

# The Liquidity Channel of Fiscal Policy

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<sup>1</sup>**Disclaimer:** The views expressed here reflect only the views of the authors and do not reflect the views of the German Federal Ministry of Finance.

# Motivation

US public debt currently above 100% of GDP and projected to increase further





## From evidence to model to policy

### **First, we document that fiscal expansions increase rates but decrease spreads**

- ▶ Local Projections: Return difference between capital and government bonds, “Liquidity Premium”, falls after a fiscal shock increasing debt.

### **A HANK model features the same effect**

- ▶ Estimating a 2-asset medium-scale HANK model, we show the same effect on the liquidity premium is present in the model and quantitatively of the same size.

### **Policy experiments and importance of the channel**

- ▶ Consider the effects of higher debt-to-gdp ratio targets in our estimated model. We find the interest-rate effects of these policies to be important.

## We contribute to three literatures

### 1) Importance of heterogeneity for business cycles and policy

- ▶ Ahn et al. (2018), Auclert et al. (2018), Bayer et al. (2019), Broer et al. (2019), Challe and Ragot (2015), Den Haan et al. (2017), Gornemann et al. (2012), Guerrieri and Lorenzoni (2017), Hagedorn et al. (2019), McKay et al. (2016), McKay and Reis (2016), Ravn and Sterk (2017), Sterk and Tenreyro (2018), Wong (2019), and Auclert et al. (2020) ...

### 2) Public debt and physical private capital

- ▶ Aiyagari and McGrattan (1998), Challe and Ragot (2011), Heathcote (2005), and Woodford (1990) and a number of papers focusing on the optimal level of public debt.

### 3) Public debt and interest rates

- ▶ Krishnamurthy and Vissing-Jorgensen (2012), Summers and Rachel (2019), Ardagna (2009), Laubach (2009), Azzimonti und Yared (2019), Aguiar et al. (2021), Mian et al. (2021), Reis (2021).

# Public Debt and Asset Returns

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## Evidence from Local Projections

# Setup: Data

## US and international evidence

- ▶ Quarterly US Data 1947-2015.  
Aggregates and asset returns from Krishnamurthy and Vissing-Jorgensen (2012), Gomme et al. (2011), and Jordà et al. (2019).
- ▶ Annual data from 16 advanced economies 1947-2015.  
Aggregates and in particular housing returns (Jordà et al., 2019).
- ▶ Exploit average response as well as cross-country heterogeneity in financing of spending.

## Setup: Identification

### Debt increases through spending shocks

- ▶ We want to look at exogenous variations in debt.
- ▶ Here through spending shocks.
- ▶ Identifying assumption – available for all data sets:  
government spending is predetermined (Blanchard and Perotti, 2002) .
- ▶ Robust to alternatives for the US.
  - ▶ We can also use the military news series from Ramey (2011)
  - ▶ or tax shocks from Romer and Romer (2010).



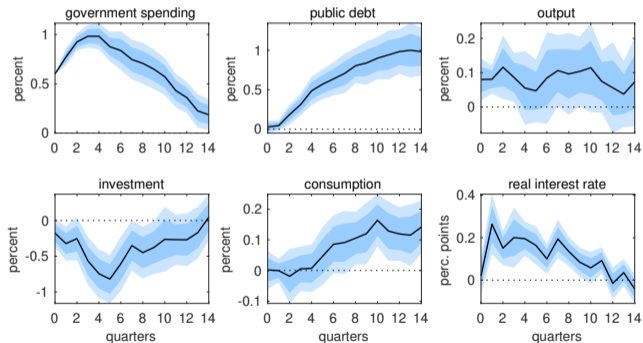
## Local projection

- ▶ Letting  $x_{t+h}$  denote the variable of interest in period  $t+h$ , we estimate how it responds to fiscal shocks in period  $t$ :

$$x_{t+h} = \psi_h \log g_t + \beta_0 + \beta_1 t + \beta_2 t^2 + \Gamma(L)Z_{t-1} + u_{t+h} . \quad (1)$$

