Organizational Form and Liquidity: Evidence from Closed-End and Open-End Municipal Bond Funds

> John Chalmers University of Oregon

> Z. Jay Wang University of Oregon

Jingyun Yang University of Oregon and

7th Annual Municipal Finance Conference July 16th, 2018

Selling Open-end vs. Closed-End Funds



Finance for \$1,000 Alex

- An explanation for virtually any asset pricing anomaly.
- What is liquidity Alex?
- Municipal bond market is commonly held up as example of an illiquid market
 - There are few trades (Harris and Piwowar (2006))
 - Trades are expensive (especially retail trades)

A Theory for why we see Closed-End Funds?

- Allows investors to more efficiently own less liquid assets
- (Cherkes, Sagi, Stanton (2008))

CEF Value = NAV

- + Capitalized liquidity benefits
- Capitalized manager's fees

Some Factors in the Municipal Bond Market that may lead to large Capitalized Liquidity Benefits

- 1) In contrast to equity markets, in the municipal bond market it costs less to trade a large lot than it does to trade a small lot allowing for efficiencies in trade.
- 2) If a fund knows that it can hold a bond to maturity, the fund doesn't have to trade (absent leverage).
- 3) Closed-End Funds are exchange traded while municipals are traded OTC perhaps leading to lower trading costs for a household that wants to own muni bonds.

In this paper we ask

- 1. Do CEFs hold less liquid assets?
- 2. Does CEF leverage interact with liquidity choices?
- 3. Do CEF earn a liquidity premium?
- Today I will present preliminary results subject to change
- I'll focus my discussion on pre-crisis data.

Measuring Liquidity

• We look at four measures of liquidity – I'll focus on Dealer Markup = $(P_{sell} - P_{buy})/P_{buy}$



• From Chalmers, Liu, and Wang (2018)

Some Sample Data Pre-Crisis: 2001-2007

Means for <u>712 Open–End</u> Funds

- TNA 660 mm
- Leverage 0
- Muni Holdings 200
- Maturity 13.7
- Annualized Q. Return 5.32%
- 3 month Mark up is .39%
- 12 month turnover is 14%

Means for <u>296 Closed-End</u> Funds

- TNA 390 mm
- Leverage 25%
- Muni Holdings 135
- Maturity 19.7
- Annualized Q. Return 7.56%
- 3 month Markup is .75%
- 12 month turnover is 11%

Do CEF hold less liquid assets and does Leverage matter? Questions 1&2 evidence is yes.

		3-month	round-trip t	rading costs		12-month round-trip trading costs					
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	
CEF	0.367***	0.328***	0.333***	0.161***	0.178***	0.272***	0.205***	0.247***	0.174***	0.191***	
	(20.14)	(14.67)	(9.45)	(4.38)	(4.83)	(12.41)	(7.45)	(5.73)	(3.80)	(4.16)	
L.TNA (\$b)		0.006	0.018	-0.015	-0.012		-0.042***	-0.031*	-0.046***	-0.044***	
		(0.63)	(1.81)	(-1.49)	(-1.20)		(-3.38)	(-2.49)	(-3.75)	(-3.57)	
L.Familysize (\$b)		0.007***	0.006***	0.005***	0.005***		0.009***	0.008***	0.008***	0.008***	
		(8.92)	(7.62)	(6.80)	(6.81)		(9.66)	(8.33)	(8.14)	(8.29)	
Turnover			-0.003***	-0.003***	-0.003***			-0.004***	-0.004***	-0.004***	
			(-13.68)	(-14.08)	(-14.22)			(-16.33)	(-15.72)	(-15.40)	
Expratio			0.164***	0.002	0.011			0.212***	0.113*	0.120**	
			(4.53)	(0.07)	(0.31)			(4.77)	(2.46)	(2.64)	
Advfee			0.198***	0.116*	0.098			0.189**	0.168*	0.161*	
			(3.41)	(2.03)	(1.73)			(2.67)	(2.37)	(2.27)	
CEF×L.Leverage			-0.561***	-0.297*	-0.328**			-0.828***	-0.739***	-0.753***	
			(-4.95)	(-2.55)	(-2.81)			(-5.97)	(-5.08)	(-5.17)	
Inv_percent				-0.072	0.015				0.017	-0.001	
				(-1.81)	(0.32)				(0.35)	(-0.02)	
Cash_percent				0.694**	0.695**				0.591*	0.605*	
				(3.12)	(3.14)				(2.13)	(2.18)	
Fix_percent				0.388***	0.283^{*}				0.441**	0.520***	
				(3.44)	(2.47)				(3.14)	(3.64)	
Avgeoupon				0.073***	0.073***				0.063***	0.070***	
				(4.78)	(4.68)				(3.31)	(3.60)	
Avgmaturity				0.028***	0.026***				0.011***	0.010***	
				(12.57)	(11.17)				(4.00)	(3.59)	
Constant	0.386***	0.328***	0.218***	-0.688***	-0.393**	0.150***	0.114***	0.026	-0.794***	-1.050***	
	(39.83)	(27.23)	(6.58)	(-5.39)	(-2.68)	(12.85)	(7.69)	(0.63)	(-4.99)	(-5.73)	
Time FE	No	No	No	No	Yes	No	No	No	No	Yes	
adj. R ²	0.065	0.101	0.156	0.210	0.221	0.026	0.053	0.125	0.140	0.149	
N	5796	4658	4405	4377	4377	5796	4658	4405	4377	4377	

