Loop Capital

Municipal Strategy Report

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You Get What You Need

The Fed was rewarded for their recent efforts with President Trump's "congratulatory" tweet ("As usual, Powell let us down"), and a raspberry from financial markets. The S&P 500 fell about one and one-third points before recovering to end down one point. The discontent reflected the difference between what was wanted and what was truly needed. What was wanted was a commitment from the Fed to engage in more aggressive monetary easing than is warranted. Instead, the Chairman gave them what was needed—the previously promised 25-basis point cut in the fed funds rate, and a surprise 2-month shorter end-date for the balance sheet roll-off. No good deed goes unpunished.

By Chris Mier, CFA | Strategist

The Fed's job just keeps getting tougher and tougher. On the one extreme you have the Administration's never-ending demands for rate cuts. Given economic performance and July's FOMC delivery on one cut and the possibility of more, the Administration is being made to look like they had it right all the time. Maybe Larry Kudlow should fill one of the open FOMC chairs? Imagine the chorus of "I told you so's" being tweeted from the White House if the Fed should follow up July's cut with one or two more. On the other extreme you had two Fed ultra-heavyweights—William Dudley and Janet Yellen piping in to say that "once is enough".

That is just the public relations part of the problem. In the monetary world the ECB has already declared its intentions for significant easing beginning in September. With Europe in the tank in 2018 before the U.S. began to slow, and falling faster, the ECB's game plan will pressure the Fed to fall in line and dance to the accommodative music. We live in a global economic world and the global monetary community is increasingly beginning to harmonize their activities like a hive of bees. Despite globalization, the U.S. remains still relatively independent of the kind of desperate need to export that Europe remains captive to. The financial markets have been beating the drums for substantial cuts. The ardor has ebbed a touch, but the markets still remain ahead of the Fed.

Then there is the data. While not blowing the doors off, the recent slate of news has been pretty good. The consumer is alive and well.

Housing is beginning to break out of the back of the pack with an uptick in refinancing activity that could signal a stronger contribution to growth as the year progresses. Labor markets remain strong. Confidence has popped back up a bit. The data will limit the Fed to its 25-basis point adjustment in July and will make consideration of a second cut this year a much more difficult call.

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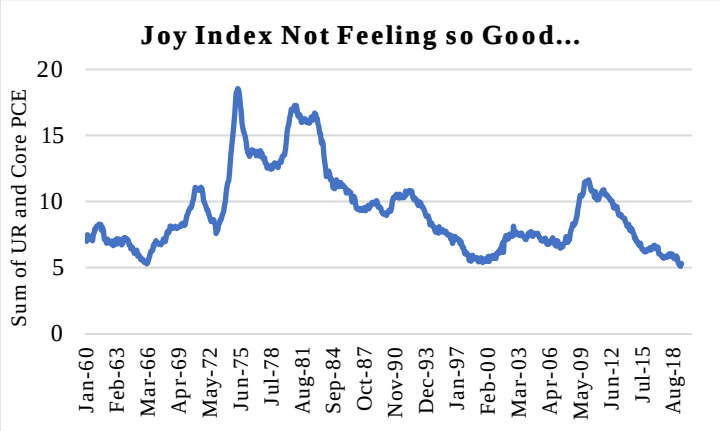
In this Issue

You Get What You Need

Remember the Misery Index in the 1970s when high unemployment rates and high inflation were the scourge? Well, the renamed Joy Index—with low unemployment and low inflation—is causing almost as much heartburn. Has the Fed ever eased when the combined UR and Core PCE were at the current level of 5.3%? It's a brave, and uncomfortable, new world and the answer is "No"



Source: FRED

With sovereign rates gapping down from U.S. Treasury rates, the Fed must consider capital flows and global financial stability. Boosting exports requires a revived global economy and a cooperative dollar. The world can benefit from lower rates across the board—it's not a zero-sum game. But there is a price to pay from too much anticipatory Fed easing. Despite all the "data dependency" rhetoric, this cut, and any that are to follow, are all about trade tensions, sentiment, and financial market stability issues and have little to do with the monetary meat and potatoes of insufficient aggregate demand and rising unemployment rolls.

As all of this unfolds, the Administration may want to consider backing off the Fed and softening the trade rhetoric. They are on the same team, right? An understatement is that U.S. fiscal and monetary policies could be better coordinated. Meanwhile, the Fed would be wise to cool the anticipation of future cuts to follow the July cut. Better to give the markets a taste and leave them hungry for more than to be co-opted into the appearance of a "Powell Put", a monetary stigma that is tough to shake.

Economic and Interest Rate Forecast — August 2019

Factors Supportive of Lower Rates

Housing data has been a mixed bag for some time, subtracting from economic growth over the last 5 to 6 quarters. Existing home sales declined 1.7% in June, as home prices reached new records, deterring potential buyers. Volatile new home sale surged 7%, rebounding from an 8.2% drop in the previous month.

Construction spending was weaker than expected in June, falling 1.3%. The decline was broad-based, across residential and non-residential subsectors.

The intractable U.S.—China trade dispute has disrupted financial markets and eroded investor confidence, as the Administration announced additional 10% tariff on Chinese products. Euro zone growth weakened in July, as a recession in Germany's manufacturing sector deepened, while forward-looking indicators suggest that conditions will worsen.

Factors Supportive of Higher Rates

The U.S. added 224K jobs in June, the most in 10 months. The unemployment rate rose from 3.6% to 3.7%, while hourly earnings increased modest 0.2%. The employers remain optimistic about economic growth even though hiring slowed down to a more sustainable pace.

Consumer spending picked up in the second quarter even as the stimulus from tax cuts faded. U.S. retail sales were strong, rising 0.4% in June, driven by online sales, sales of motor vehicles, groceries, home improvement products as well discretionary spending in restaurants.

Consumer sentiment strengthened in July and is at historically high levels.

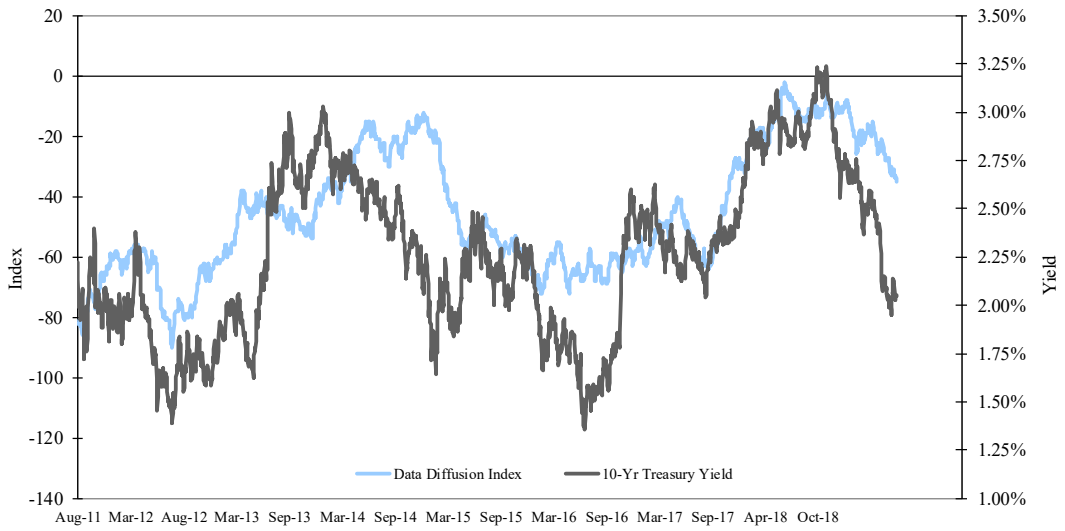
Figure 1 **Economic and Interest Rate Forecast — August 2019**

