

PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST
Form N-CSRS
November 29, 2017

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 811-21409

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)

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: March 31

Date of reporting period: April 1, 2017 through September 30, 2017

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

ITEM 1. REPORTS TO STOCKHOLDERS.

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

Pioneer Municipal High
Income Advantage Trust

Semiannual Report | September 30, 2017

Ticker Symbol: MAV

[LOGO] Amundi Pioneer
=====

ASSET MANAGEMENT

visit us: www.amundipioneer.com

Table of Contents

| | |
|--|----|
| President's Letter | 2 |
| Portfolio Management Discussion | 4 |
| Portfolio Summary | 10 |
| Prices and Distributions | 11 |
| Performance Update | 12 |
| Schedule of Investments | 13 |
| Financial Statements | 24 |
| Notes to Financial Statements | 29 |
| Additional Information | 37 |
| Trustees, Officers and Service Providers | 40 |

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 1

President's Letter

Robust, synchronized global economic growth and rising corporate profits have continued to drive strong performance in both the credit and equity markets for most of 2017. U.S. stocks, as measured by the Standard & Poor's 500 Index, have returned 14.23% year-to-date through September 30, 2017. Fixed-income markets, while not generating the same dazzling returns as equities, have held their own, led by high-yield securities, which produced a year-to-date return of 7.05% in the U.S., as measured by the Bank of America Merrill Lynch U.S. High Yield Index. Meanwhile, the Bloomberg Barclays U.S. Aggregate Bond Index has returned 3.14% since the start of the calendar year.

Continued strong employment numbers and higher consumer confidence, together with solid global economic growth and a depreciating U.S. dollar contributed to better-than-expected U.S. gross domestic product (GDP) growth of 3.1% in the second quarter. Outside the U.S., economic growth in the second quarter also surprised to the upside across the Euro zone, China, and Japan. Meanwhile,

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

despite higher oil and commodities prices, inflation continued to be moderate, both in the U.S. and globally, enabling major non-U.S. central banks to maintain their easy monetary policies. As expected, however, the U.S. Federal Reserve System (the Fed) recently announced that it would commence tapering its balance sheet this October. The Fed also appears primed to raise interest rates one more time before the end of this year, which would be the fourth rate increase since December of 2016.

As we move into the final months of 2017, we believe the U.S. economy will experience modest growth in the short term, depending on the mix of economic policies enacted as the country moves away from monetary stimulus (driven by the Fed) and toward fiscal stimulus (potentially including tax reform) as well as lighter regulatory burdens. Meanwhile, corporate earnings remain solid and we think they will improve even further, despite some pressure from wage increases. In addition, as the economy continues to grow and we begin to see a modest upturn in inflation, we believe the Fed will continue to raise interest rates.

While economic and market conditions appear solid, there are always risks to consider that could dampen the outlook. Geopolitical concerns, such as increased tensions with North Korea, and continued political gridlock in Washington are just some of the risks that could lead to increased market volatility.

2 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

It is for those reasons that we at Amundi Pioneer continue to believe that investors can benefit from the experience and tenure of our investment teams who make active and informed decisions across our funds.

As always, and particularly during times of market uncertainty, we encourage you to work with your financial advisor to develop an overall investment plan that addresses both your short- and long-term goals, and to implement such a plan in a disciplined manner.

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

Sincerely,

/s/ Lisa M. Jones

Lisa M. Jones
Head of the Americas, President and CEO of U.S.
Amundi Pioneer Asset Management USA, Inc.
September 30, 2017

Any information in this shareowner 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. Past performance is no guarantee of future results.

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 3

Portfolio Management Discussion | 9/30/17

The municipal bond market generated positive results over the six-month period ended September 30, 2017, with high-yield municipals slightly outperforming investment-grade municipals. In the following interview, David Eurkus and Jonathan Chirunga discuss the factors that influenced the performance of Pioneer Municipal High Income Advantage Trust during the six-month period. Mr. Eurkus, Director of Municipals, U.S., a senior vice president, and a portfolio manager

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

at Amundi Pioneer Asset Management ("Amundi Pioneer"), and Mr. Chirunga, a vice president and a portfolio manager at Amundi Pioneer, are responsible for the day-to-day management of the Trust.

Q How did Pioneer Municipal High Income Advantage Trust perform during the six-month period ended September 30, 2017?

A Pioneer Municipal High Income Advantage Trust returned 3.20% at net asset value (NAV) and 7.82% at market price during the six-month period ended September 30, 2017. During the same six-month period, the Trust's benchmarks, the Bloomberg Barclays U.S. Municipal High Yield Bond Index and the Bloomberg Barclays Municipal Bond Index, returned 3.52% and 3.04% at NAV, respectively. The Bloomberg Barclays U.S. Municipal High Yield Bond Index is an unmanaged measure of the performance of lower-rated municipal bonds, while the Bloomberg Barclays Municipal Bond Index is an unmanaged measure of the performance of investment-grade municipal bonds. Unlike the Trust, the two 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 6.78%, and the average return at NAV of the 11 closed-end funds in the same Lipper category was 4.48%.

The shares of the Trust were selling at a 3.19% discount to NAV on September 30, 2017. Comparatively the shares of the Trust were selling at a 7.34% discount to NAV on March 31, 2017.

On September 30, 2017, the standardized 30-day SEC yield of the Trust's shares was 4.02%*.

* 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.

4 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

Q How would you describe the investment environment in the municipal bond market during the six-month period ended September 30, 2017?

A A favorable backdrop supported the tax-advantaged, municipal bond market over the six-month period, as both economic fundamentals and technical market factors helped municipal debt turn in positive performance. Favorable fundamentals included a persistently growing economy with improving corporate profits, low inflation, declines in market interest rates, and a U.S. Federal Reserve System (the Fed) that acted with restraint in gradually tightening monetary policy. Over the period, the Fed raised the Federal Funds rate just once, in June 2017, after enacting two rate hikes in the prior six months.

Yields of longer-term debt, including U.S. Treasuries, moved lower during the period. From a technical perspective, the supply of new municipal bond issues in the market remained relatively low over the six months. Meanwhile, demand remained solid, including demand from non-traditional buyers of municipals, such as pension funds and foreign investors attracted by the relative value of municipals compared to bonds in the taxable market.

In that environment, both investment-grade and high-yield municipals fared well, even in the face of some mild market volatility related to

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

uncertainties regarding the direction of the U.S. government's fiscal policy. Some key initiatives, such as tax reform, remain under discussion, but have not yet become law.

High-yield municipal bonds slightly outperformed investment-grade municipals during the period, even though the market for higher-yielding municipals retreated somewhat after the Commonwealth of Puerto Rico's June 1, 2017, default on payments on a group of sales-tax-backed municipal bonds. That event, combined with the extensive damage the island suffered after Hurricane Maria made landfall in September, raised concerns about the Commonwealth's ability to meet its debt obligations. Before those events, Puerto Rico-issued bonds had a relatively high weighting in the Bloomberg Barclays High Yield Municipal Bond Index, accounting for about 13% of the index's asset value. The benchmark's Puerto Rico allocation had dropped significantly, from 13% to 4%, by the end of the six-month period as more defaulted bonds were removed from the Index.

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 5

Q What factors affected the Trust's performance relative to the Bloomberg Barclays municipal bond indices during the six-month period ended September 30, 2017?

A We maintained a well-diversified** portfolio during the period, with exposures to both investment-grade and high-yield municipal bonds. The diversification helped the Trust outperform the Bloomberg Barclays Municipal Bond Index, which tracks investment-grade municipals, even as it slightly trailed the return of the Bloomberg Barclays U.S. Municipal High Yield Bond Index. The Trust's exposure to longer-maturity investment-grade municipals, which performed particularly well as market interest rates declined, was a key positive contributor to benchmark-relative results.

The portfolio's holdings of certain tobacco bonds funded by Master Settlement Agreements between the tobacco industry and individual states, and bonds issued by charter schools, also contributed to the Trust's benchmark-relative performance during the period.

On the negative side, there were some holdings in the Trust's portfolio that underperformed during the period, such as bonds issued by Sanger (Texas) Industrial Development Corporation, which experienced ongoing credit problems that contributed to a moderate decrease in value, and by the Commonwealth of Puerto Rico, a general obligation bond with an 8.00% coupon, the Trust's only exposure to Puerto Rico's debt.

Q Did the Trust's distributions to shareholders change during the six-month period ended September 30, 2017?

A Yes, the Trust's distributions increased slightly over the six-month period.

Q Did the level of leverage in the Trust change during the six-month period ended September 30, 2017?

A At the end of the six-month period on September 30, 2017, 34.5% of the Trust's total managed assets were financed by leverage obtained through the issuance of preferred shares, compared with 34.6% of the Trust's total managed assets financed by leverage at the start of the period on April 1, 2017. While the amount of funds borrowed by the Trust decreased slightly, the decrease in leverage as a percentage of total managed assets was primarily due to the appreciation in values of securities in which the Trust had invested.

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

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

6 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

Q Did the Trust invest in any derivative securities during the six-month period ended September 30, 2017?

A No, the Trust's portfolio held no derivative securities during the period.

Q What is your investment outlook?

A We maintain an optimistic view of the municipal bond market, as its underlying fundamentals remain strong and investor demand remains high. Meanwhile, new supply is limited.

The expectation is that the Fed will move carefully as it considers whether to tighten monetary policy further by raising the Federal Funds rate again, though a December 2017 rate increase remains a solid possibility. The Fed also recently announced that it would begin to reduce its balance sheet by limiting reinvestments in some of the holdings it purchased during its multiple quantitative-easing programs between 2008 and 2014.

We anticipate that the U.S. economy will continue to expand at a moderate pace, and that corporate profits should continue to improve, which may benefit some of the portfolio's underlying credits. The most recent reports on growth in U.S. gross domestic product (GDP) showed that the economy grew at a 3.1% annual rate in the second quarter of 2017, while corporate earnings in the first quarter were 14.9% higher than a year earlier. Inflationary pressures have remained low, despite recent gains in employment. Thus far, policy gridlock in Congress has not caused much, if any market distress, and investors remain hopeful that lawmakers and President Trump can reach agreement on a tax reform/tax cut program that could stimulate economic growth.

At this point, the full extent of hurricane damage in Puerto Rico remains unknown, but the Trust has very little exposure to Puerto Rico-issued debt.

In managing the Trust going forward, we will continue to monitor events carefully and remain focused on intensive, fundamental research while maintaining a well-diversified portfolio, with exposures to both investment-grade and high-yield municipal securities.

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 7

Please refer to the Schedule of Investments on pages 13-23 for a full listing of Trust securities.

All investments are subject to risk, including the possible loss of principal. In the past several years, financial markets have experienced increased volatility, depressed valuations, decreased liquidity and heightened uncertainty. These conditions may continue, recur, worsen or spread.

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

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

tax. Capital gains, if any, are subject to a capital gains tax.

When interest rates rise, the prices of fixed-income securities in the Trust will generally fall. Conversely, when interest rates fall, the prices of fixed-income securities in the Trust will generally rise.

By concentrating in municipal securities, the portfolio 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 currently 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 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 meet certain regulatory and rating agency 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, which is likely to result in a decrease in the market value of the Trust's shares.

8 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

Risks of investing in the Trust are discussed in greater detail in the Trust's original offering documents relating to its common shares and shareowner reports issued from time to time.

These risks may increase share price volatility.

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. Past performance is no guarantee of future results.

