



Are Weak Copper Prices Signaling Economic Slowdown?

Historically, the movement of the global price of copper has explained about 44% of the movement in industrial production. Over the last 20 years, with the growth of the service sector, and changes in production techniques, the figure has fallen slightly to about 38%. Nonetheless, copper is a key input into economic growth and the price and quantity used maintain a close association with the level of economic activity. So is the recent concern about the price performance of copper—down 6% YTD—indicative of problems in the global economy, or much ado about nothing?

By Chris Mier, CFA | Strategist

No matter how well synchronized the many components of the economy may be, particularly when things are going unusually well or bad, there are always a few discordant notes. Most of the times, these discordant notes, which should be zigging but are instead zagging, are simply idiosyncratic events whose impact may mean little given the evolution of the prevailing economic environment. Pity the analyst that ignores these attention-getting contrary signals, however, as these are what makes forecasting legends. There is not much informational value when consumer spending grows at similar rate and pattern as GDP. Find an anomaly, however, and you may be looking through a window into the next state of the economy.

With that in mind, let's take a look at copper, which has been setting off small warning signals. This metal is critically important in a host of areas, including electricity, construction and transportation. While many raw materials have substitutes, other than the loss of the copper penny, copper has been

irreplaceable. With copper transformers having conductivity at levels around 99.75%, over more than a century no materials have as of yet surfaced that can do a better job at lower cost. Aside from silver, copper is the most effective conductor of electricity. Copper, however, benefits from significantly greater availability, lower cost, corrosion resistance, ductility, malleability, and ability to work within a wide range of power networks. Current utilization by broad industrial category, as reported by the Copper Development Association are: Electrical 65%, Construction 25%, Transport 7%, and Other 3%.

Currently the price of copper has been lagging many other commodities and is out of sync with the general tenor of strong global and domestic growth. The CRB Index is up 55% from its low in January of 2016. Over the same time period, the price of copper is up less than 21%. The price of WTI crude oil, another solid barometer of economic activity is up 78%. More recently, on a YTD basis, the rally in oil has soundly thrashed copper,

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Are Weak Copper Prices Signaling Economic Slowdown?

which has fallen around 6% while oil is up 19%.

While copper has performed poorly, it is not alone among the metals category. Silver and gold have also performed poorly given the improvement in inflation and the strength of the economy. Aluminum has spiked due to the tariffs that have been imposed. Nickel has had a steady rally and has performed the most in sync with the general performance of the economy.

So what gives? Popular theories are:

- 1) Protectionism is bringing in short-sellers in anticipation of a slow-down in trade-related global growth.
- 2) China, the world's largest copper consumer, is not immune to slowdown and appears somewhat more vulnerable now.
- 3) The economic soundings from Europe and Japan have been weaker than previously and the relatively brief period of global synchrony in the developed world has come apart.
- 4) The USD is rallying, which suppresses the price of base metals.

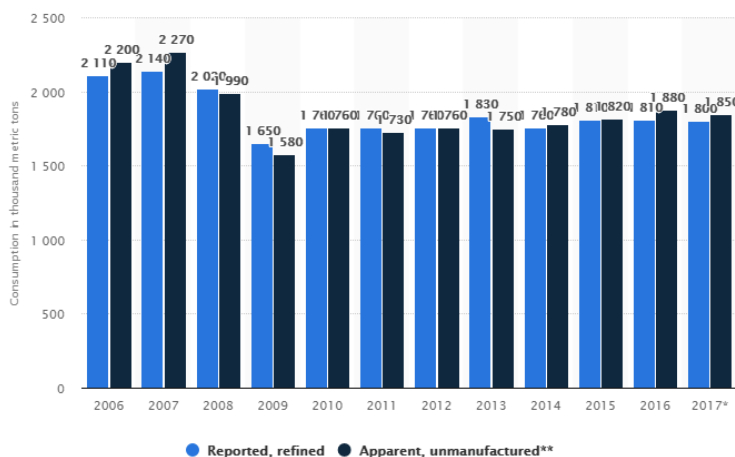
The real culprit has been the strength of the dollar. The dollar has been boosted by the current might of the US economy, yield and

inflation differentials between the US and other sovereigns, and the difference in the monetary cycles that has re-emerged after the period of synchronization. While copper is produced in the US (and we are the world's fourth largest producer), Chile, Peru, China, and Australia, followed by a host of EM nations are the major global producers. The rise in the dollar makes commodities like copper more expensive for global buyers and suppresses speculative interest as demand is adversely impacted by the high value of the dollar.

While the practical value of copper in construction, electricity, and transportation will keep it an important barometer of economic activity, new commodities are also becoming bellwether indicators. The price of soybeans explains 22% of the movement in industrial production with the same P-value. Soybeans have been rallying since early 2016 with prices now up 17% from that point. While soybeans, like aluminum and silver, are also caught up in tariff policies, the voracious demand from China and the wide variety of agricultural and industrial uses make soybean prices perhaps as good a barometer of economic activity as copper. In addition, recent advancement in storage of soybeans for multiple years has enabled soybeans to become a store of value, not unlike metals and other commodities.

Any loss of sleep over the price of copper and its relationship to economic demand is, at this time, ill-advised.

Copper consumption of the United States from 2006 to 2017 (in 1,000 metric tons)



DESCRIPTION SOURCE MORE INFORMATION

This statistic depicts the total copper consumption of the United States from 2006 to 2017. In 2017, the United States had an apparent consumption of some 1.85 million metric tons of unmanufactured copper.

Economic and Interest Rate Forecast — May 2018

Factors Supportive of Lower Rates

Despite robust job market, wage pressure is limited, with average hourly earnings increasing by only 0.1% in April.

U.S. construction spending dropped 1.7% in March, exacerbated by the decline in home building, while capital expenditures in the industrial sector were down about 3% in Q1.

ISM Non-Manufacturing Composite unexpectedly fell 2 points in April due to weaker business activity component.

Factors Supportive of Higher Rates

The U.S. added 164K jobs in April, while March reading was revised up by 32K. The unemployment fell 0.2% to 3.9%, its lowest level since December 2000, as some job seekers left the labor force.

Industrial production rose 0.7% for the second consecutive month amid acceleration in manufacturing and mining, while capacity utilization increased in April to its highest level in three years.

U.S. vehicles sold at 17.1 million annual rate, making April the ninth straight month to meet or exceed the 17 million level.

The fundamentals of consumer spending remain strong as retail sales rose 0.3% in April, in line with expectations, after surging 0.8% in March.

