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PIONEER MUNICIPAL HIGH INCOME TRUST
Form N-CSR
December 29, 2014

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

FORM N-CSR

CERTIFIED SHAREHOLDER REPORT OF REGISTERED
MANAGEMENT INVESTMENT COMPANIES

Investment Company Act file number 811-21321

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

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

Terrence J. Cullen, 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: April 30

Date of reporting period: May 1, 2014 through October 31, 2014

Form N-CSR is to be used by management investment companies to file reports with the Commission not later than 10 days after the transmission to stockholders of any report that is required to be transmitted to stockholders under Rule 30e-1 under the Investment Company Act of 1940 (17 CFR 270.30e-1). The Commission may use the information provided on Form N-CSR in its regulatory, disclosure review, inspection, and policymaking roles.

A registrant is required to disclose the information specified by Form N-CSR, and the Commission will make this information public. A registrant is not required to respond to the collection of information contained in Form N-CSR 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

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under the clearance requirements of 44 U.S.C. ss. 3507.

ITEM 1. REPORTS TO STOCKHOLDERS.

Pioneer Municipal High
Income Trust

Semiannual Report | October 31, 2014

Ticker Symbol: MHI

[LOGO] PIONEER
Investments (R)

visit us: us.pioneerinvestments.com

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President's Letter

Dear Shareowner,

As we move into the final months of 2014, we remain confident that U.S. economic growth remains self-sustaining despite weakness in foreign economies, and that the expansion will continue until the economy reaches full employment. Unemployment has ticked down below 6% and the number of job openings is at the highest level since 2000, while the number of people filing initial unemployment claims has fallen to the lowest level in fourteen years. Wage growth, while

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still low, is outpacing inflation, consumer debt burdens are modest and lower gasoline prices are freeing up discretionary spending power.

The global economic picture is less rosy, however, as the conflict between Russia and the Ukraine is exacting a toll on the European economy, Japan is still working through the impact of its large tax increase, and the growth of China's investment-driven economy has been slowing. There are also geopolitical and other threats to the outlook, such as the Ebola virus outbreak and the advance of ISIS in key areas of the Middle East. On balance, though, we expect the global economy to continue to grow over the remainder of 2014 and in 2015.

While our economic outlook is generally constructive and we believe opportunities remain for prudent investors to earn attractive returns, markets are likely to continue to be volatile, a scenario that offers the potential for rewards, but for increased risks as well.

Since 1928, Pioneer's investment professionals have worked on behalf of our shareholders, incorporating proprietary research to find attractive investment opportunities and prudent risk management to construct portfolios.

We continue to advocate the benefits of adhering to a disciplined investment strategy and encourage you to work with your financial advisor to develop and implement an overall investment plan that addresses both your short- and long-term goals.

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On August 11, 2014, I joined Pioneer as the new President and CEO of Pioneer Investment Management USA, Inc. In my role, I will focus on preserving many of the rich qualities of our history, while meeting the challenges and capitalizing on the opportunities presented by an ever-changing world.

We greatly appreciate your trust in us in the past and look forward to continuing to serve you in the future.

Sincerely,

/s/ Lisa M. Jones

Lisa M. Jones
President and CEO
Pioneer Investment Management USA, Inc.

Any information in this shareowner report regarding market or economic trends or the factors influencing the Trust's historical or future performance are statements of opinion as of the date of this report. These statements should not be relied upon for any other purposes. Past performance is no guarantee of future results, and there is no guarantee that market forecasts discussed will be realized.

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Portfolio Management Discussion | 10/31/14

Municipal bonds, both investment-grade and high-yield, delivered solid returns over the six-month period ended October 31, 2014. In the following interview, David Eurkus and Jonathan Chirunga discuss the factors that influenced the performance of Pioneer Municipal High Income Trust during the six-month period ended October 31, 2014. Mr. Eurkus, Director of Municipals, a senior vice president and a portfolio manager at Pioneer, and Mr. Chirunga, a vice president

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and a portfolio manager at Pioneer, are responsible for the day-to-day management of the Trust.

Q How did Pioneer Municipal High Income Trust perform during the six-month period ended October 31 2014?

A Pioneer Municipal High Income Trust returned 5.35% at net asset value and 6.53% at market price during the six-month period ended October 31, 2014. During the same six-month period, the Trust's benchmarks, the Barclays High Yield Municipal Bond Index and the Barclays Municipal Bond Index, returned 4.62% and 3.59% at net asset value, respectively. The Barclays High Yield Municipal Bond Index is an unmanaged measure of the performance of lower-rated municipal bonds, while the Barclays Municipal Bond Index is an unmanaged measure of the performance of investment-grade municipal bonds. Unlike the Trust, the two Barclays indices do not use leverage. While use of leverage increases investment opportunity, it also increases investment risk. During the same six-month period, the average return (at market price) of the 11 closed end funds in Lipper's High Yield Municipal Debt Closed End Funds category (which may or may not be leveraged) was 4.96%.

The shares of the Trust were selling at a 13.0% premium to net asset value at the end of the period, on October 31, 2014.

On October 31, 2014, the standardized 30-day SEC yield of the Trust's shares was 4.18%*.

Q How would you describe the investment environment in the municipal bond market during the six-month period ended October 31, 2014?

A The past six months featured a favorable environment for municipal bonds, which continued to rally as they had throughout much of 2014. Both traditional tax-conscious investors and non-traditional buyers recognized the attractive values available in the municipal market, especially relative to

* The 30-day SEC yield is a standardized formula that is based on the hypothetical annualized earning power (investment income only) of the Trust's portfolio securities during the period indicated.

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the low-yielding taxable fixed-income market. Over the six-month period, high-yield municipal securities maintained a performance edge over higher-quality municipal bonds during a market surge sustained by increasing investor confidence in the strength of the domestic economy and, more specifically, in the credit-worthiness of the municipalities and institutions issuing tax-exempt bonds. The rally was enhanced as longer-term interest rates declined and long- and intermediate-term bonds generally appreciated in price during the period.

During the period, investor confidence increased due to the growing belief that the financial markets would absorb the end of the U.S. Federal Reserve System's (the Fed's) quantitative easing bond-purchasing program without any significant disruption. Meanwhile, confidence in the credit quality of municipal bonds remained high as the market seemed to recognize that the debt problems of some individual municipal issuers did not reflect overall conditions in the municipal market, which were largely positive. In addition, municipal bond default rates remained low by historical standards.

While demand for municipal debt in general, and higher-yielding municipal bonds in particular, grew during the period, a decline in new security

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issuance limited the supply of municipal bonds in the market, and that supply/demand factor resulted in price appreciation for most municipal bonds. Also, the tightening of yield spreads - or yield advantages - of higher-yielding municipals compared with higher-quality municipals led the high-yield municipal market to outperform the general municipal market during the six-month period.

Q What were the major factors that influenced the performance of the Pioneer Municipal High Income Trust relative to the Barclays indices, the Trust's benchmarks, during the six-month period ended October 31, 2014?

A The Trust outperformed the Barclays indices during the period, with the portfolio's relatively long duration proving to be a key advantage, as long- and intermediate-term securities performed quite well in a declining interest-rate environment. (Duration is a measure of the sensitivity of the price - the value of principal - of a fixed-income investment to a change in interest rates, expressed as a number of years.)

Individual portfolio holdings that helped to support the Trust's benchmark-relative results during the period included: education bonds issued by the University of California; zero-coupon bonds of the Metropolitan Pier and Exposition Authority of Chicago; non-callable securities of the Massachusetts Development Authority; and hospital/health care bonds of Temple University Healthcare.

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The Trust's portfolio did have some positions that produced disappointing performance during the period, including bonds backed by correctional facilities in Liberty County, Florida and Central Falls, Rhode Island, and a pool of high-yield bonds issued by Non-Profit Preferred Funding Trust.

Q How did the level of leverage in the Trust change over the six-month period ended October 31, 2014?

A At the end of the six-month period on October 31, 2014, 24.8% of the Trust's total managed assets were financed by leverage obtained through the issuance of preferred shares, compared with 25.1% of the Trust's total managed assets financed by leverage at the beginning of the six-month period on May 1, 2014. However, the dollar amount of the funds obtained through the issuance of preferred shares did not change during the period. The percentage decrease was due to an increase in the values of securities in which the Trust had invested.

Q Did you use any derivatives in managing the Trust's portfolio during the six-month period ended October 31, 2014?

A No, the Trust had no exposure to derivatives during the period.

Q What is your investment outlook?

A We have a positive outlook for the municipal bond market in general, including both investment-grade and high-yield municipals. We anticipate that the domestic economy should continue to grow moderately, which may help to support the improvements in the financial health of municipalities and public agencies that issue municipal bonds. The domestic employment situation continues to improve and consumer spending has been increasing, while inflation remains low. The Fed, even with its quantitative easing program at an end, has maintained low short-term interest rates, which we believe are likely to remain at present levels until at least

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mid-2015.

This is not to say, however, that there are not areas of concern. While unemployment rates are down, labor force participation rates also are lower. Moreover, the potential effects of declining global economic growth on the domestic economy remain a concern, as signs of weakness or slowing growth rates have appeared in most major foreign economies, including those in China, Europe, Japan, and commodity-exporting emerging markets. Over the shorter term, however, the slowing of global growth has accelerated the movement of money flows into the U.S., thus helping to strengthen the U.S. dollar, while at the same time pushing market interest rates in the United States - including those in the municipal market - to lower levels.