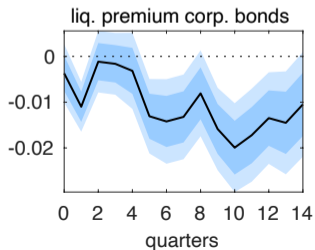
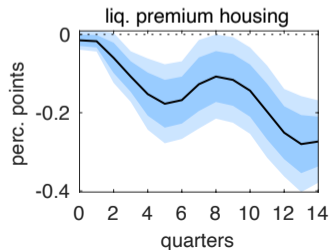
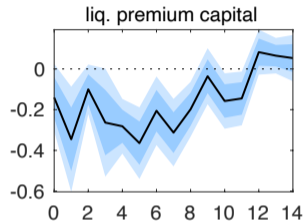
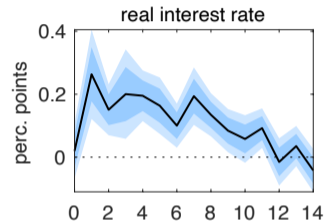
- ▶  $\psi_h$  provides a direct estimate of the impulse response at horizon  $h$  to the government spending shock in period  $t$
- ▶  $Z_{t-1}$  is a vector of control variables that always includes four (annual one) lags of government spending, output, and debt, plus the real interest rate and lags of the respective dependent variable.

## Empirical Evidence: US quarterly, aggregates



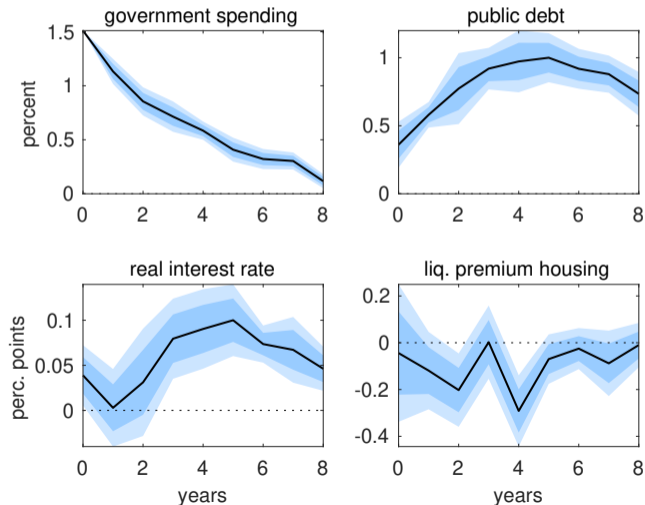
- ▶ Standard response to fiscal shock.
- ▶ Normalize top peak debt response to 1%.
- ▶ Reached roughly 3 years after shock.

## Empirical Evidence: US quarterly, premia



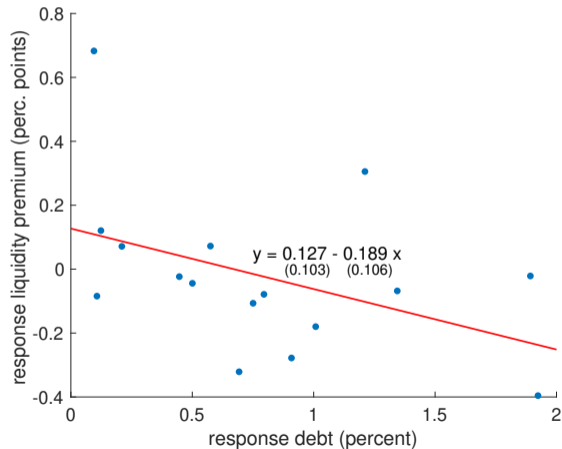
- ▶ Returns of public bonds increase.
- ▶ Relative returns of less liquid assets fall.

