The Commonwealth of Massachusetts

Commonwealth Transportation Fund Revenue Bonds

(Rail Enhancement & Accelerated Bridge Programs)

2018 Series A

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Executive Summary

Kroll Bond Rating Agency (KBRA) has taken the following rating actions relating to the Commonwealth of Massachusetts' Commonwealth Transportation Fund (CTF) Revenue Bonds ("the Bonds").

Ratings				
Issuer: Commonwealth of Massachusetts				
Series/Bond	**Rating**	**Outlook**	**Action**	**Amount Outstanding (000)**
Commonwealth Transportation Fund Revenue Bonds (Rail Enhancement & Accelerated Bridge Programs), 2018 Series A	AAA	Stable	Assigned	$225,000
Commonwealth Transportation Fund Revenue Bonds	AAA	Stable	Assigned	$2,586,660*

KBRA's Long-term ratings do not apply to bonds backed by a letter of credit or liquidity facility, unless otherwise noted

** Amount outstanding as of 6/15/2018*

The above rating actions are based upon KBRA's **U.S. Special Tax Revenue Bond Rating Methodology** and the following five key rating determinants. Also noted are the rating determinant ratings as assessed in this analysis:

- Legal Framework AAA
- Nature of Special Tax Revenues AAA
- Economic Base and Demographics AA+
- Revenue Analysis AAA
- Coverage and Bond Structure AAA

Security

The Bonds are special limited obligations of the Commonwealth and payable solely from the Pledged Funds, which primarily include Motor Fuels Tax revenues and various License and Registration Fees.

Use of Proceeds

Proceeds from the 2018 Series A Bonds will be used to fund rail enhancement and accelerated bridge programs of the Commonwealth under its comprehensive long-term transportation investment programs.

Key Rating Strengths
• Very broad and resilient nature of the pledged revenues that currently generate over 7x coverage of maximum annual debt service requirements;
• Extensive legal protections that are collectively and effectively designed to insulate pledged revenues from Commonwealth budget operations;
• The Commonwealth's diverse, wealthy, and growing economy;
• The Commonwealth has a comprehensive five year transportation debt and capital plan, that currently includes a strategy to maintain debt service coverage of 6x maximum annual debt service, and also to generate excess cash flow of approximately $1.2 billion annually for other transportation purposes; and
• A high 4x ABT that provides protects against substantial dilution.

Rating Summary

In 2009, the Commonwealth enacted comprehensive transportation reform legislation which among other things was designed to segregate and dedicate certain revenues towards capital investment in critical transportation infrastructure projects. The legislation also enabled the Commonwealth to pledge some or all of these revenues to payment of CTF special obligation revenue bonds. The segregated and dedicated revenues, which consist primarily of a broad base of motor fuels taxes, driver's license fees, and vehicle registration fees, have a long history of observable efficient and effective collection characterized by diversity in timing that smooths seasonality. The Commonwealth has demonstrated willingness and ability to adjust pledged revenues as needed to finance expanded capital needs, and also to make adjustments to offset other factors that influence the underlying base of vehicle and fuel related transactions such as lengthier registration periods

The pledged revenues currently generate approximately $1.4 billion in revenue against maximum annual debt service of $183 million after issuance of these Bonds. The Commonwealth's comprehensive transportation capital planning will lead to issuance of an additional $815 million of CTF debt over the next five years. But even after the new debt, pledged revenues are expected to cover maximum annual debt service requirements at least 6x, even while assuming very little growth in the pledged revenue base. Later in this report, KBRA discusses various stress scenarios we developed to test and demonstrate the resiliency and ability of the pledged revenues to withstand outsized economic shocks.

KBRA's Special Tax Revenue Bond Methodology does not arbitrarily impose a ceiling on ratings of special revenue bonds based on the general obligation credit rating of a sponsoring state. KBRA's assessment of the Commonwealth's general obligation credit does not limit the rating on the CTF bonds. Instead, KBRA analyzes the specific legal framework as well as other factors that may influence policymaker behavior towards the special revenues that are being pledged to the Bonds.

In this case, the CTF Bonds enjoy numerous legal protections that KBRA believes fully insulate the pledged revenues from budget operations of the Commonwealth. Among these protections, described more fully in the Legal Framework section of this report, include Constitutional restrictions on the use of the revenues; covenants not to impair the rights or remedies of the Trustee; laws that prohibit the use of the pledged revenues for any purpose before appropriation to pay debt service; and restrictions on additional debt or changes to the pledged revenues unless maximum annual debt service coverage remains at least 4x. In KBRA's view, the fact that the CTF program generates $1.2 billion of excess cash flow for other transportation purposes further dis-incents policymakers from disrupting debt service payment mechanics.

The Commonwealth, like all other states, is unable to enter bankruptcy. Meanwhile, KBRA also believes that the Commonwealth has no policy incentive to divert or disrupt the pledged revenue stream in ways that would harm bondholder interests.

Meanwhile, the Commonwealth's economy, which supports the underlying base of pledged revenues, remains diverse, wealthy, and growing at rates higher than the region.

Outlook: Stable

The Stable Outlook reflects KBRA's expectation that pledged revenues are resilient and unlikely to decline significantly enough to impair coverage of debt service, even in very adverse economic conditions. Further, KBRA believes the Commonwealth has no legal ability or political incentive to divert or dilute the pledged revenues in ways that would be detrimental to bondholders.

In KBRA's view, the following factors may lead to a rating downgrade:

- A highly unlikely scenario where there was a substantial sustained decline in pledged revenues.

Key Rating Determinants

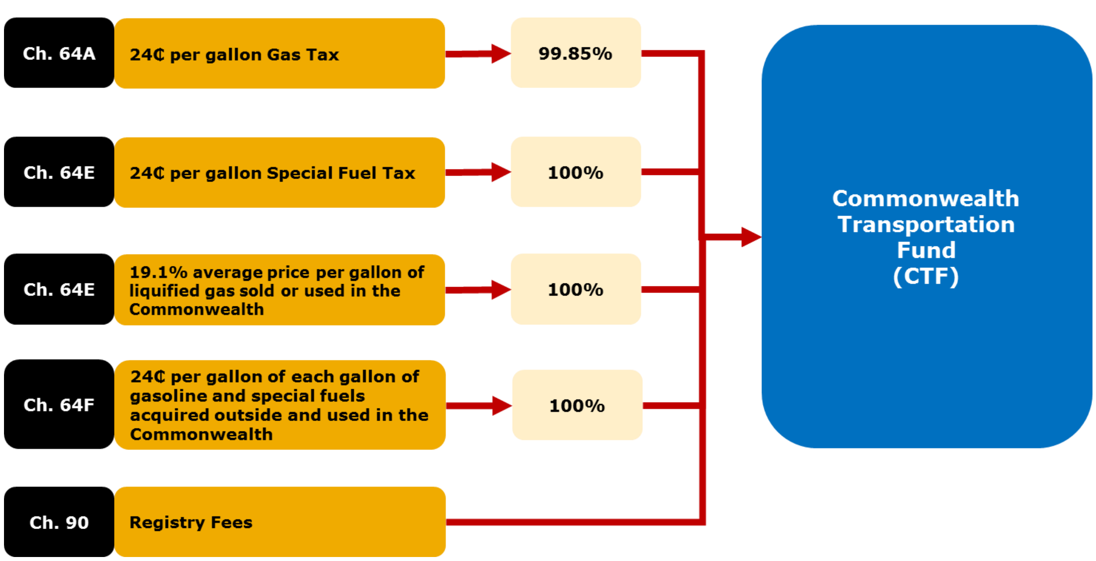
Rating Determinant 1: Legal Framework

The legal and statutory framework pursuant to which the bonds are issued impose strong protections that significantly limit bondholder risk. A principal benefit, in KBRA's view, are the covenants imposed on the Commonwealth restricting it from diverting pledged revenues away from the Commonwealth Transportation Fund ("the CTF") and/or applying pledged revenues as a transportation funding source prior to servicing CTF bonds. KBRA notes the strong revenue collection and deposit procedures with monthly deposit to the bond trustee as well as the Commonwealth's covenant that it will not impair the rights of bondholders or lower registry fees or motor fuel tax rates unless it can demonstrate that pledged revenues will provide coverage of maximum annual debt service by at least 4x. KBRA also notes the strong protections against overleveraging pledged revenues imposed by the additional bonds test requiring gross revenues to equal at least 4x maximum annual debt service on existing and proposed additional debt. Finally, KBRA notes that there is no requirement for a debt service reserve fund and that the Massachusetts Constitution requires legislative appropriation of CTF funds, along with nearly all other state spending, for CTF bond debt service and all other transportation related purposes. In KBRA's view, the importance of pledged revenues as a source of statewide transportation funding, the strength of the legal provisions that establish a first priority claim on pledged funds, and an unusually strong repayment mechanism fully mitigate any risks related to non-appropriation. In KBRA's view, they also obviate the need for a debt service reserve fund requirement.