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 9

Portfolio Summary | 9/30/17

Portfolio Diversification

(As a percentage of total investment portfolio)

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

Insured:

12.8%

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | |
|---------------------------|-------|
| Revenue Bonds: | |
| Other Revenue | 24.1% |
| Health Revenue | 16.0% |
| Education Revenue | 13.3% |
| Tobacco Revenue | 8.9% |
| Transportation Revenue | 6.4% |
| Development Revenue | 5.9% |
| Facilities Revenue | 5.3% |
| Water Revenue | 4.2% |
| Pollution Control Revenue | 1.7% |
| Airport Revenue | 1.4% |

Portfolio Maturity

(As a percentage of total investments)

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

| | |
|-------------|-------|
| 20+ years | 58.0% |
| 10-20 years | 34.6% |
| 7-10 years | 6.6% |
| 5-7 years | 0.8% |

10 Largest Holdings

(As a percentage of long-term holdings)*

1. New Jersey Transportation Trust Fund Authority, 12/15/27 (BHAC Insured)
2. Massachusetts Development Finance Agency, WGBH Foundation, Series A, 5.75%, 1/1/42 (AMBAC Insured)
3. Private Colleges & Universities Authority, Emory University, Series A, 5.0%, 10/1/43
4. Buckeye Tobacco Settlement Financing Authority, Asset-Backed, Series A-2, 6.5%, 6/1/47
5. North Texas Tollway Authority, Series F, 5.75%, 1/1/33
6. New York State Dormitory Authority, Series C, 5.0%, 3/15/39
7. New Jersey Economic Development Authority, Continental Airlines, 5.75%, 9/15/27
8. State of Connecticut, Series E, 4.0%, 9/1/30
9. Jefferson Parish Hospital Service District No. 2, East Jefferson General Hospital, 6.375%, 7/1/40
10. District of Columbia Tobacco Settlement Financing Corp., Asset-Backed, 6.75%, 5/15/40

* 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.

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

10 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

Prices and Distributions | 9/30/17

Share Prices and Distributions

Market Value per Common Share^

| | 9/30/17 | 3/31/17 |
|--------------------|---------|---------|
| Market Value | \$11.55 | \$10.99 |
| Premium/(Discount) | (3.2)% | (7.3)% |

Net Asset Value per Common Share^

| | 9/30/17 | 3/31/17 |
|-----------------|---------|---------|
| Net Asset Value | \$11.93 | \$11.86 |

Distributions per Common Share: 4/1/17 - 9/30/17

| | Net Investment Income | Short-Term Capital Gains | Long-Term Capital Gains |
|--|-----------------------|--------------------------|-------------------------|
| | \$0.2975 | \$-- | \$-- |

Yields

| | 9/30/17 | 3/31/17 |
|------------------|---------|---------|
| 30-Day SEC Yield | 4.02% | 4.56% |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

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

^ 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. Net asset value and market value are published daily on the Trust's website at www.amundipioneer.com.

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 11

Performance Update | 9/30/17

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 Advantage Trust during the periods shown, compared to that of the Bloomberg Barclays Municipal Bond Index and the Bloomberg Barclays U.S. Municipal High Yield Bond Index.

Average Annual Total Returns (As of September 30, 2017)

| Period | Net Asset Value (NAV) | Market Price | Bloomberg Barclays Municipal Bond Index | Bloomberg Barclays U.S. Municipal High Yield Bond Index |
|----------|-----------------------|--------------|---|---|
| 10 years | 5.52% | 5.07% | 4.52% | 4.74% |
| 5 years | 4.74 | 0.73 | 3.01 | 4.73 |
| 1 year | -1.07 | -6.85 | 0.87 | 1.43 |

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

Value of \$10,000 Investment

| | Pioneer Municipal High Income Advantage Trust | Bloomberg Barclays Municipal Bond Index | Bloomberg Barclays U.S. Municipal High Yield Bond Index |
|------|---|---|---|
| 9/07 | \$10,000 | \$10,000 | \$10,000 |
| 9/08 | \$ 7,164 | \$ 9,813 | \$ 8,996 |
| 9/09 | \$ 9,291 | \$11,270 | \$ 9,405 |
| 9/10 | \$11,618 | \$11,925 | \$10,547 |
| 9/11 | \$12,485 | \$12,388 | \$10,987 |
| 9/12 | \$15,815 | \$13,418 | \$12,612 |
| 9/13 | \$14,392 | \$13,121 | \$12,418 |
| 9/14 | \$17,644 | \$14,161 | \$13,904 |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | | | |
|------|----------|----------|----------|
| 9/15 | \$16,176 | \$14,609 | \$14,076 |
| 9/16 | \$17,610 | \$15,424 | \$15,670 |
| 9/17 | \$16,403 | \$15,559 | \$15,894 |

Call 1-800-225-6292 or visit www.amundipioneer.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, 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 Bloomberg Barclays Municipal Bond Index is an unmanaged, broad measure of the municipal bond market. The Bloomberg Barclays U.S. Municipal High Yield Bond Index is unmanaged, totals over \$26 billion in market value and maintains over 1,300 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, issue date later than 12/31/90, deal size over \$20 million, 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 employ leverage. You cannot invest directly in the indices.

12 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

Schedule of Investments | 9/30/17 (unaudited)

Principal
Amount
USD (\$)

Value

| | |
|-----------|---|
| | UNAFFILIATED ISSUERS -- 150.7% of Net Assets |
| | TAX EXEMPT OBLIGATIONS -- 150.6% of |
| | Net Assets (a) |
| | Alabama -- 1.7% |
| 2,500,000 | Alabama Industrial Development Authority, Pine City |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | | |
|----------------|--|--------|
| 2,500,000 | Fiber Co., 6.45%, 12/1/23 | \$ 2,5 |
| | Huntsville-Redstone Village Special Care Facilities Financing Authority, Redstone Village Project, 5.5%, 1/1/43 | 2,3 |
| | | \$ 4,8 |
| ----- | | |
| 2,000,000 | Arizona -- 0.7% | |
| | City of Phoenix, AZ, Industrial Development Authority, 3rd & Indian School Assisted Living Project, 5.4%, 10/1/36 | \$ 1,9 |
| 32,000 | County of Pima, AZ, Industrial Development Authority, Arizona Charter Schools Project, Series C, 6.75%, 7/1/31 | |
| | | \$ 1,9 |
| ----- | | |
| 6,990,000 | California -- 14.8% | |
| 38,610,000 (b) | California County Tobacco Securitization Agency, Asset-Backed, Gold County Funding Corp., 5.25%, 6/1/46 | \$ 6,8 |
| | California County Tobacco Securitization Agency, Capital Appreciation, Stanislaus County, Subordinated, Series A, 6/1/46 | 5,4 |
| 1,845,000 | California Educational Facilities Authority, Stanford University, 5.25%, 4/1/40 | 2,4 |
| 1,550,000 | California Enterprise Development Authority, Sunpower Corp., 8.5%, 4/1/31 | 1,6 |
| 5,000,000 | California Pollution Control Financing Authority, 5.0%, 7/1/37 (144A) | 5,0 |
| 3,000,000 | California School Finance Authority, Classical Academies Project, Series A, 7.375%, 10/1/43 | 3,5 |
| 1,875,000 | California Statewide Communities Development Authority, Lancer Plaza Project, 5.875%, 11/1/43 | 2,0 |
| 757,342 (c) | California Statewide Communities Development Authority, Microgy Holdings Project, 9.0%, 12/1/38 | |
| 1,500,000 (d) | City of Madera, CA, Irrigation Financing Authority, 6.25%, 1/1/31 | 1,6 |
| 1,500,000 (d) | City of Madera, CA, Irrigation Financing Authority, 6.5%, 1/1/40 | 1,6 |
| 2,695,000 (e) | Coast Community College District, Election, Series D, 5.0%, 8/1/31 | 3,2 |
| 1,000,000 | Golden State Tobacco Securitization Corp., Asset-Backed, Series A-1, 5.125%, 6/1/47 | 9 |
| 3,140,000 (f) | Lehman Municipal Trust Receipts, RIB, 11.715%, 11/1/39 (144A) (AGM Insured) | 3,3 |
| 1,000,000 | River Islands Public Financing Authority, Community Facilities, 5.5%, 9/1/45 | 1,0 |

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

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 13

Schedule of Investments | 9/30/17 (unaudited) (continued)

| Principal Amount USD (\$) | Value |
|---------------------------|-------|
|---------------------------|-------|

California -- (continued)

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | | |
|---|--|--|
| 2,425,000 (e) 465,000 | State of California, Various Purposes, 5.75%, 4/1/31 Tobacco Securitization Authority of Southern California, Series A-1, 5.125%, 6/1/46 | \$ 2,5 4 ----- \$ 42,2 |
| 1,500,000 (d) | Colorado -- 0.7% Colorado Educational & Cultural Facilities Authority, Rocky Mountain Classical Academy Project, 8.0%, 9/1/43 | \$ 2,0 |
| 2,035,000 7,200,000 (e) 1,000,000 | Connecticut -- 3.8% Mohegan Tribal Finance Authority, 7.0%, 2/1/45 (144A) State of Connecticut, Series E, 4.0%, 9/1/30 Town of Hamden, CT, Whitney Center Project, Series A, 7.75%, 1/1/43 | \$ 2,1 7,5 1,0 ----- \$ 10,7 |
| 2,355,000 6,825,000 | District of Columbia -- 3.5% District of Columbia Tobacco Settlement Financing Corp., Asset-Backed, 6.5%, 5/15/33 District of Columbia Tobacco Settlement Financing Corp., Asset-Backed, 6.75%, 5/15/40 | \$ 2,6 7,2 ----- \$ 9,8 |
| 1,500,000 1,500,000 2,500,000 (d) 5,000,000 1,000,000 (d) | Florida -- 4.4% Alachua County Health Facilities Authority, Terraces Bonita Springs Project, Series A, 8.125%, 11/15/41 Alachua County Health Facilities Authority, Terraces Bonita Springs Project, Series A, 8.125%, 11/15/46 County of Miami-Dade, FL, Aviation Revenue, Series B, 5.5%, 10/1/41 Florida's Turnpike Enterprise, Department of Transportation, Series A, 4.0%, 7/1/32 Hillsborough County Industrial Development Authority, Various Health Facilities, 8.0%, 8/15/32 | \$ 1,7 1,7 2,7 5,3 1,1 ----- \$ 12,6 |
| 5,000,000 900,000 750,000 8,750,000 | Georgia -- 6.3% City of Atlanta, GA, Water & Wastewater Revenue, Series A, 5.0%, 11/1/34 DeKalb County Georgia Hospital Authority, DeKalb Medical Center, Inc. Project, 6.0%, 9/1/30 DeKalb County Georgia Hospital Authority, DeKalb Medical Center, Inc. Project, 6.125%, 9/1/40 Private Colleges & Universities Authority, Emory University, Series A, 5.0%, 10/1/43 | \$ 5,9 9 8 10,0 ----- \$ 17,8 |

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

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

Principal
Amount
USD (\$)

