

PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST

Form N-Q

February 27, 2009

OMB APPROVAL

OMB Number: 3235-0578  
Expires: April 30, 2010  
Estimated average burden  
hours per response.....  
10.5

UNITED STATES  
SECURITIES AND EXCHANGE COMMISSION  
Washington, D.C. 20549

FORM N-Q

CERTIFIED SHAREHOLDER REPORT OF REGISTERED  
MANAGEMENT INVESTMENT COMPANIES

Investment Company Act file number 811-21409

Pioneer Municipal High Income Advantage Trust  
(Exact name of registrant as specified in charter)

60 State Street, Boston, MA 02109  
(Address of principal executive offices) (ZIP code)

Dorothy E. Bourassa, Pioneer Investment Management, Inc.,  
60 State Street, Boston, MA 02109  
(Name and address of agent for service)

Registrant's telephone number, including area code: (617) 742-7825

Date of fiscal year end: March 31

Date of reporting period: December 31, 2008

Form N-Q is to be used by management investment companies, other than small business investment companies registered on Form N-5 (239.24 and 274.5 of this chapter), to file reports with the Commission, not later than 60 days after close of the first and third fiscal quarters, pursuant to Rule 30b1-5 under the Investment Company Act of 1940 (17 CFR 270.30b-5). The Commission may use the information provided on Form N-Q in its regulatory, disclosure review, inspection, and policymaking roles.

A registrant is required to disclose the information specified by Form N-Q, and the Commission will make this information public. A registrant is not required to respond to the collection of information contained in Form N-Q unless the Form displays a currently valid Office of Management and Budget ("OMB") control number. Please direct comments concerning the accuracy of the information collection burden estimate and any suggestions for reducing the burden to Secretary, Securities and Exchange Commission, 450 Fifth Street, NW, Washington, DC 20549-0609. The OMB has reviewed this collection of information under the clearance requirements of 44 U.S.C. ss. 3507.

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## ITEM 1. Schedule of Investments.

Pioneer Municipal High Income Advantage Trust  
SCHEDULE OF INVESTMENTS 12/31/08 (unaudited)

Principal Amount (\$)		Value
	TAX-EXEMPT OBLIGATIONS - 163.1% of Net Assets	
	Arizona - 4.2%	
5,000,000	Casa Grande Industrial Development Authority, Ho\$	3,727,400
1,541,000	Pima County Industrial Development Authority, 6.7	1,138,445
2,640,000	Pima County Industrial Development Authority, 7.0	1,909,802
2,000,000	San Luis Facility Development Corp., 7.25%, 5/1/2	1,530,640
	\$	8,306,287
	California - 15.5%	
3,140,000	(a) California State University Revenue, RIB, 10.431%	2,583,215
8,575,000	(a) California State Variable Purpose, RIB, 10.004%,	5,200,480
6,000,000	California Statewide Communities Development Auth	4,806,540
2,680,000	+ Golden State Tobacco Securitization Corp., 6.75%,	3,108,371
2,500,000	San Jose California Airport Revenue, 5.0%, 3/1/37	2,082,375
10,500,000	(a) University of California, RIB, 10.834%, 5/15/38 (	8,248,485
7,670,000	Valley Health System Hospital Revenue, 6.875%, 5/	4,674,865
	\$	30,704,331
	Colorado - 1.6%	
2,850,000	+ Denver Health & Hospital Authority Healthcare Re\$	3,167,689
	Connecticut - 2.5%	
7,750,000	Connecticut State Development Authority Revenue,\$	4,936,672
	District of Columbia - 3.2%	
2,700,000	District of Columbia Tobacco Settlement Financin\$	1,802,358
6,825,000	District of Columbia Tobacco Settlement Financing	4,608,240
	\$	6,410,598
	Florida - 2.5%	
4,500,000	Hillsborough County Florida Industrial Development Authority	
Pollution	Control Revenue, 5.5%, 10/1/23	\$ 3,401,145
1,980,000	Hillsborough County Florida Industrial Development Authority	
Pollution	Control Revenue, 6.75%, 7/1/29	1,384,891
500,000	Miami Beach Health Facilities Authority, 5.375%,	264,145
	\$	5,050,181
	Georgia - 4.3%	
5,210,000	(a) Atlanta Georgia Water and Wastewater Revenue, RI\$	3,011,693
1,065,000	Effingham County Industrial Development Authority	496,609
3,360,000	Fulton County Residential Care Facilities, 7.0%,	2,145,058
7,500,000	(b) Main Street Natural Gas, Inc., Gas Project Revenu	956,400
4,500,000	(b) Main Street Natural Gas, Inc., Gas Project Revenu	573,840
1,650,000	Savannah Georgia Economic Development Authority R	1,291,620
	\$	8,475,220
	Guam - 3.8%	
3,000,000	Northern Mariana Islands, 5.0%, 6/1/30	\$ 1,705,650
4,600,000	+ Northern Mariana Islands, 6.75%, 10/1/33	5,434,900
400,000	Northern Mariana Islands, 6.75%, 10/1/33	295,064
	\$	7,435,614
	Idaho - 3.3%	
2,000,000	Power County Industrial Development Corp., 6.45%\$	1,354,300
5,920,000	Power County Pollution Control Revenue, 5.625% 10	5,207,765
	\$	6,562,065

