

Fixed Income Insights

Market Intelligence / DC Perspectives

• Spring 2021 •



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*Q&A with Rep. Joyce Beatty (D-OH), Chair of the Financial Services
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Q&A with Dr. Chris Hartshorn, Chief Commercial Officer at risQ



Dr. Chris Hartshorn, CCO at risQ

risQ's mission is simple and direct:

To catalyze and inform socially responsible systems-level adaptation to climate change. We model the complex financial risks posed by climate change, translating them to actionable insights for municipal debt stakeholders. risQ is a spinout of Northeastern University's Sustainability and Data Sciences (SDS) Lab and was funded by the National Science Foundation while the company built its commercial products and capability.

In 2016 risQ was founded by Dr. Evan Kodra and Colin Sullivan, together with Dr. Auroop Ganguly, a faculty member at Northeastern, as they were drawn to the gap between the corpus of climate change research and actual practice. Today risQ has a staff of 15 and an Advisory Board including the likes of Tom Doe of Municipal Market Analytics.

The message on risQ's home page is "Manage Financial Risk Under Climate Change". "risQ leverages economic and physical sciences to drive climate adaptation."

The work, the focus and the numbers are compelling, and we're thrilled to talk with risQ for this episode of the BDA's Fixed Income Insights.

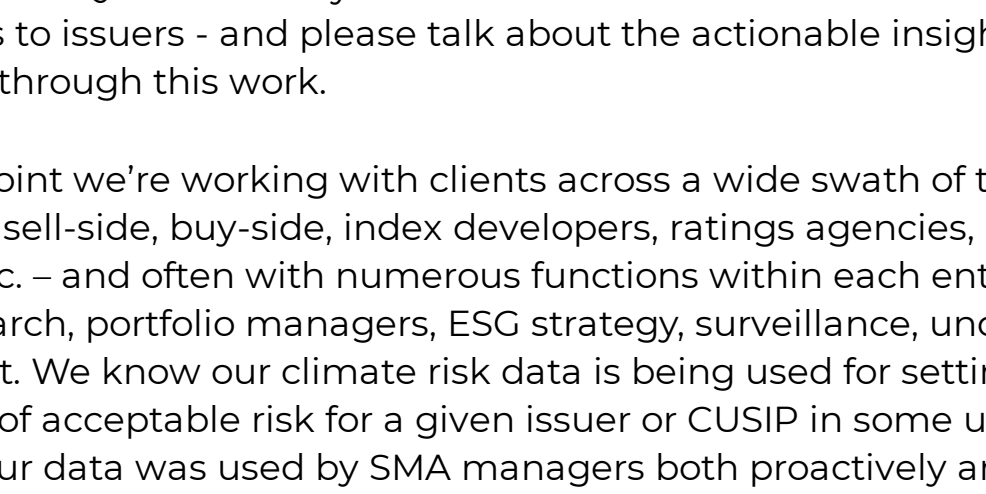
Welcome Dr. Chris Hartshorn, Chief Commercial Officer at risQ.

Q: An overview. Please walk us through who risQ is and how you're working with the municipal market on the issue of climate change.

A: risQ's team draws from a series of mutually exclusive but individually critical capabilities – climate science, data science, geospatial engineering, catastrophe modeling, financial modeling, as well as track records of starting and growing subscription-based data, analytics and advisory businesses. It's that combination that landed us in serving the US Fixed Income ecosystem, and municipal finance specifically as a starting point. We're providing climate risk – and ESG data more broadly – for every obligor and issuer of municipal bonds. We're also linking that analysis to all the associated CUSIPs to enable climate change conditioned analysis out to call dates and maturities. This means we can operate at every stage and in every channel of the municipal debt lifecycle – origination, primary sales, or secondary market, and private or public placement – and provide the data in easily ingestible ways with existing workflows. It means that every bond can be compared using the same metrics, from the largest counties in Texas to the smallest Mello Roos Districts in California, to the most complex hospital systems and housing authorities nationally. All have geospatially accurate and precise climate and social data linked to the underlying CUSIPs. It also means that every municipal bond portfolio and fund can be compared and benchmarked, from the smallest SMA to the largest mutual fund.

Q: Tell us about the partnership with the Intercontinental Exchange.

A: There are really two key components to our work with ICE Data Services. Firstly, our CUSIP-linked climate and social data is provided to clients using their existing CUSIP universe file delivery architecture. As we were getting the product off the ground having ICE to generate and deliver this universe file saved us significant time. It also allows our clients who receive the CUSIP universe file to directly integrate all our data into their internal CUSIP and portfolio querying tools. Straight away, those clients can see how climate risk compares between CUSIPs and across their holdings. Secondly, ICE has an existing channel to market which speeds up the sales cycle and adoption, especially in places where their existing reference data is already being used.



Q: How does risQ work directly with muni market stakeholders - from dealers to investors to issuers - and please talk about the actionable insights developed through this work.

A: At this point we're working with clients across a wide swath of the industry functions – sell-side, buy-side, index developers, ratings agencies, bond insurers, etc. – and often with numerous functions within each entity type – credit research, portfolio managers, ESG strategy, surveillance, underwriting – you name it. We know our climate risk data is being used for setting thresholds of acceptable risk for a given issuer or CUSIP in some users. For example, our data was used by SMA managers both proactively and reactively during the 2020 wildfire and hurricane seasons (both of which were extreme) to access risk in each account and communicate about how risk was being monitored, managed and mitigated to their clients. We have also heard about our data being used as part of buy-side conversations with bond issuers. If an issuer has higher climate risk, our clients have the ability to engage in a dialogue about how that risk is being mitigated. You can imagine that being a construct for any of the industry functions mentioned above in creating opportunity as well as mitigating risk. The last key piece in this puzzle would be to work with issuers directly and help them quantify, address and communicate their climate risk. The market is screaming for better disclosure and risk management and we're ultimately motivated to help issuers achieve that goal.

Q: My take on this is that utilizing risQ should result in greater muni market transparency and smarter investment decisions whether by institutional or retail clients. True?

A: 100%. If every market participant has access to the same scientifically sound, back-tested and credible data then everyone can make informed decisions. Issuers that invest in climate risk mitigation programs will be able to quantify the cost and benefit, including knowing that any issued debt will reflect a lower risk in how it is insured, rated and ultimately valued by investors. Price and yield will account for and include climate risk, meaning investors can make informed decisions and that fund-to-fund comparisons and benchmarks are possible and quantitatively meaningful and future-proofed. At every single decision point by every single actor in the ecosystem throughout the lifecycle of a security, climate risk becomes transparent, comparable and actionable.

Q: Can you speak to the accuracy of the risQ model?

A: We don't have time to go through all the back-testing and hold-out testing in our extensive product documentation here. That said, our climate models use peer-reviewed methodologies to take the best features of various Global Climate Models and their physical implications, including back-testing to historical climatology. Our geospatial socioeconomic, economic and asset data characterizes and quantifies property, GDP and population across the US in high resolution have undergone extensive hold-out testing and validation. The damage from historical climate events have been checked against our models to ensure output reflects reality. So, while predictions of the future are impossible to test ahead of time, every key component of our model has been historically tested and validated.

Q: Can you talk about the partnership with MMA?

A: Once we figured out how our climate and geospatial data was ideally designed for municipal bond analysis and we determined that the appetite for the data was there, Tom Doe, Matt Fabian, Lisa Washburn, and the team became great partners for us. Tom had already been discussing climate risk in municipal bonds within his network so there was already intellectual and philosophical alignment. The team's collective understanding and passion for how important climate risk is for municipal bond issuers has only grown. Perhaps just as importantly for risQ, while we had created a really powerful data asset based on best-in-class climate science, geospatial science, and catastrophe modeling capabilities, none of us were municipal finance veterans. The MMA team were – and still are – a fantastic resource for us to test and develop ideas, and for providing us proactive ideas and introductions to thought leaders in their network.

Q: You actually just released a new study with MMA as well? "Climate Risk and Municipal Bond Issuer Impairment" – tell us about that.

A: Indeed. For some time, we have been able to correlate climate risk to municipal bond issuers to changes in population, property value and even loss of ad valorem property tax base through broad-based buyouts and retirement of serially flooding properties. These are all obvious financial health indicators for municipal bond issuers. Think of these as issuer comorbidity indicators. What we hadn't been able to show was if and how climate risk correlates to actual financial performance, but our work with MMA in this report addressed exactly that. By taking our climate risQ Score for every issuer and overlaying that with MMA's proprietary data covering all impairments of municipal bond issuers dating back to 2009 – that's a list of 2,400 unique borrowers and almost 21,000 CUSIPs – we showed a statistically robust relationship between climate risk and impairment. Keep in mind that, with climate change, the depth and breadth of potential impairment is only likely to go in one direction without those issuers taking proactive steps to mitigate and adapt to their climate circumstance.

Q: How has your product and work been received by federal regulators of the municipal bond market?

A: I don't think it's any mystery or surprise that addressing climate change and, by inference, climate risk, was not the highest priority at the federal level for a period of time. That said, a sharp jolt in acknowledgment and engagement has occurred from the start of 2021, including from the SEC. In parallel, other key influencers and actors in the market having been doing their prep work in anticipation of climate risk coming to the fore. While the GFOA made an announcement only last week regarding climate risk disclosure, behind the scenes there has been work going on for some time to ready the bond issuing community for future requirements.

Q: And what about by issuers, dealers, and asset managers?

A: For the most part, the strongest early appetite came from those that end up holding the risk the longest, so asset managers in all their shapes and sizes, and also bond insurers jumped on this first. From there, our data is working its way back through the system, with ratings agencies, dealers and issuer advisors needing to assess what debt they're implicitly enabling to enter the market and be ready for the questions that will inevitably be coming. Again, at the core of this is the desire for issuers to quantify their risks and invest in adaptation and mitigation programs. With the aforementioned market participants in place, and the likes of the GFOA taking the lead, the issuers with the best climate action plans – those that serve not only economic but social interests -- will inherently be rewarded. A couple of good early examples of this thread is the work we have been doing with Climate Ready Boston on climate action and justice planning, and now with the Boston Water and Sewer Commission on measuring the social and economic benefits of investing in resilience to future floods. More to the point, those issuers will also be serving their respective populations and constituents most effectively as well. Climate risk is an E, S and G opportunity writ large.

Q: So, what's next for risQ?

A: What's "next" is more like what's now for us. The same climate risk models, ESG data and geospatial data oceans we've established and leveraged for municipal bonds are now being used to analyze Mortgage-Backed Securities, both Residential and Commercial, and Agency and Non-Agency. This allows for our US Fixed Income clients to use unified metrics across multiple assets classes on a CUSIP-by-CUSIP and portfolio level basis, quantify their climate risks and impacts of climate change, and set up larger ESG frameworks and strategies in previously unachievable ways. In parallel, we're now adding new data capabilities for carbon transition risk across our coverage universe and our clients continue to provide us further direct for data extension across ESG categories. Finally, and almost inevitably, index developers are now working with our data to establish a whole set of further use cases.

Thank you very much once again to Dr. Chris Hartshorn, the Chief Commercial Officer of risQ and for more information on risQ please don't hesitate to visit them at www.risq.io



Q&A with Rep. Joyce Beatty (D-OH), Chair of the Financial Services Committee's Subcommittee on Diversity and Inclusion

Q: You chair the first ever standing congressional subcommittee dedicated to diversity and inclusion issues. Can you tell us the goals of the subcommittee and progress on tackling these challenges?

A: The Subcommittee on Diversity and Inclusion was established to serve as a focal point for examining diversity and inclusion performance in the financial services sector. Throughout the 116th Congress, the Subcommittee hosted hearings designed to establish incontrovertibly that diversity and inclusion performance are integral to achieving greater innovation, profitability, and lowering regulatory risk. Further, the Subcommittee is committed to achieving transparency and accountability through clear qualitative and quantitative metrics of performance. In financial services, what gets measured, gets done. By establishing transparent benchmarks of performance, the Subcommittee will set a basis to measure the ongoing commitment and future results.

The financial services sector has struggled with diversity and inclusion. The Government Accountability Office has reported that overall minority representation increased from 17 percent to 21 percent, but African-Americans in senior roles decreased from 6.5 percent to 6.3 percent, and all minorities continue to be underrepresented. Much work needs to be done.

Q: What steps can the Committee take to address this discrepancy?

A: The Subcommittee has endeavored to work collaboratively with regulated entities to promote and implement best practices, which if implemented in an intentional way, yield better performance over time. It is simply not enough to hire a Chief Diversity Officer or add a diverse Director to your Board. Companies must examine how to maximize inclusion if they are to realize the benefits of greater diversity. Financial services firms have made gains through improved talent acquisition, but those gains have been offset by poor retention of mid-level professionals.

Unfortunately, many firms have not recognized that their corporate culture needs to shift if they are to retain diverse talent and maximize their investments in training and integrating diverse talent into their workforce. Unconscious bias training, examining micro-inequities, and addressing deficiencies in diversity in the C-Suite are all components of improving retention and raising cultural competence within the business culture. We know the industry has historically failed to address these issues in a substantive way, but it's clear that investors, the workforce of tomorrow, and stakeholders are demanding greater accountability through the careful review of a company's goals, values and performance.

Q: What should the industry be doing differently?

A: The industry must first acknowledge the problem. Unfortunately, there are still business leaders who do not believe diversity and inclusion is integral to enhancing their firms' innovation and profitability. The demographics of the U.S. workforce are shifting by the day, and it is incumbent upon every employer to ensure it is building a bridge to the talent of the future.

The acknowledgement of the challenges is the first step, and the second is to leverage the expertise of professionals who understand how to develop a strategic plan to increase performance. Unfortunately, many firms designate professionals within the existing workforce to lead on diversity and inclusion who do not have the requisite expertise to build a comprehensive and sustainable diversity and inclusion strategy. To achieve sustainable improvements in performance, firms must resolve to leverage the expertise of leaders who have a track record of success on these issues. I encourage firms to be intentional and to empower those with the requisite expertise to serve in leadership roles with the necessary resources to achieve success.