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The municipal market remains healthy, with strong demand and a limited supply of securities available for investment. At the same time, we believe municipal bonds still offer attractive value, particularly for tax-conscious investors. Going forward, we plan to maintain our emphasis on fundamental credit research when selecting securities for the Trust's portfolio, and to maintain a well-diversified** portfolio of securities, with a focus on project-revenue bonds backed by specific income streams.

** Diversification does not assure a profit nor protect against loss in a declining market.

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Please refer to the Schedule of Investments on pages 13-21 for a full listing of Trust securities.

Investments in high-yield or lower-rated securities are subject to greater-than-average risk.

The Trust may invest in securities of issuers that are in default or that are in bankruptcy.

A portion of income may be subject to state, federal, and/or alternative minimum tax. Capital gains, if any, are subject to a capital gains tax.

When interest rates rise, the prices of debt securities held by the Trust will generally fall. Conversely, when interest rates fall the prices of debt securities held by the Trust generally will rise.

By concentrating in municipal securities, the Trust is more susceptible to adverse economic, political or regulatory developments than is a portfolio that invests more broadly.

Investments in the Trust are subject to possible loss due to the financial failure of the issuers of the underlying securities and the issuers' inability to meet their debt obligations.

The Trust may invest up to 20% of its total assets in illiquid securities. Illiquid securities may be difficult to dispose of at a price reflective of their value at the times when the Trust believes it is desirable to do so, and the market price of illiquid securities is generally more volatile than that of more liquid securities. Illiquid securities are also more difficult to value and investment of the Trust's assets in illiquid securities may restrict the Trust's

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ability to take advantage of market opportunities.

The Trust uses leverage through the issuance of preferred shares. Leverage creates significant risks, including the risk that the Trust's incremental income or capital appreciation for investments purchased with the proceeds of leverage will not be sufficient to cover the cost of the leverage, which may adversely affect the return for the holders of common shares. Since February of 2008, regularly scheduled auctions for the Trust's preferred shares have failed and preferred shareowners have not been able to sell their shares at auction. The Board of Trustees of the Trust has considered, and continues to consider, this issue.

The Trust is required to maintain certain regulatory rating agency and other asset coverage requirements in connection with its outstanding preferred shares. In order to maintain required asset coverage levels, the Trust may be required to alter the composition of its investment portfolio or take other actions, such as redeeming preferred shares with the proceeds from portfolio transactions, at what might be inopportune times in the market. Such actions could reduce the net earnings or returns to holders of the Trust's common shares over time.

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Risks of investing in the Trust are discussed in greater detail in the Trust's original offering prospectus and in shareowner reports issued from time to time.

These risks may increase share price volatility.

Any information in this shareholder report regarding market or economic trends or the factors influencing the Fund's historical or future performance are statements of opinion as of the date of this report. These statements should not be relied upon for any other purposes. Past performance is no guarantee of future results, and there is no guarantee that market forecasts discussed will be realized.

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Portfolio Summary | 10/31/14

Portfolio Diversification

(As a percentage of total investment portfolio)

[THE FOLLOWING DATA WAS REPRESENTED AS A PIE CHART IN THE PRINTED MATERIAL]

Other Revenue	18.8%
Health Revenue	17.3%
Insured	15.1%
Facilities Revenue	12.5%
Development Revenue	11.3%
Education Revenue	8.9%
Tobacco Revenue	7.2%
Transportation Revenue	4.2%
Airport Revenue	2.1%
Pollution Control Revenue	1.3%
Water Revenue	1.3%
Utilities Revenue	0.0%*

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*Amount rounds to less than 0.1%

10 Largest Holdings

(As a percentage of long-term holdings)*

1.	Metropolitan Pier & Exposition Authority Dedicated State Tax Revenue, 6/15/22	4.4
2.	State of Washington, General Obligation, 6/1/22	3.1
3.	Lehman Municipal Trust Receipts Revenue, 0.0%, 8/21/35	3.1
4.	North Texas Tollway Authority Transportation Revenue, 5.75%, 1/1/33	2.8
5.	Lehman Municipal Trust Receipts Revenue, RIB, 0.0%, 9/20/28 (144A)	2.6
6.	Massachusetts Development Finance Agency Revenue, 5.75%, 1/1/42	2.3
7.	New York State Dormitory Authority Revenue, 0.0%, 5/29/14 (144A)	2.2
8.	New York State Dormitory Authority Revenue, 5.0%, 3/15/39	2.2
9.	State of Texas, General Obligation, 0.0%, 4/1/30	1.9
10.	District of Columbia Tobacco Settlement Financing Corp., 6.75%, 5/15/40	1.5

* This list excludes temporary cash investments and derivative instruments. The portfolio is actively managed, and current holdings may be different. The holdings listed should not be considered recommendations to buy or sell any security listed.

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Prices and Distributions | 10/31/14

Market Value per Common Share

	10/31/14	4/30/14
Market Value	\$15.26	\$14.90
Premium	13.0%	11.8%

Net Asset Value per Common Share

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	10/31/14	4/30/14
Net Asset Value	\$13.50	\$13.33

Distributions per Common Share*

	Dividends	Short-Term Capital Gains	Long-Term Capital Gains
5/1/14 - 10/31/14	\$0.57	\$ --	\$ --

The data shown above represents past performance, which is no guarantee of future results.

* The amount of distributions made to shareholders during the period were in excess of the net investment income earned by the Trust during the period. The Trust has accumulated undistributed net investment income which is part of the Trust's NAV. A portion of the accumulated net investment income was distributed to shareowners during the period.

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Performance Update | 10/31/14

Investment Returns

The mountain chart on the right shows the change in market value, including reinvestment of dividends and distributions, of a \$10,000 investment made in common shares of Pioneer Municipal High Income Trust during the periods shown, compared to that of the Barclays Municipal Bond Index and Barclays High Yield Municipal Bond Index.

Average Annual Total Returns (As of October 31, 2014)

	Net Asset Value (NAV)	Market Price	Barclays Municipal Bond Index (NAV)	Barclays High Yield Municipal Bond Index (NAV)
10 Years	6.49%	8.18%	4.71%	5.62%
5 Years	8.84	11.48	5.26	8.26
1 Year	12.03	15.59	7.82	10.84

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[THE FOLLOWING DATA WAS REPRESENTED AS A MOUNTAIN CHART IN THE PRINTED MATERIAL]

Market Value of \$10,000 Investment

	Pioneer Municipal High Income Trust	Barclays Municipal Bond Index	Barclays High Yield Municipal Bond Index
10/31/2004	\$10,000	\$ 10,000	\$ 10,000
10/31/2005	\$10,721	\$ 10,254	\$ 10,941
10/31/2006	\$11,416	\$ 10,843	\$ 12,239
10/31/2007	\$12,176	\$ 11,158	\$ 12,516
10/31/2008	\$ 8,440	\$ 10,790	\$ 10,147
10/31/2009	\$12,753	\$ 12,257	\$ 11,623
10/31/2010	\$15,747	\$ 13,210	\$ 13,234
10/31/2011	\$16,226	\$ 13,710	\$ 13,678
10/31/2012	\$19,669	\$ 14,948	\$ 15,994
10/31/2013	\$18,999	\$ 14,691	\$ 15,592
10/31/2014	\$21,960	\$ 15,839	\$ 17,282

Call 1-800-225-6292 or visit us.pioneerinvestments.com for the most recent month-end performance results. Current performance may be lower or higher than the performance data quoted.

Performance data shown represents past performance. Past performance is no guarantee of future results. Investment return and market price will fluctuate, and your shares may trade below NAV due to such factors as interest rate changes and the perceived credit quality of borrowers.

Total investment return does not reflect broker sales charges or commissions. All performance is for common shares of the Trust.

Shares of closed-end funds, unlike open-end funds, are not continuously offered. There is a one-time public offering and, once issued, shares of closed-end funds are bought and sold in the open market through a stock exchange and frequently trade at prices lower than their NAV. NAV per common share is total assets less total liabilities, which include preferred shares or borrowings, as applicable, divided by the number of common shares outstanding.

When NAV is lower than market price, dividends are assumed to be reinvested at the greater of NAV or 95% of the market price. When NAV is higher, dividends are assumed to be reinvested at prices obtained through open-market purchases under the Trust's dividend reinvestment plan.

The performance table and graph do not reflect the deduction of fees and taxes that a shareowner would pay on Trust distributions or the sale of Trust shares. Had these fees and taxes been reflected, performance would have been lower.

The Barclays Municipal Bond Index is an unmanaged, broad measure of the municipal bond market. The Barclays High Yield Municipal Bond Index is unmanaged, totals over \$26 billion in market value and maintains over 1300 securities. Municipal bonds in this index have the following requirements: maturities of one year or greater, sub investment grade (below Baa or non-rated), fixed coupon rate, issued after 12/31/90, deal size over \$20 million, and maturity size of at least \$3 million. Index returns are calculated monthly, assume reinvestment of dividends and, unlike Trust returns, do not reflect any fees, expenses or sales charges. The indices do not use leverage. It is not possible to invest directly in the indices.

