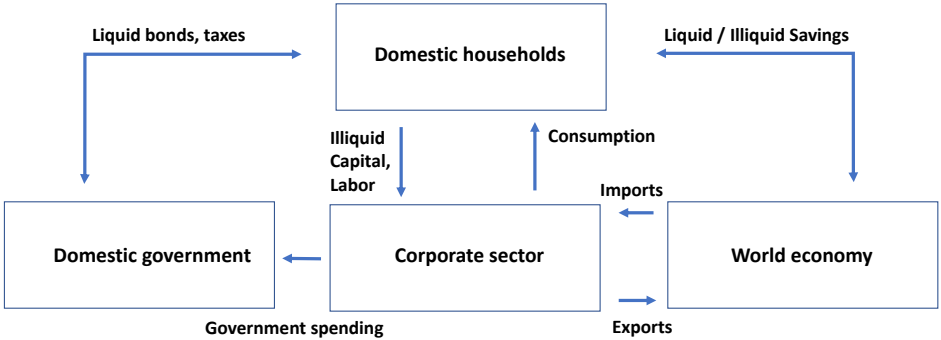
(Illiquid Net Positions)



Model

A SMOE HANK Model with Foreign Asset Portfolios

SMOE HANK Model: Overall structure



SMOE HANK Model: Overall structure

Households: Consumer, supply labor, manage portfolios of liquid and illiquid assets, subject to idiosyncratic productivity shocks.

Labor unions: Sell labor to firms, monopolistically competitive, nominal wages sticky.

Retailers: Competitive, produce final goods using input of domestic and imported goods.

Domestic goods producers: Monopolistically competitive, differentiate domestic intermediate goods, sell to domestic and foreign retailers, nominal prices sticky in domestic currency.

Intermediate goods producers: Competitive, produce using inputs of capital and labor.

Capital producers: Competitive, produce new capital subject to adjustment costs.

Domestic Government: In charge of monetary and fiscal policy, floating exchange rate.

Foreign bond markets: Provide bonds to domestic economy, interest rate is asset elastic.

Households

Preferences:

$$\mathbf{u}\left(c_i, l_i\right) = \frac{\left(c_i - \mathbf{G}\left(h_i, n_i\right)\right)^{1-\xi}}{1-\xi},$$

Skill Dynamics: Households have skill h_i and are either:

- Workers (share $\iota / \left(\iota + \zeta\right) \simeq 1$), or
- rentiers, receive all profits.

Law of motion of skills:

$$h_i = \begin{cases} \exp\left(\rho_h \log h_{i,-1} + \sigma_h \varepsilon_{h,i}\right) & \text{with probability } 1-\zeta \quad \text{if } h_{i,-1} \neq 0, \\ 1 & \text{with probability } \iota \quad \text{if } h_{i,-1} = 0, \\ 0 & \text{otherwise,} \end{cases}$$

$$\varepsilon_{h,i} \backsim N\left(0,1\right)$$

Households

Financial assets/liabilities:

$$\begin{aligned} b_i' &\geq B_{min} \quad : \quad \text{Liquid assets} \\ k_i' &\geq K_{min} \quad : \quad \text{Illiquid assets} \end{aligned}$$

Net labor income:

$$\mathbf{y}_{i,t} = \left(1 - \tau_t^L\right) \left(w_t h_{i,t} n_{i,t}\right)^{1-\tau_t^p}$$

Budget constraint

$$c_{i,t} + b_{i,t+1} + k_{i,t+1} = \mathbf{y}_{i,t} + R_t^b(\cdot) b_{i,t} A_t + R_t^k(\cdot) k_{i,t} + \tau_t \left(\mathbf{1}_{h_{i,t} \neq 0} \Pi_t^U + \mathbf{1}_{h_{i,t}=0} \Pi_t^f\right)$$

Households' International Portfolios

Liquid asset portfolio

- Domestic bonds, share $\Phi_B \in [0,1]$, and foreign assets

$$R_t^b(\cdot) = \Phi_B \frac{R_t^B}{\pi_t} + (1-\Phi_B)\frac{R_t^{B^F}}{\pi_t}\frac{S_t}{S_{t-1}}$$

Illiquid asset portfolio

- Domestic capital, share $\Phi_K \in [0,1]$, and foreign assets
- Adjustable with prob. $\lambda > 0$

$$R_t^k(\cdot) = \Phi_K \frac{q_t + r_t^K}{q_{t-1}} + (1-\Phi_K)\frac{R_t^{K^F}}{\pi_t}\frac{S_t}{S_{t-1}}$$

Labor Unions

Setting: Continuum of monopolistically competitive labor unions, sell the differentiated labor to labor packers. Calvo sticky wages set by unions.

Technology

$$N_t = \left(\int n_{j,t}^{1-1/\zeta_t} \right)^{1/(1-1/\zeta_t)} \Rightarrow$$

$$n_{j,t} = \left(\frac{W_{j,t}}{W_t^F} \right)^{-\zeta_t} N_t$$

Wage Setting

$$W_{j,t} = \text{argmax} \quad \mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} \lambda_w^{s-t} \frac{W_s^F}{P_s} N_s \left[\left(\frac{W_{j,t} \pi_W^{s-t}}{W_s^F} - \frac{W_s}{W_s^F} \right) \left(\frac{W_{j,t} \pi_W^{s-t}}{W_s^F} \right)^{-\zeta_s} \right]$$

$$\overset{\Rightarrow}{\log \left(\frac{\pi_t^w}{\pi^w} \right)} = \beta \mathbb{E}_t \log \left(\frac{\pi_{t+1}^w}{\pi^w} \right) + \kappa_w \left(mc_t^w - \frac{1}{\mu_t^w} \right)$$

Retailers

Setting: Competitive, sell final good at price P_t, produce it using inputs of domestic and foreign goods.

Technology

$$
\begin{aligned}
V_t &= \left[(1-\alpha)^{1/\eta} \left(\int_0^1 V_{H,t}(j)^{(1-1/\epsilon_t)} dj \right)^{(1-1/\eta)/(1-1/\epsilon_t)} + \alpha^{1/\eta} V_{F,t}^{1-1/\eta} \right]^{1/(1-1/\eta)} \\
V_t &= C_t + I_t + G_t
\end{aligned}
$$

The demand functions and domestic CPI inflation are then given as:

$$
\begin{aligned}
V_{H,t} &= (1-\alpha)\, p_{H,t}^{-\eta} V_t \\
V_{F,t} &= \alpha p_{F,t}^{-\eta} V_t \\
\widehat{\pi}_t &= (1-\alpha)\, p_H^{(1-\eta)} \widehat{\pi}_{H,t} + \alpha p_F^{(1-\eta)} \widehat{\pi}_{F,t}
\end{aligned}
$$

Goods Producers

Setting: Monopolistically competitive, differentiate intermediate good, sell at home and export.

Assumption: Prices sticky in the producer currency and LOP, $P_{H,t}(j) = S_t P^*_{H,t}(j)$.

