



## The Fed Should Respect the Yield Curve

*"So, while I will keep a close watch on the yield curve as an important signal on financial conditions, I will want to interpret yield curve movements as one of several considerations informing appropriate policy."* *Lael Brainard*

*By Chris Mier, CFA | Strategist*

Recently, Federal Reserve Governor Lael Brainard addressed the Detroit Economic Club with a speech entitled "What Do We Mean by Neutral and What Role Does It Play in Monetary Policy?" The speech was notable for the manner in which it covered two concepts—the shorter-term neutral rate of interest and the yield curve.

Brainard indicated that the concept of the neutral rate is a useful frame of reference for economists and policy makers. The neutral rate simply describes the level of the federal funds rate that neither stimulates nor restrains economic growth. The FOMC in their Summary of Economic Projections (SEP) provide a long-run federal funds rate forecast that effectively is their estimation of the neutral rate in the long-run. This long-run version, Brainard points out, is not useful in assessing the near-term path of monetary policy in the presence of "headwinds or tailwinds", however. It is the shorter-run neutral rate, rather than the longer-run rate, that is the relevant benchmark.

Some interesting points about the shorter-run neutral rate of interest are that:

- It is not directly observable

- It must be estimated or inferred from the movement of observed variables
- This inherently implies a time lag between Fed action, economic response, and subsequently estimation of the neutral rate
- The shorter-run neutral rate of interest is cyclical, falling in recessions and rising during expansions
- The shorter-run neutral rate can rise somewhat higher than the longer-run neutral rate, making the long-run rate ineffective as a barometer by which to estimate the short-term rate
- Estimates of the shorter-term neutral rate are model dependent and uncertain

While the neutral rate of interest is an appealing concept, its value appears to be questionable. Of what benefit is gauging the current, or the anticipated level of the federal funds rate in the short run, against an unobservable benchmark that can only be inferred with a time lag after policy has already influenced the course of the economy? The short-term neutral rate of interest is, in effect, a unicorn that only confuses the question of whether or not

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## The Fed Should Respect the Yield Curve

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monetary policy is currently stimulative or contractionary. It may be heresy, but the shorter-run neutral rate appears to be a product of the long-standing tendency of the field of economics to place faith in the existence of equilibrium conditions which may in fact not exist at all. That is to say that there may not be a federal funds rate that is consistent with a trend rate of growth at full resource utilization.

With respect to the yield curve, Governor Brainard paid hollow praise to the yield curve's ability to forecast recessions and embarked upon an explanation of why "this time may be different" with respect to the possibility of an inversion of the yield curve and its significance as a predictor of economic recessions. Reasons cited by the Governor for discounting the value of the yield curve were that:

- 10-year interest rates are historically very low

- The term premium may be lower than in the past
- The correlation between stock and bond returns has changed

The Governor cautions that "the conclusions that we can draw from historical yield curve relationships" are tempered by the change in these relationships.

What strikes me as interesting, is that the yield curve, which is observable, empirically testable, and proven as a forecasting tool, is being subjected to the Governor's minimizations while the short-term neutral rate of interest, which has none of those attributes, is being held up as a valued central banking tool. Hopefully, if the yield curve continues to flatten and begins to approach an inversion, the Fed will take its significance at face value without any rationalizations and will respond accordingly. A lack of appreciation of the value of the yield curve, as observed in the market without any of the Fed's recalibrations, would be a grave mistake.

## Economic and Interest Rate Forecast — September 2018

### Factors Supportive of Lower Rates

New home sales fell 1.7% in July to a 9-month low, while existing home sales declined 0.7%, the latest indications that the housing market is slowing down, as the sector is facing rising building material costs and shortages of land and labor. Housing starts rose 0.9% in July after plunging 12.9% in June.

U.S. vehicle sales declined 0.5% in August to 16.60 million annualized rate as rising interest rates deterred some buyers and discounts dried up due to automakers' focus on preserving profits.

Companies in emerging markets have increasing difficulty issuing bonds overseas, which jeopardizes their ability to pay back debt and hurts economic growth. U.S. tariffs on additional \$200 billion of Chinese imports could be imposed soon, while Trump also floated an idea of imposing tariffs on all Chinese imports.

### Factors Supportive of Higher Rates

The U.S. added 201K jobs in August, while July reading was revised down by 10K. The unemployment held steady at 3.9%. Job creation remains strong in higher-paying sectors of the economy, while involuntary part-time employment declined.

Hourly earnings jumped 0.4% to 2.9% YoY, a 9-yr high, an indication of increasing inflationary pressures.

Retail sales rose 0.5% in July, while consumer spending increased 0.4%, the sixth consecutive monthly gain.

ISM manufacturing index jumped to a 14-year high of 61.3 in August from 58.1 in July, while optimism among U.S. small-business owners soared to the highest level on record as companies benefited from tax cuts and robust consumer demand.

Figure 1 Economic and Interest Rate Forecast — September 2018

	1Q'17	2Q'17	3Q'17	4Q'17	1Q'18	2Q'18	3Q'18	4Q'18	1Q'19	2Q'19	3Q'19	4Q'19	Avg'17	Avg'18	Avg'19
<b>Economic Forecasts</b>															
Real GDP	1.2	3.1	3.2	2.9	2.0	4.2	3.1	2.9	2.5	2.4	2.4	2.3	2.2	3.1	2.4
Core PCE Deflator	1.8	1.6	1.5	1.6	1.7	1.9	2.3	2.2	2.3	2.2	2.2	2.1	1.6	2.0	2.2
Unemployment Rate*	4.7	4.3	4.3	4.1	4.1	3.9	3.8	3.8	3.7	3.6	3.7	3.7	4.4	3.9	3.7
Nonfarm Payrolls (chg in 1000s)	532	569	425	662	655	651	525	495	460	450	440	440	2,188	2,326	1,790
S&P 500	2,327	2,398	2,467	2,603	2,733	2,703	2,840	2,885	2,931	2,977	3,025	3,073	2,449	2,790	3,001
<b>Short-Term Interest Rates*</b>															
Fed Funds Target (%)	0.70	0.95	1.16	1.20	1.44	1.74	1.91	2.16	2.41	2.68	2.88	2.88	1.00	1.81	2.71
3-Month LIBOR (%)	1.07	1.21	1.31	1.46	1.93	2.34	2.33	2.58	2.80	3.04	3.21	3.18	1.26	2.30	3.06
7-Day SIFMA (%)	0.69	0.84	0.82	1.05	1.21	1.46	1.35	1.70	1.80	2.00	2.10	2.20	0.85	1.43	2.03
<b>Treasury Interest Rates*</b>															
2-Year Treasury (%)	1.24	1.29	1.36	1.69	2.15	2.47	2.64	2.72	2.94	3.18	3.30	3.32	1.39	2.50	3.18
3-Year Treasury (%)	1.51	1.47	1.51	1.81	2.30	2.61	2.72	2.82	3.01	3.21	3.31	3.33	1.57	2.61	3.22
5-Year Treasury (%)	1.94	1.81	1.81	2.06	2.53	2.77	2.78	2.99	3.12	3.27	3.35	3.37	1.91	2.77	3.28
7-Year Treasury (%)	2.25	2.07	2.06	2.25	2.68	2.88	2.85	3.05	3.16	3.29	3.37	3.39	2.16	2.86	3.30
10-Year Treasury (%)	2.44	2.26	2.24	2.37	2.76	2.92	2.90	3.11	3.21	3.33	3.40	3.42	2.33	2.92	3.34
30-Year Treasury (%)	3.05	2.90	2.82	2.82	3.03	3.09	3.04	3.28	3.39	3.51	3.58	3.60	2.89	3.11	3.52
<b>Municipal Interest Rates*</b>															
30-Year MMD (%)	3.08	2.86	2.75	2.71	2.91	2.99	3.02	3.21	3.28	3.35	3.37	3.35	2.85	3.03	3.34
Muni Yield Curve Slope (%)	2.21	2.02	1.93	1.58	1.51	1.36	1.47	1.39	1.36	1.23	1.15	1.03	1.93	1.43	1.19