## Empirical Evidence: International pooled, premia



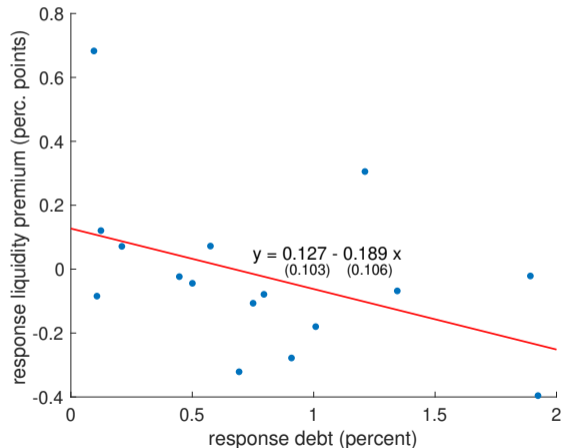
- ▶ Returns of bonds increase.
- ▶ Relative returns of housing as an asset falls.
- ▶ Government debt response peaks around year 4.

## Empirical Evidence: Differences in financing fiscal shocks



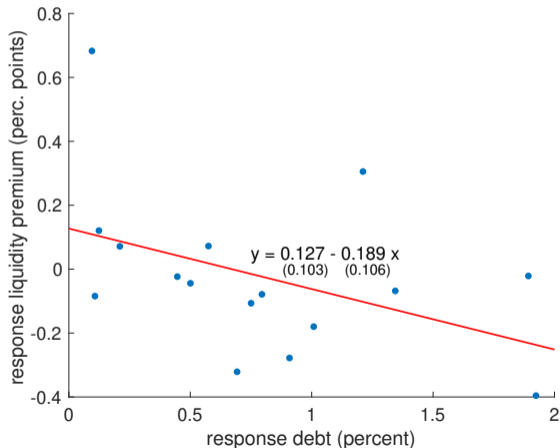
- ▶ Not all countries finance fiscal expansion by deficits.
- ▶ Individual country regressions.

## Empirical Evidence: Differences in financing fiscal shocks



- ▶ Not all countries finance fiscal expansion by deficits.
- ▶ Individual country regressions.
- ▶ Plot relative housing return response against debt response (average years 4-6 after shock).

## Empirical Evidence: Differences in financing fiscal shocks



- ▶ Not all countries finance fiscal expansion by deficits.
- ▶ Individual country regressions.
- ▶ Plot relative housing return response against debt response .
- ▶ **Finding:** 1% more debt response decreases the LP by 19bp.

## Summary

### **Bond returns and returns on other assets do not move in lockstep**

- ▶ The capital-bond spread falls after fiscal expansion.
- ▶ The more debt financed the expansion, the stronger the spread response.



# Public Debt and Asset Returns

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In a Two Asset HANK model

# Heterogenous Agent New Keynesian (HANK) model with portfolio choice

## Evidence for the importance of portfolio adjustment costs

- ▶ Households will require a compensation to hold their wealth in illiquid form.
- ▶ Known since Aiyagari and Gertler (1991): This has the potential to explain a large part of the equity premium.

## The total supply of liquidity matters

- ▶ Government debt has a special role.
- ▶ Only source of external liquid wealth in these models.
- ▶ More government debt implies a lower premium.
- ▶ Compared to one-asset incomplete markets models: *less crowding out* of capital.

# Model overview

Households		Production Sector	Government
Obtain Income	Trade Assets	Produce and Differentiate Consumption Goods	Monetary Authority, Fiscal Authority
<p><b>Wages</b></p> <ul style="list-style-type: none"> <li>-&gt; set by unions</li> <li>-&gt; s.t. adj. costs</li> <li>-&gt; Idiosyncratic Risk</li> </ul> <p><b>Interest</b></p> <ul style="list-style-type: none"> <li>-&gt; from bonds</li> </ul> <p><b>Dividends</b></p> <ul style="list-style-type: none"> <li>-&gt; from capital: MPK</li> <li>-&gt; liquid rental market</li> </ul> <p><b>Profits</b></p> <ul style="list-style-type: none"> <li>-&gt; as “entrepreneurs”</li> </ul>	<p><b>Bonds</b> (<math>b &gt; B</math>)</p> <p>= claims on HH debt, + government debt, (nominal, liquid)</p> <p>and</p> <p><b>Illiquid Assets</b>, <math>k</math></p> <p>= capital (trading friction)</p>	<p><b>Intermediate goods producers</b></p> <p>Rent capital &amp; labor</p> <hr/> <p>Competitive Market for Intermediate Goods</p> <hr/> <p><b>Entrepreneurs</b></p> <p>Monopolistic resellers s.t. price adjustment costs</p> <p>Capital goods producers</p>	<p>Policy Rules:</p> <ul style="list-style-type: none"> <li>• <b>Monetary authority</b> sets nominal interest rate -&gt; Taylor rule</li> <li>• <b>Fiscal authority</b> supplies government debt, consumes goods, taxes labor income and profits -&gt; Spending rule -&gt; Tax rule</li> </ul>

