Liquidity of China's Government Bond Market: Measures and Driving Forces

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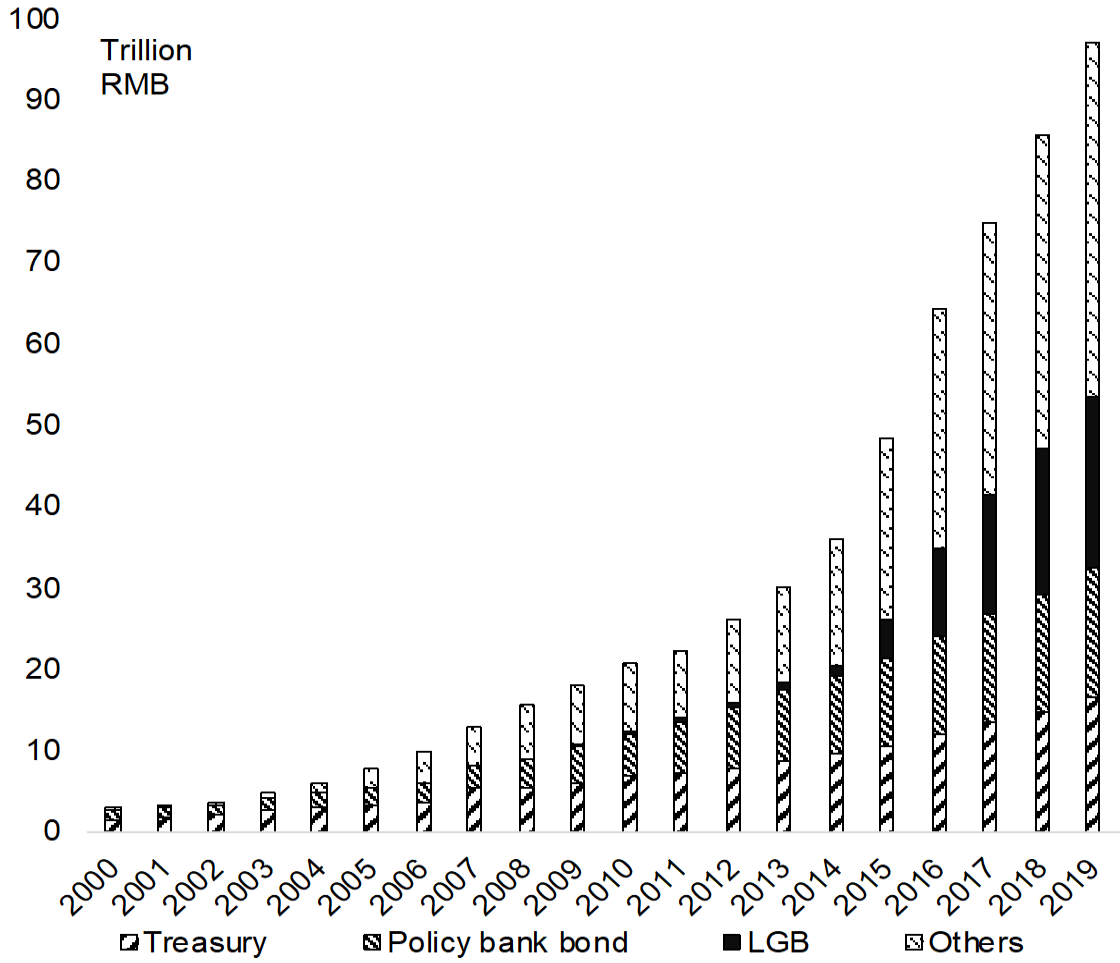
Why to study the liquidity of Government and agency bonds

- China's bond market became the second largest fixed income market in the world with total market cap of $14 trillion in mid 2020.
- ➢ Among the debt instruments, government and agency bonds are the most active ones. By the end of 2019, they accounted for 30% of the total market cap and around 60% of the total trading volume.
- Government and agency bonds are becoming more relevant to international investors
- ➢ In the last decade many barriers to government and agency bond market entry have been lowered or removed for foreign investors
- ➢ Added into the Bloomberg Barclays Global Aggregate Index during April- October 2020
- ➢ will be included in FTSE World Government Bond Index in Oct 2021



Related literature on bond market liquidity

- 1. Hameed, Helwege, Li, & Packer (2019) On Malaysia's corporate bond liquidity:

  To choose and rank 5 price measures and 5 quantity measures, and average their scores separately into price and quantity indexes. To link each of price and quantity measures and their indexes to bond characteristics (i.e., market cap, original maturity, remaining maturity)

- 2. Hoyos, Liu, Miao, & Saborowski (2020) On Mexico's government bond liquidity:

  To construct a single liquidity index from 3 high-frequency price and quantity measures, and explain its variation by domestic and global macrofinancial movements.

- 3. Adrian, Fleming & Vogt (2017) On US treasury market liquidity

  To construct a liquidity index by the simple average of the bid-ask spread, depth, and price impact measures, and explain the index variation by funding liquidity, volatility, and macro-economic indicators.

- 4. Mo and Subrahmanyam (2020) On China's corporate credit bond liquidity

  To construct a single liquidity index by the PCA method from 5 price measures, which is used with other bond characteristics to explain bond yield spreads.

Our task

1. To construct a single liquidity index for China's government and agency bonds

2. To examine the linkage between the bond liquidity variation and domestic and global macrofinancial indicators

- Logically follows Hoyos, Liu, Miao, & Saborowski (2020) and Adrian, Fleming & Vogt (2017)
- But price and quantity measures similar to Hameed, Helwege, Li, & Packer (2019), as high-frequency data is difficult to obtain.
- By the PCA method to construct liquidity index, similar to Mo and Subrahmanyam (2020)

Main findings

- Government bond market liquidity was low with significant swings before 2010, especially during the SARS epidemic in 2003 and the global financial crisis during 2007-2009.
- Market liquidity has improved since 2010. During 2013-2015 the market liquidity edged down as authorities embarked on financial deleveraging to contain risks. Since then it remained relatively stable until the outbreak of the global COVID-19 pandemic in early 2020.
- The variation of liquidity index is highly correlated with domestic funding liquidity and market volatility, but displays less correlation to global macrofinancial indicators (after 2009).

Dataset

- Source: China Central Depository & Clearing Corporation (CCDC) through WIND
- Daily data covering 2001-mid 2020
- 475 government bonds and 2776 policy bank bonds
- 84,788 records for on the run bonds at each maturity
- 11 variables

11 variables used to construct 7 basic liquidity measures

Table 1: Summary statistics for government and agency bonds

Variable	Obs	Mean	Max	Min	Sd
Closing price	84788	101.4	147.5	65.4	4.4
Daily high price	84660	101.6	147.5	65.4	4.3
Daily low price	84669	101.2	146.6	3.1	4.6
Best bid price	68876	101.0	226.6	76.6	4.4
Best ask price	69072	101.9	138.0	2.7	4.4
Daily return (%)	84620	0.03	52.9	-32.7	1.2
Trading value	84788	1920	160000	0.1	5260
Turnover ratio	74712	2.6	232.3	0.0	5.5
Number of deals	83965	13.9	381	1	31.0
Number of quotes	84788	46.3	1440	0.0	77.9
Remaining maturity	84772	8.3	50	0.1	7.5

Note: All the prices (in RMB) exclude accrued interest. The trading value is in the unit of 1 million RMB, and residual maturity is in the unit of year. Source: WIND

