Discussion of "Debt and Growth"
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This paper

- Provides new evidence on the *within-country* correlation between *changes in* debt and *changes in* growth, disaggregated by:
  - Borrower (households, firms, government)
  - Source of financing (domestic vs external)
  - Type of external financing (debt vs equity(?))

- Main findings
  - HH debt *negatively* correlated with subsequent growth in EMDEs
  - HH debt *negatively* correlated with subsequent investment in EMDEs

- Builds on huge (and mixed) empirical literature looking at partial correlations between debt and growth

This paper: core empirical specification

- Series of rolling panel regressions of three-year average future growth ($\Delta_3 y_{it+k}$) on three-year average changes in debt ratios ($\Delta_3 d_{it-1}^z, z = HH, CORP, PUBLIC$), plus country and year effects and some controls:

$$\Delta_3 y_{it+k} = \sum_{z=HH,CORP,PUB} \beta_k^z \, \Delta_3 d_{it-1}^z + \delta_k' X_{it} + \alpha_i + \gamma_t + u_{it}$$

- $k = 0,1,2,3,4,5$
- $X_{it} = (Lagged\ Growth_{it}, Savings_{it}, PopGrowth_{it})$
- Variants with different breakdowns of debt, different interactions

- Essentially a Jorda-style local projection regression for 3-year growth rates
  - More flexibility than Mian, Sufi, Verner (QJE 2017)

This discussion

- Technicalities I worried about….:
  - How much independent variation is there in different types of debt?
  - Choice of conditioning variables?
  - Serial correlation due to overlapping observations?
  - Cross-sectional dependence?
  - Timing?
  - Short time series?

- Interpretation of debt-growth partial correlations

This discussion

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- Interpretation of debt-growth partial correlations

Technicalities 1: Independent variation?

- Prior might be that different debt ratios (household, corporate, public) move closely together over time:
    - Insufficient independent variation to identify partial effects?
    - Weird stuff happening due to near-collinearities?

- Turns out not to be a problem – correlations are surprisingly low!

(obs=637)

	D3~h_res	D3~p_res	D3~b_res
D3TN1_dhh_~s	1.0000		
D3TN1_dcor~s	0.3844	1.0000	
D3TN1_dpub~s	-0.2612	-0.1136	1.0000

(obs=480)

	D3~h_res	D3~p_res	D3~b_res
D3TN1_dhh_~s	1.0000		
D3TN1_dcor~s	0.4272	1.0000	
D3TN1_dpub~s	-0.0178	0.0979	1.0000

Technicalities 2: Conditioning variables?

- Authors also condition on $X_{it} = (Savings_{it}, PopGrowth_{it})$, but not clear these should be first-order considerations

- Dropping these conditioning variables does not change things much

VARIABLES	(7) D3T0_gdp	(8) D3T1_gdp	(9) D3T2_gdp	(10) D3T3_gdp	(11) D3T4_gdp	(12) D3T5_gdp
D3TN1_dhh	0.072	-0.137*	-0.319***	-0.345***	-0.249**	-0.114
	(0.092)	(0.083)	(0.091)	(0.109)	(0.118)	(0.095)
D3TN1_dcorp	-0.021	-0.030	0.021	0.027	0.006	-0.007
	(0.053)	(0.043)	(0.056)	(0.064)	(0.066)	(0.066)
D3TN1_dpub	-0.187***	-0.086**	-0.020	-0.008	-0.017	-0.000
	(0.050)	(0.035)	(0.029)	(0.029)	(0.030)	(0.033)
Observations	472	473	474	475	440	403
R-squared	0.153	0.054	0.065	0.074	0.038	0.008
Number of ifscode	36	36	36	36	36	34

Technicalities 3: Overlapping observations?

- All specifications estimated as rolling-and-overlapping three-year windows so errors serially-correlated by construction
  - data are less informative than it appears
- "Brute-force" fix – drop all overlaps. Even so core finding goes through despite much smaller sample size!

	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	D3T0_gdp	D3T1_gdp	D3T2_gdp	D3T3_gdp	D3T4_gdp	D3T5_gdp
D3TN1_dhh	0.023	0.128	0.057	-0.191*	-0.759***	-0.795***
	(0.066)	(0.109)	(0.122)	(0.104)	(0.265)	(0.232)
D3TN1_dcorp	-0.049**	-0.045	-0.055	-0.024	-0.077	-0.042
	(0.020)	(0.042)	(0.061)	(0.069)	(0.066)	(0.059)
D3TN1_dpub	0.027	0.003	-0.065	-0.127***	-0.290***	-0.220***
	(0.023)	(0.048)	(0.061)	(0.048)	(0.046)	(0.050)
Observations	125	125	125	125	85	85
R-squared	0.852	0.628	0.110	0.293	0.489	0.468
Number of ifscode	33	33	33	33	26	26

Technicalities 4: Cross-sectional dependence?