Nature and Strength of Pledged Revenues

The bonds are secured by a gross lien pledge of revenues from several taxes and fees that are constitutionally dedicated for transportation related purposes. Figure 1 provides a brief outline of the taxes and fees that constitute pledged revenues. Information on pledged revenues is provided in greater detail within the following sections of this report. The taxes and fees are applied across the entirety of the Commonwealth capturing the economic activity of a very substantial statewide population base. While the taxes and fees extend only to transportation related services, KBRA views the breadth of the tax base as very broad given the essentiality of automobile use to the underlying statewide economy.

FIGURE 1



The pledged revenues are an essential source of funding for transportation related programs throughout the Commonwealth. Pursuant to the Massachusetts Constitution and state covenant, pledged revenues do not become available for state spending unless the appropriation for debt service for the current fiscal year has been made and the required monthly deposits to the CTF funds and accounts have also been made or provided for. It is KBRA's understanding that if the Commonwealth failed to appropriate CTF funds there would be an approximate shortfall in transportation funding of approximately $1.2 billion in fiscal year 2019.

KBRA also notes that the Commonwealth has granted a lien on pledged funds that is perfected by the filing of the trust agreement in the records of the Commonwealth Treasurer.

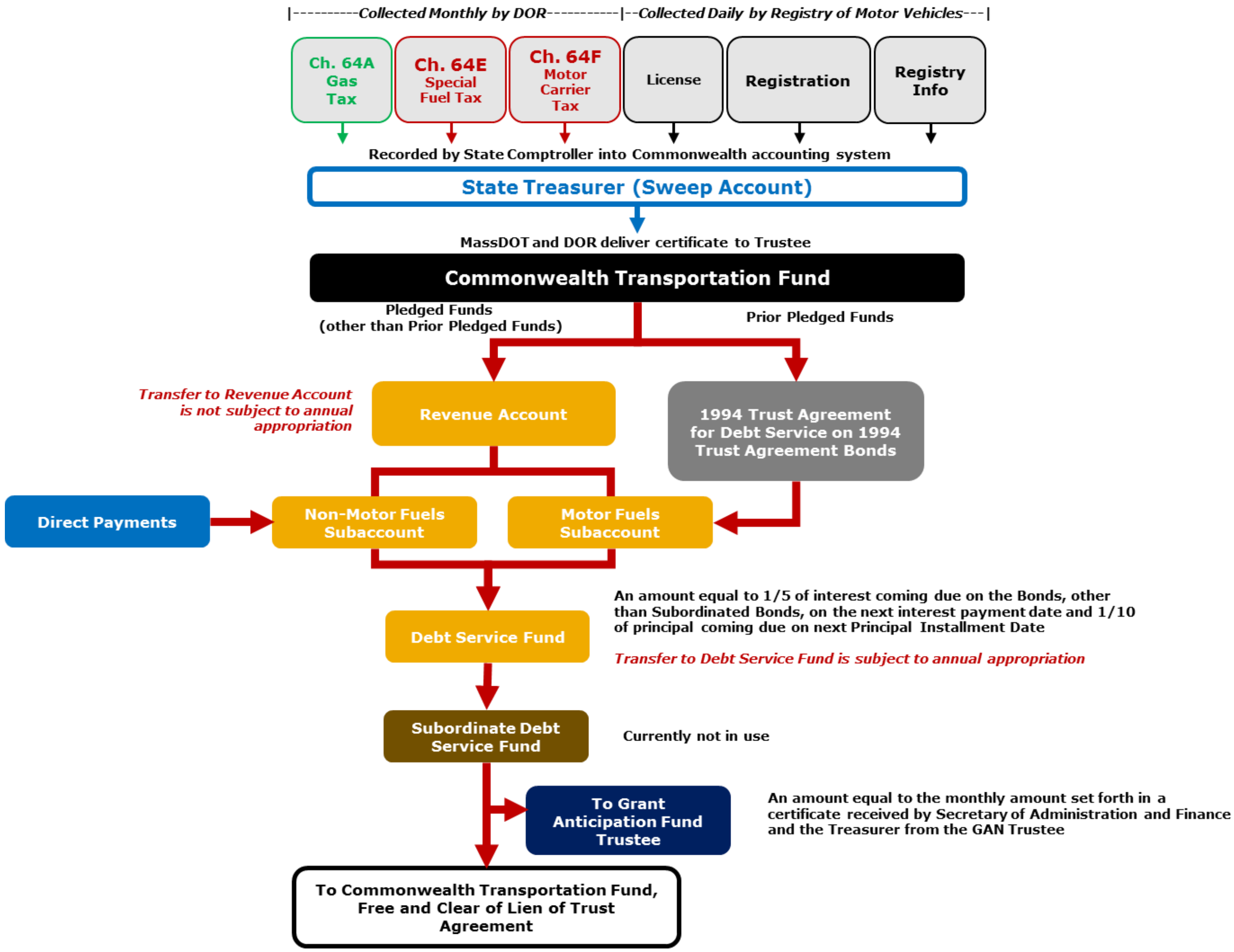
Flow of Funds & Timing of Deposits

Pledged revenues are collected by the Massachusetts Department of Revenue ("DOR") and the Registry of Motor Vehicles ("MassDOT"). The strong collection procedures for pledged revenues are outlined in Figure 2. The DOR and MassDOT are required to deliver a certificate to the bond trustee within eight business days of the end of the month confirming the amount of pledged funds deposited within the past month. The state treasurer transfers pledged funds from the Commonwealth Transportation Fund into the revenue account, which is held by the trustee, within two business days of receiving the certificate from DOR and MassDOT.

KBRA views the revenue collection procedure as very strong and notes that the Commonwealth has made technological investments that simplify the payment of fees and taxes and enhance the Commonwealth's ability to track and collected pledged revenues. KBRA understands that 99% of the dollar amount of motor fuels tax collections are remitted electronically. As noted in Figure 18, the Commonwealth has a small amount of bonds outstanding that are payable senior to CTF bonds ("1994 Trust Agreement Bonds"). The lien on the 1994 Trust Agreement Bonds is closed and any additional issuance will be limited to bond refundings. KBRA also notes that all 1994 Trust Agreement Bonds will be fully retired by 2022 and that annual debt service on these bonds is level and accounts for less than 3% of total projected pledged revenues in 2019.

As noted, the Commonwealth appropriates debt service as part of its annual budgeting process and, as noted, no funds may be transferred from the revenue account for any purpose, including debt service, until the appropriation has been made. The trustee is required to deposit monthly an amount equal to 1/5 interest due and 1/10 of the principal due on the next interest and or principal payment dates. For the Bonds, these dates are June 1 for principal and interest and December 1 for interest only. KBRA notes that the Commonwealth's fiscal year begins on July 1 which, in KBRA's view, provides a sufficient amount of time between the required budget appropriation date and principal and interest payments dates that further mitigates the risk of non-appropriation. And in any event, budget delays are addressed by continuing resolutions carrying over prior years' appropriations.