Price Setting (exploiting LOP)

$$P_{j,t} = \text{argmax}\mathbb{E}_t \sum_{s=t}^{\infty} (\beta\lambda_p)^{s-t} \left(1-\tau_s^L\right) D_{H,s}^{1-\tau_s^P} \left[\left(\frac{P_{H,t}(j)\pi_H^{s-t}}{P_{H,s}} - \frac{MC_s}{P_{H,s}} \right) \left(\frac{P_{H,t}(j)\pi_H^{s-t}}{P_{H,s}} \right)^{-\epsilon_s} \right.$$

$$\Rightarrow$$

$$\log\left(\frac{\pi_{H,t}}{\pi_H}\right) = \beta\mathbb{E}_t \log\left(\frac{\pi_{H,t+1}}{\pi_H}\right) + \kappa_w \left(mc_t - \frac{1}{\mu_t^Y} \right)$$

where:

$$D_{H,t}(j) = \left(\frac{P_{H,t}(j)}{P_{H,t}}\right)^{-\epsilon_t} \left[(1-\alpha) \left(\frac{P_{H,t}}{P_t}\right)^{-\eta} V_t + \alpha^* \left(\frac{P^*_{H,t}}{P^*_t}\right)^{-\eta} V^*_t \right]$$

Capital Producers

Setting: Competitive, turn final goods into new capital goods subject to adjustment costs.

Technology

$$K_{t+1} = (1 - \delta(u_t))\, K_t + \Psi_t \left[1 - \frac{\phi}{2}\left(\log \frac{I_t}{I_{t-1}}\right)^2\right] I_t$$

Profit maximization and F.O.C.

$$\begin{aligned} V_{K,t} &= max \mathbb{E}_s \sum_{s=t}^{\infty} \beta^{s-t} I_s \left[\Psi_s q_s \left(1 - \frac{\phi}{2}\left(\log\left(\frac{I_s}{I_{s-1}}\right)^2\right)\right) - 1\right] \\ &\Rightarrow \\ \Psi_t q_t \left[1 - \phi \log\left(\frac{I_t}{I_{t-1}}\right)\right] &= 1 - \beta \mathbb{E}_t \Psi_{t+1} q_{t+1} \phi \log\left(\frac{I_t}{I_{t-1}}\right) \end{aligned}$$

Intermediate Goods Producers

Setting: Competitive, rent labor from packers, capital from households

Technology

$$Y_t = Z_t \left(u_t K_t\right)^{1-\vartheta} N_t^{\vartheta}$$

Factor demands

$$\begin{aligned} w_t^F &= p_{H,t}\vartheta mc_t Z_t \left(\frac{u_t K_t}{N_t}\right)^{1-\vartheta} \\ r_t + q_t\delta(u_t) &= p_{H,t}(1-\vartheta) mc_t u_t Z_t \left(\frac{u_t K_t}{N_t}\right)^{-\vartheta} \\ q_t\delta'(u_t) &= p_{H,t}(1-\vartheta) mc_t Z_t \left(\frac{u_t K_t}{N_t}\right)^{-\vartheta} \end{aligned}$$

Government

Setting: In charge of monetary and fiscal policy.

Fiscal policy

$$
\begin{aligned}
\frac{G_t}{G} &= \left(\frac{G_{t-1}}{G}\right)^{\rho_G} \left(\frac{B_t}{B}\right)^{(1-\rho_G)\gamma_B^G} \left(\frac{V_t}{V_{t-1}}\right)^{(1-\rho_G)\gamma_V^G} \epsilon_t^G \\
\frac{\tau_t}{\tau} &= \left(\frac{\tau_{t-1}}{\tau}\right)^{\rho_\tau} \left(\frac{B_t}{B}\right)^{(1-\rho_\tau)\gamma_B^\tau} \left(\frac{V_t}{V_{t-1}}\right)^{(1-\rho_\tau)\gamma_V^\tau} \\
T_t &= \tau_t \left(w_t n_{it} h_{it} + \mathbb{1}_{h_{it}\neq 0}\Pi_t^U + \mathbb{1}_{h_{it}=0}\Pi_t^F\right) \\
B_{t+1} &= G_t - T_t + \frac{R_t^b B_t}{\pi_t}
\end{aligned}
$$

Monetary policy

$$
\frac{R_{t+1}^b}{R^b} = \left(\frac{R_t^b}{R^b}\right)^{\rho_R} \left(\frac{\pi_t}{\pi}\right)^{(1-\rho_R)\theta_\pi} \left(\frac{V_t}{V_{t-1}}\right)^{(1-\rho_R)\theta_V} \epsilon_t^R
$$

World Economy

Import price

$$P_{F,t} = S_t P^*_{F,t}$$

World demand

$$\log \frac{V^*_t}{V^*} = \rho_{V^*} \log \frac{V^*_{t-1}}{V^*} + e^{V^*}_t$$

International flows

$$S_t B^F_{t+1} + S_t K^F_{t+1} = \left(1 + R^{B^F}_t\right) S_t B^F_t + \left(1 + R^{K^F}_t\right) S_t K^F_t + NX_t$$

International liquid asset market

$$\begin{aligned} \mathbb{E}_t R^B_{t+1} &= \mathbb{E}_t R^{B^F}_{t+1} \frac{S_{t+1}}{S_t} \\ Q^B\left(\frac{SB^F}{P}\right) + e_t^{B^F} &= 1, Q^{B\prime} < 0, Q^{B\prime\prime} < 0 \end{aligned}$$

International illiquid asset market

$$\begin{aligned} \mathbb{E}_t R^K_{t+1} &= \mathbb{E}_t \frac{R^{K^F}_{t+1} \frac{S_{t+1}}{S_t}}{\pi_{t+1}} \\ Q^K\left(\frac{SK^F}{P}\right) + e_t^{K^F} &= 1, Q^{K\prime} < 0, Q^{K\prime\prime} < 0 \end{aligned}$$

SMOE HANK Model: Summing up

Model combines

- **Incomplete markets** through idiosyncratic risk, lack of insurance, illiquid assets.
- **New Keynesian features** through sticky prices and wages.
- **Open Economy features** through trade in goods and in liquid / illiquid assets.

Fluctuations driven by:

- **Shocks**: Idiosyncratic, domestic policy, domestic technology and markups, foreign demand and interest rates.
- **State variables**: Wealth distribution, portfolio composition including capital stock, government debt, foreign assets and debt.

Solution and Estimation Strategies

Model solution:

- The distribution Θ over b, k, h is a state variable.
- First-order perturbation of the non-linear difference equation $EF(x_t, x_{t+1}, \epsilon_t) = 0$ around the stationary equilibrium.
- Approximate the policy functions as sparse polynomials around their stationary equilibrium values and approximate the distribution functions by histograms of their marginals and a **time-varying Copula** as in Bayer and Luetticke, 2018.
- Linear system depends only on a subset of model parameters.

Parameter estimation:

- Bayesian likelihood approach as in An and Schorfheide, 2007.
- Estimate those parameters that do not enter the non-linear part of the model solution.
- Employ Kalman filter to get state-space representation of the model, then use random walk Metropolis-Hastings algorithm to generate draws from the posterior likelihood.

Sources of Fluctuations

Domestic Aggregate Shocks

- total factor and investment-specific productivity
- price and wage markup
- risk premium
- monetary policy
- government spending

Foreign Aggregate Shocks

- foreign liquid return
- foreign illiquid return
- foreign demand

Estimation

What we estimate

HA Small Open Economy-HANK model

HA0 Small Open Economy-HANK model (zero foreign assets, liquid and illiquid return shocks)

RA0 Small Open Economy-RANK model (zero foreign assets, only one return shock)

Estimation: Two-step procedure

- First, we calibrate or fix all parameters that affect the steady state of the model.
- Second, we estimate by full-information methods all parameters that only matter for the dynamics of the model, i.e., the aggregate shocks, frictions, and policy rules.
- We set the priors for shocks, frictions, and policy rules to standard values from the representative agent literature.