Value

| | | |
|---------------|--|---------------|
| 1,000,000 | Guam -- 0.4% Guam Department of Education, Certificates of Participation, John F. Kennedy High School, Series A, 6.625%, 12/1/30 | \$ 1,000,000 |
| 2,000,000 | Idaho -- 0.7% Power County Industrial Development Corp., FMC Corp. Project, 6.45%, 8/1/32 | \$ 2,000,000 |
| 1,000,000 (e) | Illinois -- 3.9% Chicago Board of Education, Series A, 7.0%, 12/1/46 (144A) | \$ 1,000,000 |
| 417,400 (f) | Illinois Finance Authority, Clare Oaks Project, Series B, 4.0%, 11/15/52 | 317,400 |
| 261,000 (b) | Illinois Finance Authority, Clare Oaks Project, Series C-1, 11/15/52 | 261,000 |
| 52,200 (b) | Illinois Finance Authority, Clare Oaks Project, Series C-2, 11/15/52 | 52,200 |
| 52,200 (b) | Illinois Finance Authority, Clare Oaks Project, Series C-3, 11/15/52 | 52,200 |
| 3,000,000 (c) | Illinois Finance Authority, Greenfields of Geneva Project, Series A, 8.125%, 2/15/40 | 1,700,000 |
| 2,500,000 (c) | Illinois Finance Authority, Greenfields of Geneva Project, Series A, 8.25%, 2/15/46 | 1,400,000 |
| 1,450,000 | Illinois Finance Authority, Memorial Health System, 5.5%, 4/1/39 | 1,500,000 |
| 2,000,000 | Illinois Finance Authority, Northwestern Memorial Hospital, Series A, 6.0%, 8/15/39 | 2,100,000 |
| 280,000 (d) | Illinois Finance Authority, Swedish Covenant, Series A, 6.0%, 8/15/38 | 300,000 |
| 1,000,000 | Metropolitan Pier & Exposition Authority, McCormick Place, Series B, 5.0%, 6/15/52 (ST APPROP Insured) | 1,000,000 |
| 1,530,000 | Southwestern Illinois Development Authority, Village of Sauget Project, 5.625%, 11/1/26 | 1,400,000 |
| | | \$ 11,200,000 |
| 250,000 | Indiana -- 0.9% City of Carmel, IN, Barrington Carmel Project, Series A, 7.0%, 11/15/32 | \$ 250,000 |
| 750,000 | City of Carmel, IN, Barrington Carmel Project, Series A, 7.125%, 11/15/42 | 800,000 |
| 500,000 | City of Carmel, IN, Barrington Carmel Project, Series A, 7.125%, 11/15/47 | 500,000 |
| 1,000,000 | Indiana Finance Authority, Educational Facilities, 5.125%, 7/1/37 | 900,000 |
| | | \$ 2,600,000 |
| 1,000,000 (d) | Kansas -- 0.4% Kansas Development Finance Authority, Hayes Medical Center, Inc., Series Q, 5.0%, 5/15/35 | \$ 1,000,000 |

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

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

Schedule of Investments | 9/30/17 (unaudited) (continued)

| Principal Amount USD (\$) | | Value |
|---------------------------------|--|---------------|
| <hr/> | | |
| | Louisiana -- 3.7% | |
| 7,000,000 | Jefferson Parish Hospital Service District No. 2, East Jefferson General Hospital, 6.375%, 7/1/41 | \$ 7,4 |
| 2,500,000 | Louisiana Local Government Environmental Facilities & Community Development Authority, Westlake Chemical Corp. Project, 6.75%, 11/1/32 | 2,5 |
| 750,000 | Opelousas Louisiana General Hospital Authority, Opelousas General Health System Project, 5.75%, 10/1/23 | 7 |
| | | <hr/> \$ 10,6 |
| <hr/> | | |
| | Maine -- 2.0% | |
| 1,500,000 | Maine Health & Higher Educational Facilities Authority, Maine General Medical Center, 7.5%, 7/1/32 | \$ 1,6 |
| 3,500,000 | Maine Turnpike Authority, Series A, 5.0%, 7/1/42 | 3,9 |
| | | <hr/> \$ 5,6 |
| <hr/> | | |
| | Maryland -- 3.9% | |
| 2,000,000 (d) | Maryland Health & Higher Educational Facilities Authority, Charlestown Community, 6.25%, 1/1/45 | \$ 2,3 |
| 2,160,000 | Maryland Health & Higher Educational Facilities Authority, City Neighbors, Series A, 6.75%, 7/1/44 | 2,3 |
| 1,250,000 (d) | Maryland Health & Higher Educational Facilities Authority, Doctor's Community Hospital, 5.75%, 7/1/38 | 1,4 |
| 4,500,000 | Maryland Health & Higher Educational Facilities Authority, Maryland University Medical System, Series A, 5.0%, 7/1/43 | 4,9 |
| | | <hr/> \$ 11,0 |
| <hr/> | | |
| | Massachusetts -- 9.9% | |
| 7,000,000 (b) | Massachusetts Bay Transportation Authority, Series A, 7/1/28 | \$ 5,1 |
| 2,575,000 | Massachusetts Development Finance Agency, Broad Institute, Inc., Series A, 5.25%, 4/1/37 | 2,8 |
| 975,142 | Massachusetts Development Finance Agency, Linden Ponds, Inc., Series A-1, 5.5%, 11/15/46 | 9 |
| 2,200,000 | Massachusetts Development Finance Agency, Partner's Healthcare System, Series M-4, 5.0%, 7/1/39 | 2,4 |
| 8,000,000 | Massachusetts Development Finance Agency, WGBH Foundation, Series A, 5.75%, 1/1/42 (AMBAC Insured) | 10,8 |
| 4,325,000 | Massachusetts Health & Educational Facilities Authority, Massachusetts Institute of Technology, Series K, 5.5%, 7/1/32 | 5,8 |
| | | <hr/> \$ 28,2 |
| <hr/> | | |
| | Michigan -- 3.0% | |
| 2,000,000 | Flint Michigan Hospital Building Authority, Hurley Medical | |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

Center, 7.375%, 7/1/35

\$ 2,1

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

16 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

| Principal Amount USD (\$) | | Value |
|---------------------------------|---|---------------|
| <hr/> | | |
| | Michigan -- (continued) | |
| 560,000 | Michigan Public Educational Facilities Authority, Crescent Academy, 7.0%, 10/1/36 | \$ 5 |
| 5,000,000 | Michigan State University, Series A, 5.0%, 8/15/41 | 5,7 |
| | | <hr/> \$ 8,4 |
| <hr/> | | |
| | Minnesota -- 2.6% | |
| 2,000,000 | Bloomington Port Authority, Radisson Blu Mall of America, 9.0%, 12/1/35 | \$ 2,1 |
| 1,000,000 | City of Ham Lake, MN, DaVinci Academy, Series A, 5.0%, 7/1/47 | 1,0 |
| 3,755,000(e) | State of Minnesota, Series B, 4.0%, 8/1/27 | 4,3 |
| | | <hr/> \$ 7,4 |
| <hr/> | | |
| | Montana -- 0.2% | |
| 2,445,000(c) | City of Hardin, MT, Tax Allocation, Rocky Mountain Power, Inc. Project, 6.25%, 9/1/31 | \$ 4 |
| 1,000,000(c) | Two Rivers Authority, Inc., 7.375%, 11/1/27 | 5 |
| | | <hr/> \$ 5 |
| <hr/> | | |
| | Nevada -- 0.7% | |
| 2,000,000 | County of Washoe, NV, Fuel Tax, 5.0%, 2/1/43 | \$ 2,0 |
| <hr/> | | |
| | New Hampshire -- 0.7% | |
| 2,000,000 | New Hampshire Health & Education Facilities Authority Act, Catholic Medical Center, 3.75%, 7/1/40 | \$ 1,9 |
| <hr/> | | |
| | New Jersey -- 9.1% | |
| 7,500,000 | New Jersey Economic Development Authority, Continental Airlines, 5.75%, 9/15/27 | \$ 8,3 |
| 3,500,000(f) | New Jersey State Turnpike Authority, RIB, 12.215%, 1/1/28 (144A) (AGM Insured) | 6,0 |
| 15,375,000(b) | New Jersey Transportation Trust Fund Authority, 12/15/27 (BHAC Insured) | 11,4 |
| | | <hr/> \$ 25,8 |
| <hr/> | | |
| | New York -- 6.9% | |
| 5,000,000 | New York State Dormitory Authority, Columbia University, 5.0%, 10/1/41 | \$ 5,6 |
| 2,000,000(d) | New York State Dormitory Authority, Orange Medical Center, 6.125%, 12/1/29 | 2,1 |
| 7,500,000 | New York State Dormitory Authority, Series C, | |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | | |
|-----------|--|---------|
| | 5.0%, 3/15/39 | 8,6 |
| 1,500,000 | New York State Dormitory Authority, Trustees of Columbia University, 5.0%, 10/1/45 | 1,9 |
| 1,357,463 | Westchester County Healthcare Corp., Series A, 5.0%, 11/1/44 | 1,4 |
| | | ----- |
| | | \$ 19,8 |

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

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 17

Schedule of Investments | 9/30/17 (unaudited) (continued)

| Principal Amount USD (\$) | | Value |
|---------------------------|---|---------|
| 500,000 | North Carolina -- 0.7% City of Charlotte, NC, Airport Revenue, Series A, 5.0%, 7/1/42 | \$ 5 |
| 1,250,000 | City of Charlotte, NC, Airport Revenue, Series A, 5.0%, 7/1/47 | 1,4 |
| | | ----- |
| | | \$ 2,0 |
| 3,000,000 (d) | Ohio -- 6.5% Akron Bath Copley Joint Township Hospital District, Akron General Health System, 5.0%, 1/1/31 | \$ 3,4 |
| 2,500,000 | Buckeye Tobacco Settlement Financing Authority, Asset-Backed, Series A-2, 5.875%, 6/1/47 | 2,3 |
| 9,945,000 | Buckeye Tobacco Settlement Financing Authority, Asset-Backed, Series A-2, 6.5%, 6/1/47 | 9,9 |
| 2,500,000 (e) | State of Ohio, Common Schools, Series B, 5.0%, 6/15/29 | 2,8 |
| | | ----- |
| | | \$ 18,6 |
| 1,000,000 | Oregon -- 1.2% Oregon Health & Science University, Series A, 5.0%, 7/1/42 | \$ 1,1 |
| 2,000,000 | Oregon State Facilities Authority, Samaritan Health Services, Series A, 5.25%, 10/1/40 | 2,1 |
| | | ----- |
| | | \$ 3,3 |
| 1,000,000 | Pennsylvania -- 10.3% Chester County Industrial Development Authority, Collegium Charter School, Series A, 5.25%, 10/15/47 | \$ 1,0 |
| 1,965,000 | Pennsylvania Economic Development Financing Authority, US Airways Group, Series B, 8.0%, 5/1/29 | 2,2 |
| 5,000,000 | Pennsylvania Economic Development Financing Authority, USG Corp. Project, 6.0%, 6/1/31 | 5,0 |
| 1,555,000 (d) | Pennsylvania Turnpike Commission, Series D, 5.3%, 12/1/41 | 1,6 |
| 3,445,000 (d) | Pennsylvania Turnpike Commission, Series D, 5.3%, 12/1/41 | 3,7 |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | | |
|-----------|---|---------|
| 500,000 | Philadelphia Authority for Industrial Development, Greater Philadelphia Health Action, Inc. Project, Series A, 6.625%, 6/1/50 | 5 |
| 6,000,000 | Philadelphia Authority for Industrial Development, Nueva Esperanze, Inc., 8.2%, 12/1/43 | 6,8 |
| 1,000,000 | Philadelphia Authority for Industrial Development, Performing Arts Charter School Project, 6.5%, 6/15/33 (144A) | 1,0 |
| 2,000,000 | Philadelphia Authority for Industrial Development, Performing Arts Charter School Project, 6.75%, 6/15/43 (144A) | 2,1 |
| 5,000,000 | Philadelphia Hospitals & Higher Education Facilities Authority, Temple University Health System, Series A, 5.0%, 7/1/34 | 5,0 |
| | | ----- |
| | | \$ 29,2 |