	3Q'17	4Q'17	1Q'18	2Q'18	3Q'18	4Q'18	1Q'19	2Q'19	3Q'19	4Q'19	1Q'20	2Q'20	3Q'20	4Q'20	Avg'17	Avg'18	Avg'19	Avg'20
Economic Forecasts																		
Real GDP	2.8	2.3	2.2	4.2	3.4	2.2	3.1	1.8	2.2	2.1	2.3	2.2	2.2	2.0	2.2	2.9	2.6	2.2
Core PCE Deflator	1.5	1.6	1.7	1.9	2.0	1.9	1.7	1.6	1.6	1.7	1.9	2.2	2.2	2.3	1.6	1.9	1.6	2.1
Unemployment Rate*	4.3	4.1	4.1	3.9	3.8	3.8	3.9	3.5	3.5	3.4	3.5	3.6	3.7	3.7	4.4	3.9	3.6	3.6
Nonfarm Payrolls (chg in 1000s)	409	654	683	728	568	700	521	512	450	400	380	360	300	300	2,164	2,679	1,883	1,340
S&P 500*	2,467	2,603	2,733	2,703	2,850	2,699	2,721	2,882	3,003	3,040	3,077	3,115	3,153	3,192	2,449	2,746	2,912	3,134
Short-Term Interest Rates*																		
Fed Funds Target (%)	1.16	1.20	1.44	1.74	1.92	2.18	2.40	2.40	2.21	1.96	1.88	1.88	1.88	1.88	1.00	1.82	2.24	1.88
3-Month LIBOR (%)	1.31	1.46	1.93	2.34	2.34	2.62	2.69	2.51	2.29	2.08	2.01	2.01	2.02	2.03	1.26	2.31	2.39	2.02
7-Day SIFMA (%)	0.82	1.05	1.21	1.46	1.35	1.63	1.54	1.70	1.40	1.50	1.45	1.60	1.50	1.60	0.85	1.41	1.54	1.54
Treasury Interest Rates*																		
2-Year Treasury (%)	1.36	1.69	2.15	2.47	2.66	2.80	2.49	2.13	1.82	2.03	1.99	2.04	2.08	2.13	1.39	2.52	2.12	2.06
3-Year Treasury (%)	1.51	1.81	2.30	2.61	2.74	2.84	2.46	2.09	1.79	2.05	2.02	2.08	2.13	2.18	1.57	2.62	2.10	2.10
5-Year Treasury (%)	1.81	2.06	2.53	2.77	2.81	2.88	2.46	2.12	1.82	2.10	2.13	2.14	2.20	2.26	1.91	2.75	2.13	2.18
7-Year Treasury (%)	2.06	2.25	2.68	2.88	2.88	2.97	2.52	2.22	1.92	2.14	2.19	2.20	2.26	2.32	2.16	2.85	2.20	2.24
10-Year Treasury (%)	2.24	2.37	2.76	2.92	2.92	3.04	2.65	2.34	2.05	2.20	2.19	2.26	2.33	2.40	2.33	2.91	2.31	2.29
30-Year Treasury (%)	2.82	2.82	3.03	3.09	3.06	3.27	3.01	2.78	2.58	2.40	2.35	2.45	2.50	2.60	2.89	3.11	2.69	2.48
Municipal Interest Rates*																		
30-Year MMD (%)	2.75	2.71	2.91	2.99	3.04	3.27	2.95	2.47	2.31	2.17	2.14	2.24	2.31	2.42	2.85	3.05	2.47	2.28
Muni Yield Curve Slope (%)	1.93	1.58	1.51	1.36	1.47	1.40	1.34	1.03	1.16	1.02	1.04	0.99	1.16	1.17	1.93	1.44	1.14	1.09

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 July 26, 2019

Market Review *Data Diffusion | ADS Index*

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

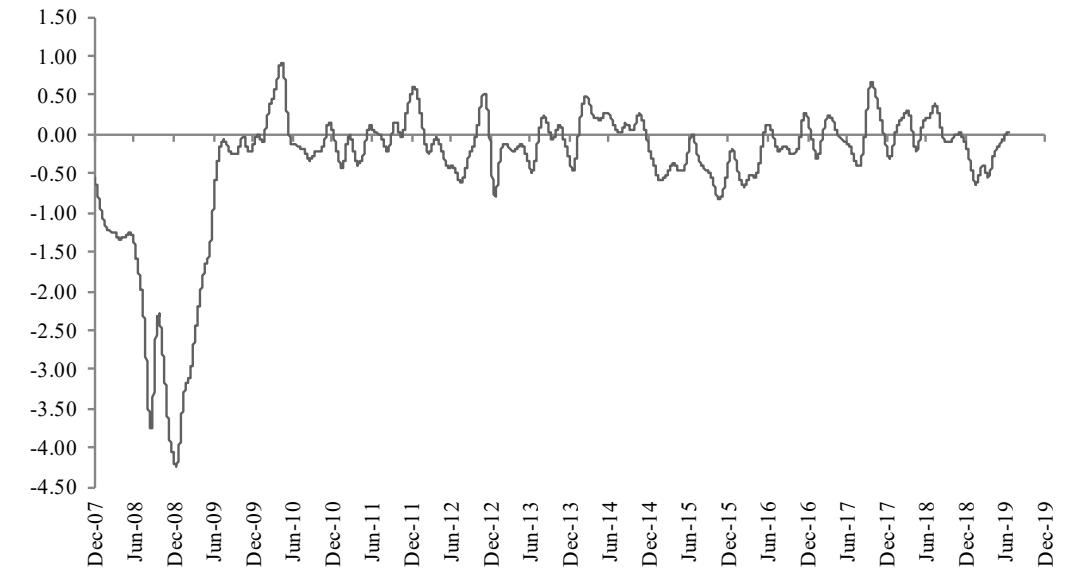


Sources: FRED, Loop Capital Markets

As economic releases came weaker than expected, Treasury yields declined.

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 — 07/20/2019)**



Source: Federal Reserve Bank of Philadelphia

After trending up for several years, the ADS index weakened from December through mid-February. It partially recovered since that time, and currently remains around the trend growth rate of about 2%.

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.

Bloomberg BFV Striving to Take Market Share from MMD

By Chris Mier, CFA | Strategist

The war over dominance as the industry's standard benchmark AAA scale used in pricing new issues and secondary market trading is heating up. Bloomberg recently announced that four issuers had used Bloomberg's Fair Value (BFV) Scale as the benchmark determinant in the pricing of their new issues. Given the growing interest in benchmark scales, and the budding interest on the part of issuers to consider alternatives to MMD, we recently released a piece called "Comparing Benchmark AAA Scales". Some of the summarized discussion of the piece is included below.

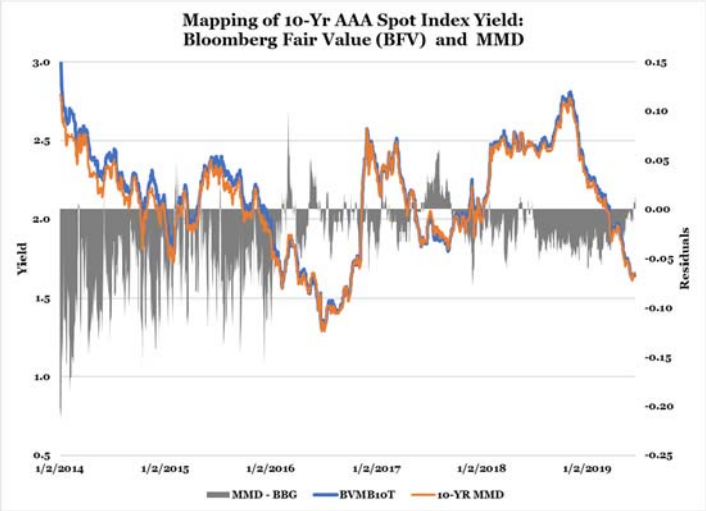
Statistically Examining BFV and MMD

To shed light on the properties of the BFV and MMD scales, we started with five years of daily pricing for the 10-year spot AAA index yield from each provider. The 10-year is an active area for municipal activity and has the advantage of ease of comparability to the 10-year Treasury. It is also the longest noncallable bond, eliminating the issue of how accurately embedded options are priced. By statistically examining the properties of the two scales, we may be able to establish characteristics unique to one, but not the other, that confers an advantage to that provider. Our purpose is to provide interested parties—issuers, investors, financial advisors, etc.—with the statistical properties that distinguish these two prominent indices providers and ask the questions that assist readers in distinguishing for themselves what aspects of a given provider's data is more accurate, or perhaps just more valued, by the people who transact in the municipal market. While we believe that more information is better, the market is best served by the most accurate provider of the data that is foundational to price discovery in the muni market. In future reports, we may examine the offerings of some of the other data providers, hoping that the development of new technologies yields greater accuracy.

Taking an Initial Look: Bloomberg Fair Value and MMD

Using 10-year AAA data from January 2nd, 2014 to June 18th, 2019, we plot their values with the differences between them, shown as the MMD value minus the BFV value.