Calibration/Parameterization of Steady-State

Table: Steady State Calibration Targets

Target	Annual value	Source	Parameter
Capital to Output ($\frac{K}{Y}$)	307%	BOK	Discount factor
Gov Debt to Output ($\frac{D_G}{Y}$)	30%	Stat Korea	Portfolio liquidity
Gov spending over GDP ($\frac{G}{Y}$)	14%	BOK	Tax level
Top 10% Wealth Share	58%	WID	Fraction of entrepreneurs
Import share ($\frac{V_H^*}{V}$)	37%	Stat Korea	Share in V
Foreign Liquid Assets to Output ($\frac{B_F}{Y}$)	13.6%	Stat Korea	Share in liquid assets
Foreign Illiquid Assets to Output ($\frac{K_F}{Y}$)	-13.7%	Stat Korea	Share in illiquid assets

Time period: 1990-2019

Calibration/Parameterization of Steady-State

Household side:

- Risk aversion: 2, Frisch elasticity: 0.5

- Income process: $\rho_h = 0.95$, $\sigma_h = 0.20$ from Chang *et al.* (2015)
- Average time as rentier: 6 years from Guvenen *et al.* (2014)
- Tax progressivity: $\tau^p = 0.13$ from Chang *et al.* (2015)

Calibration/Parameterization of Steady-State

Firm side:

- Labor income share of 62 percent
- Capital depreciation rate of 2% per quarter
- Price and wage markups of 10%

Estimation of Dynamics

Remaining parameters estimated using full-information approach:

- Real frictions: capital utilization and investment adjustment costs
- Nominal frictions: Price and wage adjustment costs

- Monetary policy rule
- Fiscal policy rules

- Elasticity of substitution with foreign goods
- Foreign interest rate schedule

- Aggregate shocks: Persistence and variance of domestic and foreign shocks

Observables

Table: Aggregate time series data (quarterly)

Time series (90Q1∼19Q4)	Source
In first-differences:	
Output(Y_t), Consumption(C_t), Investment(I_t)	National Accounts (BOK)
Wage(w_t, hourly), Hours worked(N_t) (all seasonally adjusted, per capita, real)	Stat Korea
Effective exchange rate (S_t)	Effective rate (BIS)
Exports (X_t), Imports (I_t)	National accounts (BOK)
In log-levels:	
Inflation (π_t)	Consumption deflator (BOK)
Nominal interest rate (R_t^B)	Average of base rate (BOK)
Spread ($R_t^K - R_t^B$)	Own calculations

All demeaned and with measurement error on w_t, I_t.

Prior and Posterior

Parameter		Prior		Posterior		
	Distribution	Mean	Std. Dev.	HANK	HANK0	RANK0
Frictions						
$\delta_s = \delta''/\delta'$	Gamma	5.00	2.00	1.90	0.94	1.03
ϕ	Gamma	4.00	2.00	5.49	5.35	11.08
κ	Gamma	0.10	0.01	0.21	0.19	0.19
κ_w	Gamma	0.10	0.01	0.14	0.16	0.15
Monetary policy rule						
ρ_R	Beta	0.50	0.20	0.69	0.70	0.71
σ_R	Inv.-Gamma	0.10	2.00	0.39	0.39	0.39
θ_π	Normal	1.70	0.30	1.96	1.99	2.00
θ_Y	Normal	0.13	0.05	0.35	0.34	0.24

Prior and Posterior

Parameter		Prior		Posterior		
	Distribution	Mean	Std. Dev.	HANK	HANK0	RANK0
Spending rule						
γ_B	Normal	0.00	1.00	-0.18	-0.26	-0.31
γ_Y	Normal	0.00	1.00	-0.11	-0.01	-0.02
ρ_G	Beta	0.50	0.20	0.98	0.96	0.99
σ_G	Inv.-Gamma	0.10	2.00	17.34	16.25	23.86

Prior and Posterior

Parameter		Prior		Posterior		
	Distribution	Mean	Std. Dev.	HANK	HANK0	RANK0
Foreign Elasticities						
η_{open}	Gamma	2.00	1.00	0.83	0.67	0.69
ϕ_{B^F}	Inv.-Gamma	0.10	2.00	0.0007	0.0000	0.0000
ϕ_{K^F}	Inv.-Gamma	0.10	2.00	0.0004	0.0002	-
Foreign Shocks						
ρ_{V^S}	Beta	0.50	0.20	0.94	0.93	0.89
σ_{V^S}	Inv.-Gamma	0.10	2.00	4.66	4.58	4.71
$\rho_{R^{B^F}}$	Beta	0.50	0.20	0.97	0.99	0.99
$\sigma_{R^{B^F}}$	Inv.-Gamma	0.10	2.00	0.25	0.18	0.15
$\rho_{R^{K^F}}$	Beta	0.50	0.20	0.70	0.94	-
$\sigma_{R^{K^F}}$	Inv.-Gamma	0.10	2.00	2.23	2.16	-

Prior and Posterior

Parameter		Prior		Posterior		
	Distribution	Mean	Std. Dev.	HANK	HANK0	RANK0
Domestic shocks						
ρ_A	Beta	0.50	0.20	0.99	0.91	0.98
σ_A	Inv.-Gamma	0.10	2.00	0.36	0.44	0.13
ρ_Z	Beta	0.50	0.20	0.99	0.99	0.99
σ_Z	Inv.-Gamma	0.10	2.00	3.81	3.48	1.54
ρ_Ψ	Beta	0.50	0.20	0.28	0.41	0.81
σ_Ψ	Inv.-Gamma	0.10	2.00	28.87	29.41	4.02
ρ_μ	Beta	0.50	0.20	0.47	0.41	0.37
σ_μ	Inv.-Gamma	0.10	2.00	14.81	16.55	10.00
$\rho_{\mu w}$	Beta	0.50	0.20	0.72	0.48	0.73
$\sigma_{\mu w}$	Inv.-Gamma	0.10	2.00	0.13	0.00	6.15

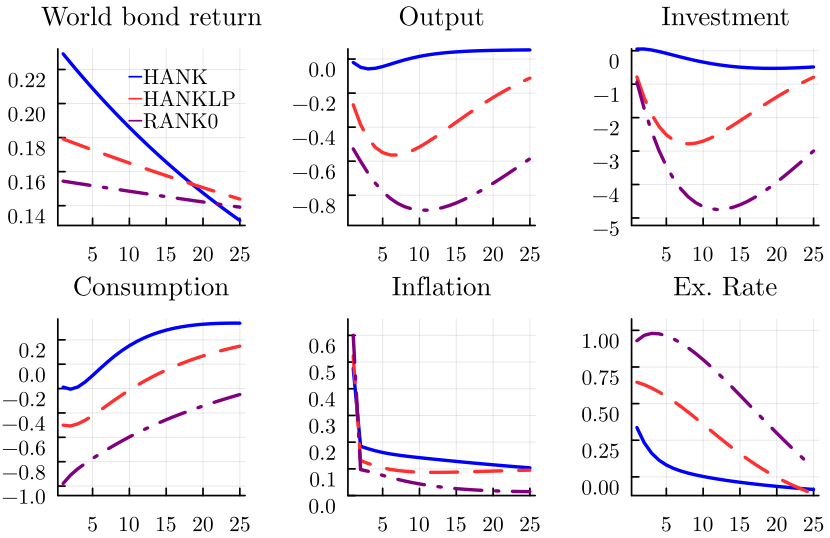
Parameter Estimates

Parameter estimates: SMOE-HANK is a mix of the RANK and SMOE-NK model:

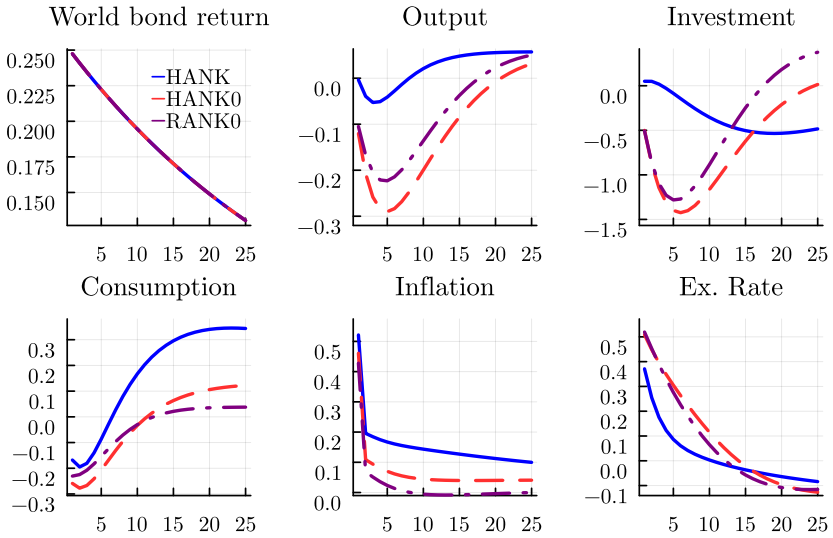
- Prices sticky for around 6-8 months, wages close to a year.
- Smaller investment adjustment costs in HANK than RANK due to incomplete markets.
- Estimates of "foreign" parameters very similar in HANK and RANK.
- We find elasticity of substitution between foreign and domestic bundle below one.

Foreign Portfolios and the Transmission Mechanism of Shocks

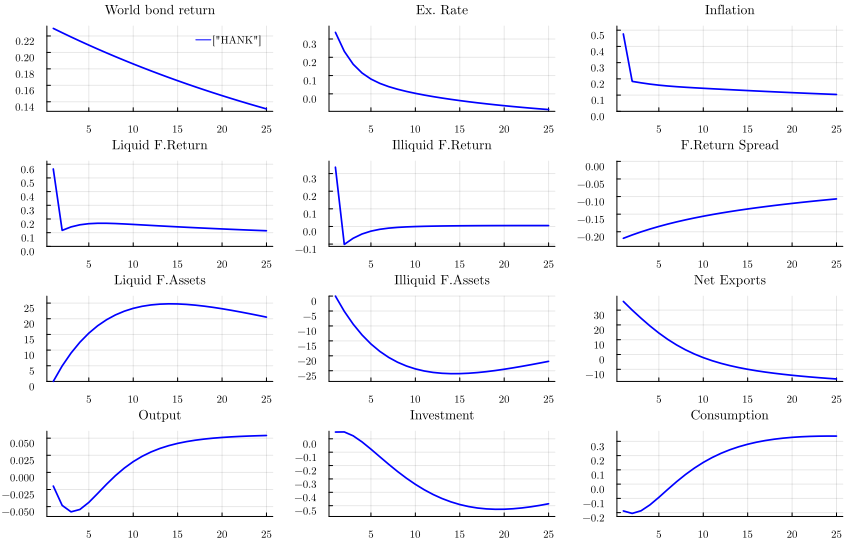
Impulse Responses to Foreign Liquid Return in 3 Models (estimated)



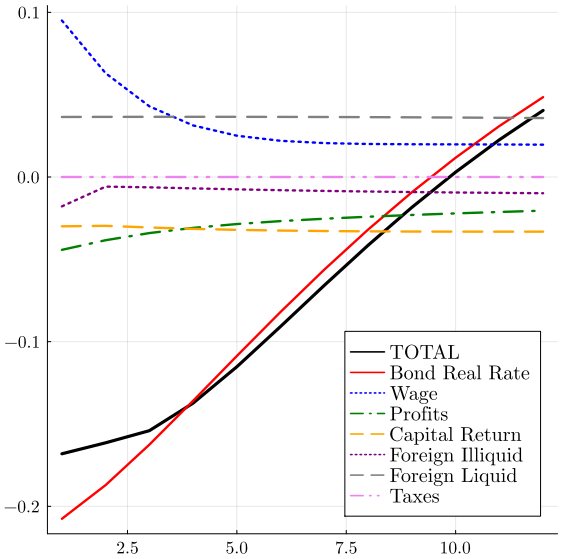
Impulse Responses to Foreign Liquid Return in 3 Models (counterfactual)



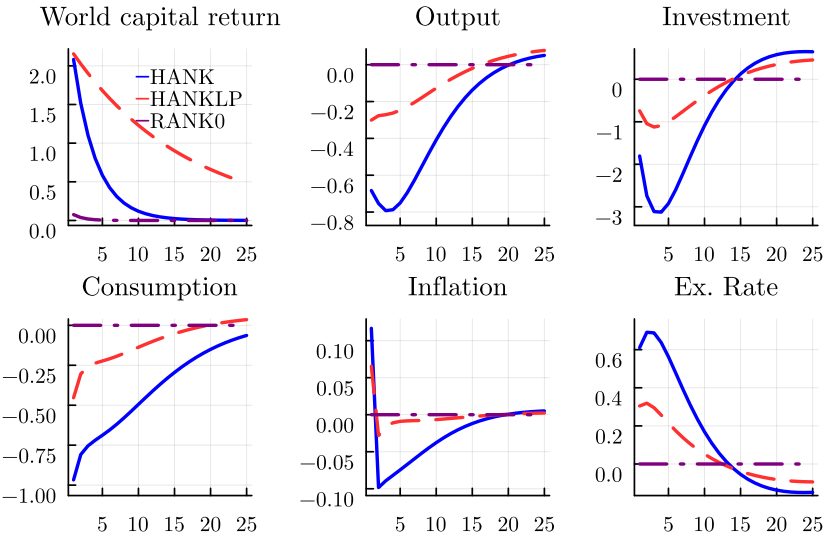
Impulse Responses to Foreign Liquid Return - Baseline



