

RatingsDirect®

Massachusetts; Appropriations; CP; General Obligation; General Obligation Equivalent Security; Joint Criteria; Sales Tax

Primary Credit Analyst:

David G Hitchcock, New York (1) 212-438-2022; david.hitchcock@spglobal.com

Secondary Contact:

Timothy W Little, New York (212) 438-7999; timothy.little@spglobal.com

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Credit Profile		
US\$300.0 mil GO bnds consolidated loan ser 2017F due 11/01/2046		
<i>Long Term Rating</i>	AA/Stable	New
US\$300.0 mil GO bnds consolidated loan ser 2017E due 11/01/2036		
<i>Long Term Rating</i>	AA/Stable	New
US\$218.125 mil GO rfdg bnds ser 2017E due 11/01/2027		
<i>Long Term Rating</i>	AA/Stable	New
Massachusetts GO		
<i>Long Term Rating</i>	AA/Stable	Affirmed

Rationale

S&P Global Ratings has assigned its 'AA' rating to the Commonwealth of Massachusetts' \$300 million general obligation (GO) bonds, consolidated loan of 2017, series E; \$300 million GO bonds, consolidated loan of 2017, series F; and \$218.125 million GO refunding bonds, 2017 series E.

In addition, S&P Global Ratings has affirmed its 'AA' rating on approximately \$22 billion of parity GO bonds outstanding, and its 'A' rating on Boston Housing Authority housing project bonds, West Broadway Homes IV project, series 2003, supported by the commonwealth. The outlook on all ratings is stable.

Factors supporting the 'AA' GO rating include what we view as Massachusetts':

- Deep and diverse economy, which continues to outperform the nation on several economic indicators;
- High income levels, with per capita income at 130% of the nation in 2016;
- Timely monitoring of revenues and expenditures and swift action when needed to make adjustments;
- Strong financial, debt, and budget management policies, including annualized formal debt affordability statements, and multiyear capital investment planning; and
- Modest budget stabilization fund (BSF) balance, equal to 3.1% of expenditures at fiscal year-end 2017.

Offsetting factors include high debt, pension, and other postemployment benefit (OPEB) liabilities. In particular, the commonwealth has a low 57% pension funded ratio and has contributed less to its pension funds in recent years than the actuarial annual required contribution (ARC) using the state's actuarial methodology; however, Massachusetts has put in place a plan to increase annual pension contributions 8.9% per year in order to fully amortize unfunded pension liabilities by 2036. The state has budgeted to pay 73% of ARC in fiscal 2018.

We understand consolidated loan 2017 series E and F bond proceeds will be used to fund various capital projects included in the commonwealth's five-year capital improvement plan (CIP), while the refunding 2017 series E will

refund various bonds outstanding.

Massachusetts' economy has recovered steadily, outpacing national and regional trends by most measures. Real state GDP rose 2.02% in 2016, compared with 1.54% for the nation. The commonwealth's average annual unemployment rate in 2016 was 3.7% compared with 4.9% for the nation. The state unemployment rate has inched up slightly to 4.3% as of July 2017, the same as the nation, reflecting growth in the labor force that is outpacing employment growth. Following the financial crisis, employment growth was strong relative to that of other states and the commonwealth regained its pre-recession employment peak in 2013, according to the Bureau of Labor Statistics. However, IHS Markit forecasts slightly lower state employment growth in 2017, 2018, and 2019 at 1.5%, 1.1%, and 1.0%, respectively, in those years, compared with its forecast of 1.5%, 1.4%, and 1.2% for the U.S. in those years, respectively. In our view, Massachusetts' economic fundamentals and key anchors, which center on higher education, technology, and health care, should contribute to continued expansion. Income growth has also been strong relative to that of other states, with 2016 per capita personal income ranked second behind that of Connecticut, at 130% of the U.S. average.

Despite a prolonged period of economic expansion and generally positive revenue trends, Massachusetts continues to operate with thin operating margins and has needed several rounds of midyear budget adjustments over the past three years to address a combination of revenue shortfalls and spending pressures. The commonwealth identified several rounds of midyear budget gaps in fiscal 2017 that were met with midyear spending adjustments. The commonwealth ended fiscal 2017 with a BSF balance of \$1.3 billion, or 3.1% of operating expenditures and other uses, almost unchanged from the year before. The commonwealth is currently budgeting for a fiscal year-end 2018 BSF balance of \$1.4 billion, or 3.2%, should capital gains tax meet budgeted levels. Massachusetts reports that through September 2017, tax revenues have been running a slight \$124 million over budget. Total fiscal 2018 reserves are currently budgeted at \$1.3 billion, including a projected negative undesignated balance of \$113 million, or 3.0%. Projected balances include the effect of the governor's line-item vetoes, some of which have been overridden by the legislature, with others pending. The commonwealth believes that if all vetoes were overridden the net exposure to the general fund budget would only be about \$124 million.