Figure 1 Economic and Interest Rate Forecast — May 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
Economic Forecasts															
Real GDP	1.2	3.1	3.2	2.9	2.3	3.3	3.1	2.9	2.8	2.7	2.7	2.6	2.3	2.9	2.7
Core PCE Deflator	1.8	1.5	1.4	1.5	1.7	1.9	2.3	2.1	2.3	2.1	2.2	2.0	1.6	2.0	2.2
Unemployment Rate*	4.7	4.4	4.3	4.1	4.1	3.9	3.9	3.8	3.7	3.6	3.7	3.8	4.4	3.9	3.7
Nonfarm Payrolls (chg in 1000s)	532	569	425	662	635	525	500	480	460	450	440	440	2,188	2,140	1,790
S&P 500	2,327	2,398	2,467	2,603	2,733	2,720	2,773	2,827	2,848	2,869	2,890	2,912	2,449	2,763	2,880
Short-Term Interest Rates*															
Fed Funds Target (%)	0.70	0.95	1.16	1.20	1.44	1.70	1.89	2.16	2.41	2.68	2.88	2.88	1.00	1.80	2.71
3-Month LIBOR (%)	1.07	1.21	1.31	1.46	1.93	2.35	2.50	2.73	2.95	3.18	3.25	3.30	1.26	2.38	3.17
7-Day SIFMA (%)	0.69	0.84	0.82	1.05	1.21	1.70	1.65	1.75	1.85	2.00	2.10	2.20	0.85	1.58	2.04
Treasury Interest Rates*															
2-Year Treasury (%)	1.24	1.29	1.36	1.69	2.15	2.44	2.67	2.87	3.05	3.26	3.30	3.32	1.39	2.53	3.23
3-Year Treasury (%)	1.51	1.47	1.51	1.81	2.30	2.58	2.74	2.90	3.07	3.26	3.31	3.33	1.57	2.63	3.24
5-Year Treasury (%)	1.94	1.81	1.81	2.06	2.53	2.75	2.85	2.95	3.10	3.27	3.35	3.37	1.91	2.77	3.27
7-Year Treasury (%)	2.25	2.07	2.06	2.25	2.68	2.87	2.96	3.01	3.14	3.29	3.37	3.39	2.16	2.88	3.30
10-Year Treasury (%)	2.44	2.26	2.24	2.37	2.76	2.92	3.07	3.09	3.20	3.33	3.40	3.42	2.33	2.96	3.34
30-Year Treasury (%)	3.05	2.90	2.82	2.82	3.03	3.10	3.21	3.31	3.41	3.52	3.58	3.60	2.89	3.16	3.53
Municipal Interest Rates*															
30-Year MMD (%)	3.08	2.86	2.75	2.71	2.91	2.99	3.08	3.15	3.24	3.31	3.33	3.35	2.85	3.03	3.31
Muni Yield Curve Slope (%)	2.21	2.02	1.93	1.58	1.51	1.30	1.31	1.28	1.27	1.19	1.11	1.03	1.93	1.35	1.15

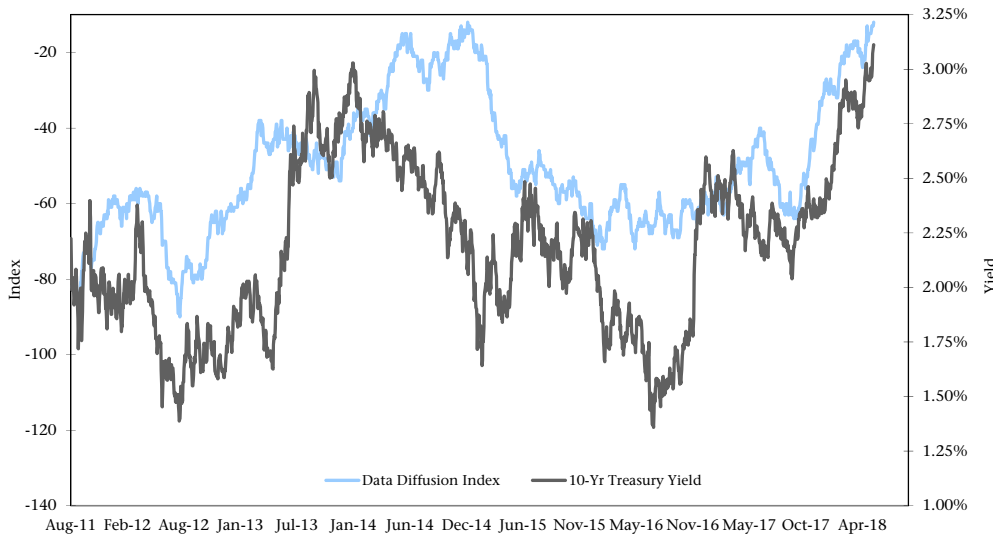
P: Preliminary Data

* 3-month average

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

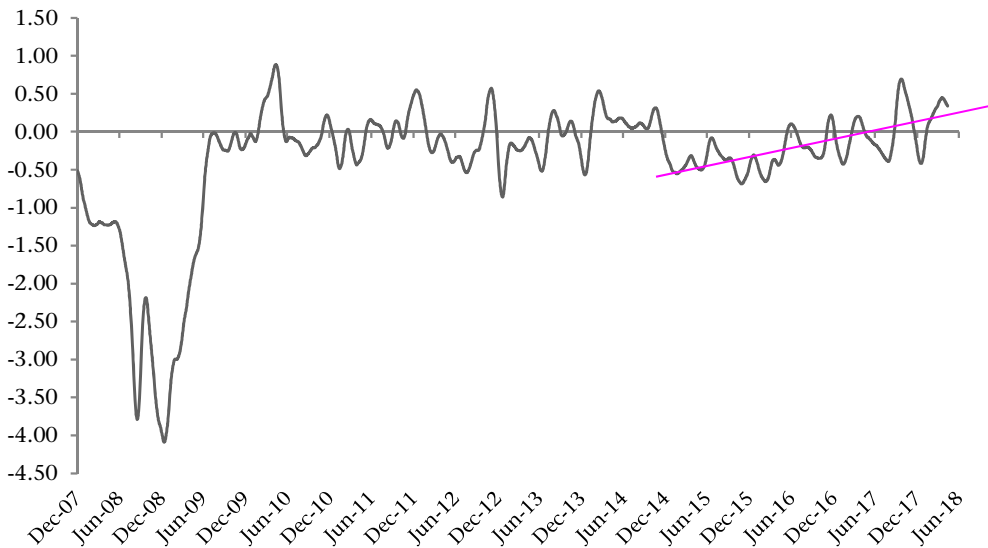
Market Review *Data Diffusion / ADS Index*

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



Sources: FRED, Loop Capital Markets

Figure 3 Aruoba-Diebold-Scotti Business Conditions Index (12/31/2007 — 5/12/2018)



Source: Federal Reserve Bank of Philadelphia

Economic indicators continue to exceed expectations, pushing Treasury yields up.

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).

The index has been volatile lately, but the trend line is positive. The comparison is relative 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.

State Revenues Are on the Rise, but Budgetary Pressures Remain

By Rachel Barkley | Vice President

States are in the midst of budget season as we approach the beginning of fiscal 2019. Budget negotiations are taking a different tone than in the last few years as continued economic growth and the recent federal tax reforms have left states with increased revenue growth for the upcoming year.

Perhaps due to the relatively rosy revenue pictures, spending needs that have been put off in past years are demanding attention. The most prominent of these is education, highlighted by the recent teacher strikes in several states. Several states have not been able to fully meet their spending needs this year without new revenue measures, leading them to either raise taxes and fees or push off funding needs for certain areas to future years. For many, fiscal 2019 will likely only be a pause before budgetary pressures and structural deficits reappear.

Here we look at eight states with meaningful budget developments this year.

Alaska

Alaska's budgetary stability continues to be tied to oil. While oil prices have rebounded markedly from their recent low of \$26.2 per barrel in February 2016 (WTI), they remain below their peak of over \$100 in early 2014.¹ This downturn has driven the state to face a \$2.9B deficit for fiscal 2019 as it began its budget process for the year. Governor Walker has advocated for a wage tax to help fix the deficit, which has yet to gain sufficient support.

The recent increase in oil prices over the past few months led to a slight reduction in the projected deficit. The Spring 2018 Revenue Forecast, released in March, shows a \$212M increase in revenue from the prior forecast. Total Unrestricted General Fund Revenues are projected at \$2.26B.