Figure 1. Mapping of 10-Yr AAA Yield



Sources: TM3, Bloomberg

Visual observation shows that:

1. The Indices map much closer in the period starting summer of 2016 than in the earlier period starting January 2nd, 2014.
2. Bloomberg altered their scale development process during this earlier period, possibly accounting for the wider variation relative to MMD until mid-2016.
3. Bloomberg yields are consistently higher than MMD, with BFV yields exceeding MMD 84.5% of the time during this period. This bias creates a fundamental problem for market participants.
4. When BFV yields exceeded MMD, they were higher by 4.5 bps on average; when MMD yields exceeded BFV, they were higher by 1.9 bps on average. The narrower "excess" market yield estimate by MMD over BFV implies greater systemic control over price generation with a lower tendency to overshoot levels.

A comparison of the descriptive statistics is shown below:

Figure 2. Descriptive Statistics for BFV and MMD (01/02/14 – 06/18/19)

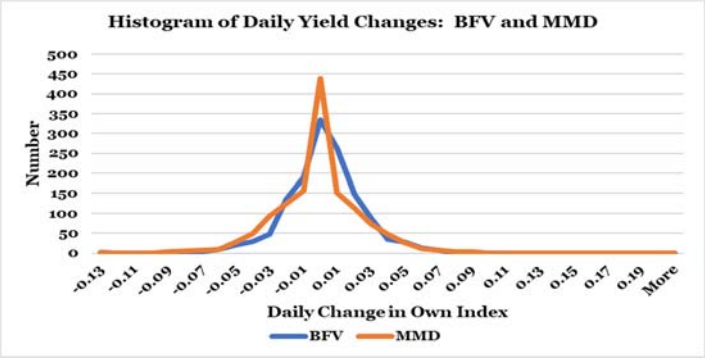
Daily Change of Each Series Versus Previous Day			
BFV		**MMD**	
Mean	-0.001	Mean	-0.001
Standard Error	0.001	Standard Error	0.001
Median	0.000	Median	0.000
Mode	0.000	Mode	0.000
Standard Deviation	0.024	Standard Deviation	0.027
Sample Variance	0.001	Sample Variance	0.001
Kurtosis	7.325	Kurtosis	6.586
Skewness	0.190	Skewness	0.244
Range	0.360	Range	0.390
Minimum	-0.160	Minimum	-0.170
Maximum	0.200	Maximum	0.220
Sum	-1.359	Sum	-1.130
Count	1364	Count	1364

The mean, median and mode for each series are the same, and their standard deviations are relatively similar (MMD has a slightly larger standard deviation), indicating that the distributions are broadly similar. Bloomberg's BFV has a higher minimum value, a lower maximum value, and a narrower range of values over the time period.

When looking at the direction of change—yields rising or falling—over 1,364 observations, the two indices moved in the same direction 63.7% of the time, which appears to be quite low. More than one-third of the time BFV and MMD were not moving in the same direction with respect to prices/yields! How can that be? Is the direction of market movement in municipals that difficult to gauge? Do municipal prices stay centered around a zero-price change, making this phenomenon a likely possibility? Municipals react significantly to changes in inflation, macroeconomic data, and supply and demand fundamentals (to name just a few factors). This divergence in assessing the direction of market change is a fundamental problem for the market.

Digging deeper into this phenomenon of one index seeing the market up (in price) while the other sees it as being down (in price), we generated a histogram of changes that is shown below.

Figure 3. Histogram of Daily Changes



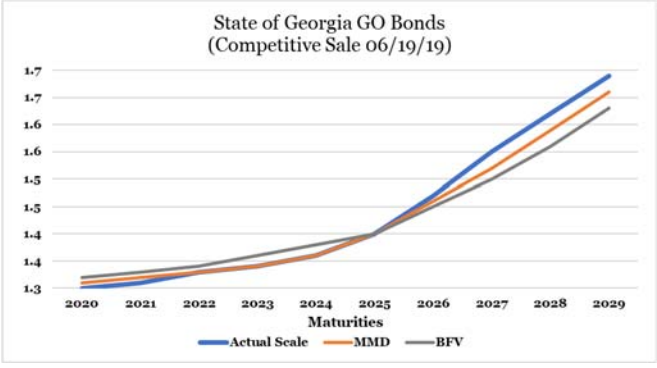
Both lines on the histogram show that data for both providers is skewed to the right, meaning that the right tail extends further out to the right then the left tail extends to the left. Another way to characterize this is the extent to which the mean and median for each data set exceed (in the case of a distribution skewed to the right) the mode. While the MMD daily difference data is slightly more skewed to the right (0.244) than the BFV data (0.190), both are within the +0.5 to -0.5 tolerance range that is used to categorize a distribution as approximately symmetric. Both distributions have high values of kurtosis ("positive excess kurtosis"), or in other words, a substantial degree of "peakedness". One interpretation of higher peakedness is that MMD has a greater number of market changes centered around a smaller number of values. This suggests that MMD may be capturing the market more accurately, or that BFV is capturing changes in yields that MMD is overlooking or not picking up. The greater symmetry in the MMD distribution suggests something that is consistent with markets over time: daily changes over a constrained range of yields should result in about the same number of positive daily changes as negative daily changes.

Case Study

The State of Georgia sold $315 million bonds through competitive auction on June 19, 2019. Georgia is AAA rated by all three rating agencies—Moody's, S&P, and Fitch—and has been AAA-rated by Moody's since at least 1992. Georgia's relatively low volume of issuance compared to many states confers scarcity value. The bonds for this tranche were all noncallable with 5% coupons on each of ten serial maturities. The BFV scale on this day exceeded the actual yields on each of the first five maturities, was equal to the yield on the 6th maturity, and underestimated the yield on the last 4 maturities. MMD, by contrast, was closer to the competitive bid yield level at every maturity than BFV. MMD was accurate on four of the ten maturities, while BFV was accurate only once.

The squared deviations of the differences between each scale provider and the actual scale was significantly different with BFV's squared deviations almost four times as large as MMD's.

Figure 4. State of Georgia GO Bonds



Conclusion

In comparing two indices, there may not be a single determinant of which index more accurately captures the market. Examining an array of statistics, however, can paint a picture of the various characteristics of each provider that can help in determining if the properties of one provider appear to coincide with market experience more than properties of the other.

MMD is the industry-dominant provider of AAA scales, with new issue pricings and secondary market trading principally relying on its data for price determination. Bloomberg is newer to the game as a provider but has the advantage of large amounts of data and highly sophisticated quantitative capabilities.

An important question is whether the differing methodologies of these indices necessarily determine their differing statistical fingerprints. BFV uses actual trade data, combined with internet surveillance, and substantial use of their proprietary yield curves for market subsectors to formulate their scale. MMD uses similar market data, a smaller set of component yield curves and a survey approach, where trading desks and large institutional investors are queried as to their views on where the scale should be based upon trades they have seen in the marketplace.

The purpose of this exercise is simply to compare the two most commonly used market metrics in terms of their statistical properties, and let the reader make their own conclusions. There are enough significant differences that no doubt readers will form their preferences, if they have not already done so through their market activities.

Moody's Proposed Pension Methodology Changes Create More Questions Than Answers

By Rachel Barkley | Senior Vice President

Moody's has released a Request for Comment (RFC) in which it proposes adjustments to its Adjustments to U.S. State and Local Government Pension Data methodology, published December 2017.

Under the new proposed methodology, Moody's would continue to adjust pension liabilities based on a market-based discount rate, the FTSE Pension Liability Index, enabling Moody's to properly account for pension liabilities true risk levels, as well as putting all plans on a level playing field by using the same discount rate. The adequacy of pension contributions would still be measured based on the treading water indicator, based on assumed investment returns.

The major change for pension analysis is the addition of an asset shock indicator (PASI). The PASI estimates the probability that the issuer will experience an annual investment loss from their pension plans that equals 25% of more of the government's operating revenues. The PASI is based on a combination of the size of pension assets compared to the general government operating budget as well as the perceived volatility of their investments. As shown below, both of these factors can create dramatically different PASI scores for entities that are all else equal. An issuer with a higher asset shock indicator has greater exposure to pension investment losses leading to a meaningful impact on their balance sheet.