Section 342 of the Dodd-Frank Act implemented several steps designed to encourage the industry to improve D&I performance including creating Offices of Minority and Women Inclusion (OMWI) at all federal financial regulatory agencies and creating a voluntary reporting mechanism to allow financial services companies to report on their D&I results.

Q: Have the OMWI offices been effective in their mission? What portion of the industry is participating in the voluntary disclosure program? What can we do to encourage broader participation?

A: Since the enactment of Dodd-Frank, the Offices of Minority and Women Inclusion (OMWIs) have acted in good faith with policymakers and regulated entities to achieve the goals of the statute. In many respects, the OMWIs have been a start-up operation tasked with moving their institutions to embrace, devise, and implement policies and practices to improve agency performance. While those agencies have achieved varying degrees of performance gains, the OMWIs must remain focused on achieving sustainable progress in the future.

The responsibility for oversight of diversity and inclusion performance of regulated entities is a key focus for the OMWIs under Dodd-Frank. Congress's intent in the statute was clear – it intended for the OMWIs to create standards and assess how regulated entities were meeting those standards on a routine basis. The Joint Standards, a set of best practices designed to serve as both a measuring stick and beacon for enhancing performance, were completed in 2015. The Joint Standards were developed in collaboration with the regulated entities, yet those firms have not embraced the self-assessment process on a voluntary basis in a constructive way. On average, less than 20% of regulated entities are sharing performance information voluntarily. This is not a name and shame effort and the OMWIs have taken great care to aggregate performance metrics and not publish identifiable information.

Access to diversity performance data is critical to investors, policymakers, workers, and stakeholders, and is integral to achieving success in the future. I join my colleagues in saying very clearly that we will not rest until the industry addresses diversity and inclusion performance in a comprehensive way that achieves greater inclusion for all Americans. The financial services sector plays a critical role in wealth creation, and diversity and inclusion performance in the sector is a bridge to achieving greater economic inclusion for all Americans, especially those who live in underserved communities.

Q: Is there a role for colleges and universities in helping to improve the financial industry's D&I performance? How can the industry better connect with diverse students seeking employment?

A: Colleges and universities play a vital role in developing the industry leaders of tomorrow. We must ensure their curriculums are preparing graduates for success in the workforce of today, but also position them to leverage the technologies of tomorrow. The industry has a golden opportunity to partner with diverse institutions like the HBCUs to aid their curriculum development and provide exposure for students through internships. Those investments will reap rewards over time for all employers looking to expand their talent acquisition pipeline.

Through targeted grants and endowments, financial services firms can be a catalyst in improving educational outcomes on college campuses. It is incumbent upon the industry to illuminate the numerous pathways to success in financial services sector for graduates. Unfortunately, the industry's history of exclusion has led many talented graduates to pursue careers elsewhere, but by shifting the narrative to one of inclusion the industry will attract the best and brightest from all communities.

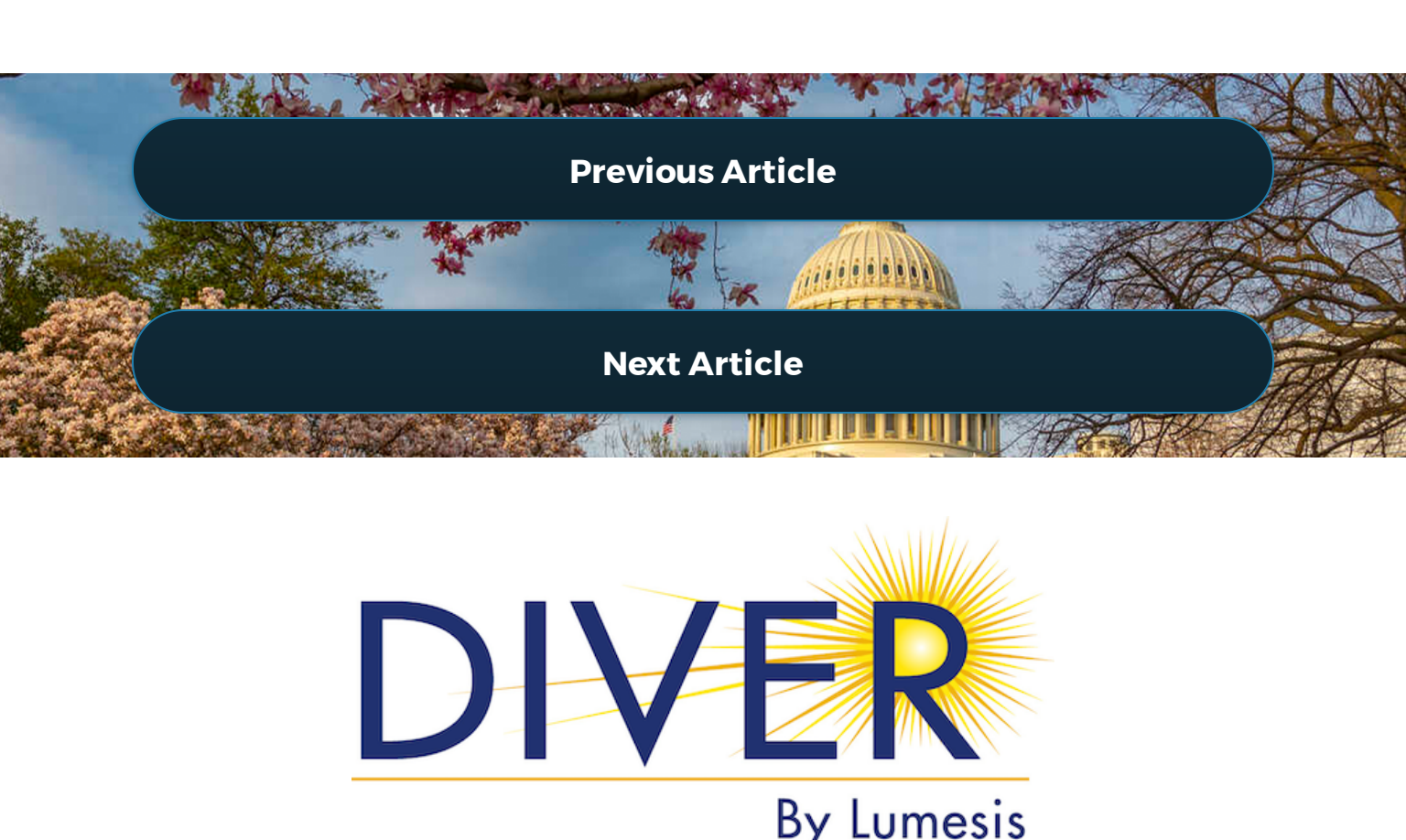
Q: What will be your subcommittee's top priorities for the rest of the year?

A: During the 117th Congress, the Subcommittee will prioritize transparency and accountability through greater access to diversity data. To that end, I recently joined Chairwoman Maxine Waters in a data collection request for the nation's top 31 investment managers who manage greater than \$400B dollars in assets. They play a critical role in managing the assets of workers, investors, and companies, and we want to better understand how asset managers are integrating diversity and inclusion performance into their overall business goals and performance.

Our Subcommittee will also focus on closure of the gender and racial wealth gaps by examining a broad range of factors including compensation equity, business diversity through procurement, and the quality, cost and level of access to financial products and services for diverse consumers, among other factors. A 2019 study by Citi found the US economy lost \$16T dollars due to discrimination against African Americans since 2000. The study also estimates our economy could grow by \$5T dollars over the next five years by addressing systemic racism and barriers to full economic inclusion.

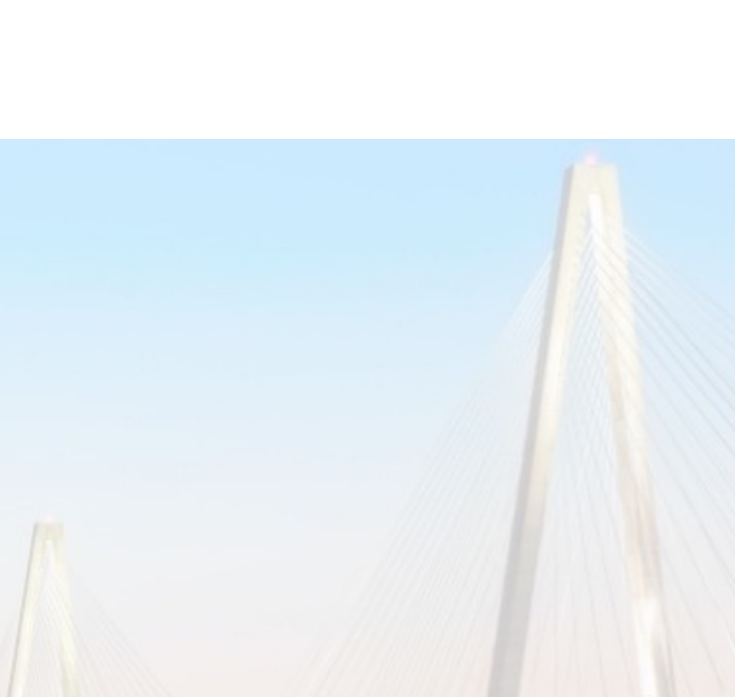
Access to capital for Minority and Women-Owned Businesses (MWOBs) is a top priority as well. The COVID-19 pandemic decimated MWOBs, and greater investment in Minority Depository Institutions (MDIs) and Community Development Financial Institutions (CDFIs) is an important pathway to building diverse businesses of the future.

Finally, our Subcommittee will remain focused on the promotion of

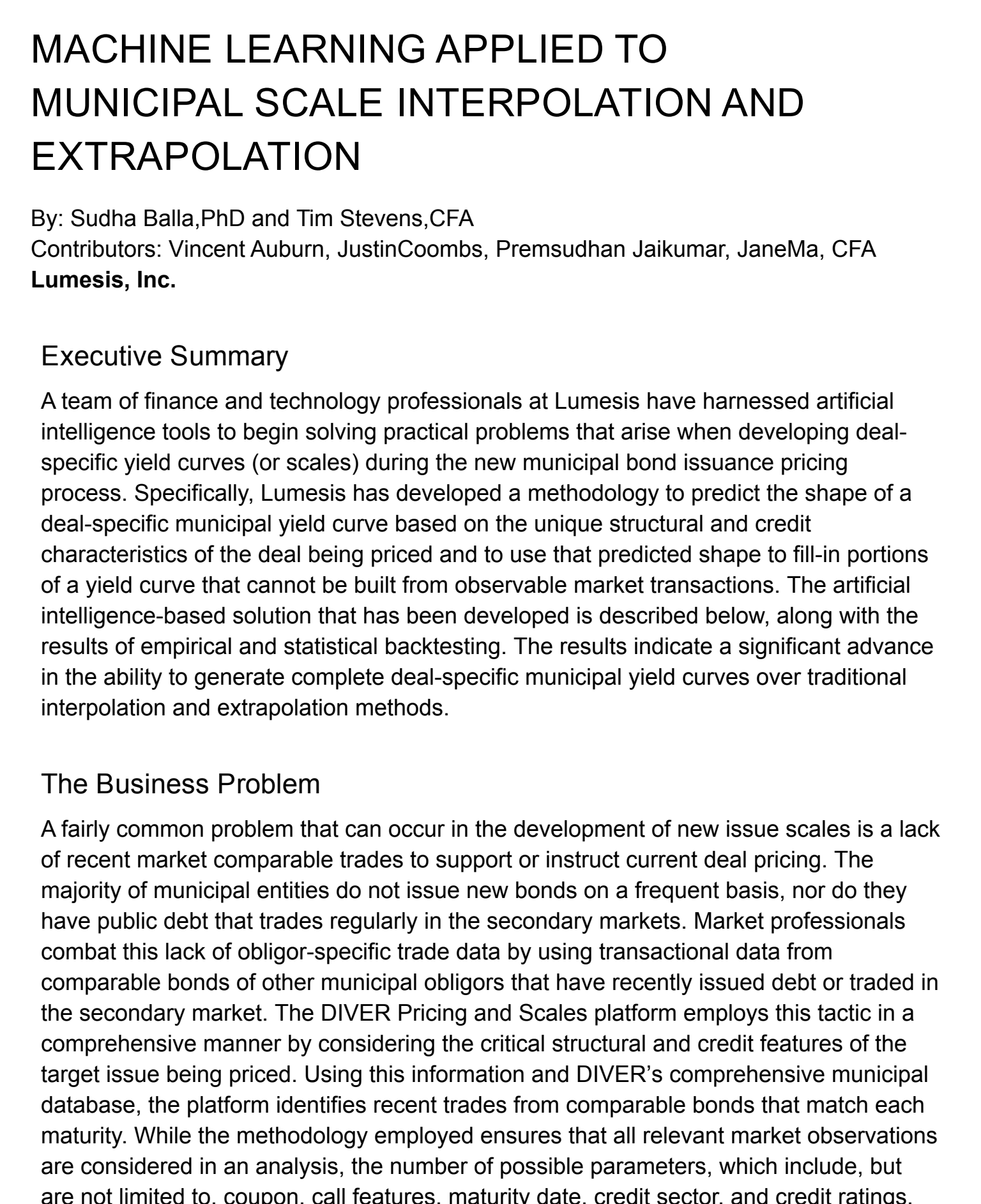


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White Paper
January 2021



MACHINE LEARNING APPLIED TO MUNICIPAL SCALE INTERPOLATION AND EXTRAPOLATION

By: Sudha Balla, PhD and Tim Stevens, CFA

Contributors: Vincent Auburn, Justin Coombs, Prensudhan Jaikumar, JaneMa, CFA

Lumesis, Inc.

Executive Summary

A team of finance and technology professionals at Lumesis have harnessed artificial intelligence tools to begin solving practical problems that arise when developing deal-specific yield curves (or scales) during the new municipal bond issuance pricing process. Specifically, Lumesis has developed a methodology to predict the shape of a deal-specific municipal yield curve based on the unique structural and credit characteristics of the deal being priced and to use that predicted shape to fill-in portions of a yield curve that cannot be built from observable market transactions. The artificial intelligence-based solution that has been developed is described below, along with the results of empirical and statistical backtesting. The results indicate a significant advance in the ability to generate complete deal-specific municipal yield curves over traditional interpolation and extrapolation methods.