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Schedule of Investments | 10/31/14 (unaudited)

Principal Amount USD (\$)		Value
	TAX EXEMPT OBLIGATIONS -- 127.0% of Net Assets	
4,500,000	Alabama -- 1.5% Huntsville-Redstone Village Special Care Facilities Financing Authority Nursing Home Revenue, 5.5%, 1/1/43	\$ 4,502,3
24,000	Arizona -- 0.0%+ Pima County Industrial Development Authority Education Revenue, 6.75%, 7/1/31	\$ 24,0
3,000,000(a)	California -- 10.8% Abag Finance Authority for Nonprofit Corp., Revenue, 5.75%, 7/1/37	\$ 3,171,0
1,450,000	California Enterprise Development Authority Recovery Zone Facility Revenue, 8.5%, 4/1/31	1,677,6
1,000,000	California Municipal Finance Authority, 5.75%, 7/1/30	1,042,6
5,000,000	California Pollution Control Financing Authority, 5.0%, 7/1/37 (144A)	5,168,5
1,740,000	California School Finance Authority, 7.375%, 10/1/43	1,998,1
1,400,000	California Statewide Communities Development Authority, 5.625%, 11/1/33	1,483,6
568,006(b) (c)	California Statewide Communities Development Authority Environmental Facilities Revenue, 9.0%, 12/1/38	
20,000,000(d)	Inland Empire Tobacco Securitization Authority Revenue, 6/1/36	4,078,6
7,885,000(e)	Lehman Municipal Trust Receipts Revenue, RIB, 0.0%, 9/20/28 (144A)	10,387,8
2,000,000	Tobacco Securitization Authority of Northern California Revenue, 5.375%, 6/1/38	1,641,1
3,000,000	Tobacco Securitization Authority of Southern California Revenue, 5.0%, 6/1/37	2,395,7
		\$ 33,044,8
1,500,000	Colorado -- 1.5% Colorado Educational & Cultural Facilities Authority, 8.0%, 9/1/43	\$ 1,537,8
2,000,000	Colorado Health Facilities Authority Revenue, 5.25%, 5/15/42	2,151,8
1,000,000	Kremmling Memorial Hospital District Certificate of Participation, 7.125%, 12/1/45	830,7
		\$ 4,520,4
1,000,000	Connecticut -- 7.7% Hamden Connecticut Facility Revenue, 7.75%, 1/1/43	\$ 1,023,6
10,335,000(e)	Lehman Municipal Trust Receipts Revenue, 0.0%, 8/21/35	12,272,8
5,000,000	Mohegan Tribe of Indians Gaming Authority, 6.25%, 1/1/31	4,992,9

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5,000,000	State of Connecticut, General Obligation, 4.0%, 9/1/30	5,387,5
		\$ 23,676,9

The accompanying notes are an integral part of these financial statements.

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Schedule of Investments | 10/31/14 (unaudited) (continued)

Principal Amount USD (\$)		Value
	District of Columbia -- 3.8%	
5,000,000	District of Columbia Tobacco Settlement Financing Corp., 6.5%, 5/15/33	\$ 5,749,0
6,000,000	District of Columbia Tobacco Settlement Financing Corp., 6.75%, 5/15/40	5,999,1
		\$ 11,748,1
	Florida -- 6.5%	
1,500,000	Alachua County Health Facilities Authority Revenue, 8.125%, 11/15/41	\$ 1,731,4
1,500,000	Alachua County Health Facilities Authority Revenue, 8.125%, 11/15/46	1,729,3
500,000	Capital Trust Agency Revenue Bonds, 7.75%, 1/1/41	509,9
5,000,000	Florida's Turnpike Enterprise, 4.0%, 7/1/34	5,236,8
1,000,000 (a)	Hillsborough County Industrial Development Authority Revenue, 8.0%, 8/15/32	1,319,8
2,260,000 (b)	Liberty County Subordinate Revenue, 8.25%, 7/1/28	498,3
2,500,000	Miami-Dade County Florida Aviation Revenue, 5.5%, 10/1/41	2,855,1
2,250,000 (e)	St. Johns County Industrial Development Authority Revenue, 1.344%, 1/1/49	857,2
832,581 (b)	St. Johns County Industrial Development Authority Revenue, 2.5%, 1/1/49	
5,000,000	Tallahassee Health Facilities Revenue, 6.375%, 12/1/30	5,018,6
		\$ 19,756,7
	Georgia -- 5.1%	
4,240,000 (e)	Atlanta Georgia Water and Wastewater Revenue, RIB, 0.0%, 11/1/43 (144A)	\$ 4,276,5
2,500,000	Clayton County Development Authority Revenue, 8.75%, 6/1/29	3,122,8
3,445,000	Clayton County Development Authority Revenue, 9.0%, 6/1/35	3,568,4
4,000,000	Private Colleges & Universities Authority Revenue, 5.0%, 10/1/43	4,561,2
		\$ 15,529,1
	Idaho -- 1.6%	

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5,000,000	Power County Industrial Development Corp., Revenue, 6.45%, 8/1/32	\$	5,009,3

	Illinois -- 14.8%		
1,827,000 (d)	Illinois Finance Authority Revenue, 11/15/52	\$	160,3
2,087,000 (e)	Illinois Finance Authority Revenue, 4.0%, 11/15/52		1,352,5
3,865,000	Illinois Finance Authority Revenue, 6.0%, 8/15/38		4,359,4
2,000,000	Illinois Finance Authority Revenue, 6.0%, 8/15/39		2,348,5
580,000	Illinois Finance Authority Revenue, 6.375%, 5/15/17		580,7

The accompanying notes are an integral part of these financial statements.

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Principal Amount USD (\$)			Value

	Illinois -- (continued)		
2,500,000	Illinois Finance Authority Revenue, 6.5%, 4/1/39	\$	2,747,1
240,000	Illinois Finance Authority Revenue, 7.0%, 11/15/17		240,0
500,000	Illinois Finance Authority Revenue, 7.0%, 5/15/18		500,6
1,700,000	Illinois Finance Authority Revenue, 7.625%, 5/15/25		1,807,9
600,000	Illinois Finance Authority Revenue, 7.75%, 5/15/30		626,1
2,000,000	Illinois Finance Authority Revenue, 8.0%, 5/15/40		2,104,5
3,200,000	Illinois Finance Authority Revenue, 8.0%, 5/15/46		3,351,4
2,000,000	Illinois Finance Authority Revenue, 8.125%, 2/15/40		2,118,4
3,000,000	Illinois Finance Authority Revenue, 8.25%, 5/15/45		2,133,7
2,500,000	Illinois Finance Authority Revenue, 8.25%, 2/15/46		2,654,9
16,880,000 (d)	Metropolitan Pier & Exposition Authority Dedicated State Tax Revenue, 0.0%, 6/15/22		17,316,8
1,250,000	Southwestern Illinois Development Authority Revenue, 5.625%, 11/1/26		1,004,4
		\$	45,407,9

	Indiana -- 1.7%		
250,000	City of Carmel Indiana Nursing Home Revenue, 7.0%, 11/15/32	\$	273,4
750,000	City of Carmel Indiana Nursing Home Revenue, 7.125%, 11/15/42		816,6
500,000	City of Carmel Indiana Nursing Home Revenue, 7.125%, 11/15/47		542,7
3,570,000	Vigo County Hospital Authority Revenue, 5.8%, 9/1/47 (144A)		3,693,2
		\$	5,326,0

	Kentucky -- 1.9%		
5,000,000	Kentucky Economic Development Finance Authority Revenue, 6.375%, 6/1/40	\$	5,778,0

	Louisiana -- 3.1%		
2,260,000	Jefferson Parish Hospital Service District No. 2, 6.375%, 7/1/41	\$	2,513,2
1,500,000	Louisiana Local Government Environmental Facilities &		

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5,000,000	Community Development Authority Revenue, 6.75%, 11/1/32	1,679,4
	Louisiana Public Facilities Authority Revenue, 5.5%, 5/15/47	5,260,7
		\$ 9,453,4
1,500,000	Maine -- 1.9%	
	Maine Health & Higher Educational Facilities Authority Revenue, 7.5%, 7/1/32	\$ 1,775,5
3,500,000	Maine Turnpike Authority Revenue, 5.0%, 7/1/42	3,915,0
		\$ 5,690,6

The accompanying notes are an integral part of these financial statements.

