

IMPLICATIONS OF LOW PRODUCTIVITY GROWTH FOR DEBT SUSTAINABILITY

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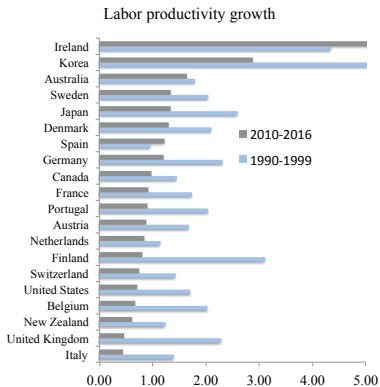
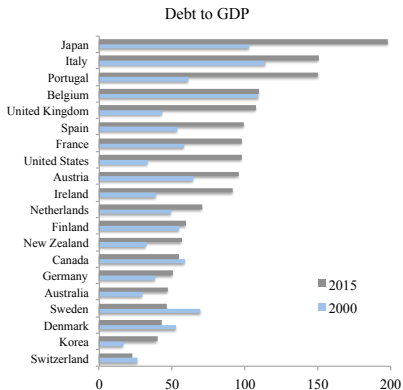
Brown University

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PUBLIC DEBT AND PRODUCTIVITY GROWTH

OECD ECONOMIES



DEBT SERVICING COSTS

OECD ECONOMIES



US fiscal cost

RESEARCH QUESTION AND APPROACH:

Key tradeoff:

- ▶ Persistent $r < g$ implies the increases in debt *raise* revenues
- ▶ With a large stock of public debt, interest rate reversals impose sizable fiscal costs

Approach:

- ▶ Empirical evidence on level and variability of debt servicing costs
- ▶ Interest rate and debt servicing cost projections for the G7
- ▶ Employ a quantitative model to study implications for debt servicing cost of low productivity growth

HISTORICAL DEBT SERVICING COST

Servicing the public debt:

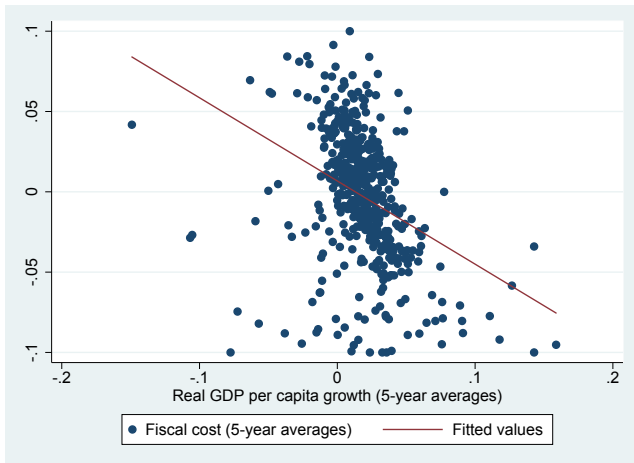
$$T_t + B_{t+1}^g = G_t + (1 + r_t) B_t^g$$

$$\Rightarrow \tilde{T} = \tilde{G} + (r - g) \tilde{B}_g$$

	17 Advanced Countries		United States	
	1870-2013	1946-2013	1870-2013	1946-2013
Net fiscal cost: $r - (g+n)$				
25th percentile	-2.64	-2.74	-2.15	-1.72
Median	0.08	-0.38	-0.16	-1.35
75th percentile	2.28	1.55	1.09	0.57
Fraction < 0	49.3%	54.3%	55.2%	69.2%
Fraction < -2%	31.4%	32.6%	31.0%	23.1%
No. of observations	493	221	29	13

DEBT SERVICING COST AND PRODUCTIVITY GROWTH

ADVANCED ECONOMIES: 1870-2013



REVERSION SCENARIOS

CURRENT G7 COVARIATES

Probit specification:

$$P(\text{fisc}_{i,t+j} > 0 \mid X) = \Phi(c + \beta_f \text{fisc}_{i,t} + \beta_p \text{popgrwth}_{i,t} + \beta_d \text{dgdgp}_{i,t} + \epsilon_{i,t})$$

Countries	Likelihood of $r > g$		Fiscal consolidation			
	5-year forward	10-year forward	Debt to GDP ratio	Current unit cost	Current fiscal cost	Fiscal cost if $r-g = 1.55\%$
Canada	41.2%	47.9%	67	-1.54%	-1.03	1.01
France	52.8%	54.8%	96	-0.14%	-0.14	1.44
Germany	49.0%	57.3%	68	-1.62%	-1.10	1.02
Italy	83.5%	71.7%	133	2.43%	3.23	2.00
Japan	24.9%	38.1%	198	-1.51%	-2.98	2.97
United Kingdom	38.2%	48.1%	90	-1.84%	-1.65	1.35
United States	41.1%	47.9%	76	-1.42%	-1.08	1.14