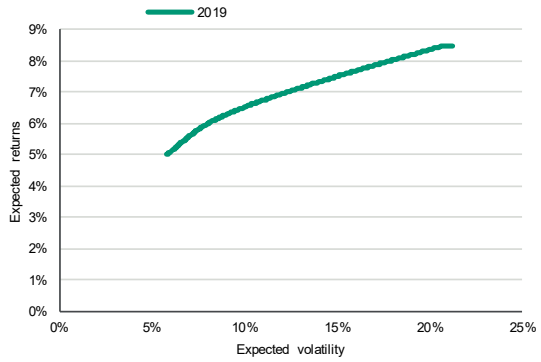
Figure 1: Sample PASI Calculations

Pension Assets ($000s)	500	500	500	500
Operating Revenues ($000s)	100	450	450	100
Pension assets as % of revenues	500%	111%	111%	500%
"Shock" asset loss equal to 25% of operating revenues ($000s)	-25.0	-112.5	-112.5	-25.0
Shock loss rate (shock loss as % of pension assets)	-5.0%	-22.5%	-22.5%	-5.0%
Target Return	7.50%	7.50%	6.50%	6.50%
Expected Volatility	14.98%	14.98%	9.91%	9.91%
Z Score	-0.83	-2.00	-2.93	-1.16
PASI	**20.3%**	**2.3%**	**0.2%**	**12.3%**

Source: Moody's Investors Service and Loop Capital

Each pension plan's return volatility is determined based on Moody's risk-return map, which the rating agency will update and publish annually. The map details the expected volatility based on each fund's investment return target. For 2019, the expected volatility varies from 5.84% for a plan with a 5% expected return to 21.25% for an 8.5% expected return.

Figure 2: Moody's Risk-Return Map



Source: Moody's Investors Service

However, Loop believes this measure of volatility for pension plans is too simplistic as plans that have the same investment target can have significantly different investment portfolios, impacting their volatility.

Based on their 2018 valuations, the six plans below have the same assumed investment rate of 7.5% despite having some notable differences in portfolio composition. Arizona's SRS and Ohio' School Employees plans particularly stick out as having lower concentrations in equities and fixed income and higher levels of alternative investments, including private equity, real estate, and hedge fund holdings, which have historically been more volatile.

Figure 3: Investment Portfolios with 7.5% Assumed Investment Return for 2018

State Plan	Arizona SRS	Georgia TRS	Kentucky TRS	Oklahoma Police	Minnesota GERF	Ohio School Employees
Equities	46.3%	69.4%	64.0%	62.6%	60.8%	46.0%
Fixed Income	10.2%	30.6%	22.5%	24.2%	24.3%	13.5%
Private Equity	21.0%	5.5%				10.3%
Real Estate	10.8%	5.8%				14.1%
Cash	2.2%	1.2%		1.2%	1.1%	5.3%
Commodities	1.4%	1.0%		12.0%		0.0%
Hedge Fund	8.1%	0.0%				10.8%
Misc. Alternatives	0.0%	0.0%			13.8%	0.0%

Sources: Public Pension Database and Loop Capital

Moody's states that they expect few, if any, rating actions to be taken due to the proposed methodology changes. However, this is likely optimistic based on the agency's track record of rating changes based on their evolving outlook on pension liabilities. Plans with high assumed investment returns and large pension assets as a percent of governmental revenues are the most at risk of negative rating actions. Alabama, Connecticut, Minnesota all have plans with an 8% target return for their 2018 valuations.

Congestion Pricing

By Ivan Gulich, CFA | Senior Vice President

Cordon area congestion pricing is a fee or tax paid by motorists to enter a restricted area, typically a city center, as part of a demand management strategy to relieve traffic congestion. The concept has been used overseas for several decades and is currently being implemented in New York City. We describe the benefits and challenges of congestion pricing and also discuss congestion pricing programs implemented in overseas jurisdictions.

Benefits

The economic rationale behind congestion pricing is to incentivize the motorists to make fewer trips to the city by imposing a fee for doing so. Congestion pricing charges reduce the number of vehicles in the restricted area, which results in improved flow of traffic, reduced air pollution and noise, fewer traffic accidents and improved quality of urban life.

With a well calibrated congestion pricing plan:

- There are fewer vehicles on the road, which increases the speed of traffic.
- The motorists get to their destination faster. Spending less time in traffic also benefits the employers.
- The vehicles don't use as much fuel due to lower mileage and less idling in traffic.
- Reduced fuel consumption improves air quality.
- There are fewer accidents and injuries due to reduced vehicle-miles travelled.
- The quality of life for city residents improves with fewer vehicles clogging the streets.

Finally, congestion pricing programs bring revenue that can be used for capital expenditures in public transportation.

The cities that have implemented these programs are mostly located in Europe, with a notable exception of Singapore, which has been a pioneer in cordon area congestion pricing.

Challenges

Congestion pricing proposals are generally unpopular with motorists as well as restricted area residents who are subject to charges. Since the proposals are often controversial both before and after implementation, political feasibility is often a critical issue.

A frequently raised objection is that congestion pricing is not equitable, pricing the poor off the roads so that the wealthy can move about unencumbered (the so-called "Lexus lane" problem). It further penalizes (1) drivers who live far from public transit stops and may already subsidize the system by paying tolls and (2) people who are too frail to take public transportation or navigate the crowds.

Other common objections:

- Congestion pricing places economic burden on commuters in neighboring communities, pitting suburbs against the cities.
- Restricting traffic has a negative effect on retailers and economic activity and land use in terms of lost sales and increased delivery costs.
- Congestion pricing is "just another tax".
- The installation of a large numbers of cameras for tracking purposes may raise civil liberties concerns.

Other Factors that Increase Congestion

It is often difficult to disentangle impact of other interventions that have reduced the effective capacity of the road network in order to improve the urban environment, increase road safety and prioritize public transport, pedestrian and cycle traffic. For example:

- Creating bicycle lanes and pedestrian malls reduces the number of driving lanes for vehicles. Bike lanes are lightly used in winter months but contribute to a year-round gridlock.
- An influx of ride-hailing vehicles such as Uber and Lyft that barely existed just a decade ago greatly contributes to congestion. Unlike commuters who get in and out of the restricted area relatively quickly, ride-hailing vehicles often spend all day in traffic.
- Delivery vans block the curbs due to growth of online shopping.
- Roadwork by utilities and general development activity routinely reduce the flow of traffic.

Best Practices in Building Support for Congestion Pricing

It is critical to engage various stakeholders early on, including elected officials, commuters and residents who influence public policy and then work with these constituencies to build support for

congestion pricing. During this process, legitimate concerns by various constituencies must be addressed. For example:

The equity and fairness concerns, particularly about the adverse effects that congestion pricing could have on:

- Low-income groups, as well as
- Elderly motorists, people with disabilities or health issues, who generally have difficulty navigating the crowds or climbing the stairs to access public transit.

Certain groups of motorists could be exempt from charges (low income motorists, disabled motorists), or pay steeply discounted charges (local residents).

Concern over disparate geographic impact—congestion pricing negatively impacts suburbanites, who could bear the brunt of the cost of the program.

To make the program more attractive to this group, the existing public transportation infrastructure may have to be upgraded to accommodate increased ridership from commuters who decide to switch to public transportation, which may require opening new bus routes or new subway stops.

Concerns over other sources of congestion, unrelated to the influx of commuters, also need to be addressed:

- Drivers who block or slow down traffic by blocking bus lanes, double-parking, etc. Stepped up traffic enforcement should be an effective deterrent to this type of behavior.
- Regulation and limits on the number of congestion-causing ride-hailing and delivery vehicles may have to be implemented.
- Allocation of parking spaces for tour buses that are clogging traffic lanes as there is no place for them to go while they wait for passengers to return.

Concerns over potential loss of revenue and profits due to fewer customers and higher delivery costs.

Studies have shown that in places where congestion pricing was implemented, negative impact on retail sales was very small, if any. On the other hand, reduced congestion speeds up deliveries, offsetting marginal increase in transportation costs.

Finally, and this is a very important point—the revenue from a congestion pricing program should be dedicated to improving transportation infrastructure, instead of being diverted to other uses, in which case the charge would be perceived as being "just another tax". The motorists and residents are much more likely to support a congestion pricing proposal if the proceeds are used to improve the roads, transit system and overall quality of life in the restricted zone, instead of being used for general purposes. Dedicating congestion pricing revenue to improving chronically underfunded transportation infrastructure is good public policy.

Next, we cover congestion pricing programs implemented overseas.