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Schedule of Investments | 10/31/14 (unaudited) (continued)

Principal Amount USD (\$)		Value
1,500,000	Maryland -- 0.5%	
	Maryland Health & Higher Educational Facilities Authority Revenue, 6.75%, 7/1/44	\$ 1,617,5
7,100,000	Massachusetts -- 5.5%	
	Massachusetts Development Finance Agency Revenue, 5.75%, 1/1/42	\$ 9,038,3
2,095,000	Massachusetts Development Finance Agency Revenue, 7.1%, 7/1/32	2,096,4
635,000	Massachusetts Educational Financing Authority Revenue, 6.0%, 1/1/28	676,9
4,500,000 (b) (c)	Massachusetts Health & Educational Facilities Authority Revenue, 6.5%, 1/15/38	11,7
5,000,000	Massachusetts Health & Educational Facilities Authority Revenue, 6.75%, 10/1/33	5,006,1
		\$ 16,829,6
895,000	Michigan -- 3.3%	
	Doctor Charles Drew Academy Certificate of Participation, 5.7%, 11/1/36	\$ 178,9
2,000,000	Kent Hospital Finance Authority Revenue, 6.25%, 7/1/40	2,051,7
2,640,000	Michigan State University Revenue, 5.0%, 8/15/41	2,997,1
6,100,000	Michigan Tobacco Settlement Finance Authority Revenue, 6.0%, 6/1/48	4,938,7
		\$ 10,166,6
2,000,000	Minnesota -- 0.7%	
	Port Authority of the City of Bloomington, Minnesota Recovery Zone Facility Revenue, 9.0%, 12/1/35	\$ 2,274,4

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1,600,000 (b) (c)	Montana -- 0.0%+ Two Rivers Authority Inc., Project Revenue, 7.375%, 11/1/27	\$	126,7
3,000,000	New Jersey -- 1.9% New Jersey Economic Development Authority Revenue, 5.25%, 9/15/29	\$	3,179,8
2,500,000	New Jersey Economic Development Authority Revenue, 5.75%, 9/15/27		2,615,3
		\$	5,795,2
1,500,000	New Mexico -- 1.3% Otero County New Mexico Project Revenue, 6.0%, 4/1/23	\$	1,357,4
2,960,000	Otero County New Mexico Project Revenue, 6.0%, 4/1/28		2,508,7
		\$	3,866,1

The accompanying notes are an integral part of these financial statements.

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Principal Amount USD (\$)			Value
2,000,000	New York -- 9.7% Chautauqua County Capital Resource Corp., Revenue, 8.0%, 11/15/30	\$	2,094,3
2,000,000	Hempstead Local Development Corp., Revenue, 5.75%, 7/1/39		2,173,2
2,000,000	New York City Industrial Development Agency Revenue, 5.25%, 12/1/32		2,000,0
2,000,000	New York City Industrial Development Agency Revenue, 7.625%, 12/1/32		2,010,9
7,040,000 (e)	New York State Dormitory Authority Revenue, 0.0%, 5/29/14 (144A)		8,819,8
7,500,000	New York State Dormitory Authority Revenue, 5.0%, 3/15/39		8,572,3
1,000,000	New York State Dormitory Authority Revenue, 6.125%, 12/1/29		1,071,8
2,577,540	Westchester County Healthcare Corp., Revenue, 5.0%, 11/1/44		2,857,7
		\$	29,600,3
2,525,000	North Dakota -- 0.9% County of Burleigh ND, 5.0%, 7/1/38	\$	2,702,2
2,500,000	Ohio -- 1.8% Buckeye Tobacco Settlement Financing Authority Revenue, 5.875%, 6/1/47	\$	1,974,9
1,700,000	Buckeye Tobacco Settlement Financing Authority Revenue, 6.0%, 6/1/42		1,339,2

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2,000,000 (e)	Ohio Air Quality Development Authority Revenue, 3.1%, 3/1/23	2,030,9
		\$ 5,345,1
5,190,000	Oregon -- 1.9% Oregon Health & Science University Revenue, 5.0%, 7/1/32	\$ 5,949,5
1,550,000	Pennsylvania -- 5.9% Allegheny County Hospital Development Authority Revenue, 5.125%, 5/1/25	\$ 1,561,9
1,280,000 (b) (c)	Langhorne Manor Borough Higher Education Authority Revenue, 7.35%, 7/1/22	377,6
5,000,000	Pennsylvania Economic Development Financing Authority Solid Waste Disposal Revenue, 6.0%, 6/1/31	5,008,8
1,000,000	Philadelphia Authority for Industrial Development Revenue, 6.5%, 6/15/33 (144A)	1,026,8
2,000,000	Philadelphia Authority for Industrial Development Revenue, 6.75%, 6/15/43 (144A)	2,058,0
2,000,000	Philadelphia Authority for Industrial Development Revenue, 8.2%, 12/1/43	2,149,6

The accompanying notes are an integral part of these financial statements.

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Schedule of Investments | 10/31/14 (unaudited) (continued)

Principal Amount USD (\$)		Value
5,900,000	Pennsylvania -- (continued) Philadelphia Hospitals & Higher Education Facilities Authority Revenue, 5.0%, 7/1/34	\$ 5,939,1
		\$ 18,121,9
3,255,000	Puerto Rico -- 0.9% Commonwealth of Puerto Rico, General Obligation, 8.0%, 7/1/35	\$ 2,847,9
5,900,000 (b) (c)	Rhode Island -- 1.6% Central Falls Rhode Island Detention Facility Corp., Revenue, 7.25%, 7/15/35	\$ 3,231,3
1,500,000	Rhode Island Health & Educational Building Corp., Revenue, 8.375%, 1/1/46	1,728,7
		\$ 4,960,0
4,600,000	Tennessee -- 1.6% Sullivan County Health, Educational & Housing Facilities Board Revenue, 5.25%, 9/1/36	\$ 4,838,6
	Texas -- 16.5%	

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1,000,000	Arlington Higher Education Finance Corp., Revenue Bonds, 7.0%, 3/1/34	\$	1,054,4
2,500,000	Central Texas Regional Mobility Authority Revenue, 6.75%, 1/1/41		2,943,2
5,000,000	Goose Creek Consolidated Independent School District, General Obligation, 4.0%, 2/15/26		5,558,4
725,078 (b) (c)	Gulf Coast Industrial Development Authority Revenue, 7.0%, 12/1/36		
3,750,000	Houston Airport System Special Facilities Revenue, 5.7%, 7/15/29		3,759,0
5,340,000	Lubbock Health Facilities Development Corp., Nursing Home Revenue, 6.625%, 7/1/36		5,514,7
10,000,000	North Texas Tollway Authority Transportation Revenue, 5.75%, 1/1/33		11,131,8
1,500,000	Red River Health Facilities Development Corp., Revenue, 8.0%, 11/15/41		1,769,0
4,000,000	Sanger Industrial Development Corp., Revenue, 8.0%, 7/1/38		4,424,8
7,040,000 (e)	State of Texas, General Obligation, 0.0%, 4/1/30		7,496,8
2,000,000	Tarrant County Cultural Education Facilities Finance Corp., Revenue, 8.0%, 11/15/34		2,334,3
1,000,000	Tarrant County Cultural Education Facilities Finance Corp., Revenue, 8.125%, 11/15/39		957,3
1,000,000	Tarrant County Cultural Education Facilities Finance Corp., Revenue, 8.25%, 11/15/44		963,5
2,500,000	Travis County Health Facilities Development Corp., Revenue, 7.125%, 1/1/46		2,728,1
		\$	50,635,7

The accompanying notes are an integral part of these financial statements.

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Principal Amount USD (\$)			Value
14,315,000 (d)	Washington -- 7.5%		
3,795,000	State of Washington, General Obligation, 6/1/22	\$	12,297,5
1,150,000	Washington State Health Care Facilities Authority Revenue, 6.0%, 1/1/33		4,353,0
5,000,000	Washington State Housing Finance Commission Revenue, 6.75%, 10/1/47		1,232,0
	Washington State Housing Finance Committee Nonprofit Revenue, 5.625%, 1/1/27		5,025,3
		\$	22,908,0
2,000,000	West Virginia -- 0.9%		
735,000	City of Philippi WV, 7.75%, 10/1/44	\$	2,009,1
	West Virginia Hospital Finance Authority Hospital Revenue, 9.125%, 10/1/41		793,4
		\$	2,802,5

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5,000,000	Wisconsin -- 2.7%		
	Wisconsin Public Finance Authority Continuing Care Retirement Community Revenue, 8.25%, 6/1/46	\$	5,874,8
535,000	Wisconsin State Public Finance Authority Revenue, 8.375%, 6/1/20		536,7
1,500,000	Wisconsin State Public Finance Authority Revenue, 8.625%, 6/1/47		1,804,9
		\$	8,216,4
TOTAL TAX EXEMPT OBLIGATIONS (Cost \$361,504,720)		\$	389,073,1
10,000,000 (c) (e)	MUNICIPAL COLLATERALIZED DEBT OBLIGATION -- 0.4% of Net Assets Non-Profit Preferred Funding Trust I, 0.0%, 9/15/37 (144A)	\$	1,198,6
TOTAL MUNICIPAL COLLATERALIZED DEBT OBLIGATION (Cost \$10,000,000)		\$	1,198,6
TOTAL INVESTMENTS IN SECURITIES -- 127.4% (Cost \$371,504,720) (f) (g)		\$	390,271,7
OTHER ASSETS AND LIABILITIES -- 5.6%		\$	17,171,4
PREFERRED SHARES AT REDEMPTION VALUE, INCLUDING DIVIDENDS PAYABLE -- (33.0)%		\$	(101,000,6
NET ASSETS APPLICABLE TO COMMON SHAREOWNERS -- 100.0%		\$	306,442,6

+ Amount rounds to less than 0.1%.

The accompanying notes are an integral part of these financial statements.

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Schedule of Investments | 10/31/14 (unaudited) (continued)

(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 October 31, 2014, the value of these securities amounted to \$36,629,507, or 12.0% of total net assets applicable to common shareowners.