# Estimate HANK-DSGE

## Two Step Estimation Procedure:

- ▶ First, estimate or fix all parameters that affect the steady state (matching wealth, portfolio, and income distributions in the micro data)
- ▶ Second, estimate the parameters that only matter for dynamics via Bayesian methods. Same shocks and observables as in Smets and Wouters (2007).

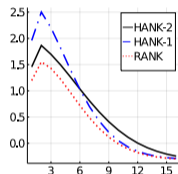
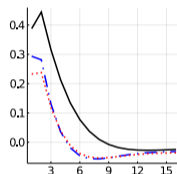
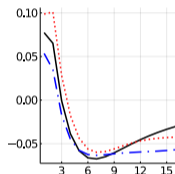
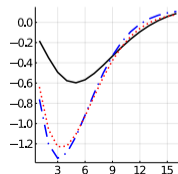
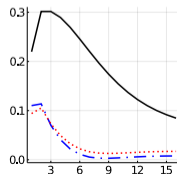
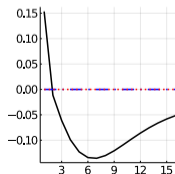
**Solution Procedure:** We build on the algorithm suggested by Reiter (2009) to solve for aggregate dynamics, which treats the policy **functions** as controls and the distribution **function** as a state, representing the dynamic system as a **function valued difference equation** using the refinement of Bayer and Luetticke (2018).

# The Short Run

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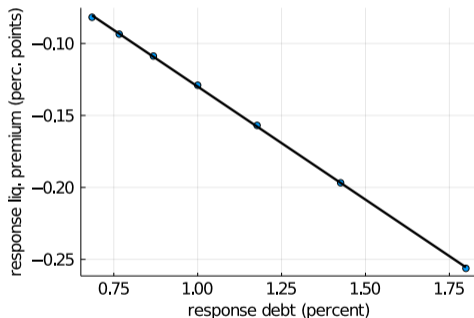
## Government Spending Shocks

# IRFs to Government Spending Shock

Government spending  $G_t$ Output  $Y_t$ Consumption  $C_t$ Investment  $I_t$ Nominal rate  $RB_t$ Liquidity premium  $LP_t$ 

- ▶ Estimated HANK model
- ▶ IRFs normalized to 1% debt increase.
- ▶ matches the movements of the Liquidity Premium
- ▶ as well as aggregates.

## Debt vs. Liquidity Premium: Model



- ▶ In line with empirical finding:
- ▶ A 1% stronger debt response leads to a 16bp stronger LP response.
- ▶ (Empirical: 19bp)

*Notes:* Dots represent the response of government debt (x-axis) and liquidity premium (y-axis) at 12 horizons to a spending shock for alternative solutions of the model, where we let taxes react differently strong to the growth rate of government debt.