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

18 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

| Principal Amount USD (\$) | | Value |
|---------------------------|---|--------|
| 6,500,000 (c) (e) | Puerto Rico -- 1.1% Commonwealth of Puerto Rico, Series A, 8.0%, 7/1/35 | \$ 3,1 |
| 1,355,000 (c) | Rhode Island -- 1.9% Central Falls Detention Facility Corp., 7.25%, 7/15/35 | \$ 3 |
| 3,000,000 | Rhode Island Health & Educational Building Corp., Brown University, Series A, 4.0%, 9/1/37 | 3,2 |
| 1,500,000 (d) | Rhode Island Health & Educational Building Corp., Tockwatten Home Issue, 8.375%, 1/1/46 | 1,8 |
| | | ----- |
| | | \$ 5,4 |
| 4,400,000 (g) | South Carolina -- 2.1% Tobacco Settlement Revenue Management Authority, Series B, 6.375%, 5/15/30 | \$ 6,0 |
| 4,000,000 | South Dakota -- 1.4% South Dakota Health & Educational Facilities Authority, Sanford Health, Series B, 4.0%, 11/1/44 | \$ 4,0 |
| 5,000,000 | Tennessee -- 1.9% Johnson City Health & Educational Facilities Board, Mountain States Health Alliance, 6.5%, 7/1/38 | \$ 5,4 |
| 1,000,000 | Texas -- 21.1% Arlington Higher Education Finance Corp., Universal Academy, Series A, 7.0%, 3/1/34 | \$ 1,0 |
| 1,500,000 | Arlington Higher Education Finance Corp., Universal Academy, Series A, 7.125%, 3/1/44 | 1,5 |
| 2,500,000 (d) | Central Texas Regional Mobility Authority, Sub Lien, 6.75%, 1/1/41 | 2,9 |
| 2,500,000 (e) | County of Harris TX, Series A, 5.0%, 10/1/26 | 3,0 |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | | |
|-------------------|--|-----|
| 5,000,000 (e) | Goose Creek Consolidated Independent School District, Series C, 4.0%, 2/15/26 (PSF-GTD Insured) | 5,6 |
| 5,020,000 | Grand Parkway Transportation Corp., Series A, 5.5%, 4/1/53 | 5,6 |
| 2,663,453 (c) | Gulf Coast Industrial Development Authority, Microgy Holdings Project, 7.0%, 12/1/36 | |
| 1,705,000 (f) | Harris County Health Facilities Development Corp., The Methodist Hospital System, Series A-2, 0.98%, 12/1/41 | 1,7 |
| 3,000,000 | Houston Higher Education Finance Corp., St. John's School Project, Series A, 5.0%, 9/1/38 | 3,2 |
| 3,355,000 | North Texas Tollway Authority, Series A, 5.0%, 1/1/30 | 3,9 |
| 9,750,000 (d) | North Texas Tollway Authority, Series F, 5.75%, 1/1/33 | 9,8 |
| 1,500,000 (d) | Red River Health Facilities Development Corp., MRC Crestview, Series A, 8.0%, 11/15/41 | 1,8 |
| 2,000,000 (e) | Richardson Independent School District, School Building, 5.0%, 2/15/38 (PSF-GTD Insured) | 2,2 |
| 6,960,000 (c) (h) | Sanger Industrial Development Corp., Texas Pellets Project, Series B, 8.0%, 7/1/38 | 3,3 |
| 1,000,000 | Tarrant County Cultural Education Facilities Finance Corp., Mirador Project, Series A, 4.875%, 11/15/48 | 8 |

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

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 19

Schedule of Investments | 9/30/17 (unaudited) (continued)

| Principal Amount USD (\$) | | Value |
|---------------------------------|--|------------------|
| ----- | | |
| | Texas -- (continued) | |
| 750,000 | Tarrant County Cultural Education Facilities Finance Corp., Mirador Project, Series A, 5.0%, 11/15/55 | \$ 60,1 |
| 1,000,000 (c) | Texas Midwest Public Facility Corp., Secure Treatment Facility Project, 9.0%, 10/1/30 | 3 |
| 3,365,000 | Texas Private Activity Bond Surface Transportation Corp., NTE Mobility Partners LLC, 7.0%, 12/31/38 | 3,8 |
| 2,500,000 | Travis County Health Facilities Development Corp., Longhorn Village Project, 7.125%, 1/1/46 | 2,6 |
| 5,000,000 (e) | Tyler Independent School District, School Building, 5.0%, 2/15/38 (PSF-GTD Insured) | 5,6 |
| | | ----- \$ 60,1 |
| ----- | | |
| | Utah -- 2.2% | |
| 5,000,000 | County of Utah, UT, IHC Health Services, Inc., Series B, 4.0%, 5/15/47 | \$ 5,1 |
| 1,000,000 | Salt Lake City Corp., Airport Revenue, Series B, 5.0%, 7/1/36 | 1,1 |
| | | ----- \$ 6,3 |
| ----- | | |
| | Virginia -- 7.2% | |
| 2,275,000 (e) | County of Arlington, VA, 4.0%, 8/15/35 | \$ 2,4 |
| 2,000,000 | County of Washington, VA, Industrial Development Authority, Mountain States Health Alliance, Series C, 7.75%, 7/1/38 | 2,1 |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | | |
|--------------|---|---------|
| 4,550,000 | Tobacco Settlement Financing Corp., Series B-1, 5.0%, 6/1/47 | 4,4 |
| 5,000,000 | University of Virginia, Series A, 5.0%, 4/1/42 | 5,9 |
| 5,000,000 | Virginia Public School Authority Revenue, 4.0%, 8/1/25 (State Aid Withholding) | 5,6 |
| | | \$ 20,6 |
| ----- | | |
| | Washington -- 4.2% | |
| 3,000,000 | City of Seattle, WA, Water System Revenue, 4.0%, 8/1/32 | \$ 3,2 |
| 2,500,000(e) | King County, Issaquah School District No. 411, 4.0%, 12/1/31 (SCH BD GTY Insured) | 2,7 |
| 2,500,000 | University of Washington, Series B, 5.0%, 6/1/29 | 2,9 |
| 1,500,000(d) | Washington State Health Care Facilities Authority, Kadlec Regional Medical Center, 5.5%, 12/1/39 | 1,7 |
| 1,100,000 | Washington State Housing Finance Commission, Mirabella Project, Series A, 6.75%, 10/1/47 (144A) | 1,1 |
| | | \$ 11,9 |
| ----- | | |
| | West Virginia -- 0.4% | |
| 2,000,000(c) | City of Philippi, WV, Alderson-Broadus College, Inc., Series A, 7.75%, 10/1/44 | \$ 1,2 |
| ----- | | |
| | Wisconsin -- 3.5% | |
| 5,000,000 | Public Finance Authority, Glenridge Palmer Ranch, Series A, 8.25%, 6/1/46 | \$ 5,8 |

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

20 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

| Principal Amount USD (\$) | | Value |
|---------------------------------|---|----------|
| | Wisconsin -- (continued) | |
| 750,000 | Public Finance Authority, Roseman University Health Sciences Project, 5.875%, 4/1/45 | \$ 8 |
| 1,500,000 | Public Finance Authority, SearStone CCRC Project, Series A, 8.625%, 6/1/47 (144A) | 1,7 |
| 1,500,000(d) | Wisconsin Health & Educational Facilities Authority, Pro Healthcare, Inc. Group, 6.625%, 2/15/39 | 1,6 |
| | | \$ 10,0 |
| ----- | | |
| | TOTAL TAX EXEMPT OBLIGATIONS (Cost \$408,200,751) | \$ 429,5 |
| ----- | | |
| | MUNICIPAL COLLATERALIZED DEBT OBLIGATION -- 0.1% of Net Assets | |
| 13,000,000(f) | Non-Profit Preferred Funding Trust I, Series E, 0.0%, 9/15/37 (144A) | \$ 2 |
| ----- | | |
| | TOTAL MUNICIPAL COLLATERALIZED DEBT OBLIGATION (Cost \$13,000,000) | \$ 2 |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | |
|---|-----------|
| TOTAL INVESTMENTS IN UNAFFILIATED ISSUERS -- 150.7% | |
| (Cost -- \$421,200,751) | \$ 429,7 |
| OTHER ASSETS AND LIABILITIES -- 1.9% | \$ 5,4 |
| PREFERRED SHARES AT REDEMPTION VALUE, INCLUDING DIVIDENDS PAYABLE -- (52.6)% | \$ (149,9 |
| NET ASSETS APPLICABLE TO COMMON SHAREOWNERS -- 100.0% | \$ 285,2 |

(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 September 30, 2017, the value of these securities amounted to \$24,132,089, or 8.5% of total net assets applicable to common shareowners.

RIB Residual Interest Bond is purchased in a secondary market. The interest rate is subject to change periodically and inversely based upon prevailing market rates. The interest rate shown is the rate at September 30, 2017.

- (a) Consists of Revenue Bonds unless otherwise indicated.
- (b) Security issued with a zero coupon. Income is recognized through accretion of discount.
- (c) Security is in default.
- (d) 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.
- (e) Represents a General Obligation Bond.
- (f) The interest rate is subject to change periodically. The interest rate, reference index and spread shown at September 30, 2017.
- (g) Escrow to maturity.

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

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 21

Schedule of Investments | 9/30/17 (unaudited) (continued)

- (h) Security is valued using fair value methods (other than prices supplied by independent pricing services). See notes to Financial Statements -- Note 1A.

Purchases and sales of securities (excluding temporary cash investments) for the six months ended September 30, 2017 aggregated \$51,431,568 and \$50,854,156 respectively.

The Trust is permitted to engage in purchase and sale transactions ("cross trades") with certain funds and accounts for which Amundi Pioneer Asset

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

Management, Inc., formerly Pioneer Investment Management, Inc. (the Adviser) serves as the investment adviser, as set forth in Rule 17a-7 under the Investment Company Act of 1940, pursuant to procedures adopted by the Board of Trustees. Under these procedures, cross trades are effected at current market prices. During the six months ended September 30, 2017, the Trust engaged in purchases and sales pursuant to these procedures amounting to \$3,236,071 and \$-, respectively resulting in a gain of \$-.

At September 30, 2017, the net unrealized appreciation on investments based on cost for federal tax purposes of \$414,417,796 was as follows:

| | |
|--|--------------|
| Aggregate gross unrealized appreciation for all investments in which there is an excess of value over tax cost | \$ 38,802,10 |
| Aggregate gross unrealized depreciation for all investments in which there is an excess of tax cost over value | (23,482,21 |
| Net unrealized appreciation | \$ 15,319,88 |

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.

The following is a summary of the inputs used as of September 30, 2017, in valuing the Trust's investments.

| | Level 1 | Level 2 | Level 3 | Total |
|--|---------|---------------|--------------|---------------|
| Tax Exempt Obligations | | | | |
| Texas | \$ -- | \$ 56,879,130 | \$ 3,306,000 | \$ 60,185,130 |
| All Other Tax Exempt Obligations | -- | 369,325,049 | -- | 369,325,049 |
| Municipal Collateralized Debt Obligation | -- | 227,500 | -- | 227,500 |
| Total | \$ -- | \$426,431,679 | \$ 3,306,000 | \$429,737,679 |

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

22 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

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

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | Tax Exempt Obligations |
|--|---------------------------|
| Balance as of 3/31/17 | \$4,176,000 |
| Realized gain (loss) (1) | -- |
| Change in unrealized appreciation (depreciation) (2) | (868,528) |
| Purchases | -- |
| Sales | -- |
| Accrued discounts/premiums | (1,472) |
| Changes between Level 3* | -- |
| Balance as of 9/30/17 | \$3,306,000 |

(1) Realized gain (loss) on these securities is included in the net realized gain (loss) from investments in the Statement of Operations.