RIB Residual Interest Bond. The interest rate is subject to change periodically and inversely based upon prevailing market rates. The interest rate shown is the rate at October 31, 2014.

(a) 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.

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

(c) Indicates a security that has been deemed illiquid. As of October 31,

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2014 the aggregate cost of illiquid securities in the Trust's portfolio was \$20,739,304. As of that date, the aggregate value of illiquid securities in the Trust's portfolio of \$4,945,993 represented 1.6% of total net assets applicable to common shareowners.

- (d) Security issued with a zero coupon. Income is recognized through accretion of discount.
- (e) The interest rate is subject to change periodically. The interest rate shown is the rate at October 31, 2014.
- (f) The concentration of investments by type of obligation/ market sector is as follows:

Insured	15.1%
Revenue Bonds:	
Other Revenue	18.8
Health Revenue	17.3
Facilities Revenue	12.5
Development Revenue	11.3
Education Revenue	8.9
Tobacco Revenue	7.2
Transportation Revenue	4.2
Airport Revenue	2.1
Pollution Control Revenue	1.3
Water Revenue	1.3
Utilities Revenue	0.0*

	100.0%
	=====

* Amount is less than 0.1%.

- (g) At October 31, 2014, the net unrealized appreciation on investments based on cost for federal tax purposes of \$367,222,980 was as follows:

Aggregate gross unrealized appreciation for all investments in which there is an excess of value over tax cost	\$ 45,986,194
Aggregate gross unrealized depreciation for all investments in which there is an excess of tax cost over value	(22,937,384)

Net unrealized appreciation	\$ 23,048,810
	=====

For financial reporting purposes net unrealized appreciation on investments was 18,767,070 and cost of investments aggregated \$371,504,720.

Purchases and sales of securities (excluding temporary cash investments) for the six months ended October 31, 2014 aggregated \$35,478,502 and \$35,224,888, respectively.

The accompanying notes are an integral part of these financial statements.

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

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 risks, etc.). See Notes to Financial Statements -- Note 1A.

Level 3 -- significant unobservable inputs (including the Trust's own assumptions in determining fair value of investments). See Notes to Financial Statements -- Note 1A.

Generally, equity securities are categorized as Level 1, fixed income securities and senior loans are categorized as Level 2, and securities valued using fair value methods (other than prices supplied by independent pricing services or broker dealers) as Level 3. See Notes to Financial Statements -- Note 1A.

The following is a summary of the inputs used as of October 31, 2014, in valuing the Trust's investments.

	Level 1	Level 2	Level 3
Tax Exempt Obligations	\$ --	\$389,073,190	\$ --
Municipal Collateralized Debt Obligation	--	1,198,600	--
Total Investments in Securities	\$ --	\$390,271,790	\$ --

The following is a reconciliation of assets valued using significant unobservable inputs (Level 3):

	Balance as of 4/30/14	Realized gain (loss) (1)	Change in Unrealized appreciation (depreciation) (2)	Purchases	Sales	Accrued discounts/ premiums	Transf in to Level
Tax Exempt Obligations	\$2,955,000	\$339,303	\$(156,198)	\$ --	\$(3,139,500)	\$1,395	\$ --
Total	\$2,955,000	\$339,303	\$(156,198)	\$ --	\$(3,139,500)	\$1,395	\$ --

* Transfers are calculated on the beginning of period values. During the six months ended October 31, 2014, there were no transfers between Levels 1, 2 and 3.

(1) Realized gain (loss) on these securities is included in the realized gain

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(loss) from investments in the Statement of Operations.

- (2) Unrealized appreciation (depreciation) on these securities is included in the change in unrealized appreciation (depreciation) from investments in the Statement of Operations.

Net change in unrealized (depreciation) of Level 3 investments still held and considered Level 3 at 10/31/14: \$0.

The accompanying notes are an integral part of these financial statements.

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Statement of Assets and Liabilities | 10/31/14 (unaudited)

ASSETS:

Investments in securities, at value (cost \$371,504,720)	\$ 390,271,790
Cash	9,058,036
Receivables --	
Investment securities sold	640,000
Interest receivable	7,737,432
Reinvestment of distributions	112,834
Prepaid expenses	3,290
<hr style="border-top: 1px dashed black;"/>	
Total assets	\$ 407,823,382

LIABILITIES:

Payables --	
Trustees' fees	983
Due to affiliates	207,995
Administration fee payable	68,437
Accrued expenses	102,695
<hr style="border-top: 1px dashed black;"/>	
Total liabilities	\$ 380,110

PREFERRED SHARES AT REDEMPTION VALUE:

\$25,000 liquidation value per share applicable to 4,040 shares, including dividends payable of \$649	101,000,649
---	-------------

NET ASSETS APPLICABLE TO COMMON SHAREOWNERS:

Paid-in capital	\$ 317,625,900
Undistributed net investment income	4,444,804
Accumulated net realized loss on investments	(34,395,151)
Net unrealized appreciation on investments	18,767,070
<hr style="border-top: 1px dashed black;"/>	
Net assets applicable to common shareowners	\$ 306,442,623

NET ASSET VALUE PER COMMON SHARE:

No par value (unlimited number of shares authorized)	
Based on \$306,442,623 / 22,692,712 common shares	\$ 13.50

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Statement of Operations (unaudited)

For the Six Months Ended 10/31/14

INVESTMENT INCOME:		
Interest		\$12,369,053

EXPENSES:		
Management fees	\$1,225,486	
Administrative reimbursements	99,328	
Transfer agent fees and expenses	11,858	
Shareholder communication expenses	5,250	
Auction agent fees	127,433	
Custodian fees	2,608	
Professional fees	54,270	
Printing expenses	8,081	
Trustees' fees	5,189	
Pricing fees	10,177	
Miscellaneous	39,782	

Total expenses		\$ 1,589,462

Net investment income		\$10,779,591

REALIZED AND UNREALIZED GAIN ON INVESTMENTS:		
Net realized gain investments	\$ 44,150	
Change in net unrealized appreciation investments	6,068,009	

Net gain on investments		\$ 6,112,159

DISTRIBUTIONS TO PREFERRED SHAREOWNERS FROM NET INVESTMENT INCOME:		\$ (63,766)

Net increase in net assets resulting from operations		\$16,827,984
=====		

The accompanying notes are an integral part of these financial statements.

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Statements of Changes in Net Assets

	Six Months Ended 10/31/14 (unaudited)	Year Ended 4/30/14

FROM OPERATIONS:		
Net investment income	\$ 10,779,591	\$ 23,700,477
Net realized gain on investments	44,150	22,640
Change in net unrealized appreciation (depreciation) on investments	6,068,009	(29,259,650)
Distributions to preferred shareowners from net		

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investment income	(63,766)	(146,53
<hr/>		
Net increase (decrease) in net assets resulting from operations	\$ 16,827,984	\$ (5,683,06
<hr/>		
DISTRIBUTIONS TO COMMON SHAREOWNERS:		
Net investment income and previously undistributed net investment income (\$0.57 and \$1.14 per share, respectively)	\$ (12,919,422)	\$ (25,766,17
<hr/>		
Total distributions to common shareowners	\$ (12,919,422)	\$ (25,766,17
<hr/>		
FROM TRUST SHARE TRANSACTIONS:		
Reinvestment of distributions	\$ 662,244	\$ 1,128,49
<hr/>		
Net increase in net assets applicable to common shareowners from Trust share transactions	\$ 662,244	\$ 1,128,49
<hr/>		
Net increase (decrease) in net assets applicable to common shareowners	\$ 4,570,806	\$ (30,320,74
<hr/>		
NET ASSETS APPLICABLE TO COMMON SHAREOWNERS:		
Beginning of period	301,871,817	332,192,56
<hr/>		
End of period	\$ 306,442,623	\$ 301,871,81
<hr/>		
Undistributed net investment income	\$ 4,444,804	\$ 6,648,40
<hr/>		

The accompanying notes are an integral part of these financial statements.

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Financial Highlights

	Six Months Ended 10/31/14 (unaudited)	Year Ended 4/30/14	Year Ended 4/30/13
<hr/>			
Per Share Operating Performance			
Net asset value, beginning of period	\$ 13.33	\$ 14.72	\$ 14.12
<hr/>			
Increase (decrease) from investment operations: (a)			
Net investment income	\$ 0.48	\$ 1.05	\$ 1.14
Net realized and unrealized gain (loss) on investments	0.26	(1.29)	0.61
<hr/>			
Distributions to preferred shareowners from:			
Net investment income	\$ (0.00) (b)	\$ (0.01)	\$ (0.01)
<hr/>			
Net increase (decrease) from investment operations	\$ 0.74	\$ (0.25)	\$ 1.74
<hr/>			
Distributions to common shareowners from:			
Net investment income and previously undistributed net investment income	\$ (0.57) *	\$ (1.14) *	\$ (1.14)
<hr/>			
Net increase (decrease) in net asset value	\$ 0.17	\$ (1.39)	\$ 0.60

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Net asset value, end of period (c)	\$ 13.50	\$ 13.33	\$ 14.72
Market value, end of period (c)	\$ 15.26	\$ 14.90	\$ 16.02
Total return at market value (d)	6.53%	1.10%	11.48%
Ratios to average net assets of common shareowners:			
Total expenses (e)	1.04% (f)	1.04%	1.03%
Net investment income before preferred share distributions	7.03% (f)	7.89%	7.84%
Preferred share distributions	0.04% (f)	0.05%	0.08%
Net investment income available to common shareowners	6.99% (f)	7.84%	7.76%
Portfolio turnover	9%	19%	10%
Net assets of common shareowners, end of period (in thousands)	\$306,443	\$301,872	\$332,193

The accompanying notes are an integral part of these financial statements.