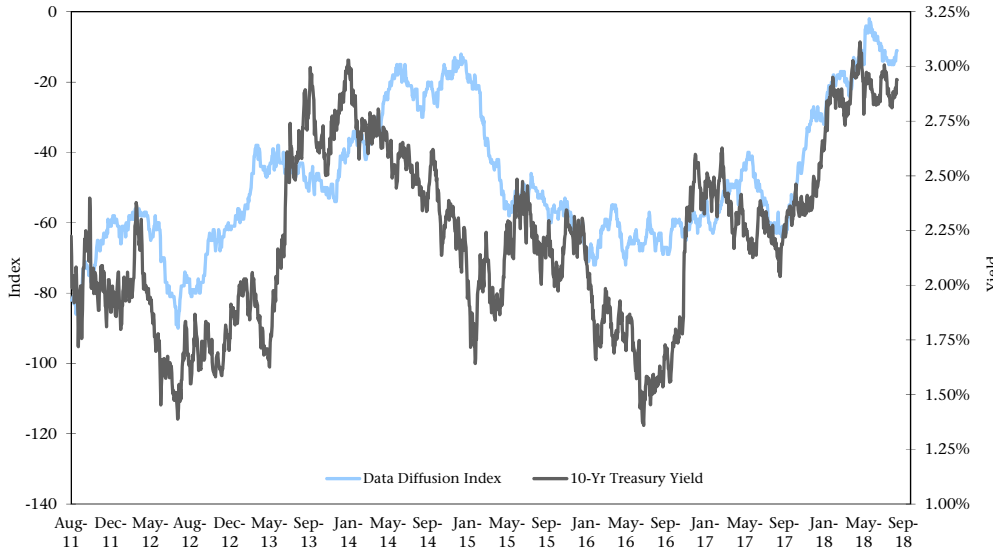
P: Preliminary Data

\* 3-month average

Source: Loop Capital Markets' Analytical Services Division and Short-Term Desk. Black Text: Actual Blue Text: Forecast as of September 11, 2018

# Market Review *Data Diffusion / ADS Index*

**Figure 2 Data Diffusion Index vs. 10-Yr Treasury Yield**

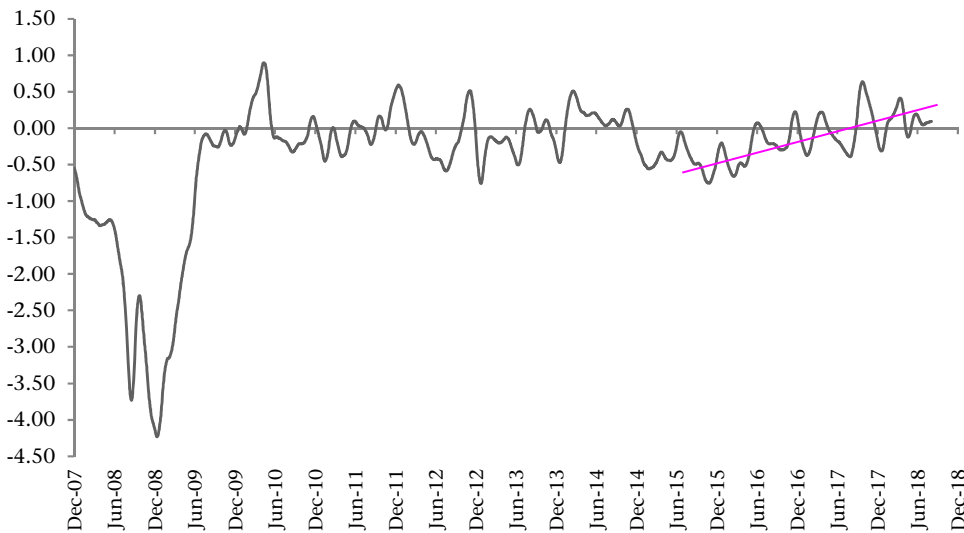


Sources: FRED, Loop Capital Markets

As Data Diffusion Index rose 4 points since mid-August, 10-yr Treasury yield increased 8 bps. The two curves have followed each other reasonably well over the last 7 years.

**Data Diffusion Index:** We calculate the Data Diffusion Index based on 30 different weekly, monthly and quarterly economic releases, such as construction spending, capacity utilization and new home sales. If the number came above the consensus estimate (which is positive for economic growth) the index would increase by one, and vice versa. The Treasury yield is expected to track the data diffusion index (the yields would increase as the economy exceeds expectations and vice versa).

**Figure 3 Aruoba-Diebold-Scotti Business Conditions Index (12/31/2007 — 09/01/2018)**



Source: Federal Reserve Bank of Philadelphia

The index has been trending up over the last 3 years and is currently close to trend growth of about 2%, represented by the flat line.

**Reading the ADS Index:** The index is designed to track real business conditions at high frequency. Its underlying (seasonally adjusted) economic indicators (weekly initial jobless claims; monthly payroll employment, industrial production, personal income less transfer payments, manufacturing and trade sales; and quarterly real GDP) blend high and low-frequency information and stock and flow data.

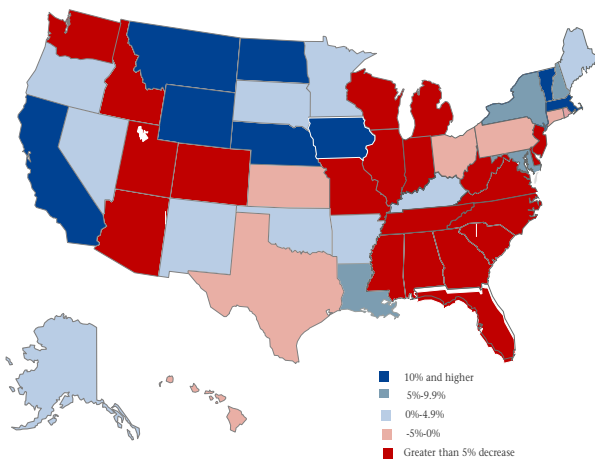
# Teacher Strikes Leading to Increased Education Funding, Potential Credit Pressure

By Rachel Barkley / Vice President

Teachers staged either walk-outs or strikes in six states (Arizona, Colorado, Kentucky, North Carolina, Oklahoma and West Virginia) this spring. With the new school year beginning, new work stoppages or the threat of them continue in various areas across the country. Teachers in the state of Washington went on strike at the beginning of the 2018-2019 school year, while union members in the Los Angeles Unified School District (LAUSD) voted on August 29<sup>th</sup> to authorize a strike if negotiations between the teachers' union and the district fail to come to an acceptable conclusion. In this piece we go through some of the recent strikes and explore the potential credit impact, including proposed tax initiatives.

Generally, the strikes have been driven by unmet requests for funding increases, benefit protections and increased administrative support as well as classroom improvements. Overall, teacher salaries remain below pre-recession levels in 28 states, when adjusted for inflation. Nationally, teacher pay for 2017 was 1.6% lower than 1999 levels and 5% lower than in 2009, when adjusted for inflation.<sup>1</sup> The Southeast and Midwest had the largest percentage decreases since 2009, while the West, Plains and New England increased teacher pay over the period. One in five teachers currently works a second job in order to make ends meet, according to the National Center for Education Statistics.