From 11 variables to 7 basic liquidity measures

- 1. Bid-ask spread: Best ask price – Best bid price
- 2. Amihud ratio: |daily return|/trading value
- 3. Price dispersion: the trading value weighted variance of closing prices relative to the trading value weighted average of closing prices $(\frac{\sum_i w_i p_i^2}{\sum_i w_i p_i} - \sum_i w_i p_i)$.
- 4. Price amplitude: $(p_h - p_l)$/avg(p_h, p_l), with p_h=daily high price & p_l=daily low price
- 5. Turnover ratio
- 6. Trade number (deflated by trading value)
- 7. Quote number (deflated by trading value)

Summary statistics for 7 daily liquidity measures after aggregation across maturities

Variable	Obs	Mean	Max	Min	Sd
Bid-ask spread	3104	1.04	8.41	0	0.79
Amihud ratio	3902	0.02	10.11	0	0.18
Price dispersion	3928	0.04	2.64	0	0.14
Price amplitude	3620	0.01	0.41	0	0.02
Turnover ratio	3948	2.43	50.07	0	2.32
Trade number	3948	0.35	5.272	0	0.509
Quote number	3948	1.06	26.112	0	1.952

Correlations between liquidity measures

Table 4: Correlations between liquidity measures

	Bid-ask spread	Amihud Ratio	Price dispersion	Price amplitude	Turnover Ratio	Trades	Quotes
Bid ask spread	1						
Amihud ratio	0.20	1					
Price dispersion	0.43	0.32	1				
Price amplitude	0.31	0.20	0.39	1			
Turnover ratio	-0.07	-0.10	-0.09	0.02	1		
Trades number	0.17	-0.09	-0.19	-0.10	0.34	1	
Quotes number	0.10	-0.06	-0.17	-0.12	0.23	0.86	1

Principal Component Analysis

- To multiply -1 to all 3 quantity measures to make them pointing to the same direction of liquidity movements as price measures.
- To normalize 7 measures into zero mean, unity variance variables $[x_1 x_{2,\ldots,} x_7]$
- Principal component *i:* $Comp_i = a_{i1}x_1+a_{i2}x_2+\ldots+a_{i7}x_{7,}$

  where $[a_{i1}\ a_{i2}\ \ldots+a_{i7}]$ = *ith Eigenvector*
- Composite liquidity index = $k_1Comp_1 + k_2Comp_2 +\ldots+ k_5Comp_{5,}$

  where $k_i = Eigenvalue_i / \sum_i Eigenvalue_i$
- Contribution of liquidity measure x_j to the variation of the composite index:

  $\text{coef}(x_j) * sd(x_j) / sum(\text{coef}(x_j) * sd(x_j))$

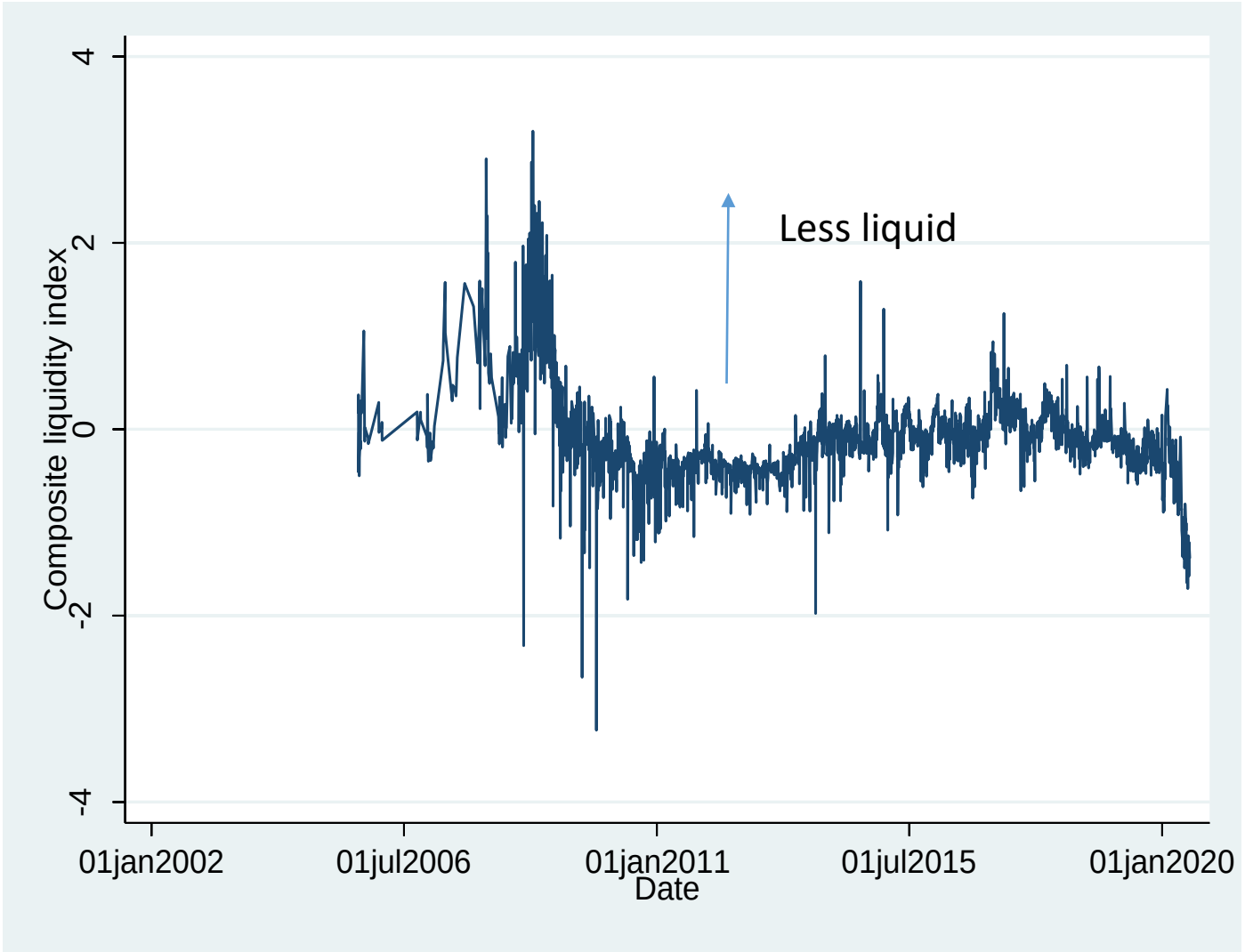
  $= \sum_i k_i a_{ij} / \sum_j \sum_i k_i a_{ij}$, j=1,2,…,7

Choosing 5 Principal Components

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7
Bid ask spread	0.1728	0.5414	0.1666	0.391	-0.3072	0.6239	-0.1128
Amihud ratio	0.2707	0.2935	0.3006	-0.8425	0.1015	0.172	0.0225
Price dispersion	0.4011	0.3964	-0.0734	0.0487	-0.4567	-0.6794	0.0634
Price amplitude	0.3098	0.379	-0.4311	0.1595	0.7401	-0.0358	-0.0038
Turnover ratio	0.3121	-0.1602	0.7829	0.33	0.3283	-0.1793	0.1232
trades	0.5284	-0.3992	-0.1164	-0.0246	-0.0794	0.0751	-0.7317
Quotes	0.5131	-0.3673	-0.2533	0.003	-0.1578	0.2836	0.6574
Cumulative Eigenvalue proportion	0.3176	0.581	0.713	0.8286	0.9144	0.9824	1
Weight k_j	0.347	0.288	0.144	0.126	0.094	0	0

