The Great Wall of Debt
The Cross Section of Chinese Local Government Credit Spreads

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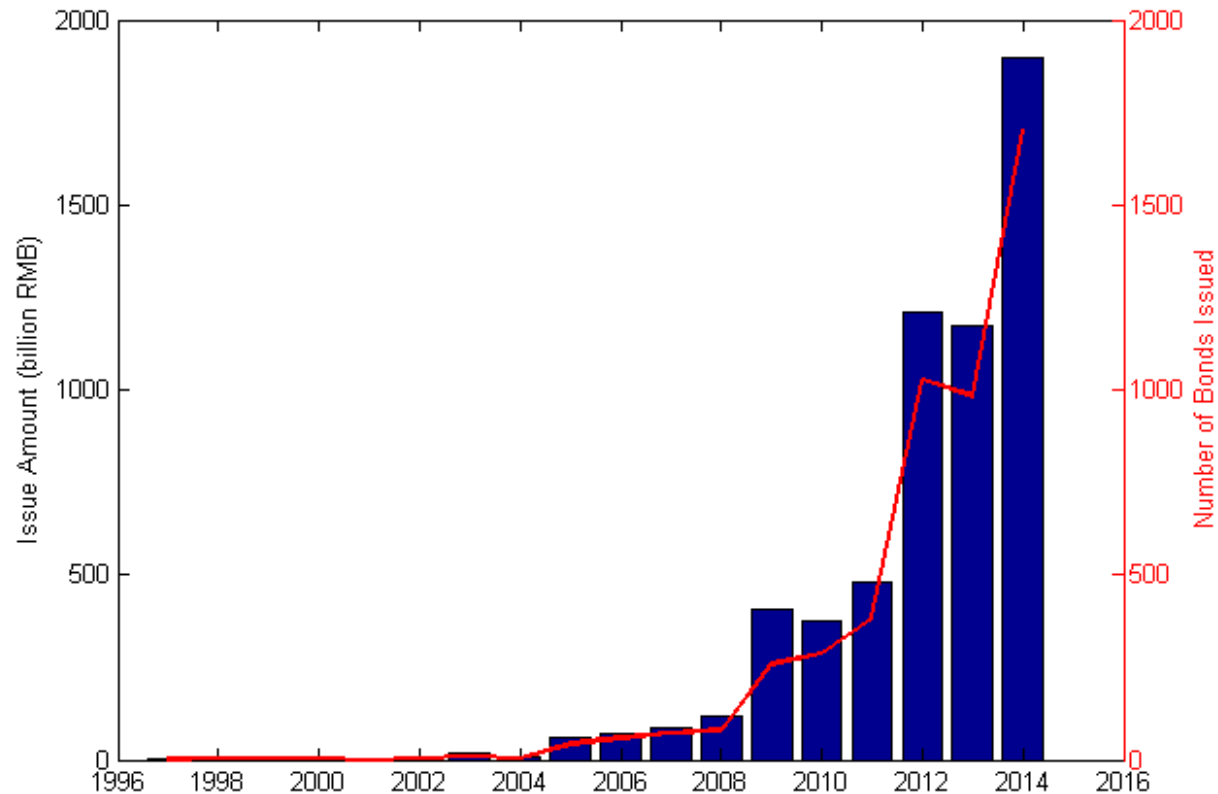**Andrew Ang (Columbia)**
Hao Zhou (PBC Tsinghua)

Example: '09沪城投

Shanghai Tower ($2.4 bil)

- Issue:4/10/2009
- Size: RMB 5bil
  (USD .77 bil)
- Tenor: 5-year
- Yield: 3.5%
- Issuer: Shanghai Chengtou Corp.
- Issuer type: SOE

ChengTou Bond Issuance

- 1992: first CTB, Pudong development bond, RMB 500 million
- By 12/31/2014: total outstanding of RMB 4.95 trillion

ChengTou Bond (城投债)