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	Illinois - 5.8%	
3,000,000	Centerpoint Intermodal Center, 8.0%, 6/15/23 (14\$	2,258,190
3,000,000	City of Chicago Illinois, 5.0%, 1/1/28	2,900,010
1,000,000	Illinois Finance Authority Revenue, 6.0%, 11/15/2	655,320
2,500,000	Illinois Finance Authority Revenue, 6.125%, 11/15	1,696,300
1,645,000	Illinois Health Facilities Authority Revenue, 5.5	1,232,977
1,500,000	(b) Illinois Health Facilities Authority Revenue, 6.9	813,750
2,700,000	Southwestern Illinois Development Authority Reven	1,859,247
		\$ 11,415,794
	Indiana - 6.6%	
10,000,000	Indiana State Development Finance Authority Reve\$	9,378,200
5,000,000	Jasper County Industrial Economic Development Rev	2,224,600
2,085,000	Vincennes Industrial Economic Development Revenue	1,455,330
		\$ 13,058,130
	Kentucky - 1.7%	
500,000	Kentucky Economic Development Finance Authority \$	471,675
4,400,000	Kentucky Economic Development Finance Authority H	2,971,540
		\$ 3,443,215
	Louisiana - 6.1%	
2,500,000	Louisiana Local Government Environmental Facilit\$	1,363,750
6,000,000	Louisiana Public Facilities Authority Revenue, 5.	4,271,460
750,000	Opelousas Louisiana General Hospital Authority Re	620,550
9,415,000	Tobacco Settlement Financing Corp., 5.875%, 5/15/	5,879,573
		\$ 12,135,333
	Maryland - 0.4%	
460,000	Maryland Health & Higher Educational Facilities \$	246,887
1,250,000	Maryland Health & Higher Educational Facilities A	609,900
		\$ 856,787
	Massachusetts - 8.5%	
2,195,000	Massachusetts Health & Educational Facilities Au\$	1,438,274
4,000,000	Massachusetts Health & Educational Facilities Aut	4,147,760
1,000,000	+ Massachusetts Health & Educational Facilities Aut	1,148,570
10,760,000	Massachusetts Housing Finance Agency, 5.35%, 12/1	8,048,050
900,000	Massachusetts Development Finance Agency, 5.25%,	676,701
2,000,000	Massachusetts Development Finance Agency, 7.1%, 7	1,446,740
		\$ 16,906,095
	Michigan - 4.6%	
1,500,000	+ Delta County Michigan Economic Development Corp.\$	1,691,925
3,000,000	+ Macomb County Hospital Finance Authority Revenue,	3,485,550
745,000	Michigan Public Educational Facilities Authority	541,019
4,130,000	Michigan State Hospital Finance Authority Revenue	2,596,572
1,000,000	Michigan State Strategic Fund Solid Waste Dispos\$	732,080
		\$ 9,047,146
	Missouri - 2.2%	
1,850,000	Kansas City Industrial Development Authority Rev\$	1,151,643
1,500,000	(b) St. Louis Industrial Development Authority Revenu	600,000
6,640,000	(b) St. Louis Industrial Development Authority Revenu	2,656,000
		\$ 4,407,643
	Montana - 1.0%	
2,445,000	(c) Hardin Increment Industrial Infrastructure Devel\$	1,363,894
1,000,000	Two Rivers Authority, Inc., Project Revenue, 7.37	545,630
		\$ 1,909,524
	Nevada - 2.2%	
1,600,000	Nevada State Department of Business & Industry, \$	360,832
1,000,000	Nevada State Department of Business & Industry, 7	225,780
1,320,000	Nevada State Department of Business & Industry, 7	298,267
5,000,000	Reno Nevada Hospital Revenue, 5.25%, 6/1/41	3,378,600
		\$ 4,263,479
	New Hampshire - 0.4%	
1,125,000	New Hampshire Health & Educational Facilities Au\$	770,389
	New Jersey - 12.4%	