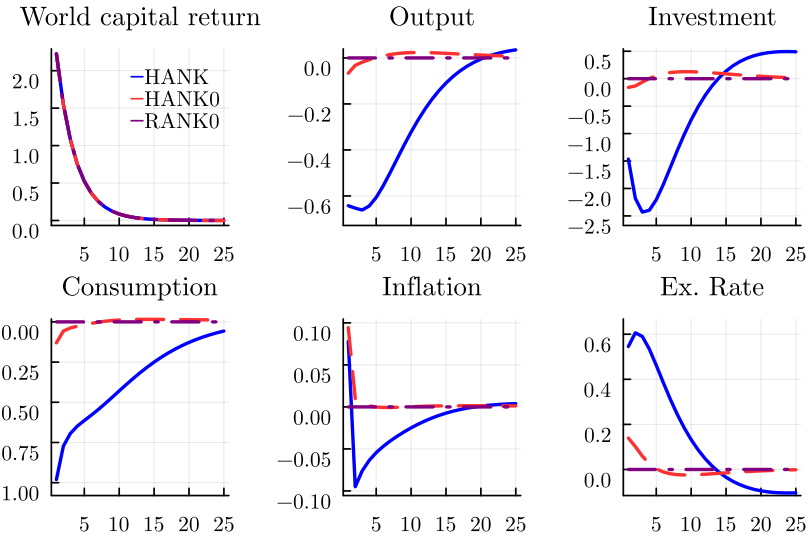
Foreign Liquid Return Shock: Decomposition of Consumption



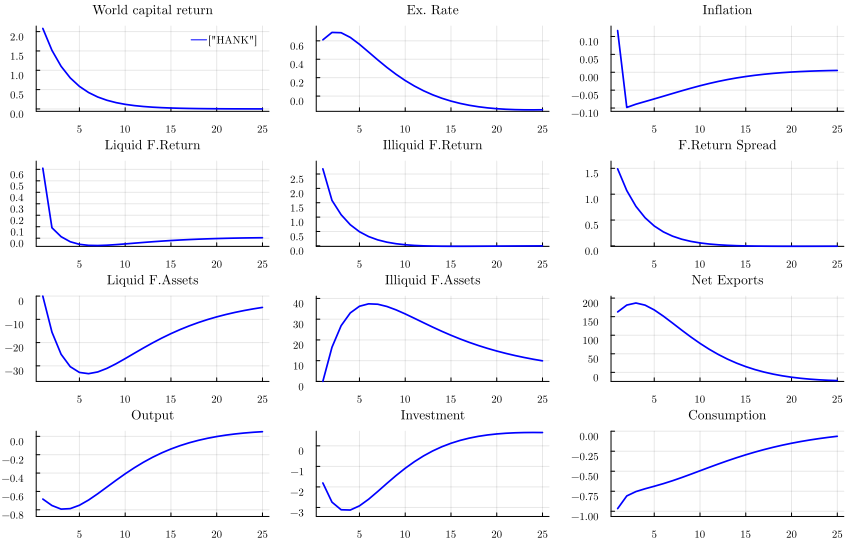
Impulse Responses to Foreign Illiquid Return in 3 Models (estimated)



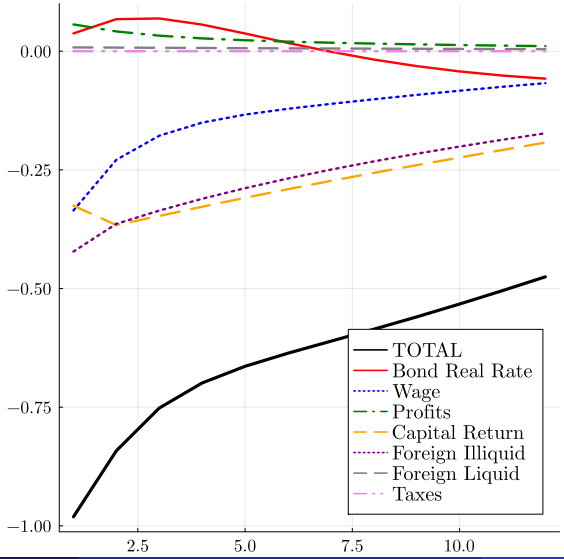
Impulse Responses to Foreign Illiquid Return in 3 Models (counterfactual)



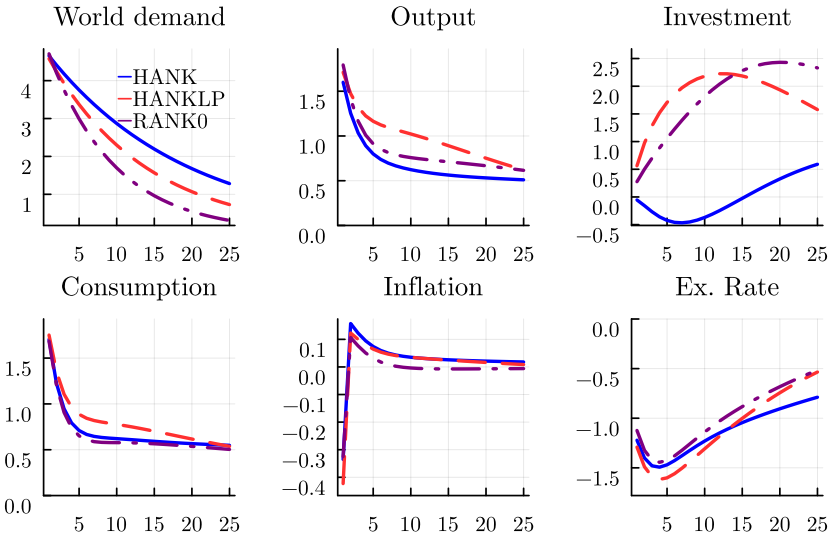
More Impulse Responses to Foreign Illiquid Return - Baseline



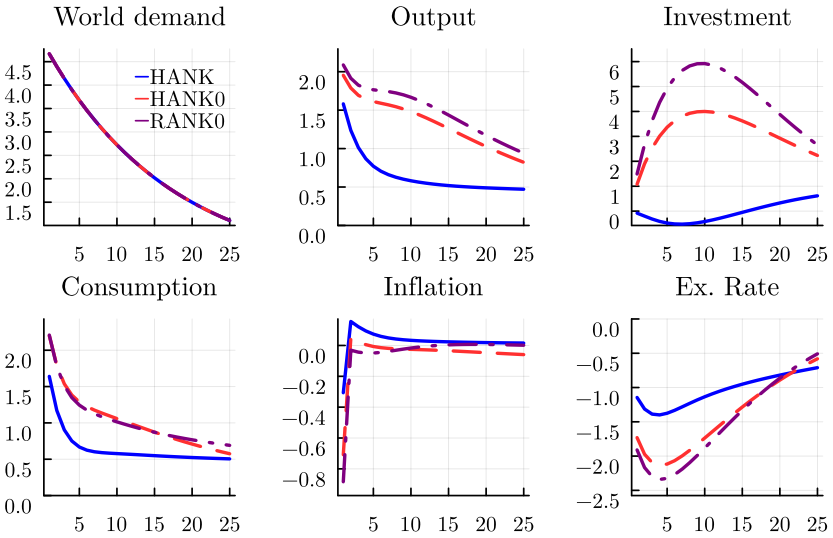
Foreign Illiquid Return Shock: Decomposition of Consumption