- CTB is China's pseudo muni bond for the purpose of municipal gov. investment and city construction

- CTB is issued by local government financial vehicles (LGFV), including state-owned enterprises (SOE)

- CTB is guaranteed explicitly/implicitly by local government revenue (through land sales and asset transfer)

The Importance of CTB Market

- CTB market is unique to investigate the effect of government guarantees, political risk, and distortions to market pricing

- CTB market is integral to China's shadow banking system

- CTB market is tightly linked to the real estate market

The Nexus of Local Gov't Debt
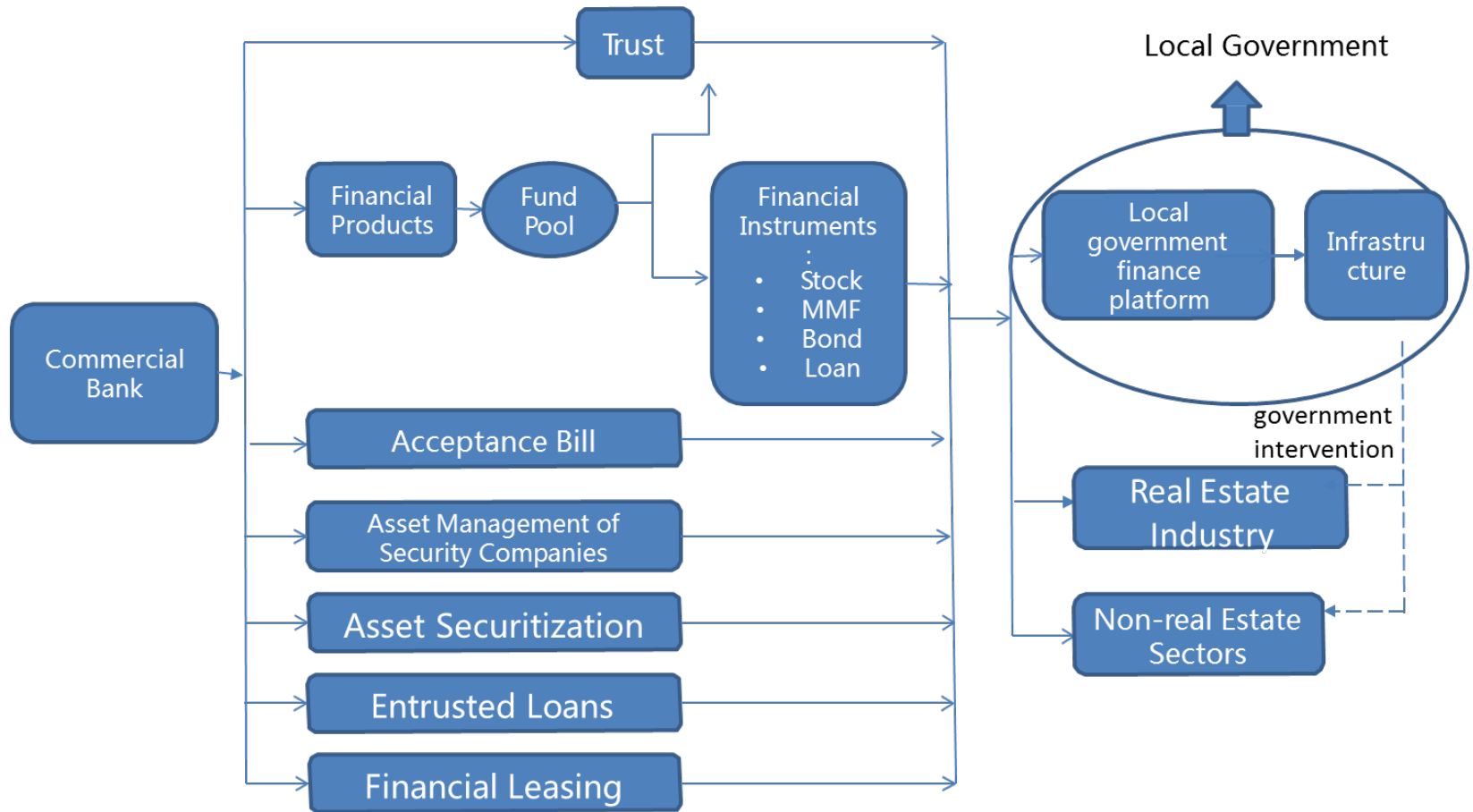
Central Government Guarantee

- The explicit and implicit central government guarantee should mean that all CTBs have similar yields.