The Business Problem

A fairly common problem that can occur in the development of new issue scales is a lack of recent market comparable trades to support or instruct current deal pricing. The majority of municipal entities do not issue new bonds on a frequent basis, nor do they have public debt that trades regularly in the secondary markets. Market professionals combat this lack of obligor-specific trade data by using transactional data from comparable bonds of other municipal obligors that have recently issued debt or traded in the secondary market. The DIVER Pricing and Scales platform employs this tactic in a comprehensive manner by considering the critical structural and credit features of the target issue being priced. Using this information and DIVER's comprehensive municipal database, the platform identifies recent trades from comparable bonds that match each maturity. While the methodology employed ensures that all relevant market observations are considered in an analysis, the number of possible parameters, which include, but are not limited to, coupon, call features, maturity date, credit sector, and credit ratings, can result in maturities that cannot be matched with recent comparable trades.

When particular maturities lack recent trades to support a level, traditional mathematical techniques can be used to estimate yields for these 'missing' maturities in a scale. Missing maturities which represent inner points on a scale can be estimated by using interpolation techniques which build off of the nearest points, (both before and after the missing points), on the curve that have market observations. Missing maturities at the beginning or end of a scale can be estimated by extrapolating from the nearest maturity that has market observations. There are several accepted methods for performing these interpolation and extrapolation calculations, all of which can have significant weaknesses when used in practice.

The weaknesses of traditional interpolation and extrapolation methods are most obvious at 'transitional' points in a curve. Specifically, credit or structural features that change from one maturity to another are not taken into account using traditional methods. Examples of transitional points resulting from deal structure include changes in coupon, changes in callability, and moving from serial to term bonds.

The following example illustrates the problem with traditional interpolation methods when there are transitional shifts in coupon from one maturity to another in a municipal bond issue. In the graph below, the grey line represents an actual new issue pricing scale for a Water & Sewer tax exempt deal that came to market in July of 2020. The blue line represents a baseline proposed curve using market comparables and the natural cubic spline interpolation method to estimate missing inner points on the curve.



The actual pricing scale, depicted by the grey line, shows a steep change in yield from the 2032 to the 2033 maturity because this represents a structural transition area where coupons shift from 4's to 1's. 1% and 2% coupons were used to price this deal throughout the 2033 to 2040 maturities and then reverted back to 4% in 2041.

The baseline proposed scale, represented by the blue line, had points supported by market observations up until the 2028 maturity, but then lacked market observations until the 2034 maturity. As a result, the natural cubic spline interpolation method was utilized to estimate the intervening maturities and generated a nice, smooth curve from 2028 to 2034. Unfortunately, that is well accepted interpolation method significantly overestimated the yields for those maturities and could not factor in the market yield adjustment associated with the change in coupons.

AI Solution - Conceptual Framework

Recognizing the shortcomings associated with the interpolation and extrapolation techniques described above, a team at Lumesis used Artificial Intelligence ('AI'), and adopted Machine Learning ('ML') techniques to find a solution to this problem. These techniques were back tested and, as detailed below, found to be superior to traditional approaches in the majority of cases.

The conceptual framework developed by the Lumesis team used computers to study thousands of actual new issue yield curves, and to associate the shapes of those yield curves with a myriad of credit and structural features and the related transitions from one maturity to another. By utilizing ML technology and linking the same with Lumesis' comprehensive database of all new issue scales, important issue and bond level terms, as well as proprietary credit information, we were able to create predictive models for curve shape. Practically speaking, what that means is that the Lumesis methodology can predict, with very high accuracy, the difference in curve shape and steepness between individual maturities for different types of credits with different structural features.

With this ML curve shape prediction model in place, we then developed mathematical methods to use those predictions to fill the gaps or holes in a proposed new issue scale for any maturities that lack recent market observations. We then implemented this logic into the DIVER Pricing and Scales platform and integrated it with the ML predictive models to provide users with an AI alternative to traditional interpolation and extrapolation methods.

Backtesting - Empirical Analysis

To validate and refine our models and algorithms for integrating AI-predicted curve shape into segments of a scale where market comparables were unavailable, we performed significant backtesting on both tax exempt and taxable historical deals. Deals used for testing were randomly selected. For tax exempt deals, which have much more variability in curve shape than taxable deals, we made sure that all thematic curve shape types were represented in approximately the same proportions as are observed in the market. For each deal selected, four scenarios were tested:

- Naturally occurring gaps for both interpolation and extrapolation
- Interpolation with structural transition (e.g. coupon, call, serial to term bond structural changes)
- Interpolation with no structural transition
- Extrapolation at both the beginning and end of the scale

In each scenario, the DIVER Pricing and Scales platform used either 1) our AI-based methodology or 2) our existing/traditional interpolation and extrapolation methods to fill in missing points in the baseline scale. Analysts then compared the quantitative and graphical results of each method to the actual pricing curve and made an assessment of whether the AI method was superior, whether both methods were largely equivalent or whether the existing traditional method was superior.

Tax Exempt Backtesting Results

In summary, the AI-based method performed superior or equivalent to traditional approaches in 94% of the scenarios tested while the existing traditional method showed superior results only 6% of the time. Breaking that out further, of the 200 scenarios tested:

- AI Method Superior: 66%
- Both Methods Equivalent: 28%
- Existing Method Superior: 6%

The AI method was particularly impressive in cases of interpolation with structural transition. Based on our observations, Lumesis' AI model recognized structural transitions and properly predicted significant spread changes where appropriate, including points of curve inversion. An example of this can be seen in the graph below, which is an extension of the Water & Sewer tax exempt sample deal previously shown above.



The blue line represents a curve using market comparables and the natural cubic spline interpolation method to estimate missing inner points on the curve from the 2028 to the 2034 maturities. The actual pricing scale is depicted by the grey line. The green line represents a curve using market comparables and the AI curve shape prediction model to fill in the same missing points on the curve. As can be seen in the portion of the graph circled in red, the traditional interpolation method significantly overestimated the actual yields while the AI-based method properly predicted a gradual rise in yields until 2032 and then an appropriate significant increase in yields as a result of the structural change in coupon from 4% in 2032 to 1% in 2033.

Taxable Backtesting Results

For the taxable market, our summary results showed that the AI-based method performed superior or equivalent to traditional approaches in 98% of the scenarios tested, while the existing traditional method showed superior results only 2% of the time. Breaking that out further, of the 200 scenarios tested:

- AI Method Superior: 75%
- Both Methods Equivalent: 23%
- Existing Method Superior: 2%

Despite the relatively weaker statistical metrics of mean difference and standard deviation (discussed below), the manual backtesting of applied AI was even more impressive for taxable deals than for tax exempts. We believe this performance to be due to the relative difference in spread curve shapes. Unlike the tax exempt market, which exhibits much more variability, the taxable market tends to have more uniform curve shapes (i.e. spreads continuously upward sloping, or upward sloping until the 16 year point where there exists an inversion due to the market's convention of transitioning, at that point, from spread to the 10 year Treasury rate to the 30 year Treasury rate).

For taxable deals, the most impressive finding was the recognition by ML of the market's convention of switching benchmark curve points at the 16 year maturity. This phenomenon can be seen in the example below for a taxable Fuel Excise Tax deal that came to market in August of 2020.

The light blue line represents the benchmark Treasury curve. The grey line represents the actual scale of the deal as it priced. The dark blue line represents a curve using market comparables and an extrapolation method to estimate missing points at the end of the curve after the 2030 maturity, where spreads consistent with the last maturity calculated using market comparables are applied to the underlying benchmark curve. The green line represents a curve using market comparables and the AI curve shape prediction model to fill in the same missing points on the curve. As can be seen in the portion of the graph circled in red, the traditional extrapolation method significantly underestimated actual yields until the 16 year point on the curve where it then overestimated actual yields for much of the remaining maturities. The AI-based methodology, however, predicted a nearly perfect shape of gradually rising yields over the same maturities.

Backtesting - Statistical Results

In addition to the empirical backtesting described above, we performed backtesting using twelve months of primary market issuances between October 2019 and September 2020. We trained separate ML models for primary market issuances that are taxable (TAX) and those that are either exempt from tax or are taxable subject to alternative minimum tax (EXMP).

For EXMP issuances, the mean of residuals, the difference between actual and predicted spread changes, were very close to zero, in the range from -0.41 to 0.3 bp, indicating that the ML models were neither underestimating nor overestimating. This is particularly impressive as the testing period included the municipal market dislocation that occurred in March and April of 2020 stemming from the Coronavirus pandemic. 83.70% to 88.72% of the residuals fell within 1 - Standard Deviation (range from 4.08 to 6.09 bp) from the mean, suggesting a distribution tighter than a standard normal distribution. Please see graphical and tabular statistical results below.

Year 2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
# of adjacent maturity pairs in Test Dataset	7568	8042	4904	7569	9421	1204	9623	9673	11042
1st Quartile	-1.88	-1.41	-2.01	-2.02	-2.25	-1.60	-1.70	-1.76	-1.95
Median	-0.53	-0.18	-0.27	-0.20	-0.46	0.01	-0.16	-0.20	-0.26
3rd Quartile	0.80	1.25	1.69	1.80	1.61	1.96	1.69	1.63	1.50
Mean	-0.41	0.06	-0.06	-0.17	-0.30	0.30	0.05	-0.04	-0.23
Standard Deviation (STDEV)	4.30	4.08	6.09	5.78	5.20	5.05	4.51	4.63	5.38
Percent predictions <= 1-STDEV	86.75	86.91	88.72	86.88	84.63	85.55	83.70	84.77	87.77
Percent predictions <= 2-STDEV	95.96	96.33	96.51	95.98	95.69	96.04	95.29	95.71	96.34
Percent predictions <= 3-STDEV	98.06	98.17	98.51	98.26	98.09	98.21	97.98	98.15	98.22
Percent predictions > 3-STDEV (Outliers)	1.94	1.83	1.49	1.74	1.91	1.79	2.02	1.85	1.78

For TAX issuances, the mean of residuals were in the range from -0.24 to 2.97 bp, indicating some underestimation during the months of April (mean=2.97) and May (mean=1.47). 81.47% to 88.98% of the residuals fell within 1-Standard Deviation (range from 5.21 to 9.27 bp), again displaying a relatively tight distribution around the mean. Please see graphical and tabular statistical results below.

Year 2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
# of adjacent maturity pairs in Test Dataset	1101	1532	448	725	963	2433	1996	2089	3359
1st Quartile	-2.74	-2.82	-2.43	-0.24	-2.09	-2.16	-2.03	-2.38	-1.96
Median	-0.42	-0.02	0.71	2.93	1.13	0.68	0.58	0.30	0.46
3rd Quartile	2.08	2.64	3.63	5.95	4.95	3.57	3.26	3.06	2.87
Mean	-0.16	-0.24	0.29	2.97	1.47	0.81	0.70	0.43	0.50
Standard Deviation (STDEV)	5.21	6.51	6.96	8.11	7.95	9.27	7.49	6.82	6.51
Percent predictions <= 1-STDEV	82.74	84.60	81.47	87.72	83.07	88.98	87.83	85.97	85.53
Percent predictions <= 2-STDEV	96.64	96.21	94.20	96.41	96.78	96.22	96.99	96.65	96.81
Percent predictions <= 3-STDEV	98.82	98.04	98.21	97.52	98.86	97.41	98.40	97.94	98.45
Percent predictions > 3-STDEV (Outliers)	1.18	1.96	1.79	2.48	1.14	2.59	1.60	2.06	1.55

Interpolation and Extrapolation using Real-Time ML Predictions

In the primary market DIVER Pricing and Scales platform, for those points on a proposed baseline pricing curve that do not have comparable bonds and trades for the user-specified search criteria and observation period, we use the real-time spread change predictions from our ML models between adjacent maturities in the Target Issue's maturity schedule to perform interpolations and extrapolations as described below.

Bootstrapped Extrapolation

When comparable bonds and trades for the user-specified search criteria and observation period are missing in the extremities of a pricing curve, we extrapolate adopting a bootstrap strategy using spread changes predicted between the maturities in the extremes starting from the last available spread on the curve. For extrapolations associated with the shortest maturities of the curve, we subtract the predicted spread change and for extrapolations associated with the longest maturities, we add them to the previous known spread on the curve.

Weighted Interpolation

Interpolation is required when one or more inner points on a pricing curve do not have comparable bonds and trades. This poses additional challenges in using the ML predicted spread changes, as for a given inner point that needs interpolation, there will be two spread values available - one obtained by adding the predicted spread change from its previous maturity and the other by subtracting that from its next maturity in the maturity schedule of the Target Issue. This complexity increases when multiple consecutive inner points on the curve are missing comparables. To address this complexity, we adopt a weighted bootstrap strategy when using the predicted spread changes from the ML models.

Feature Selection

Several attributes of a primary market maturity were used as features to train our ML models. Numerical features consisted of attributes such as coupon and call price. Date attributes were converted into numerical features by calculating the number of days or number of months between two date attributes of a maturity or those of adjacent maturities of an issuance. Ratings of the Obligor of a maturity from multiple rating agencies were employed as ordinal features. Categorical features included proprietary attributes such as the Sector and State of the location to which the Obligor of a maturity is mapped to, insurance and school credit enhancement if any, etc.

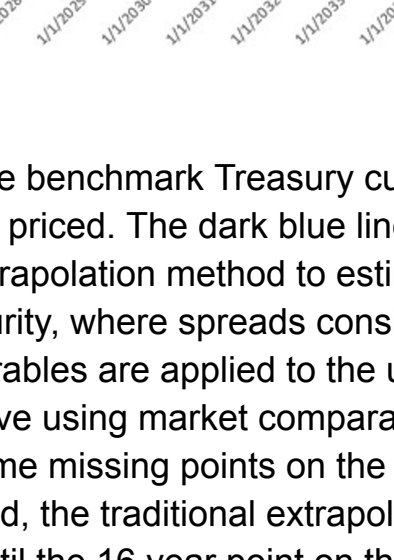
We also experimented by training our models with different combinations of attributes to understand their impact on the prediction capabilities of the resulting ML models in order to arrive at an optimal set of features. For example, we inferred that attributes such as the offering type, offering amount of an issuance and that of its individual maturities do not materially impact the prediction capability of the ML models when predicting curve shape.