Do CEF Earn a liquidity premium? Not sure. (Quarterly Net Return pre-Crisis) (Table 4)

	(1)	(13)	(14)
CEF	0.5716***	0.1883***	0.1843***
	(21.62)	(3.44)	(3.37)
L.TNA (\$b)	()	0.0050	0.0066
		(0.34)	(0.45)
L.Familysize (\$b)		-0.0005	-0.0007
		(-0.43)	(-0.62)
Expratio		-0.1877***	-0.1926***
-		(-3.42)	(-3.51)
Advfee		0.1437	0.1384
		(1.69)	(1.63)
Avgtv3			
0			
Avgtv12			
_			
Avgmarkup3		0.0303	
		(1.34)	
Avgmarkup12			0.0475**
			(2.62)
Avgzero			
Avgamihud			
The second se		0.0000	0.000.0
Turnover		0.0003	0.0004
OPD II		(0.87)	(1.19)
CEF×L.Leverage		0.4919**	0.5193**
I		(2.84)	(2.99)
Inv_percent		-0.1915**	-0.1954**
C		(-3.14)	(-3.21)
Cash_percent		0.5411	0.5327
D: .		(1.64)	(1.62)
Fix_percent		-0.1101	-0.1229
		(-0.64)	(-0.72)
Avgcoupon		0.0653**	0.0646**
		(2.85)	(2.82)
Avgmaturity		0.0480^{***}	0.0484^{***}
<i>a</i>		(14.11)	(14.44)
Constant	-0.0587	-0.7906***	-0.7697^{***}
	(-1.66)	(-4.00)	(-3.90)
adj. R^2	0.766	0.805	0.805
N	5671	4332	4332

Do CEF Investors Earn a liquidity premium after adjusting for Risk Factors? (Quarterly Net Return - Table 6)

CEF Returns minus Open-End Returns regressed on Risk factors to test performance relative to OEFs by fund type

- Risk factors mostly load positively for CEF perhaps liquidity in here too
- Constant term is a measure of performance after risk adjustment

	(1)	(2)	(3)	(4)	(5)	(6) Muni National
	All Sample Funds	National Funds	Single-State Funds	High Yield Funds	Muni National Long	Intermediate
Constant	-0.0282	-0.0249	-0.0392**	0.0460	-0.0335**	0.0122
	(-1.42)	(-1.13)	(-2.15)	(1.58)	(-1.99)	(0.41)
Stock Market Excess Return	-0.0020	-0.0023	-0.0014	0.0044	0.0047	0.0097
	(-0.42)	(-0.43)	(-0.31)	(0.63)	(1.17)	(1.37)
Muni Excess Return	0.3597***	0.3349***	0.4362***	0.0916	0.3453***	0.2807***
	(7.33)	(6.11)	(9.65)	(1.23)	(8.29)	(3.83)
Credit Spread	0.1532***	0.1783***	0.0975***	0.1655***	0.1380***	0.1874***
	(13.33)	(13.87)	(9.21)	(9.60)	(14.14)	(10.92)
Term Spread	0.3343***	0.3801***	0.2343***	0.1143*	0.2306***	0.1068*
	(8.29)	(8.42)	(6.30)	(1.86)	(6.73)	(1.77)
adj. R-sq	0.947	0.941	0.946	0.597	0.945	0.766
N	168	168	168	166	168	168

Preliminary Findings

- We find convincing evidence
 - that CEF are holding less liquidity securities
 - CEFs that employ leverage hold more liquid municipals
- At this point, it's not clear
 - whether investors are benefiting from a liquidity premium or
 - whether CEF are taking more risk and earning higher returns but a non-positive alpha.