CTB Excess Yield

$$Y_{ijt} = y_{ijt}^{CTB} - y_{it}^{CGB}$$

Step 1: calculate CGB zero-coupon yield curve

Step 2: calculate the CTB yield y_{ijt}^{CTB} based on bond characteristics (ttm, coupon, price, etc)

Step 3: calculate CTB-implied government bond yield y_{it}^{CGB}, based on CTB cash flow and CGB zero yield curve

Cross-sectional Dispersion

CTB: Regional Issuance

Color | **Issue Amount (Billion RMB)**

- >200
- 100~200
- 50~100
- 10~50
- <10
- NaN
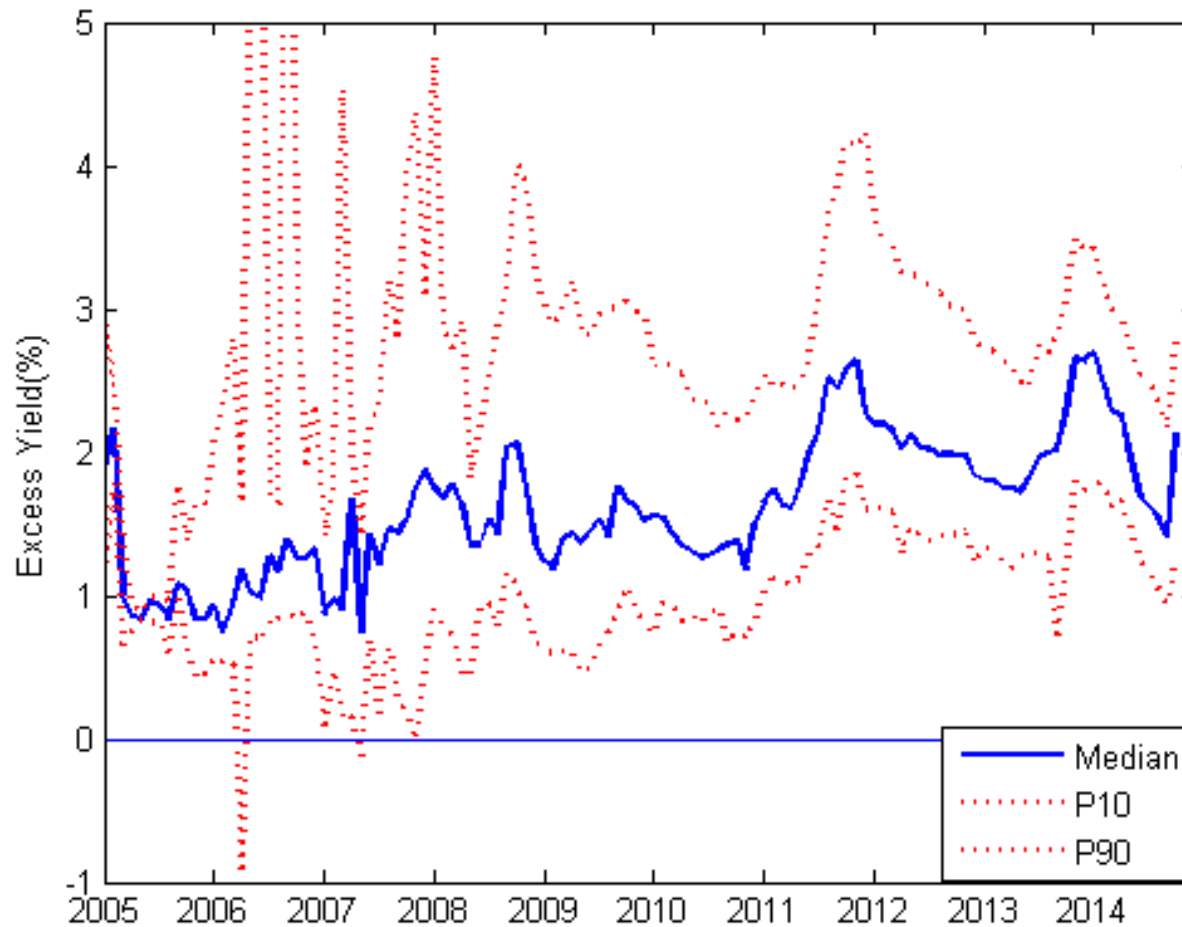
CTB: Issue Amount Relative to GDP
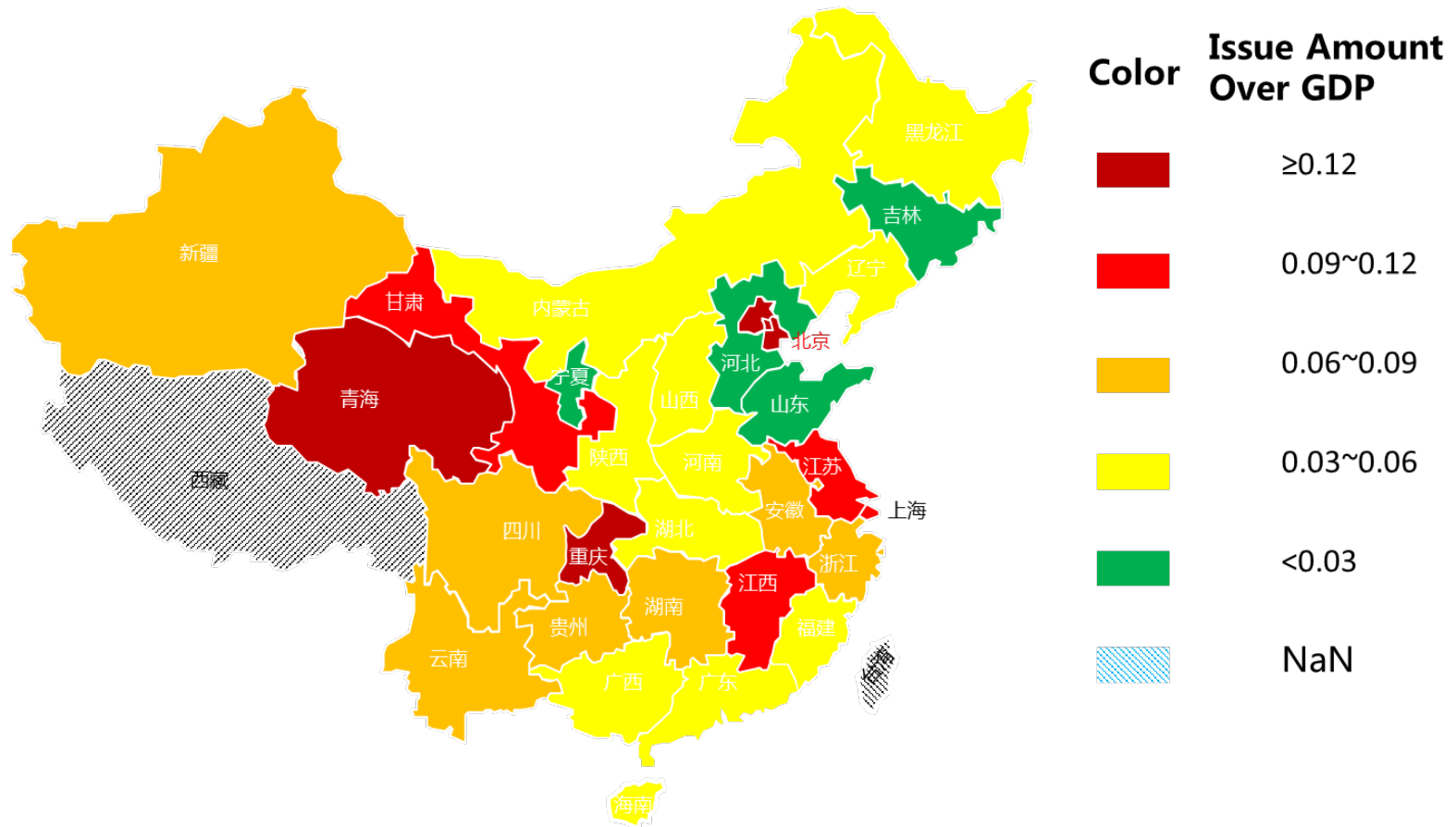
Distribution of Excess Yields