The enacted fiscal 2018 budget, exclusive of vetoes, projects 3.7% growth in operating fund tax revenue, and 3.3% total operating revenue growth. After spending growth of 3.5%, it projects a slight operating deficit of \$144 million, or 0.3% of spending. We view the 2018 budget as generally structurally balanced, except for the \$898 million actuarial shortfall in funding the 2018 annual pension contribution. The revenue forecast no longer assumes an income tax reduction to 5.05% from 5.10%, effective Jan. 1, 2018, pursuant to state law when historical revenue growth exceeds certain targets. In previous years, enacted budgets have overridden statutory procedure for transferring certain excess capital gains tax into the BSF in order to use it for operating spending. Massachusetts is projecting capital gains taxes at about its threshold for determining excess capital gains in fiscal 2018, and it is unclear this early in the year the extent to which excess capital gains tax may be available to distributed to the BSF per formula.

Other budgetary pressures for fiscal 2018 and beyond include MassHealth expenses that are budgeted to rise at a faster rate than revenues and that have been one of main sources of previous midyear budget adjustments. Additional long-term pressures include a state pension payment schedule that increases annual pension contributions by 8.9% annually, a pace we believe is likely to exceed revenue growth. Although we recognize that Massachusetts has made

budgeting its fixed costs a priority, we also view the growth in these areas as placing increased pressure on the commonwealth's ability to maintain structural balance. We calculate that combined operating funds debt service, pension, and OPEB costs (not including a \$25 million advance contribution to an OPEB trust fund) budgeted in fiscal 2018 total \$5.2 billion, or 12.1% of budgeted expenditures and other uses.

A citizen's initiative has qualified for the November 2018 ballot for a 4% income tax surcharge on wealthy individuals, but proceeds targeted for specific purposes. This initiative is currently undergoing a court challenge. Four other initiatives are also circulating that would reduce the state sales tax rate, with potential effect on future years' budgets, although none has qualified for the ballot.

On a generally accepted accounting principles (GAAP) basis, Massachusetts ended fiscal 2016 (the most recent audited year) with an available assigned and unassigned general fund balance of \$1.28 billion, plus a BSF balance of \$1.29 billion. This led to a combined balance that we view as still strong at 6.6% of general fund expenditures and transfers out, but down from 7.5% in fiscal 2015.

By most measures, we believe Massachusetts' debt burden remains high compared with that of other states. At fiscal year-end 2016, we calculate GO debt of \$21.7 billion and total tax-supported debt of \$35.4 billion, producing total tax-backed debt per capita of \$5,199, and 8.1% of personal income. As of August 2017, the state had \$22.4 billion of GO debt outstanding. Planned debt issuance remains within the parameters of the commonwealth's debt affordability policy and bond cap. A capital and debt affordability committee includes seven voting and eight nonvoting members from the legislature and is charged with formally reviewing the CIP and providing an estimate of debt authorization for each year to stay within certain debt parameters. Massachusetts' currently anticipates selling about \$2.1 billion of new capital debt in fiscal 2018, similar to issuance levels in each of the past two years. We calculate fiscal 2016 total tax-backed debt service at 7.3% of general governmental spending, a level we view as moderately high.

Other long-term liabilities are also large, in our opinion. We believe Massachusetts' share of the combined net pension liability for state employees' and teachers' retirement systems is high at \$37.7 billion as of the Jan. 1, 2016, valuation date on a Governmental Accounting Standards Board (GASB) 67/68 basis, or \$5,534 per capita, and 8.6% of personal income. The aggregate funded ratio dropped to 57.3% from 60.7% in fiscal 2016 on a GASB basis and the three-year average declined to 62% from 63% in fiscal 2016. The decline in the commonwealth's actuarial pension funded ratio as of the Jan. 1, 2016, actuarial valuation date was primarily due to the state's decision to lower assumed actuarial returns to a less aggressive 7.50% in 2016 from 7.75%, after previously lowering it to 7.75% from 8.00% in 2015.