Composite liquidity index by PCA method

- Liquidity was tighter and more volatile before 2010
- Liquidity has eased and been relatively stable since 2010
- Liquidity further eased after the pandemic took place in early 2020



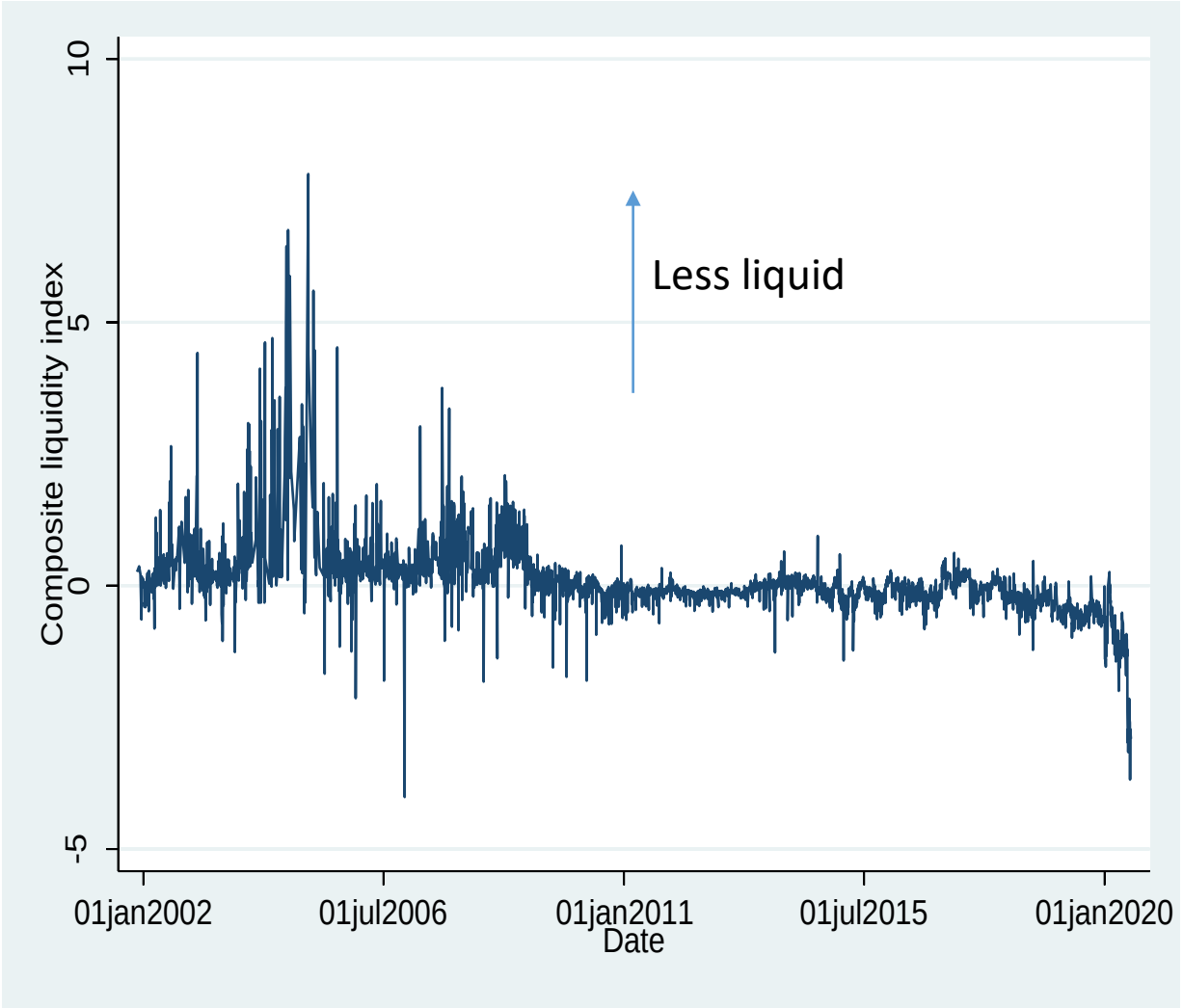
Contributions of each liquidity measure to the variation of composite liquidity index

- All the 4 price measures are important contributors
- Turnover ratio is the only important contributor among the quantity measures

Measures	Contribution (%)
Bid ask spread	22.7
Amihud ratio	10.9
Price dispersion	18.0
Price amplitude	21.3
Turnover ratio	21.6
trades	3.6
Quotes	1.9

Composite liquidity index by simple average as a comparison

- More obs available before 2006
- Liquidity was tighter and more volatile before 2010
- Liquidity has eased and been relatively stable since 2010
- Liquidity further eased after the pandemic took place in early 2020



Event study for the linkage between liquidity swings and macrofinancial events

- 5 events with 7-day window, the event-occurring day labelled as t =0

- an AR(4) process with calendar effects to fit the liquidity index obtained by PCA method:

$$Compindex_t = \sum_{i=1}^{4} \beta_i Compindex_{t-i} + \sum_{i=1}^{12} \gamma_i M_i + \sum_{i=1}^{5} \rho_i W_i + \varepsilon_t$$

- and to produce predicted value:

$$Compindex_t^e = \sum_{i=1}^{4} \hat{\beta}_i Compindex_{t-i} + \sum_{i=1}^{12} \hat{\gamma}_i M_i + \sum_{i=1}^{5} \hat{\rho}_i W_i$$

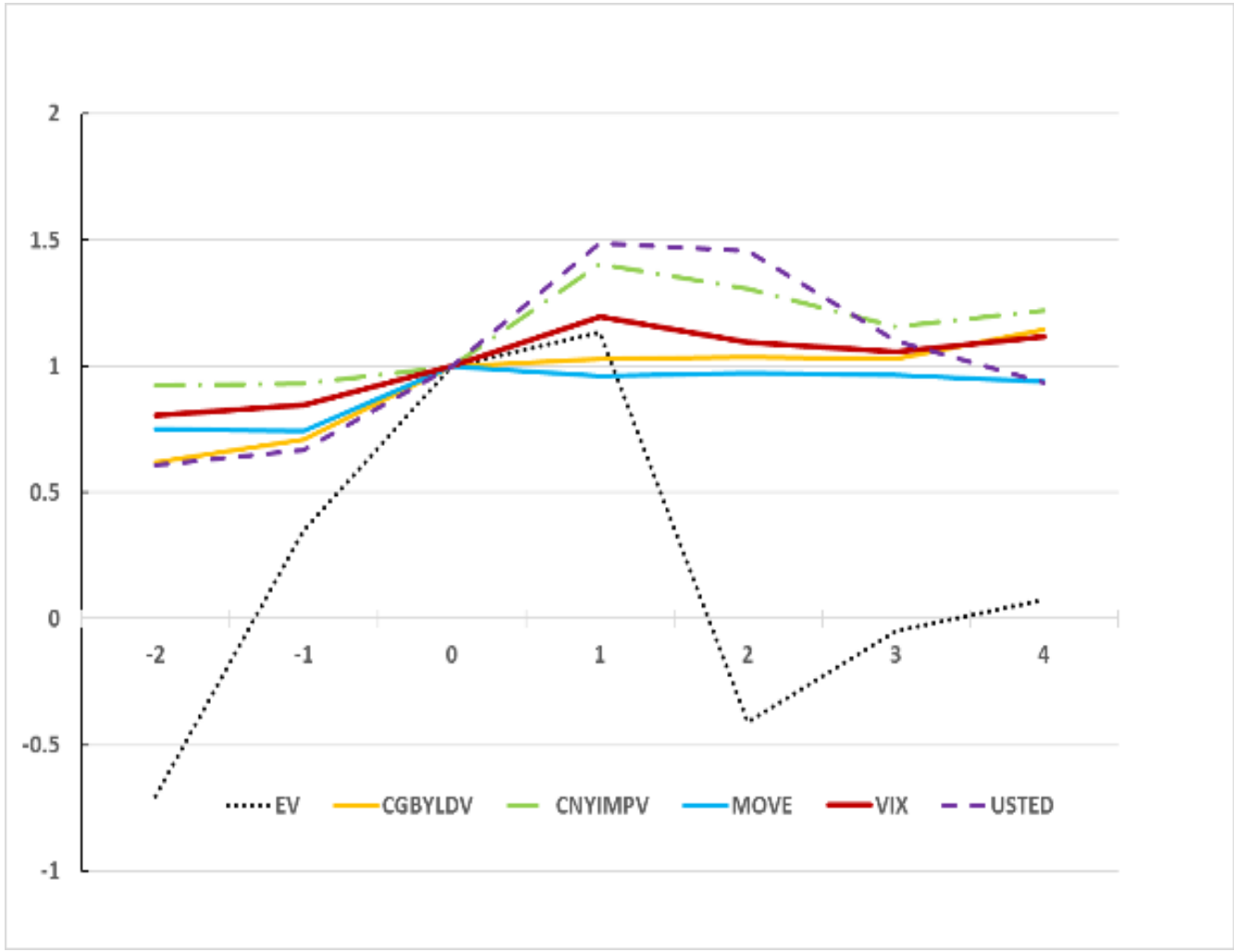
- A liquidity swing caused by a macofinancial event is measured by liquidity index's forecast error:

$$EV_t = Compindex_t - Compindex_t^e$$

Macrofinancial events and Liquidity Swings(1)

Lehman bankruptcy on 16 September 2008

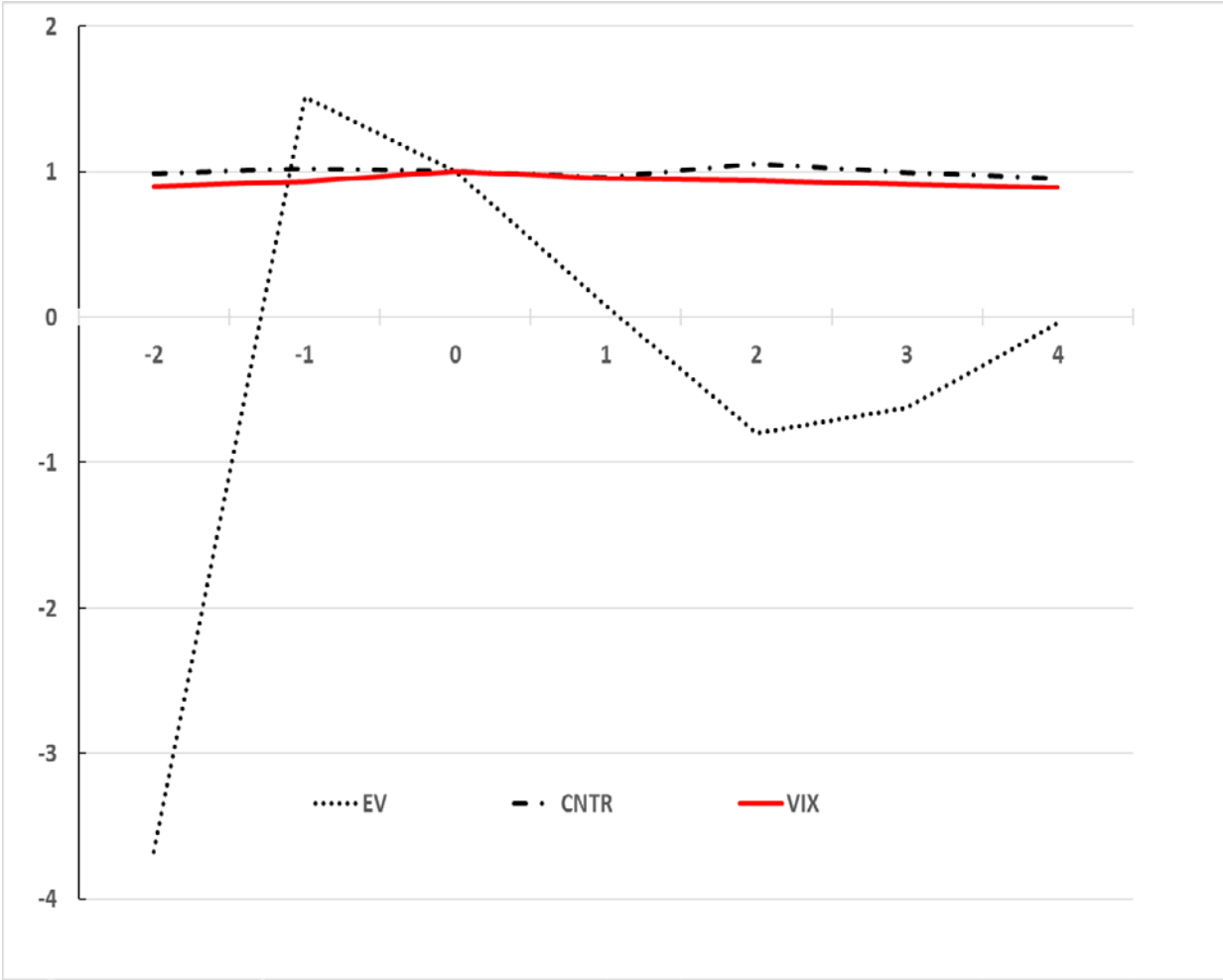
- Liquidity stress loomed before the announcement of bankruptcy and continued into the second day of the announcement before the situation improved
- The US financial market indicators MOVE, VIX and USTED moved up in the first four days, with a quick contagious effect on Chinese financial market



Macro events and Liquidity Swings(2)