Extra Slides for Questions

- Rule 22e4
- Optionality
- OAS/OAD
- States / sectors AA go and AA hospital
- Credit quality / lower of two

Calculating Transaction Costs – aka Net markups

• Estimate dealer markups from MSRB transaction data following (e.g. Green, Hollifield, Schürhoff (2007b))

	Immediate Match									
	04Dec2004	200,000	Dealer Buy	\$101.00						
a) Immediate	04Dec2004	200,000	Dealer Sell	\$103.00						
	Dealer Buy 200k		Dealer Sell 2	00k to Customer						
		-trip								
h) Devue al turine	01Mar2003	900,000	Dealer Buy	\$100.00						
b) Round-trip	02Mar2003	400,000	Dealer Sell	\$100.50						
	05Mar2003	500,000	Dealer Sell	\$100.80						
	Dealer Buy 900k		Dea Dea	aler Sell 400k aler Sell 500k						
		FIFO Match								
	02Feb2003	5,000,000	Dealer Buy	\$98.00						
	04Feb2003	5,000,000	Inter-dealer	\$98.00						
C) FIFO	09Feb2003	2,000,000	Dealer Sell	\$99.00						
	09Feb2003	2,000,000	Dealer Sell	\$98.50						
	Dealer Buy 5	M 🗪 Anot	her Dealer	Sell 2M Sell 2M						

Gross Markup=(Sale Price_{Weighted Avg.}-Purchase Price)/Purchase Price Net Markup=Gross Markup – Return on Muni Index_{Maturity Matched}

Measuring Liquidity

- Spreads in yields, Spreads in prices
 - A five year and ten year bond both 5% annual coupons

	5% Coupon		
	5 year	10 year	
at 5% yld	100	100	
at 4.95	100.22	100.39	ask
at 5.05	99.78	99.61	bid
\$ spread	0.44	0.78	
at 4.975	100.11	100.19	Ask
at 5.025	99.89	99.81	Bid
\$ spread	0.22	0.38	

Do CEF Earn a liquidity premium? Not sure. (Quarterly Net Return pre-Crisis) (Table 4)