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

* Transfers are calculated on the beginning of period value. During six months ended September 30, 2017, there were no transfers between Levels 1, 2 and 3.

| | |
|--|--------------|
| Net change in unrealized appreciation (depreciation) of investments still held as of 9/30/17 | \$ (868,528) |
| | ===== |

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

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 23

Statement of Assets and Liabilities | 9/30/17 (unaudited)

| | |
|--|----------------------|
| ASSETS: | |
| Investments in unaffiliated issuers, at value (cost \$421,200,751) | \$429,737,679 |
| Receivables -- | |
| Investment securities sold | 2,005,444 |
| Interest | 6,084,805 |
| Total assets | \$437,827,928 |
| LIABILITIES: | |
| Due to custodian | \$ 2,405,976 |
| Payables -- | |
| Administration fee | 63,726 |
| Trustees' fees | 442 |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | |
|--|---------------|
| Due to affiliates | 50,339 |
| Accrued expenses | 122,065 |
| ----- | |
| Total liabilities | \$ 2,642,548 |
| ===== | |
| PREFERRED SHARES AT REDEMPTION VALUE: | |
| \$25,000 liquidation value per share applicable to 6,000 shares, including dividends payable of \$20,250 | \$149,979,750 |
| ----- | |
| NET ASSETS APPLICABLE TO COMMON SHAREOWNERS: | |
| Paid-in capital | \$306,599,040 |
| Undistributed net investment income | 2,755,499 |
| Accumulated net realized loss on investments | (32,685,837) |
| Net unrealized appreciation on investments | 8,536,928 |
| ----- | |
| Net assets applicable to common shareowners | \$285,205,630 |
| ===== | |
| NET ASSET VALUE PER COMMON SHARE: | |
| No par value (unlimited number of shares authorized) | |
| Based on \$285,205,630 / 23,899,020 common shares | \$ 11.93 |
| ===== | |

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

24 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

Statement of Operations (unaudited)

For the Six Months Ended 9/30/17

| | |
|---|---------------|
| INVESTMENT INCOME: | |
| Interest from unaffiliated issuers | \$10,269,200 |
| ----- | |
| Total investment income | \$ 10,269,200 |
| ----- | |
| EXPENSES: | |
| Management fees | \$ 1,314,093 |
| Administrative expense | 108,016 |
| Transfer agent fees | 7,809 |
| Shareowner communications expense | 7,448 |
| Auction agent fees | 74,309 |
| Custodian fees | 3,768 |
| Professional fees | 28,410 |
| Printing expense | 7,162 |
| Trustees' fees | 8,039 |
| Pricing fees | 11,615 |
| Miscellaneous | 44,357 |
| ----- | |
| Total expenses | \$ 1,615,026 |
| ----- | |
| Net investment income | \$ 8,654,174 |
| ----- | |
| REALIZED AND UNREALIZED GAIN (LOSS) ON INVESTMENTS: | |
| Net realized gain (loss) on: | |
| Investments from unaffiliated issuers | \$ 2,734,243 |
| Change in net unrealized depreciation on: | |
| Investments from unaffiliated issuers | (1,416,340) |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | |
|---|----------------|
| Net realized and unrealized gain (loss) on investments | \$ 1,317,903 |
| ----- | |
| DISTRIBUTIONS TO PREFERRED SHAREOWNERS FROM NET INVESTMENT INCOME: | \$ (1,184,365) |
| ----- | |
| Net increase in net assets resulting from operations | \$ 8,787,712 |
| ===== | |

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

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 25

Statements of Changes in Net Assets

| | Six Months Ended 9/30/17 (unaudited) | Year Ended 3/31/17* |
|--|---|------------------------|
| ----- | | |
| FROM OPERATIONS: | | |
| Net investment income (loss) | \$ 8,654,174 | \$ 19,075,550 |
| Net realized gain (loss) on investments | 2,734,243 | (217,084) |
| Change in net unrealized appreciation (depreciation) on investments | (1,416,340) | (16,216,394) |
| Distributions to preferred shareowners from net investment income | (1,184,365) | (1,559,147) |
| ----- | | |
| Net increase in net assets resulting from operations | \$ 8,787,712 | \$ 1,082,925 |
| ----- | | |
| DISTRIBUTIONS TO COMMON SHAREOWNERS: | | |
| Net investment income and previously undistributed net investment income (\$0.30 and \$0.74 per share, respectively) | \$ (7,109,958) | \$ (17,540,094) |
| ----- | | |
| Total distributions to common shareowners | \$ (7,109,958) | \$ (17,540,094) |
| ----- | | |
| FROM TRUST SHARE TRANSACTIONS: | | |
| Reinvestment of distributions | \$ -- | \$ 967,385 |
| ----- | | |
| Net increase in net assets applicable to common shareowners from Trust share transactions | \$ -- | \$ 967,385 |
| ----- | | |
| Net increase (decrease) in net assets applicable to common shareowners | \$ 1,677,754 | \$ (15,489,784) |
| ----- | | |
| NET ASSETS APPLICABLE TO COMMON SHAREOWNERS: | | |
| Beginning of period | 283,527,876 | 299,017,660 |
| ----- | | |
| End of period | \$285,205,630 | \$ 283,527,876 |
| ----- | | |
| Undistributed net investment income | \$ 2,755,499 | \$ 2,395,648 |
| ===== | | |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

* The Trust was audited by another independent registered public accounting firm other than Ernst & Young LLP.

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

26 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

Financial Highlights

| | Six Months Ended 9/30/17 (unaudited) | Year Ended 3/31/17* | Year Ended 3/31/16* | Year Ended 3/31/15* |
|--|---|---------------------------|---------------------------|---------------------------|
| Per Share Operating Performance | | | | |
| Net asset value, beginning of period | \$ 11.86 | \$ 12.55 | \$ 12.68 | \$ 12.83 |
| Increase (decrease) from investment operations: (a) | | | | |
| Net investment income | \$ 0.36 | \$ 0.80 | \$ 0.83 | \$ 0.83 |
| Net realized and unrealized gain (loss) on investments | 0.06 | (0.68) | 0.02 | 0.02 |
| Distributions to preferred shareowners from: | | | | |
| Net investment income | \$ (0.05) | \$ (0.07) | \$ (0.02) | \$ (0.02) |
| Net increase (decrease) from investment operations | \$ 0.37 | \$ 0.05 | \$ 0.83 | \$ 0.83 |
| Distributions to common shareowners from: | | | | |
| Net investment income and previously undistributed net investment income | \$ (0.30) | \$ (0.74) | \$ (0.96)** | \$ (0.96)** |
| Net increase (decrease) in net asset value | \$ 0.07 | \$ (0.69) | \$ (0.13) | \$ (0.13) |
| Net asset value, end of period | \$ 11.93 | \$ 11.86 | \$ 12.55 | \$ 12.83 |
| Market value, end of period | \$ 11.55 | \$ 10.99 | \$ 13.87 | \$ 13.87 |
| Total return at net asset value (b) | 3.20% (c) | 0.28% | 6.61% | 6.61% |
| Total return at market value (b) | 7.82% (c) | (15.92)% | (3.48)% | (3.48)% |
| Ratios to average net assets of common shareowners: | | | | |
| Total expenses (d) | 1.12% (e) | 1.12% | 1.21% | 1.21% |
| Net investment income before preferred share distributions | 6.02% (e) | 6.47% | 6.72% | 6.72% |
| Preferred share distributions | 0.82% (e) | 0.53% | 0.13% | 0.13% |
| Net investment income available to shareowners | 5.20% (e) | 5.94% | 6.59% | 6.59% |
| Portfolio turnover | 12% (c) | 9% | 11% | 11% |
| Net assets of common shareowners, end of period (in thousands) | \$285,206 | \$283,528 | \$299,018 | \$299,018 |

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

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 27

Financial Highlights (continued)

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

| | Six Months Ended 9/30/17 (unaudited) | Year Ended 3/31/17* | Year Ended 3/31/16 |
|---|---|---------------------------|--------------------------|
| Preferred shares outstanding (in thousands) | \$150,000 | \$150,000 | \$150,000 |
| Asset coverage per preferred share, end of period | \$ 72,531 | \$ 72,252 | \$ 74,000 |
| Average market value per preferred share (f) | \$ 25,000 | \$ 25,000 | \$ 25,000 |
| Liquidation value, including dividends payable, per preferred share | \$ 24,997 | \$ 24,998 | \$ 25,000 |

* The Trust was audited by another independent registered public accounting firm other than Ernst & Young LLP.

** 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) Total investment return is calculated assuming a purchase of common shares at the current net asset value or market value on the first day and a sale at the current net asset value or 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.

(c) Not annualized.

(d) Expense ratios do not reflect the effect of distribution payments to preferred shareowners.

(e) Annualized.

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

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

28 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

Notes to Financial Statements | 9/30/17 (unaudited)

1. Organization and Significant Accounting Policies

Pioneer Municipal High Income Advantage Trust (the Trust) was organized as a Delaware statutory trust on August 6, 2003. Prior to commencing operations on October 20, 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

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

investment objective.

On July 3, 2017, Amundi acquired Pioneer Investments, a group of asset management companies located throughout the world. Amundi, one of the world's largest asset managers, is headquartered in Paris, France. As a result of the transaction, Pioneer Investment Management, Inc., the Trust's investment adviser, became an indirect wholly owned subsidiary of Amundi and Amundi's wholly owned subsidiary, Amundi USA, Inc. Prior to July 3, 2017, Pioneer Investments was owned by Pioneer Global Asset Management S.p.A., a wholly owned subsidiary of UniCredit S.p.A.

In connection with the transaction, the names of the Trust's investment adviser and principal underwriter changed. Effective July 3, 2017, the name of Pioneer Investment Management, Inc. changed to Amundi Pioneer Asset Management, Inc. (the Adviser) and the name of Pioneer Funds Distributor, Inc. changed to Amundi Pioneer Distributor, Inc. (the Distributor).

In October 2016, the Securities and Exchange Commission (SEC) released its Final Rule on Investment Company Reporting Modernization. In addition to introducing two new regulatory reporting forms (Form N-PORT and Form N-CEN), the Final Rule amends Regulation S-X, which impacts financial statement presentation, particularly related to the presentation of derivative investments. The Fund's financial statements were prepared in compliance with the amendments to Regulation S-X.

The Trust's financial statements have been prepared in conformity with U.S. generally accepted accounting principles (U.S. GAAP) that require the management of the Trust to 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.

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 29

The Trust is an investment company and follows investment company accounting and reporting guidance under U.S. GAAP. The following is a summary of significant accounting policies followed by the Trust in the preparation of its financial statements:

A. Security Valuation

The net asset value of the Trust is computed once daily, on each day the New York Stock Exchange (NYSE) is open, as of the close of regular trading on the NYSE.

Fixed-income securities are valued by using 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, or may use a pricing matrix or other fair value methods or techniques to provide an estimated value of the security or instrument. A pricing matrix is a means of valuing a debt security on the basis of current market prices for other debt securities, historical trading patterns in the market for fixed-income securities and/or other factors. Non-U.S. debt securities that are listed on an exchange will be valued at the bid price obtained from an independent third party pricing service. When independent third party pricing services are unable to supply prices, or when prices or market quotations are considered to be unreliable, the value of that security may be determined using quotations from one or more broker-dealers.

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

Shares of open-end registered investment companies (including money market mutual funds) are valued at such Trust's net asset value. Repurchase agreements are valued at par. Cash may include overnight time deposits at approved financial institutions.

Securities for which independent pricing services or broker-dealers 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 the Adviser, pursuant to procedures adopted by the Trust's Board of Trustees. The Adviser's fair valuation team uses fair value methods approved by the Valuation Committee of the Board of Trustees. The Adviser's fair valuation team is responsible for monitoring developments that may impact fair valued securities and for discussing and assessing fair values on an ongoing basis, and at least quarterly, with the Valuation Committee of the Board of Trustees.

Inputs used when applying fair value methods to value a security may include credit ratings, the financial condition of the company, current market conditions and comparable securities. The Trust may use fair value methods if it is determined that a significant event has occurred after the close of the exchange or market on which the security trades and prior to the determination of the Trust's net asset value. Examples of a significant event

30 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

might include political or economic news, corporate restructurings, natural disasters, terrorist activity or trading halts. Thus, the valuation of the Trust's securities may differ significantly from exchange prices and such differences could be material.

At September 30, 2017, one security was valued using fair value methods (in addition to securities valued using prices supplied by independent pricing services, broker-dealers or using third party insurance pricing model) representing 1.2% of net assets. The value of this fair valued security is \$3,306,000.

B. Investment Income and Transactions

Interest income, including interest on income-bearing cash accounts, is recorded on the accrual basis, net of unrecoverable foreign taxes withheld at the applicable country rates and net of income accrued on defaulted securities.