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Financial Highlights (continued)

	Six Months Ended 10/31/14 (unaudited)	Year Ended 4/30/14	Year Ended 4/30/13
Preferred shares outstanding (in thousands)	\$101,001	\$101,000	\$101,000
Asset coverage per preferred share, end of period	\$100,852	\$ 99,721	\$107,000
Average market value per preferred share (g)	\$ 25,000	\$ 25,000	\$ 25,000
Liquidation value, including dividends payable, per preferred share	\$ 25,001	\$ 25,001	\$ 25,000

* The amount of distributions made to shareowners during the period were in excess of the net investment income earned by the Trust during the period. The Trust has accumulated undistributed net investment income which is part of the Trust's NAV. A portion of the accumulated net investment income was distributed to shareowners during the period.

- (a) The per common share data presented above is based upon the average common shares outstanding for the periods presented.
- (b) Amount rounds to less than \$(0.005) per share.
- (c) Net asset value and market value are published in Barron's on Saturday, The Wall Street Journal on Monday and The New York Times on Monday and Saturday.
- (d) Total investment return is calculated assuming a purchase of common shares at the current market value on the first day and a sale at the current market value on the last day of the periods reported. Dividends and distributions, if any, are assumed for purposes of this calculation to be reinvested at prices obtained under the Trust's dividend reinvestment plan. Total investment return does not reflect brokerage commissions. Past performance is not a guarantee of future results.
- (e) Expense ratios do not reflect the effect of distribution payments to preferred shareowners.

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(f) Annualized.

(g) Market value is redemption value without an active market.

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Notes to Financial Statements | 10/31/14 (unaudited)

1. Organization and Significant Accounting Policies

Pioneer Municipal High Income Trust (the Trust) was organized as a Delaware statutory trust on March 13, 2003. Prior to commencing operations on July 21, 2003, the Trust had no operations other than matters relating to its organization and registration as a diversified, closed-end management investment company under the Investment Company Act of 1940, as amended. The investment objective of the Trust is to seek a high level of current income exempt from regular federal income tax, and the Trust may, as a secondary objective, also seek capital appreciation to the extent that it is consistent with its primary investment objective.

The Trust's financial statements have been prepared in conformity with U.S. generally accepted accounting principles that require the management of the Trust to, among other things, make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of income, expenses and gain or loss on investments during the reporting period. Actual results could differ from those estimates.

The following is a summary of significant accounting policies followed by the Trust in the preparation of its financial statements, which are consistent with those policies generally accepted in the investment company industry:

A. Security Valuation

Security transactions are recorded as of trade date. Fixed income securities are valued at prices supplied by independent pricing services, which consider such factors as market prices, market events, quotations from one or more brokers, Treasury spreads, yields, maturities and ratings. Valuations may be supplemented by dealers and other sources, as required. The values of interest rate swaps are determined by obtaining dealer quotations. Equity securities that have traded on an exchange are valued at the last sale price on the principal exchange where they are traded. Equity securities that have not traded on the date of valuation or securities for which sale prices are not available, generally are valued using the mean between the last bid and asked prices. Shares of money market mutual funds are valued at such funds' net asset value.

Securities for which independent pricing services are unable to supply prices or for which market prices and/or quotations are not readily available, or are considered to be unreliable are valued by a fair valuation team comprised of certain personnel of Pioneer Investment Management, Inc. (PIM), the Trust's investment adviser, pursuant to procedures adopted by the Trust's Board of

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Trustees. PIM's fair valuation team uses fair value methods approved by the

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Valuation Committee of the Board of Trustees. PIM's valuation team is responsible for monitoring developments that may impact fair valued securities and for discussing and assessing fair value on an ongoing basis, and at least quarterly, with the Valuation Committee of the Board of Trustees.

At October 31, 2014, there were no securities valued using fair value methods (other than securities valued using prices supplied by independent pricing services or broker-dealers).

B. Investment Income and Transactions

Dividend income is recorded on the ex-dividend date, except that certain dividends from foreign securities where the ex-dividend date may have passed are recorded as soon as the Trust becomes aware of the ex-dividend date in the exercise of reasonable diligence.

Interest income, including interest or income bearing cash accounts, is recorded on an accrual basis. Discount and premium on debt securities are accreted or amortized, respectively, daily, into interest income on a yield-to-maturity basis with a corresponding increase or decrease in the cost basis of the security.

Gains and losses on sales of investments are calculated on the identified cost method for both financial reporting and federal income tax purposes.

C. Federal Income Taxes

It is the Trust's policy to comply with the requirements of the Internal Revenue Code applicable to regulated investment companies and to distribute all of its taxable income and net realized capital gains, if any, to its shareowners. Therefore, no federal income tax provision is required. As of April 30, 2014, the Trust did not accrue any interest or penalties with respect to uncertain tax positions, which if applicable, would be recorded as an income tax expense in the Statement of Operations. Tax returns filed within the prior three years remain subject to examination by federal and state tax authorities.

The amount and character of income and capital gain distributions to shareowners are determined in accordance with federal income tax rules, which may differ from U.S. generally accepted accounting principles. Distributions in excess of net investment income or net realized gains are temporary overdistributions for financial statement purposes resulting from differences in the recognition or classification of income or distributions for financial statement and tax purposes. Capital accounts within the financial statements are adjusted for permanent book/tax differences to reflect tax character, but are not adjusted for temporary differences.

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The tax character of distributions paid to shareowners during the year ended April 30, 2014 was as follows:

2014

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Distribution paid from:	
Tax exempt income	\$ 25,370,988
Ordinary income	541,725

Total taxable distribution	\$ 25,912,713
=====	

The following shows the components of distributable earnings (losses) on a federal income tax basis at April 30, 2014:

2014	
Distributable earnings:	
Undistributed tax-exempt income	\$ 4,813,807
Undistributed ordinary income	400,499
Capital loss carryforward	(36,519,720)
Post-October loss deferred	(766,920)
Dividends payable	(306)
Unrealized appreciation	16,980,801

Total	\$(15,091,839)
=====	

The difference between book-basis and tax-basis unrealized appreciation is primarily attributable to the difference between book and tax amortization methods for premiums and discounts on fixed income securities, the book/tax difference in accrual of income on securities in default, and other book and tax temporary differences.

D. Automatic Dividend Reinvestment Plan

All common shareowners whose shares are registered in their own names automatically participate in the Automatic Dividend Reinvestment Plan (the Plan), under which participants receive all dividends and capital gain distributions (collectively, dividends) in full and fractional common shares of the Trust in lieu of cash. Shareowners may elect not to participate in the Plan. Shareowners not participating in the Plan receive all dividends and capital gain distributions in cash. Participation in the Plan is completely voluntary and may be terminated or resumed at any time without penalty by notifying American Stock Transfer & Trust Company, the agent for shareowners in administering the Plan (the Plan Agent), in writing prior to any dividend record date; otherwise such termination or resumption will be effective with respect to any subsequently declared dividend or other distribution.

If a shareowner's shares are held in the name of a brokerage firm, bank or other nominee, the shareowner can ask the firm or nominee to participate in the Plan on the shareowner's behalf. If the firm or nominee does not offer the

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Plan, dividends will be paid in cash to the shareowner of record. A firm or nominee may reinvest a shareowner's cash dividends in common shares of the Trust on terms that differ from the terms of the Plan.

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Whenever the Trust declares a dividend on common shares payable in cash, participants in the Plan will receive the equivalent in common shares acquired by the Plan Agent either (i) through receipt of additional unissued but authorized common shares from the Trust or (ii) by purchase of outstanding common shares on the New York Stock Exchange or elsewhere. If, on the payment date for any dividend, the net asset value per common share is equal to or less than the market price per share plus estimated brokerage trading fees (market premium), the Plan Agent will invest the dividend amount in newly issued common shares. The number of newly issued common shares to be credited to each account will be determined by dividing the dollar amount of the dividend by the net asset value per common share on the date the shares are issued, provided that the maximum discount from the then current market price per share on the date of issuance does not exceed 5%. If, on the payment date for any dividend, the net asset value per common share is greater than the market value (market discount), the Plan Agent will invest the dividend amount in common shares acquired in open-market purchases. There are no brokerage charges with respect to newly issued common shares. However, each participant will pay a pro rata share of brokerage trading fees incurred with respect to the Plan Agent's open-market purchases. Participating in the Plan does not relieve shareowners from any federal, state or local taxes which may be due on dividends paid in any taxable year. Shareowners holding Plan shares in a brokerage account may not be able to transfer the shares to another broker and continue to participate in the Plan.