(1) (2) (3) (4) (5) (7) (6) (10) (11) (12) (13) (14) (15) (16) (21,27) (17,50) (13,10) (12,27) (17,50) (13,10) (12,37) (13,10) (13,17)								Depen	dent variable:	Quarterly I	et return						
CEF 0.5714*** 0.5714*** 0.6300*** 0.4899*** 0.124*** 0.1294*** 0.1385*** <		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	CEF	0.5716***	0.5761***	0.5374***	0.4910***	0.4892***	0.4913	0.4599***	0.4784	0.4274***	0.4309***	0.1948***	0.1959***	0.1883***	0.1843***	0.2031***	0.1956***
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		(21.62)	(17.59)	(15.29)	(13.10)	(12.87)	(12.95)	(12.11)	(12.70)	(10.93)	(11.21)	(3.56)	(3.58)	(3.44)	(3.37)	(3.71)	(3.57)
Lamiby (2.80) (3.34) (3.88) (3.89) (3.37) (3.82) (4.80) (2.82) (3.65) (0.32) (0.32) (0.33) (0.05) (0.05) (0.07) LPamilyai (0.0010) (0.003) (0.0005 (0.007) (0.019) (0.36) (-0.32) (-0.32) (-0.31) (-0.62) (-0.03) (-0.002) (-0.03) (-0.002) (-0.19)	L.TNA (\$b)		0.0418	0.0479	0.0571	0.0584	0.0585	0.0562	0.0598	0.0423	0.0536	0.0047	0.0047	0.0050	0.0066	0.0083	0.0040
L.Pamilysize (8b) 0.0001 0.0001 0.0005 0.0005 0.0005 0.0000 0.0006 0.0005 0.0007 0.0001 0.0017 0.0001 0.0001 0.0007 0.0001 0.0001 0.0007 0.0001 0.0007 0.0001 0.0007 0.0001 0.0001 0.0001 0.0001 0.0001 0.0001 0.0001 0.0001 0.0001 0.0001 0.0001 0.0001 0.0001 0.			(2.86)	(3.24)	(3.88)	(3.96)	(3.97)	(3.82)	(4.06)	(2.82)	(3.65)	(0.32)	(0.32)	(0.34)	(0.45)	(0.56)	(0.27)
	L.Familysize (\$b)		0.0010	0.0013	0.0006	0.0008	0.0008	0.0000	0.0002	0.0004	-0.0006	-0.0003	-0.0002	-0.0005	-0.0007	-0.0003	-0.0002
Expando 0.1418** 0.0012 0.0025 0.0320 0.0352 0.0352 0.0355 0.187*** 0.187*** 0.1897** 0.1418* 0.1418 0.1419 0.177* Argero - - - - 0.057** - 0.0307** - - -0.0574 Argero - - - <			(0.90)	(1.17)	(0.52)	(0.71)	(0.77)	(0.04)	(0.19)	(0.36)	(-0.52)	(-0.27)	(-0.21)	(-0.43)	(-0.62)	(-0.24)	(-0.19)
Advise (1.14) (1.17) (0.83) (0.94) (0.60) (0.25) (3.40) (-3.42) (-3.45) (-1.44) (1.14) (1.14) (1.74) (1.44) (1.74) (1.74) (1.45) (-1.45) (-1.45) Avgint (-2.80)	Expratio			0.1418**		0.0612	0.0626	0.0443	0.0502	0.0368	0.0133	-0.1876***	-0.1867***	-0.1877***	-0.1926***	-0.1911***	-0.1874***
Advise 0.3204*** 0.3272** 0.2271** 0.2201** 0.2727** 0.2271** 0.1477 0.1477 0.1437				(3.04)		(1.14)	(1.17)	(0.83)	(0.94)	(0.69)	(0.25)	(-3.42)	(-3.40)	(-3.42)	(-3.51)	(-3.48)	(-3.42)
Argiv3 (4.48) (3.27) (3.26) (3.27) (3.12) (3.26) (1.74) (1.69) (1.63) (1.69) (1.63) (1.69) (1.63) (1.69) (1.63) (1.69) (1.61) (1.69) (1.61) (1.69) (1.61) (1.69) (1.61) (1.69) (1.61)<	Advfee				0.3204***	0.2727**	0.2711**	0.2661**	0.2727**	0.2596**	0.2711**	0.1479	0.1477	0.1437	0.1384	0.1441	0.1479
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $					(4.48)	(3.27)	(3.25)	(3.20)	(3.27)	(3.12)	(3.26)	(1.74)	(1.74)	(1.69)	(1.63)	(1.69)	(1.74)
	Avgtv3					0.0011	× /	· · ·	· · ·			0.0025		× /			
Argiv12 0.0012 0.0021 Arginarkup3 0.1022*** (0.62) 0.0303 Arginarkup12 0.0579*** (1.33) (1.33) Arginarkup12 0.0579*** 0.0077** Arginarkup12 -2.2884*** (2.67) Arginarkup12 -2.2884*** (2.67) Arginarkup3 -2.2884*** (2.67) Arginarkup4 -2.2884*** (6.52) Turnover 0.4556*** -0.0001 CEF × LLeverage 0.421*** 0.489** -1.194** Inv_percent -0.192** -0.195** -0.191** Inv_percent -0.192** -0.191** -0.191** Cash_percent -0.192** -0.191** -0.191** Arginarturiy -0.192** -0.192** -0.191** -0.191** Gastant -0.055* -0.051 (0.041) -0.192** 0.483** Gastant -0.057** -0.191** -0.191** -0.191** -0.191** Gastant -0.055** -0.015** -0						(0.20)						(0.41)					
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Avgtv12					()	0.0012					()	0.0021				
Avgmarkup3 0.002** 0.002** 0.0303 Avgmarkup12 0.0579** 0.0303 Avgmarkup12 0.0579** 0.0455* Avgmarkup12 0.0579** 0.0303 Avgmarkup12 0.0579** 0.0303 Avgmarkup12 0.0579** 0.0304 Avgmarkup12 0.0579** 0.04556** Avgmarkup12 0.0579** 0.0574 Avgmarkup12 0.0579** 0.0574 Avgmarkup12 0.0579** 0.0574 Avgmarkup12 0.0579** 0.0574 Avgmarkup3 0.4556** 0.0001 Avgmarkup4 0.4556** 0.0001 0.0003 0.0004 0.0002 0.0001 0.0001 0.0003 0.0004 0.0002 0.0001 0							(0.62)						(0.96)				