**Average Teacher Salary % Change in Constant Dollars 2009-2017**



There remains a strong correlation between cost-of-living and teacher pay, with California having the highest average teacher

salary at \$78,711, followed by Massachusetts at \$77,804. However, several of the lower paying states, especially the ones that have had teacher strikes this year, have a notable variance in where they rank in terms of teacher pay compared to their cost of living rank, as shown below.

## Average Teacher Pay and Cost of Living by Quintile

	Teacher Pay	Cost of Living	Variance
New York	1	1	0
California	1	1	0
Massachusetts	1	1	0
Connecticut	1	1	0
New Jersey	1	1	0
Alaska	1	1	0
Maryland	1	1	0
Rhode Island	1	1	0
Pennsylvania	1	3	-2
Michigan	1	5	-4
Oregon	2	1	1
Illinois	2	3	-1
Delaware	2	2	0
Vermont	2	2	0
Wyoming	2	4	-2
Hawaii	2	1	1
Nevada	2	2	0
Minnesota	2	3	-1
New Hampshire	2	2	0
Ohio	2	4	-2
Iowa	3	4	-1
Wisconsin	3	3	0
Georgia	3	5	-2
Washington	3	2	1
Texas	3	5	-2
Kentucky	3	4	-1
Nebraska	3	4	-1
North Dakota	3	3	0
Montana	3	2	1
Maine	3	2	1
<b>Virginia</b>	<b>4</b>	<b>2</b>	<b>2</b>
Indiana	4	4	0
Louisiana	4	4	0
North Carolina	4	4	0
<b>Florida</b>	<b>4</b>	<b>3</b>	<b>1</b>
Alabama	4	5	-1
Arkansas	4	5	-1
South Carolina	4	3	1
Tennessee	4	5	-1
Missouri	4	5	-1
Kansas	5	5	0
Idaho	5	4	1
New Mexico	5	4	1
<b>Arizona</b>	<b>5</b>	<b>3</b>	<b>2</b>
<b>Utah</b>	<b>5</b>	<b>3</b>	<b>2</b>
<b>Colorado</b>	<b>5</b>	<b>2</b>	<b>3</b>
<b>West Virginia</b>	<b>5</b>	<b>3</b>	<b>2</b>
Oklahoma	5	5	0
Mississippi	5	5	0
<b>South Dakota</b>	<b>5</b>	<b>2</b>	<b>3</b>

Sources: U.S. Department of Education and the Council for Community and Economic Research

States with teacher pay at least two quintiles below its cost-of-living quintile are bolded. Three of the states that have had teacher strikes

<sup>1</sup> U.S. Department of Education.

in the past year, Arizona, Colorado and West Virginia, fall into this category.

### Arizona

Arizona teachers went on strike in April, while the state was undergoing budget negotiations. The state originally offered teachers a 1% raise, stating that was all it could afford.<sup>2</sup> This was increased to a proposed 20% raise by 2020, which was rejected by the teachers. The state's first ever teachers strike followed as teachers sought a return to pre-recession education funding levels and a dedicated revenue source for raises, as well as raises for support staff.

A compromise was eventually reached between the parties. Teachers received a 9% raise in fiscal 2019, while an additional 5% raise is slated for both fiscal 2020 and fiscal 2021. The budget also includes an additional \$100MM of funding that can be used for various school needs, including raises for support staff. Actual raises for both teachers and support staff, however, will be at the discretion of each school district which will be allocated dollars by the state to use as they see fit.<sup>3</sup>

Proposition 207 had been scheduled for this November, which if passed would have increased the tax rate from its current highest rate of 4.54% to 8% for individual filers making between \$250,001 and \$500,000 and for married joint filers making between \$500,001 to \$1MM. Filers making more than those amounts would have had their rate raised to 9%. Revenue from the increase was scheduled to be divided between teacher salaries, which would have received 60% of the increase, school support personnel and full-day kindergarten funding. However, on August 29<sup>th</sup>, the Arizona Supreme Court removed Proposition 207 from the ballot stating the since petition signers were not informed that the measure would also eliminate the indexing income tax brackets for inflation.<sup>4</sup>

The enacted fiscal 2019 budget totals \$10.4B, a 4% increase from the current year. K-12 spending will increase by \$477MM, an 11.3% increase, including \$240MM for teacher salary raises and \$126MM in school funding formula spending. Teacher raises for fiscal 2019 will be funded by a combination of taking revenues from special funds as well as from a newly enacted car registration fee.

Economic forecasts currently project state revenue growth to be less than the budgeted increase, which could lead to mid-year budget

adjustments or funding cuts for fiscal 2020.<sup>5</sup> Additionally, despite the additional funding in fiscal 2019, education spending is still budgeted to remain below pre-recession levels. In total, state K-12 funding fell 36.6% on a per student basis between fiscal 2008 and 2015, the largest percentage decrease of any state.<sup>6</sup> Failure to come through with the additional funding for teacher raises in the fiscal 2020 budget would likely not be received well by teachers and potentially lead to another strike.

### Colorado

The 2018 Colorado teacher strike lasted for two and a half weeks in late April and May. Teacher pay fell 15% from 2009 to 2017 adjusted for inflation. In 2017, it had the fifth lowest average teacher pay, while the cost-of-living is 17<sup>th</sup> highest<sup>7</sup>, a sizeable disconnect. The teachers' union, the Colorado Education Association (CEA), claimed the state underfunded education by a total of \$6.6B since 2009.<sup>8</sup>

Teachers were seeking a \$150MM increase in education funding in fiscal 2019, which would increase to \$822MM by 2022 and a sustainable fix for pension funding. During the strike, the state passed its fiscal 2019 budget which included the requested \$150MM increase in K-12 funding.

On June 4<sup>th</sup>, Governor Hickenlooper signed into law SB200, a pension reform bill. The final legislation included many aspects that were supported by the CEA, including the state contributing \$225MM annually to pensions.

There will also be a statewide ballot initiative, Amendment 73, which would increase taxes to fund education. The bill would change the personal income tax from a flat rate to a graduated rate. Those earning up to \$150,000 would have no change to their current rate of 4.63%, with tax rates for high-income earners would be raised to between 5% (\$150,001-\$200,000) to 8.25% (\$500,001 and above). The corporate tax rate would be raised from 4.64% to 6%. Revenue generated from the increases would be deposited in a new fund, the Quality Public Education Fund. In addition, property taxes levied by school districts would be lowered from 7.2% to 7% for residential property and from 29% to 24% for non-residential property.

Additionally, at least seven districts in the state have approved ballot initiatives that would increase tax rates at the local level to

<sup>2</sup> Arizona lawmakers pass new budget; Ducey signs off on teacher pay raises. Tucson.com. May 3, 2018.

<sup>3</sup> Arizona Passes New Education Funding to End Teachers' Strike. New York Magazine. May 3, 2018.

<sup>4</sup> 'Invest in Ed' initiative knocked off Arizona ballot. Tucson.com. August 31, 2018.

<sup>5</sup> Ducey's teacher pay plan relies on sunny economic forecast, less Medicaid spending. AZ Central. April 17, 2018.

<sup>6</sup> A Punishing Decade for School Funding. Center for Budget and Policy Priorities. November 29, 2017.

<sup>7</sup> U.S. DOE and the Council for Community and Economic Research

<sup>8</sup> Educators demand action, Apr. 26 & 27. Colorado Education Association. April 28, 2018.

fund teacher salary increases and other school measures.<sup>9</sup> These currently include some of the state's larger districts, such as Aurora which is seeking \$35MM in collection year 2019 in additional funding through a TABOR millage override.