Discounts and premiums on purchase prices of debt securities are accreted or amortized, respectively, daily, into interest income on an effective yield to maturity basis with a corresponding increase or decrease in the cost basis of the security. Premiums and discounts related to certain mortgage-backed securities are amortized or accreted in proportion to the monthly paydowns. Interest income payable by delivery of additional shares is reclassified as PIK (payment-in-kind) income upon receipt and is included in interest income.

Security transactions are recorded as of trade date. 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

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

all of its net taxable income and net realized capital gains, if any, to its shareowners. Therefore, no federal income tax provision is required. As of March 31, 2017, 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. GAAP. Distributions in excess of net investment income or net realized gains are temporary overdistributions 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.

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 31

The tax character of current year distributions payable to shareowners will be determined at the end of the current taxable year. The tax character of distributions paid to shareowners during the year ended March 31, 2017 was as follows:

| | | |
|--------------------------|-------|--------------|
| | ----- | 2017 |
| | ----- | |
| Distributions paid from: | | |
| Tax exempt income | | \$18,477,950 |
| Ordinary income | | 621,291 |
| | ----- | |
| Total | | \$19,099,241 |
| | ===== | |

The following shows the components of distributable earnings (losses) on a federal income tax basis at March 31, 2017:

| | | |
|--------------------------------------|-------|----------------|
| | ----- | 2017 |
| | ----- | |
| Distributable earnings: | | |
| Undistributed ordinary income | | \$ 224,502 |
| Capital loss carryforward | | (41,662,439) |
| Late year loss deferrals | | (599,676) |
| Other book/tax temporary differences | | 6,782,955 |
| Tax-exempt spillback | | 2,230,226 |
| Unrealized appreciation | | 9,953,268 |
| | ----- | |
| Total | | \$(23,071,164) |
| | ===== | |

The difference between book-basis and tax-basis unrealized appreciation/depreciation is primarily attributable to the realization for tax purposes of unrealized gains on investments in passive foreign investment companies,

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

the book/tax differences in the accrual of income on securities in default, the difference between book and tax amortization methods and discounts on fixed income securities.

D. Automatic Dividend Reinvestment Plan

All 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 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.

32 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

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

Whenever the Trust declares a dividend on shares payable in cash, participants in the Plan will receive the equivalent in shares acquired by the Plan Agent either (i) through receipt of additional unissued but authorized shares from the Trust or (ii) by purchase of outstanding shares on the New York Stock Exchange or elsewhere. If, on the payment date for any dividend, the net asset value per 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 shares. The number of newly issued shares to be credited to each account will be determined by dividing the dollar amount of the dividend by the net asset value per 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 share is greater than the market value (market discount), the Plan Agent will invest the dividend amount in shares acquired in open-market purchases. There are no brokerage charges with respect to newly issued 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 be able to transfer the shares to another broker and continue to participate in the Plan.

E. Risks

The value of securities held by the Trust may go up or down, sometimes rapidly or unpredictably, due to general market conditions, such as real or perceived adverse economic, political or regulatory conditions, inflation, changes in interest rates, lack of liquidity in the bond markets or adverse investor sentiment. In the past several years, financial markets have experienced increased volatility, depressed valuations, decreased liquidity

and heightened uncertainty. These conditions may continue, recur, worsen or spread.

Interest rates in the U.S. recently have been historically low, so the Trust faces a heightened risk that interest rates may rise. A general rise in interest rates may cause investors to move out of fixed income securities on a large scale, which could adversely affect the price and liquidity of fixed income securities.

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 33

The municipal bond market can be susceptible to unusual volatility, particularly for lower-rated and unrated securities. Liquidity can be reduced unpredictably in response to overall economic conditions or credit tightening. Municipal issuers may be adversely affected by rising health care costs, increasing unfunded pension liabilities, and by the phasing out of federal programs providing financial support. Unfavorable conditions and developments relating to projects financed with municipal securities can result in lower revenues to issuers of municipal securities, potentially resulting in defaults. Issuers often depend on revenues from these projects to make principal and interest payments. The value of municipal securities can also be adversely affected by changes in the financial condition of one or more individual municipal issuers or insurers of municipal issuers, regulatory and political developments, tax law changes or other legislative actions, and by uncertainties and public perceptions concerning these and other factors. Municipal securities may be more susceptible to down-grades or defaults during recessions or similar periods of economic stress. In recent periods, an increasing number of municipal issuers in the United States have defaulted on obligations and commenced insolvency proceedings. Financial difficulties of municipal issuers may continue or get worse. To the extent the Trust invests significantly in a single state, including California, Pennsylvania and Texas, or in securities the payments on which are dependent upon a single project or source of revenues, or that relate to a sector or industry, including health care facilities, education, transportation, special revenues and pollution control, the Trust will be more susceptible to associated risks and developments.

2. Management Agreement

The Adviser, manages the Trust's portfolio. Management fees payable under the Trust's Advisory Agreement with the Adviser 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 issuance of debt securities), (ii) the issuance of preferred stock or other similar preference securities, and/or (iii) any other means. For the six months ended September 30, 2017, the net management fee was 0.60% (annualized) of the Trust's average daily managed assets, which was equivalent to 0.91% (annualized) of the Trust's average daily net assets.

34 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

In addition, under the Adviser management and administration agreements, certain other services and costs are paid by the Adviser. At September 30, 2017, \$114,065, was payable to the Adviser related to management costs, administrative costs and certain other services is included in "Due to affiliates" and "Administration fee" on the Statement of Assets and Liabilities.

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

3. Transfer Agent

American Stock Transfer & Trust Company (AST) serves as the transfer agent with respect to the Trust's common shares. The Trust pays AST an annual fee, as is agreed to from time to time by the Trust and AST, for providing such services.

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

Deutsche Bank Trust Company Americas (Deutsche Bank) is the transfer agent, registrar, dividend-paying agent and auction agent with respect to the Trust's auction preferred shares (APS). The Trust pays Deutsche Bank an annual fee, as is agreed to from time to time by the Trust and Deutsche Bank, for providing such services.

4. 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 September 30, 2017 and the year ended March 31, 2017 were as follows:

| | 9/30/17 | 3/31/17 |
|---|------------|------------|
| Shares outstanding at beginning of period | 23,899,020 | 23,822,909 |
| Reinvestment of distributions | -- | 76,111 |
| Shares outstanding at end of period | 23,899,020 | 23,899,020 |

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 September 30, 2017, there were 6,000 APS as follows: Series A -- 3,000 and Series B -- 3,000.

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

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 35

for each series is 125% of the 7 day commercial paper rate or adjusted Kenny rate. Dividend rates on APS ranged from 0.0128% to 0.0189 % during the six months ended September 30, 2017.

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 ratios described in the prospectus for the APS.

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

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 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.

5. Subsequent Events

A monthly dividend was declared on October 4, 2017 from undistributed and accumulated net investment income of \$0.500 per common share payable October 31, 2017, to common shareowners of record on October 18, 2017.

Subsequent to September 30, 2017, dividends declared and paid on preferred shares totaled \$278,970 in aggregate for the two outstanding preferred share series through November 8, 2017.

The Board of Trustees has approved the redemption of the Trust's outstanding APS at the liquidation preference per share of each series of APS, together with accrued and unpaid dividends, if any, as of the redemption date.

The redemption of the Trust's APS is subject to the successful negotiation of a refinancing plan, the satisfaction of certain notice and regulatory requirements, and the closing conditions of the new financing. Specific information related to the redemption process and timeframes will be released by the Trust separately.

36 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

ADDITIONAL INFORMATION

During the period, 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.

Change in Independent Registered Public Accounting Firm

Prior to July 3, 2017 Pioneer Investment Management, Inc. (the "Adviser"), the

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

Trust's investment adviser, was an indirect, wholly owned subsidiary of UniCredit S.p.A. ("UniCredit"). On that date, UniCredit completed the sale of its Pioneer Investments business, which includes the Adviser, to Amundi (the "Transaction"). As a result of the Transaction, the Adviser became an indirect, wholly-owned subsidiary of Amundi. Amundi is controlled by Credit Agricole S.A. Amundi is headquartered in Paris, France, and, as of September 30, 2016, had more than \$1.1 trillion in assets under management worldwide.

Deloitte & Touche LLP ("D&T"), the Trust's previous independent registered public accounting firm, informed the Audit Committee and the Board that it would no longer be independent with respect to the Trust upon the completion of the Transaction as a result of certain services being provided to Amundi and Credit Agricole, and, accordingly, that it intended to resign as the Trust's independent registered public accounting firm upon the completion of the Transaction. D&T's resignation was effective on July 3, 2017, when the Transaction was completed.

During the periods as to which D&T has served as the Trust's independent registered public accounting firm, including the Trust's two most recent fiscal years preceding the fiscal year ended July 31, 2017, D&T's reports on the Trust's financial statements 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 disagreements with D&T on any matter of accounting principles or practices, financial statement disclosure, or auditing scope or procedure, which, if not resolved to the satisfaction of D&T, would have caused D&T to make reference to the subject matter of the disagreement in connection with its report on the

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 37

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.

Effective immediately following the completion of the Transaction on July 3, 2017, the Board, acting upon the recommendation of the Audit Committee, engaged a new independent registered public accounting firm, Ernst & Young LLP ("EY").

Prior to its engagement, EY had advised the Trust's Audit Committee that EY had identified the following matters, in each case relating to services rendered by other member firms of Ernst & Young Global Limited, all of which are located outside the United States, to UniCredit and certain of its subsidiaries during the period commencing July 1, 2016, that it determined to be inconsistent with the auditor independence rules set forth by the Securities and Exchange Commission ("SEC"): (a) project management support services to UniCredit in the Czech Republic, Germany, Italy, Serbia and Slovenia in relation to twenty-two projects, that were determined to be inconsistent with Rule 2-01(c)(4)(vi) of Regulation S-X (management functions); (b) two engagements for UniCredit in Italy where fees were contingent/success based and that were determined to be inconsistent with Rule 2-01(c)(5) of Regulation S-X (contingent fees); (c) four engagements where legal and expert services were provided to UniCredit in the Czech Republic and Germany, and twenty engagements where the legal advisory services were provided to UniCredit in Austria, Czech Republic, Italy and Poland, that were determined to be inconsistent with Rule 2-01(c)(4)(ix) and (x) of Regulation S-X (legal and expert services); and (d) two engagements for UniCredit in Italy involving assistance in the sale of certain assets, that were determined to be inconsistent with Rule 2-01(c)(4)(viii) of Regulation S-X (broker-dealer, investment advisor or investment banking services). None of the foregoing services involved the Trust, any of the other funds in the Pioneer Family of Funds or any other Pioneer entity sold by UniCredit in the Transaction.

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

EY advised the Audit Committee that it had considered the matters described above and had concluded that such matters would not impair EY's ability to exercise objective and impartial judgment in connection with the audits of the financial statements of the Trust under the SEC and Public Company Accounting Oversight Board independence rules, and that a reasonable investor with knowledge of all relevant facts and circumstances would reach the same conclusion. Management and the Audit Committee considered these matters and discussed the matters with EY and, based upon EY's description of the matters and statements made by EY, Management and the Audit Committee believe that EY will be capable of exercising objective and

38 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

impartial judgment in connection with the audits of the financial statements of the Trust, and Management further believes that a reasonable investor with knowledge of all relevant facts and circumstances would reach the same conclusion.