Probit estimates

DEBT SERVICING COST PROJECTIONS

	Countries						
	Canada	France	Germany	Japan	Italy	UK	USA
Real interest rates							
Current: 2012-2017	0.41	0.70	-0.25	-0.28	2.10	0.26	0.74
Projection: 2018-2025	1.38	1.76	-0.25	-1.01	1.13	1.71	1.00
GDP per capita growth							
Current: 2012-2017	0.95	0.27	1.34	1.21	-0.49	1.62	1.30
Downside (PIIE estimates)	0.70	0.50	0.50	0.10	0.10	0.50	0.70
Cost of servicing the debt (% of GDP)							
Current: 2012-2017	-1.00	-0.10	-1.12	-2.93	3.19	-1.66	-1.08
Projection: 2018-2025	-0.35	0.92	-1.12	-4.38	1.90	-0.35	-0.88
Downside (PIIE estimates)	-0.18	0.70	-0.55	-2.18	1.12	0.66	-0.43

- ▶ Real interest rate projections obtained from 3-variable VECM
- ▶ Uncertainty bands quite large for real interest rate projections

INTEREST RATE DETERMINATION IN A LIFECYCLE MODEL

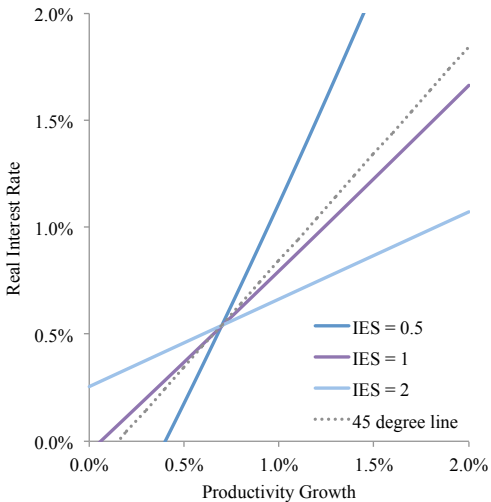
Debt servicing cost:

$$((1 + r(g, n, \tilde{B}_g)) - (1 + g)(1 + n)) \tilde{B}_g$$

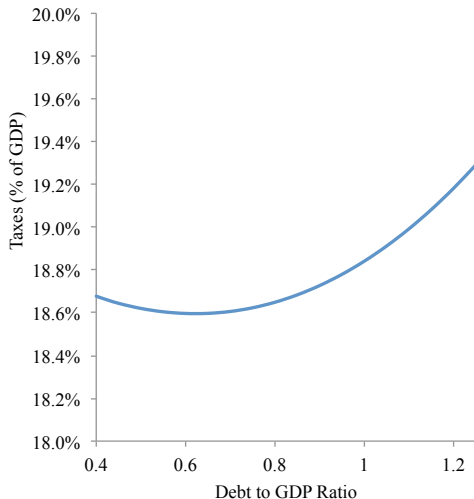
- ▶ Quantitative 56-period lifecycle model
- ▶ Households face lifecycle profile of income, save for retirement, and face mortality risk
- ▶ Calibrate to US labor share, I/Y , real interest rate r , risk premia

EFFECT OF PRODUCTIVITY GROWTH ON US FISCAL COST

MODEL INTEREST RATE ELASTICITIES



EFFECT OF DEBT TO GDP RATIO ON US FISCAL COST



DEBT SUSTAINABILITY IN SMALL OPEN ECONOMIES

Debt servicing cost:

$$((1 + r(g^*, n^*)) - (1 + g)(1 + n)) \tilde{B}_g$$

- ▶ Evidence of a stronger common component in rates than growth
- ▶ Key determinant: deviation of g from global prod. growth g^*
- ▶ Indirect channels: real exchange rate and financial stability
- ▶ Evidence that when US real rates are low, RER appreciates, loan growth increases, house prices increase

KEY TAKEAWAYS

Lessons:

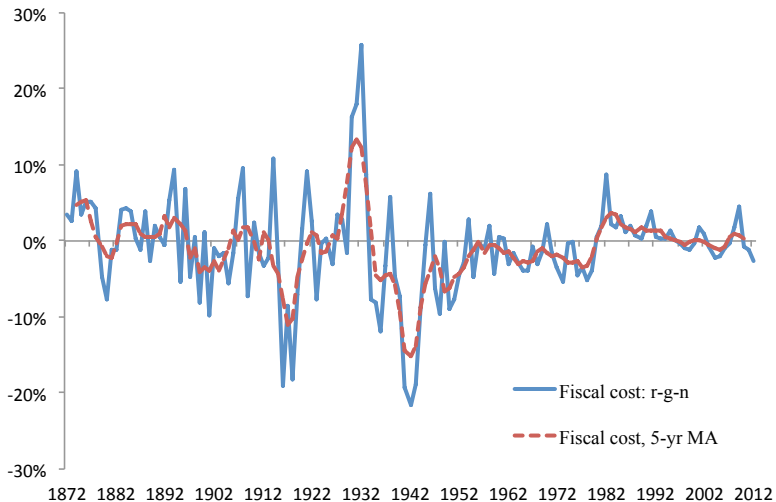
- ▶ On average, cost of servicing the debt is frequently negative
- ▶ Nevertheless, servicing cost shows substantial variability and a moderate likelihood of reversion in medium term
- ▶ Slower productivity growth may benefit debt sustainability by lowering real interest rate
- ▶ Even with $r < g$, revenue-maximizing level of debt is *lower*

Limitations:

- ▶ $r - g$ not a sufficient statistic for optimal level of debt
- ▶ Abstracted from any constraints on real rates due to the ZLB

Additional Slides

COST OF SERVICING THE US PUBLIC DEBT



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REVERSION LIKELIHOODS

Probit specification:

$$P\left(\text{fisc}_{i,t+j} > 0 \mid X\right) = \Phi\left(c + \beta_f \text{fisc}_{i,t} + \beta_p \text{popgrwth}_{i,t} + \beta_d \text{dgdgdp}_{i,t} + \epsilon_{i,t}\right)$$

Variable	5-year forward: (r > g+n)		10-year forward (r > g+n)	
	(2)	(3)	(5)	(6)
Current value: r - (g+n)	12.483*** (1.174)	25.869*** (3.430)	5.707*** (1.421)	12.895*** (3.281)
Debt to GDP ratio	-0.146 (0.183)	-0.142 (0.280)	-0.212 (0.189)	-0.204 (0.315)
Population growth	-29.185** (11.762)	-24.618 (23.497)	-24.450** (10.973)	-28.148 (22.866)
Constant	0.363** (0.145)	0.373* (0.200)	0.300** (0.143)	0.483** (0.207)
McFadden pseudo R-squared	0.120	0.260	0.037	0.110
No. of observations	448	204	431	187

EXTERNAL AND FINANCIAL SPILLOVERS TO SMALL OPEN ECONOMIES

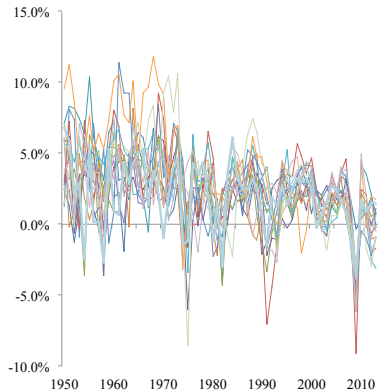
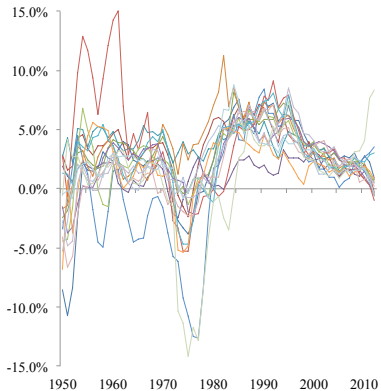
Fixed effects specification:

$$y_{i,t} = c_i + \delta \mathbb{1}_t + \delta_{lag} \mathbb{1}_{t-1} + \epsilon_{i,t}$$

Dependent variable	External		Financial		
	Current account	Real exchange	Loan growth	Mortgage loan	House prices
		rate		growth	
	(1)	(2)	(3)	(4)	(5)
US real rate (< 1%)	0.000 (0.003)	-0.033*** (0.004)	0.007 (0.006)	0.004 (0.008)	0.009 (0.006)
US real rate (< 1%, 5 yr. lag)	-0.012** (0.005)	0.023*** (0.005)	0.031*** (0.007)	0.030*** (0.008)	0.021* (0.010)
H0: Sum of current and one lag	-0.012* (0.006)	-0.010* (0.005)	0.038*** (0.008)	0.034*** (0.010)	0.030** (0.012)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
No. of observations	208	208	208	208	190

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COMMON COMPONENT IN RATES AND GDP GROWTH