## Kentucky

While teachers in Kentucky had asked for increased funding, events reached a boiling point when the state passed a pension reform bill in March, which teachers described as 'bait and switch'.<sup>10</sup> The original pension reform bill, Senate Bill 1, was included under Senate Bill 151, which had originally been about local wastewater services. The reforms included the formation of a hybrid cash balance plan for new hires and limiting the number of sick days teachers can use towards their benefit calculation.

Thousands of teachers called out sick in April in a coordinated "sick-out" causing schools to close. While teachers lost the battle on pension reforms, which were signed into law, the Legislature did override Governor Bevin's vetoes on a 50 cent cigarette tax increase and the widening the sales tax to include additional services, which will be used to increase education funding.<sup>11</sup>

The repercussions of the teachers' discontent are also playing out in the current election cycle. Kentucky's House Majority Leader, Johnathon Schnell, was defeated in the primary this May, by a school teacher. Schnell had been a leader in a recent effort to reduce teacher pension benefits.

## North Carolina

North Carolina teachers held a rally, walking out of work in May. Average 2017 teacher salaries in the state were 9.4% below 2009 levels when adjusted for inflation, while more than half of the state's teachers hold a second job, according to the National Center for Education Statistics.

The North Carolina Association of Educators was asking for increased teacher and support staff pay, increase per student spending, increase support and administrative staffing levels and create a statewide construction board to address school conditions and class size.

Before the walkout began, the Legislature announced that teachers could expect a 6.2% raise for fiscal 2019<sup>12</sup>. The protest lasted one day, partially due to it being illegal in the state for teachers to strike. Teacher raises for fiscal 2019 were slightly higher than promised prior to the walkout at 6.5%, while some teachers will be eligible for \$2,000 performance-based bonuses as well.<sup>13</sup> The state also increased the needs-based school capital fund by \$42MM, which will be funded by lottery revenues. No additional funding was provided for class-size reduction.

The state continues to prioritize its bottom-line, budgeting to add \$161MM to its rainy day fund. While this is good for investors, it means relatively little was done for teachers, who are in a weak bargaining position compared to other states.

## Oklahoma

Oklahoma teacher pay is the third lowest nationally at \$45,245.<sup>14</sup>

Teachers went on a nine day strike in April, after the Legislature passed a \$6,000 pay raise for teachers in March. The teachers' union was asking for a \$10,000 raise for teachers as well as \$5,000 raises for support staff and \$200MM in additional education funding. The walkout ended after nine days with no additional funding modifications by the state.

On an inflation-adjusted basis, total spending for fiscal 2019 remains \$0.6B below fiscal 2009 levels.<sup>15</sup> Funding for vital services, including higher education, transportation and healthcare, is well below levels from a decade prior. Neighboring states, particularly Texas, continue to try to recruit Oklahoma teachers by advertising higher salaries.<sup>16</sup> These accumulated cost pressures will need to be addressed, largely offsetting increases in revenue in future years.

## West Virginia

Teachers went on strike in February seeking higher pay and a fix to the Public Employees Insurance Agency (PEIA), which provides health and other forms of insurance to public employees. The state ranked 47<sup>th</sup> in terms of teacher pay in 2017, while cost-of-living was 26<sup>th</sup> highest.<sup>17</sup> The state had previously passed a 2% raise for teachers in 2019, followed by a 1% raise annually for the next two years and a 16 month benefit freeze. Increases in teacher pay failed

<sup>9</sup> Higher teacher pay and more school safety are up for a vote with November tax requests. Chalkbeat. August 24, 2018

<sup>10</sup> Kentucky teachers to skip work after lawmakers' 'bait and switch' on pension reform. CNN. March 31, 2018

<sup>11</sup> Teachers in Kentucky claim victory as Republicans reject GOP governor's veto. Associated Press. April 14, 2018.

<sup>12</sup> Here's what teachers accomplished with their protests this year. CNN. May 29, 2018.

<sup>13</sup> Republicans release legislative budget with pay raise for teachers, principals. News Observer. May 28, 2018.

<sup>14</sup> U.S. D.O.E.

<sup>15</sup> Despite funding boost, state budget fails to restore most cuts. Tulsa World. April 29, 2018.

<sup>16</sup> Fort Worth ISD hopes to lure Oklahoma teachers with billboards advertising higher salaries. Dallas Morning News. May 8, 2018.

<sup>17</sup> U.S. DOE and the Council for Community and Economic Research

to keep up with increases in the employee contribution for the PEIA. The Legislature had approved increasing state contributions to PEIA by allocating 20% of annual General Fund surpluses to the Agency to help offset this gap but the teachers were calling for a more stable funding solution.

After the nine day strike, Governor Justice agreed to a 5% raise for teachers, which was applied to all state employees, and will be funded by budget cuts. The Governor also issued an executive order creating a task force to look at long-term revenue solutions for the PEIA, including potential severance taxes, gaming revenues and toll road revenues.<sup>18</sup>

The PEIA task force held public outreach meetings in May and June and has released a report on its findings thus far. Public support indicates a gas severance tax would likely be supported to fund the system.<sup>19</sup> The current severance tax accounts for 3.6% of General Fund revenues. An increase in the tax to fund the Agency would not harm general government operations and take advantage of the state's expanding natural gas industry.

### **Closing Thoughts**

The threat of teacher strikes continues. Earlier this year, Brookings determined that Alabama, Georgia, Idaho, Mississippi, New Mexico, South Carolina, South Dakota and Utah all have a combination of the factors that have driven recent strikes, making them vulnerable to teacher strikes and/or protests unless changes are made.<sup>20</sup> While whether an actual teacher strike may occur in these states is difficult to predict, these states may be in a position in the next few years where they feel the need to increase education funding. These changes may come more rapidly or be more comprehensive if those with educational backgrounds are elected to office. Funding these increases could be particularly hard to do while maintaining balance budget operations once the current economic growth cycle eventually turns.

<sup>18</sup> Statement from Three Education Organizations Regarding Action on Agreement Items. West Virginia Education Association. March, 2018.

<sup>19</sup> Public Outreach and Legislative Subcommittee Report. West Virginia Public Employee Insurance Agency Stability Task Force. 2018.

<sup>20</sup> Which states might experience the next wave of teacher strikes?. Brookings. April 13, 2018.



# California Pledges Carbon-Free Electricity

By Ivan Gulich | Senior Vice President

On September 10, 2018 California Governor Jerry Brown signed into law SB 100, a landmark bill which mandates 100% carbon-free electricity by 2045. We examine the impact this law will have on electric industry and public power companies operating in California.

## Electric Consumption

California has second lowest residential electric consumption per capita due to extensive efforts to increase energy efficiency and reduce energy use. It is notable that this was accomplished despite the state's relative warm climate that necessitates the use of energy-gobbling air-conditioning.