FIGURE 2



Bondholder Protections & Statutory Limitations

In addition to the legal provisions set forth in the trust indenture, KBRA notes the statutory provisions that help create the strong legal framework supporting the Bonds, several of which are specifically outlined as follows:

- Article 78 of the Articles of Amendment to the Massachusetts Constitution, as amended, requires that any fees, duties, excises or license taxes relating to the registration, operation or use of vehicles on public highways, or to fuels used for propelling such vehicles be expended only for the following purposes: (1) the cost of administration of laws providing for such revenue, (2) the making of refunds and adjustments relating to such revenue; (3) the payment of highway obligations; (4) the cost of construction, reconstruction, maintenance and repair of public highways, bridges and mass transportation lines; (5) the cost of enforcing state traffic laws; and (6) the cost of other mass transportation purposes. Article 78 revenues may be expended by the Commonwealth and its counties, cities and towns for these purposes only in such manner as the Legislature may direct.

- The motor fuels tax imposed under Chapters 64*A,* 64*E* and 64*F* and the registry fees are classified as Article 78 revenues. The Pledged motor fuels tax receipts thus are available to be used only for such transportation-related purposes, including debt service on CTF bonds.

- The Commonwealth has agreed that any future amendments of the authorizing legislation, and other statutes that govern pledged funds, are subject to the covenant of the Commonwealth that it shall not take any action that would impair the rights and remedies of the owners of the Bonds. Specifically, the Commonwealth's right to make such changes is restricted by the trust agreement in which the Commonwealth has covenanted not to impair, in any way, the rights and remedies of the owners of the bonds under the trust agreement.

- The Commonwealth has covenanted in the trust agreement that, so long as any bonds are outstanding and unless an appropriation has been made by the legislature which is sufficient to pay debt service on the bonds, the pledged funds shall not be applied to any other use.

- The trust agreement does permit the Commonwealth to lower the rates of the motor fuels tax or any registry fees or both, provided that the state treasurer delivers to the bond trustee a certificate demonstrating the amount of pledged funds received by the state treasurer during any 12 consecutive months of the 18-month period ending with the last full month immediately preceding the effective date of any such change, as adjusted, as set forth in such certificate, to reflect the proposed change in rates, to be at least equal to 400% of the maximum annual debt service requirement due in any fiscal year of the then outstanding bonds.

Additional Bonds Test

Additional bonds may be issued if the Commonwealth can demonstrate that gross pledged revenues for any 12 consecutive months during the most recent 18-month period was not less than 4x maximum annual debt service due in the current or any future fiscal year on the outstanding bonds and the bonds to be issued. As noted, KBRA views the additional bonds test as restrictive and as providing sufficient protection against overleveraging pledged revenues. KBRA also notes that total projected amount of FY2018 pledged revenues is approximately $1.4 billion and that debt service requirements for FY 2019, including the 2018 bonds, is $179.5 million or approximately 12.5% of pledged revenues.

Based on the foregoing, KBRA views the security provisions governing the Bonds as being consistent with a AAA rating determinant rating.

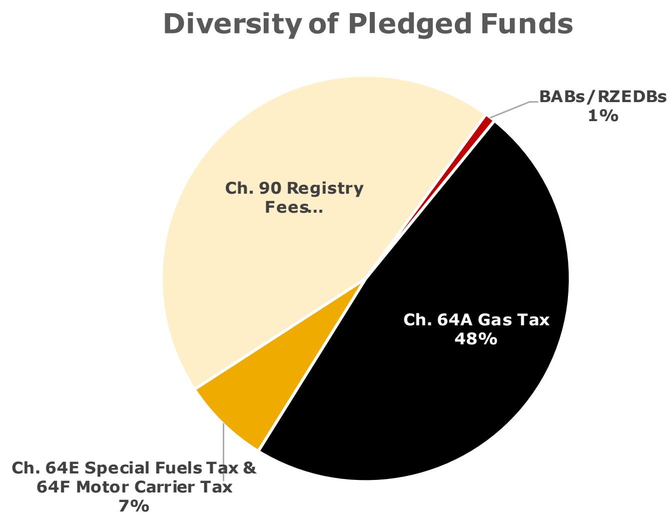
Bankruptcy Assessment

The United States Bankruptcy Code is not applicable to states. Because the Commonwealth is a state, it is thus not eligible for relief under the U.S. Bankruptcy Code.

Rating Determinant 2: Nature of Special Tax Revenues

In KBRA's view, the pledged funds, derived from a broad and essential base provide a strong source for repayment of the bonds. The pledged revenues consist of six motor fuels taxes and registry fees and are levied across the entire Commonwealth, which includes 6.8 million people and 5.5 million registered vehicles. Gas taxes and vehicle registry fees account for 48% and 44% of the pledged revenues respectively; and 7% of the pledged revenues come from special fuels and motor carrier taxes (See Figure 3). An additional 1% of pledged revenues comes from federal Build America Bonds subsidies.

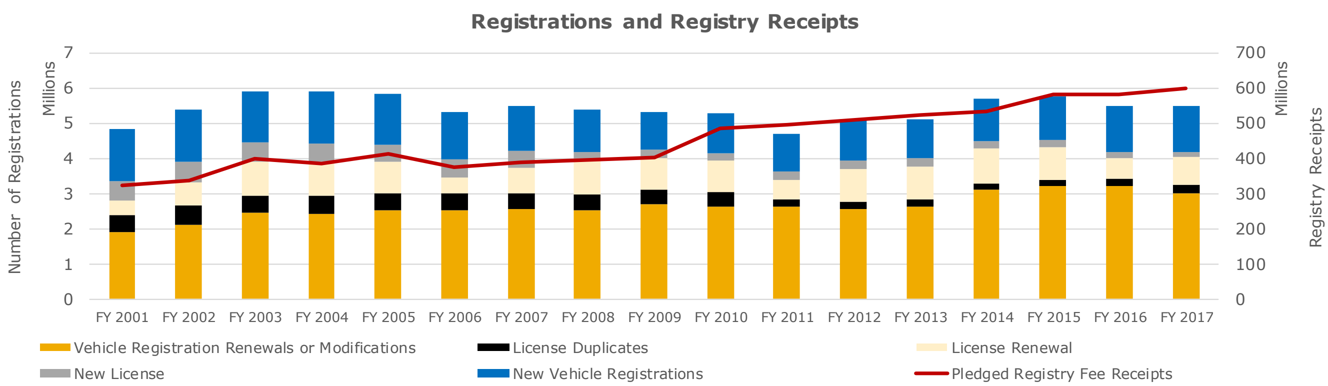
FIGURE 3



Source: Commonwealth of Massachusetts

The pledged taxes and fees, which generated nearly $1.4 billion in 2017, have a long history of efficient collection and are diverse in timing. Registry fees, which consist of motor vehicle registrations and driver license fees. The steady trend in registry transaction count by type is shown in Figure 4. The Commonwealth implemented fee increases in 2009, and fee adjustments in 2014, which have led to increased pledged revenues despite the implementation of longer registration periods and longer license renewal periods over the past decade.

