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

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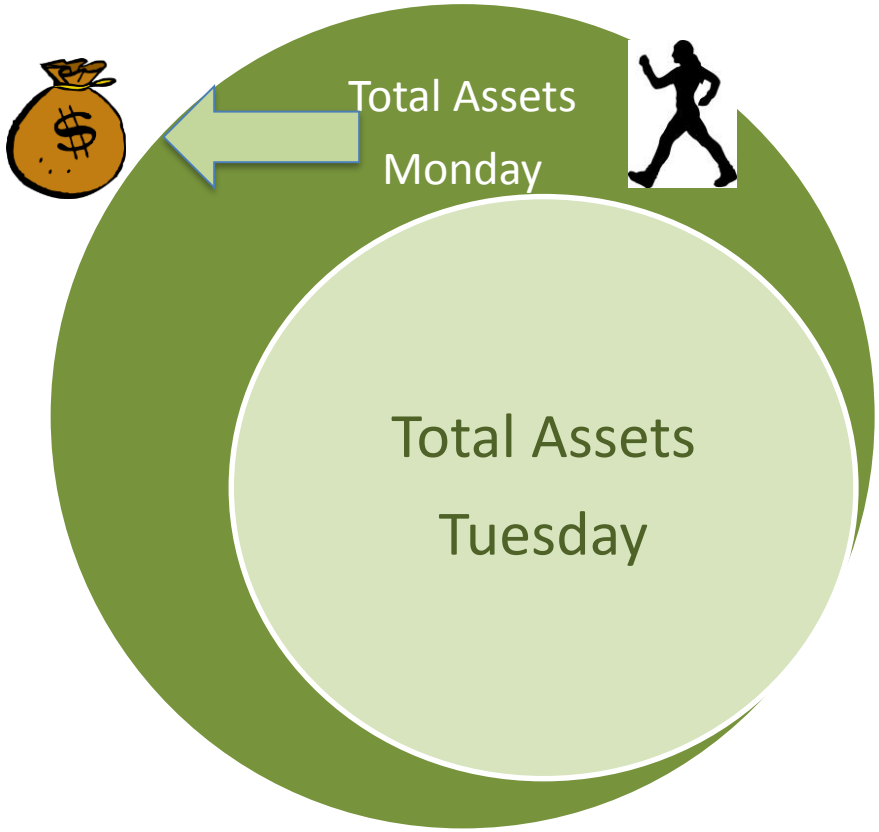
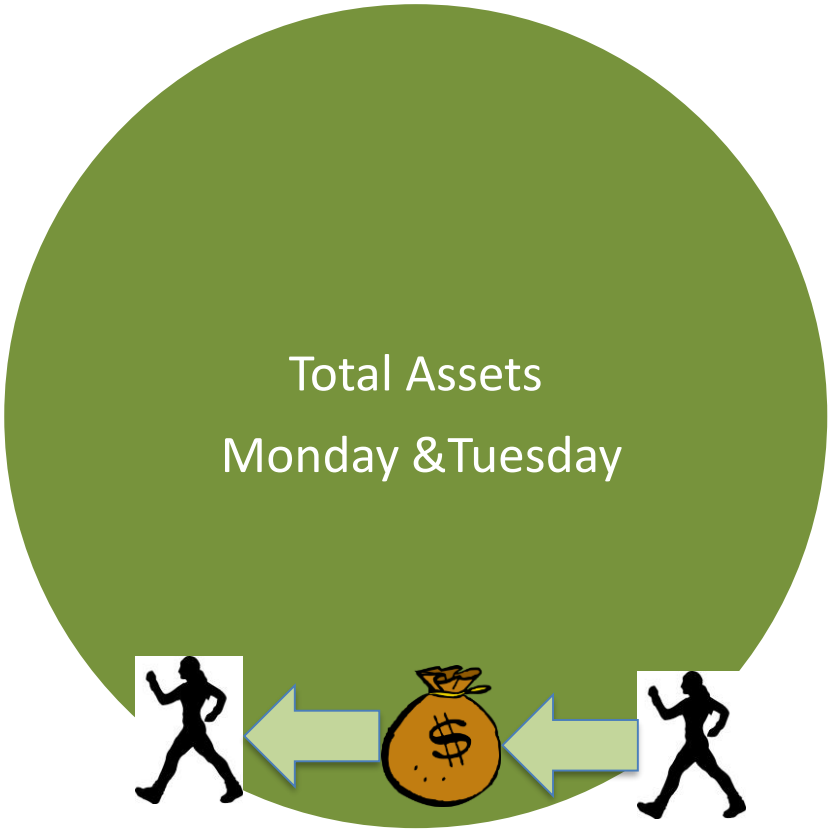
Selling Open-end vs. Closed-End Funds

Open–End Fund



Closed-End Fund – No Leverage



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.