### Average Annual Residential El. Consumption per Capita

#	State	(kWh)	State	(kWh)	
1	Hawaii	1,828	27	Montana	4,672
2	California	2,247	28	Washington	4,699
3	New York	2,563	29	Wyoming	4,703
4	Alaska	2,706	30	Idaho	4,864
5	Massachusetts	2,886	31	Arizona	4,877
6	Rhode Island	2,914	32	Indiana	4,978
7	Utah	3,078	33	Delaware	5,000
8	New Mexico	3,185	34	Nebraska	5,105
9	New Jersey	3,240	35	Texas	5,231
10	Vermont	3,299	36	South Dakota	5,361
11	New Hampshire	3,325	37	Virginia	5,370
12	Colorado	3,406	38	Georgia	5,613
13	Maine	3,447	39	Missouri	5,640
14	Michigan	3,477	40	North Carolina	5,755
15	Connecticut	3,533	41	Oklahoma	5,812
16	Illinois	3,583	42	Kentucky	5,937
17	District of Columbia	3,656	43	Arkansas	5,951
18	Wisconsin	3,779	44	Florida	5,970
19	Minnesota	3,946	45	South Carolina	6,173
20	Pennsylvania	4,213	46	Mississippi	6,183
21	Nevada	4,318	47	West Virginia	6,221
22	Iowa	4,502	48	North Dakota	6,275
23	Ohio	4,519	49	Tennessee	6,282
24	Maryland	4,534	50	Louisiana	6,541
25	Oregon	4,546	51	Alabama	6,595
26	Kansas	4,646			

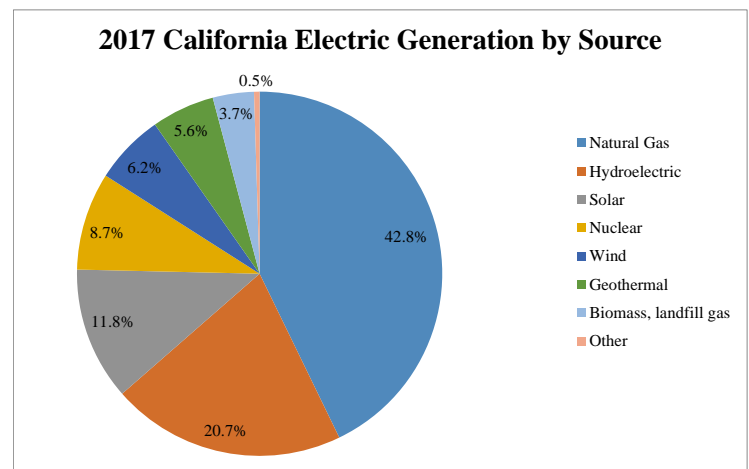
Sources: U.S. Energy Information Administration (EIA), Census Bureau

Hawaii is an outlier in terms of energy consumption due to extremely high cost of electricity and widespread use of ceiling fans as an alternative to air-conditioning. In the South, electric

consumption per capita is more than double California levels due to hot climate and modest conservation efforts.

## Electric Generation

California has experienced significant changes in generation mix in recent years.



Source: EIA

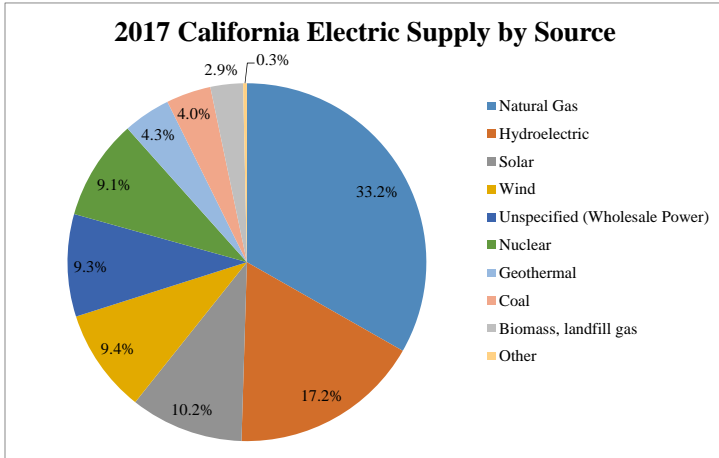
Coal-fired generation has been practically phased out. On January 11, 2018 California Public Utilities Commission approved the closing of the state's last nuclear power plant, the Diablo Canyon Power Plant in San Luis Obispo County by 2025.<sup>21</sup>

Natural gas has become the dominant fuel source, while share of hydroelectric power in generation mix varies from year-to-year depending on annual precipitation. Environmental mandates have spurred growth of renewable power sources. Solar and wind currently account for about 12% and 6% of total generation, respectively.

29.3% of California electric consumption in 2017 was generated out-of-state.<sup>22</sup> When imported electricity is added to in-state generation, California's fuel mix looks like this:

<sup>21</sup>K. Leslie: Diablo Canyon will close in 2025 — without San Luis Obispo County's \$85 million settlement, The Tribune, January 11, 2018

<sup>22</sup> California Energy Commission: 2017 Total System Electric Generation in Gigawatt Hours, [http://www.energy.ca.gov/almanac/electricity\\_data/total\\_system\\_power.html](http://www.energy.ca.gov/almanac/electricity_data/total_system_power.html)



Sources: EIA, California Energy Commission

Excluding nuclear power generation, about 41% of California electric supply currently comes from carbon-free sources that qualify as renewable under SB 100: hydroelectric, solar, wind and geothermal.

**Electric Rates**

California has 5<sup>th</sup> highest residential rates among the lower 48 states.

**Average Residential Rates in 2017**

#	State	(¢/kWh)	State	(¢/kWh)	
1	Connecticut	20.31	25	Colorado	12.13
2	New Hampshire	19.22	26	Nevada	12.00
3	Massachusetts	18.92	27	Indiana	11.95
4	Rhode Island	18.30	28	Florida	11.85
5	California	18.24	29	Georgia	11.80
6	New York	18.04	30	South Dakota	11.68
7	Vermont	17.65	31	Virginia	11.67
8	Maine	15.96	32	West Virginia	11.62
9	New Jersey	15.69	33	Wyoming	11.41
10	Michigan	15.47	34	Missouri	11.27
11	Wisconsin	14.68	35	Mississippi	11.19
12	Pennsylvania	14.33	36	Texas	11.18
13	Maryland	13.99	37	North Carolina	11.12
14	Delaware	13.44	38	Montana	11.11
15	Kansas	13.27	39	Utah	11.04
16	Minnesota	13.19	40	Nebraska	10.98
17	Dist. of Columbia	12.93	41	Oregon	10.71
18	New Mexico	12.92	42	Tennessee	10.65
	U.S. Total	12.90	43	Kentucky	10.64
19	South Carolina	12.78	44	Oklahoma	10.48
20	Illinois	12.70	45	North Dakota	10.40
21	Alabama	12.61	46	Arkansas	10.22
22	Iowa	12.60	47	Idaho	10.11
23	Arizona	12.50	48	Washington	9.60
24	Ohio	12.37	49	Louisiana	9.51

Source: EIA

The most important factor influencing the cost of power is fuel source. Most power in low-cost states is generated using fossil fuels such as coal and natural gas that California is transitioning away from. As state’s efforts accelerated in recent years, electric rates in California rose faster than in the U.S.

From 2011 through 2018, electric rates in California rose about 2.5% faster each year than the national average.<sup>23</sup>

**Energy Legislation**

SB 350, which was signed into law in October 2015, set the following renewable energy targets for utilities as share of total electric sales:<sup>24</sup>

- 2020: 33%
- 2024: 40%
- 2027: 45%
- 2030+: 50%

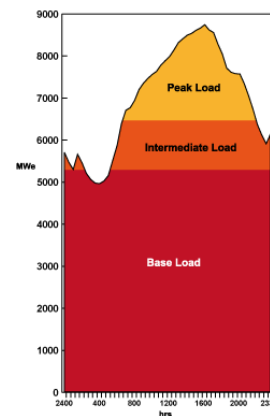
SB 100, signed into law on September 10, 2018, accelerates these targets and mandates complete elimination of carbon-dioxide emissions in the electric utility industry by 2045:

- 2026: 50%
- 2030: 60%
- 2045: 100%

The law stipulates that these targets must be met without increasing carbon-dioxide emissions elsewhere, prohibiting the outsourcing of fossil fuel emissions to neighboring states.<sup>25</sup>

**Technical Challenges**

The following chart illustrates aggregate demand for power across typical electric utility’s service territory during a 24-hour period.