Results of Shareholder Meeting

At a special meeting held on June 13, 2017, shareholders of the Trust were asked to consider the proposal described below. A report of the total votes cast by the Trust's shareholders follows:

| | For | Against | Abstain | Broker Non-Votes |
|---|----------------|-------------|-------------|------------------|
| Proposal 1 - To approve a New Management Agreement with the Adviser | 13,115,887.183 | 874,618.256 | 578,132.000 | 0.000 |

At the annual meeting of shareowners held on September 21, 2017, shareowners of the Trust were asked to consider the proposals described below. A report of the total votes cast by the Trust's shareholders follows:

| | For | Withheld |
|---|----------------|---------------|
| Proposal 2 - To elect three Class II Trustees | | |
| Benjamin M. Friedman | 19,952,911.445 | 1,253,964.418 |
| Margaret B.W. Graham | 19,888,416.834 | 1,318,459.029 |
| Kenneth J. Taubes | 20,103,871.338 | 1,103,004.525 |

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 39

Trustees, Officers and Service Providers

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

Trustees

Thomas J. Perna, Chairman
David R. Bock
Benjamin M. Friedman
Margaret B.W. Graham
Lisa M. Jones
Lorraine H. Monchak
Marguerite A. Piret
Fred J. Ricciardi
Kenneth J. Taubes

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
Amundi Pioneer Asset Management, Inc.

Custodian and Sub-Administrator
Brown Brothers Harriman & Co.

Principal Underwriter
Amundi Pioneer Distributor, Inc.

Legal Counsel
Morgan, Lewis & Bockius LLP

Transfer Agent
American Stock Transfer & Trust Company

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 www.amundipioneer.com. This information is also available on the Securities and Exchange Commission's web site at www.sec.gov.

40 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

This page is for your notes.

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 41

This page is for your notes.

42 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

This page is for your notes.

Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17 43

This page is for your notes.

44 Pioneer Municipal High Income Advantage Trust | Semiannual Report | 9/30/17

How to Contact Amundi Pioneer

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

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

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

Account Information

1-800-225-6292

Or write to AST:

For
General inquiries, lost dividend checks,
change of address, lost stock certificates,
stock transfer

Write to
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 www.amundipioneer.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.

[LOGO] Amundi Pioneer
=====

ASSET MANAGEMENT

Amundi Pioneer Asset Management, Inc.
60 State Street
Boston, MA 02109
www.amundipioneer.com

Securities offered through Amundi Pioneer Distributor, Inc.
60 State Street, Boston, MA 02109
Underwriter of Pioneer Mutual Funds, Member SIPC
(C) 2017 Amundi Pioneer Asset Management 19435-11-1117

ITEM 2. CODE OF ETHICS.

(a) Disclose whether, as of the end of the period covered by the report, the
registrant has adopted a code of ethics that applies to the registrant's
principal executive officer, principal financial officer, principal accounting
officer or controller, or persons performing similar functions, regardless of
whether these individuals are employed by the registrant or a third party. If
the registrant has not adopted such a code of ethics, explain why it has not
done so.

The registrant has adopted, as of the end of the period covered by this report,

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

a code of ethics that applies to the registrant's principal executive officer, principal financial officer, principal accounting officer and controller.

(b) For purposes of this Item, the term "code of ethics" means written standards that are reasonably designed to deter wrongdoing and to promote:

- (1) Honest and ethical conduct, including the ethical handling of actual or apparent conflicts of interest between personal and professional relationships;
- (2) Full, fair, accurate, timely, and understandable disclosure in reports and documents that a registrant files with, or submits to, the Commission and in other public communications made by the registrant;
- (3) Compliance with applicable governmental laws, rules, and regulations;
- (4) The prompt internal reporting of violations of the code to an appropriate person or persons identified in the code; and
- (5) Accountability for adherence to the code.

(c) The registrant must briefly describe the nature of any amendment, during the period covered by the report, to a provision of its code of ethics that applies to the registrant's principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions, regardless of whether these individuals are employed by the registrant or a third party, and that relates to any element of the code of ethics definition enumerated in paragraph (b) of this Item. The registrant must file a copy of any such amendment as an exhibit pursuant to Item 10(a), unless the registrant has elected to satisfy paragraph (f) of this Item by posting its code of ethics on its website pursuant to paragraph (f)(2) of this Item, or by undertaking to provide its code of ethics to any person without charge, upon request, pursuant to paragraph (f)(3) of this Item.

The registrant has made no amendments to the code of ethics during the period covered by this report.

(d) If the registrant has, during the period covered by the report, granted a waiver, including an implicit waiver, from a provision of the code of ethics to the registrant's principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions, regardless of whether these individuals are employed by the registrant or a third party, that relates to one or more of the items set forth in paragraph (b) of this Item, the registrant must briefly describe the nature of the waiver, the name of the person to whom the waiver was granted, and the date of the waiver.

Not applicable.

(e) If the registrant intends to satisfy the disclosure requirement under paragraph (c) or (d) of this Item regarding an amendment to, or a waiver from, a provision of its code of ethics that applies to the registrant's principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions and that relates to any element of the code of ethics definition enumerated in paragraph (b) of this Item by posting such information on its Internet website, disclose the registrant's Internet address and such intention.

Not applicable.

(f) The registrant must:

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

(1) File with the Commission, pursuant to Item 12(a)(1), a copy of its code of ethics that applies to the registrant's principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions, as an exhibit to its annual report on this Form N-CSR (see attachment);

(2) Post the text of such code of ethics on its Internet website and disclose, in its most recent report on this Form N-CSR, its Internet address and the fact that it has posted such code of ethics on its Internet website; or

(3) Undertake in its most recent report on this Form N-CSR to provide to any person without charge, upon request, a copy of such code of ethics and explain the manner in which such request may be made. See Item 10(2)

ITEM 3. AUDIT COMMITTEE FINANCIAL EXPERT.

(a) (1) Disclose that the registrant's board of trustees has determined that the registrant either:

(i) Has at least one audit committee financial expert serving on its audit committee; or

(ii) Does not have an audit committee financial expert serving on its audit committee.

The registrant's Board of Trustees has determined that the registrant has at least one audit committee financial expert.

(2) If the registrant provides the disclosure required by paragraph (a)(1)(i) of this Item, it must disclose the name of the audit committee financial expert and whether that person is "independent." In order to be considered "independent" for purposes of this Item, a member of an audit committee may not, other than in his or her capacity as a member of the audit committee, the board of trustees, or any other board committee:

(i) Accept directly or indirectly any consulting, advisory, or other compensatory fee from the issuer; or

(ii) Be an "interested person" of the investment company as defined in Section 2(a)(19) of the Act (15 U.S.C. 80a-2(a)(19)).

Ms. Marguerite A. Piret, an independent trustee, is such an audit committee financial expert.

(3) If the registrant provides the disclosure required by paragraph (a)(1)(ii) of this Item, it must explain why it does not have an audit committee financial expert.

Not applicable.

ITEM 4. PRINCIPAL ACCOUNTANT FEES AND SERVICES.

(a) Disclose, under the caption AUDIT FEES, the aggregate fees billed for each of the last two fiscal years for professional services rendered by the principal accountant for the audit of the registrant's annual financial statements or services that are normally provided by the accountant in connection with statutory and regulatory filings or engagements for those fiscal years.

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

N/A

(b) Disclose, under the caption AUDIT-RELATED FEES, the aggregate fees billed in each of the last two fiscal years for assurance and related services by the principal accountant that are reasonably related to the performance of the audit of the registrant's financial statements and are not reported under paragraph (a) of this Item. Registrants shall describe the nature of the services comprising the fees disclosed under this category.

N/A

(c) Disclose, under the caption TAX FEES, the aggregate fees billed in each of the last two fiscal years for professional services rendered by the principal accountant for tax compliance, tax advice, and tax planning. Registrants shall describe the nature of the services comprising the fees disclosed under this category.

N/A

(d) Disclose, under the caption ALL OTHER FEES, the aggregate fees billed in each of the last two fiscal years for products and services provided by the principal accountant, other than the services reported in paragraphs (a) through (c) of this Item. Registrants shall describe the nature of the services comprising the fees disclosed under this category.

N/A

(e) (1) Disclose the audit committee's pre-approval policies and procedures described in paragraph (c) (7) of Rule 2-01 of Regulation S-X.

PIONEER FUNDS

APPROVAL OF AUDIT, AUDIT-RELATED, TAX AND OTHER SERVICES PROVIDED BY THE INDEPENDENT AUDITOR

SECTION I - POLICY PURPOSE AND APPLICABILITY

The Pioneer Funds recognize the importance of maintaining the independence of their outside auditors. Maintaining independence is a shared responsibility involving Pioneer Investment Management, Inc ("PIM"), the audit committee and the independent auditors.

The Funds recognize that a Fund's independent auditors: 1) possess knowledge of the Funds, 2) are able to incorporate certain services into the scope of the audit, thereby avoiding redundant work, cost and disruption of Fund personnel and processes, and 3) have expertise that has value to the Funds. As a result, there are situations where it is desirable to use the Fund's independent auditors for services in addition to the annual audit and where the potential for conflicts of interests are minimal. Consequently, this policy, which is intended to comply with Rule 210.2-01(C)(7), sets forth guidelines and procedures to be followed by the Funds when retaining the independent audit firm to perform audit, audit-related tax and other services under those circumstances, while also maintaining independence.

Approval of a service in accordance with this policy for a Fund shall also constitute approval for any other Fund whose pre-approval is required pursuant to Rule 210.2-01(c)(7)(ii).

In addition to the procedures set forth in this policy, any non-audit services that may be provided consistently with Rule 210.2-01 may be approved by the Audit Committee itself and any pre-approval that may be waived in accordance

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

with Rule 210.2-01(c) (7) (i) (C) is hereby waived.

Selection of a Fund's independent auditors and their compensation shall be determined by the Audit Committee and shall not be subject to this policy.

SECTION II - POLICY

| SERVICE CATEGORY | SERVICE CATEGORY DESCRIPTION | SPECIFIC PRE-APPROVED SERVICE SUBCATEGORIES |
|----------------------------|--|---|
| I. AUDIT SERVICES | Services that are directly related to performing the independent audit of the Funds | <ul style="list-style-type: none"> o Accounting research assistance o SEC consultation, registration statements, and reporting o Tax accrual related matters o Implementation of new accounting standards o Compliance letters (e.g. rating agency letters) o Regulatory reviews and assistance regarding financial matters o Semi-annual reviews (if requested) o Comfort letters for closed end offerings |
| II. AUDIT-RELATED SERVICES | Services which are not prohibited under Rule 210.2-01(C) (4) (the "Rule") and are related extensions of the audit services support the audit, or use the knowledge/expertise gained from the audit procedures as a foundation to complete the project. In most cases, if the Audit-Related Services are not performed by the Audit firm, the scope of the Audit Services would likely increase. The Services are typically well-defined and governed by accounting professional standards (AICPA, SEC, etc.) | <ul style="list-style-type: none"> o AICPA attest and agreed-upon procedures o Technology control assessments o Financial reporting control assessments o Enterprise security architecture assessment |

AUDIT COMMITTEE APPROVAL POLICY

AUDIT COMMITTEE REPORTING POLICY

o "One-time" pre-approval for the audit period for all pre-approved specific service subcategories. Approval of the independent auditors as auditors for a Fund shall constitute pre approval for

o A summary of all such services and related fees reported at each regularly scheduled Audit Committee meeting.

these services.

- o "One-time" pre-approval for the fund fiscal year within a specified dollar limit for all pre-approved specific service subcategories
- o Specific approval is needed to exceed the pre-approved dollar limit for these services (see general Audit Committee approval policy below for details on obtaining specific approvals)
- o Specific approval is needed to use the Fund's auditors for Audit-Related Services not denoted as "pre-approved", or to add a specific service subcategory as "pre-approved"
- o A summary of all such services and related fees (including comparison to specified dollar limits) reported quarterly.