Singapore's Electronic Road Pricing (ERP) Program[1]

The city of 5.6 million inhabitants has been at the forefront of implementing zone pricing, with the system that has been in operation since 1998. The program's objective is to manage congestion in the most operationally efficient manner, not to maximize tolling revenue.

It is technologically most elaborate and flexible open road tolling system, consisting of a network of overhead control points concentrated in the main business district and along major highways. Vehicles equipped with transponders are charged every time they pass through cordon area in and out of the restricted area. The fees vary by the road and time of day, depending on local traffic conditions.

Taxis and ride-hailing cars also have to pay the congestion fees, which are passed along to passengers.

As traffic patterns change over time, the city periodically moves the control points from one road to another. To reduce the costs of physical infrastructure the city will use satellites to track vehicles starting in 2020.

ERP rates are determined by a quarterly review of traffic speeds on priced roads. Based on an optimal speed range of 20-30 km/h on arterial roads and 45-65 km/h on expressways, ERP rates are adjusted accordingly.

The program has been a success. Singapore has maintained optimal speeds on their roads despite the steady increase in the number of vehicles entering the city due to population growth. Public transit ridership has been growing at 5% annually. Singapore program generates the equivalent of $100 million in net revenue per year. Operating costs consume about 16% of revenues.

[1] Singapore Land Transport Authority: Electric Road Pricing (ERP), 2019

London Congestion Charge[2]

Congestion charge was introduced in February 2003 to reduce high traffic flow and pollution in the central area of about 8 square miles and raise investment funds for London's transportation system.

The system relies on a network of 1,360 closed-circuit cameras equipped with automatic number plate recognition technology, located at 348 sites within the charging zone. A vehicle driving within the restricted zone incurs a daily fee regardless of how many times it goes in and out of a designated congestion zone in the center of the city.

The daily fee of £11.50 (which has risen at 6.1% annual rate over the last 16 years) is applied during regular business hours. More polluting vehicles pay extra £10 toxicity charge, bringing total daily charges to an equivalent of about $30 dollars. There is free access to the congestion charge zone for electric cars, some plug-in hybrids, and low emission vehicles. Residents are eligible for 90% discount, while taxis and ride-hailing cars are exempt.

Charges are automatically deducted from a payment/debit card associated with the vehicle, or billed monthly to vehicle owner. Annual net revenues are the equivalent of about $180 million. However, due to relatively complex system design, up to ½ of gross revenues is spent on operating and administrative expenses.

After program implementation, traffic was consistently lower 15%-20% compared to pre-charge levels. However, congestion has gradually returned to levels before program implementation as the city's population grew by about 20% between 2003 and 2018 and as other interventions reduced the effective capacity of the road network. However, without congestion pricing program, London's gridlock would be much worse than it is today.

Stockholm Congestion Tax[3]

The program was introduced in 2006, and implemented permanently in August 2007 to reduce traffic congestion, improve air quality, pay for infrastructure development (building roads and highways, expanding the subway system, and making other investments in public transit) in a restricted area of about 12 square miles.

The system consists of overhead gantries and cameras equipped with automatic license plate recognition technology at one of 18 control points which form a cordon around the inner city. Motorists pay congestion tax during regular business hours every time they enter or exit congestion zone subject to a daily limit of about $13 U.S. dollars per vehicle per day. The tax varies by time of day, with highest fees in effect at the busiest times of day.

Emergency service vehicles, large buses and disabled motorists are exempt. A bill is sent to the vehicle owner at the end of each month.

The system raises around $155 million in net revenues annually. It is very efficient, considering that operating and administrative costs take up only about 7% of gross revenues.

The program has been very effective in reducing congestion, as the number of vehicles entering the restricted zone dropped by 22%. The average rush-hour travel times have dropped by as much as half, with less variation on a day-to-day basis.

Final Thoughts

Congestion pricing is a very attractive concept for large U.S. cities with congestion problems, especially in coastal areas where traffic is geographically constrained. In addition to reliving congestion, revenue from the program can be used to fund transportation infrastructure.

Congestion pricing is a novel concept in the United States. New York City's pioneering congestion pricing program, which is currently being implemented, is scheduled to go into effect in January 2021.

The main challenges to embracing congestion pricing are political, as motorists are uniformly opposed to paying the charge. However, extensive experience from overseas jurisdictions that have had congestion pricing programs in place for more than a decade demonstrate that (1) the benefits of the program greatly outweigh the costs and that (2) the public, despite initial opposition embraced congestion pricing after experiencing the benefits of shorter commute times and improved transportation infrastructure.

[2] Transport for London: Congestion Charge Factsheet (2019)
[3] Tri-State Transportation Campaign—A Way Forward for New York City (2018)

Modeling Muni to Treasury Ratios

By Chris Mier, CFA | Strategist

The fascinating dynamics between large Lipper inflows into the muni market, maturities and redemptions simultaneously sucking bonds out of portfolios, and new issue volume struggling to keep up with their replacement, has generated a lot of interest in Municipal to Treasury yield ratios. These ratios have been volatile this year, and in certain parts of the curve have hit levels of richness earlier this year not seen in quite some time. For this piece we illustrate how to model Municipal to Treasury ratios to better understand their dynamics.

Formulating a M/T Ratio Model

The preferred goal of modelling a financial relationship is to try to capture the underlying economic dynamics of the relationship to gain insights into what factors are important and why. We tested over 16 variables before settling on a six-variable model that captures almost three-quarters of the movement in the 10-year M/T Ratio while passing all statistical tests of significance.

The 10-year M/T Ratios Model we used includes the following independent variables:

- BBG 30-day Visible Supply
- The Treasury 10-Year Note
- The Muni Curve from 2 to 10 years
- Lipper Flows
- Whether the week occurred in the month of December
- The VIX Index

The economic logic of the model is straightforward. We have a demand component (Lipper Flows), the prevailing level of interest rates, the municipal yield curve, a supply component (the 30-Day Visible Supply), a seasonal dummy variable to account for the tendency for ratios to rise in December due to seasonal outflows, and a measure of market volatility. The intuitive logic of why these independent variables would explain movements in M/T ratios will probably be agreed upon by market participants. What is interesting, however, is the variables that were tested, but failed to meet the test of significance. These included the amount of municipal bonds outstanding, the amount of maturing bonds over the next 30 days, the amount of called bonds over the next 30 days, and two dummy variables for June and July, which were chosen for their association with periods of large redemptions and reinvestment activity.

The regression output is shown below. The signs of the coefficients of the independent variables are generally as expected. Higher visible supply results in higher ratios, as does the December dummy variable the VIX Index. Three variables, however, have questionable signs for their coefficients. Generally, lower rates produce higher ratios, but not with this dataset. The slope of the muni curve is similarly contrary to expectation. The most surprising is the Lipper Flows variable, which one would expect to be negative, meaning that more Lipper Flows produce lower, not higher, M/T ratios. We think the explanation for the counterintuitive signs of the coefficients is a result of the relatively short time period used—from July 28, 2017 forward. This was a time when rates were already very low and muni ratios didn't exhibit the tendency to be higher at lower rate levels given the constrained sample of the data. This analysis would apply to the yield curve variable as well. With the Lipper Flows data, most of the data represented positive inflows into municipal funds and there were few significant yield back-ups during this period that would tend to be a factor responsible for outflows. Running a regression without these variables resulted in a model significantly inferior to the full model.

Figure 1.