<sup>23</sup> EIA

<sup>24</sup> California Energy Commission: Clean Energy & Pollution Reduction Act SB 350 Overview

<sup>25</sup> J. Spector: On to Governor Brown’s Desk: What 100% Clean Energy Means for California, GreenTech Media, August 29, 2018

We note that base load remains practically constant. Plants that provide base load run constantly run at full capacity and are optimized to produce inexpensive power. Baseload plants run on nuclear and fossil fuel (mostly coal). To meet added load, utilities dispatch so-called intermediate units that run on coal or natural gas. Finally, to meet peak load, utilities rely on gas turbines that run on oil or natural gas. These units produce expensive electricity, but can generate it on a short notice, just like home generators.

Since SB 100 legislatively phases out plants that run on fossil fuels, such as coal and natural gas, nuclear power remains the only technically feasible choice to generate zero-emission baseload power past 2045. However, hostility toward nuclear power, demonstrated by the recent decision to shut down California's last remaining nuclear power plant leaves utility planners with no technically feasible solution to meet their base load based on current technology.

Renewable power sources, such as solar panels and wind generators, produce power intermittently. When the sun doesn't shine, for example at night, or wind doesn't blow, generation goes down to zero. On the other hand, electric system must be able to absorb extra solar or wind power during period of peak production but limited demand.

To reduce volatility and balance the load across the grid, planners are looking at energy storage. Utilities could deploy large scale lithium-ion battery farms, at very high cost, to balance supply from intermittent energy sources over a short term period (several hours). However, storing energy for weeks or months is not technically feasible at this point in time.<sup>26</sup>

New pumped hydro facilities that could store electricity are expensive to build and face siting concerns, while carbon capturing technology, which could make plants burning fossil fuel zero-emission facilities, is not economically feasible.

### **Impact of legislative mandates on LADWP Electric System<sup>27</sup>**

LADWP's 2017 Strategic Long-Term Resource Plan (SLTRP) includes an assessment of the revenue requirements and rate impacts of strategies to reduce greenhouse gas emissions. The scenarios that were analyzed—50% renewable scenario by 2030 (based on SB 350) as well as aspirational 65% renewable scenario—are much less stringent than the new SB 100 mandate of 100% zero-emissions power generation.

The study determined that integrating growing share of renewable resources in the power system increases costs and operational challenges. Ramping down generation from thermal units as the sun rises and dramatically ramping up output as the sun sets would result in significant stress on the power system. Current system does not have sufficient capacity to accommodate fast fluctuations in solar power output in 50% renewables scenario. Renewable resources such as solar provide minimal dependable capacity when LADWP's system is at peak load after the sun sets in the evening.

Interestingly, energy efficiency programs raise LADWP's retail rates the most due to compound effects of program costs and reduced energy sales. In terms of the rate impact, the combined effect of various programs, including increasing the share of renewables in LADWP's portfolio mix from 31% to 65% target would raise average retail rates about 2.8% annually through 2037 based on recommended scenario. By 2037 solar power would account for about 50% of renewable portfolio mix. The estimates are heavily dependent on a number of assumptions such as projected fuel and purchase power costs and state and federal mandates.

### **Discussion and Conclusions**

Existing environmental mandates pose operational challenges for California's electric utilities. These initiatives have already contributed to annual rate increases that were about 2.5% higher than the national average from 2011 through 2018.

Complying with SB 100 provisions will exacerbate these trends. Increasing renewable portfolio from 30% to 65% over a 20-year period is much easier than reaching a 100% (zero-emissions) target by 2045. The task is complicated by political hostility to nuclear power and ever shifting public attitudes which make long-term utility planning particularly challenging.

SB 100 interim targets are not that much different from those stipulated in SB 350. The utilities are required to achieve 50% target in 2026 vs. 45% in 2027 mandated previously. The target for 2030 was raised from 50% to 60%. These intermediate targets are achievable, which makes it unlikely that the passage of SB 100 would disrupt state's electric utility industry or materially impact the credit quality of affected utilities. The target for 100% carbon-free electricity is set far into the future. Research and technological advances over the next couple of decades could generate solutions that are technically and economically feasible. The long time frame will minimize the threat of utilities being saddled with significant stranded costs and associated liabilities as fossil fuel powered plants are phased out.

<sup>26</sup> J. Spector: On to Governor Brown's Desk: What 100% Clean Energy Means for California, GreenTech Media, August 29, 2018

<sup>27</sup> LADWP: 2017 Power Strategic Long-Term Resource Plan, December 31, 2017

However, if implemented as planned, SB 100 will inevitably increase already high power prices in California for all classes of customers. Just as electric vehicles are more expensive than comparable gas-fueled vehicles, so is zero-emissions power compared to power produced from fossil fuels.

California is becoming increasingly economically bifurcated between the affluent and the poor as middle-class residents, squeezed by high taxes, unaffordable housing and strained infrastructure, continue to move out-of-state. The zero-emissions target is a priority for affluent individuals who also tend to purchase electric vehicles, but not necessarily for the rest of the population. Rising power costs could cause voter backlash, forcing the

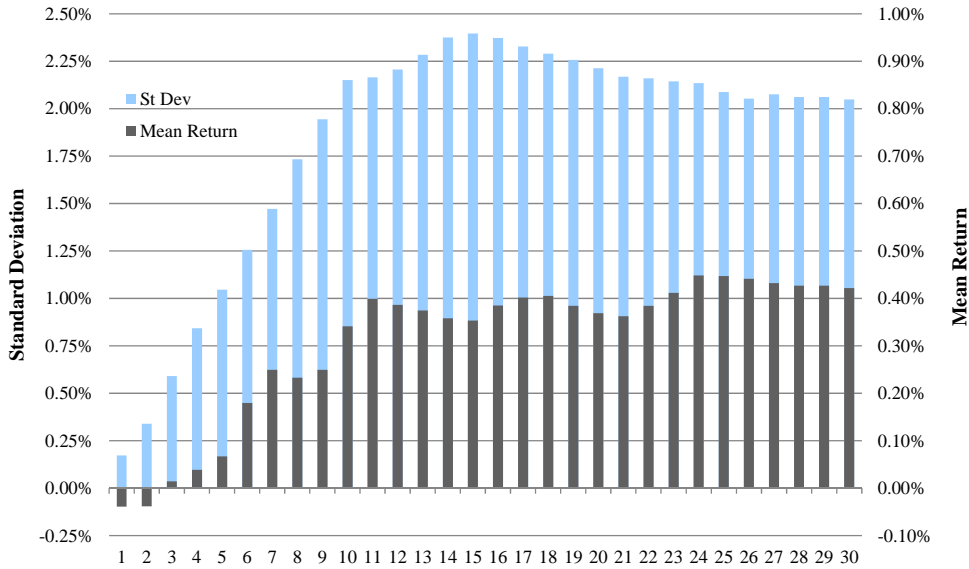
relaxation of ambitious SB 100 targets, similar to what happened to ill-conceived industry deregulation efforts that caused price spikes and rolling blackouts in 2000-01 and greatly eroded support for former Governor Gray Davis.

It will be interesting to see if California's approach is adopted by other states, especially in light of opposition at the federal level evidenced by Trump's commitment to reviving the coal industry and gutting of EPA's Clean Power Plan that was introduced by the previous Administration. If efforts to limit carbon-dioxide emissions at the federal level are successful, that would lead to reconfiguration of the entire electric utility industry, including public power companies.



# Market Review *Historical Monthly Bond Price Changes*

Figure 4 Muni Benchmark Callable Scale — Average Bond Price Changes (September)



Sources: Loop Capital Markets, TM3

We show historical bond price changes for each point on the muni benchmark callable curve during the month of September for the last 17 years.

The returns in September were positive about 60% of the time, with bond prices rising 0.30% on average across the curve.