Model Training

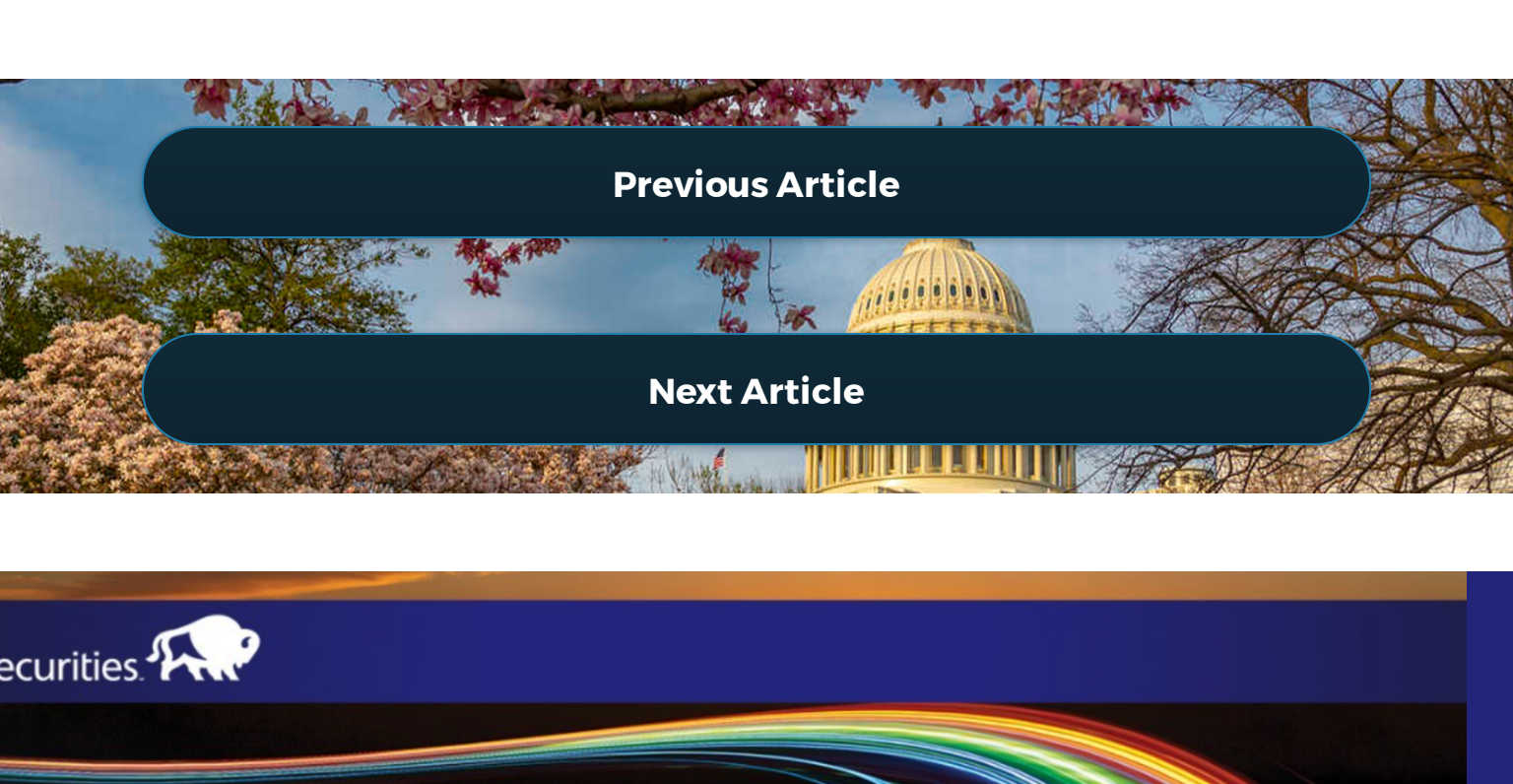
During the research and development stages of our work, we trained our ML models on a monthly basis. While our initial production implementation of AI will also be trained monthly, we intend to train our models more frequently, likely once per week, so that models trained with the most recent primary market issuance data are available for use in the DIVER Pricing and Scales platform. We will continue to train multiple models and pick the best trained ones to be used in the application. We have developed an automated process for scheduled training, validation and testing of our ML models. As soon as a new set of models have been trained, Subject Matter Experts ('SMEs') are notified with performance metrics of the models on test data. After careful evaluation and a comparison of performance metrics with the previous models, SMEs approve the new models to be used in the DIVER Pricing and Scales platform.

About Lumesis, Inc.

Lumesis is a fintech company focused on delivering software and data solutions to the US municipal market. Founded more than ten years ago by Gregg Bienstock and Tim Stevens, Lumesis, under its DIVER brand, serves constituents across the municipal market with business and regulatory solutions. Now serving the needs of hundreds of institutional clients, law firms, municipal advisors and issuers, Lumesis prides itself on delivering cost-effective solutions to meet market needs and demands. The Lumesis team is routinely highlighted for their outstanding client service. www.lumesis.com



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We Could Be On Brink of a Golden Age of U.S. Public Finance, Especially if Infrastructure Stimulus Follows

by Tom Kozlik, Head of Strategy and Credit at Hilltop Securities Inc.

A Golden Age for U.S. Public Finance

At least \$650 billion is going to flow to public finance sectors by way of the [\\$1.9 Trillion American Rescue Plan Act of 2021](#). We believe a "Golden Age" for U.S. Public Finance could be upon us, especially if infrastructure stimulus follows. The week of March 21st, reports out of Washington, D.C. indicated the Democrats' legislative agenda could include an infrastructure and jobs package that could amount to as much as \$3 trillion.

A Seventh Phase Could Bring Total COVID Related Fiscal Policy to Almost \$10 Trillion				
Phase	Became Law	Legislation	Details	Amount (billions)
Phase 1	March 6, 2020	Coronavirus Preparedness and Response Supplemental Appropriations Act	Research and development, health-care services and supplies	\$8.30
Phase 2	March 18, 2020	Families First Coronavirus Response Act	Testing funds, paid leave, food stamp funding	192.00
Phase 3	March 27, 2020	Coronavirus Aid, Relief, and Economic Security (CARES) Act	Expanded unemployment, PPP, Fed Reserve & industry loans, payroll tax credits, created MLF, other	2,700.00
Phase (3.5 or 4)	April 24, 2020	Paycheck Protection Program and Healthcare Enhancement Act	Expanded PPP, hospital & testing funding	733.00
Phase 5	Dec. 27, 2020	The \$1.4 trillion Consolidated Appropriations Act, 2020 was a federal govt. funding measure & included \$910 billion of COVID-19 relief provisions	Unemployed, relief, PPP, funds for education, transportation, health care, vaccine distribution, etc., but no direct unencumbered state and local govt. relief	910.00
Phase 6	March 11, 2021	American Rescue Plan Act of 2021	\$1,400 payments, \$350B S&L aid, expanded unemployed relief	1,900.00
Phase 7	Unknown	Infrastructure and Jobs Stimulus	Details to come	1,000-3,000
Total U.S. COVID-19 Fiscal Policy Response Projection				\$9,443.30

Source: HilltopSecurities.

A seventh phase of this magnitude could bring the total amount of U.S. fiscal policy response to COVID-19 to almost \$10 trillion in just over a year's time. This is a massive amount of policy support. The sixth phase did include significant support for public finance. It is possible the seventh phase includes targeted stimulus for U.S. public finance as well.

The Rescue Plan has been criticized for not including enough public investment. It is possible the forthcoming policy initiatives could be those needed to create a sustainable, multi-year growth scenario for the U.S. economy. But the devil, or shortcomings and potential roadblocks, all lie in the details. It is likely that in the coming weeks policymakers will unveil which specific policies are to be prioritized, how much in aggregate is likely to be spent, and how it is all going to be funded.

Subpar U.S. Infrastructure Report Card and Competing Priorities in D.C.

The [status of infrastructure in the U.S. is still below average](#), according to America's Infrastructure 2021 GPA from the American Society of Civil Engineers (ASCE). ASCE released their 2021 Report Card for America's Infrastructure in early March, noting "For the first time in 20 years, our [ASCE] infrastructure GPA is a C-, up from a D+ in 2017." But, a C- is still below average.

The Washington Post's Fareed Zakaria partially covered the topic of infrastructure in last week's commentary. [He indicated a key reason why the U.S. has not allocated more to infrastructure is due to competing interests in Washington](#). An example Zakaria cited was comparing the [\\$1.7 trillion cost of the U.S. F-35 fighter jet program](#) with a similar amount being spent by China on their [Belt and Road infrastructure initiative](#). Zakaria asked rhetorically, "which is money better spent?"

Very Preliminary Talks on Infrastructure

A preliminary presentation is expected to be made to President Joe Biden this week by his advisors about upcoming legislative strategy. The major items that are expected to be discussed as part of the talks include, according to the Washington Post:

- \$1 trillion for infrastructure
- Universal pre-k
- Free community college
- \$200 billion for housing
- \$100 billion for green and climate change related initiatives
- Expanded multi-year child benefit
- Affordable Care Act (ACA)

How Will These Initiatives Be Funded?

A key financial and political question, "How will lawmakers pay for this next phase?" remains. It has been contemplated that the [first major tax hike since 1993](#) is likely soon to be proposed as part of the White House's next economic plan. Republicans have made it clear [they do not favor tax increases](#). This impasse could present a major roadblock to the chances an infrastructure package becomes law on a bipartisan basis. There is the potential Democrats use the budget reconciliation path again, but this could present obstacles too.

If taxes do rise, we believe tax increases should increase the already steady demand for tax-exempt municipal bonds.

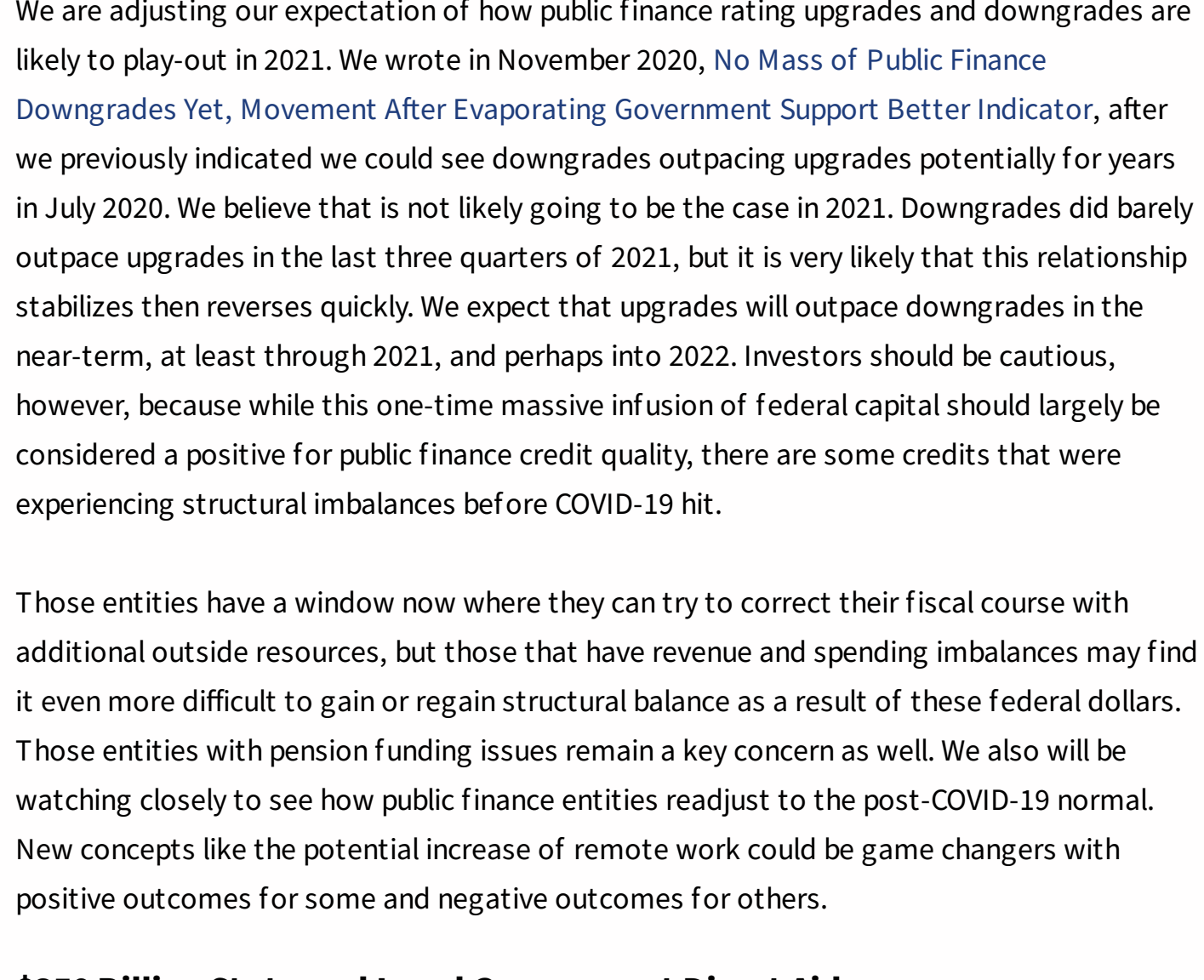
Maybe Municipal Bond-Friendly Elements

It is still not entirely clear if the same municipal bond-friendly elements included in last summer's [\\$1.5 trillion Moving Forward Act](#) will be included this time around. It is possible, but we will have a better idea of the details as lawmakers' negotiations progress.

Contents of The American Rescue Plan Act of 2021

The American Rescue Plan Act was mostly focused on payments to individuals and safety net spending. There was also direct relief to state and local governments. There was a substantial lack of public investment for such a large fiscal policy action. However, it is likely assumed that some funds may be indirectly invested for long-term economic gain through state and local governments. This sixth phase of COVID-19 relief included a third round of relief payments for individuals, in the amount of \$1,400 per person for a total of \$410 billion of the total \$1.9 trillion. Unemployment benefits were extended until September 2021 for a total cost of about \$289 billion. A new spending line-item that was finally included in the \$1.9 trillion Rescue Act was \$350 billion of direct relief for state and local governments.