Massachusetts' actuarial report as of Jan. 1, 2017, using the state's actuarial methodology, shows an essentially unchanged combined funded ratio of 56.7% on an actuarial basis and 55.8% on a market value basis. Massachusetts sets its annual pension contribution based on its own methodology under state statute; it has not fully funded its ARC since fiscal 2011, but currently plans to increase pension contributions 8.9% per year to fully amortize the unfunded liability by 2036.

In our opinion, Massachusetts' unfunded OPEB is also moderately high, at \$16.3 billion as of Jan. 1, 2016, net of \$760.4 million of actuarial assets in an OPEB trust fund, or \$2,396 per capita. Massachusetts has in recent years made payments to an OPEB trust fund. In fiscal years 2016 and 2017, the legislature appropriated 10% of tobacco settlement revenue, equal to about \$25 million per year to the OPEB trust fund.

The commonwealth's combined budgetary debt service, pension payments, and OPEB payments were about 12% of budgeted expenditures in fiscal 2016, 12.7% in fiscal 2017, and are budgeted to be about 12.1% in fiscal 2018.

Based on the analytic factors we evaluate for states, on a scale of '1.0' (strongest) to '4.0' (weakest), we have assigned a composite score of '1.9' to Massachusetts, which is consistent with a 'AA' indicative rating.

Outlook

The stable outlook reflects our view that Massachusetts' strong economic growth and proactive management will allow it to continue to manage its budgetary pressures, even amid midyear budget shortfalls, albeit with some continued use of one-time measures to balance the budget. At the current rating level, we expect the commonwealth to maintain relatively stable, although somewhat limited, reserves. We further expect it to take measures to manage the impacts of potentially increased Medicaid costs should healthcare reform legislation negatively affect revenues.

Upside scenario

Should the commonwealth demonstrate a renewed commitment to building its reserves during periods of economic growth, absent rising long-term liability funding pressures, we could raise the rating.

Downside scenario

The rating could see further downward pressure if the commonwealth fails to maintain near-structural balance during periods of economic expansion. Among the factors that could further pressure the rating are increased Medicaid costs, reduced revenues due to income tax cyclicity, and growing fixed costs in excess of revenue growth leading to significant structural imbalance and greatly diminished reserves. Structural balance could also be pressured to the extent that Massachusetts fails to adhere to its current plan to increase annual pension contributions by 8.9% per year in order to amortize unfunded pension liabilities.

Governmental Framework

State finance law requires that the governor submit a balanced budget and the House and Senate each produce a balanced budget. The final general appropriation act must also be balanced. If there is a revenue shortfall, the governor is required by section 9C of Chapter 29 to reduce agency appropriations or recommend a transfer from the BSF.

Massachusetts has autonomy to raise taxes and has adjusted its tax structure. Medicaid accounts for about 37% of total spending while direct local aid accounts for about 14% of fiscal 2017 spending. Funding levels for major program areas have been adjusted as needed. Massachusetts voters have approved revenue growth limitations, but these have not negatively affected operations or limited flexibility, in our view. More significant measures to reduce or eliminate major tax sources have been on the ballot but not approved.

The commonwealth is authorized to issue GO debt, special obligation debt, and federal grant anticipation notes. There is a statutory limit on debt outstanding and a policy limitation as stipulated by the commonwealth's debt affordability policy published annually with its CIP, which is designed to limit debt service on Massachusetts' direct debt to no more than 8% of budgeted revenues. These limitations have not impaired flexibility to manage capital and infrastructure

requirements. There is no statutory priority for funding debt, but debt service payments are not subject to the warrant requirement applicable to other state spending, and we understand that the comptroller and other state officials have developed procedures to prioritize payments and that debt service is given the highest priority among various payment obligations.

On a scale from '1.0' (strongest) to '4.0' (weakest), S&P Global Ratings assigned a score of '1.5' to the commonwealth's governmental framework.

Financial Management

Financial management assessment: Strong

S&P Global Ratings maintains a strong financial management assessment (FMA) score for Massachusetts. In its framework, an FMA of strong indicates that practices are strong, well embedded, and likely sustainable. Many of the commonwealth's management practices related to debt and financial management are embedded in statute.

Highlights include the following:

- Massachusetts uses internal resources and outside economic forecasting firms to develop consensus revenue forecast. It has regularly performed monthly revenue estimates and quarterly budget reviews. Legislation approved in 2008 requires that revenue reports be submitted semimonthly to the legislature.
- A five-year CIP (administrative intent, not binding) coordinates every facet of debt issuance. The CIP includes a detailed debt affordability analysis that officials update each year.