Greece sovereign debt downgraded on 8 December 2009

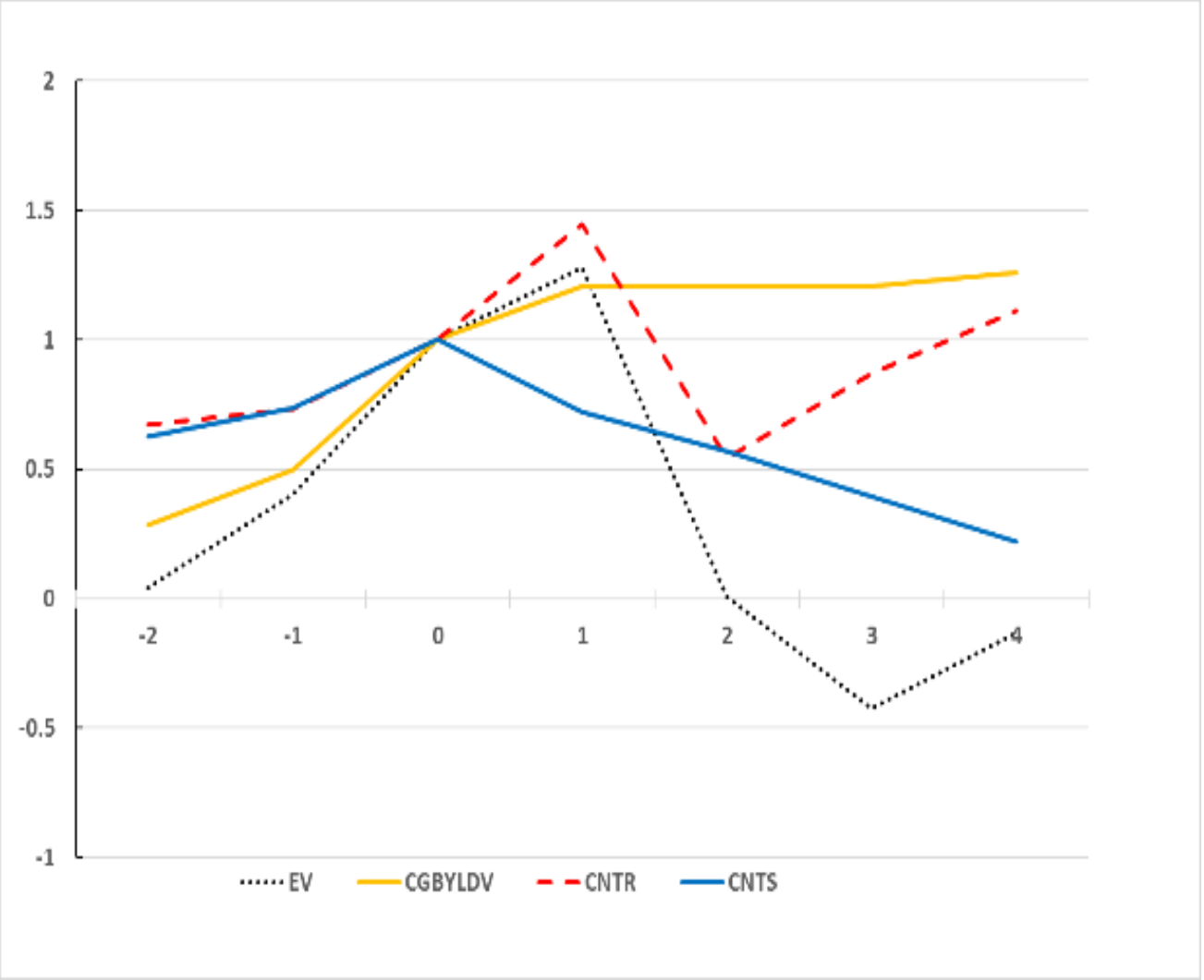
- The initial impact on domestic bond liquidity was high
- As US and China's rescue packages were already in place, both the RMB exchange rate and money markets were stable, so were the US financial market



Macro events and Liquidity Swings(3)

Chinese banking liquidity crisis on 20 June 2013

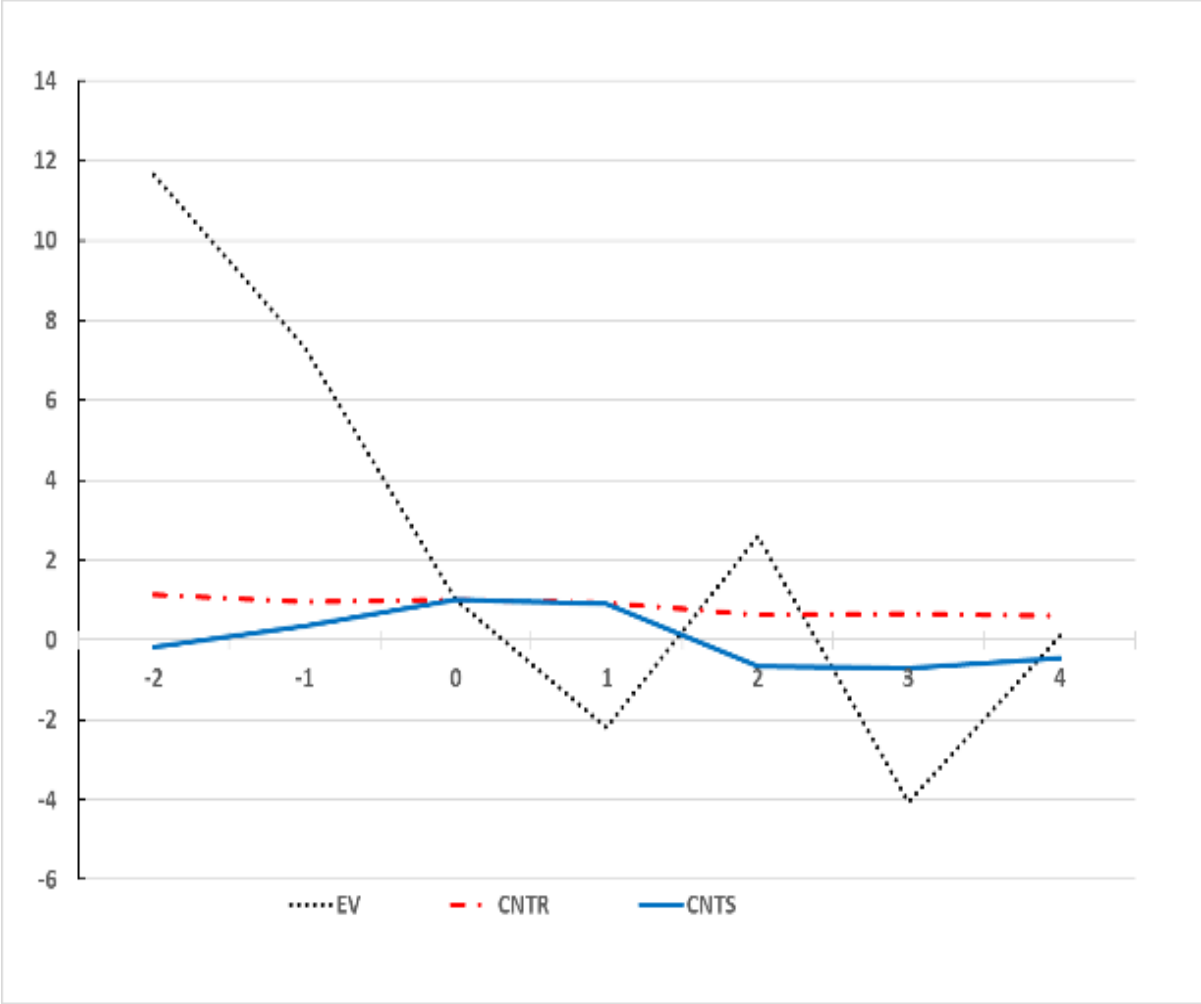
- A rapid rise in domestic interest rate swap rates and repo rates in the first 4 days
- Increased domestic bond volatility
- US liquidity indicators did not show much distress at the same time



Macro events and Liquidity Swings(4)

Launch of Bond Connect Scheme on 3 July 2017

- An increase in bond liquidity (i.e., index was trending down) in the seven-day window
- The episode did not appear to have a big impact on other segments of domestic market



Macro events and Liquidity Swings(5)

A temporary shortfall in bond liquidity on 29 May 2020

- Deadline for corporate tax payment and new government bond issuance in May drained market liquidity, driving up two money market rates.
- the PBoC conducted a RMB300 billion reverse Repo on *t*=0, lowering money market rates and easing bond market liquidity in the following days

Explaining liquidity index variation by macrofinancial indicators

Domestic funding liquidity variables	
CN treasury-swap spread (CNTS)	(+)
CN treasury-repo spread (CNTR)	(+) : Tight funding liquidity condition is associated with low bond liquidity
Domestic financial market volatility	
CN bond mark volatility (CGBYLDV)	(+)
CN equity market volatility (CNSSEV)	(+)
CNY option implied volatility (CNYIMPV)	(+): High financial market volatility is associated with low bond liquidity
Volatility / funding liquidity Variables in the US financial market	
US bond market volatility (MOVE)	(+)
US CBOE volatility index (VIX)	(+) High financial market volatility is associated with low bond liquidity
US TED spread (USTED)	(+):Tight funding liquidity condition is associated with low bond liquidity
Global macro variables	
Brent oil futures movement (BRENTR)	(-): High oil demand is associated with high bond liquidity
Citi global economic surprise index (CESIGL)	(-): Good global economic condition is associated with high bond liquidity