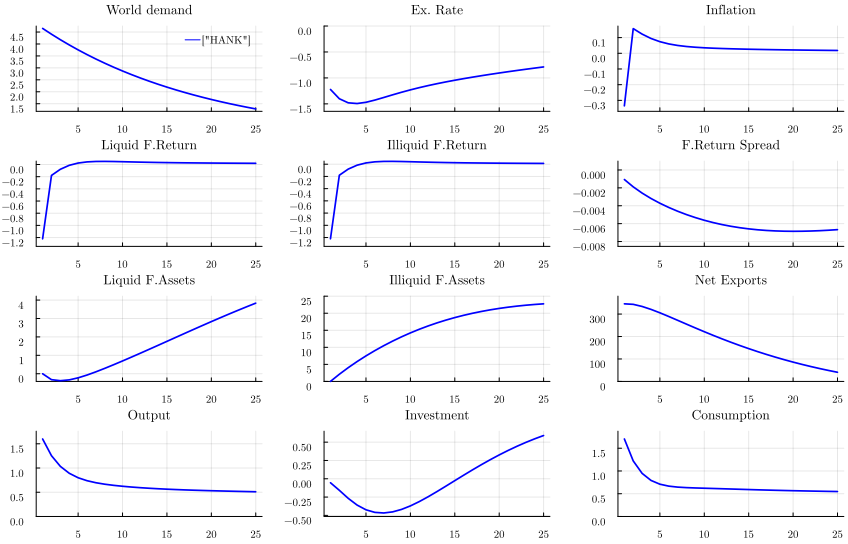
Impulse Responses to Foreign Demand in 3 Models (estimated)



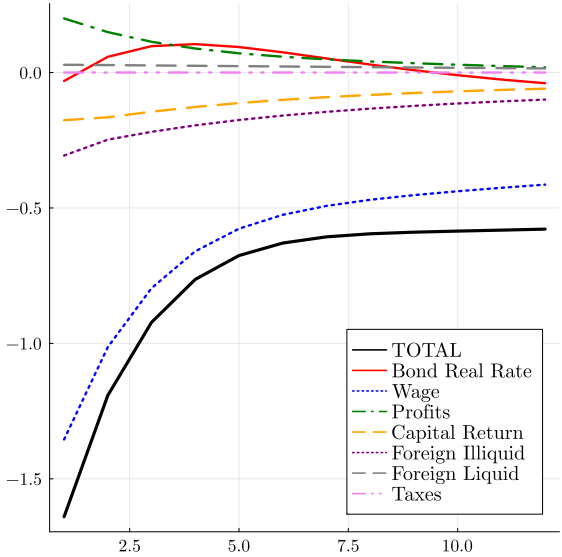
Impulse Responses to Foreign Demand in 3 Models (counterfactual)



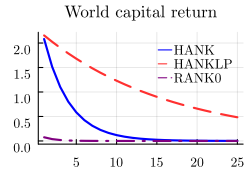
Impulse Responses to Foreign Demand - Baseline

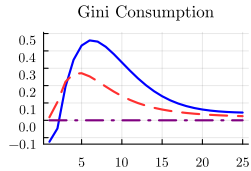


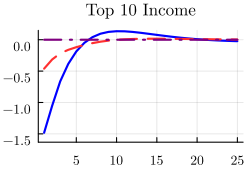
Foreign Demand Shock: Decomposition of Consumption

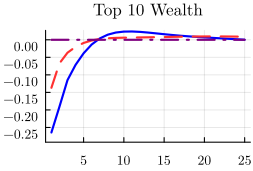


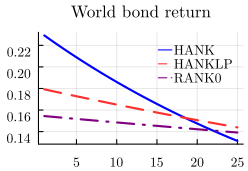
Impulse Responses of Inequality to Foreign Return Shocks (estimated)

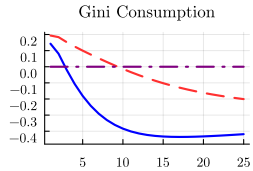


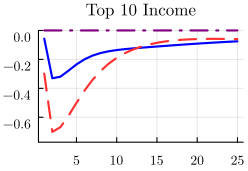


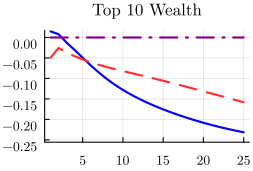






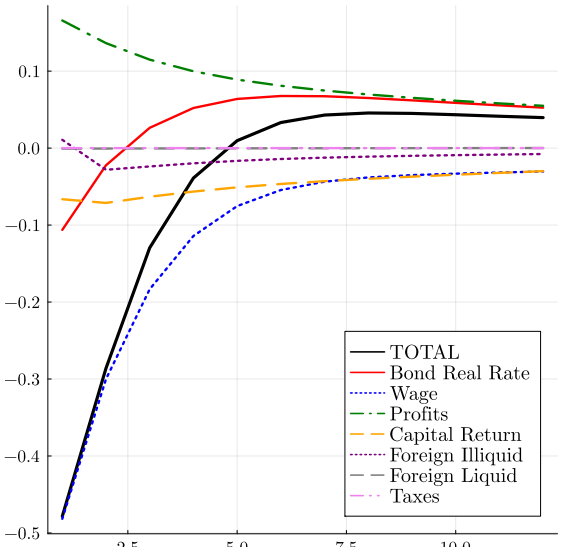






Foreign Portfolios and the Transmission Mechanism of Policy

Monetary Transmission: Decomposition of Consumption



International liquid and illiquid asset market

$$
\begin{aligned}
R^{B^F}_{t+1} &= R^{B^*} + \phi_{B^F} \log\left[\frac{B^F_t}{\bar{B^F}}\right] + \epsilon_{R^{B^F}} \\
R^{K^F}_{t+1} &= R^{K^*} + \phi_{K^F} \log\left[\frac{K^F_t}{\bar{K^F}}\right] + \epsilon_{R^{K^F}}
\end{aligned}
$$

- **Parameter estimates**: $\phi_{B^F} = 0.000425 \quad \phi_{K^F} = 0.000467$
- In words, semi-elasticity of 0.04%. Foreign returns respond little to Korean investment.

Fiscal Transmission

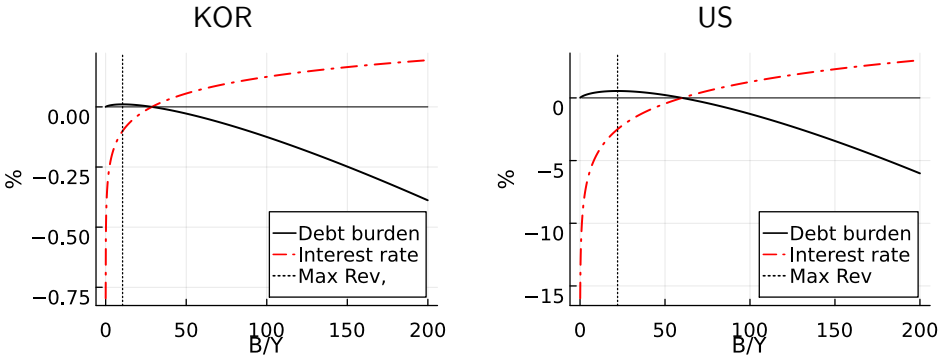
Domestic bonds market

- Bayer et al (2022) find a semi-elasticity of 2.5% for US government debt (closed economy).

- Here: Substitution between domestic and foreign bonds.
- Semi-elasticity of 0.1% for South Korean government debt.