Topline Summary of the \$1.9 Trillion American Rescue Plan Act of 2021 (\$ in billions)



Source: Tax Foundation, Joint Committee on Taxation, Committee for a Responsible Federal Budget, and HilltopSecurities.

The American Rescue Plan Act of 2021 is an Extraordinary, but Short-Term Boost to Municipal Credit Quality

When the COVID-19 shutdowns began about a year ago, the worst was feared. Public finance credits in sectors such as transportation and healthcare were immediately impacted to the downside. But now COVID-19 cases and deaths have fallen since the beginning of 2021. Vaccinations are continuing across the country. And state and local government revenue losses have generally not been as severe as originally feared. [Analysis from The Urban Institute](#) show that state tax revenues have only fallen 1.8% from April to December year-over-year. In addition, Moody's Analytics recently (Feb. 2021) published a [net revenue shortfall for U.S. state governments of only \\$56 billion](#) for fiscal years 2020 through 2022. Therefore, U.S. states are likely to experience near-term excesses, considering the American Rescue Plan Act included \$220 billion (of \$350 billion) for state governments.

Included in the \$1.9 trillion American Rescue Plan Act are provisions that provide an extraordinary, but short-term, boost to municipal credit quality across many sectors. It is a massive amount of spending that will directly impact state and local governments, school districts, healthcare, higher education, mass transit, and housing sectors. This boost of capital could be the foundation of what is one day referred to as a Golden Age of U.S. public finance because of the scope of possibilities. This could be especially true if Washington lawmakers are also able to follow through with infrastructure legislation in 2021. We will be reevaluating the sector credit outlooks on each of our public finance sectors, because we expect some could improve as a result of the Rescue Plan infusion. We most recently reiterated our "Negative" [State Sector outlook](#) and "Stable" [Housing Sector outlook](#) at the beginning of this year.

Public Finance Sector-by-Sector Impact From the American Rescue Plan Act of 2021				
Provision	Amount (billions)	Sector(s) to Benefit Most	Credit Relevance	
State and Local Govt. Aid	\$350.00	U.S. state, local, and tribal governments	Direct fiscal assistance to governments, in some cases totaling as much as 30% of operating revenue- (not completely unencumbered, however)	
K-12 School Aid	126.00	U.S. state and local govts.	Focused on primary and secondary education funding	
Affordable Care Act (ACA) Tax Credits & COBRA Coverage	63.00	Healthcare	More generous tax credits will allow more people to obtain or maintain health insurance and reduce hospitals' uncompensated healthcare costs	
Higher Education Relief Fund	39.60	Higher Education	Additional direct aid to universities and colleges; must use a percentage for emergency student financial aid	
Additional Aid to Mass Transit Operators	30.50	Mass Transit	Provides financial assistance to sector hand hit by ridership and operating revenue declines	
Incentives for non-expansion states under ACA to expand Medicaid	16.40	State govt., Healthcare	If all 12 non-expansion states accept the incentives, each will net an estimated \$10 billion (nearly), after their new Medicaid costs	
Coronavirus Capital Projects Fund	10.00	U.S. state, local, and tribal governments	Critical capital projects in response to the public health emergency (Sec 604)	
Homeowner Assistance Fund	10.00	Housing	Assistance to homeowners for mortgage payments, utilities and insurance	
Emergency housing vouchers	5.00	Housing	Incremental emergency housing vouchers that provide tenant-based rental assistance under Section-8	
\$650.50				

Source: Moody's Investor Service, House Oversight Committee, Joint Committee on Taxation, Committee for a Responsible Federal Budget, and HilltopSecurities.

We are adjusting our expectation of how public finance rating upgrades and downgrades are likely to play-out in 2021. We wrote in November 2020, [No Mass of Public Finance Downgrades Yet, Movement After Evaporating Government Support Better Indicator](#), after we previously indicated we could see downgrades outpacing upgrades potentially for years in July 2020. We believe that is not likely going to be the case in 2021. Downgrades did barely outpace upgrades in the last three quarters of 2021, but it is very likely that this relationship stabilizes then reverses quickly. We expect that upgrades will outpace downgrades in the near-term, at least through 2021, and perhaps into 2022. Investors should be cautious, however, because while this one-time massive infusion of federal capital should largely be considered a positive for public finance credit quality, there are some credits that were experiencing structural imbalances before COVID-19 hit.

Those entities have a window now where they can try to correct their fiscal course with additional outside resources, but those that have revenue and spending imbalances may find it even more difficult to gain or regain structural balance as a result of these federal dollars. Those entities with pension funding issues remain a key concern as well. We also will be watching closely to see how public finance entities readjust to the post-COVID-19 normal. New concepts like the potential increase of remote work could be game changers with positive outcomes for some and negative outcomes for others.

\$350 Billion State and Local Government Direct Aid

Washington, D.C. lawmakers came through a little less than one year after [Speaker of the House Nancy Pelosi said during a press conference](#) that getting aid for state and locals was a priority and after [state and locals dropped their employment levels by about 1.3 million](#). One of the largest spending line-items in the American Rescue Plan Act is \$350 billion of direct and almost completely unencumbered aid for state and local governments. \$220 billion is earmarked for states and the remaining \$130 billion will flow to local governments. Please see the last page our report where we include a Tax Foundation chart comparing revenues (or revenue losses) with the expected or approximate state-by-state allocations of the \$350 billion. There are also [approximate allocations that can be found at the House Committee on Oversight and Reform's website](#). It shows estimated budget allocations by state, local government, and territory. There is also a link for more detail about funding estimates for local governments.

One of the 2020 CARES Act's criticisms was the \$150 billion sent to state and local governments in the beginning of 2020 was restricted to COVID-19 specific purposes. The \$350 billion Rescue Plan money is not quite as restricted, but there are some limitations as to use. Allocation will be managed by the U.S. Treasury. Money for states will flow through the State Fiscal Recovery Fund. Money for locals will flow through the Coronavirus Local Fiscal Recovery Fund. Funds can be used for the following purposes, by Dec. 31, 2024, and they possess the following limitations:

- Respond to the COVID-19 public health emergency or its negative economic impacts, including assistance to households, small businesses, and nonprofits, or aid to impacted industries such as tourism, travel, and hospitality
- Provide premium pay for essential workers > Cover for lost revenue in providing services
- Make investments in water, sewer, or broadband infrastructure
- Allocated funds cannot be used to cover lost revenues from a tax cut
- Money cannot be deposited into pension funds

The full text of H.R. 1319 American Rescue Plan Act of 2021 can be found here.

The bill's original guidance is vague and still requires additional direction from the federal government. We are aware of a process by groups representing state and local governments who are currently communicating with the U.S. Treasury Department and other offices in Washington. We expect there could be more clarification from the Treasury Department in the next two months, [as reported by Reuters](#). The [Government Finance Officers Association](#) is currently collecting questions to pose to the Treasury Department.

One provision, or should we say restriction, that is garnering attention is the above section that basically does not allow states to use American Rescue Plan Act relief dollars to cut taxes. In essence, the language [does appear to limit the ability to use the infusion to cut taxes](#). Also please see [Rescue Plan Protects Against Using Federal Dollars to Cut State Taxes](#) by the Center on Budget and Policy Priorities. The [Ohio attorney general announced a lawsuit](#) challenging the federal government's ability to include such a provision.

K-12 Funding for Schools

School districts have not only been hit hard since COVID-19 began, but many experienced funding declines since the wake of the Financial Crisis of 2008. The \$126 billion (\$123 billion for public schools) of K-12 funding is a significant infusion of resources for schools to utilize over the next three years. Schools face high price tags as they seek to open for in-person learning, close the digital divide, and help keep students across the country from losing too much ground as a result of the time spent outside of the classroom during COVID-19. Please see [American Rescue Plan Act Includes Much-Needed K-12 Funding](#) by the Center on Budget and Policy Priorities for more.

A Comparison of U.S. State Revenue Changes with American Rescue Act Relief				
Change in State Revenue in Calendar Year 2020 vs. 2019, with Aid Allocations				
American Relief Act Aid Allocations				Fed. Aid Calculation
State	Revenue Change	State Aid	Local Aid	Total Aid
Alabama	\$563,716,794	\$2,088,109,980	\$1,890,457,564	\$3,978,567,544
Alaska	(\$423,777,385)	\$1,250,000,000	\$257,269,324	\$1,507,269,324
Arizona	\$359,373,486	\$4,727,380,641	\$2,545,326,640	\$7,272,707,281
Arkansas	(\$19,800,000)	\$1,625,508,134	\$1,198,939,470	\$2,824,447,604
California	\$6,167,098,000	\$25,672,242,592	\$14,943,211,818	\$40,615,454,409
Colorado	\$853,587,000	\$3,894,086,649	\$1,879,159,818	\$5,773,246,467
Connecticut	(\$242,259,847)	\$2,607,685,594	\$1,640,619,508	\$4,248,305,102
Delaware	(\$263,695,643)	\$1,250,000,000	\$305,135,704	\$1,555,135,704
District of Columbia	(\$434,620,000)	\$1,712,325,487	\$493,510,164	\$2,205,757,651
Florida	(\$2,604,900,000)	\$10,077,563,954	\$6,047,585,455	\$16,125,149,409
Georgia	\$598,533,000	\$4,584,350,259	\$3,565,534,086	\$8,149,489,321
Hawaii	(\$1,151,388,697)	\$1,607,573,544	\$481,024,078	\$2,088,597,622
Idaho	\$484,103,896	\$1,250,000,000	\$642,991,105	\$1,892,991,105
Illinois	(\$443,209,773)	\$7,078,600,932	\$5,743,479,413	\$13,122,080,345
Indiana	(\$228,700,000)	\$3,164,287,495	\$2,831,054,188	\$5,845,341,684
Iowa	(\$43,660,455)	\$3,358,228,983	\$1,496,214,690	\$4,854,443,673
Kansas	\$13,514,896	\$1,561,950,910	\$1,545,968,242	\$3,097,919,152
Kentucky	\$342,059,355	\$2,403,806,436	\$1,842,016,986	\$4,245,876,322
Louisiana	(\$514,832,133)	\$3,160,523,381	\$1,960,935,249	\$5,121,458,630
Maine	\$110,714,348	\$1,250,000,000	\$645,944,718	\$1,895,944,718
Maryland	(\$2,604,782,910)	\$3,811,534,788	\$1,952,954,533	\$5,764,489,321
Massachusetts	\$503,158,772	\$4,444,672,468	\$3,718,287,046	\$8,162,959,514
Michigan	\$215,473,000	\$5,569,433,975	\$4,394,510,607	\$9,963,944,582
Minnesota	(\$470,979,000)	\$2,538,554,243	\$2,089,287,955	\$4,627,842,198
Mississippi	\$106,565,829	\$1,777,022,931	\$1,259,098,668	\$3,036,401,598
Missouri	\$52,965,166	\$2,773,950,806	\$2,499,324,557	\$5,273,275,363
Montana	(\$66,558,000)	\$1,250,000,000	\$409,233,237	\$1,659,233,237
Nebraska	\$162,771,567	\$1,250,000,000	\$802,781,938	\$2,052,781,938
Nevada	(\$650,334,637)	\$2,902,454,982	\$945,070,418	\$3,847,525,399
New Hampshire	(\$54,600,000)	\$1,250,000,000	\$558,245,183	\$1,808,245,183
New Jersey	(\$145,193,000)	\$6,337,020,215	\$2,944,569,244	\$9,281,589,459
New Mexico	(\$160,423,717)	\$3,709,339,072	\$838,780,675	\$4,548,119,747
New York	(\$1,229,203,949)	\$12,379,759,682	\$10,612,147,641	\$22,991,907,322
North Carolina	\$353,700,000	\$5,196,448,534	\$3,785,634,988	\$8,980,403,522
North Dakota	(\$634,998,008)	\$1,250,000,000	\$278,536,341	\$1,528,536,341
Ohio	\$1,386,444,000	\$2,553,441,961	\$5,415,968,242	\$10,969,410,204
Oklahoma	(\$520,800,000)	\$1,411,538,421	\$1,392,397,620	\$3,593,936,041
Oregon	(\$634,914,734)	\$2,568,859,439	\$5,540,499,474	\$8,109,358,913
Pennsylvania	(\$67,636,000)	\$7,183,557,197	\$5,765,269,175	\$12,948,826,372
Rhode Island	(\$271,333,333)	\$1,250,000,000	\$592,841,749	\$3,842,841,749
South Carolina	(\$272,600,000)	\$2,063,612,223	\$1,626,600,061	\$3,690,212,284
South Dakota	\$131,092,878	\$1,250,000,000	\$345,024,191	\$1,595,024,191
Tennessee	\$135,465,000	\$3,763,168,202	\$2,464,710,251	\$6,227,878,453
Texas	(\$4,081,812,000)	\$16,445,251,204	\$10,337,277,468	\$26,782,528,672
Utah	\$727,600,000	\$1,493,813,670	\$1,012,752,533	\$2,506,566,203
Vermont	\$189,760,000	\$1,250,000,000	\$305,917,280	\$1,555,917,280
Virginia	\$444,400,000	\$3,709,339,072	\$2,676,624,514	\$6,385,963,586
Washington	\$637,678,000	\$4,188,785,028	\$2,435,472,640	\$7,260,931,777
West Virginia	(\$114,495,000)	\$1,230,617,479	\$839,702,297	\$2,070,319,777
Wisconsin	\$2,344,131,000	\$3,158,022,885	\$2,493,465,345	\$5,651,488,231
Wyoming	(\$192,100,707)	\$1,250,000,000	\$131,311,647	\$1,381,311,647
Tribal Governments	unknown	\$20,000,000,000	—	\$20,000,000,000
U.S. Territories	unknown	\$4,500,000,000	\$2,173,214,858	\$6,673,214,858
State Subtotal	(\$1,689,702,940)	\$195,300,000,000	\$128,026,785,142	\$323,326,785,142
U.S. Totals	n/a	\$219,800,000,000	\$130,200,000,000	\$350,000,000,000

Source: Tax Foundation, Reason Foundation and HilltopSecurities.