Correlations of domestic and global macrofinancial indicators

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) CNTR	1.000									
(2) CNTS	0.196	1.000								
(3)CGBYLDV	0.034	0.135	1.000							
(4) CNSSEV	0.233	0.158	0.266	1.000						
(5) CNYIMPV	0.169	0.382	0.127	0.108	1.000					
(6) USTED	0.182	0.253	0.385	0.390	0.298	1.000				
(7) MOVE	0.174	0.034	0.417	0.533	0.012	0.640	1.000			
(8) VIX	0.170	0.130	0.403	0.443	0.150	0.626	0.727	1.000		
(9) BRENTR	0.007	0.014	0.044	0.041	0.012	0.025	0.028	0.099	1.000	
(10) CESIGL	0.136	0.332	0.202	0.173	0.118	0.288	0.101	0.310	0.009	1.000

Factors to explain domestic bond market liquidity: full sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Domestic funding liquidity	Domestic volatility	U.S. and global macrofinancial indicators		All indicators		
CNTR	0.033***				0.018	0.019*	0.022*
	(3.003)				(1.633)	(1.661)	(1.907)
CNTS	0.030				0.144***	0.151***	0.153***
	(1.317)				(5.909)	(6.055)	(6.125)
CGBYLDV		0.707***			0.530***	0.603***	0.616***
		(21.055)			(13.580)	(14.428)	(15.806)
CNSSEV		0.002**			0.002***	0.002**	0.001*
		(2.465)			(2.641)	(2.403)	(1.716)
CNYIMPV		0.044***			0.017**	0.028***	0.024***
		(7.218)			(2.504)	(4.068)	(3.390)
USTED(-1)			0.460***		0.345***		
			(13.545)		(12.049)		
MOVE(-1)			0.002***			0.001***	
			(4.324)			(2.757)	
VIX(-1)			0.002				0.004***
			(1.421)				(4.052)
BrentR(-1)				-0.007***	-0.004*	-0.005**	-0.004
				(-2.711)	(-1.707)	(-2.005)	(-1.566)
CESIGL(-1)				-0.003***	-0.001*	-0.001***	-0.001**
				(-8.425)	(-1.778)	(-3.862)	(-2.361)
N	2731	2971	2205	2251	2020	2064	2064
Adj R2	0.48	0.60	0.60	0.52	0.63	0.60	0.61

Note: T-statistics in parentheses. ***p<0.01, **p<0.05, *p<0.1. Source: Authors' estimates

Factors to explain bond market liquidity: Year> 2009

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CNTR	0.041***				0.021**	0.025***	0.025***
	(4.982)				(2.375)	(2.789)	(2.795)
CNTS	0.143***				0.146***	0.147***	0.148***
	(8.077)				(7.344)	(7.396)	(7.407)
CGBYLDV		0.445***			0.398***	0.416***	0.413***
		(14.844)			(11.625)	(11.707)	(12.196)
CNSSEV		0.003***			0.003***	0.003***	0.003***
		(4.644)			(4.760)	(4.364)	(4.167)
CNYIMPV		0.000			0.002	0.004	0.003
		(0.082)			(0.314)	(0.637)	(0.524)
USTED(-1)			0.325***		0.200***		
			(6.543)		(4.816)		
MOVE(-1)			0.003***			-0.000	
			(6.228)			(-0.154)	
VIX(-1)			-0.004***				0.000
			(-3.245)				(0.476)
BrentR(-1)				-0.005**	-0.004**	-0.004**	-0.004**
				(-2.306)	(-2.084)	(-2.118)	(-2.031)
CESIGL(-1)				0.003***	0.002***	0.002***	0.002***
				(8.766)	(5.540)	(6.102)	(6.175)
N	2460	2523	1872	1913	1818	1859	1859
Adj R^2	0.46	0.49	0.49	0.49	0.56	0.55	0.55

Note: T-statistics in parentheses. ***p<0.01, **p<0.05, *p<0.1. Source: Authors' estimates

Probability of liquidity stress and macrofinancial factors

- Dynamic Markov Switching model with 3 states to estimate the likelihood of liquidity regime:
- $Compindex = a_0^k + \varepsilon_t^k$
- $\varepsilon \sim N(0, \delta^k)$, k =1, 2, 3 refers to high, mild, and low liquidity condition respectively

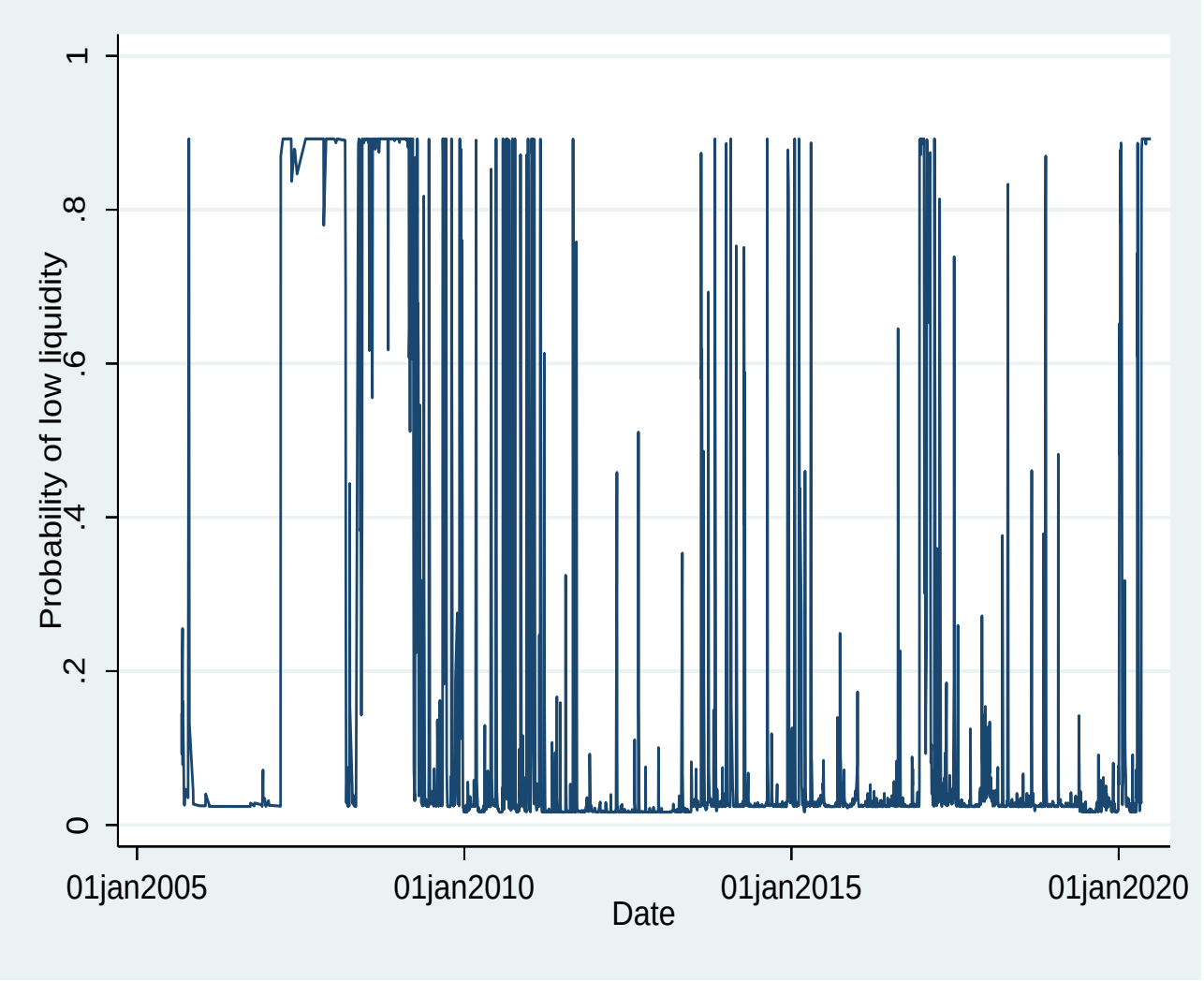
Parameters for 3 liquidity states			
	State 1 High liquidity	State 2 Mild liquidity	State 3 Low liquidity
α	-0.39	-0.041	0.276
	(0.007)	(0.007)	(0.052)
δ	0.140	0.182	1.016
	(0.005)	(0.005)	(0.037)