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2,500,000	Burlington County New Jersey Bridge Commission R\$	1,372,625
13,000,000	New Jersey Economic Development Authority Revenue	6,763,380
2,500,000	New Jersey Health Care Facilities Financing Autho	1,739,125
3,500,000	(a) New Jersey State Turnpike Authority, RIB, 10.654%	3,717,350
1,000,000	+ Tobacco Settlement Financing Corp., 6.25%, 6/1/43	1,166,800
3,250,000	+ Tobacco Settlement Financing Corp., 6.75%, 6/1/39	3,860,025
5,000,000	+ Tobacco Settlement Financing Corp., 7.0%, 6/1/41	6,004,750
	\$	24,624,055
	New York - 7.5%	
1,000,000	Nassau County New York Industrial Development Ag\$	650,630
5,000,000	New York City Industrial Development Agency, 5.25	2,393,200
2,000,000	New York City Industrial Development Agency, 5.37	1,516,020
2,000,000	New York City Industrial Development Agency, 6.9%	758,620
3,950,000	New York City Industrial Development Agency, 7.62	2,577,138
5,000,000	New York State Environmental Facilities Corp., 5.	4,808,850
500,000	Ulster County New York Industrial Development Age	293,830
2,000,000	Yonkers Industrial Development Agency Civic Facil	1,787,200
	\$	14,785,488
	North Carolina - 1.8%	
6,000,000	Charlotte North Carolina Special Facilities Reve\$	3,548,820
	Ohio - 2.4%	
3,115,000	Belmont County Health System Revenue, 5.7%, 1/1/\$	2,665,661
1,000,000	Belmont County Health System Revenue, 5.8%, 1/1/1	702,800
3,000,000	Cleveland Airport Special Revenue, 5.375%, 9/15/2	1,404,150
	\$	4,772,611
	Oklahoma - 2.2%	
1,695,000	Jackson County Memorial Hospital Authority Reven\$	1,611,809
2,220,000	Tulsa Municipal Airport Transportation Revenue, 6	1,331,623
1,500,000	Tulsa Municipal Airport Transportation Revenue, 7	1,325,415
	\$	4,268,847
	Pennsylvania - 12.0%	
3,000,000	+ Allegheny County Hospital Development Authority \$	3,445,170
500,000	+ Allegheny County Hospital Development Authority R	574,195
1,000,000	Clarion County Hospital Authority Revenue, 5.625%	1,001,390
3,600,000	Columbia County Hospital Authority Revenue, 5.85%	2,451,420
3,110,000	(b) Delaware County Industrial Development Authority	1,689,756
1,050,000	Hazleton Health Services Authority Hospital Reven	861,420
2,415,000	Montgomery County Higher Education & Health Autho	2,401,476
1,430,000	Pennsylvania Economic Development Financing Autho	1,039,181
1,805,000	Pennsylvania Economic Development Financing Autho	1,713,505
2,330,000	Pennsylvania Economic Development Financing Autho	2,138,800
5,000,000	Philadelphia Hospitals & Higher Education Facilit	2,644,550
2,005,000	Scranton-Lackawanna Health & Welfare Authority Re	1,860,941
2,245,000	Scranton-Lackawanna Health & Welfare Authority Re	2,029,053
	\$	23,850,857
	Rhode Island - 3.1%	
1,385,000	Central Falls Rhode Island Detention Facilities \$	958,088
8,285,000	Tobacco Settlement Financing Corp., 6.25%, 6/1/42	5,180,859
	\$	6,138,947
	South Carolina - 9.9%	
1,500,000	Connector 2000 Association, Inc., Toll Road Reve\$	585,060
1,600,000	Loris Community Hospital District, 5.625%, 1/1/29	1,129,312
7,140,000	+ South Carolina Jobs Economic Development Authorit	8,260,552
860,000	+ South Carolina Jobs Economic Development Authorit	1,003,852
3,000,000	+ South Carolina Jobs Economic Development Authorit	3,399,000
4,400,000	(d) Tobacco Settlement Revenue Management, 6.375%, 5/	5,248,848
	\$	19,626,624
	Tennessee - 4.4%	
1,000,000	+ Johnson City Health & Educational Facilities Boa\$	1,127,420
7,000,000	Knox County Health Educational & Housing Faciliti	6,144,110
2,400,000	Sullivan County Health Educational and Housing Fa	1,380,192