The commonwealth has detailed and frequently reviewed investment policies managed through the office of the treasurer. Quarterly cash flow projections are prepared and submitted to the legislature.

Massachusetts has a statutorily established BSF that prescribes a mechanism for funding, as well as funding levels; however, the mechanism has been weakened in the past few years by the decision to adjust deposit thresholds and suspend required transfers into the fund. Statute requires the deposit of 100% of consolidated net surplus in any given year into the BSF. The statute also provides that the BSF's maximum amount cannot exceed 15% of the current year's revenues. The commonwealth must use any excess for tax reduction. A change in 2010 directed capital gains tax revenues of more than \$1 billion to the fund, although Massachusetts has suspended this in the past two years. Legislation from 2012 indexes the capital gains amount to growth in U.S. GDP. The statute also directs 5% of the excess to the state retiree benefits trust fund and the pension liability fund. We believe this measure has the benefit of enhancing the fund while decreasing budget reliance on this cyclical revenue source. Nevertheless, in fiscal years 2015 and 2016, the commonwealth diverted to the general fund excess capital gains tax that would otherwise have gone to the BSF. A revised threshold and lower collections in fiscal 2017 eliminated the potential for a transfer in that fiscal year. Some judgments and settlements must also be deposited to the fund, although this requirement was modified in fiscal 2015 so that only settlements and judgments exceeding the average of the total for the preceding five fiscal years would be transferred to the BSF.

There are statutory limits on debt issuance. For direct debt, there is a limit allowing the issue of up to 105% of the previous year's limit. In addition to the aforementioned statutory requirement, the governor's office adheres to an

administrative bond cap (debt service capped at 8% of budgeted revenues), which sets the annual limit on debt issuance. The treasurer's office maintains debt management and swap policies that we view as comprehensive. Officials also introduced an asset-liability management policy in fiscal 2014.

The commonwealth has detailed and frequently reviewed investment policies managed through the office of the treasurer. Quarterly cash flow projections are prepared and submitted to the legislature.

Budget Management Framework

Once the budget is approved, the Secretary of Administration and Finance (A&F) monitors expenditures, at least quarterly, and receives regular monthly updates on revenue receipts. The A&F secretary is required to formally update revenue projections and submit them to the legislature in October. If officials expect projected revenues to be insufficient to meet appropriations, A&F certifies this and, pursuant to statute (section 9C of Chapter 29), the governor is required to reduce allotments, or submit proposals to raise additional revenues or to make appropriations from the BSF to restore balance. Budget adjustments have historically been implemented regularly and on time, and deficits are not carried forward.

Massachusetts is a voter-initiative state. Although there have been initiatives that limit the overall growth in state tax revenue and a limit on the amount of bonds outstanding and debt service appropriations, these have not substantially altered Massachusetts' ability to manage its budget or fund debt service in our opinion. While more recent ballot initiatives to reduce or eliminate the commonwealth's major tax sources were not approved, the legislature can amend an initiative, and a recent initiative rolled back inflation indexing for a gas tax. An initiative to add an extra 4% income tax to annual income of more than \$1 million a year received enough signatures for the legislature to consider placing it on the November 2018 ballot. The legislature gave the initiative its initial approval in May 2016, and it will be placed on the 2018 ballot, if at least 25% of the legislature also approves it in the upcoming legislative session. However, the measure is currently undergoing litigation that could knock it off the ballot as an unconstitutional appropriation of funds, because it directs the extra revenue to specific uses. If it passes court muster and is approved by the voters in November 2018, the measure would become law effective in calendar 2019 (for half of fiscal 2020).

There are also four separate initiatives circulating to reduce the state sales tax rate by differing amounts. None of these initiatives has had enough signatures collected as yet to be placed before the legislature.

The commonwealth provides a relatively high level of service, in our opinion. Adjustments have been made to programs but reductions to areas such as education have been limited.

On a scale from '1.0' (strongest) to '4.0' (weakest), S&P Global Ratings assigned a score of '1.0' to Massachusetts' financial management framework.

Economy

Massachusetts' labor market fared relatively well in 2016. Unemployment rates have declined at a steady pace due to positive employment trends. The average annual unemployment rate for 2016 was 3.7%, which was below the 5.3%

rate for the nation, while the state unemployment rate as of July 2017 had rose slightly to 4.3%, the same rate as the nation. The U.S. Census Bureau population estimate for Massachusetts in 2016 is 6.8 million, a 0.4% increase from 2015, and a 6.1% increase over the past 10 years, compared with 8.0% for the nation. Population growth has outpaced the region since 2007 but continues to lag the nation and we expect this trend to continue. The commonwealth's age dependency ratio of nonworking age population to working age population, at 56.3% in 2016, was better than that of the nation (61.3%).