Note: Standard errors in parentheses. Source: Authors' estimates

Probability of liquidity stress

High liquidity stress identified:

- March 2007-March 2008 (imminent to financial crisis)
- June 2008-February 2009 (fail of Bear Sterns and Lehman Brothers)
- March 2009-April 2011 (European debt crisis)
- Probability of liquidity stress is occasionally high in the first half of 2020
- Some heightened liquidity volatility but not associated with those “renowned” events: August 2013 –April 2014, December 2014 – April 2015, and Dec2016 – April 2017



Explaining the probability of liquidity stress: Whole sample							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Domestic funding liquidity	Domestic volatility	U.S. and global macrofinancial indicators		All indicators		
CNTR	0.025***				0.023***	0.026***	0.023***
	(3.326)				(2.801)	(3.224)	(2.836)
CNTS	-0.038**				0.021	0.023	0.021
	(-2.454)				(1.161)	(1.321)	(1.205)
CGBYLDV		0.289***			0.229***	0.270***	0.243***
		(12.665)			(8.008)	(9.120)	(8.780)
CNSSEV		-0.002***			-0.002***	-0.002***	-0.002***
		(-3.665)			(-4.089)	(-4.062)	(-3.256)
CNYIMPV		0.027***			0.029***	0.033***	0.035***
		(6.467)			(5.900)	(6.616)	(7.009)
USTED(-1)			0.071***		-0.048**		
			(2.959)		(-2.275)		
MOVE(-1)			-0.000			-0.002***	
			(-0.496)			(-4.751)	
VIX(-1)			0.001				-0.004***
			(1.567)				(-5.175)
BrentR(-1)				0.000	0.000	-0.000	-0.001
				(-0.004)	(0.075)	(-0.161)	(-0.624)
CESIGL(-1)				-0.002***	-0.001***	-0.001***	-0.002***
				(-10.670)	(-6.604)	(-6.204)	(-7.819)
N	2731	2971	2158	2204	1999	2043	2043
Adj R^2	0.39	0.49	0.43	0.45	0.46	0.46	0.46

Note: T-statistics in parentheses. ***p<0.01, **p<0.05, *p<0.1. Source: Authors' estimates

Explaining the probability of liquidity stress: Year>2009

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	PR_state3	PR_state3	PR_state3	PR_state3	PR_state3	PR_state3	PR_state3
CNTR	0.030***				0.029***	0.028***	0.025***
	(4.480)				(3.895)	(3.772)	(3.383)
CNTS	0.017				0.025	0.022	0.018
	(1.172)				(1.524)	(1.302)	(1.088)
CGByldv		0.148***			0.155***	0.164***	0.154***
		(6.038)			(5.444)	(5.525)	(5.470)
CNSSEv		-0.004***			-0.004***	-0.004***	-0.003***
		(-7.411)			(-7.187)	(-6.569)	(-5.490)
CNYimpv		0.025***			0.028***	0.029***	0.034***
		(5.873)			(5.802)	(6.022)	(6.974)
USTED(1-)			-0.122***		-0.248***		
			(-3.079)		(-7.156)		
MOVE(-1)			0.001**			-0.001***	
			(2.217)			(-3.166)	
VIX(-1)			-0.004***				-0.005***
			(-4.282)				(-6.454)
BrentR(-1)				0.001	0.001	0.001	-0.000
				(0.564)	(0.432)	(0.347)	(-0.275)
CESIGL(-1)				0.000	0.000	0.000	-0.000
				(1.139)	(0.341)	(0.416)	(-0.897)
_cons	0.006	0.020	0.520***	0.401***	0.019	0.318***	0.367***
	(0.299)	(1.130)	(14.461)	(21.089)	(0.771)	(8.273)	(9.991)
N	2460	2523	1866	1907	1812	1853	1853
Adj R^2	0.16	0.18	0.17	0.15	0.22	0.21	0.22

Factors to explain low liquidity probability using moving average liquidity index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CNTRL	0.024***				0.025***	0.028***	0.025***
	(3.609)				(3.573)	(4.123)	(3.627)
CNTS	-0.038***				0.023	0.025*	0.023
	(-2.785)				(1.474)	(1.662)	(1.510)
CGBYLDV		0.287***			0.229***	0.279***	0.246***
		(14.388)			(9.284)	(10.916)	(10.327)
CNSSEV		-0.002***			-0.002***	-0.002***	-0.002***
		(-4.207)			(-4.757)	(-4.606)	(-3.673)
CNYIMPV		0.027***			0.030***	0.033***	0.036***
		(7.514)			(6.922)	(7.821)	(8.205)
USTED(-1)			0.081***		-0.048***		
			(3.810)		(-2.623)		
MOVE(-1)			-0.000			-0.002***	
			(-0.899)			(-6.084)	
VIX(-1)			0.001*				-0.004***
			(1.662)				(-6.184)
BrentR(-1)				0.000	0.001	0.000	-0.001
				(0.204)	(0.350)	(0.025)	(-0.507)
CESIGL(-1)				-0.002***	-0.001***	-0.001***	-0.002***
				(-11.925)	(-7.379)	(-6.799)	(-8.779)
N	2731	2971	2158	2204	1999	2043	2043
Adj R^2	0.44	0.55	0.49	0.51	0.52	0.53	0.53

Note: T-statistics in parentheses. ***p<0.01, **p<0.05, *p<0.1. Source: Authors' estimates

For probability of liquidity distress with 2 states

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	PR_state2	PR_state2	PR_state2	PR_state2	PR_state2	PR_state2	PR_state2
CNTEDsprdL	0.072***				0.067***	0.072***	0.069***
	(7.580)				(6.164)	(6.725)	(6.400)
CNTEDsprdS	-0.025				0.005	0.008	0.005
	(-1.289)				(0.227)	(0.317)	(0.207)
CGByldvox		0.247***			0.212***	0.270***	0.227***
		(8.424)			(5.544)	(6.795)	(6.102)
CNSSEvox		-0.000			-0.000	-0.001	-0.000
		(-0.576)			(-0.639)	(-0.866)	(-0.535)
CNYimpvox		0.015***			0.011*	0.020***	0.020***
		(2.782)			(1.693)	(2.987)	(2.930)
L.USTEDsprd			0.106***		-0.001		
			(3.467)		(-0.037)		
L.MOVEindex			-0.001			-0.002***	
			(-1.202)			(-4.050)	
L.VIXindex			0.001				-0.003***
			(0.982)				(-2.894)
L.BrentR				-0.003	-0.004*	-0.005**	-0.005**
				(-1.414)	(-1.751)	(-2.004)	(-2.165)
L.CESIGL				-0.001***	-0.001**	-0.001**	-0.001***
				(-5.624)	(-2.168)	(-2.070)	(-3.129)
_cons	0.843***	-0.113*	0.021	0.972***	-0.187***	0.880***	0.705***
	(32.098)	(-1.788)	(0.233)	(10.570)	(-4.729)	(11.619)	(12.749)
N	2731	2971	2158	2204	1999	2043	2043