FIGURE 4



Source: Commonwealth of Massachusetts

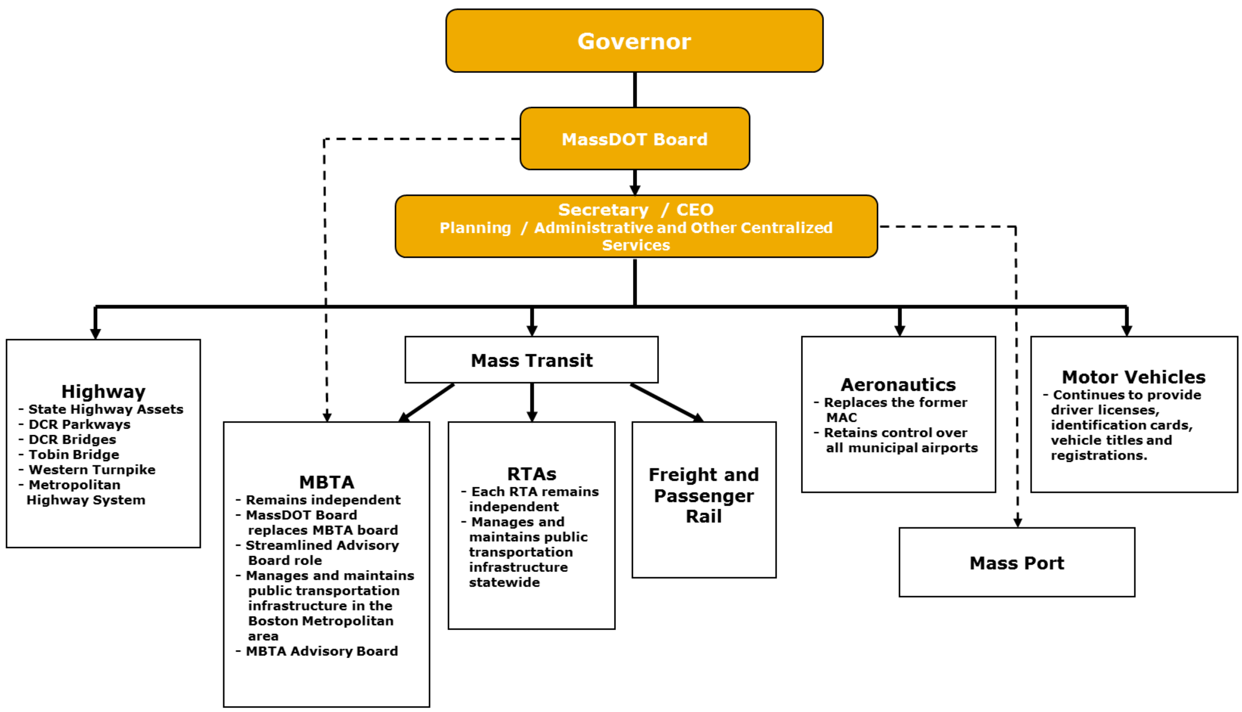
Meanwhile, the motor fuels taxes, which the Commonwealth has imposed since 1928, are levied across numerous fuel types capturing virtually all consumption or importation of motor fuels in the Commonwealth.

MassDOT

In June of 2009 the Commonwealth restructured its transportation system and created the Massachusetts Department of Transportation ("MassDOT"). MassDOT represents a merger of several state governmental entities including the Massachusetts Turnpike Authority, the Massachusetts Highway Department, the Registry of Motor Vehicles and the Executive Office of Transportation and Public Works. The Massachusetts Bay Transportation Authority ("MBTA") and the Regional Transit Authorities ("RTAs") located across the state remain independent but are subject to oversight by MassDOT.

MassDOT owns, operates and maintains the state highway system, including the Metropolitan Highway System and the I-90 Turnpike. It is responsible for planning and completing capital improvement projects on the state highway system while coordinating with the MBTA and RTAs on bus and rail operations. MassDOT is also responsible for funding the Registry of Motor Vehicles as well as the Aeronautics Division, which retains control over all Commonwealth municipal airports. MassDOT develops its annual operating and capital budget in consultation with the Governor and the Executive Office for Administration and Finance, the Secretary of Transportation.

FIGURE 5



Source: Commonwealth of Massachusetts

Statewide Transportation Funding Sources

The annual operating and capital budgets for transportation are developed by the Governor, the Legislator, MassDOT, the MassDOT Board of Directors, and the Metropolitan Planning Organizations and RTAs that are located across the state.

The Commonwealth's transportation system is funded from five primary sources including state taxes, motor vehicle fees, federal funds, toll revenues and bond proceeds. These funding sources are administered through the Commonwealth Transportation Fund and the Massachusetts Transportation Trust Fund ("MTTF"). The two funds segregate and account for all transportation related revenues and expenses made by the Commonwealth.

Based on the foregoing, KBRA views the nature of the special tax revenues as being consistent with a AAA rating.

Rating Determinant 3: Economic Base and Demographics

KBRA views the economic base of the Commonwealth as broad, wealthy, demonstrably resilient, and diverse. Many economic indicators are among the strongest in the New England Region[1] (See Figure 7). For example, Massachusetts' population of roughly 6.8 million, representing 46% of the region, has grown at nearly double the region's rate of growth since 2010. The Commonwealth also has a lower than average age dependency ratio, above average education attainment, and much higher than average wealth levels. Many of these positive indicators can be attributed to the presence of many strong higher-education institutions as well as high-paying healthcare and professional services jobs, as discussed further below.

FIGURE 6

	2016 Population	Chg. from 2010	2016 Age Dependency Ratio [1,2]	Chg. from 2010	2016 Population w/ B.A. Degree or Higher [2,4]	Chg. from 2010	2016 Poverty Level [2]	Chg. from 2010
Massachusetts	6,811,779	3.9%	56.3%	1.4%	42.7%	3.7%	10.4%	0.3%
New England	14,735,525	1.9%	57.8%	1.7%	39.1%	3.5%	10.4%	-0.8%
United States	323,127,515	4.5%	61.3%	2.5%	31.3%	3.1%	14.0%	-1.3%
Massachusetts as % of New England	N/A		97.4%		109.2%		100.0%	
Massachusetts as % of U.S.	N/A		91.8%		136.4%		74.3%	
	2017 Personal Income ($ Billions)	**Chg. from 2010**	**2017 Per Capita Personal Income**	**Chg. from 2010**	**2017 Real Gross State Product ($Billions)**	**Chg. from 2010**	**2017 Real GSP Per Capita**	**Chg. from 2010**
Massachusetts	$452.0	29.8%	$65,890	24.2%	$456.2	14.3%	$66,500	9.3%
New England	$927.6	23.1%	$62,632	20.3%	$883.2	7.5%	$59,637	5.0%
United States	$16,413.6	31.7%	$50,392	25.1%	$16,721.5	14.3%	$51,337	8.6%
Massachusetts as % of New England	N/A		105.2%		N/A		111.5%	
Massachusetts as % of U.S.	N/A		130.8%		N/A		129.5%	

Source: US Census Bureau and Bureau of Economic Analysis

[1] Age dependency ratio is the sum of the population under 18 yrs and over 65 yrs divided by persons age 18 to 64 yrs.

[2] Year over year change shown as nominal change in percentage points.

[3] New England is defined as Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont

[4] Percent of the population aged 25 and over.

Labor Market of the Commonwealth

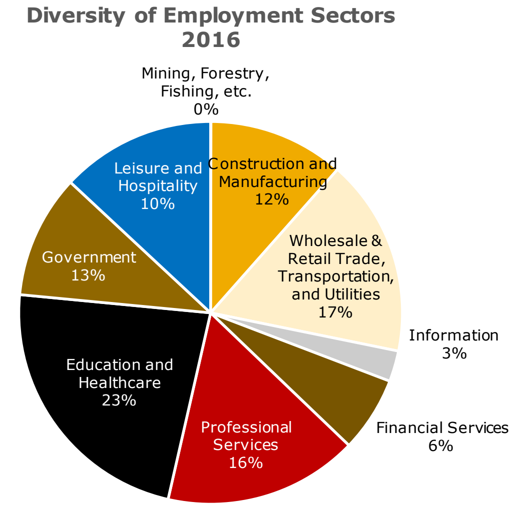
The Commonwealth's employment opportunities are diverse. At 23%, the education and healthcare sector is the largest, which provides a pool of relatively stable, high-skill, and high-paying jobs in the Commonwealth. Trade, transportation, and utilities, professional services, government, and leisure and hospitality make up approximately 55% of the labor market (see Figure 8). The top private sector employers include 8 hospitals, 4 supermarkets, and 3 universities, most of which are located in the Greater Boston area. The Commonwealth is also home to 12 Fortune 500 company headquarters.