E. Risks

At times, the Trust's investments may represent industries or industry sectors that are interrelated or have common risks, making the Trust more susceptible to any economic, political, or regulatory developments or other risks affecting those industries and sectors. Information regarding the Trust's principal risks is contained in the Trust's original offering prospectus, with additional information included in the Trust's shareowner reports issued from time to time. Please refer to those documents when considering the Trust's principal risks.

The Trust may invest in both investment grade and below investment grade (high-yield) municipal securities with a broad range of maturities and credit ratings. Debt securities rated below investment grade are commonly referred to as "junk bonds" and are considered speculative. Below investment grade

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securities involve greater risk of loss, are subject to greater price volatility, and are less liquid and more difficult to value, especially during periods of economic uncertainty or change, than higher rated debt securities.

2. Management Agreement

PIM, the Trust's investment adviser, a wholly owned indirect subsidiary of UniCredit S.p.A. (UniCredit), manages the Trust's portfolio. Management fees payable under the Trust's Advisory Agreement with PIM are calculated daily at the annual rate of 0.60% of the Trust's average daily managed assets. "Managed assets" means (a) the total assets of the Trust, including any form of investment leverage, minus (b) all accrued liabilities incurred in the normal course of operations, which shall not include any liabilities or obligations attributable to investment leverage obtained through (i) indebtedness of any type (including, without limitation, borrowing through a credit facility or the

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issuance of debt securities), (ii) the issuance of preferred stock or other similar preference securities, and/or (iii) any other means. For the period ended October 31, 2014, the net management fee was 0.60% of the Trust's average daily managed assets, which was equivalent to 0.80% of the Trust's average daily net assets attributable to the common shareowners.

In addition, under PIM's management and administration agreements, certain other services and costs are paid by PIM and reimbursed by the Trust. At October 31, 2014, \$276,432 was payable to PIM related to management costs, administrative costs and certain other services is included in "Due to Affiliates" and "Administration fees payable" on the Statement of Assets and Liabilities.

3. Transfer Agents

Pioneer Investment Management Shareholder Services, Inc. (PIMSS), a wholly owned indirect subsidiary of UniCredit, through a sub-transfer agency agreement with American Stock Transfer & Trust Company, provides substantially all transfer agent and shareowner services related to the Trust's common shares at negotiated rates.

In addition, the Trust reimburses PIMSS for out-of-pocket expenses incurred by PIMSS related to shareowner communications activities such as proxy and statement mailings and outgoing phone calls.

4. Expense Offset Arrangement

The Trust has entered into an arrangement with its custodian whereby credits realized as a result of uninvested cash balances are used to reduce a portion of the Trust's custodian expenses. For the period ended October 31, 2014, the Trust expenses were not reduced under such arrangement.

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5. Trust Shares

There are an unlimited number of common shares of beneficial interest authorized.

Transactions in common shares of beneficial interest for the six months ended October 31, 2014 and the year ended April 30, 2014 were as follows:

	10/31/14	4/30/14
Shares outstanding at beginning of period	22,646,773	22,564,036
Reinvestment of distributions	45,939	82,737
Shares outstanding at end of period	22,692,712	22,646,773

The Trust may classify or reclassify any unissued shares of beneficial interest into one or more series of preferred shares of beneficial interest. As of October 31, 2014, there were 4,040 APS as follows: Series A -- 2,000 and Series B -- 2,040.

Dividends on Series A and Series B are cumulative at a rate which is to be reset

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every seven days based on the results of an auction. An auction fails if there are more APS offered for sale than there are buyers. When an auction fails, the dividend rate for the period will be the maximum rate on the auction dates described in the prospectus for the APS. Preferred shareowners are not able to sell their APS at an auction if the auction fails. Since February 2008, the Trust's auctions related to the APS have failed. The maximum rate for each series is 125% of the 7 day commercial paper rate or adjusted Kenny rate. Dividend rates on APS ranged from 0.075% to 0.261% during the period ended October 31, 2014.

The Trust is required to maintain asset coverage of at least 200% with respect to all outstanding APS under the 1940 Act and the prospectus for the APS. The Trust may not declare dividends or make other distributions on its common shares or purchase any such shares if, at the time of the declaration, distribution or purchase, the Trust does not comply with the asset coverage ratio described above.

The APS are redeemable at the option of the Trust, in whole or in part, on any dividend payment date at \$25,000 per share plus any accumulated or unpaid dividends, whether or not declared. The APS are also subject to mandatory redemption at \$25,000 per share plus any accumulated or unpaid dividends, whether or not declared, if certain requirements relating to the composition of the assets and liabilities of the Trust as set forth in the Statement of Preferences are not satisfied.

The holders of APS have voting rights equal to the holders of the Trust's common shares (one vote per share) and will vote together with holders of the common shares as a single class. Holders of APS are also entitled to elect two

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of the Trust's Trustees. In addition, the Investment Company Act of 1940, as amended, requires that along with approval by shareowners that might otherwise be required, the approval of the holders of a majority of any outstanding preferred shares, voting separately as a class, would be required to (a) adopt any plan of reorganization that would adversely affect the preferred shares and (b) take any action requiring a vote of security holders, including, among other things, changes in the Trust's subclassification as a closed-end management investment company or changes in its fundamental investment restrictions.

6. Subsequent Events

The Board of Trustees of the Trust declared on November 3, 2014 a monthly dividend from undistributed and accumulated net investment income of \$0.085 per common share, payable November 28, 2014, to common shareowners of record on November 17, 2014.

Subsequent to October 31, 2014, dividends declared and paid on preferred shares totaled \$16,569 in aggregate for the two outstanding preferred share series through December 17, 2014.

7. Change in Independent Registered Public Accounting Firm

The Board of Trustees of the Trust, with the approval and recommendation of the Audit Committee, appointed Deloitte & Touche LLP to serve as the Trust's independent registered public accounting firm for the fiscal year ending April 30, 2015. Deloitte & Touche LLP replaces Ernst & Young LLP, which resigned as the Trust's independent registered public accounting firm, effective upon completion of the audit of the Trust's financial statements for the fiscal year ended April 30, 2014.

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During the periods that Ernst & Young LLP served as the Trust's independent registered public accounting firm, including the Trust's fiscal years ending April 30, 2014 and April 30, 2013, Ernst & Young LLP's reports on the financial statements of the Trust have not contained an adverse opinion or disclaimer of opinion and have not been qualified or modified as to uncertainty, audit scope or accounting principles. Further, there have been no disagreement with Ernst & Young LLP on any matter of accounting principles or practices, financial statement disclosure, or auditing scope or procedure, which, if not resolved to the satisfaction of Ernst & Young LLP would have caused Ernst & Young LLP to make reference to the subject matter of the disagreement in connection with its report on the financial statements. In addition, there have been no reportable events of the kind described in Item 304(a)(1)(v) of Regulation S-K under the Securities Exchange Act of 1934.

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ADDITIONAL INFORMATION (unaudited)

During the period ended October 31, 2014, there have been no material changes in the Trust's investment objective or fundamental policies that have not been approved by the shareowners. There have been no changes in the Trust's charter or By-Laws that would delay or prevent a change in control of the Trust which has not been approved by the shareowners. During the period, there have been no changes in the principal risk factors associated with investment in the Trust. There were no changes in the persons who are primarily responsible for the day-to-day management of the Trust's portfolio.

Notice is hereby given in accordance with Section 23(c) of the Investment Company Act of 1940 that the Trust may purchase, from time to time, its common shares in the open market.

Results of Shareholder Meeting (unaudited)

At the annual meeting of shareowners held on September 23, 2014, shareowners of Pioneer Municipal High Income Trust were asked to consider the proposal described below. A report of the total votes cast by the Trust's shareholders follows:

Proposal 1 -- To elect Class II Trustees.

Nominee	For	Withheld
Benjamin M. Friedman	19,947,909	645,441
Margaret B.W. Graham	19,909,467	683,883
Kenneth J. Taubes	20,004,485	588,865

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Approval of Investment Advisory Agreement

Pioneer Investment Management, Inc. (PIM) serves as the investment adviser to Pioneer Municipal High Income Trust (the Trust) pursuant to an investment advisory agreement between PIM and the Trust. In order for PIM to remain the investment adviser of the Trust, the Trustees of the Trust must determine annually whether to renew the investment advisory agreement for the Trust.

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The contract review process began in January 2014 as the Trustees of the Trust agreed on, among other things, an overall approach and timeline for the process. Contract review materials were provided to the Trustees in March 2014 and July 2014. Supplemental contract review materials were provided to the Trustees in September 2014. In addition, the Trustees reviewed and discussed the Trust's performance at regularly scheduled meetings throughout the year, and took into account other information related to the Trust provided to the Trustees at regularly scheduled meetings, in connection with the review of the Trust's investment advisory agreement.

In March 2014, the Trustees, among other things, discussed the memorandum provided by Trust counsel that summarized the legal standards and other considerations that are relevant to the Trustees in their deliberations regarding the renewal of the investment advisory agreement, and reviewed and discussed the qualifications of the investment management teams, as well as the level of investment by the Trust's portfolio managers in the Trust. In July 2014, the Trustees, among other things, reviewed the Trust's management fee and total expense ratios, the financial statements of PIM and its parent companies, the profitability analyses provided by PIM, and possible economies of scale. The Trustees also reviewed the profitability of the institutional business of PIM and PIM's affiliate, Pioneer Institutional Asset Management, Inc. (together with PIM, "Pioneer"), as compared to that of PIM's fund management business, and considered the differences between the fees and expenses of the Trust and the fees and expenses of Pioneer's institutional accounts, as well as the different services provided by PIM to the Trust and by Pioneer to the institutional accounts. The Trustees further considered contract review materials in September 2014.