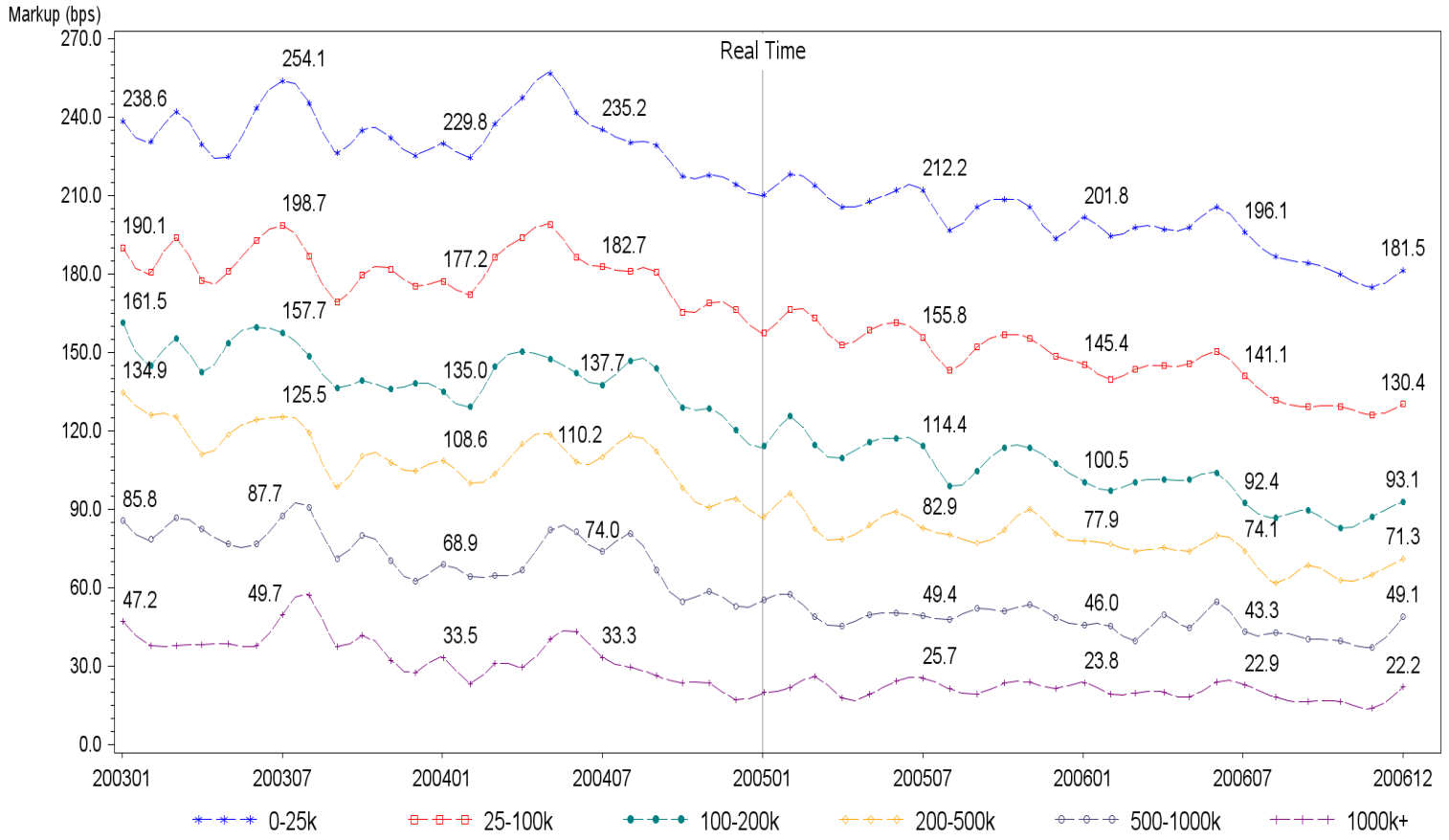
In this paper we ask

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 712 Open–End 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 296 Closed-End 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 trading 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)
Avgcoupon				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			
Avgtv12			
Avgmarkup3		0.0303	
		(1.34)	
Avgmarkup12			0.0475**
			(2.62)
Avgzero			
Avgamihud			
Turnover		0.0003	0.0004
		(0.87)	(1.19)
CEF×L.Leverage		0.4919**	0.5193**
		(2.84)	(2.99)
Inv_percent		-0.1915**	-0.1954**
		(-3.14)	(-3.21)
Cash_percent		0.5411	0.5327
		(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***
		(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)
	All Sample Funds	**National Funds**	**Single-State Funds**	**High Yield Funds**	**Muni National Long**	**Muni National 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))