[1] New England Region is defined as Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

FIGURE 7

Largest Private Sector Employers in 2017 *(In Alphabetical Order)* 2017		
Employer	**Headquarters**	**Product or Service**
Bay State Medical Center, Inc.	Springfield	Hospital
Beth Israel Deaconess Medical Center	Boston	Hospital
Big Y Foods, Inc.	Springfield	Supermarket
Boston Medical Center Corporation	Boston	Hospital
Boston University	Boston	University
Brigham and Women's Hospital, Inc.	Boston	Hospital
DeMoulas Supermarkets, Inc.	Tewksbury	Supermarket
EMC Corporation	Hopkinton	Computer Storage & Peripherals
General Hospital Corporation	Boston	Hospital
Massachusetts Institute of Technology	Cambridge	University
Partners Healthcare Systems, Inc.	Boston	Hospital
President and Fellows of Harvard College	Cambridge	University
Raytheon Company	Lexington	Electronics / Defense
The Stop & Shop Supermarkets, Co.	Quincy	Supermarket
Shaw's Supermarkets, Inc.	West Bridgewater	Supermarket
State Street Bank and Trust Company	Boston	Banking
The Children's Hospital Corporation	Boston	Hospital
The TJX Companies, Inc.	Framingham	Retail
UMASS Memorial Medical Center, Inc.	Worcester	Hospital

Source: Commonwealth of Massachusetts CAFR 2017



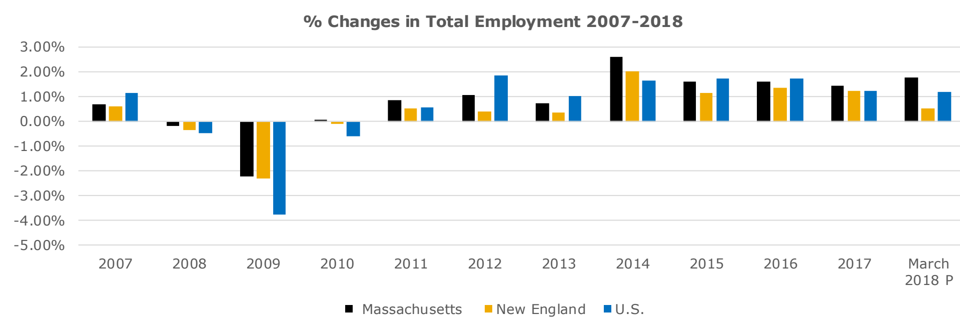
Source: Bureau of Economic Analysis

Before the Great Recession, growth in employment often lagged that of the U.S. However, this growth pattern changed post-recession (see Figure 9). Employment growth has been rapid and has outpaced the U.S. in many of the last 9 years owing to the robust development in technology, biotech, and healthcare. Post-recession unemployment rates in the Commonwealth have been consistently lower than the region and the nation.

FIGURE 8

Unemployment Rates (Not Seasonally Adjusted)			
Year	**Massachusetts**	**New England**	**U.S.**
2009	8.1%	8.0%	9.3%
2010	8.3%	8.4%	9.6%
2011	7.3%	7.7%	8.9%
2012	6.7%	7.2%	8.1%
2013	6.7%	6.9%	7.4%
2014	5.7%	5.9%	6.2%
2015	4.8%	4.9%	5.3%
2016	3.9%	4.1%	4.9%
2017	3.7%	3.8%	4.4%
March 2018 P	3.8%	3.9%	4.1%

Source: U.S. Bureau of Labor Statistics
P=Preliminary



Massachusetts is well positioned to attract and retain talents given the presence of 114 colleges and universities with over 500,000 enrolled students in 2016. Research and development spending at universities and colleges was ranked #6 in the nation in 2016, totaling approximately $4 billion. Massachusetts is home to a number of internationally recognized institutions, such as Harvard University and the Massachusetts Institute of Technology.

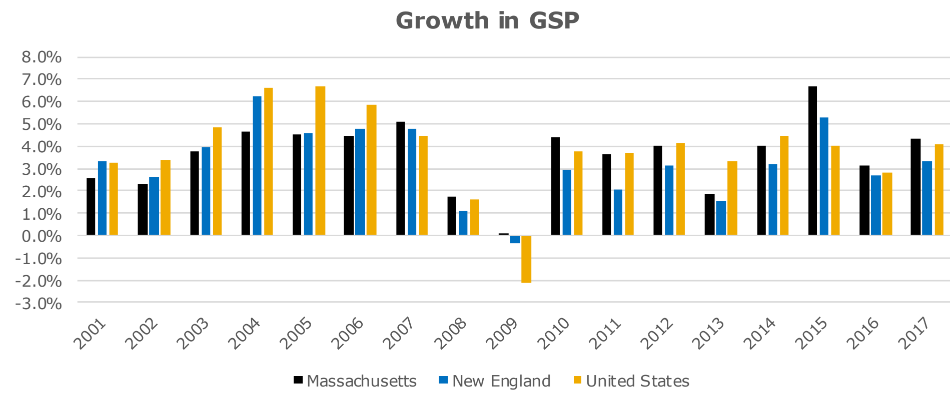
Economic Output Performance

Massachusetts ranked 11th among states in economic output at over $527 billion in 2017, punching above its population rank of 15. GSP growth has been strong and resilient, and has outpaced the U.S. in six of the last ten years. The Commonwealth's total GSP growth of 14.3% was on par with the country between 2010 and 2016, but unlike the region and the U.S., both of which contracted during the Great Recession, the GSP of Massachusetts only experienced slower growth during the same period (See Figure 10).

Massachusetts is ranked 19th in exports in the U.S. and the largest in the region. Total exports in 2017 equaled $27.5 billion, increasing 4.1% from 2016, slightly lower than the nation's 4.4%. Overall, Massachusetts had a trade deficit of $7 billion in 2017. The top trade partners of the Commonwealth are Canada, China, Mexico, Germany, and the U.K. The top commodities traded are high-tech and medical related machineries.

It is KBRA's view that the Commonwealth's robust economic output is related to its innovation focused economy with large venture capital investments in biotechnology, software, and technology infrastructure.

FIGURE 9

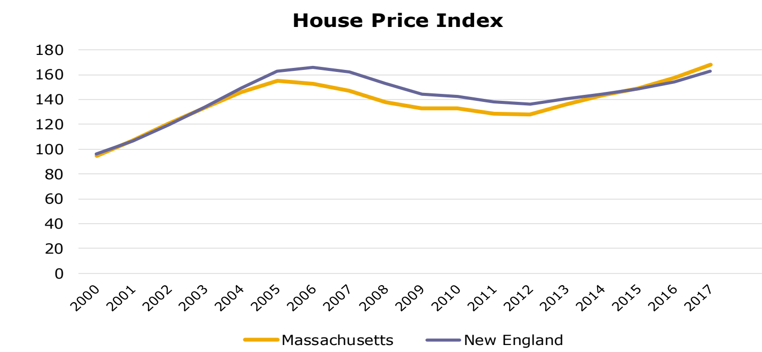


Source: Bureau of Economic Analysis

Housing Market

Despite declining by 17% from its pre-recession peak, the impact of the Great Recession was milder on Massachusetts' housing market than on the region. Recovery since its recessionary trough in 2012 has been gradual and healthy, currently at 108% of its 2005 pre-recession peak, compared to 98% for the region.

FIGURE 10



Source: Freddie Mac
New England is the average of Massachusetts, Connecticut, Maine, New Hampshire, Rhode Island, and Vermont

Based on the foregoing, KBRA rates the Economic Base and Demographics Rating Determinant at AA+.