- Year effects are meager approach to controlling common shocks (very important for growth and credit expansions)

- Re-estimate developed-country specification where T is big enough to do DK standard errors – results actually are a bit stronger!

VARIABLE	(1) D3T0_gdp	(2) D3T1_gdp	(3) D3T2_gdp	(4) D3T3_gdp	(5) D3T4_gdp	(6) D3T5_gdp
D3TN1_dh	-0.015	-0.081**	-0.162***	-0.198***	-0.179***	-0.134**
	(0.015)	(0.039)	(0.051)	(0.043)	(0.050)	(0.066)
D3TN1_dc	-0.021*	-0.053**	-0.064**	-0.035	0.019	0.053**
	(0.011)	(0.024)	(0.031)	(0.029)	(0.029)	(0.023)
D3TN1_dp	-0.006	-0.019	-0.008	0.017	0.048*	0.064**
	(0.010)	(0.021)	(0.030)	(0.028)	(0.026)	(0.027)
Observatic	622	622	622	622	601	580
R-squared	0.834	0.493	0.174	0.149	0.124	0.100
Number of	21	21	21	21	21	21

Technicalities 5: Timing is everything…

- Movements in debt/GDP ratio $d_t = \frac{D_t}{Y_t}$ reflect movements in numerator as well as denominator:

$$d_t = \left(\frac{1 + r_t}{1 + g_t}\right) d_{t-1} + b_t$$

- Mechanical denominator channel contributes to negative *contemporaneous* correlation (changes in) growth and (changes in) debt
  - Authors look at three-year change in debt and <u>*subsequent*</u> three-year changes in growth to avoid this
  - But half of most tables in the paper still have *overlap* between intervals of debt changes and growth changes

Technicalities 5: Timing is everything...

Table 3: Household, Firm, and Public Debt, Baseline

	$\Delta_3 y_{it}$	$\Delta_3 y_{it+1}$	$\Delta_3 y_{it+2}$	$\Delta_3 y_{it+3}$	$\Delta_3 y_{it+4}$	$\Delta_3 y_{it+5}$
			Panel A: Developed Countries			
$\Delta_3 d_{it-1}^{H}$	-0.015	-0.081^*	-0.162^{**}	-0.198^{**}	-0.179^{**}	-0.134
$\Delta_3 d_{it-1}^{F}$	-0.021^*	-0.053^{**}	-0.064^{**}	-0.035	0.019	0.053
$\Delta_3 d_{it-1}^{P}$	-0.006	-0.019	-0.008	0.017	0.048	0.064^*
R^2	0.834	0.493	0.174	0.149	0.124	0.100
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t-1 to t-4

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$\Delta_3 d^F_{it-1}$	−0.021*	−0.053**	−0.064**	−0.035	0.019	0.053
$\Delta_3 d^P_{it-1}$	−0.006	−0.019	−0.008	0.017	0.048	0.064*
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t-1 to t-4

t to t-3

t+1 to t-2

t+2 to t-1

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- Focus on RHS of all tables in the paper
- Patterns of signs and significance not always same in RHS as LHS

Technicalities 6: Nickell and diming…

- Specifications with household/firm/government debt have pretty short T ($T = 12$ on average – much less if nonoverlapping – see Technicality 3)

- Panel regressions (rightly) include fixed effects and lags of growth (see Technicality 5)

- Leads to worries about Nickell bias
  - We don't care so much about coefficient on lagged growth
  - But if lagged growth is correlated with lagged debt (see again Technicality 5) then Nickell bias spills over to coefficients on debt variables of interest

- Standard solutions (like lags as internal instruments) are unappealing

Interpretation

- Higher debt causing lower growth?
  - Debt overhang?
  - FDI "debt"

- Third factors driving both debt accumulation and subsequent lower growth (this is the part that probably is most relevant for policymakers)
  - Misallocation of credit?
  - Procyclical credit cycles?
  - Contractionary monetary policy responses to credit booms?
  - What else?

- Findings more useful for policymakers if we can disentangle these factors