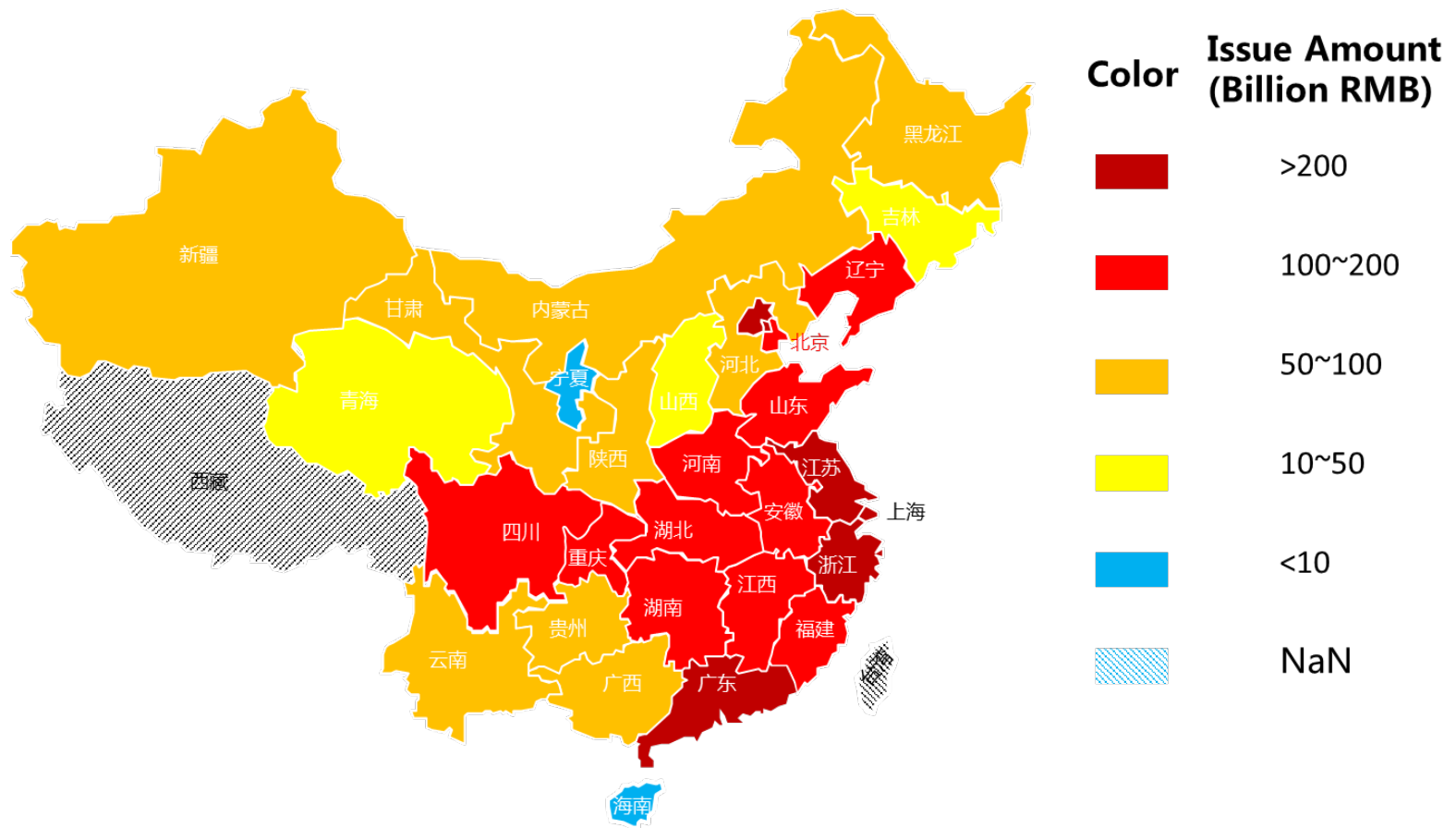|		Mean	SD	P10	P90
Geography					
	Coastal	1.87	0.81	1.04	2.83
	Middle	2.15	0.83	1.19	3.19
	West	2.21	0.75	1.34	3.10
Fiscal Surplus					
	High	2.37	0.76	1.43	3.29
	Mid	2.13	0.79	1.24	3.09
	Low	1.85	0.80	1.03	2.81
GDP Growth					
	High	2.09	0.80	1.25	3.05
	Mid	2.10	0.81	1.20	3.07
	Low	1.79	0.79	0.97	2.79
RE Rank					
	High	1.92	0.81	1.08	2.90
	Mid	2.08	0.81	1.14	3.11
	Low	2.17	0.76	1.26	3.07
All Bonds		1.98	1.90	0.81	1.11