Massachusetts has always had high income levels. Per capita personal income increased to \$64,235 in 2016, or 130% of the national level--a ratio the commonwealth has held consistently for the past seven years. We expect that income will remain well ahead of that of other states based on the nature of the jobs being created and the pace of expansion. IHS Markit projects real state gross product to rise 2.2% in 2017, 2.3% 2018, 2.1% in 2019, and 1.9% in 2020, at rates slightly under, but comparable to, its forecast for the U.S. In 2016, gross state product per capita was 131% of that of the nation.

The economy has diversified and education and health services now make up the primary employment sectors, accounting for 22.0% of total nonfarm employment in 2016 according to the Bureau of Labor Statistics, compared with 15.7% for the nation. This is followed by trade and transport (16.1% versus 18.9% nationally) and professional business services (15.4% versus 13.9%). Cyclical sectors, such as manufacturing and construction, represent only 6.9% and 4.1% of employment, respectively. The increasing role of services in the economy reflects growth in research laboratories, computer software, management consulting, other business services, and health care. Higher education anchors, a high level of federal research funding, and venture capital give the commonwealth a leading edge in emerging industries, such as biotechnology, software, communications equipment, and surgical instruments. In addition, its defense-related industries continue to perform well. Massachusetts ranks eighth out of the 50 states by value of federal defense and research contract awards. It is unclear how proposed increased spending at the federal level would affect the commonwealth's economy.

On a scale from '1.0' (strongest) to '4.0' (weakest), S&P Global Ratings assigned a score of '1.4' to Massachusetts' economy.

Budgetary Performance

The state has established a formal BSF under statutory law that receives excess capital gains taxes over a threshold amount, indexed for inflation. A threshold of \$1 billion was in effect for fiscal years 2011, 2012, and 2013. Since then, the threshold is subject to annual adjustment to reflect the average annual rate of growth in U.S. GDP over the preceding five years. Under statutory law, tax revenues collected from capital gains income during a fiscal year that exceed the threshold are required to be transferred to the BSF, with 5% of the amount so deposited then transferred to the State Retiree Benefits Trust Fund (for OPEB) and an additional 5% transferred to the commonwealth's pension liability fund. However, in fiscal years 2015 and 2016 state budgets diverted capital gains taxes that would have otherwise flowed to the BSF to instead pay for general fund budget expenditures. In 2017, capital gains taxes came in below the level that would have triggered a transfer of excess capital gains to the BSF. The enacted fiscal 2018 budget anticipates that capital gains will be just enough over the excess tax threshold to result in a small transfer to the BSF.

The administration has filed legislation to establish a floor of \$51.5 million for the transfer to the BSF in fiscal 2018.

The enacted fiscal 2018 budget, exclusive of vetoes, projects 3.7% growth in operating fund tax revenue, and 3.3% total operating revenue and other sources growth, to \$43.04 billion. After spending and other uses growth of 3.5%, to \$43.18 billion, it projects a slight operating deficit of \$144 million, or 0.3% of spending. In our view, the 2018 budget is close to structural balance, apart from the \$898 million underfunding of the pension ARC, still a modest 2% of total expenditures and other uses. However, even though Massachusetts is in the eighth year of economic recovery and experiencing positive revenue trends, and despite policies that were intended to more aggressively build up reserves to help the commonwealth manage through revenue downturns, budget worries remain, in our view, regarding growth in MassHealth and pension spending and the lack of a build-up of the BSF during a period of positive revenue growth.

The BSF reached a peak of \$2.335 billion at fiscal year-end 2007, before being drawn down to \$670 million at fiscal year-end 2010 during the Great Recession. The commonwealth subsequently began using judgments and settlement and other surpluses to build up the fund again to \$1.65 billion at fiscal year-end 2012, before drawing it down to \$1.25 billion in 2014. The BSF balance stood at \$1.30 billion at fiscal year-end 2017, or 3.1% of operating expenditures. The enacted 2018 budget projects a \$79 million deposit to the BSF, which will depend in part on actual capital gains taxes collected during the year. Budgeted fiscal 2018 capital gains tax in total represents about 5% of fiscal 2018 operating tax revenues.