Figure 5 Muni Benchmark Callable Scale — Average Bond Price Changes (September)

AAA MMD - MONTHLY PRICE CHANGE

Maturity	5	10	15	20	25	30
Sep-01	0.35%	-0.16%	-0.85%	-1.15%	-0.99%	-0.84%
Sep-02	1.16%	2.71%	1.97%	2.03%	2.10%	2.03%
Sep-03	2.44%	3.89%	3.45%	2.70%	2.45%	2.29%
Sep-04	-0.13%	0.24%	0.40%	0.47%	0.24%	0.16%
Sep-05	-0.58%	-1.82%	-1.73%	-1.73%	-1.72%	-1.72%
Sep-06	0.22%	0.56%	0.72%	0.64%	0.63%	0.63%
Sep-07	0.53%	1.20%	1.35%	1.51%	1.42%	1.42%
Sep-08	-2.24%	-4.65%	-6.23%	-5.40%	-4.42%	-4.12%
Sep-09	1.08%	3.12%	3.84%	3.81%	4.20%	4.36%
Sep-10	-0.45%	-1.53%	-0.80%	0.08%	0.08%	-0.08%
Sep-11	-0.59%	0.24%	1.30%	1.45%	2.66%	2.74%
Sep-12	0.32%	0.33%	0.49%	0.41%	0.40%	0.32%
Sep-13	0.90%	3.29%	3.58%	3.55%	2.80%	2.64%
Sep-14	-0.41%	-0.81%	-0.32%	-0.32%	-0.24%	-0.48%
Sep-15	0.27%	1.07%	0.90%	0.65%	0.57%	0.48%
Sep-16	-0.72%	-0.74%	-1.22%	-1.30%	-1.54%	-1.54%
Sep-17	-1.03%	-1.14%	-0.81%	-1.13%	-1.05%	-1.12%
<b>Mean</b>	<b>0.07%</b>	<b>0.34%</b>	<b>0.35%</b>	<b>0.37%</b>	<b>0.45%</b>	<b>0.42%</b>
<b>St Dev</b>	<b>1.05%</b>	<b>2.15%</b>	<b>2.40%</b>	<b>2.21%</b>	<b>2.09%</b>	<b>2.05%</b>

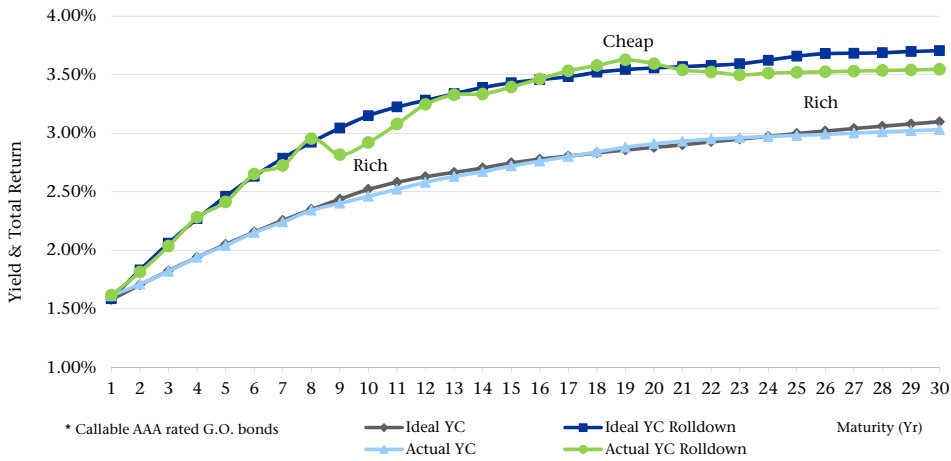
Sources: Loop Capital Markets, TM3

The 24-yr point has the highest expected return.

The 13 to 18-year range was most volatile, with standard deviation of monthly bond price changes of 2.34%.

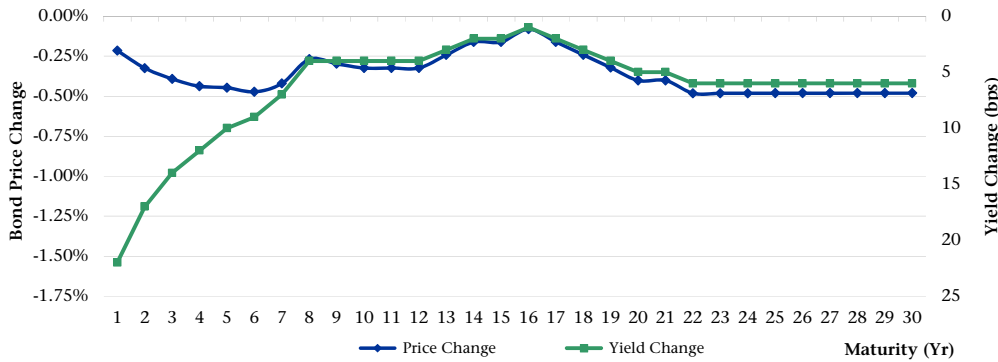
# Market Review *The Yield Curve*

**Figure 6 1-Year Forward Roll-down—Muni Benchmark Curve\* (September 4, 2018)**



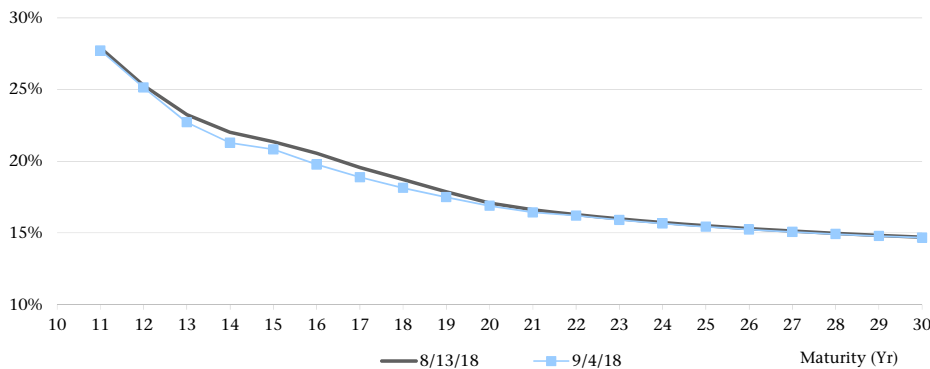
Sources: Loop Capital Markets, TM3 | \*Callable AAA-rated G.O. bonds

**Figure 7 Monthly Price Change — AAA GO Bonds\* (8/10/18 — 9/10/18)**



Sources: Loop Capital Markets, TM3 | \*Price Change Only

**Figure 8 Implied Municipal Volatilities**



Sources: Loop Capital Markets, TM3 | \*10-year call

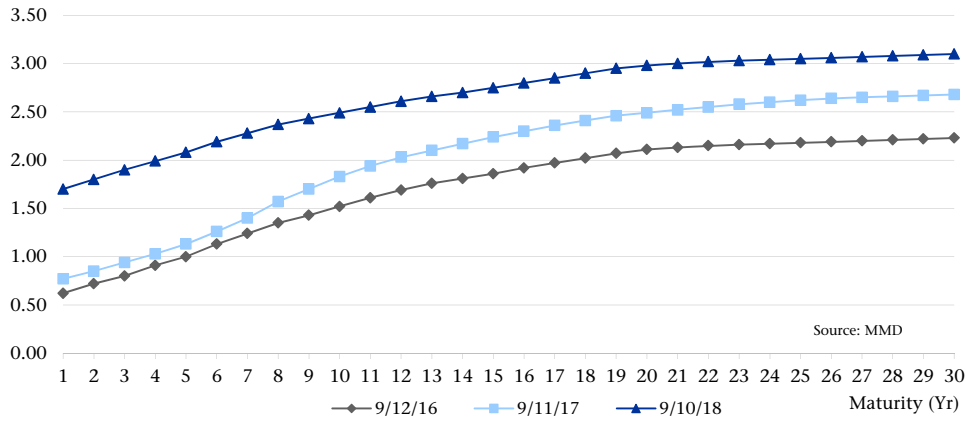
The yield curve shows rich (9 to 11-yr, 23-yr+) and cheap (19-yr) points on the AAA MMD curve, based on one year holding period returns and assuming no change in the yield curve. 19-yr maturity offers the highest expected total return.