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Addressing Disclosure and Due Diligence Responsibilities During Forward Delivery Bond Purchase Periods

By: Nixon Peabody

With the elimination of tax-exempt advance refundings, we have seen an increase in forward delivery bond transactions, where bonds settle longer (sometimes much longer) than ordinary transactions, as one of the tools the market is using to serve as a viable substitute. While these transactions have been done for decades, in light of the recent increased enforcement scrutiny by the Securities and Exchange Commission (the “SEC”), we have prepared a framework for considering disclosure and due diligence responsibilities during the period from the time that the issuer prints the final official statement to the delivery of the bonds (which we refer to as the “Forward Period”).

*Basic Principles Under the Federal Antifraud Laws*¹

As we have analyzed forward delivery bond transactions, we have kept in mind the following two fundamental federal antifraud laws to understand the disclosure and due diligence responsibilities that may continue during the Forward Period.

1. Liability of the issuer and broker/dealer is tested at the time of the investment decision by an investor

The SEC considered this to be settled law when it promulgated Rule 159 in 2005, which codified this principle for purposes of Section 17(a)(2)². One case cited by the SEC when adopting Rule 159, *Radiation Dynamics, Inc. v. Goldmuntz*³, makes this point particularly well. In *Radiation Dynamics*, the facts were similar to forward delivery bond transactions. In *Radiation Dynamics*, there was a commitment to purchase securities followed by a delivery of the securities a few months later. In *Radiation Dynamics*, there developed material information in between the time of commitment and delivery of the securities. The court rejected the purchaser’s Rule 10b-5 claim on the basis that federal antifraud liability attaches to the time of commitment not delivery. There, the court stated:

In keeping with such purposes, we hold that Judge Pollack correctly instructed the jury when he stated that the time of a “purchase or sale” of securities within the meaning of Rule 10b-5 is to be determined as the time when the parties to the transaction are committed to one another. A party does not, within the intentment of Rule 10b-5, use material inside information unfairly when he fulfills contractual commitments which were incurred by him previous to his acquisition of that information, for, as Judge Pollack instructed the jury, the Rule imposes “no obligation to pull back from a commitment previously made by the buyer and accepted by the seller because of after acquired knowledge.” The goal of fundamental fairness in the securities marketplace is achieved by such a determination.

This principle espoused by *Radiation Dynamics* and other federal courts, and codified by the SEC in Rule 159, can help parties clarify what their responsibilities are during the Forward Period. When the terms of the offering are clear that the only investment decisions in connection with the offering by the issuer or the underwriter are at the time of the pricing of the transaction, then this principle can strongly aide the issuer and underwriter in not inadvertently triggering a disclosure or due diligence obligation during the Forward Period. But, if the terms of the offering are not clear, and ongoing trading between the underwriter and investors is expected to continue through the Forward Period, then this principle may raise the question whether disclosure and due diligence responsibilities carry through to each point in time when an investment decision will be made.

2. Liability of the issuer and broker/dealer is tested at the time of the investment decision by an investor

In the municipal securities market, the SEC created the affirmative due diligence obligation of underwriters under a 1988 interpretative release (the “1988 Interpretative Release”) by predicated it on the implied recommendation of dealers to their customers⁴. As the SEC stated in the 1988 Interpretative Release:

An underwriter, whether of municipal or other securities, occupies a vital position in an offering. The underwriter stands between the issuer and the public purchasers, assisting the issuer in pricing and, at times, in structuring the financing and preparing disclosure documents. Most importantly, its role is to place the offered securities with public investors. By participating in an offering, an underwriter makes an implied recommendation about the securities. Because the underwriter holds itself out as a securities professional, and especially in light of its position vis-à-vis the issuer, this recommendation itself implies that the underwriter has a reasonable basis for belief in the truthfulness and completeness of the key representations made in any disclosure documents used in the offerings.

Dealers generally make implied recommendations when they trade with customers, and that would remain true of underwriters during the Forward Period⁵. The SEC uses that implied recommendation in the 1988 Interpretative Release by tying the role and responsibility of the underwriter with what due diligence should support the implied recommendation. This thinking can be carried through to the Forward Period in forward delivery bond transactions. The concern that underwriters should be focused on is that, if the underwriter continues to trade in the bonds during the Forward Period, the underwriter will likely be construed to be making implied recommendations and the SEC could use that implied recommendation to predicate a due diligence responsibility beyond what dealers owe to customers in secondary market trades. But we believe that the answer to this question likely hinges on the perspective of the reasonable investor. Without properly clarifying the structure of the offering, a reasonable investor may expect that an underwriter that is trading municipal securities during the Forward Period has some reasonable basis that the final official statement remains materially accurate and complete in a way that would not be expected of a dealer merely engaged in a secondary trade. Here are a few reasons why that could be the case: (1) the reasonable investor may expect an underwriter to have remained knowledgeable about the municipal securities until delivery, (2) a reasonable investor may expect more from an underwriter if it has sole right to determine whether the municipal securities are actually delivered (e.g., the underwriter can waive conditions to the Delivery Closing), and (3) a reasonable investor may expect more from the underwriter since it remains in privity with the issuer. These and other factors can, especially in retrospect, be made to give a strong appearance that any implied recommendations that the underwriter makes in connection with trading during the Forward Period entail some level of due diligence not required with an ordinary secondary market trade.

We note that, other than these general federal antifraud law principles, no additional guidance exists of which we are aware that can help guide understanding of disclosure and due diligence responsibilities in the Forward Period. While forward delivery bond transactions may be somewhat common (and much more common since 2017) in the municipal securities market, to our understanding, they are very unusual in the larger capital markets. Mortgage-backed securities transaction trade on forward basis in order to ensure that trades use the most current pool balances that are updated on the first of each month. But those transactions tend to trade on a forward basis for a number of weeks, not months. There is not, to our knowledge, any widely distributed security instrument that is sold to public capital market investors in which the delivery date after execution of the bond purchase agreement is so far in advance. Furthermore, we are not aware of any SEC or court cases that have considered the securities law implications of these forward delivery bond transactions. In other words, we have no specific regulatory guidance to use other than these general federal antifraud law principles in order to understand the responsibilities of issuers and underwriters during the Forward Period.

Clarifying the Distribution

Since federal antifraud liability attaches at the timing of the investment decision and an underwriter’s implied recommendation occurs at the time of trading, if a reasonable investor can believe it is purchasing as a part of the primary offering distribution, it can raise the question of whether the primary offering disclosure should be accurate and complete at the time. From the perspective of issuers and underwriters, they may believe strongly that the only offering occurred at pricing and that any ongoing trading is solely in the nature of secondary market trading. But if the forward delivery bond transaction is not structured to disabuse a reasonable investor of reaching the opposite conclusion, then an investor’s expectations could differ from those of an issuer or underwriter. This mismatch in expectations could result in an issuer or underwriter inadvertently having disclosure duties during the Forward Period they do not expect and therefore are not prepared to undertake.

Accordingly, we seek to either make very clear that the distribution of the forward delivery bonds ends with the pricing of the forward delivery bonds or ensure that the issuer or underwriter are prepared to keep the final official statement updated for material events. Some transactions are clearly structured to address these considerations to avoid a situation where the issuer or underwriter continue to have primary offering responsibilities. In these transactions, the initial investors purchasing the bonds execute a delayed delivery contract that clarifies explicitly the responsibilities of the issuer and underwriter during the Forward Period and establishes limitations on trading of the bonds. With these transactions, it is difficult for an investor to reasonably conclude that the distribution has continued past the pricing of the forward delivery bond transaction because the investors (1) are executing a contract that explains that it is not, (2) are accepting trading limitations, and (3) also have some control of the delivery of the bonds if the conditions are not met. In addition, in these transactions, the underwriter no longer expects to support trading in the forward delivery bonds. Importantly, these transactions do not rely on mere disclaimers in the preliminary official statement but instead take the kind of concrete steps—such as limiting the trading of the bonds and providing for investors themselves to execute contracts—that define the boundaries of what reasonable investors can expect from the issuer and the underwriter.

Some transactions, however, are structured to continue supporting trades during the Forward Period, and that is also permissible, as long as the parties understand what due diligence and disclosure responsibilities they may have. In these transactions, the forward delivery bond purchase agreement is structured such that the issuer will continue to update the final official statement and the issuer is equipped to maintain the disclosure in a manner that will support trading during the Forward Period. If significant events occur, the issuer needs to be prepared to supplement the final official statement so that if any trades occur during the Forward Period, the investors have the benefit of being informed of the new event or development.

The key here is to be intentional and avoid a middle nowhere ground between the two scenarios, where trades are likely to be made during the Forward Period and reasonable investors could expect primary offering responsibilities to be ongoing but neither the issuer nor the underwriter are aware of this expectation and not prepared to undertake the responsibility to maintain the accuracy or completeness of the final official statement for the duration of such Forward Period.

1. We do note that these questions tend not to give rise to compliance questions under Rule 15c2-12 because the Participating Underwriter complies with the final official statement requirement of Rule 15c2-12 within seven business days of the pricing of the forward delivery bond transactions.
2. See footnote 397 in SEC Release No. 33-8591 (July 2005). Section 17(a)(2) of the Securities Act and Rule 10b-5 are the two federal antifraud laws that govern statements in connection with municipal securities.
3. F.2d 876 (2d Cir. 1972).
4. Release 34-26100 (Sep. 22, 1988); 53 FR 37778 (Sep. 28, 1988).
5. This topic is discussed in numerous FINRA regulatory notices, including FINRA Regulatory Notices 11-02 and 01-23.

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David Parker

Head of MTS Markets International

Corporate bonds – 1st Quarter Update, and E-trading Revolutions

During the first quarter, the market saw secondary credit spreads grind ever tighter and reach historical all-time lows around mid-February. The technology sector led the way in terms of trading activity, with bellwethers Verizon, Apple, Microsoft, Oracle, and Comcast all seeing robust flows. At these tight levels and with an uncertain macro/political backdrop, dealers invariably began the year with low risk appetites and subsequently light inventories, leaving the door open for a very well-received primary issuance calendar. Roughly \$440 billion of new investment grade bonds have been issued this year to date as we approach quarter-end. This number is in excess of analyst predictions and puts 2021 just above a historically strong albeit COVID-affected Q1 2020.

We saw the reflation trade start to take hold in the Treasury market, as the yield on the 10 year note rose from 0.91% to a high of 1.72% and the 2s/10s curve bear steepened from a difference of 80 out to 156 basis points. This sharp move kept bids strong in the long end of the curve, but interest in shorter maturities dropped off significantly. The Federal Reserve was the main catalyst behind these moves, repeatedly sending a message of continued accommodative policy and a willingness to let inflation run higher than normal until the labor market and overall economy show significant ongoing improvements.

The strong Q1 performance and stability in corporate bonds has been a welcome safe harbor in the face of creeping uneasiness in the market due to valuation concerns and of course the ever-present backdrop of COVID flareups, political changes, and an economy that may never return to normal. As spreads have climbed the wall of worry over the past year, electronic trading has also seen a pandemic-driven boost: Greenwich Associates reported in early March that the average daily volume of corporate bond electronic trading reached \$10.6bn, a new record. The consultancy estimates that close to 40% of total investment grade volume and 26% of high yield volume is now electronically traded.

The vast majority of that volume has been in “Request for Quote” (RFQ) trading via the two largest incumbent vendors. By which to say, there was a continued growth in “more of the same,” accelerated by the pandemic and work-from-home mandates. But behind the headline numbers we can also see a revolution in how market makers are operating, and in who is actually providing liquidity.

The answer is, increasingly, the machines. According to Greenwich, from 2017 to 2021 the proportion of the U.S. high grade market trading electronically increased from about 19% to about 37%, a healthy 95% jump. And according to data from MarketAxess, the market leader in electronic corporate bond trading, during that same period the proportion of “algorithmically generated” responses to inquiries on the platform leaped by over 650%. From 2019 to 2020 alone, the number of algo responses grew by 64%. The large dealers have for years been able to trade credit in an automated way, and the pandemic has put a new spotlight on those desks.

The revolution isn't just that the largest dealers are trading algorithmically and e-trading is gaining market share, but that a whole new crop of specialist market makers have arrived in the credit space and seem to be here to stay. The MTS BondsPro platform has seen the number of clients involved in automated market making grow from three in 2017 to over twenty today, coinciding with a tripling of pre-trade liquidity over that time. It is that deluge of pre-trade liquidity, and the information it conveys, that will bring about the next revolution in the credit markets...but that is a story for another day.

*David Parker is the Head of MTS Markets International, Inc.
MTS Markets International, Inc. is a member of FINRA and SIPC.*

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A Bumpy Road to Recovery

Lynn Martin
President, Fixed Income and Data Services at Intercontinental Exchange

This time last year, many of us were pulling late nights as global markets plunged into pandemic-triggered volatility. Now, it's clear that quick action from the Fed and Treasury worked to stabilize markets. With the 2008 credit crisis as a template, they stepped in and dampened volatility. In fixed income, almost every sector has since stabilized and rallied - the exception being lower-rated Commercial Mortgage Backed Securities, amid a paradigm shift toward remote work, which I have referenced in previous articles.

Our analysis below indicates most asset classes saw peak volatility in March/ April last year, before hitting a recent bottom in this year's first quarter. Still, volatility in interest rates remains relatively elevated due to the weaker tone in Treasury markets. As the yield curve steepens amid inflation concerns, long term Treasuries have shed 16% in price since the start of the year, according to IDS data. Yields are around their highest level since January 2020 and some analysts see them rising further. Making matters worse, demand has waned while supply remains robust. Case in point was **last month's \$62 billion 7 year Treasury Note** auction that was met with a tepid bid-to-cover ratio of just barely over 2x. "Don't fight the Fed" may be a maxim of investment markets, but it certainly makes recent price action interesting.

Bond market rumbles have spilled into equities, with recent rotation away from tech into traditional sectors like banking, which benefits from a steeper yield curve, higher rate environment. In other words: extreme price action may be behind us, but volatility is far from over.