The state currently assumes an Alaska North Slope (ANS) oil price of \$61 per barrel for fiscal 2018 and \$63 a barrel for fiscal 2019.² Production is expected to average 521,800 barrels a day in fiscal 2018, rising to 526,600 in fiscal 2019.

The Senate passed a \$4.5B budget for fiscal 2019, which includes \$3.2B for agency and statewide operations and \$1.2B for education funding. It appropriates \$1B from the Permanent Fund to fund \$1,600 per capita dividends. A draw of \$600MM from the

Constitutional Budget Reserve is also included. A conference committee is now hammering out the difference between budgets passed by the Senate and House.

The Legislature has approved Senate Bill (SB) 26, the Permanent Fund Protection Act, which would allow the state to use Permanent Fund investment earnings to fund general operations. The annual draw on the Permanent Fund would be limited to 5.25% of the average market value of the fund for fiscal 2019 and fiscal 2020 and 5% thereafter. Draws from the fund would be allocated between the Dividend Fund and the General Fund. For fiscal 2019, this is projected to lead to a total of \$2.66B withdrawn from the fund, \$1.33B of which would be used to ease the General Fund budget gap.³ While this lessens the structural deficit, additional work remains for the state to regain budgetary balance.

Arizona

Arizona was among the states to have a teacher strike this year as it was undergoing budget negotiations. The state originally offered teachers a 1% raise, stating that was all it could afford.⁴ 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 will receive 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 on 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.⁵ Backers of a dedicated funding stream for education are now aiming to get a ballot initiative in front of voters in November, seeking approval for an additional income tax on those who earn more than \$250,000 annually.⁶

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

¹ EIA

² State of Alaska Spring 2018 Revenue Forecast.

³ Fiscal Note Analysis. SB 26. State of Alaska Legislature.

⁴ Arizona lawmakers pass new budget; Ducey signs off on teacher pay raises. Tuscon.com. May 3, 2018.

⁵ Arizona Passes New Education Funding to End Teachers' Strike. New York Magazine. May 3, 2018.

⁶ Voters could have say on education funding, teacher pay. AZ Central. April 28, 2018.

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. Other areas are seeing relatively minor funding increases including universities (\$18MM) and Medicaid (\$1.6MM).

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 2020.⁷ 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.⁸ 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.

Connecticut

Connecticut passed its budget on May 9th, an improvement over last year when the budget was approved a third of the way into the fiscal year. The \$20.9B budget includes a 1.6% increase in General Fund spending and no tax changes.

The state was aided with a \$1.3B increase in income tax receipts this April, stemming from capital gains and other investment income, with \$300MM of this additional revenue scheduled to be spent in fiscal 2019.⁹ Planned Medicaid cutbacks, announced last fall, have been reversed, representing \$130MM. Higher education will receive \$16.2MM in additional funding, although this is not expected to cover the expected \$45MM deficit for the Connecticut State Colleges and Universities (CSCU) system.¹⁰

The state also passed legislation aimed at mitigating the impact of federal tax reform on its residents. The state has estimated that residents will face \$10B in lost deductions under the tax changes. Under Connecticut's plan, municipalities will be able to form charitable organizations to receive contributions in exchange for property tax credits.¹¹

The state is expected to end fiscal 2019 with roughly \$1.1B in reserves. However, the state's prosperity may be fleeting. The legislature's Office of Fiscal Analysis projects a \$2B deficit for fiscal 2020 and a \$2.6B gap for fiscal 2021. Increasing required pension payments are a main driver of out-year deficits.

⁷ Ducey's teacher pay plan relies on sunny economic forecast, less Medicaid spending. AZ Central. April 17, 2018.

⁸ A Punishing Decade for School Funding. Center for Budget and Policy Priorities. November 29, 2017.

⁹ Legislature overwhelmingly enacts a bipartisan CT budget. The CT Mirror. May 9, 2018.

¹⁰ Regents: Extra state funds not a cure-all for a system in crisis. The CT Mirror. May 10, 2018.

¹¹ Connecticut Passes Bill to Ease Federal Tax Burden. New York Times. May 10, 2018.

Iowa

The fiscal 2019 budget totals \$7.48B, including a 3.1% increase in funding for state agencies. As part of the budgetary process, the state enacted tax reform in May with a goal of stimulating the economy. The personal income tax will be reduced from nine brackets to four in two stages, with the top rate lowered from 8.98% to 6.5%. For fiscal 2019, the top rate will be lowered to 8.53%. Iowa will also decouple from the federal \$10,000 state and local government tax deduction limit, which otherwise would have limited the amount of local property taxes that could be deducted from state income taxes. Additional reductions will take place subject to revenue triggers in 2023. The sales tax base will be expanded to cover digital goods, ride shares and subscription services, as well as more online transactions. The corporate income tax will have its maximum rate of 12% reduced to 9.8% in 2021.

In total, the tax changes are expected to lead to a \$100.2MM reduction in revenues in fiscal 2019 and \$261.7MM in fiscal 2020.¹² Revenue losses would escalate annually to \$624.6MM by fiscal 2024 if revenue triggers are met and the complete reforms take effect.

Critics of the plan worry the tax cuts may not lead to additional economic growth leading to a structural deficit, similar to what happened to Kansas. The state has been optimistic in recent years in its revenue projections, leading to \$35.5MM in mid-year budget cuts this March. Senator McCoy (D), a vocal critic of the reforms, has stated that the tax changes put the state on "a bobsled to bankruptcy."¹³

Kentucky

The fiscal 2019-2020 biennial budget process was contentious with the Governor vetoing both the budget bill passed by the Legislature and an accompanying tax reform package, the proceeds of which were incorporated into the budget. Governor Bevin reportedly thought revenue projections from tax reforms were too optimistic, making the budget imbalanced.¹⁴ However, the Legislature overturned the gubernatorial vetoes on both measures, allowing the budget to pass.

The \$22B enacted budget includes \$480MM of additional revenue through a combination of broadening the sales tax base, increasing the cigarette tax and lowering the income tax on residents and businesses. Pension contributions are budgeted at the fully

¹² Iowa Legislature approves \$2.1 billion tax overhaul; ending 2018 session. Iowa State Daily. May 6, 2018.

¹³ Iowa Legislature approves \$2.1 billion tax overhaul; ending 2018 session. Iowa State Daily. May 6, 2018.

¹⁴ Kentucky Lawmakers Override Governor Veto on Tax, Budget Bills. The Wall Street Journal. April 13, 2018.

actuarially required amount. However, the increase in pension contributions is eating up revenue increases and even causing funding cuts in some areas. Base higher education funding was reduced 6.25%, partially offset by additional funding based on performance. K-12 education was increased, but remains below fiscal 2008 funding levels on a per student basis when adjusted for inflation.

The state has faced mid-year budget gaps for each of the past two years, indicating a trend of overestimating revenues.

Louisiana

Louisiana closed a budget gap in 2016 by passing a temporary sales tax increase, which is set to expire at the end of fiscal 2018. The expiration of the sales tax was expected to lead to a \$1.6B for fiscal 2019. However, this gap has been gradually lowered over the past year due to an increase in projected sales tax collections and personal income tax revenues. As of the April 2018 Revenue Forecast, the current fiscal 2019 gap stands at \$648MM.