At a meeting held on September 16, 2014, based on their evaluation of the information provided by PIM and third parties, the Trustees of the Trust, including the Independent Trustees voting separately, unanimously approved the renewal of the investment advisory agreement for another year. In

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considering the renewal of the investment advisory agreement, the Trustees considered various factors that they determined were relevant, including the factors described below. In all quintile rankings referred to throughout this disclosure, first quintile is most favorable to the Trust's shareowners. The Trustees did not identify any single factor as the controlling factor in determining to approve the renewal of the agreement.

Nature, Extent and Quality of Services

The Trustees considered the nature, extent and quality of the services that had been provided by PIM to the Trust, taking into account the investment objective and strategy of the Trust. The Trustees reviewed the terms of the investment advisory agreement. The Trustees also reviewed PIM's investment approach for the Trust and its research process. The Trustees considered the resources of PIM and the personnel of PIM who provide investment management services to the Trust. They also reviewed the amount of non-Trust assets managed by the portfolio managers of the Trust. The Trustees considered the non-investment resources and personnel of PIM involved in PIM's services to the Trust, including PIM's compliance and legal resources and personnel. The Trustees noted the substantial attention and high priority given by PIM's senior management to the Pioneer fund complex.

The Trustees considered that PIM supervises and monitors the performance of the Trust's service providers and provides the Trust with personnel (including Trust officers) and other resources that are necessary for the Trust's business

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management and operations. The Trustees also considered that, as administrator, PIM is responsible for the administration of the Trust's business and other affairs. The Trustees considered the fees paid to PIM for the provision of administration services.

Based on these considerations, the Trustees concluded that the nature, extent and quality of services that had been provided by PIM to the Trust were satisfactory and consistent with the terms of the investment advisory agreement.

Performance of the Trust

In considering the Trust's performance, the Trustees regularly review and discuss analysis and data prepared by PIM and information comparing the Trust's performance with the performance of its peer group of funds as classified by each of Morningstar, Inc. (Morningstar) and Lipper, and with the performance of the Trust's benchmark index. They also discuss the Trust's performance with PIM on a regular basis. The Trustees confirmed that these regular reviews and discussions were factored into the Trustees' deliberations

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concerning the renewal of the advisory agreement. For purposes of their contract renewal deliberations, the Trustees considered the discussions held throughout the year regarding the Trust's performance and the performance results of the Trust over various time periods, including the Trust's performance results for periods ended June 30, 2014. The Trustees indicated that they were satisfied with PIM's response to the Trust's performance issues.

Management Fee and Expenses

The Trustees considered information showing the fees and expenses of the Trust in comparison to the management fees and the expense ratios of a peer group of funds selected on the basis of criteria determined by the Independent Trustees for this purpose using data provided by Strategic Insight Mutual Fund Research and Consulting, LLC (Strategic Insight), an independent third party.

The Trustees considered that the Trust's management fee (based on managed assets) for the twelve months ended June 30, 2014 was in the third quintile relative to the management fees paid by other funds in its Strategic Insight peer group for the comparable period. The Trustees considered that the expense ratio (based on managed assets) of the Trust's common shares for the twelve months ended June 30, 2014 was in the third quintile relative its Strategic Insight peer group for the comparable period.

The Trustees reviewed management fees charged by Pioneer to institutional and other clients, including publicly offered European funds sponsored by affiliates of Pioneer, unaffiliated U.S. registered investment companies (in a sub-advisory capacity), and unaffiliated foreign and domestic separate accounts. The Trustees also considered PIM's costs in providing services to the Trust and Pioneer's costs in providing services to the other clients and considered the differences in management fees and profit margins for Trust and non-Trust services. In evaluating the fees associated with Pioneer's client accounts, the Trustees took into account the respective demands, resources and complexity associated with the Trust and client accounts. The Trustees noted that, in some instances, the fee rates for those clients were lower than the management fee for the Trust and considered that, under the investment advisory agreement with the Trust, PIM performs additional services for the Trust that it does not provide to those other clients or services that are broader in scope, including oversight of the Trust's other service providers and activities related to compliance and the extensive regulatory and tax regimes to which the Trust is subject. The Trustees also considered the different entrepreneurial risks associated with PIM's

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management of the Trust and Pioneer's management of the other client accounts.

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The Trustees concluded that the management fee payable by the Trust to PIM was reasonable in relation to the nature and quality of the services provided by PIM to the Trust.

Profitability

The Trustees considered information provided by PIM regarding the profitability of PIM with respect to the advisory services provided by PIM to the Trust, including the methodology used by PIM in allocating certain of its costs to the management of the Trust. The Trustees also considered PIM's profit margin in connection with the overall operation of the Trust. They further reviewed the financial results realized by PIM and its affiliates from non-fund businesses. The Trustees considered PIM's profit margins with respect to the Trust in comparison to the limited industry data available and noted that the profitability of any adviser was affected by numerous factors, including its organizational structure and method for allocating expenses. The Trustees concluded that PIM's profitability with respect to the management of the Trust was not unreasonable.

Economies of Scale

The Trustees considered the extent to which PIM may realize economies of scale or other efficiencies in managing and supporting the Trust. Since the Trust is a closed-end fund that has not raised additional capital, the Trustees concluded that economies of scale were not a relevant consideration in the renewal of the investment advisory agreement.

Other Benefits

The Trustees considered the other benefits to PIM from its relationship with the Trust. The Trustees considered the character and amount of fees paid by the Trust, other than under the investment advisory agreement, for services provided by PIM and its affiliates. The Trustees further considered the revenues and profitability of PIM's businesses other than the fund business. Pioneer is the principal U.S. asset management business of Pioneer Global Asset Management, the worldwide asset management business of UniCredit Group, which manages over \$150 billion in assets (including the Funds). Pioneer and the Funds receive reciprocal intangible benefits from the relationship, including mutual brand recognition and, for the Funds, direct and indirect access to the resources of a large global asset manager. The Trustees concluded that any such benefits received by Pioneer as a result of its

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relationship with the Funds were reasonable and their consideration of the advisory agreement between the Trust and PIM and the fees thereunder were unaffected by Pioneer's possible receipt of any such intangible benefits.

Conclusion

After consideration of the factors described above as well as other factors, the Trustees, including all of the Independent Trustees, concluded that the investment advisory agreement between PIM and the Trust, including the fees payable thereunder, was fair and reasonable and voted to approve the proposed renewal of the investment advisory agreement for the Trust.

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Trustees, Officers and Service Providers

Trustees

Thomas J. Perna, Chairman
David R. Bock
Benjamin M. Friedman
Margaret B.W. Graham
Marguerite A. Piret
Fred J. Ricciardi**
Kenneth J. Taubes

Advisory Trustee

Lorraine H. Monchak*

Officers

Lisa M. Jones, President and Chief
Executive Officer
Mark E. Bradley, Treasurer and
Chief Financial Officer
Christopher J. Kelley, Secretary and
Chief Legal Officer

Investment Adviser and Administrator

Pioneer Investment Management, Inc.

Custodian and Sub-Administrator

Brown Brothers Harriman & Co.

Principal Underwriter

Pioneer Funds Distributor, Inc.

Legal Counsel

Morgan, Lewis & Bockius LLP

Shareowner Services and Transfer Agent

Pioneer Investment Management Shareholder Services, Inc.

Proxy Voting Policies and Procedures of the Fund are available without charge, upon request, by calling our toll free number (1-800-225-6292). Information regarding how the Fund voted proxies relating to portfolio securities during the most recent 12-month period ended June 30 is publicly available to shareowners at us.pioneerinvestments.com. This information is also available on the Securities and Exchange Commission's web site at www.sec.gov.

* Ms. Monchak became a non-voting Advisory Trustee on November 11, 2014.

** Mr. Ricciardi became a Trustee on November 11, 2014.

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How to Contact Pioneer

We are pleased to offer a variety of convenient ways for you to contact us for assistance or information.

You can call American Stock Transfer & Trust Company (AST) for:

Account Information 1-800-710-0935

Or write to AST:

For Write to

General inquiries, lost dividend checks, change of address, lost stock certificates, stock transfer	American Stock Transfer & Trust Operations Center 6201 15th Ave. Brooklyn, NY 11219
Dividend reinvestment plan (DRIP)	American Stock Transfer & Trust Wall Street Station P.O. Box 922 New York, NY 10269-0560

Website www.amstock.com

For additional information, please contact your investment advisor or visit our web site us.pioneerinvestments.com.

The Trust files a complete schedule of investments with the Securities and Exchange Commission for the first and third quarters for each fiscal year on Form N-Q. Shareowners may view the filed Form N-Q by visiting the Commission's web site at www.sec.gov. The filed form may also be viewed and copied at the Commission's Public Reference Room in Washington, DC. Information regarding the operations of the Public Reference Room may be obtained by calling 1-800-SEC-0330.

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Investments (R)

Pioneer Investment Mana