We could never have guessed that a year on from global lockdowns, the greatest worry for markets would be inflation, with all eyes on the 10-year Treasury yield. Demand for inflation hedges has fueled assets like Bitcoin to new records, and shifted its previously positive correlation with gold. Still, the Fed has characterized inflation as likely to be a "short lived bump" this year, and with the U.S. leading the global recovery, there's reason for optimism.

Stay well,
Lynn

Five things we're watching

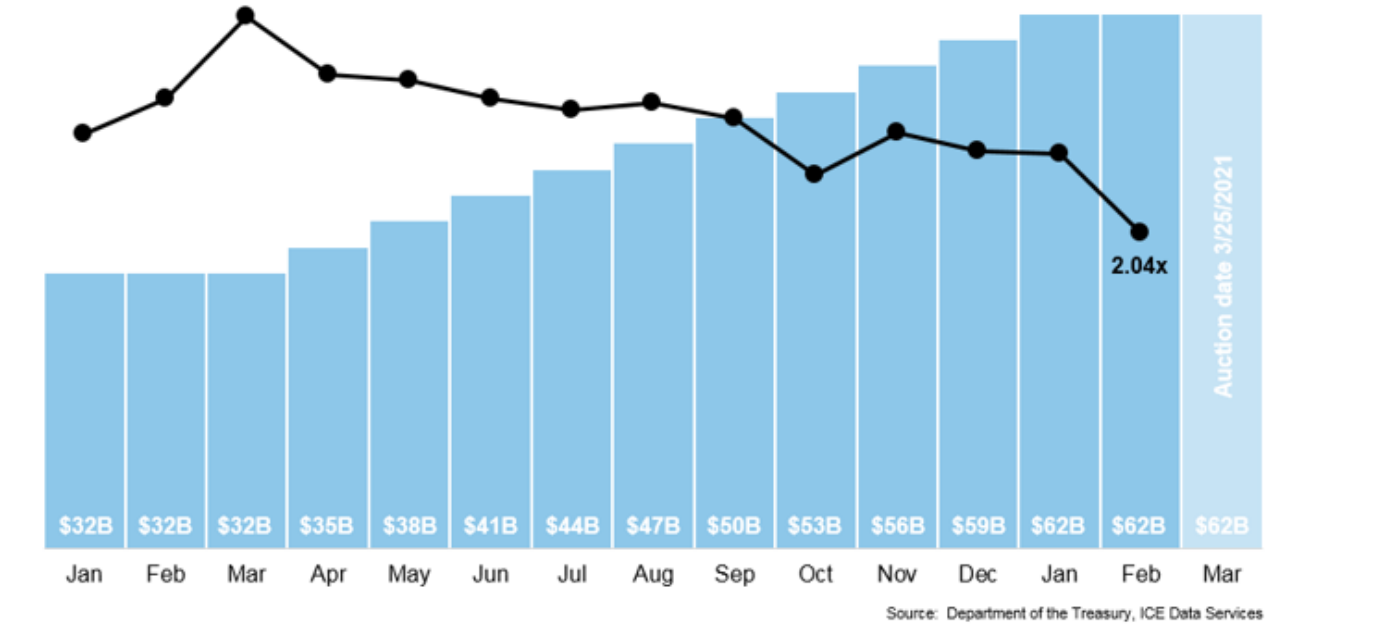
Options traders have had a wild ride over the past year. Most major asset classes followed a similar pattern, with volatility peaking in March/April 2020 during peak COVID-19 disruption, and bottoming out most recently in the first quarter of 2021.

Implied Volatility (%) 1mo ATM Options							
	Current	1yr ago	Change		Period High	Period Low	
Brent	34	45		168	Apr 2020	26	Aug 2020
WTI	37	48		263	Apr 2020	27	Sep 2020
Heating Oil	33	41		124	Apr 2020	27	Feb 2021
Low Sulphur Gasoil	38	42		235	Apr 2020	29	Feb 2021
Gasoline	53	43		213	Apr 2020	29	Feb 2021
Henry Hub	35	46		85	Apr 2020	29	Mar 2021
Gold	16	16		42	Mar 2020	11	Jul 2020
Copper	31	21		47	Mar 2020	19	Sep 2020
Corn	30	16		37	Jan 2021	16	Mar 2020
Cocoa	26	27		36	Mar 2020	25	Feb 2021
Coffee	32	44		64	Mar 2020	30	Feb 2021
Soybean	20	13		31	Jan 2021	11	Aug 2020
Sugar	28	27		43	Apr 2020	21	Feb 2021
Wheat	27	26		36	Mar 2020	20	Jan 2021
Nasdaq 100	24	30		76	Mar 2020	21	Feb 2021
CDX IG	50	86		131	Mar 2020	53	Mar 2021
CDX HY	51	66		148	Mar 2020	43	Feb 2021
iTraxx Europe	49	96		146	Mar 2020	47	Mar 2021
iTraxx Crossover	49	83		136	Mar 2020	47	Mar 2021
SMOVE	66	105		168	Mar 2020	38	Sep 2020
AUDUSD	10	10		29	Mar 2020	8	Mar 2020
EURUSD	6	8		15	Mar 2020	5	Feb 2021
GBPUSD	7	8		22	Mar 2020	7	Feb 2021
USDJPY	6	9		22	Mar 2020	5	Feb 2021

Source: ICE Data Services

The US Treasury will auction \$62 billion 7-year notes on March 25. Traders will be watching to see if the bid/cover ratio (an indicator of demand) will bounce back from historic lows set at last month's sale.

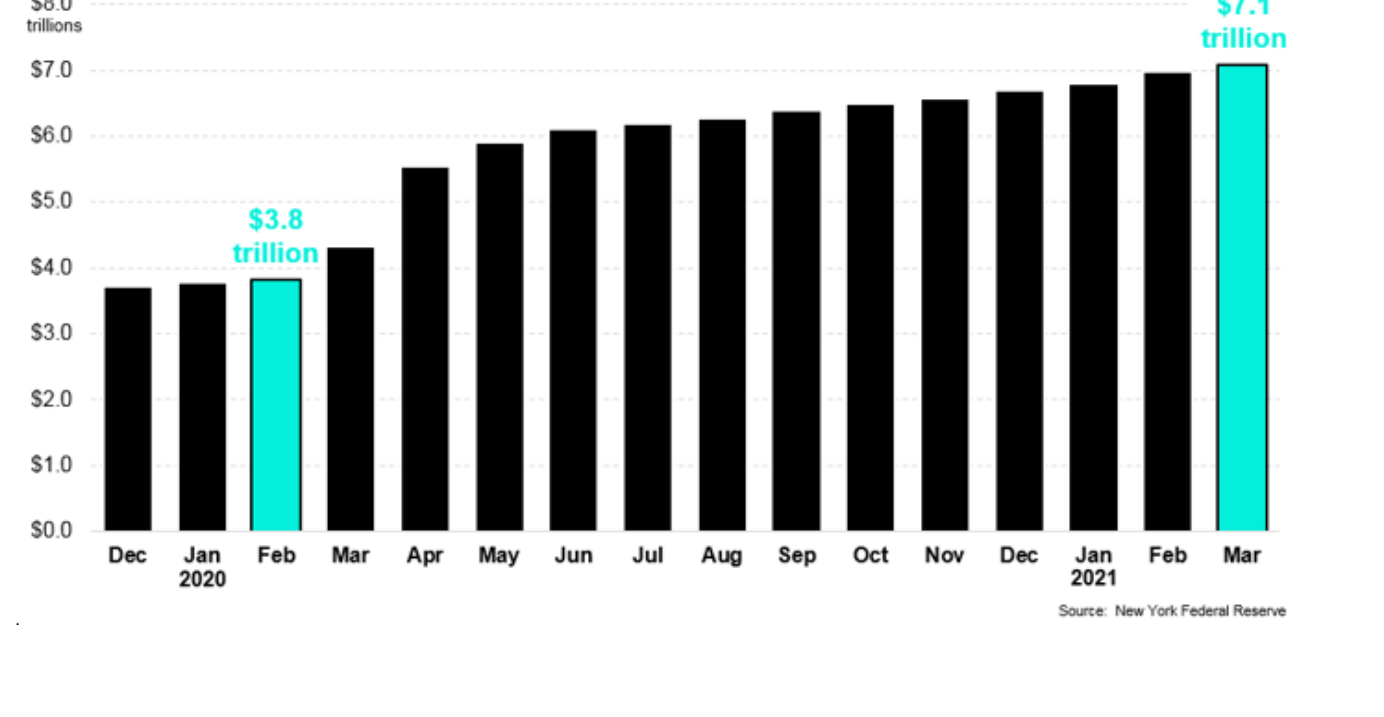
7-year US Treasury Note Auction Size vs. Bid/Cover



Source: Department of the Treasury, ICE Data Services

The Federal Reserve has stepped up with unprecedented stimulus over the past year. SOMA holdings have grown by +85% to over \$7 trillion, led mainly by increased purchases of US Treasury Notes/Bonds and Agency Mortgage-Backed Securities

Federal Reserve System Open Market Account (SOMA) Portfolio Holdings



Source: New York Federal Reserve

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MarketAxess Aims to Unlock Buy-Side Liquidity

By: Shanny Basar, Markets Media

Gareth Coltman, global head of trading automation at MarketAxess, said the next focus for the electronic platform for fixed income trading and reporting is to make it as easy as possible for the buy side to automate trading and unlock their potential liquidity.

Gareth Coltman, MarketAxess
Gareth Coltman, MarketAxess
Coltman told Markets Media: “We will see a rapid growth in the buy-side becoming more active price-makers and we are a big believer that automation will be the key to unlocking that latent buy-side liquidity.”

He continued that MarketAxess has built the protocols to allow clients to automatically respond to request for quotes (RFQs), to post to MarketAxess anonymously, to use the Live Markets order book and Mid-X, the new session-based protocol in Europe.

“The next big area of focus is to make accessing all these protocols as easy as possible and a completely seamless part of the buy-side’s existing workflow in an automated way in the background,” added Coltman.

Live Markets is a protocol for Open Trading, the all-to-all model, which creates a single view of two-way, actionable prices for the most active bonds. Mid-X is session-based and allows firms to trade against the mid-point price established by CP+, MarketAxess’ composite pricing tool.

Coltman said clients are already starting to use these automation tools and there is a big desire from them to see more integration into their execution/order management systems, which can slow adoption due to the significant technical uplift required from OMS/EMS vendors.

“So we are also focused on letting clients use these tools directly inside the MarketAxess platform as well as via their OMS/EMS,” he added.

Coltman envisages a future where a client is able to set their urgency, their appetite for price improvement and place their order into MarketAxess defining how they would like to participate in different protocols. A highly urgent order could go out straight away for automated execution as an RFQ, but if they had more time the order could participate throughout the day in other protocols such as Live Markets or Mid-X.

MarketAxess has been developing machine learning analytics and CP+ to predict scenarios such as how many responses are likely to sending out an RFQ or how long a client might wait for inbound liquidity after making a price.

“We are doing similar work to predict the results clients might get with other protocols to help guide clients as to the best type of order use,” added Coltman.



“It is quite a futuristic vision but we are very close to having the right data, stronger analytics, and the right pathways to access different protocols within MarketAxess automatically.”

He highlighted that for buy-side firms building a multi-billion dollar portfolio, the opportunity to save the entire bid-ask spread will be a significant cost saving.

“Some of the biggest buy-side firms are using this technology as it is too good of an alpha generation opportunity to pass up,” said Coltman.

Open Trading

Open Trading is MarketAxess’ all-to-all trading mechanism allowing multiple parties in a network to come together to trade, rather than the traditional model of only banks supplying liquidity to the buy side.

Coltman said: “Open Trading will absolutely increase on a long-term basis and our vision is that it will continue to become an increasingly significant part of how clients trade.”

In the fourth quarter of last year, Open Trading credit volume was \$218bn, up 63% from the last three months of 2019, with estimated total system-wide cost savings of \$225m.

Coltman added there has been rapid growth in participants such as banks who want to find ways to efficiently unwind, rather than warehouse, risk and also from traditional buy-side firms who are seeking price improvement.

Last month Open Trading total credit trading volume was \$94.4bn.

MarketAxess reported a number of trading volume records in March 2021, including total credit average daily trading volume of \$12.7bn and total credit trading volume of \$292.6bn.



Gareth Coltman, MarketAxess

Read the original article [here](#).

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Tapping the Network Effect to Unearth Bond Liquidity

By: [Kevin McPartland](#), [Greenwich Associates](#)

Competition among fixed-income trading platforms is increasingly fierce. Despite an already impressive run-up in electronic trading levels, expectations for growth in this segment are so high that an arms race is underway among those trying to take part.

The ways in which they compete, however, has changed. When most of these platforms were originally founded—some 20 years ago and some less than five—the biggest challenge was to convince liquidity providers to become active on the venue, which in turn attracted the buy side to come in search of liquidity.

This was, and still is, no small feat that remains a notable chicken or egg problem. Liquidity providers go where their customers might be, and the customers only go where they see liquidity. As we've written in the past, trading venues, like social media platforms, are no fun if you're the only one there.

Today, however, differentiating based solely on liquidity providers on the platform doesn't cut it anymore. Don't get me wrong, the size of the network matters—especially as the number of market participants able to provide liquidity has expanded to include all manner of buy- and sell-side firms. However, Coalition Greenwich data shows that the top 3 dealers for any given investor still handle 40% of their investment grade activity.

Moreover, at minimum, the top 20 dealers by volume are on all of the main corporate bond platforms. So, having liquidity providers on the platform in and of itself isn't enough to get the buy side excited about something new—it is now just table stakes.

The top 3 dealers for any given investor still handle 40% of their investment-grade activity



Price Improvement is Key

Trading venues increasingly stand out based on their ability to provide price improvement, which today comes from access to unique liquidity. Unique liquidity can sometimes come from unique liquidity providers—perhaps an emerging nonbank liquidity provider or regional bank.

But increasingly, unique liquidity involves unearthing buy and sell interest regardless of firm type. Asset managers, hedge funds and even pension funds can enter the equation when platforms provide more seamless methods to connect everyone with everyone.