Budget flexibility is limited in Louisiana as more than half of the state's general revenue dollars are obligated due to constitutional provisions. Attempts to hold a constitutional convention to amend the state's tax structure (House Bill 500) failed in May. The large proportion of earmarked revenues has historically led to budget cuts being focused on health care and higher education. Anticipating budget reductions for fiscal 2019, the Louisiana Department of Health has begun advising Medicaid patients of potential service reductions.¹⁵

There has been discussion on potentially raising revenues to prevent service reductions, although there has yet to be an agreement as to what taxes would be targeted and if it would be accomplished by an increase in the tax base or in the tax rate.

The state's legislative sessions is set to run until June 4th. If the state ends up going to a special session to pass its budget, it would be the sixth special session in the past two years.

New Jersey

Governor Murphy's first proposed budget marks a significant departure from his predecessor, Governor Christie. The Governor's \$37.4B proposed budget for fiscal 2019, a 5.7% increase over the current year. However, 78% of new revenues are estimated to come from \$1.5B in tax increases, indicating the state's lackluster economic growth in recent years is expected to continue. Revenues remain below their pre-recession peak.

¹⁵ Scare tactic? Or just scary? Louisiana's elderly, disabled put on notice of possible lost services. The Advocate. May 9, 2018.

Notable tax changes include implementing a 10.75% tax personal income over \$1MM and increasing the sales tax from 6.875% to 7%. The proposed budget includes a \$743MM surplus and increases funding for property tax relief (\$1.1B), K-12 education (\$341MM), New Jersey Transit (\$242MM) and community colleges (\$50MM). Pension contributions are expected to total \$3.2B, up from \$2.2B in fiscal 2018. Fiscal 2019 contributions include slightly over a \$1B of lottery proceeds. Total contributions are projected to equal six-tenths of the actuarially recommended contribution level.

The proposed budget is fighting pushback, most notably from State Senate President Stephen Sweeney (D), who has described the proposed budget as extreme.¹⁶ The state government is under trifecta leadership, with a democratic governor and democratic majorities in both houses of the legislature. Despite this party unity, the new governor is likely to face push back on raising taxes on the already highly taxed state.

Oklahoma

Oklahoma is benefitting from the recent uptick in oil prices. State revenues have increased on a YoY basis for 13 consecutive months, including a 15.4% YoY increase for April. Gross production tax receipts have led the way, increasing 47.4% YoY for April, while income tax revenues are up 17.7%. The solid revenue growth eased the state's budget process this year, although the state did face some very vocal spending pressures, especially from teachers who went on strike in April.

The fiscal 2019 budget was passed in late April. At \$7.5B, this represents a 10.9% increase from the current budget. Education received the bulk of additional funding, including teacher salaries and additional revenue dedicated to the school funding formula. State employees will also receive a raise.

Despite the budget increase for the coming year, allocated revenues for many departments are below fiscal 2009 levels, unadjusted for inflation. On an inflation-adjusted basis, total spending for fiscal 2019 remains \$0.6B below fiscal 2009 levels.¹⁷ 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.¹⁸ These accumulated cost pressures will need to be addressed, largely offsetting increases in revenue in future years.

¹⁶ Republican says Phil Murphy's budget is 'scary and extreme'. NJ.com. May 8, 2018.

¹⁷ Despite funding boost, state budget fails to restore most cuts. Tulsa World. April 29, 2018.

¹⁸ Fort Worth ISD hopes to lure Oklahoma teachers with billboards advertising higher salaries. Dallas Morning News. May 8, 2018.

Parting Thoughts

Funding reductions made over the past decade are demanding to be addressed. In many states, additional revenues are not expected to fully offset recent budget reductions. States this year have prioritized increasing funding for K-12 education, leaving other areas that have borne funding cuts, including higher education and infrastructure, to make due for at least one more year. Additionally, K-12 education funding cuts in some states have been severe over

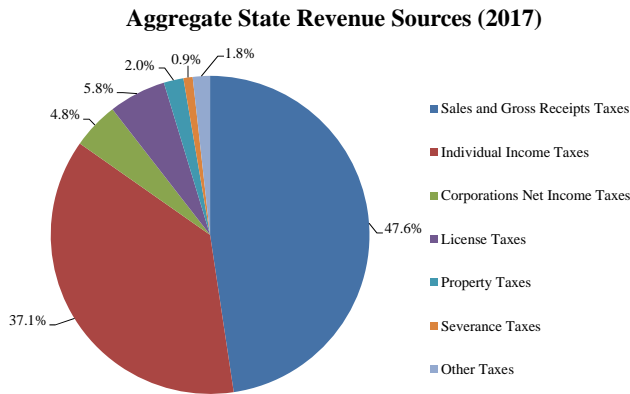
the past decade and will require additional funding in future years to reach pre-recession levels on an inflation-adjusted basis. At the same time, a handful of states have to notably increase their pension contributions over the next few years, which will also hamper affected states' ability to meet other service area needs. The need to address these funding needs is likely to offset positive credit momentum from revenue increases and economic growth for many states.

Growth and Volatility of State Revenues

By Ivan Gulich / Senior Vice President

Budget shortfalls and increasing tax burdens due to demographic and other factors are recurring themes in muni finance.

On average, sales and gross receipts taxes account for almost ½ of state revenue sources. Personal income tax is second largest source, at 37%, while all other taxes and fees account for about 15% of state revenues.



For historical and political reasons, tax structures and tax burdens vary greatly across states. The following table ranks states by their tax burden as a share of personal income. The tax burden included sales and gross receipts taxes, personal income taxes, fees and other taxes paid by individuals.

Tax Burden by State in 2017*

1 Hawaii	9.1%	27 New Jersey	5.2%
2 District of Columbia	8.4%	28 Pennsylvania	5.1%
3 Minnesota	7.8%	29 Washington	5.1%
4 West Virginia	6.7%	30 Illinois	5.1%
5 Mississippi	6.5%	31 Kansas	5.0%
6 Maine	6.5%	32 Louisiana	5.0%
7 Arkansas	6.3%	33 Nebraska	5.0%
8 Iowa	6.3%	34 Alabama	4.7%
9 New York	6.2%	35 Virginia	4.6%
10 Vermont	6.1%	36 South Carolina	4.5%
11 Connecticut	6.1%	37 Oklahoma	4.5%
12 Idaho	6.0%	38 Georgia	4.5%
13 California	5.9%	39 Missouri	4.5%
14 Wisconsin	5.9%	40 North Dakota	4.4%
15 Kentucky	5.9%	41 Montana	4.3%
16 Nevada	5.9%	42 Arizona	4.2%
17 Indiana	5.8%	43 Colorado	4.2%
18 New Mexico	5.7%	44 Delaware	4.1%
19 Utah	5.7%	45 South Dakota	4.0%
20 Oregon	5.6%	46 Florida	3.8%
21 Rhode Island	5.6%	47 Texas	3.7%
22 North Carolina	5.6%	48 Tennessee	3.7%
23 Michigan	5.6%	49 Wyoming	2.7%
24 Massachusetts	5.5%	50 New Hampshire	1.7%
25 Ohio	5.4%	51 Alaska	0.8%
26 Maryland	5.4%		

* PIT, Sales Tax and Fees as share of Personal Income

Conservative states with no income tax, including those that collect severance taxes, enjoy the lowest tax burdens.

It should be noted that these rankings would change if property taxes, which are mostly unaccounted at the state level even though they fund a substantial portion of K-12 education, were included in the overall tax burden.

The tax structures vary greatly across states. Generally speaking, red state revenues rely disproportionately on regressive sales taxes, while blue states draw most of their revenue from progressive personal income taxes.