Actual returns will depend on the level and shape of the yield curve a year from now.

Yields rose 5 bps on average in the 7 to 30 year range of the yield curve over the last 4 weeks. On the short end of the curve yields increased up to 22 bps, but the resulting price change was modest due to much shorter duration.

Implied volatilities changed marginally since mid-August.

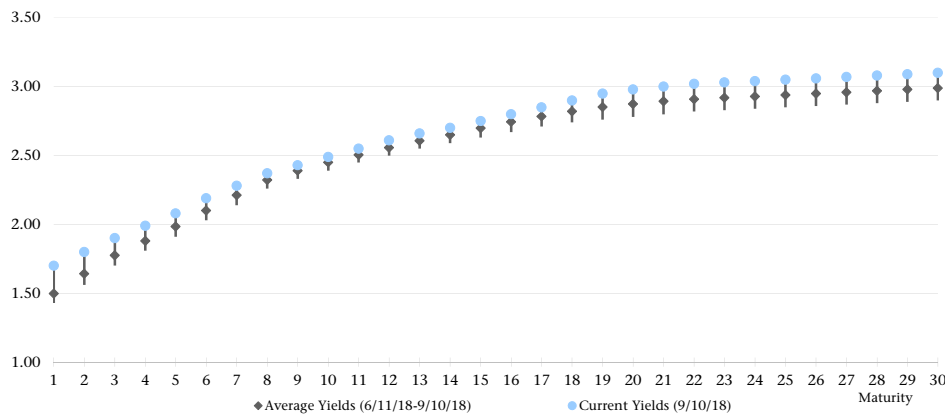
Figure 9 Current vs. Historical Municipal Yield Curves (%)



Source: TM3

Yields are currently higher by about 95 bps across the curve compared to September 2016. The yield increased the most on the front end of the curve over the last 12 months, as the Fed tightened monetary policy.

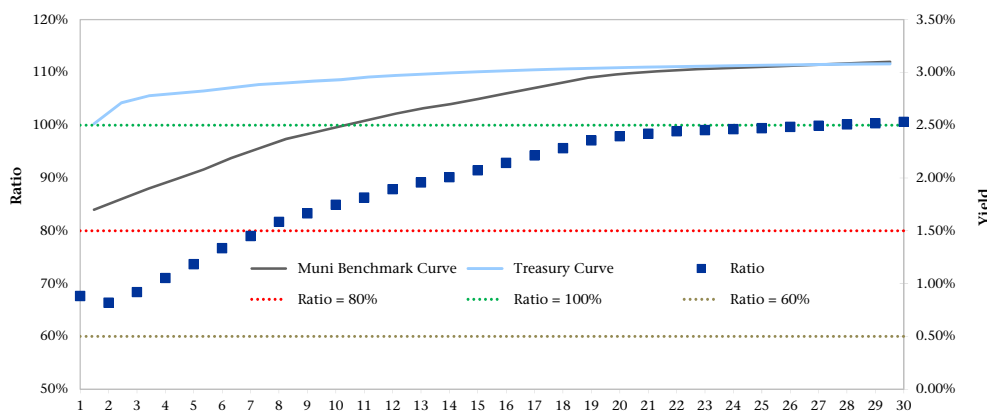
Figure 10 3-Month Average Benchmark Muni Curve Yield



Source: TM3

The yields are at their highest points in 3 months across the muni curve.

Figure 11 Muni and Treasury Yield Curves and Ratios



Sources: Eikon, TM3

The Treasury curve is much flatter than the muni curve. M/T ratios are around 100% on the long end of the curve.



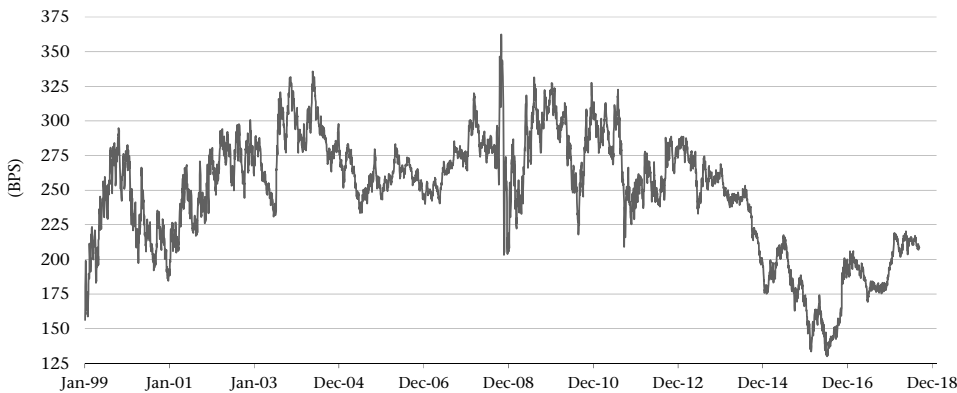
# Market Conditions

Figure 12 2 to 30-Yr Muni Spread (bps)



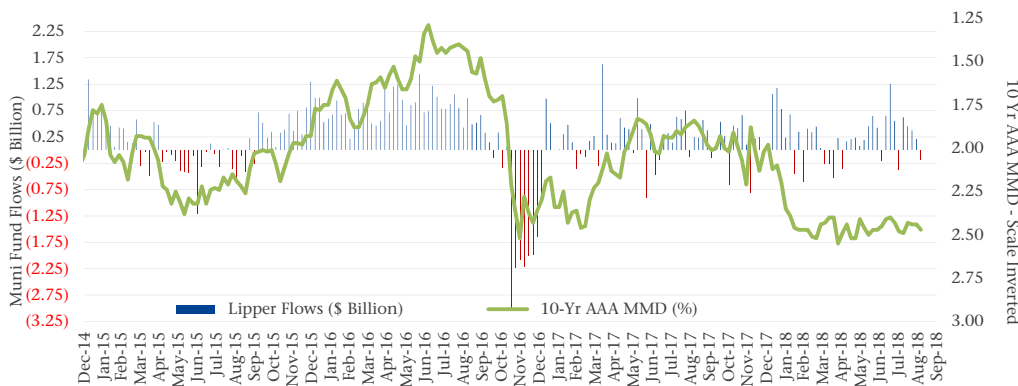
Source: TM3

Figure 13 Inflation Expectations



Source: FRED

Figure 14 Lipper Weekly Municipal Mutual Fund Flows (\$ Billion)



Source: Lipper

The slope of the curve has marginally steepened year-to-date despite Fed tightening. This could be partially attributed to banks selling longer-term bonds from their portfolios in response to the cut in corporate tax rate.

Fed's five-year forward breakeven inflation rate, derived from TIPS and regular Treasury yields has been range bound year-to-date.

Lipper fund flows have been generally positive lately. Average weekly inflow year-to-date is \$252MM while 4-week average is +\$215MM.



## Loop Capital Markets Upcoming Negotiated Calendar

Date	Par Amount (\$ mil)	Issue	Loop Capital's Role
9/18/18	1,594.3	Texas Water Development Board SWIRFT Revenue Bonds Series 2018B	Co-Manager
9/18/18	35.6	Texas Water Development Board SWIRFT Revenue Bonds Series 2018C (Taxable)	Co-Manager

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