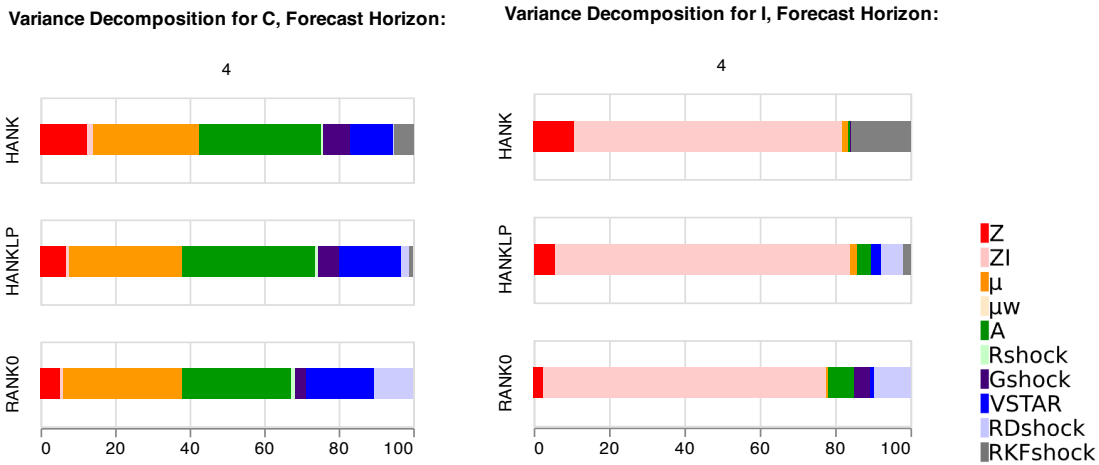
- Implication: Fiscal revenue maximizing level of government debt is close to zero for KOR, but fiscal costs are smaller too.

Fiscal Transmission

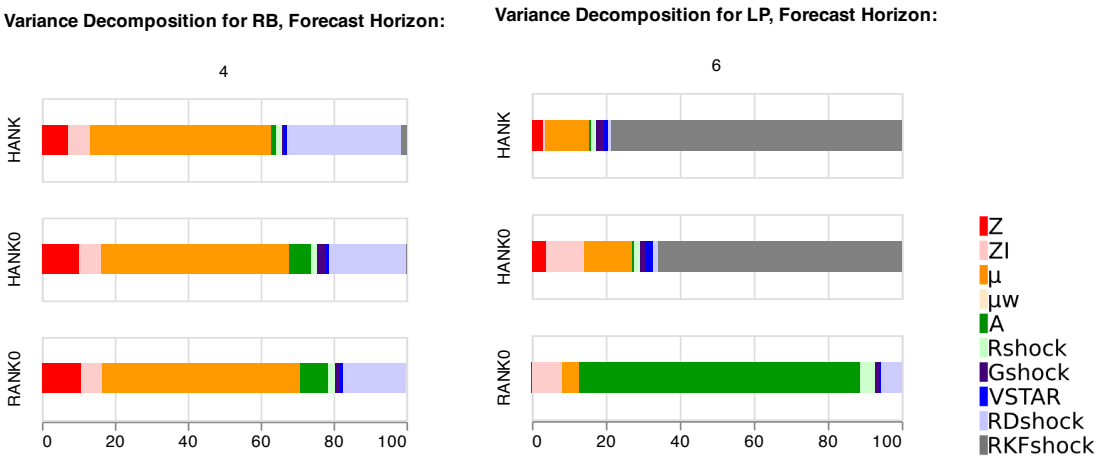


Historical and Variance Decompositions of Korean Business Cycle

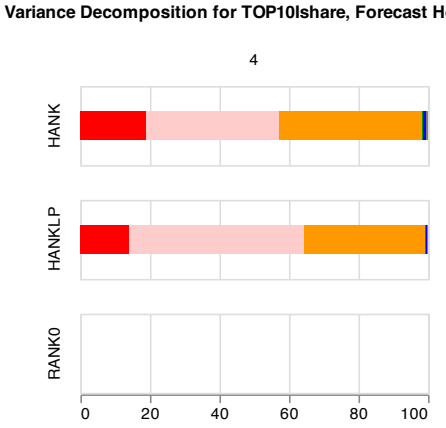
Variance decomposition: Investment and Consumption