Characterizing Risk of CTB Bonds

More expensive (lower yield) CTB bonds tend to be those issued in provinces …

- Located along the coast;

- Having higher housing prices;

- Having lower GDP growth and smaller fiscal surplus

Given the central government guarantee, there still exists heterogeneity of CTB risk across provinces!

Province Risk Exposure

- Province betas to national macro and financial conditions

$$\Delta Y_{jt} = \alpha_j + \beta_{j,F}\Delta F_t + \varepsilon_{jt}$$

- CTB excess yields sorted by province betas

	$\beta_{\Delta CDS}$	$\beta_{\Delta FDI}$	$\beta_{\Delta CA}$	$\beta_{\Delta FX}$	$\beta_{\Delta RF}$	β_{RET}
Low	1.91	1.89	1.98	2.05	2.15	2.11
High	2.15	2.10	2.13	1.97	1.94	2.01
Low-High	-0.24	-0.21	-0.16	0.07	0.21	0.09
t-stat	-5.52	-5.51	-3.82	1.81	5.15	2.49

- In the cross-sectional test, macro betas on CDS, EX, and RF are priced in CTB excess yields.

Further Specification

- Controlling for province risk exposures, examine province-level and bond-level characteristics:

$$Y_{ijt} = \alpha_0 + \alpha Y_{ij,t-1} + \sum_{s=1}^{S} \xi_s \cdot X_{ijt} + \sum_{k=1}^{K} \gamma_k \cdot \beta_{j,F(k)} + \eta_t + \varepsilon_{ijt}$$

- X_{ijt} include

  - Real estate characteristics
  - Political risk
  - Liquidity risk

Real Estate

	(1)	(2)	(3)	(4)
Real Estate GDP	**-0.03**		**-0.03**	**-0.04**
	[-5.03]		[-3.80]	[-4.83]
Service GDP	**-0.01**		**-0.01**	-0.01
	[-1.85]		[-1.91]	[-1.00]
Retail GDP	0.01		0.01	0.00
	[1.23]		[1.30]	[0.10]
Hotel GDP	0.01		0.01	-0.01
	[0.55]		[0.57]	[-0.32]
GDP Growth		**0.02**	0.00	-0.01
		[2.94]	[0.50]	[-1.27]
Fiscal Surplus		**0.01**	0.00	0.00
		[2.31]	[-0.66]	[0.07]
Control for Betas				Y
Control for Lagged Yield	Y	Y	Y	Y
Month Fixed Effect	Y	Y	Y	Y
Adj R2	0.628	0.620	0.628	0.628