Regression Statistics	
Multiple R	86.8%
R Squared	75.3%
Adjusted R Squared	**73.7%**
Standard Error	2.04%
Observations	104

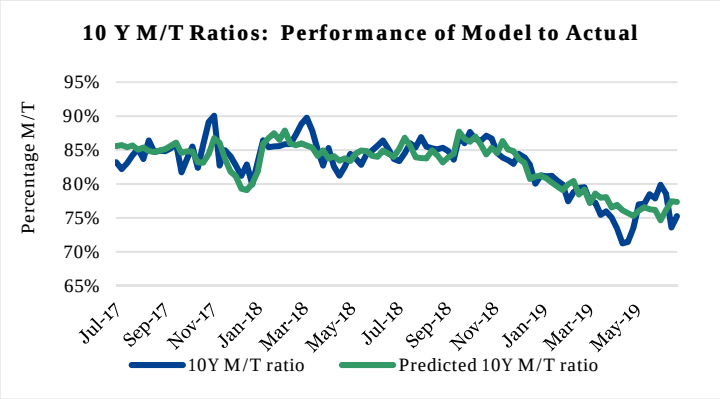
	Coefficients	***Std Error***	***t-Stat***	***P-value***
Intercept	0.633273	0.0264	23.97	0.0000
BBG 30-day Vis Supply	0.000002	0.0000	3.14	0.0023
GT10 Govt	0.033013	0.0080	4.11	0.0001
Muni Curve 10/02	0.111099	0.0103	10.82	0.0000
Lipper Flows	0.000000	0.0000	(2.61)	0.0105
Month of December	0.021892	0.0079	2.77	0.0067
VIX Index	0.001305	0.0005	2.43	0.0170

Source: Loop Capital Markets

The model performs well compared to the actual data, as is shown below in Figure 2. The average error is plus or minus 1.6 percentage points and the model does a good job of capturing most turning points. The largest errors are during the period of the most aberrational market performance—April through May of this year when ratios were driven sharply lower by both strong Lipper flows and high redemptions, and also, we believe, by portfolio managers'

strategy to get ahead of a long summer of anticipated redemptions by buying ahead and using the 30 to 45 day settlement period for new issues to bridge the gap between their own forecasted redemptions and reinvestment needs. In a perfect storm of higher visible supply, larger fund flows, and increased volatility occurring in May the market did not fully capture the decline in M/T ratios and was shy by about 4.8 percentage points. Including a measure of investor sentiment may have boosted model performance over this period.

Figure 2.



Sources: TM3, Loop Capital Markets

The correlations between the variables provide insight for forecasting. For example, if you anticipate that Lipper flows will continue to be positive, the correlations suggest that all the values of all variables should be chosen to be negative versus previous values. Logic should prevail, but all else equal, the expectation for higher Lipper flows suggests:

- Declining Treasury yields
- Lower visible supply
- A flatter muni curve
- Lower volatility

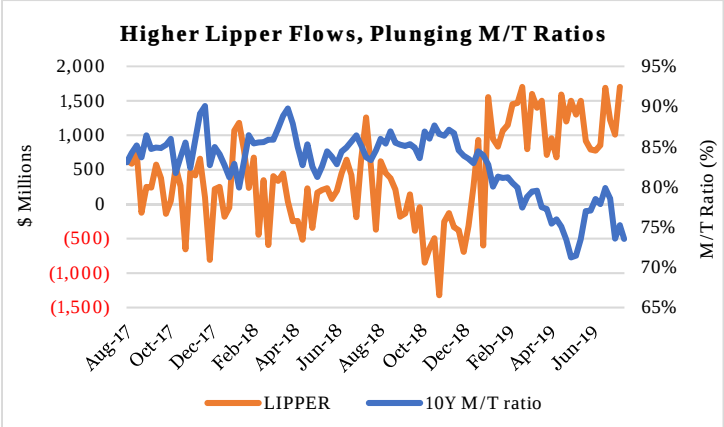
Obviously, the December variable is only going to be "1" if it is in fact December data you are projecting and, as always, these are associations, not causal relationships.

Figure 3.

	10Y M/T	LIPPER	Vis Supply	GT10 Govt	Mun 10/02	DEC Month	VIX Index
10Y M/T Ratio	1.00						
LIPPER Flows	(0.65)	1.00					
Visible Supply	0.16	(0.18)	1.00				
GT10 Govt	0.43	(0.45)	(0.26)	1.00			
Muni 10/02	0.70	(0.40)	0.03	0.12	1.00		
DEC Month	0.12	(0.20)	0.18	(0.06)	(0.18)	1.00	
VIX Index	0.13	(0.15)	(0.28)	0.39	(0.19)	0.17	1.00

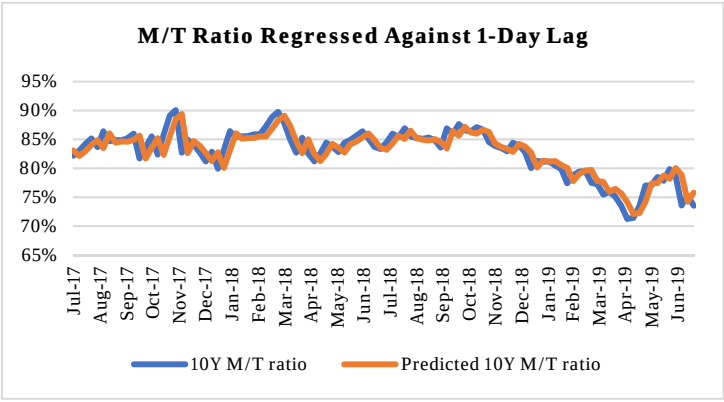
Selecting one independent variable, Lipper Flows, and graphing it against M/T ratios shows the expected relationship.

Figure 4.



It is always wise to graph the dependent variable against itself with a lag to test for serial autocorrelation. As it turns out, the best predictor of tomorrow's M/T ratio is today's M/T ratio! The R-Squared on this simple regression was over 80%—higher than the more robust model, with a good p-value for the lagged independent variable.

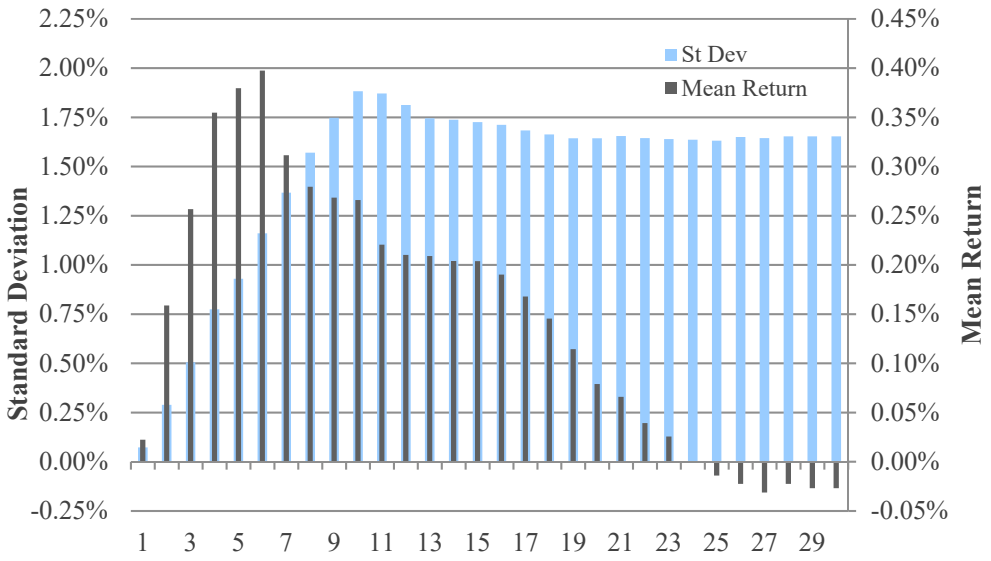
Figure 5.



To experiment with the model, select values for the independent variables, multiply them by the coefficients, add the intercept and you will have an estimated ratios.

Market Review *Historical Monthly Bond Price Changes*

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



Sources: Loop Capital Markets, TM3

We show historical bond price changes for each point on the muni benchmark callable curve during the month of July for the last 18 years.

The returns in July were positive 60% of the time, with bond prices rising, on average, 0.15% across the curve.