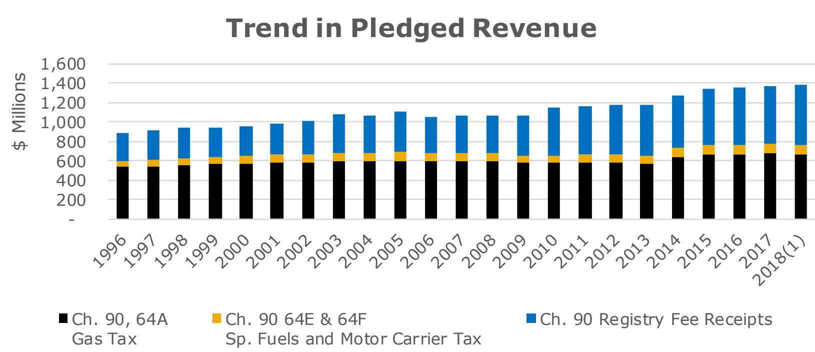
Rating Determinant 4: Revenue Analysis

Overall trends in pledged revenues have shown modest but steady growth (see Figure 12). A combination of modest timely tax or fee increases, and transaction growth has offset long term stasis in fuel consumption and general movement toward lengthier license and registration cycles.

FIGURE 11

Trend in Pledged Revenues ($000)

Fiscal Year	Ch. 90, 64A Gas Tax	% chg	Ch. 90 64E & 64F Sp. Fuels and Motor Carrier Tax	% chg	Ch. 90 Registry Fee Receipts	% chg	Pledged Funds	% chg
1996	532,324	-	65,259	-	280,923	-	878,506	-
1997	535,040	0.5%	66,528	1.9%	313,215	11.5%	914,783	4.1%
1998	546,213	2.1%	73,822	11.0%	312,180	-0.3%	932,215	1.9%
1999	561,714	2.8%	73,549	-0.4%	297,658	-4.7%	932,921	0.1%
2000	572,209	1.9%	79,041	7.5%	300,040	0.8%	951,290	2.0%
2001	576,974	0.8%	81,547	3.2%	322,808	7.6%	981,329	3.2%
2002	585,519	1.5%	79,904	-2.0%	338,440	4.8%	1,003,863	2.3%
2003	593,691	1.4%	81,255	1.7%	397,683	17.5%	1,072,629	6.9%
2004	600,255	1.1%	82,659	1.7%	386,284	-2.9%	1,069,198	-0.3%
2005	599,736	-0.1%	84,382	2.1%	413,481	7.0%	1,097,599	2.7%
2006	589,591	-1.7%	80,785	-4.3%	375,670	-9.1%	1,046,046	-4.7%
2007	594,892	0.9%	79,545	-1.5%	388,496	3.4%	1,062,933	1.6%
2008	595,380	0.1%	75,560	-5.0%	396,904	2.2%	1,067,844	0.5%
2009	578,691	-2.8%	73,462	-2.8%	403,780	1.7%	1,055,933	-1.1%
2010	576,676	-0.3%	76,369	4.0%	485,789	20.3%	1,138,834	7.9%
2011	580,031	0.6%	79,152	3.6%	496,034	2.1%	1,155,217	1.4%
2012	581,148	0.2%	79,028	-0.2%	508,608	2.5%	1,168,785	1.2%
2013	570,477	-1.8%	79,302	0.3%	522,199	2.7%	1,171,978	0.3%
2014	640,702	12.3%	89,938	13.4%	533,194	2.1%	1,263,834	7.8%
2015	656,445	2.5%	97,947	8.9%	581,686	9.1%	1,336,078	5.7%
2016	666,539	1.5%	98,309	0.4%	580,426	-0.2%	1,345,274	0.7%
2017	670,093	0.5%	97,762	-0.6%	598,683	3.1%	1,366,538	1.6%
2018[1]	667,785	-0.3%	97,400	-0.4%	615,146	2.7%	1,380,331	1.0%



Source: Commonwealth of Massachusetts
(1) Fiscal Year 2018 Revenues are projected

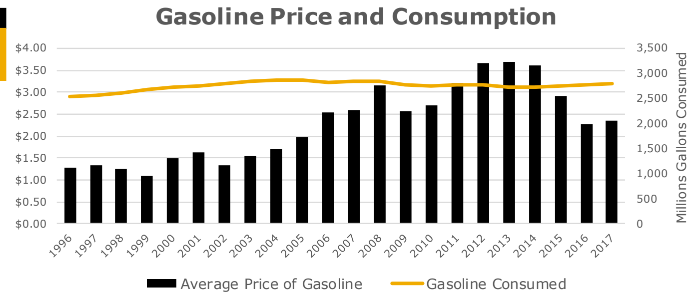
Motor Fuels Tax

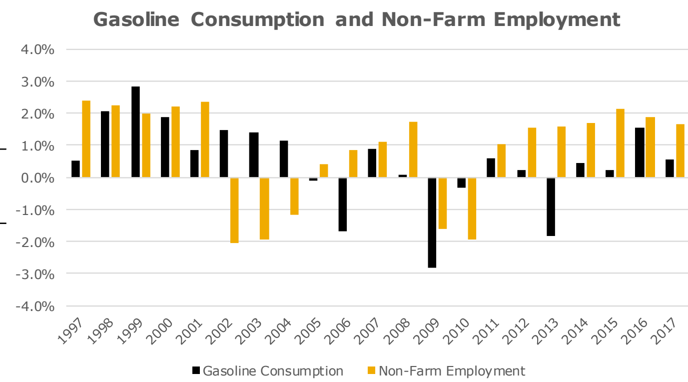
The Commonwealth has imposed a tax on fuel since 1928. In general, motor fuels consumption and therefore motor fuel tax revenues are sensitive to oil price cycles, especially in places where public transportation provides a good alternative to driving. In Massachusetts, however, motor fuel consumption displays less sensitivity to oil prices than it does to overall employment activity and to general trends in fuel efficiency, as shown in Figure 13. In fact, total motor fuel consumption peaked in 2008. Nevertheless, a tax increase from 21 to 24 cents per gallon in 2013 led to a roughly $80 million increase in fuel tax revenues that year despite relatively flat consumption (see Figure 13). KBRA believes the Commonwealth's revenue raising action in 2013 demonstrates commitment to pledged revenues to support the CTF debt and also to support its long-term transportation infrastructure investment program.

FIGURE 12

HISTORICAL GASOLINE SALES						
Fiscal Year	Average Price of Gasoline [1]	*% chg*	Gasoline Consumed (millions of gallons) [2]	*% chg*	Non-Farm Employment (thousands) [3]	*% chg*
1996	$1.29		2,539		3,008	
1997	$1.35	4.3%	2,552	0.5%	3,080	2.4%
1998	$1.25	-7.4%	2,605	2.1%	3,149	2.2%
1999	$1.09	-12.5%	2,679	2.8%	3,212	2.0%
2000	$1.51	38.3%	2,729	1.9%	3,283	2.2%
2001	$1.64	8.8%	2,752	0.8%	3,360	2.3%
2002	$1.34	-18.2%	2,792	1.5%	3,291	-2.1%
2003	$1.54	14.6%	2,831	1.4%	3,227	-1.9%
2004	$1.71	11.1%	2,863	1.1%	3,189	-1.2%
2005	$1.98	15.8%	2,860	-0.1%	3,202	0.4%
2006	$2.53	27.9%	2,812	-1.7%	3,229	0.8%
2007	$2.59	2.5%	2,837	0.9%	3,265	1.1%
2008	$3.15	21.5%	2,839	0.1%	3,321	1.7%
2009	$2.58	-18.1%	2,759	-2.8%	3,267	-1.6%
2010	$2.69	4.5%	2,750	-0.3%	3,204	-1.9%
2011	$3.20	18.9%	2,766	0.6%	3,237	1.0%
2012	$3.65	14.0%	2,772	0.2%	3,287	1.5%
2013	$3.68	0.9%	2,721	-1.8%	3,339	1.6%
2014	$3.61	-1.9%	2,733	0.4%	3,396	1.7%
2015	$2.93	-19.0%	2,739	0.2%	3,468	2.1%
2016	$2.28	-22.0%	2,781	1.5%	3,533	1.9%
2017	$2.35	2.8%	2,796	0.5%	3,592	1.7%
5 yr CAGR	-7.1%		0.1%		1.5%	
10 yr CAGR	-0.9%		-0.1%		0.9%	
10 yr total growth	-25%		-2%		8%	