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		\$	8,651,722
	Texas - 21.8%		
8,650,000	Brazos River Authority Pollution Control Revenue	\$	4,638,736
4,000,000	Brazos River Authority Pollution Control Revenue,		2,572,840
7,350,000	Gulf Coast Industrial Development Authority, 7.0%		4,756,847
10,000,000	Houston Texas Airport System Special Facilities R		5,309,600
1,000,000	IAH Public Facility Corp., Project Revenue Bonds,		861,950
1,000,000	IAH Public Facility Corp., Project Revenue Bonds,		732,960
1,350,000	IAH Public Facility Corp., Project Revenue Bonds,		922,630
2,750,000	Lower Colorado River Authority, 5.0%, 5/15/31		2,498,458
845,000	Lubbock Health Facilities Development Corp., 6.5%		592,227
2,000,000	Lubbock Health Facilities Development Corp., 6.62		1,314,300
7,750,000	Matagorda County Navigation District Number 1 Rev		4,921,328
10,000,000	North Texas Tollway Authority Revenue, 5.75%, 1/1		8,325,200
1,711,000	Panhandle Regional Housing Finance Corp. Multifam		1,664,050
5,000,000	Tomball Hospital Authority, 6.0%, 7/1/25		4,034,000
		\$	43,145,126
	Utah - 0.5%		
1,600,000	Spanish Fork Charter School Revenue, 5.7%, 11/15		979,952
	Washington - 3.5%		
1,285,000	Tobacco Settlement Authority Revenue, 6.5%, 6/1/\$		1,073,810
2,000,000	Washington State Health Care Facilities Authority		1,397,100
2,000,000	Washington State Health Care Facilities Authority		1,400,220
5,000,000	Washington State Housing Finance Commission Nonpr		3,126,600
		\$	6,997,730
	Wisconsin - 1.2%		
2,900,000	Aztalan Wisconsin Exempt Facilities Revenue, 7.5%		978,141
1,000,000	Wisconsin State Health & Educational Facilities A		711,990
1,000,000	Wisconsin State Health & Educational Facilities A		628,590
		\$	2,318,721
	TOTAL TAX-EXEMPT OBLIGATIONS		
	(Cost \$414,965,198)	\$	322,971,692
	MUNICIPAL COLLATERALIZED DEBT OBLIGATION - 5.7% of Net Assets		
13,000,000	(e) (f) Non-Profit Preferred Funding Trust I, Series E,	\$	11,283,870
	TOTAL MUNICIPAL COLLATERALIZED DEBT OBLIGATION		
	(Cost \$13,000,000)	\$	11,283,870
	Shares		
	COMMON STOCK - 0.6% of Net Assets		
109,138	(g) Delta Airlines, Inc.	\$	1,250,722
	TOTAL COMMON STOCK		
	(Cost \$3,210,349)	\$	1,250,722
	TAX-EXEMPT MONEY MARKET MUTUAL FUND - 3.0% of Net Assets		
6,000,000	BlackRock Liquidity Funds MuniFund Portfolio	\$	6,000,000
	TOTAL TAX-EXEMPT MONEY MARKET MUTUAL FUND		
	(Cost \$6,000,000)	\$	6,000,000
	TOTAL INVESTMENTS IN SECURITIES - 172.4%		
	(Cost \$437,175,547) (h) (i)	\$	341,506,284
	OTHER ASSETS AND LIABILITIES - 3.3%	\$	6,593,144
	PREFERRED SHARES AT REDEMPTION VALUE, INCLUDING	\$	(150,020,083)
	NET ASSETS APPLICABLE TO COMMON SHAREOWNERS - 10	\$	198,079,345

(144A) Security is exempt from registration under Rule 144A of the Securities Act of 1933. Such securities may be resold normally to qualified institutional buyers in a transaction exempt from registration. At December 31, 2008, the value of these securities amounted to \$38,434,878, or 19.4% of total net assets applicable to common shareowners.

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RIB Residual Interest Bonds.

NR Security not rated by S&P or Moody's.

+ Prerefunded bonds have been collateralized by U.S. Treasury or U.S. Government Agency securities which are held in escrow to pay interest and principal on the tax exempt issue and to retire the bonds in full at the earliest refunding date.

(a) The interest rate is subject to change periodically and inversely based upon prevailing market rates. The rate shown is the coupon rate at December 31, 2008.

(b) Security is in default and is non-income producing.

(c) Debt obligation initially issued at one coupon which converts to a higher coupon at a specific date.  
The rate shown is the coupon rate at December 31, 2008.

(d) Escrow to maturity.

(e) Indicates a security that has been deemed illiquid. The aggregate cost of illiquid securities is \$13,000,000. The aggregate value is \$11,283,870, or 5.7% of the total net assets applied to common shareowners.