The dealers should not be left out of this conversation, however. While big-dealer dominance used to come from their large balance sheets, which allowed them to take principal risk, their dominance now is based much more on the network of clients they've created over time, and their ability to connect opposing interests among them. In other words, they know where the bonds are buried.

You might be thinking “that's always been the case”—and you'd be correct. However, today there are so many more bonds and so many market participants that trading in this space without the right technology is nearly impossible. Each major bank effectively has its own ecosystem of customers and partners, similar to the networks created by the largest trading venues.

A lot of work has been done over the past decade using artificial intelligence and (perhaps less novel) database technologies to pour through every manner of customer interaction in those ecosystems—be it chat messages, phone calls, expressed interest in a bond—to provide the sell-side trader with ideas on whom to call about which bonds.

The Quest for Smart Transparency

Nevertheless, there is still room for improvement in both the technology and the process. First, there is a continued push to increase market transparency without creating information leakage. Put another way, how can corporate bond investors express interest in a bond and understand current market pricing and depth without showing their hand? The goal is to create “smart transparency” that optimizes price discovery while minimizing information leakage.

Second, with sell-side credit trading headcount down 7% over the last five years according to Coalition Greenwich data, bond dealers need to more effectively mine their long-curated network of bond buyers and sellers to find the right matches at the right time. This should mean not only finding one buyer to match every seller's interest, but perhaps finding enough buyers to match a single seller's interest.

To that point, there is an opportunity to expand upon the current market model of matching one buyer to one seller by allowing multiple buyers to more easily fill the order of a single seller. Mechanisms to achieve this today are limited, in part because of the long-held market convention and, in part, because of a fear of information leakage.

The RFQ winner's curse could be made worse if the market knew only a portion of the order was filled, leaving the rest to trade (or not) at another price with another liquidity provider. Solving this challenge could continue the string of wins for innovative trading venues that have unlocked liquidity that would not have been found a decade ago, while allowing the buy side to still tap the sell side's deep trading networks.



Sell-side credit trading headcount is down 7% over the last five years

Improving Best-Ex Analysis

Over the last decade, fixed-income electronic-trading growth has also taught us that allowing dealers to continue to do what they do best—provide liquidity via their balance sheet or via their distribution network—must remain a part of the new market structure. While technology has changed how the dealers do what they do, it doesn't change what they do. As such, enhancing those capabilities is a more likely path to success than trying to diminish or move them elsewhere.

To move forward with these and other ideas, best-execution analysis must become more science than art so that traders can measure price improvement across platforms and dealers more effectively. Use of transaction cost analysis (TCA) by fixed-income investors has grown slightly, from 38% in 2019 to 44% in 2021, according to Coalition Greenwich data. But in most cases, the analytics are used post-trade and provide only limited insight into the liquidity-seeking process at the time of trade.

Furthermore, as corporate bond trading has become more systematic over the past decade, so too should dealer and venue selection. Such analyses must be backed by solid data and models that have been proven over time. Otherwise, comparing best-ex reports is doomed to remain in the realm of arguing over how many angels can dance on the head of a pin.

Ideas that look great on paper only become truly great when they help market participants make (or save) money. When refined through the fierce forges of intense competition, the best systems prove out that they can deliver that most sought-after of outputs—price-improved executions from unique liquidity.

Read the original article [here](#).

Use of TCA by fixed-income investors has grown slightly, from 38% in 2019 to 44% in 2021



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Analysis: Fixed income e-trading platforms still seeing outperformance in March

By: Dan Barnes, The Desk

Major electronic bond trading platforms have reported record trading volumes across several sectors of fixed income, supporting the contention that increased adoption last year has moved beyond a response to market volatility.

MarketAxess saw a total credit average daily trading volume (ADV) of US\$12.7 billion and total credit trading volume of US\$292.6 billion. Its all-to-all Open Trading total credit trading volume reached US\$94.4 billion. It also saw US investment-grade total trading volume of US\$145.7 billion, high yield total trading volume of US\$43.9 billion and emerging markets total trading volume of US\$64.2 billion. The total trading volume for Eurobonds was US\$36.5 billion.

Analysts at Morgan Stanley estimated MarketAxess's market share for investment grade was 21% for March, up 75 bps YoY and up 165 bps month-on-month (MoM), while in high-yield market share of 16% for March is up 390 bps YoY and up 185 bps MoM.

Tradeweb's reported record total trading volume for March 2021 was US\$24.7 trillion across rates, credit, equities and money markets with ADV for the month reaching a record US\$1.07 trillion, an increase of 7.3 percent year-on-year (YoY).

US credit ADV was up 49.8% YoY to US\$6.4 billion and European credit ADV was up 39.3% YoY to US\$2.1 billion. Tradeweb reported a record ADV in portfolio trading for US investment grade and European credit, and new clients for both US and European credit began using the protocol. Automated trading continued to grow with record ADV via AiEX in US high yield and European credit.

Morgan Stanley estimates give Tradeweb a market share of 19% in investment grade for March is up 650 bps YoY including 11% fully electronic that is up 675 bps YoY and a high-yield market share of 7% for March which is up 370 bps YoY including 5% fully electronic up 325 bps YoY.

In US government bonds ADV was up 17.7% YoY to US\$113.4 billion, and European government bond ADV was down 1.8% YoY to US\$31 billion.

Lee Olesky, Tradeweb CEO, said, "I believe we are in the early days of a new normal for electronic trading, led by stronger client engagement and accelerated trends in both adoption and innovation. March 2021 trading volumes soared, with monthly ADV handily exceeding the historic level reached back in March 2020. We also outperformed some broader market trends in March, including in U.S. Treasuries where Tradeweb volume climbed 18% YoY as overall volumes across Treasury markets declined."

Portfolio trading has also proven valuable for Intercontinental Exchange (ICE); although it has not reported full trading volumes it has reported that in the first quarter of 2021, over US\$4.2 billion in US-based notional activity was executed at ICE, up from US\$1.9 billion in the fourth quarter of 2020, over double the volume of the prior quarter.



Lee Olesky, CEO, Tradeweb

Ascendant bond trading platform Trumid reported its average daily volume (ADV) in March was US\$2.1 billion, representing a 123% increase year-over-year and a 48% increase month-over-month. It noted platform engagement has been high throughout 2021, including 910 active users on the platform in the month of March, with elevated participation leading to record user success rates for the 550 buy and sell side institutions within the Trumid network.

"Trading venues increasingly stand out based on their ability to provide price improvement, which today comes from access to unique liquidity. Unique liquidity can sometimes come from unique liquidity providers—perhaps an emerging nonbank liquidity provider or regional bank," wrote Kevin McPartland, head of market structure and technology research at Greenwich Associates in his blog on 8 April 2021. "But increasingly, unique liquidity involves unearthing buy and sell interest regardless of firm type. Asset managers, hedge funds and even pension funds can enter the equation when platforms provide more seamless methods to connect everyone with everyone."

Read the original article [here](#).

BDA Regulatory & Legislative Priorities

The Bond Dealers of America (BDA) deploys a variety of advocacy and grassroots tools to influence the policy-making process and promote a more efficient fixed income market. Regulatory authorities in Washington, D.C. recognize the BDA as an authority on technical issues and market trends. Through a variety of events and forums, our members have the opportunity to meet regulators and legislators to discuss market and business challenges. Our federal Political Action Committee (PAC) supports legislators who work to advance policies that improve the fixed income markets.

Infrastructure and Municipal Bonds

The BDA and MBFA continue to press for an infrastructure package that further emboldens the municipal bond market.

Senator Roger Wicker (R-MS) and Debbie Stabenow (D-MI) **introduced legislation** that would reinstate tax-exempt advance refundings and their House counterparts **Reps. Dutch Ruppersberger (D-MD) and Steve Stivers (R-OH)**.

The bills have strong bipartisan support and are well-positioned for debate as Congress turns its attention to infrastructure and public works later this year.

In late March, the BDA Board hosted House Ways and Means Chairman Richard Neal (D-MA) for a virtual infrastructure roundtable in which the reinstatement of AR was discussed at length, among other municipal bond priorities including:

- **Expansion of PABs including for ESG uses;**
- **Raising the BQ debt limit; and**
- **Reinstatement of direct-pay bonds exempt from sequestration.**

The newly reformed Municipal Bonds for America Council has also been active in promoting muni priorities. Following the early March Ways and Means hearing titled, “Tax Tools to Help Local Governments,” the MBFA submitted testimony in support of the municipal market.

The BDA and MBFA continue to work with our partners on Capitol Hill and in the Public Finance Network (PFN) to ensure that municipal bond provisions are well placed and considered as Congress works on additional 2021 measures such as infrastructure and public works which we believe will be addressed in the coming months.

Remote Work

Last year BDA submitted a short paper to FINRA and the MSRB on regulatory and compliance issues arising from the pandemic and remote work. Since then FINRA has issued a formal request for comment on lessons learned from the pandemic and issues related to remote work, and **BDA submitted comments in response to FINRA Notice 20-42** (remote work).

Corporate Syndicate Rule

BDA is pursuing a change in regulation to address a mismatch between the SEC Net Capital Rule and FINRA Rule 11880 which governs the settlement of syndicate accounts on corporate bond and equity issuances. FINRA rules allow syndicate leads managers 90 days after deal closing to close syndicate accounts and return funds to co-managers. However, the SEC capital rule specifies that receivables older than 30 days cannot count towards regulatory capital compliance. So co-managers’ funds are locked up for the final 60 of the 90 days until the syndicate account is closed.

In late 2019, the **BDA wrote FINRA** calling to amend FINRA Uniform Practice Code Rule 11880 (“Rule 11880”) to reduce the maximum time to settle syndicate accounts from the current 90 days. The BDA believes reducing the time to settle syndicate accounts would streamline the corporate bond and equity issuance process and reduce counter-party credit risk. Alternatively, an industry best practice recommending that lead managers return the majority of co-managers’ funds within 30 days and the rest within 90 days could be a solution.

Additionally, the MSRB amended its Rule G-11 governing underwriting syndicates in 2009, reducing the time to settle a syndicate from 90 days after closing to 30.

Since our letter to FINRA, we have had continuing conversations with FINRA and SEC staff on this issue. We continue to discuss three possible solutions: amending the FINRA syndicate closing rule, amending or obtaining clarifying guidance on the SEC net capital rule, or working with the industry more broadly to develop a best practice that would mitigate the capital issue for co-managers.

Temporary Conditional Exemption for MA's on Private Placements

The Temporary Conditional Exemption issued by the SEC in June which permitted non-dealer Municipal Advisors to solicit investors in certain bank placement transactions expired at the end of 2020. The BDA lobbied the SEC for two years to kill the broad 2019 proposed Exemptive Order and to let the temporary exemption expire at the end of the year as scheduled.

Following the SEC’s early summer announcement that they are proceeding with a limited and temporary version of exemptive relief for MA’s, the BDA responded immediately. As recently as November 30, 2020, BDA wrote the SEC arguing that the temporary exemption due to expire at the end of the year is unneeded and dangerous. BDA has filed numerous letters and conducted several meetings with the SEC on municipal private placement over the last 18 months.

BDA also partnered with multiple Members of Congress in opposition to the proposed exemptive order and the temporary exemption. Representative French Hill (R-AR), following advice from the BDA, pressed SEC Chairman Clayton on these problematic aspects, and the BDA continues to work with Congressman Hill on the next steps to be taken.

The BDA followed up with the SEC in December following hearings on Capitol Hill reiterating the request to allow the Exemption to expire at years end, and that request was granted. The BDA continues to remain vigilant on the issue and continues to work to ensure the Exemption is not revived including pursuing additional letters and support from Capitol Hill.

FINRA 4210 Amendments

FINRA Rule 4210 (Margin Requirements) are the margin requirements that determine the number of collateral customers are expected to maintain in their margin accounts, including both strategy-based margin accounts and portfolio margin accounts. The BDA believes that the amendments are anti-competitive for smaller and mid-size broker-dealers and believe that FINRA should revise the amendments to allow dealers to either charge margin or to take a “capital charge in lieu of margin” on certain transactions.

Following multiple BDA proposals and recommendations, FINRA recently announced that they seek to comment on proposed amendments to Rule 4210 (Margin Requirements) that would clarify and incorporate into the rule current interpretations regarding when issued and other extended settlement transactions, and provide relief to facilitate the application of the rule to these transactions.

The BDA will host a call in the coming weeks to work on draft comments with membership. Comments are due May 14, 2021.

SEC Rule ATS

The SEC has released a significant proposed rule change to their Rule ATS. SEC Rule ATS creates a regulatory structure for certain alternative trading systems, including fixed income trading platforms. When the rule was adopted in 1998, the SEC exempted trading systems that support trading in government securities from the regulatory scheme. The SEC’s current proposal would repeal that exemption and apply Rule ATS to government securities trading systems. The release proposing the rule change also requests comment on the regulatory structure for platforms that support trading in municipal and corporate bonds. This inquiry arises from a 2018 recommendation from the SEC’s Fixed Income Market Structure Advisory Committee to review the rule with an eye towards equalizing the regulatory treatment of fixed income trading platforms with varying structures. BDA is preparing a comment letter in response.

TRACE Pilot

The TRACE pilot program, as proposed by FINRA, was to review the impact of giving traders two full days before having to reveal the largest block trade transactions. BDA opposed the pilot program as BDA member firms believe the proposed 48-hour delay in disseminating trade information would introduce significant and damaging opacity to the market, disadvantage retail investors, and include no incentive for middle-market firms to increase their capital commitment or provision of liquidity. We learned last year that FINRA does not plan to act on the proposed pilot program. We also learned that the SEC’s Fixed Income Market Structure Advisory Committee may revisit the issue this year with an eye towards amending their recommendation.

Municipal Advisor Rule

The BDA is exploring the prospect of pressing the SEC to amend the 2013 municipal advisor rule. A strong case can be made that the SEC interpreted the statute too narrowly. The SEC has the statutory authority, for example, to exempt underwriting firms from treatment as a MA at the time the dealer discloses to the issuer that they are seeking business as an underwriter rather than when the firm is formally engaged. BDA is drafting an appeal to the SEC to reopen the MA rule with the notion of revising the definition of an underwriter in the context of potential treatment as a MA.