State	Sales and Gross Receipts Taxes as Share of Total State Revenue	State	Individual Income Taxes as Share of Total State Revenue*
1 Texas	87.5%	1 Oregon	70.3%
2 South Dakota	83.0%	2 Virginia	58.8%
3 Florida	82.9%	3 New York	56.0%
4 Nevada	80.3%	4 California	54.1%
5 Washington	79.9%	5 Massachusetts	53.5%
47 DC	24.3%	38 Arizona	24.8%
48 Alaska	22.1%	39 Vermont	23.8%
49 Montana	21.7%	40 Mississippi	23.6%
50 Delaware	15.5%	41 New Mexico	23.2%
51 Oregon	13.4%	42 North Dakota	9.2%

* Excluding states that do not tax wages

Policy makers faced with cyclical budget shortfalls are preoccupied with growth and stability of state tax revenues. To meet increasing pension and other deferred liabilities associated with demographic changes, states must ensure that tax revenues grow slightly faster than state economy. Stability of state tax revenues is also important in order to avoid fiscal boom-and-bust cycles that have bedeviled some states over the years.

Many factors influence growth and volatility of tax revenues. Industry mix and level of diversification of state economy are important factors. Economic downturn often disproportionately affects certain industries. For example, technology was his especially hard during the 2000-01 recession. The 2008-09 financial crisis and the resulting housing collapse dragged other industries and the entire nation into a deep recession.

Since elected officials have limited influence on state economy, they must rely on tax policy to meet tax revenue objectives. Personal income taxes are highly sensitive to economic cycles, especially in states where relatively few high-income earners carry much of the tax burden. Corporate income tax receipts are cyclical. Sales taxes

Sources for charts and tables: Bureau of Economic Analysis, U.S. Census

are generally less volatile, especially the consumer staple component.

One of the key factors that impact the growth and volatility of state tax revenues is the composition of tax revenue sources. In evaluating the effectiveness of various tax structures, in this analysis we have focused on Illinois and neighboring Midwestern states (Indiana, Wisconsin, Michigan, Iowa, and Missouri) as well as large states with a history of budget problems (California, New Jersey, Pennsylvania and New York).

To perform the analysis we have collected annual PIT, sales tax and total tax receipts, as well as aggregate personal income (a proxy for economic growth) for states from 1970 through 2017.

Total State Tax Revenue

To evaluate tax revenue growth we have regressed total tax receipts against aggregate personal income using logarithmic values, following the approach laid out in a similar Federal Reserve of Kansas City analysis for the Tenth District.¹⁹ The regression coefficient above 1 indicates that tax receipts are expanding faster than the economy and vice versa.

Growth Rate {LN (Total Tax) vs. LN (Personal Income)}

#	STATE	Reg. Coeff.	t-Statistic	Adj. R ²
1	NEW JERSEY	1.13	81.2	99.3%
2	INDIANA	1.08	107.7	99.6%
3	CALIFORNIA	1.06	124.9	99.7%
4	MICHIGAN	1.02	69.0	99.0%
5	MISSOURI	1.02	66.7	99.0%
6	IOWA	1.02	77.1	99.2%
7	ILLINOIS	1.01	93.4	99.5%
8	NEW YORK	0.97	98.2	99.5%
9	PENNSYLVANIA	0.96	108.3	99.6%
10	WISCONSIN	0.93	109.1	99.6%

1 = Growing at the same rate

Tax revenues grew faster than the economy in New Jersey and California, two states that have steadily increased their tax rates over the years, but also in fiscally conservative Indiana. Illinois tax receipts have expanded approximately at the same rate as the economy, while in Wisconsin tax revenues grew slower than the economy.

To estimate revenue volatility over the business cycle we have regressed the change in tax revenue against the change in personal income on a year-over-year basis using logarithmic transformation.

¹⁹ R. Alison Felix: The Growth and Volatility of State Tax Revenue Sources in the Tenth District, Economic Review, Third Quarter 2008, Federal Reserve Bank of Kansas City

Volatility {Delta LN (Total Tax) vs. Delta LN (Personal Income)}

#	STATE	Reg. Coeff.	t-Statistic	R ²
1	CALIFORNIA	1.45	6.60	48.1%
2	MICHIGAN	1.34	6.23	45.1%
3	NEW JERSEY	1.30	5.27	36.8%
4	PENNSYLVANIA	1.00	4.68	31.2%
5	WISCONSIN	0.98	6.22	45.0%
6	MISSOURI	0.97	4.68	31.2%
7	ILLINOIS	0.96	5.48	38.7%
8	NEW YORK	0.91	4.78	32.2%
9	INDIANA	Not Statistically significant		
10	IOWA	Not Statistically significant		

1 = Changes in tax revenue and personal income aligned

California, with its dependence on highly volatile capital gains taxes, exhibits the highest revenue volatility. So does Michigan, a state heavily dependent on auto industry fortunes, as well as New Jersey, which also relies on capital gains taxes. It should be noted that R-squared statistic is much weaker for revenue volatility than it is for revenue growth.

Personal Income Tax

The same analysis was performed using PIT instead of total taxes:

Growth Rate {LN (PIT) vs. LN (Personal Income)}

#	STATE	Reg. Coeff.	t-Statistic	Adj. R ²
1	NEW JERSEY	2.17	19.3	88.8%
2	MISSOURI	1.34	66.8	99.0%
3	CALIFORNIA	1.30	78.7	99.2%
4	INDIANA	1.27	39.3	97.0%
5	PENNSYLVANIA	1.23	26.2	93.7%
6	ILLINOIS	1.18	58.9	98.7%
7	IOWA	1.17	40.0	97.1%
8	NEW YORK	1.12	94.2	99.5%
9	MICHIGAN	1.08	32.7	95.8%
10	WISCONSIN	0.97	67.9	99.0%

1 = Growing at the same rate

PIT growth exceeds economic growth for the following reasons: tax rate hikes, real wage growth, and tax brackets that are unadjusted for inflation. New Jersey's unusually high regression coefficient is anomalous. In the 1970s, PIT rates increased rapidly, which exaggerated growth and reduced R-squared. When a regression was performed for the period from 1980 through 2017, regression coefficient was a more reasonable 1.40, with R-squared of 99%.

Ideally, the regression should be performed with one additional independent variable — effective PIT rate. However, effective income tax rates are difficult to compute because rates vary across

tax brackets, unless the state has flat tax structure. Also, PIT rates going back decades are not readily available.

Volatility {Delta LN (PIT) vs. Delta LN (Personal Income)}

#	STATE	Reg. Coeff.	t-Statistic	R ²
1	MICHIGAN	2.18	4.6	30.9%
2	CALIFORNIA	2.07	4.7	31.8%
3	ILLINOIS	1.54	4.2	26.2%
4	WISCONSIN	1.42	4.9	33.5%
5	MISSOURI	1.40	3.7	21.7%
6	NEW YORK	1.31	4.3	27.9%
7	INDIANA	Not Statistically significant		
8	IOWA	Not Statistically significant		
9	NEW JERSEY	Not Statistically significant		
10	PENNSYLVANIA	Not Statistically significant		

1 = Changes in tax revenue and personal income aligned

PIT volatility over the business cycle is higher than was the case for total tax revenues. It should be noted that the reliability of volatility estimates is lower than reported previously.

Sales Tax

Sales tax receipts, on the other hand, generally grow slower than the economy. They are often imposed on just a fraction of consumer products. Food is often exempt from taxation or subject to lower tax rates. Manufacturing advances have reduced relative cost of many items purchased by consumers, while spending on services, which is generally not subject to taxation, is gradually increasing compared to spending on products.

As a result, growth in sales tax receipts generally lags economic growth.