Political Risk

- Corruption index is calculated as the rank-weighted

Corruption: Officials named in CCDI Graft Reports

Guangdong 65 — 5,706.8	**Beijing** 45 — 1,787.9	**Hubei** 43 — 2,225	**Sichuan** 40 — 2,387.3	**Shanxi** 36 — 1,211.3	**Henan** 36 — 2,959.9	**Hunan** 32 — 2,215.4	**Fujian** 32 — 1,970.2
Hainan 31 — 285.6	**Guizhou** 30 — 685.2	**Anhui** 28 — 1,721.2	**Shaanxi** 27 — 1,445.4	**Liaoning** 25 — 2,484.6	**Jiangxi** 25 — 1,294.9	**Shandong** 23 — 5,001.3	**Heilongjiang** 20 — 1,369.2
Hebei 18 — 2,657.5	**Xinjiang** 18 — 750.5	**Guangxi** 15 — 1,303.5	**Jiangsu** 15 — 5,405.8	**Yunnan** 13 — 1,031	**Gansu** 13 — 565	**Chongqing** 12 — 1,141	**Inner Mongolia** 11 — 1,588.1
Jilin 11 — 1,193.9	**Zhejiang** 10 — 3,466.5	**Shanghai** 8 — 2,018.2	**Ningxia** 8 — 234.1	**Qinghai** 4 — 189.3	**Tibet** 4 — 70.1	**Tianjin** 2 — 1,289.4	

Political Risk

	(1)	(2)	(3)	(4)	(5)
Corruption	**0.09**		**0.02**	**0.02**	**0.02**
	[4.33]		[4.39]	[4.01]	[3.59]
Num of Corruption Cases		**0.05**	**0.01**	**0.02**	**0.01**
		[3.09]	[2.92]	[4.12]	[2.03]
Control for Betas				Y	Y
Control for Rating					Y
Control for Lagged Yield			Y	Y	Y
Month Fixed Effect	Y	Y	Y	Y	Y
Adj R2	0.198	0.191	0.620	0.621	0.630

Liquidity Risk

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Turnover	**0.07**			**0.02**	**0.02**	**0.01**	**0.02**
	[4.42]			[3.77]	[3.77]	[3.26]	[3.41]
Turnover*HQ							**-0.01**
							[-1.65]
Illiq_Amihud		**-0.04**		0.01	0.01	0.01	0.01
		[-3.23]		[1.07]	[1.11]	[1.64]	[1.08]
Illiq* HQ							0.00
							[-0.28]
spread			0.00	0.00	0.00	0.00	
			[-0.17]	[-0.74]	[-0.65]	[0.29]	
Control for Betas						Y	Y
Control for Lagged Yield				Y	Y	Y	Y
Month Fixed Effect	Y	Y	Y	Y	Y	Y	Y
Adj R2	0.195	0.201	0.187	0.675	0.676	0.684	0.684

* HQ=1 if Rating=AAA

Conclusion

- Despite the central government guarantee, CTB yields exhibit significant economic heterogeneity across provinces.

- Real estate plays a vital role in determining CTB yields.

- Political risk is equally important as economic risk.

Appendix

CTB Characteristics

USA: Munis

- Federation: central gov't bear no responsibility
- Munis have little systemic risk
- Relatively little corruption and transparency
- Debt does not have to be backed by physical collateral
- Tax-exempt

China: CTB

- Central government implicitly guarantees CTBs
- CTB mkt affects systematic risk and financial stability
- Relatively more corruption and opacity
- Collateral is often required; linked to *real estate* market
- Non tax-exempt