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Avgmarkup3						(0.1022***						0.0303			
Avgmarkup12 0.0579*** 0.0475** (2.62) Avgero -2.2884*** (2.61) (2.71) Avganihud -2.2884*** (-5.45) 0.0001 0.0003 0.0004 (0.002 0.0072 Turnover -0.574 (-5.65) -0.671 (-0.71) -0.671 (-0.71) CEF×LLeverage -0.480* 0.480* 0.480* 0.480* 0.4919* 0.5194* 0.4020 0.0001 Imv_percent -0.421* -0.482** 0.480** 0.480** 0.0901 0.0004* 0.431* Cash_percent -0.921** -0.1921** -0.195** -0.191** -0.194** -0.194* -0.194* -0.194* -0.194** <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>(4.73)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>(1.34)</td> <td></td> <td></td> <td></td>								(4.73)						(1.34)			
(3.31) (2.62) Argaen (2.63) (2.64) Argaen (2.63) (2.64) (2.64) (2.67) Argaen (1.62) -0.0574 Argaen (1.62) -0.0574 (2.61) -0.0574 (2.62) -0.0574 -0.0574 -0.0574 -0.0574 -0.0574 (2.62)	Avgmarkup12							· · ·	0.0579***					× /	0.0475**		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $									(3.31)						(2.62)		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Avgzero									-2.2884***						1.0346*	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	0									(-5.45)						(2.17)	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Avgamihud									()	0.4556***					()	-0.0574
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $											(6.52)						(-0.71)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Turnover										()	0.0001	0.0001	0.0003	0.0004	0.0002	0.0001
$\begin{array}{c c c c c c c c c c c c c c c c c c c $												(0.44)	(0.26)	(0.87)	(1.19)	(0.71)	(0.43)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	CEF×L.Leverage											0.4821**	0.4808**	0.4919**	0.5193**	0.5024**	0.4807**
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	<u>u</u>											(2.78)	(2.77)	(2.84)	(2.99)	(2.90)	(2.77)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Inv_percent											-0.1921**	-0.1885**	-0.1915**	-0.1954**	-0.1940**	-0.1955**
$\begin{array}{c c c c c c c c c c c c c c c c c c c $												(-3.15)	(-3.08)	(-3.14)	(-3.21)	(-3.19)	(-3.20)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Cash_percent											0.5623	0.5618	0.5411	0.5327	0.6045	0.5638
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$												(1.71)	(1.71)	(1.64)	(1.62)	(1.83)	(1.71)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Fix percent											-0.0947	-0.0894	-0.1101	-0.1229	-0.0930	-0.0859
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	- maper centre											(-0.55)	(-0.52)	(-0.64)	(-0.72)	(-0.54)	(-0.50)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Avecoution											0.0686**	0.0699**	0.0653**	0.0646**	0.0648**	0.0695**
Avgmaturity 0.0488***	regeoupon											(2.98)	(3.04)	(2.85)	(2.82)	(2.83)	(3.02)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Avgmaturity											0.0488***	0.0488***	0.0480***	0.0484***	0.0522***	0.0499***
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $												(14.56)	(14.56)	(14.11)	(14.44)	(14.16)	(13.65)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Constant	-0.0587	-0.1076**	-0.2216***	-0.2538***	-0.2883***	-0.3016***	-0.2020***	-0.2763***	1.9107***	-0.3784***	-0.8316***	-0.8621***	-0.7906***	-0.7607***	-1.8226***	-0.8280***
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	S-SHOULLY	(-1.66)	(-2.72)	(-3.03)	(-4.87)	(_4.53)	(-4.62)	(-5.05)	(-4.77)	(4 70)	(-6.35)	(.4.11)	(-4.24)	(-4.00)	(-3.00)	(-3.60)	(-4.18)
$\frac{1}{N} = \frac{1}{5671} + \frac{1}{4577} + \frac{1}{4530} + \frac{1}{493} + \frac{1}{4492} + \frac{1}{4492} + \frac{1}{4492} + \frac{1}{4492} + \frac{1}{4492} + \frac{1}{432} + \frac{1}{4332} + \frac{1}{433$	adi R ²	0.766	0.788	0.780	0.704	0.704	0.794	0.705	0.705	0.705	0.796	0.805	0.805	0.805	0.805	0.805	0.805
n out and active cost active c	N	5671	4577	4520	4402	4402	4402	4402	4402	4402	4402	4222	4222	4222	4222	4222	4222
	23	1106	4911	4000	4490	4492	4492	4492	4492	4492	4492	4002	4002	4004	4004	4004	4002