a) Immediate

Immediate Match

04Dec2004	200,000	Dealer Buy	$101.00
04Dec2004	200,000	Dealer Sell	$103.00

b) Round-trip

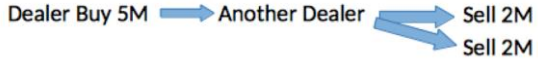
Round-trip

01Mar2003	900,000	Dealer Buy	$100.00
02Mar2003	400,000	Dealer Sell	$100.50
05Mar2003	500,000	Dealer Sell	$100.80

c) FIFO

FIFO Match

02Feb2003	5,000,000	Dealer Buy	$98.00
04Feb2003	5,000,000	Inter-dealer	$98.00
09Feb2003	2,000,000	Dealer Sell	$99.00
09Feb2003	2,000,000	Dealer Sell	$98.50



Gross Markup=(Sale Price$_{\text{Weighted Avg.}}$-Purchase Price)/Purchase Price

Net Markup=Gross Markup – Return on Muni Index$_{\text{Maturity Matched}}$

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)

	Dependent variable: Quarterly net return															
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
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***
	(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)
L.TNA ($b)		0.0418***	0.0479***	0.0571***	0.0584***	0.0585***	0.0562***	0.0598***	0.0423***	0.0536***	0.0047	0.0047	0.0050	0.0066	0.0083	0.0040
		(2.86)	(3.24)	(3.88)	(3.96)	(3.97)	(3.82)	(4.06)	(2.82)	(3.65)	(0.32)	(0.32)	(0.34)	(0.45)	(0.56)	(0.27)
L.Familysize ($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
		(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)
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***
			(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)
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
				(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					
					(0.20)						(0.41)					
Avgtv12						0.0012						0.0021				
						(0.62)						(0.96)				
Avgmarkup3							0.1022***						0.0303			
							(4.73)						(1.34)			
Avgmarkup12								0.0579***						0.0475**		
								(3.31)						(2.62)		
Avgzero									-2.2884***						1.0346*	
									(-5.45)						(2.17)	
Avgamihud										0.4556***						-0.0574
										(6.52)						(-0.71)
Turnover											0.0001	0.0001	0.0003	0.0004	0.0002	0.0001
											(0.44)	(0.26)	(0.87)	(1.19)	(0.71)	(0.43)
CEF×L.Leverage											0.4821**	0.4808**	0.4919**	0.5193**	0.5024**	0.4807**
											(2.78)	(2.77)	(2.84)	(2.99)	(2.90)	(2.77)
Inv_percent											-0.1921**	-0.1885**	-0.1915**	-0.1954**	-0.1940**	-0.1955**
											(-3.15)	(-3.08)	(-3.14)	(-3.21)	(-3.19)	(-3.20)
Cash_percent											0.5623	0.5618	0.5411	0.5327	0.6045	0.5638
											(1.71)	(1.71)	(1.64)	(1.62)	(1.83)	(1.71)
Fix_percent											-0.0947	-0.0894	-0.1101	-0.1229	-0.0930	-0.0859
											(-0.55)	(-0.52)	(-0.64)	(-0.72)	(-0.54)	(-0.50)
Avgcoupon											0.0686**	0.0699**	0.0653**	0.0646**	0.0648**	0.0695**
											(2.98)	(3.04)	(2.85)	(2.82)	(2.83)	(3.02)
Avgmaturity											0.0488***	0.0488***	0.0480***	0.0484***	0.0522***	0.0499***
											(14.56)	(14.56)	(14.11)	(14.44)	(14.16)	(13.65)
Constant	-0.0587	-0.1076**	-0.2216***	-0.2538***	-0.2883***	-0.3016***	-0.2920***	-0.2763***	1.9107***	-0.3784***	-0.8316***	-0.8621***	-0.7906***	-0.7697***	-1.8226***	-0.8280***
	(-1.66)	(-2.72)	(-3.93)	(-4.87)	(-4.53)	(-4.62)	(-5.05)	(-4.77)	(4.70)	(-6.35)	(-4.11)	(-4.24)	(-4.00)	(-3.90)	(-3.60)	(-4.18)
adj. R^2	0.766	0.788	0.789	0.794	0.794	0.794	0.795	0.795	0.795	0.796	0.805	0.805	0.805	0.805	0.805	0.805
N	5671	4577	4530	4493	4492	4492	4492	4492	4492	4492	4332	4332	4332	4332	4332	4332

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