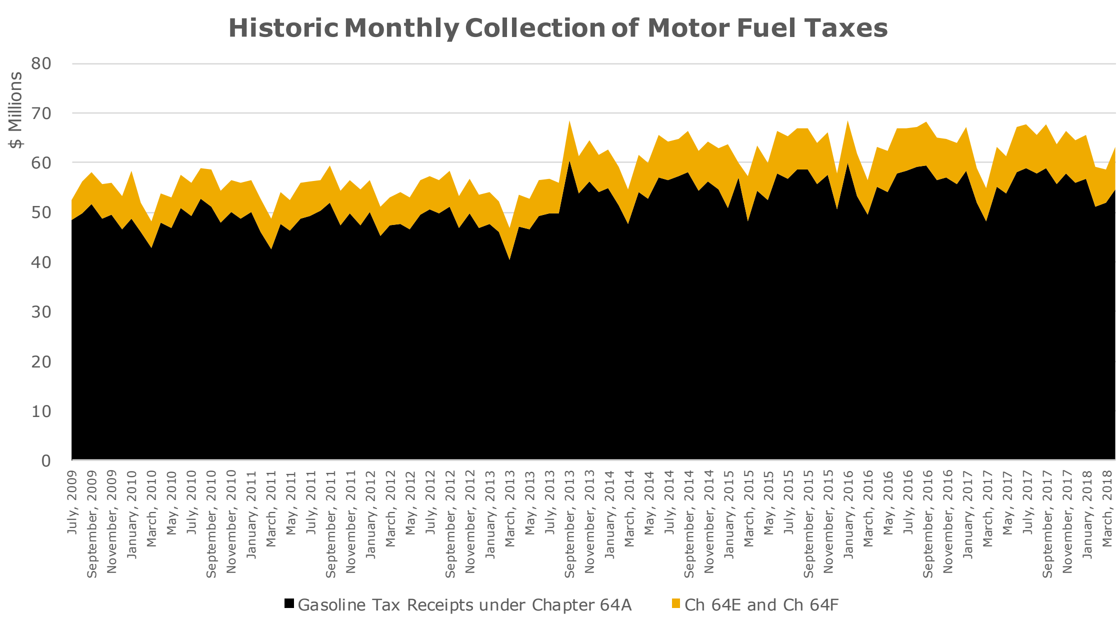
Source: Commonwealth of Massachusetts
(1) Reflects the Average Price of Gasoline in all of Massachusetts.
(2) Based on Historical Gasoline Tax Collections pursuant to Chapter 64*A* , *except* Aviation Fuel. See the Official Statements under Commonwealth Motor Fuels Tax - Refunds and Abatements from Gasoline Tax.
(3) Seasonally adjusted. Calculated as fiscal year average of monthly employment. Historical employment figures have recently been revised by the U.S. Bureau of Labor Statistics by a re-benchmarking process which the Bureau goes through periodically.





While there is some seasonality in fuels tax receipts (See Figure 14), this risk factor is more than offset by the excess cash flowing through the CTF debt service fund on a monthly basis as described previously in the discussion of the Flow of Funds.

FIGURE 13



Source: Commonwealth of Massachusetts

Registry Fees

Meanwhile, vehicle registration and license fees are less susceptible to seasonality and economic cycles but are affected by changes in regulations in policy. The overall number of registry transactions is little changed over the past decade (see Figure 19), but the cycle of transactions has changed because of lengthier license renewal and vehicle registration periods. Corresponding adjustments to fee structure in 2010 and some fee increases in 2015 have offset the more modest growth trends in transactions (See Figure 15)

FIGURE 14

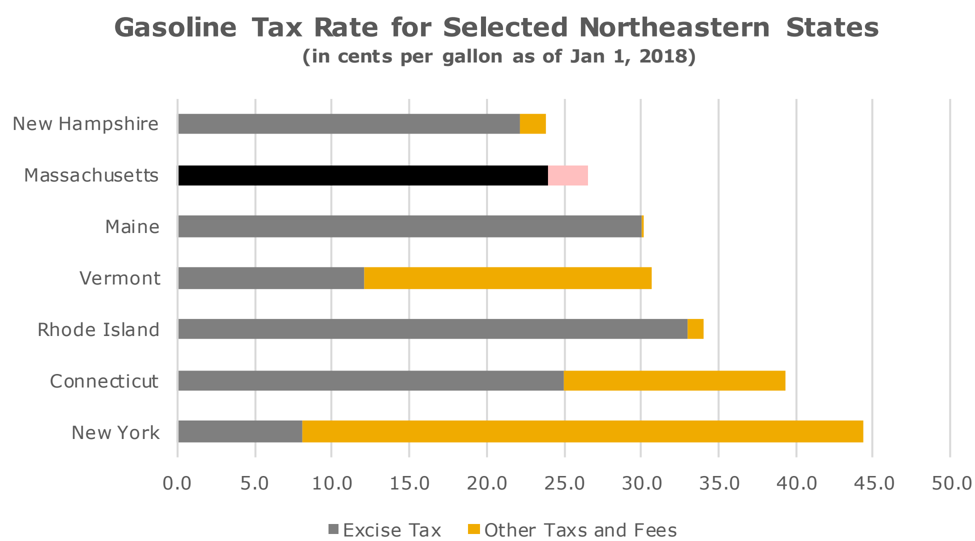
Historic Rates of Various Pledged Fees/Taxes

FY	Gasoline and Special Fuels Tax Rates per gallon	Pledged Motor Fuels Receipts ($000)	% Chg.	Registry Fees: Passenger Vehicles New Registrations and Renewal	Registry Fees: Commercial Vehicles New Registrations and Renewal per 1,000lbs GVW	Registry Fees: Certificate of Title	Registry Fees: Class D License Renewal	Pledged Registry Fees Receipts ($000)	% Chg.
2007	$0.21	674,437	0.6%	$36	$15	$50	$40	388,496	3.4%
2008	$0.21	670,940	-0.5%	$36	$15	$50	$40	396,904	2.2%
2009	$0.21	652,153	-2.8%	$50	$20	$75	$50	403,780	1.7%
2010 (4)	$0.21	653,045	0.1%	$50	$20	$75	$50	485,789	20.3%
2011	$0.21	659,183	0.9%	$50	$20	$75	$50	496,034	2.1%
2012	$0.21	660,177	0.2%	$50	$20	$75	$50	508,608	2.5%
2013	$0.21	649,779	-1.6%	$50	$20	$75	$50	522,199	2.7%
2014 (2)	$0.24	730,640	12.4%	$50	$20	$75	$50	533,194	2.1%
2015 (3)	$0.24	754,392	3.3%	$60	$20	$75	$50	581,686	9.1%
2016	$0.24	764,848	1.4%	$60	$20	$75	$50	580,426	-0.2%
2017	$0.24	767,855	0.4%	$60	$20	$75	$50	598,683	3.1%
2018(1)	$0.24	765,185	-0.3%	$60	$20	$75	$50	615,146	2.7%

Source: Commonwealth of Massachusetts
(1) Fiscal Year 2018 revenues are projected
(2) Effective July 31, 2013 Motor fuel tax increased to 24cents/gallon from 21 cents/gallon
(3) 2015 increase in revenues due to increases in certain Registry Fees
(4) 2010 increase in revenues due to change in fee structure

KBRA notes that despite motor fuels tax increases in 2014, Massachusetts fuel tax levels remain competitive in the region (see Figure 16).

FIGURE 15



Source: Commonwealth of Massachusetts | American Petroleum Institute

Given the modest growth in the base of pledged revenues, as well as the timely actions by the Commonwealth to adjust taxes and fees to fund expanded capital needs, KBRA assigns a AAA to the Revenue Analysis rating determinant.