For probability of liquidity distress with 2 states & Year>2009

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	PR_state2	PR_state2	PR_state2	PR_state2	PR_state2	PR_state2	PR_state2
CNTEDsprdL	0.078***				0.073***	0.074***	0.070***
	(8.614)				(6.970)	(7.072)	(6.767)
CNTEDsprdS	0.033*				-0.002	-0.008	-0.012
	(1.695)				(-0.078)	(-0.359)	(-0.520)
CGByldvox		0.154***			0.163***	0.170***	0.152***
		(4.487)			(4.073)	(4.083)	(3.841)
CNSSEvox		-0.002***			-0.002**	-0.002**	-0.001
		(-2.736)			(-2.306)	(-2.162)	(-1.491)
CNYimpvox		0.005			0.002	0.006	0.011
		(0.935)			(0.273)	(0.922)	(1.556)
L.USTEDsprd			-0.106*		-0.261***		
			(-1.910)		(-5.359)		
L.MOVEindex			0.002***			-0.002***	
			(3.170)			(-2.782)	
L.VIXindex			-0.005***				-0.005***
			(-3.927)				(-4.474)
L.BrentR				-0.003	-0.003	-0.004	-0.005*
				(-1.414)	(-1.328)	(-1.481)	(-1.867)
L.CESIGL				-0.001***	0.002***	0.002***	0.002***
				(-5.624)	(5.823)	(5.859)	(4.905)
_cons	-0.119***	-0.002	0.565***	0.972***	-0.046	0.465***	0.497***
	(-4.292)	(-0.071)	(11.213)	(10.570)	(-1.345)	(8.657)	(9.610)
N	2460	2523	1866	2204	1812	1853	1853
Adj R^2	0.30	0.28	0.28	0.44	0.32	0.32	0.32

Summary for regressions

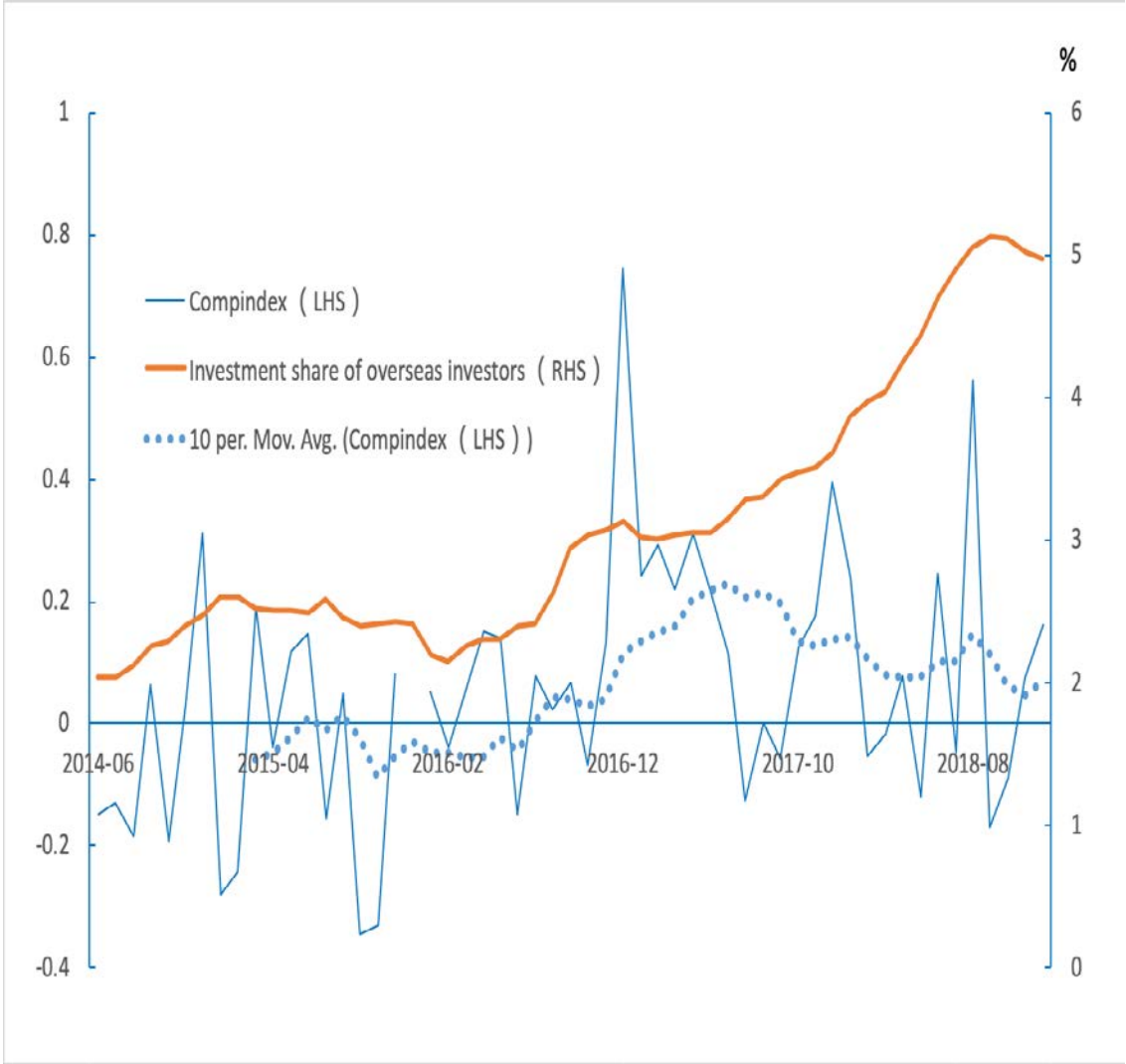
- Overall, bond market liquidity responds to domestic funding liquidity condition and financial market volatility, as well as to the US and global macrofinancial factors.

- Domestic financial market indicators have more significant & consistent impacts on domestic bond market liquidity than the US financial and global economic factors, especially after 2009.

Bond liquidity and capital inflows

- Foreign participation could help to improve government bond liquidity.

Since 2016 after the launch of bond connect and further relax of restrictions on QFII quota, there is a noticeable negative correlation between government bond liquidity index and capital inflows.



Conclusion

- We construct the liquidity index for China's government and agency bonds from seven price and quantity liquidity measures.
- Before 2010, government and agency bond liquidity was relatively low and volatile. Liquidity condition improved after 2010.
- In general, lower (domestic & US) funding liquidity condition and higher financial market volatility are associated with lower domestic bond liquidity; Higher global demand and economic surprises are associated with higher domestic bond liquidity.
- Domestic factors appear to have more significant and consistent effects on domestic bond liquidity.
- Global market integration and CNY internationalization could help to improve government and agency bond liquidity further.

Thanks!