(f) The interest rate is subject to change periodically. The interest rate shown is the rate at December 31, 2008.

(g) Non-income producing.

(h) The concentration of investments by type of obligation/market sector is as follows:  
Insured

6.7%

	1.5
	0.4
	0.2
Revenue Bonds:	
Health Revenue	30.4
Tobacco Revenue	11.1
Development Revenue	10.2
Other Revenue	9.6
Pollution Control Revenue	7.3
Airport Revenue	6.8
Transportation Revenue	5.0
Facilities Revenue	4.7
Housing Revenue	3.8
Water Revenue	1.4
Education Revenue	0.5
Utilities Revenue	0.4

100.0%

(i) At December 31, 2008, the net unrealized loss on investments based on cost for federal income tax purposes of \$433,024,394 was as follows:

Aggregate gross unrealized gain for all investments in which there is an excess of value over tax cost \$ 13,316,302

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Aggregate gross unrealized loss for all investments in  
 which

there is an excess of tax cost over value	(104,834,412)
Net unrealized loss	\$ (91,518,110)

For financial reporting purposes net unrealized loss on  
 investments was \$95,669,263  
 and cost of investments aggregated \$437,175,547.

Various inputs are used in determining the value of the Trust's  
 investments. These inputs are summarized in the three broad levels listed  
 below.

Highest priority is given to Level 1 inputs and lowest priority is  
 given to Level 3.

- Level 1 - quoted prices in active markets for  
 identical securities
- Level 2 - other significant observable inputs  
 (including quoted prices for similar  
 securities, interest rates, prepayment  
 speeds, credit risk, etc.)

Level 3 - significant unobservable inputs (including the  
 Trust's own assumptions in determining fair value of investments)

The following is a summary of the inputs used as of December 31,  
 2008, in valuing the Trust's Investments:

Valuation Inputs	Investments in Other Financial Instruments*
Level 1 - Quoted Prices	1,250,722
Level 2 - Other Significant Observable Inputs	340,255,562 (414,543)
Level 3 - Significant Unobservable Inputs	0 -
Total	341,506,284 (414,543)

\*Other financial instruments include interest rate swaps.

### ITEM 2. CONTROLS AND PROCEDURES.

(a) Disclose the conclusions of the registrant's principal executive officer or  
 officers and principal financial officer or officers, or persons performing  
 similar functions, about the effectiveness of the registrant's disclosure  
 controls and procedures (as defined in Rule 30a-3(c) under the Act (17 CFR  
 270.30a-3(c))) as of a date within 90 days of the filing date of the report  
 that includes the disclosure required by this paragraph, based on their  
 evaluation of these controls and procedures required by Rule 30a-3(b)  
 under the Act (17 CFR 270.30a-3(b)) and Rule 13a-15(b) or 15d-15(b)  
 under the Exchange Act (17 CFR 240.13a-15(b) or 240.15d-15(b)).

The registrant's principal executive officer and principal financial officer  
 have concluded that the registrant's disclosure controls and procedures are  
 effective based on their evaluation of these controls and procedures as of  
 a date within 90 days of the filing date of this report.

(b) Disclose any change in the registrant's internal controls over financial  
 reporting (as defined in Rule 30a-3(d) under the Act (17 CFR 270.30a-3(d))  
 that occurred during the registrant's last fiscal quarter that has materially  
 affected, or is reasonably likely to materially affect, the registrant's  
 internal control over financial reporting.

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There were no significant changes in the registrant's internal control over financial reporting that occurred during the second fiscal quarter of the period covered by this report that have materially affected, or are reasonably likely to materially affect, the registrant's internal control over financial reporting.

ITEM 3. EXHIBITS.

(a) A separate certification for each principal executive officer and principal financial officer of the registrant as required by Rule 30a-2 under the Act (17 CFR 270.30a-2).

Filed herewith.

SIGNATURES

[See General Instruction F]

Pursuant to the requirements of the Securities Exchange Act of 1934 and the Investment Company Act of 1940, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

(Registrant) Pioneer Municipal High Income Advantage Trust

By (Signature and Title)\* /s/ John F. Cogan, Jr.  
John F. Cogan, Jr, President

Date February 27, 2009

Pursuant to the requirements of the Securities Exchange Act of 1934 and the Investment Company Act of 1940, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

By (Signature and Title)\* /s/ John F. Cogan, Jr.  
John F. Cogan, Jr., President

Date February 27, 2009

By (Signature and Title)\* /s/ Mark Bradley  
Mark Bradley, Treasurer

Date February 27, 2009

\* Print the name and title of each signing officer under his or her signature.