We view Massachusetts' liquidity as strong, with the help of annual cash flow note borrowing. The commonwealth does not engage in interfund borrowing. It currently projects to end fiscal 2018 with a general fund cash balance of \$2.2 billion, and estimates its month-end cash low point in fiscal 2018 will have been February 2018, with a \$1.2 billion non-segregated operating funds cash balance. Earlier in fiscal 2018, the commonwealth issued \$1.5 billion in revenue anticipation notes, maturing in April, May, and June 2018. Cash flow notes must be repaid by the end of the fiscal year. Fiscal 2017 ended with a non-segregated operating funds cash position of \$2.1 billion.

We view Massachusetts' revenue sources as diverse. Income tax was 57% of operating funds tax revenue in fiscal 2017 on a budgetary basis, and sales tax was 24%.

We believe the commonwealth's revenue forecasting is good. Massachusetts prepares quarterly revenue updates and uses a consensus revenue forecast for budgeting purposes. We believe that state budgeting has historically been done with an eye toward long-term structural balance, apart from below ARC pension contributions. However, we believe that Massachusetts is a high service state, with expenditures that could be difficult to reduce at times. In particular, Medicaid plus health and human services spending accounts for 50% of fiscal 2018 total budgeted expenditures, while operating funds' debt service accounted for about 5.6%. Pension funding costs from operating funds in fiscal 2018 are scheduled to increase 8.9% to \$2.39 billion, or 5.5%, while OPEB costs for current retirees are about another 1.0%, not including a \$25 million transfer to the state's OPEB trust fund to pre-fund future liabilities.

On a scale from '1.0' (strongest) to '4.0' (weakest), S&P Global Ratings assigned a score of '2.0' to Massachusetts' budgetary performance.

Debt And Liabilities

We calculate total GO bond proceeds outstanding at fiscal year-end 2016, the most recent audited year, at \$20.8 billion, and total tax-supported debt at \$34.5 billion, including debt issued by Massachusetts' authorities and supported by the statewide sales tax, gas taxes, and debt of state agencies supported by annual state contract assistance payments. The commonwealth reports it had \$22 billion of GO debt outstanding as of Aug. 31, 2017. By most measures, Massachusetts' debt burden remains high compared with that of other states. The variable-rate portfolio is 17% of total GO debt, and the commonwealth actively manages this under formal debt policies. About \$1.6 billion, or 8% of state GO debt, consists of unhedged variable-rate bonds, with the remainder of the variable-rate debt's interest rates synthetically fixed through interest rate swaps. Massachusetts has a multiyear asset liability management program that could increase its exposure to unhedged variable-rate debt. However, there are no major plans to significantly expand its unhedged portfolio in the near term. In the past several years, the overall portfolio of variable-rate debt has diversified, and put risk has fallen significantly, in our opinion. The commonwealth also has about \$897 million of direct placement debt, whose structure we do not believe creates an unusual risk to the state. Tax-backed debt per capita is high, in our view, at what we calculate as \$5,199 at fiscal year-end 2016 and 8.1% of personal income. We also calculate combined total tax-backed debt service to operating expenditures as high at 7.3% on a GAAP basis.

The current five-year CIP projects debt service to remain below the commonwealth's calculation of 8% of budgeted revenues through fiscal 2022. A state debt and capital affordability committee conducts an annual debt affordability study. The committee includes seven voting members and eight nonvoting members from the legislature and is charged with formally reviewing the CIP and providing an estimate of debt authorization for the year. The current CIP for fiscal 2018 calls for a bond cap of \$2.3 billion, about level with that of recent years, as part of a fiscal 2018 total capital budget of \$4.4 billion. Our debt calculation includes special tax bonds supported by statewide tax sources in the ratios we use to assess total tax-supported debt.

Massachusetts has gradually lowered its investment return assumption in recent years, which we view as positive, but which translates into declines in its combined funded ratio and increased funding needs. The commonwealth lowered its assumed actuarial rate of return to 8.00% from 8.25% in 2013, to 7.75% in 2015, and to 7.50% in 2016. In 2017, it held the assumed return constant at 7.5%. The state also attributes recent declines in its funded ratio to previous-year investment losses and optional transfer of Optional Retirement Program members into Massachusetts State Employee Retirement System, and the adoption of an employee retirement incentive program. The new assumed rate of return of 7.5% remains below the Pension Retirement Investment Trust's 9.2% five-year and the 5.0% 10-year average returns.

The combined pension-funded ratio of the various state retirement systems' net pension liability was 57% funded on a GASB basis as of Jan. 1, 2016, down from 67% in January 2014. The net pension liability was \$37.7 billion, or \$5,534 per capita and 8.6% of state personal income.