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

AAA MMD - MONTHLY PRICE CHANGE

Maturity	5	10	15	20	25	30
Jul-01	0.75%	1.33%	1.32%	1.16%	1.23%	1.23%
Jul-02	1.06%	1.50%	1.40%	0.85%	1.00%	1.08%
Jul-03	-2.64%	-6.25%	-4.93%	-4.60%	-4.81%	-4.74%
Jul-04	0.53%	1.28%	1.43%	1.26%	0.70%	0.86%
Jul-05	-0.93%	-1.66%	-1.18%	-0.79%	-0.63%	-0.71%
Jul-06	0.58%	1.19%	1.03%	1.11%	1.19%	1.26%
Jul-07	0.58%	0.80%	0.71%	0.63%	0.55%	0.55%
Jul-08	1.25%	0.88%	-0.08%	-0.31%	-0.16%	-0.08%
Jul-09	1.45%	1.78%	1.12%	0.79%	0.16%	-0.23%
Jul-10	1.22%	1.80%	1.29%	0.64%	0.40%	0.40%
Jul-11	0.54%	0.65%	0.88%	0.56%	0.08%	0.00%
Jul-12	0.64%	1.65%	2.72%	2.79%	2.53%	2.61%
Jul-13	0.59%	-0.89%	-2.29%	-2.67%	-2.74%	-2.89%
Jul-14	-0.09%	0.00%	-0.08%	-0.08%	-0.08%	-0.16%
Jul-15	0.36%	0.74%	1.06%	1.05%	1.29%	1.29%
Jul-16	0.23%	-0.41%	-0.74%	-0.90%	-0.81%	-0.81%
Jul-17	0.63%	0.33%	0.41%	0.57%	0.41%	0.40%
Jul-18	0.09%	0.08%	-0.40%	-0.64%	-0.56%	-0.56%
Mean	0.38%	0.27%	0.20%	0.08%	-0.01%	-0.03%
St Dev	0.93%	1.88%	1.73%	1.64%	1.63%	1.65%

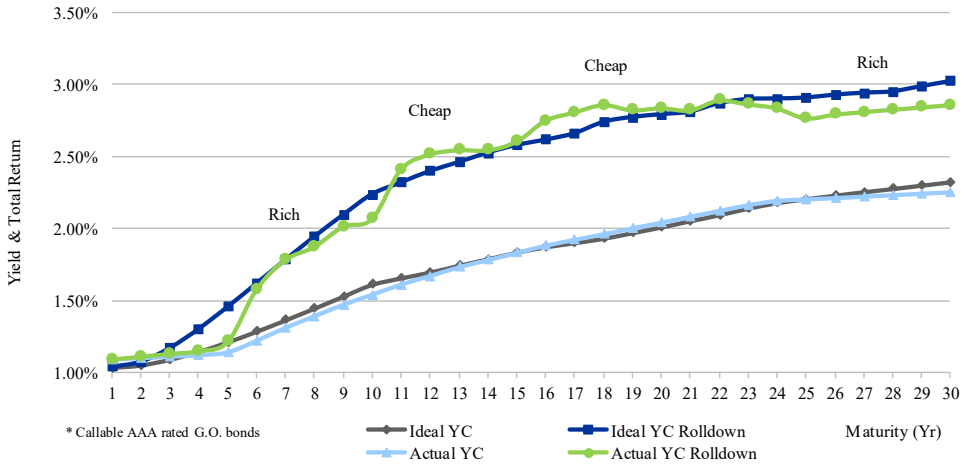
Sources: Loop Capital Markets, TM3

The 6-yr point has the highest expected total return.

The 10 to 12-year range has historically been the most volatile, with standard deviation of monthly bond price changes of 1.75%+.

Market Review *The Yield Curve*

Figure 6 **1-Year Forward Roll-down—Muni Benchmark Curve* (July 25, 2019)**

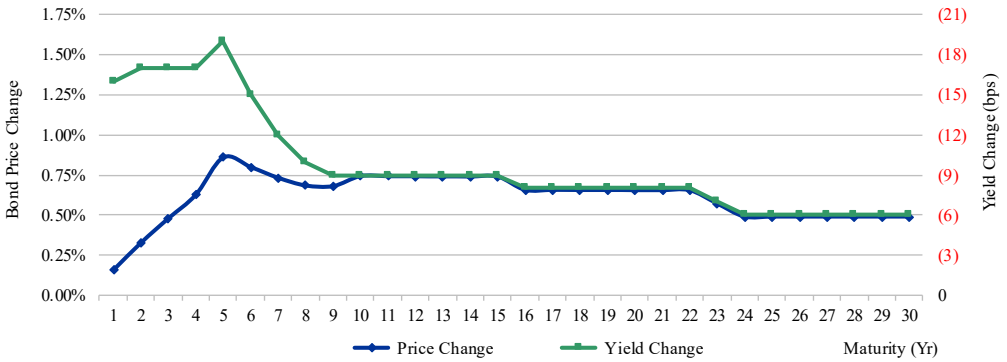


Sources: Loop Capital Markets, TM3 | *Callable AAA-rated G.O. bonds

The yield curve shows rich (4 to 5-yr, 9 to 10-yr and 24+ yr) and cheap (11 to 13-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. 22-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.

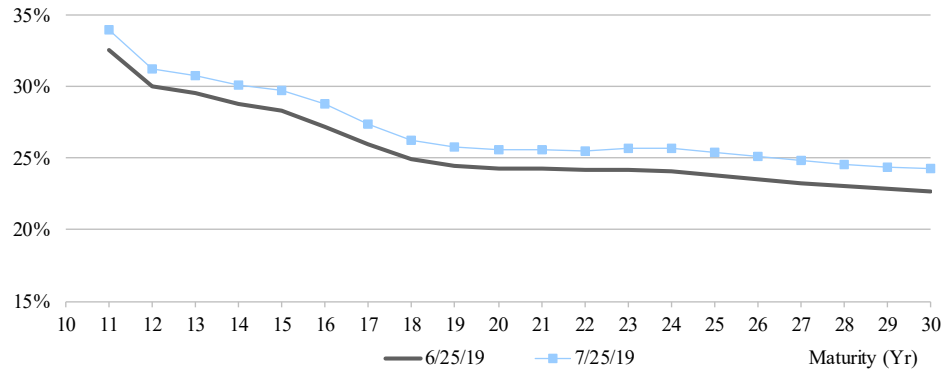
Figure 7 **Monthly Price Change — AAA GO Bonds* (06/28/19 — 07/29/18)**



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

Yields declined the most on the front end of the curve in July, with the 5-yr point performing the best.

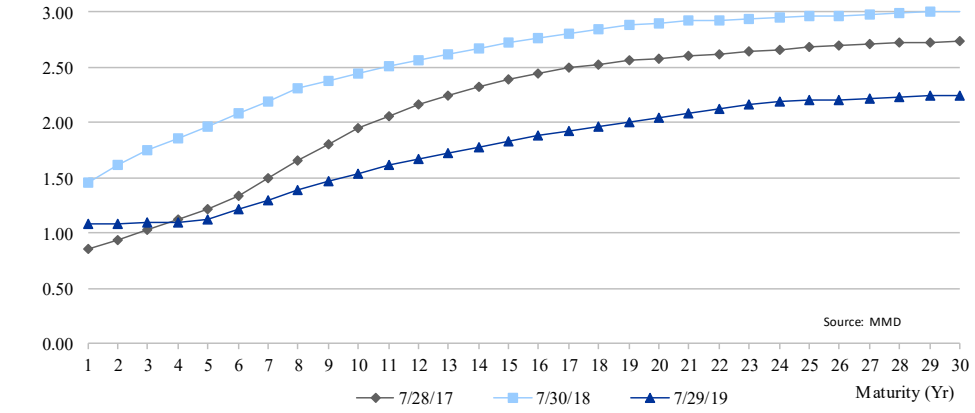
Figure 8 **Implied Municipal Volatilities**



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

Implied volatilities rose, while the intrinsic value of bond calls increased, as yields declined across the curve.

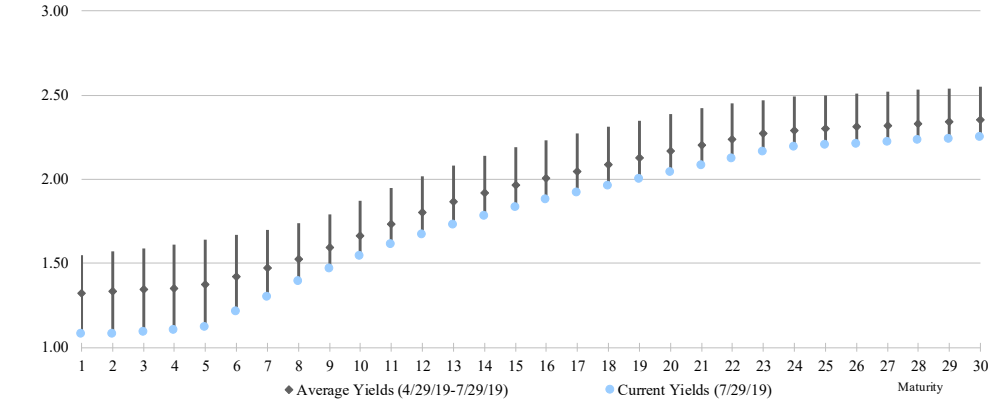
Figure 9 **Current vs. Historical Municipal Yield Curves (%)**



Source: TM3/Refinitiv

Yields are currently about 80 bps and 50 bps lower on the long end of the curve than they were in July 2018 and July 2017, respectively.