Growth Rate {LN (Sales Tax) vs. LN (Personal Income)}

#	STATE	Reg. Coeff.	t-Statistic	Adj. R ²
1	MICHIGAN	1.02	41.2	97.3%
2	INDIANA	1.00	47.3	97.9%
3	IOWA	0.99	59.6	98.7%
4	NEW JERSEY	0.98	59.8	98.7%
5	WISCONSIN	0.97	97.6	99.5%
6	PENNSYLVANIA	0.93	111.3	99.6%
7	CALIFORNIA	0.93	101.5	99.5%
8	ILLINOIS	0.90	80.7	99.3%
9	NEW YORK	0.89	72.4	99.1%
10	MISSOURI	0.89	55.5	98.5%

1 = Growing at the same rate

Sales tax receipts are also much less volatile than PIT receipts.

Volatility {Delta LN (Sales Tax) vs. Delta LN (Personal Income)}

#	STATE	Reg. Coeff.	t-Statistic	R ²
1	NEW JERSEY	1.04	4.3	27.9%
3	CALIFORNIA	0.96	4.3	28.0%
4	MISSOURI	0.78	3.7	21.3%
9	WISCONSIN	0.65	4.3	27.6%
8	ILLINOIS	0.61	3.6	20.2%
6	PENNSYLVANIA	0.57	4.8	32.5%
7	IOWA	Not Statistically significant		
5	INDIANA	Not Statistically significant		
2	MICHIGAN	Not Statistically significant		
10	NEW YORK	Not Statistically significant		

1 = Changes in tax revenue and personal income aligned

It should be noted that R-squared statistic is relatively weak in this case.

Analysis and Conclusions

Many states will continue to grapple with budget deficits due to structural problems that are exacerbated by demographic and economic trends. On the one hand, the population lives longer and is getting older. On the other hand, a substantial share of employees with families work in low-paying service jobs in a globalized American economy. These two segments of the population require expensive services. Much of the cost of providing these services (Medicaid, K-12 education, transportation and public pension funding, etc.) falls on states.

These problems are exacerbated in states that have experienced out-migration of the middle class due to high taxes, unaffordable housing and deteriorating quality of life.

The costs of providing an ever-expanding array of services and benefits demanded by voters will continue to pressure state budgets, especially during inevitable economic downturns. This extra funding will have to come from tax hikes. We have observed the trend of rising tax rates over the last several decades. For example, 3 out of 10 states we looked at in our analysis increased their sales tax rate between 2000 and 2017, but none of them reduced it. An attempt to slash taxes in a grand Reaganesque experiment has spectacularly backfired in Kansas.

So the question for politicians and policy-makers is not if, but what taxes to raise.

Taxes other than PIT and sales taxes represent a relatively small portion of the tax pie. Fees and corporate taxes can be raised by only so much before the electorate gets annoyed and corporations start leaving the state.

Raising sales tax rates is unpopular because these taxes are regressive, hitting the section of the population that can least afford it. If sales tax is too high, consumers are incentivized to reduce purchases, shop in neighboring jurisdictions, or find other ways to avoid sales tax altogether.

It is probably wiser to expand the universe of products that are subject to taxation (and perhaps include some services), instead of simply raise sales tax rate above a certain level.

Flat income tax is also regressive, but less so than sales tax, since most extra dollars come from individuals in higher income brackets. That's why taxpayers in low income brackets are somewhat supportive of raising income tax rate, as it pays for services disproportionately used by them. High-income earners, while

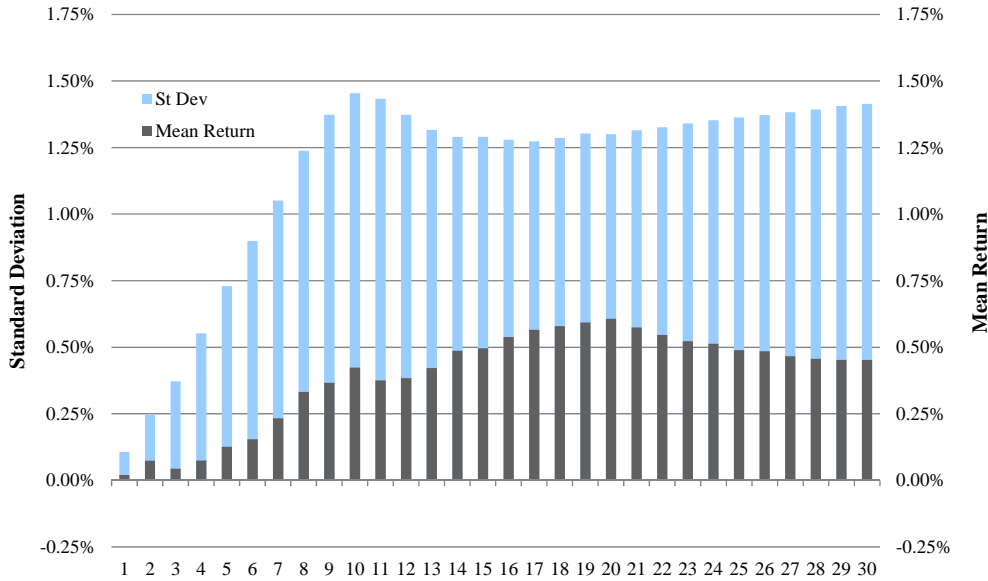
unhappy about the tax hike, can afford it and also feel good about not living in a state with graduated income tax rates.

Finally, in states with graduated income tax rates, the most expedient way to boost state revenues is to raise taxes on high incomes in a "tax-the-rich" scheme, a populists' favorite, hoping the increase won't motivate these taxpayers to start leaving the state.

Due to PIT growth potential and political considerations, states will increasingly resort to raising income tax rates and attempt to replace flat with graduated PIT structures to cover revenue shortfall. Taxing labor may not be the best way to stimulate effort, but it will provide funding to pay the bills and support state credit ratings.

Market Review *Historical Monthly Bond Price Changes*

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



Sources: Loop Capital Markets, TM3

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

The returns in April were positive 70% of the time, with bond prices rising, on average, 0.40% across the curve.

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

AAA MMD - MONTHLY PRICE CHANGE

Maturity	5	10	15	20	25	30
May-01	0.70%	0.93%	0.54%	0.69%	0.46%	0.38%
May-02	0.44%	0.16%	0.54%	0.23%	0.15%	0.15%
May-03	1.62%	3.59%	2.57%	2.31%	2.23%	2.15%
May-04	-0.71%	0.24%	-0.47%	-0.23%	-0.62%	-0.47%
May-05	0.00%	0.64%	0.72%	0.95%	0.87%	0.87%
May-06	-0.09%	0.48%	0.16%	0.00%	0.00%	0.00%
May-07	-0.71%	-1.18%	-1.34%	-1.18%	-1.18%	-1.18%
May-08	0.00%	0.16%	0.55%	0.71%	0.63%	0.63%
May-09	-0.58%	-0.32%	0.80%	0.95%	0.24%	-0.08%
May-10	0.59%	1.14%	0.72%	0.96%	0.32%	0.40%
May-11	1.22%	1.63%	1.53%	1.92%	2.15%	2.23%
May-12	0.32%	0.66%	1.23%	1.22%	1.38%	1.37%
May-13	-0.90%	-3.22%	-2.80%	-2.79%	-2.86%	-3.17%
May-14	0.36%	1.31%	1.63%	1.87%	1.94%	1.94%
May-15	-0.49%	-0.57%	-0.48%	-0.40%	-0.72%	-0.88%
May-16	-0.50%	-0.41%	0.33%	0.74%	0.98%	1.06%
May-17	0.86%	1.98%	2.22%	2.37%	2.37%	2.28%
Mean	0.13%	0.42%	0.50%	0.61%	0.49%	0.45%
St Dev	0.73%	1.45%	1.29%	1.30%	1.36%	1.41%