Using the commonwealth's actuarial methodology and actuarial asset smoothing methods (not GASB), the funded ratio for the combined state employees, teachers, and Boston teachers' pension funds stayed the same at 56.7% as of Jan. 1, 2017, compared with the year before, but down from 59.0% in 2015, 71.1% in 2011, and 78.6% in 2008, before the

Great Recession. Based on Massachusetts' actuarial calculation, the commonwealth's primary government unfunded pension liability was \$39.6 billion, as of Jan. 1, 2017, up from \$37.9 billion in 2016.

Massachusetts' current plan assumes 8.9% per year growth in commonwealth annual pension contributions to reach full amortization of Massachusetts' unfunded liability by fiscal 2036, four years ahead of the commonwealth's statutory requirement. However, from a funding standpoint, Massachusetts has continued to calculate its contribution by setting funding targets based on percentage increases to contributions rather than adjusting for increases necessary to keep level amortization of the liability. This translates into a slightly more back-loaded amortization of the liability. Furthermore, the commonwealth continues to establish its contribution levels on a three-year lagged budgetary basis. Although actuarial valuations are conducted each year, this policy of only adjusting funding every three years provides greater budgetary predictability at the expense of more timely funding adjustments in recognition of known assumption changes, such as revised assumed rate of return and demographic assumptions. Massachusetts recently updated its contribution projections with the annual increase in contribution rising to the 8.9% level from its previously planned 7.0% annual increases. Despite these increased contributions, the funded ratio on an actuarial basis remains at 57%. In fiscal 2017, the commonwealth contributed 72% of ARC to its two main employees' retirement system, down from 81% in fiscal 2014. For fiscal 2018, it has budgeted to fund \$2.39 billion, or 73%, of the \$3.29 billion ARC. As part of our revised criteria, we look to the ratio of active-to-inactive members to determine how mature the system is and how it compares with the national average. For Massachusetts State Retirement Board and Massachusetts Teachers' Retirement System, the ratio of actives to retirees is 1.6 and 1.4, respectively, and in line with the 1.5 national average. Experience studies are only conducted every six years as per statute, which we view as a weakness. Although the commonwealth updates portions of the studies more frequently, this is not done on a set schedule, but rather as needed.

As of Jan. 1, 2016, Massachusetts had a \$16.3 billion unfunded actuarial accrued OPEB liability which we consider sizable, at \$2,396 per capita, but stabilized at near the same level as five years ago, as various reform measures have been phased in and OPEB trust fund deposits have been made. The commonwealth has dedicated a portion of tobacco settlement revenues toward its OPEB trust fund to provide a permanent funding source, which we consider a credit positive, although exact deposits have deviated from formula depending on the enacted budget. The portion of tobacco settlement money dedicated to the OPEB trust fund was scheduled to increase in 10% increments each year, until it reaches 100%, although the incremental increase has been suspended since 2016. The commonwealth has budgeted a \$25 million deposit in fiscal 2018, or about 10% of tobacco settlement money. The trust had assets of \$760.4 million as of Jan. 1, 2016.

On a scale from '1.0' (strongest) to '4.0' (weakest), S&P Global Ratings assigned a score of '3.5' to Massachusetts' debt and liability profile.

Ratings Detail (As Of October 12, 2017)

Massachusetts Bay Transp Auth sr sales tax		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts Bay Transp Auth sr sales tax (AGM) (MBIA)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed

Ratings Detail (As Of October 12, 2017) (cont.)

Massachusetts Bay Transp Auth CP		
<i>Short Term Rating</i>	A-1+	Affirmed
Massachusetts Bay Transp Auth CP		
<i>Short Term Rating</i>	A-1+	Affirmed
Massachusetts Bay Transp Auth CP		
<i>Short Term Rating</i>	A-1+	Affirmed
Massachusetts Bay Transp Auth SALESTAX		
<i>Long Term Rating</i>	AA/A-1+/Stable	Affirmed
Massachusetts CP		
<i>Short Term Rating</i>	A-1+	Affirmed
Massachusetts CP A		
<i>Short Term Rating</i>	A-1+	Affirmed
Massachusetts CP B		
<i>Short Term Rating</i>	A-1+	Affirmed
Massachusetts GO bnds consolidated loan ser 2016I due 12/01/2035		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts GO bnds consolidated loan ser 2016J due 12/01/2046		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts GO bnds cons loan ser 2014 D-2 due 09/01/2043		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts GO VRDBs - C		
<i>Long Term Rating</i>	AA/A-2/Stable	Affirmed
Massachusetts GO VRDBs 2000A		
<i>Long Term Rating</i>	AA/A-1/Stable	Affirmed
Massachusetts GO VRDBs 2000B		
<i>Long Term Rating</i>	AA/A-1/Stable	Affirmed
Massachusetts GO (wrap of insured) (ASSURED GTY & AMBAC) (SEC MKT)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts GO (wrap of insured) (FGIC & BHAC) (SEC MKT)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts GO (AGM) (SEC MKT)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts GO (BAM) (SECMKT)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts GO (BAM) (SECMKT)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts GO (BAM) (SECMKT)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts GO (BAM) (SEC MKT)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed

Ratings Detail (As Of October 12, 2017) (cont.)

Massachusetts GO (FGIC)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts GO (MBIA) (Assured Gty)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts GO		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts GO		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts GO		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts GO		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts GO		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts GO		
<i>Long Term Rating</i>	AA/Stable	Affirmed

Massachusetts Bay Transp Auth sr sales tax

<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
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Massachusetts GO

<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
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The Commonwealth Of Massachusetts General Obligation Bonds Consolidated Loan of 2006 Series A

<i>Long Term Rating</i>	AA/A-2/Stable	Affirmed
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Boston Hsg Auth, Massachusetts

Massachusetts

Boston Hsg Auth (Massachusetts) APPROP

<i>Long Term Rating</i>	A/Stable	Affirmed
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Massachusetts Bay Transp Auth, Massachusetts

Massachusetts

Massachusetts Bay Transp Auth (Massachusetts) var rate gen transp sys bnds 2000A-1 & A-2 ser dtd 03/09/2000 RMKTD dtd 09/30/2011 due 03/01/2030

<i>Long Term Rating</i>	AA/A-2/Stable	Affirmed
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Massachusetts Bay Transp Auth (Massachusetts) GO

<i>Long Term Rating</i>	AA/Stable	Affirmed
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Massachusetts Bay Transp Auth (Massachusetts) GOEQUIV

<i>Long Term Rating</i>	AA/A-1/Stable	Affirmed
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Massachusetts Bay Transp Auth (Massachusetts) GO (AGM)

<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
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Massachusetts Bay Transp Auth transp sys bnds (Massachusetts)

Ratings Detail (As Of October 12, 2017) (cont.)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts Bay Transp Auth (Massachusetts)		
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts Dept of Transp, Massachusetts		
Massachusetts		
Massachusetts Dept of Transp (Massachusetts) GO		
<i>Long Term Rating</i>	AA/A-1/Stable	Affirmed
<i>Unenhanced Rating</i>	NR(SPUR)	
Massachusetts Dept of Transp (Massachusetts) GO		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts Dept of Transp (Massachusetts) GO VRDO 2010A-1		
<i>Long Term Rating</i>	AA/A-1+/Stable	Affirmed
Massachusetts Dept of Transp (Massachusetts) GO VRDO 2010A-2 A-7		
<i>Long Term Rating</i>	AA+/A-1	Affirmed
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts Dept of Transp (Massachusetts) GO VRDO 2010B		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts Dept of Transp (Massachusetts) JOINTCRIT		
<i>Long Term Rating</i>	AA+/A-1	Affirmed
<i>Unenhanced Rating</i>	AA(SPUR)/Stable	Affirmed
Massachusetts Dept of Transp (Massachusetts) Metropolitan hwy sys rfdg bnds (Massachusetts) ser 2016A dtd 12/20/2016 due 01/01/2035		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Massachusetts Dept of Transp (Massachusetts) VRDBs 2010A-7		
<i>Long Term Rating</i>	AA/A-1+/Stable	Affirmed
Massachusetts Development Finance Agency, Massachusetts		
Massachusetts		
Massachusetts Dev Fin Agy (Massachusetts) GO		
<i>Long Term Rating</i>	AA/Stable	Affirmed
Univ of Massachusetts Bldg Auth, Massachusetts		
Massachusetts		
University of Massachusetts Bldg Auth (Massachusetts) GO		
<i>Long Term Rating</i>	AA/A-2/Stable	Affirmed
Univ of Massachusetts Bldg Auth (Massachusetts) GOEQUIV		
<i>Long Term Rating</i>	AA/A-1+/Stable	Affirmed

Many issues are enhanced by bond insurance.

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