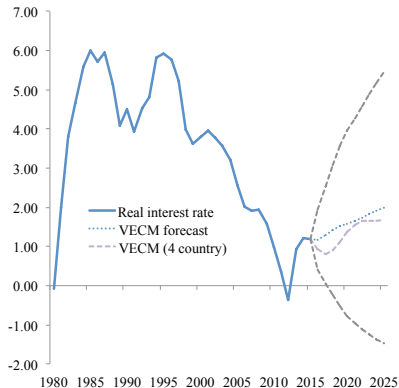
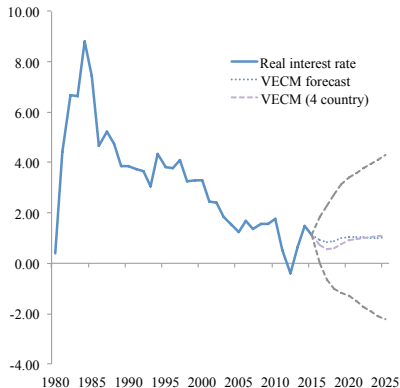
VECM ESTIMATES OF REAL RATES

VECM specification:

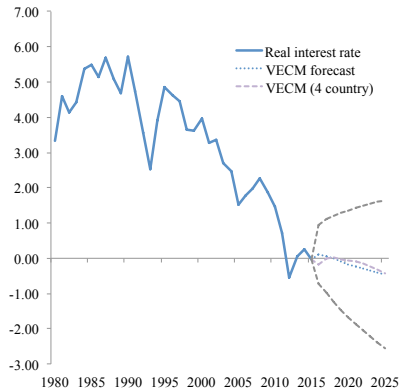
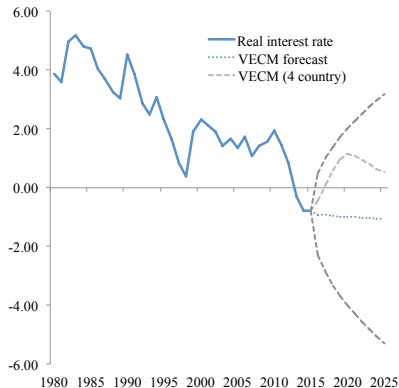
$$\Delta \mathbf{y}_t = \gamma + \alpha \beta \mathbf{y}_{t-1} + \sum_{j=1}^J \Pi_j \Delta \mathbf{y}_{t-j} + \epsilon_t$$

	Countries						
	Canada	France	Germany	Japan	Italy	UK	USA
Cointegration coefficients							
US real interest rate	-0.96** (0.12)	-0.83** (0.14)	-0.76** (0.13)	-1.40** (0.28)	-1.58** (0.27)	-1.45** (0.35)	N/A N/A
Local GDP per capita growth	0.82** (0.13)	0.01 (0.16)	-0.65** (0.11)	-0.06 (0.15)	0.26 (0.23)	2.62** (0.44)	-4.50** (0.89)
Error-correction coefficients							
Local real interest rate	-0.22** (0.07)	-0.44** (0.09)	-0.11 (0.08)	-0.06 (0.08)	-0.21** (0.07)	-0.07** (0.02)	N/A N/A
US real interest rate	-0.10 (0.08)	-0.005 (0.08)	0.19** (0.09)	0.19** (0.05)	0.08 (0.06)	-0.04 (0.03)	0.01 (0.02)
Johansen trace statistic							
H0: No cointegrating relationship	65.93**	44.48**	40.98**	33.26*	27.81	63.40**	28.96**
Lag specification							
Criterion	AIC	AIC	AIC	AIC	AIC	AIC	AIC
Lag length	2	2	2	2	4	2	3
No. of observations	64	64	64	64	62	64	63

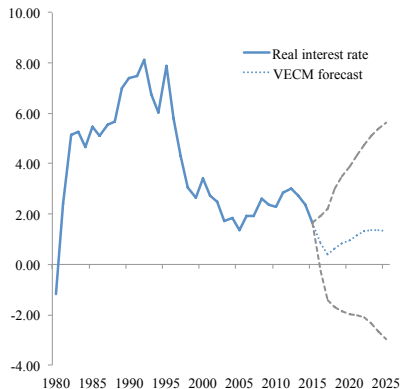
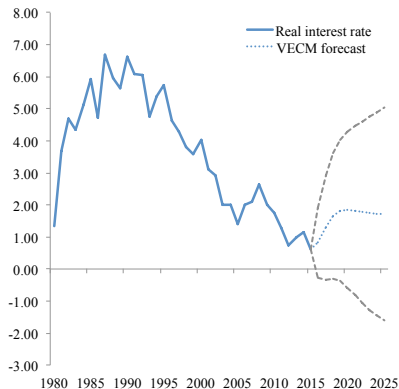
REAL INTEREST RATE PROJECTIONS: US AND UK



REAL INTEREST RATE PROJECTIONS: JAPAN AND GERMANY



REAL INTEREST RATE PROJECTIONS: FRANCE AND ITALY



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