KBRA KROLL BOND RATING AGENCY

Rating Determinant 5: Coverage and Bond Structure

Historically, pledged revenues have provided extraordinarily high coverage of debt service (see Figure 17). This high coverage reflects the quality of the pledged revenues as well as the purposeful design and timing of the Commonwealth's transportation debt and capital programs.

FIGURE 16

Historic Annual DSCR ($millions)		
FY	**ADS**	**DSCR**
2011	14,318	15.77x
2012	32,623	12.76x
2013	58,108	10.01x
2014	86,093	9.11x
2015	101,922	8.64x
2016	106,707	8.51x
2017	124,825	7.76x
MADS Year	**MADS**	**MADS Coverage**
2024	183,414	7.53x

Source: Commonwealth of Massachusetts

KBRA notes that the Commonwealth plans to issue an additional $815 million of bonds in 2019 to 2022, but to do so in a way that maintains debt service coverage at 6x – assuming only modest growth in pledged revenues (see Figure 18). The Commonwealth's debt plans are designed to achieve level debt service climbing to roughly $230 million annually, and to continue allow the CTF to spin off roughly $1.2 billion of excess cash flow each year for other transportation needs.

FIGURE 17

CTF Bond Debt Service Coverage Projection (1) ('000)

SFY Ending June 30	1994 Trust Agreement Bonds Total Debt Service	Projected CTF Pledged Funds	Prior CTF Bonds Debt Service (2)	Debt Service on 2018 Bonds	Prior CTF Bonds and 2018 Bonds Debt Service	Prior CTF Bonds and 2018 Bonds Debt Service Coverage (1)	Excess Pledge Funds	Total Debt Service on Future Bonds (3)	Total Debt Service Coverage (1)	Excess Pledged Funds
2019	29,818	1,362,014	166,141	10,306	176,448	7.7	1,185,567	-	176,448	7.7
2020	29,822	1,362,011	166,143	13,339	179,481	7.6	1,182,529	11,250	190,731	7.1
2021	29,821	1,362,012	166,143	13,342	179,485	7.6	1,182,527	27,259	206,744	6.6
2022	29,821	1,362,011	166,140	13,343	179,483	7.6	1,182,528	42,054	221,537	6.1
2023	-	1,391,832	169,818	13,593	183,411	7.6	1,208,422	47,408	230,819	6.0
2028	-	1,390,208	169,622	13,576	183,198	7.6	1,207,010	47,352	230,550	6.0
2033	-	1,387,487	169,279	13,564	182,843	7.6	1,204,643	47,259	230,102	6.0
2038	-	1,383,804	168,830	13,523	182,353	7.6	1,201,450	47,137	229,491	6.0
2043	-	1,380,331	168,401	13,497	181,898	7.6	1,198,433	47,016	228,915	6.0
2048	-	1,380,331	-	65,074	65,074	21.2	1,315,257	163,838	228,912	6.0
2049	-	1,380,331	-	-	-	-	1,380,331	228,911	228,911	6.0

Source: Commonwealth of Massachusetts

(1) Estimated Debt service coverage for fiscal year 2018 and thereafter is based on the Commonwealth's projected revenues in fiscal year 2019, which is preliminary, unaudited and subject to change, and assuming no growth in such receipts in future years. Debt Service projections for Bonds to be issued in fiscal years 2019 through 2023 are estimates based on current program needs.

(2) Reflects gross debt service on Prior CTF Bonds.

(3) Assumes the aggregate issuance in fiscal years 2019 through 2022 of $937.3 million (which amount includes net premium) of Additional Bonds for the Accelerated Bridge Program and Rail Enhancement Program. Projected Debt Service on future issuance assumes current market rates

FIGURE 18

RMV Transactions Since FY 2008

Transaction	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Vehicle Registration Renewals or Modifications	2,531,974	2,685,700	2,640,476	2,643,757	2,552,172	2,644,174	3,097,268	3,208,001	3,206,242	3,021,320
License Duplicates	450,212	421,102	391,682	201,258	206,378	184,318	186,499	194,490	210,267	233,338
License Renewal	951,117	911,523	902,692	556,539	951,498	946,787	987,767	918,640	602,081	790,989
New License (1)	236,269	227,098	213,416	222,157	224,365	230,148	231,807	207,191	158,807	152,968
New Vehicle Registrations	1,213,443	1,083,422	1,119,292	1,079,229	1,175,158	1,123,537	1,204,382	1,250,330	1,315,621	1,302,777
Total Transactions	**5,383,015**	**5,328,845**	**5,267,558**	**4,702,940**	**5,109,571**	**5,128,964**	**5,707,723**	**5,778,652**	**5,493,018**	**5,501,392**

Source: MassDOT

(1) New License transactions totals for FY 2008-2013 have been restated due to a calculation error when recording new license transactions. Revenue attributable to the transactions has not changed

Stress Testing

KBRA constructed several scenarios to assess the ability of the pledged revenues to meet debt service requirements under adverse conditions. Results of these stress scenarios demonstrate the resilient nature of the revenue base as well as the benefit of having such a large amount of cash flow cushion.

KBRA provides three of its stress scenarios below (see Figure 20). In one scenario, labeled double dip recession, KBRA took the recent worst three-year period in pledged revenue performance (2004-06), tripled its severity and repeated it back to back over the six years 2019-24. In this scenario, even when we assume the Commonwealth continues with all of its planned debt issuance, the pledged revenues cover maximum annual debt service over 4.5x.

Meanwhile, KBRA's models determined that pledged revenues would have to decline by over 33% before the CTF cash flow reaches the minimum 4x debt service coverage ratio required in the ABT. And, pledged revenues would have to decline over 83% before reaching 1x debt service coverage. In both of these breakeven models KBRA assumed that the Commonwealth issued all CTF debt as planned.

FIGURE 19

	Base Case	Recession Double Dip	Breakeven to 4.00x ABT	Breakeven to 1.00x DSCR
Summary	Based on the Commonwealth's revenue projections with slight YOY variations but overall no growth in Pledged Revenues	Recession effect on the Pledged Funds was minimal. KBRA chose the period of the Pledged Funds performance between 2004-2006 (-0.3%, 2.7%, and -4.7%), which is more severe than the declines during the Great Recession. KBRA multiplied the 3-year recessionary stress 3 times (-0.9%, 2.7%, and -14.1%) and repeated twice from 2019-2024 in this scenario.	To show how much decline the Pledged Funds can withstand before MADS including future bondings reaches the 4.00x ABT	To show how much decline the Pledged Funds can withstand before MADS including future bondings reaches 1.00x
Revenue Growth Rate	0.00%	-23.71% between 2018 and 2024 no growth thereafter	-33.11%	-83.28%
2018A Bonds DS Only — Debt service requirement includes exiting CTF Revenue Bonds and preliminary DS schedule of the 2018A Bonds				
MADS Year	2024	2024	2024	2024
MADS (000)	$183,414	$183,414	$183,414	$183,414
MADS Coverage	7.59x	5.74x	5.03x	1.26x
DS Including Future Bonding Needs — Debt service requirement includes exiting CTF Revenue Bonds and preliminary DS schedule of the 2018A Bonds, and DS schedule of anticipated future bondings				
MADS Year	2024	2024	2024	2024
MADS (000)	$230,823	$230,823	$230,823	$230,823
MADS Coverage	6.03x	4.56x	4.00x	1.00x

Because the pledged revenues can withstand extraordinary and highly unlikely declines before breaching even the 4X ABT, KBRA assigns a AAA to the Coverage and Bond Structure rating determinant.

Conclusion

KBRA has assigned a long-term rating of AAA with a Stable Outlook to the Commonwealth of Massachusetts' Commonwealth Transportation Fund Revenue Bonds (Rail Enhancement & Accelerated Bridge Programs), 2018 Series A. The long-term AAA rating and Stable Outlook also applies to all of Massachusetts' $2.59 billion outstanding Commonwealth Transportation Fund Revenue Bonds, except for bonds backed by a letter of credit or liquidity facility.