SECTION III - POLICY DETAIL, CONTINUED

| SERVICE CATEGORY | SERVICE CATEGORY DESCRIPTION | SPECIFIC PRE-APPROVED SERVICE SUBCATEGORIES |
|-------------------|---|---|
| III. TAX SERVICES | Services which are not prohibited by the Rule, if an officer of the Fund determines that using the Fund's auditor to provide these services creates significant synergy in the form of efficiency, minimized disruption, or the ability to maintain a desired level of confidentiality. | <ul style="list-style-type: none"> o Tax planning and support o Tax controversy assistance o Tax compliance, tax returns, excise tax returns and support o Tax opinions |

AUDIT COMMITTEE APPROVAL POLICY

AUDIT COMMITTEE REPORTING POLICY

- o "One-time" pre-approval for the fund fiscal year within a specified dollar limit
- o A summary of all such services and related fees (including comparison to specified dollar limits) reported quarterly.

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

- o Specific approval is needed to exceed the pre-approved dollar limits for these services (see general Audit Committee approval policy below for details on obtaining specific approvals)
- o Specific approval is needed to use the Fund's auditors for tax services not denoted as pre-approved, or to add a specific service subcategory as "pre-approved"

SECTION III - POLICY DETAIL, CONTINUED

| SERVICE CATEGORY | SERVICE CATEGORY DESCRIPTION | SPECIFIC PRE-APPROVED SERVICE SUBCATEGORIES |
|--|---|--|
| IV. OTHER SERVICES A. SYNERGISTIC, UNIQUE QUALIFICATIONS | Services which are not prohibited by the Rule, if an officer of the Fund determines that using the Fund's auditor to provide these services creates significant synergy in the form of efficiency, minimized disruption, the ability to maintain a desired level of confidentiality, or where the Fund's auditors posses unique or superior qualifications to provide these services, resulting in superior value and results for the Fund. | <ul style="list-style-type: none"> o Business Risk Management support o Other control and regulatory compliance projects |

| AUDIT COMMITTEE APPROVAL POLICY | AUDIT COMMITTEE REPORTING POLICY |
|--|---|
| <ul style="list-style-type: none"> o "One-time" pre-approval for the fund fiscal year within a specified dollar limit o Specific approval is needed to exceed the pre-approved dollar limits for these services (see general | <ul style="list-style-type: none"> o A summary of all such services and related fees (including comparison to specified dollar limits) reported quarterly. |

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

Audit Committee approval policy below for details on obtaining specific approvals)

- o Specific approval is needed to use the Fund's auditors for "Synergistic" or "Unique Qualifications" Other Services not denoted as pre-approved to the left, or to add a specific service subcategory as "pre-approved"

SECTION III - POLICY DETAIL, CONTINUED

| SERVICE CATEGORY | SERVICE CATEGORY DESCRIPTION | SPECIFIC PROHIBITED SERVICE SUBCATEGORIES |
|---------------------|--|---|
| PROHIBITED SERVICES | Services which result in the auditors losing independence status under the Rule. | <ol style="list-style-type: none"> 1. Bookkeeping or other services related to the accounting records or financial statements of the audit client* 2. Financial information systems design and implementation* 3. Appraisal or valuation services, fairness* opinions, or contribution-in-kind reports 4. Actuarial services (i.e., setting actuarial reserves versus actuarial audit work)* 5. Internal audit outsourcing services* 6. Management functions or human resources 7. Broker or dealer, investment advisor, or investment banking services 8. Legal services and expert services unrelated to the audit 9. Any other service that the Public Company Accounting Oversight Board determines, by regulation, is impermissible |

AUDIT COMMITTEE APPROVAL POLICY

- o These services are not to be performed with the exception of the(*) services that may be permitted if they would not be subject to audit procedures at the audit client (as defined in rule 2-01(f)(4)) level the firm providing the service.

AUDIT COMMITTEE REPORTING POLICY

- o A summary of all services and related fees reported at each regularly scheduled Audit Committee meeting will serve as continual confirmation that has not provided any restricted services.

GENERAL AUDIT COMMITTEE APPROVAL POLICY:

- o For all projects, the officers of the Funds and the Fund's auditors will each make an assessment to determine that any proposed projects will not impair independence.
 - o Potential services will be classified into the four non-restricted service categories and the "Approval of Audit, Audit-Related, Tax and Other Services" Policy above will be applied. Any services outside the specific pre-approved service subcategories set forth above must be specifically approved by the Audit Committee.
 - o At least quarterly, the Audit Committee shall review a report summarizing the services by service category, including fees, provided by the Audit firm as set forth in the above policy.
-

(2) Disclose the percentage of services described in each of paragraphs (b) through (d) of this Item that were approved by the audit committee pursuant to paragraph (c) (7) (i) (C) of Rule 2-01 of Regulation S-X.

N/A

(f) If greater than 50 percent, disclose the percentage of hours expended on the principal accountants engagement to audit the registrant's financial statements for the most recent fiscal year that were attributed to work performed by persons other than the principal accountant's full-time, permanent employees.

N/A

(g) Disclose the aggregate non-audit fees billed by the registrants accountant for services rendered to the registrant, and rendered to the registrants investment adviser (not including any sub-adviser whose role is primarily portfolio management and is subcontracted with or overseen by another investment adviser), and any entity controlling, controlled by, or under common control with the adviser that provides ongoing services to the registrant for each of the last two fiscal years of the registrant.

N/A

(h) Disclose whether the registrants audit committee of the board of trustees has considered whether the provision of non-audit services that were rendered to the registrants investment adviser (not including any subadviser whose role is primarily portfolio management and is subcontracted with or overseen by another investment adviser), and any entity controlling, controlled by, or under common control with the investment adviser that provides ongoing services to the registrant that were not pre-approved pursuant to paragraph (c) (7) (ii) of Rule 2-01 of Regulation S-X is compatible with maintaining the principal accountant's independence.

The Fund's audit committee of the Board of Trustees has considered whether the provision of non-audit services that were rendered to the Affiliates (as defined) that were not pre-approved pursuant to paragraph (c) (7) (ii) of Rule 2-01 of Regulation S-X is compatible with maintaining the principal accountant's independence.

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

ITEM 5. AUDIT COMMITTEE OF LISTED REGISTRANTS

(a) If the registrant is a listed issuer as defined in Rule 10A-3 under the Exchange Act (17 CFR 240.10A-3), state whether or not the registrant has a separately-designated standing audit committee established in accordance with Section 3(a)(58)(A) of the Exchange Act (15 U.S.C. 78c(a)(58)(A)). If the registrant has such a committee, however designated, identify each committee member. If the entire board of directors is acting as the registrant's audit committee as specified in Section 3(a)(58)(B) of the Exchange Act (15 U.S.C. 78c(a)(58)(B)), so state.

N/A

(b) If applicable, provide the disclosure required by Rule 10A-3(d) under the Exchange Act (17 CFR 240.10A-3(d)) regarding an exemption from the listing standards for audit committees.

N/A

ITEM 6. SCHEDULE OF INVESTMENTS.

File Schedule of Investments in securities of unaffiliated issuers as of the close of the reporting period as set forth in 210.1212 of Regulation S-X [17 CFR 210.12-12], unless the schedule is included as part of the report to shareholders filed under Item 1 of this Form.

Included in Item 1

ITEM 7. DISCLOSURE OF PROXY VOTING POLICIES AND PROCEDURES FOR CLOSED-END MANAGEMENT INVESTMENT COMPANIES.

A closed-end management investment company that is filing an annual report on this Form N-CSR must, unless it invests exclusively in non-voting securities, describe the policies and procedures that it uses to determine how to vote proxies relating to portfolio securities, including the procedures that the company uses when a vote presents a conflict between the interests of its shareholders, on the one hand, and those of the company's investment adviser; principal underwriter; or any affiliated person (as defined in Section 2(a)(3) of the Investment Company Act of 1940 (15 U.S.C. 80a-2(a)(3)) and the rules thereunder) of the company, its investment adviser, or its principal underwriter, on the other. Include any policies and procedures of the company's investment adviser, or any other third party, that the company uses, or that are used on the company's behalf, to determine how to vote proxies relating to portfolio securities.

N/A

ITEM 8. PORTFOLIO MANAGERS OF CLOSED-END MANAGEMENT INVESTMENT COMPANIES.

(a) If the registrant is a closed-end management investment company that is filing an annual report on this Form N-CSR, provide the following information:

(1) State the name, title, and length of service of the person or persons employed by or associated with the registrant or an investment adviser of the registrant who are primarily responsible for the day-to-day management

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

of the registrant's portfolio ("Portfolio Manager"). Also state each Portfolio Manager's business experience during the past 5 years.

N/A

ITEM 9. PURCHASES OF EQUITY SECURITIES BY CLOSED-END MANAGEMENT INVESTMENT COMPANY AND AFFILIATED PURCHASERS.

(a) If the registrant is a closed-end management investment company, in the following tabular format, provide the information specified in paragraph (b) of this Item with respect to any purchase made by or on behalf of the registrant or any affiliated purchaser, as defined in Rule 10b-18(a)(3) under the Exchange Act (17 CFR 240.10b-18(a)(3)), of shares or other units of any class of the registrant's equity securities that is registered by the registrant pursuant to Section 12 of the Exchange Act (15 U.S.C. 781).

During the period covered by this report, there were no purchases made by or on behalf of the registrant or any affiliated purchaser as defined in Rule 10b-18(a)(3) under the Securities Exchange Act of 1934 (the Exchange Act), of shares of the registrants equity securities that are registered by the registrant pursuant to Section 12 of the Exchange Act.

ITEM 10. SUBMISSION OF MATTERS TO A VOTE OF SECURITY HOLDERS.

Describe any material changes to the procedures by which shareholders may recommend nominees to the registrant's board of directors, where those changes were implemented after the registrant last provided disclosure in response to the requirements of Item 407(c)(2)(iv) of Regulation S-R(17 CFR 229.407) (as required by Item 22(b)(15)) of Schedule 14A (17 CFR 240.14a-101), or this Item.

There have been no material changes to the procedures by which the shareholders may recommend nominees to the registrant's board of directors since the registrant last provided disclosure in response to the requirements of Item 407(c)(2)(iv) of Regulation S-R of Schedule 14(A) in its definitive proxy statement, or this item.

ITEM 11. CONTROLS AND PROCEDURES.

(a) Disclose the conclusions of the registrant's principal executive and principal financial officers, or persons performing similar functions, regarding 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 the evaluation of these controls and procedures required by Rule 30a-3(b) under the Act (17 CFR 270.30(a)-3(b) and Rules 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 the evaluation of these controls and procedures as of a date within 90 days of the

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

filing date of this report.

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

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.

The registrant's principal executive officer and principal financial officer, however, voluntarily are reporting the following information:

In August of 2006 the registrant's investment adviser enhanced its internal procedures for reporting performance information required to be included in prospectuses. Those enhancements involved additional internal controls over the appropriateness of performance data generated for this purpose. Such enhancements were made following an internal review which identified prospectuses relating to certain classes of shares of a limited number of registrants where, inadvertently, performance information not reflecting the deduction of applicable sales charges was included. Those prospectuses were revised, and the revised prospectuses were distributed to shareholders.

ITEM 12. EXHIBITS.

(a) File the exhibits listed below as part of this Form. Letter or number the exhibits in the sequence indicated.

(1) Any code of ethics, or amendment thereto, that is the subject of the disclosure required by Item 2, to the extent that the registrant intends to satisfy the Item 2 requirements through filing of an exhibit.

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

Filed herewith.

SIGNATURES

[See General Instruction F]

Edgar Filing: PIONEER MUNICIPAL HIGH INCOME ADVANTAGE TRUST - Form N-CSRS

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/ Lisa M. Jones
Lisa M. Jones, President & Chief Executive Officer

Date November 29, 2017

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/ Lisa M. Jones
Lisa M. Jones, President & Chief Executive Officer

Date November 29, 2017

By (Signature and Title)* /s/ Mark E. Bradley
Mark E. Bradley, Treasurer & Chief Accounting & Financial Officer

Date November 29, 2017

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