# The Long Run

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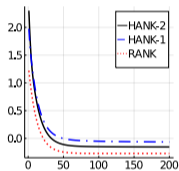
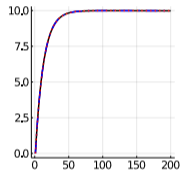
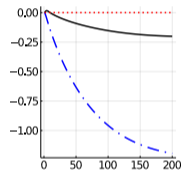
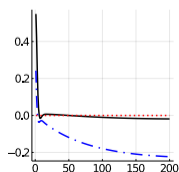
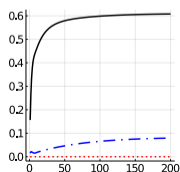
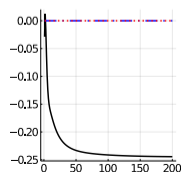
## Public Debt and Interest Rates



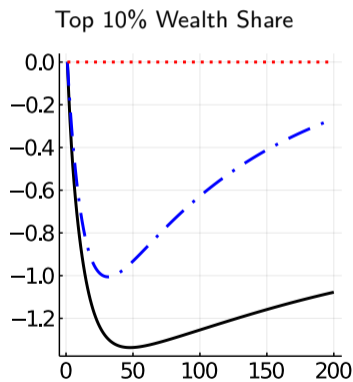
## Increasing the government debt target

- ▶ Increase government debt target by 10%.
- ▶ Almost permanent increase ( $\rho_{\bar{B}} = 0.9999$ ).
- ▶ 10 year transition period.
- ▶ Let (non-distortionary) taxes adjust, constant expenditures.

## Response to an increase in the debt target

Transfer (% of  $\bar{Y}$ )Public debt  $B_t$ Capital  $K_t$ Output  $Y_t$ Nominal rate  $RB_t$ Liquidity premium  $LP_t$ 

# Distributional consequence of an increase in the debt target



## Fiscal Implications of Public Debt

- ▶ Fiscal burden of public debt:  $\mathcal{R}(B)B$ , where  $\mathcal{R} = R_t^b/\pi_t - \log(Y_{t+1}/Y_t)$
- ▶ Our log-linearized solution yields constant semi-elasticity of interest-growth differential:

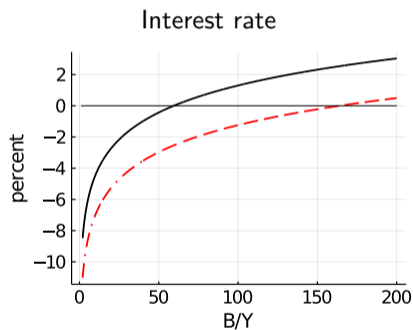
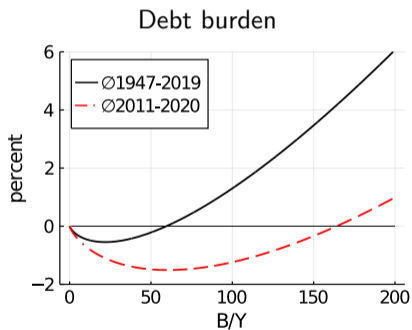
$$\mathcal{R}(B) \approx \mathcal{R}(\bar{B}) + \eta_B \ln(B/\bar{B})$$

- ▶ Marginal fiscal burden of additional debt starting from steady state:

$$\frac{\partial(\mathcal{R}(B)B)}{\partial B} = \mathcal{R}(B) + \eta_B$$

- ▶ Our estimate:  $\eta_B = 2.5\% \Rightarrow$  despite the fact that the marginal real rate on government bonds is zero, there is an important fiscal burden from higher public debt.

# Fiscal Implications of Public Debt



# Conclusion

## Concluding Remarks

- ▶ Return differentials between public debt and physical capital respond to fiscal expansions
- ▶ Overshooting of bond yields:  
+25 basis points on impact vs. +2.5 basis points in the long run (after +1% debt)
- ▶ A HANK model with liquid and illiquid assets can explain this effect.






## Concluding Remarks

### How much debt is fiscally optimal?





- ▶ Debt is fiscally more expensive than  $R-g$  suggests.
- ▶ Low debt levels below can nonetheless be (fiscally) inefficient.
- ▶ Under the currently high demand for liquidity, this critical level has moved to around 60%.
- ▶ Much higher debt rates needed to “normalize” ( $R > g$ ) interest rates.



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