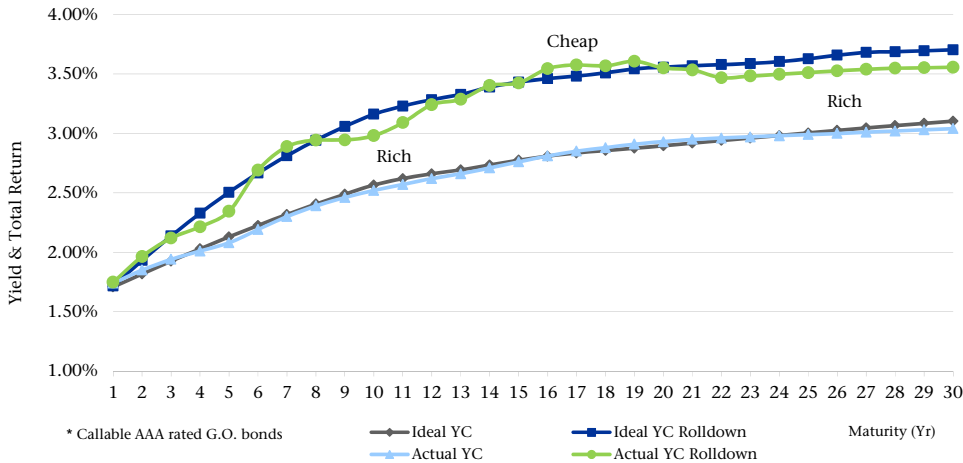
Sources: Loop Capital Markets, TM3

The 20-yr point has the highest expected return.

The 10 to 11-year range was most volatile, with standard deviation of monthly bond price changes of 1.44%.

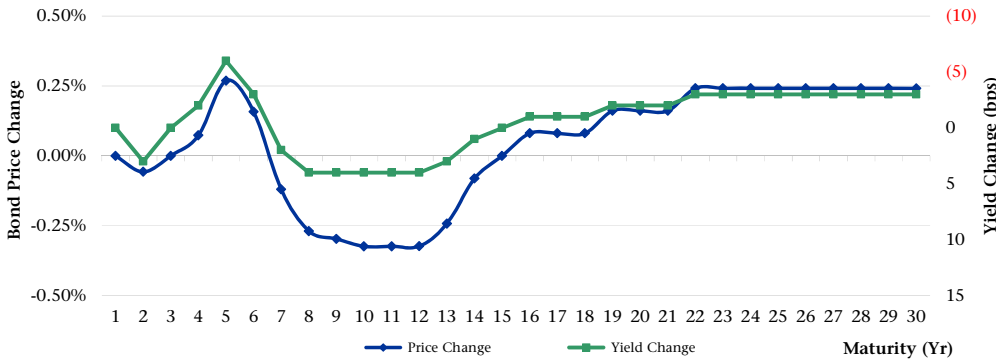
Market Review *The Yield Curve*

Figure 6 1-Year Forward Roll-down—Muni Benchmark Curve* (May 16, 2018)



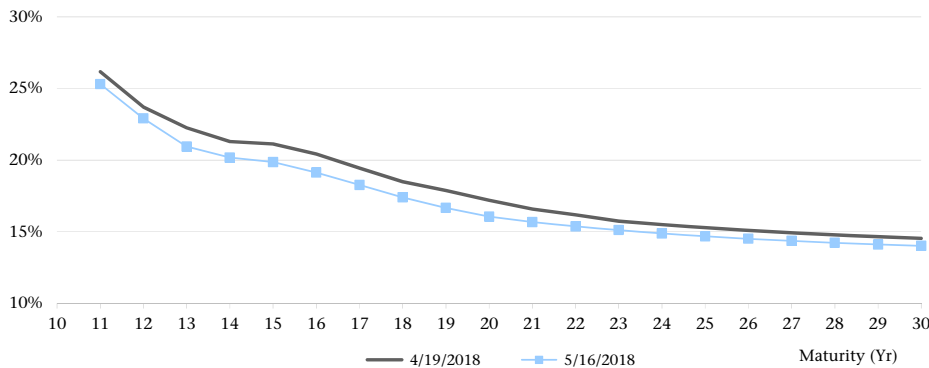
Sources: Loop Capital Markets, TM3 | *Callable AAA-rated G.O. bonds

Figure 7 Monthly Price Change — AAA GO Bonds* (4/23/18 — 5/23/18)



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

Figure 8 Implied Municipal Volatilities



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

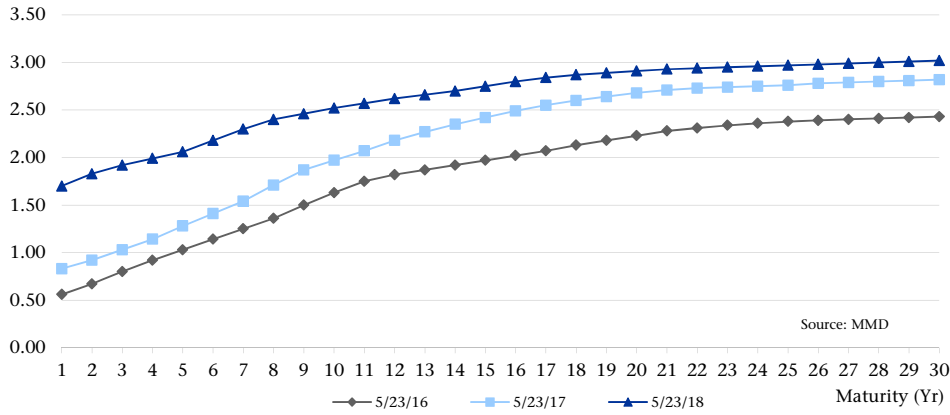
The yield curve shows rich (4 to 5-yr, 9 to 11-yr, 22+ yr) and cheap (7-yr, 16 to 19-yr) points on the AAA MMD curve, based on one year holding period returns and assuming no change in the yield curve. 19-yr maturity offers the highest expected total return.

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

Yields rose up to 4 bps in the 7 to 14-yr range and declined in the 4 to 6-yr range and on the long end of the curve last month, resulting in a somewhat unusual shape of the graph.

Implied volatilities declined last month as yields rose across the curve over a 4-week period through mid-May. Since non-callable bonds depreciate faster in rising interest rate environment than their callable counterparts, the price differential between the two, and the respective implied volatilities, declined as a result.

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

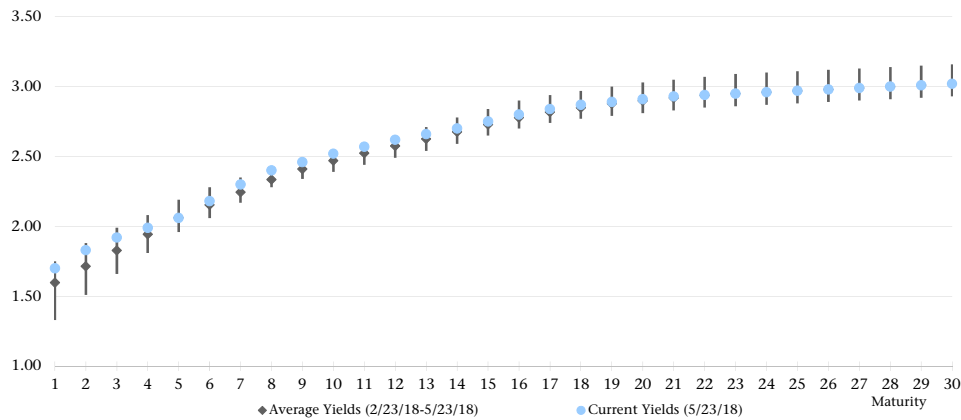


Source: TM3

Yields are about 90 and 20 bps lower on the short and long end, respectively, than they were 12 months ago.