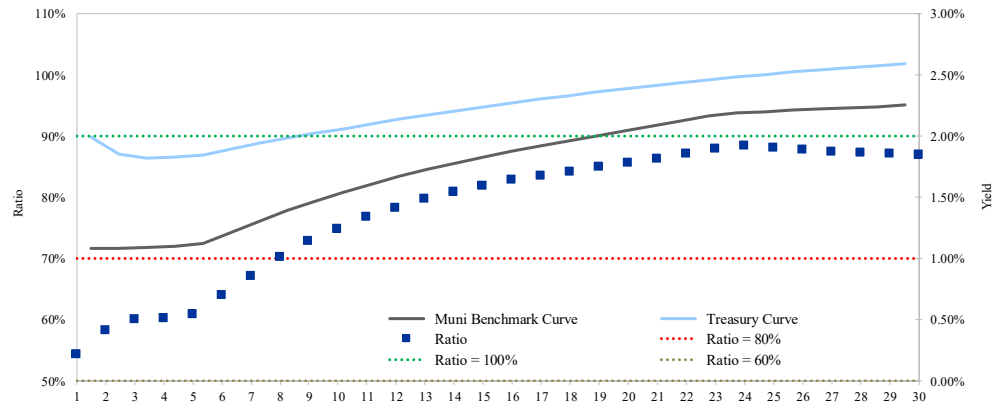
Figure 10 **3-Month Average Benchmark Muni Curve Yield**



Source: TM3/Refinitiv

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

Figure 11 **Muni and Treasury Yield Curves and Ratios**

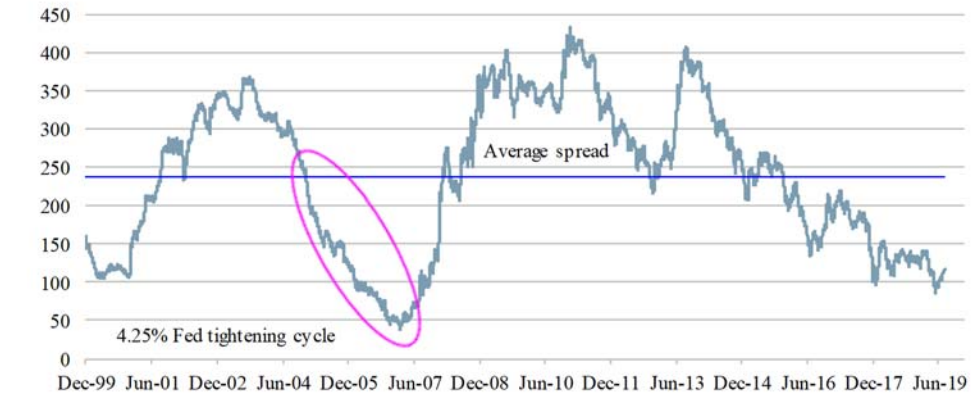


Sources: Eikon, TM3/Refinitiv

M/T ratios fell across the curve and are currently low by historical standards, especially on the front end of the curve.

Market Conditions

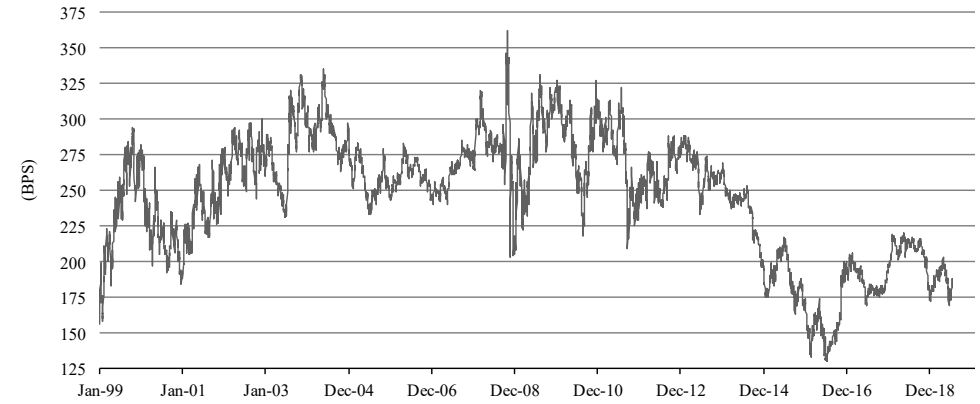
Figure 12 **2 to 30-Yr Muni Spread (bps)**



Source: TM3

The slope of the curve increased 30 bps since bottoming in mid-May.

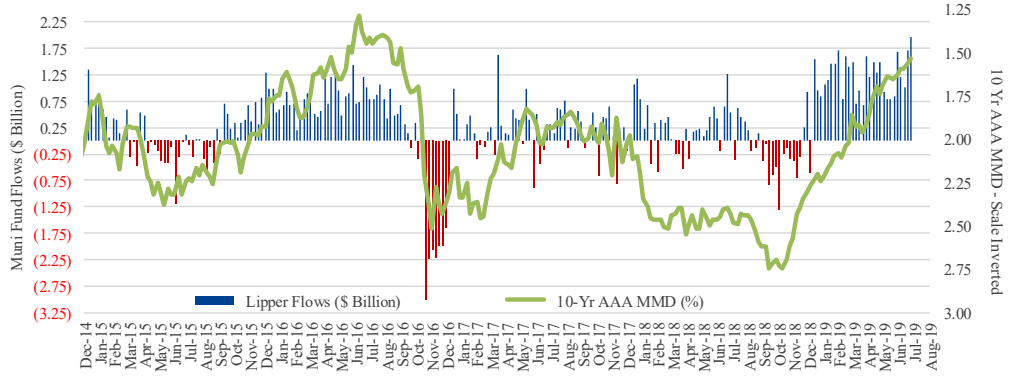
Figure 13 **Inflation Expectations**



Source: FRED

Fed's five-year forward breakeven inflation rate, derived from TIPS and regular Treasury yields, is currently 1.85%.

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



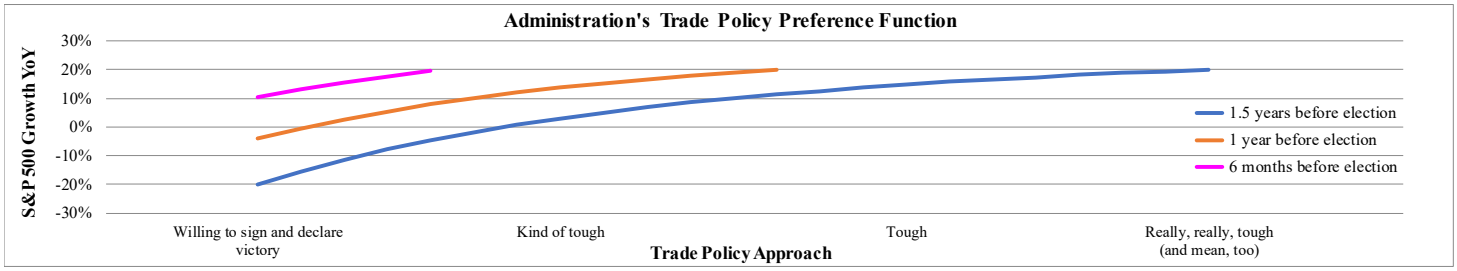
Source: Lipper

Lipper reported net inflows of $1.96 billion into muni funds last week, an all-time high, boosted by foreign money pouring in instead of being invested in negative-yielding sovereigns overseas. The 4-week average inflow is approximately $1.47 billion. Twenty-nine consecutive weeks of net inflows boosted fund assets by almost $36 billion.

Loop Capital Markets Upcoming Negotiated Calendar

Date	Par Amount ($ mil)	Issue	Loop Capital's Role
8/7/19	350.0	Pennsylvania Turnpike Commission Turnpike Revenue Bonds Series A of 2019	Senior Manager
8/6/19	415.0	New York Liberty Development Corporation, 2nd Priority Liberty Ref. Bonds Series 2019	Co-Manager
8/6/19	200.0	Pennsylvania Higher Ed. Facilities Authority (University of Pennsylvania) Taxable 2019B	Co-Manager
8/6-7/19	TBD	Cleveland Public Library, Library Fund Facility Notes (Tax-Exempt and Taxable)	Co-Manager
Wk. of 8/5	350.0	Miami-Dade County Aviation Refunding Bonds	Co-Manager
Wk. of 8/5	80.0	Cuyahoga County General Obligation Bonds	Co-Manager

Econohumor:



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