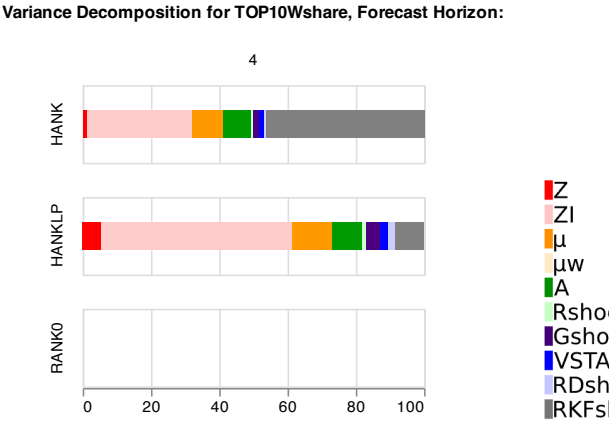


Variance decomposition: Policy Rate and Liquidity Premium

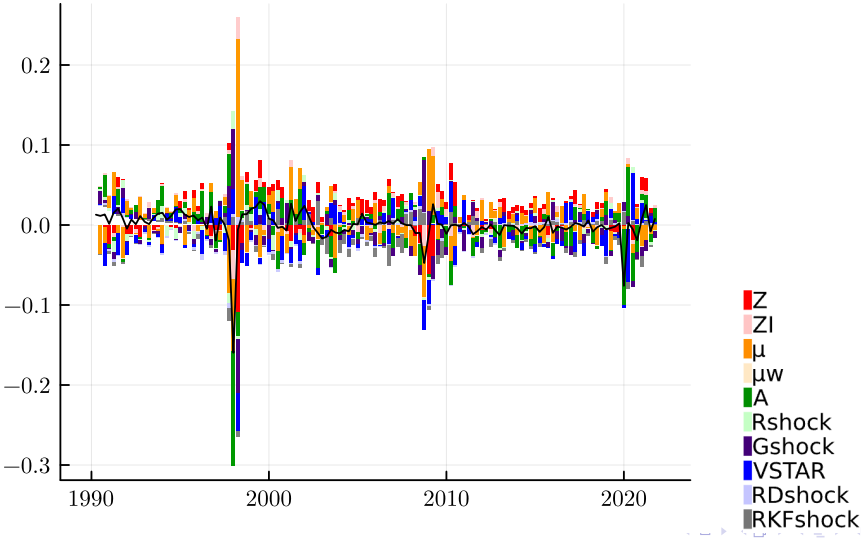


Variance decomposition: Inequality

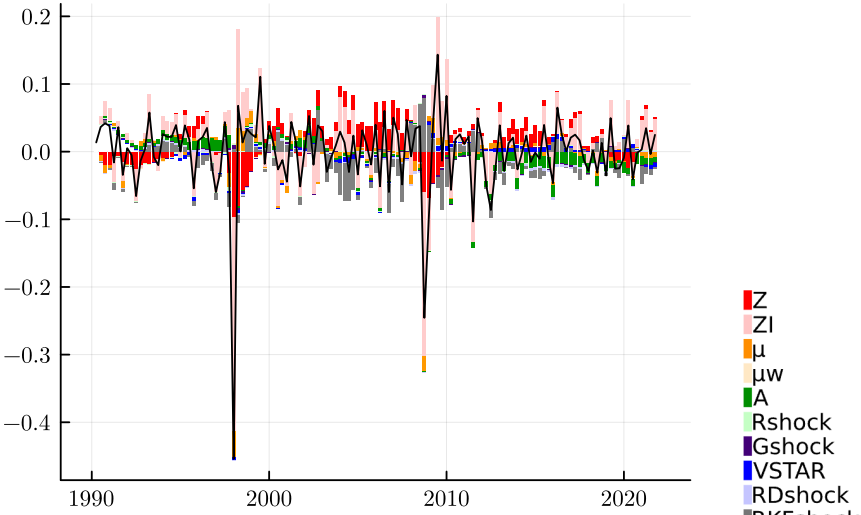




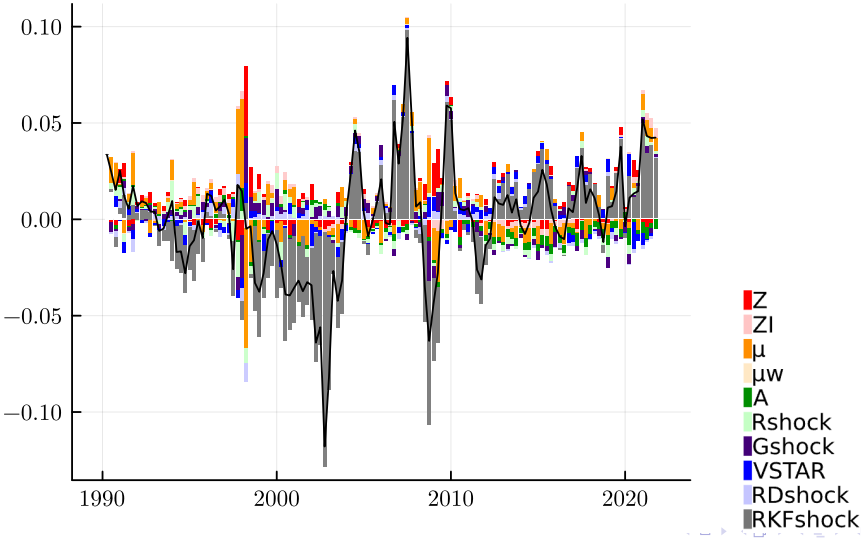
Historical decomposition: Growth of Consumption



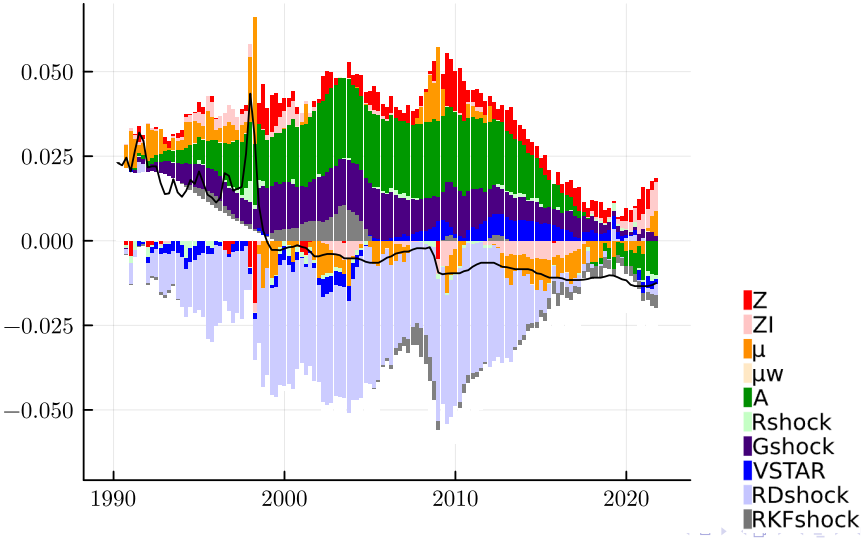
Historical decomposition: Growth of Investment



Historical Decomposition: Liquidity Premium



Historical Decomposition: Return on Bonds



Summary

What we have done

- Formulated SMOE with heterogeneity in foreign portfolios.
- Estimated model on South Korean data.
- Used the model to
  - understand transmission mechanisms of foreign shocks.
  - understand the effect of foreign portfolios on monetary and fiscal policy.
  - understand drivers of the economy in KOR.

Still to be done

- Indirect net household foreign asset positions
- Decomposition of transmission to investment
- Correlated return shocks

Households' Asset and Liability Classification

(% of GDP)

Assets	Liquid	Illiquid	Liabilities	Liquid	Illiquid
Real Estate		262.3	Mortgages		43.8
Consumer durables		3.2	Credit card loan & etc	9.7	
Deposits	92.6				
Government bonds	1.4				
Corporate bonds	1.3				
Corporate equity		38.2			
Private equity		5.9			

Reference date: 31 Dec 2019

Households' Domestic/Foreign Assets/Liabilities Structure

(% of GDP)

Assets	Liquid	Illiquid	**Liabilities**	Liquid	Illiquid
Domestic Assets and Liabilities					
(A) Domestic liquid assets	98.8		(E) Domestic liquid liabilities	24.1	
(B) Foreign liquid asset	0.5		(F) Foreign liquid liabilities	0	
(C) Domestic illiquid assets		373.6	(G) Domestic illiquid liabilities		73.5
(D) Foreign illiquid assets		1.2	(H) Foreign illiquid Liabilities		1.9
Total Positions					
(I) Total liquid assets, (A)+(B)	99.4		(L) Total liquid liabilities, (E)+(F)	24.1	
(J) total illiquid assets, (C)+(D)		374.9	(M) Total illiquid liabilities, (G)+(H)		75.4
(K) Total foreign assets, (B)+(D)	1.7		(N) total foreign liabilities, (F)+(H)	1.9	
Net Positions					
(O) Net liquid assets, (I)-(L)	75.3				
(P) Net illiquid assets, (J)-(M)		299.4			
(Q) Net foreign assets, (K)-(N)	-0.2				

Households' Domestic/Foreign Assets/Liabilities Structure

Assets	Liquid	Illiquid	**Liabilities**	Liquid	Illiquid
Domestic Assets and Liabilities					
(1) Real estate		262.3	(10) Mortgages		43.8
(2) Consumer durables		3.2	(11) Credit card loans & etc	9.7	
(3) Deposits	92.6				
(4) Domestic government bonds, BG_H^H	1.1				
(5) Domestic corporate bonds, BC_H^H	1.0				
(6) Domestic corporate equity, E_H^H		37.0			
(7) Domestic private equity, EP_H		5.9			
(8) Other dom. liquid assets	4.1		(12) Other dom. liquid liab.	14.4	
(9) Other dom. illiquid assets		65.2	(13) Other dom. illiquid liab.		29.8
Foreign Assets and Liabilities					
(14) Foreign government bonds, BG_H^F	0.3		(20) Domestic government bonds, BG_F^H	0	
(15) Foreign corporate bonds, BC_H^F	0.2		(21) Domestic corporate bonds, BC_F^H	0	
(16) Foreign equity, E_H^F		0.7	(22) Domestic equity, E_F^H		0
(17) Domestic FDI abroad, FDI_H		0.6	(23) Foreign FDI at home, FDI_F		0
(18) Other liquid foreign assets	0		(24) Other liquid foreign liabilities	0	
(19) Other illiquid foreign assets		0	(25) Other illiquid foreign liabilities		1.9