On the front end of the curve yields have risen the most as a result of Fed tightening.

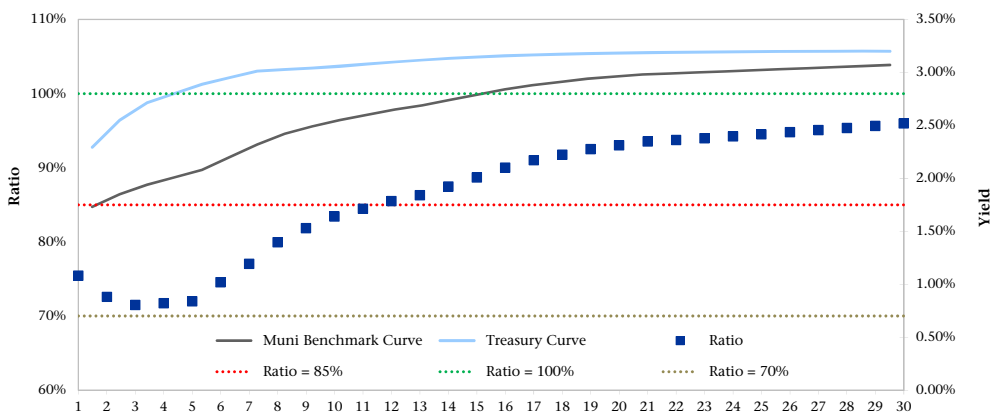
Figure 10 3-Month Average Benchmark Muni Curve Yield



Source: TM3

The yields are around their 3-month averages on the long end. The yields fluctuated in a relatively tight range of 15 to 17 bps in the 8 to 13-yr range over the same period.

Figure 11 Muni and Treasury Yield Curves and Ratios

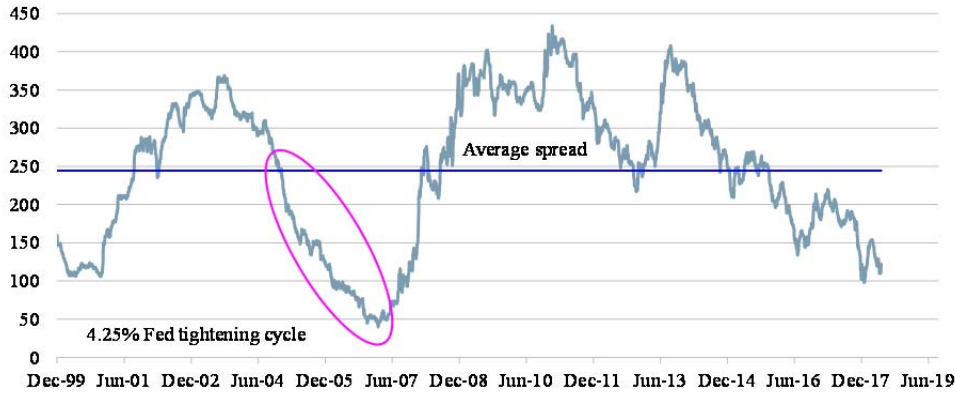


Sources: Eikon, TM3

The ratios have declined across the curve. The ratio curve is upward sloping, except on the short end.

Market Conditions

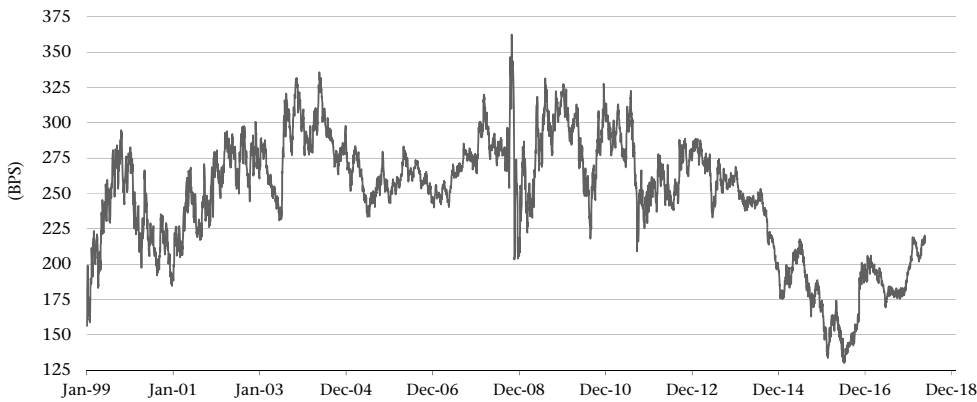
Figure 12 2 to 30-Yr Muni Spread (bps)



Source: TM3

The slope of the curve has continued its downward trend since spiking at the end of February.

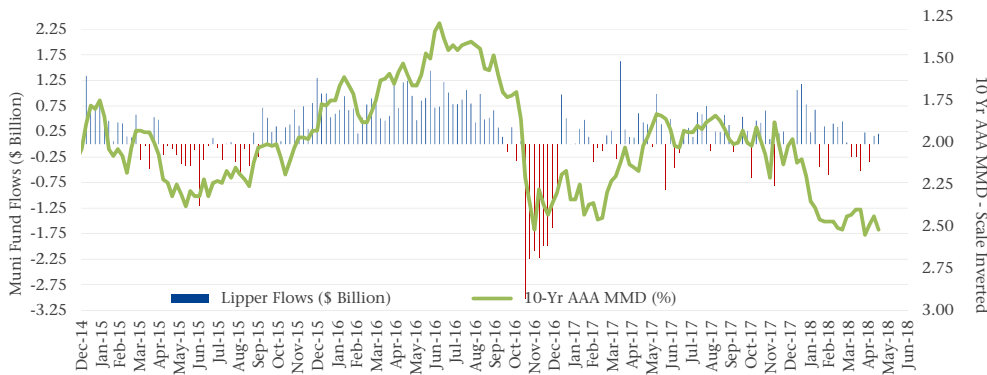
Figure 13 Inflation Expectations



Source: FRED

Fed's five-year forward breakeven inflation rate, derived from TIPS and regular Treasury yields, is close to its highest level since October 2014.

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



Source: Lipper

Muni funds had 2 consecutive weeks of inflows after experiencing tax-related outflows in April.

Loop Capital Markets Upcoming Negotiated Calendar

Date	Par Amount (\$ mil)	Issue	Loop Capital's Role
5/29/18	29.0	Montgomery County Housing Opp. Commission SF Mortgage Revenue Bonds	Co-Manager
5/30/18	40.0	City of Bridgeport General Obligation Refunding Bonds (Taxable and Tax-Exempt)	Co-Manager
5/31/18	50.0	Massachusetts Housing Finance Authority Single Family Housing Revenue Bonds	Co-Manager



Will the Illinois legislature pass a budget if in the time remaining they get half of it done, then another half done over that remaining half, then another half over... etc.?

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