

# ICE Trading Analytics

Serving fast-evolving fixed income markets

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## Executive summary

ICE Trading Analytics is a suite of data and analytical tools involving the aggregation and contextualization of substantial amounts of unstructured fixed income data to generate:

- Evaluated pricing data (including evaluations, yield and spread information)
- Size Adjusted Pricing Calculations
- Liquidity metrics (including scores and trade volume projections)
- Execution quality metrics and best execution scores
- Transaction cost analysis (TCA)
- Market depth and market data sentiment

ICE Trading Analytics covers a wide range of data and analytics designed to help support:

- Fixed income order flow
- Fixed income pricing and transparency related to pricing
- A consistent reference point shared between the front office and compliance

ICE Trading Analytics help to create more transparency related to ICE's fixed income evaluations and as a result may assist in reducing trading risk or help to identify trading opportunities.

- The data can be consumed programmatically or visually.

Current fixed income market structure has led to an increase in demand for additional data to help clients gain more visibility heading into a trade decision.



## Introduction

The fixed income market has undergone significant structural changes during the past several years. Enhancements in information gathering, data synthesis, data analysis and trade execution continue to happen on an almost daily basis, creating trading and investment opportunities. Despite these advancements, fixed income trading has not reached the level of electronification currently seen in the equity markets. The sheer number of securities (thousands for equities versus millions for fixed income) plus diversity of asset types, security structures, settlement parameters, etc. have hindered progress on this front. As market participants become increasingly adept in processing and applying the vast amount of fixed income market information, that gap with the equity market (and others) is closing.

Fixed income investing has long been a story of price and yield. Forty years ago, it was still commonplace to look up prices/yields on tables or in books. Experienced traders or investors could look at a bond's characteristics and do a rudimentary dollar duration (DVO1) calculation in their head to consider market changes. Over time, those tasks became automated while at the same time bond structures became more complex, adding more variables like adjustable coupons, prepayments, and credit events. However, fixed income investing generally remained a bond-by-bond price/yield story. Investors in other asset classes, such as equities, FX, and futures, consider aggregate metrics, often referred to as technical analysis, to gain some market insight. In fixed income, at least in the United States, market participants looked to the Federal Reserve Board (the "Fed") as to the future direction of interest rates, using a process that leveraged qualitative analysis as much as it did quantitative data. As the market reacts to the Fed, fund flows, individual credit events and various macroeconomic and geopolitical events, firms continue to search for ways to gain an edge.

Though that edge may come in many forms, at ICE we try to provide data and analytics to help firms gain that edge.

**Firms with exposure to the fixed income market looking for transparency related to pricing, liquidity metrics, execution quality, transaction cost, market depth and market sentiment should think of ICE as a leading provider of this content.** Furthermore, the content is made available from a basic, easy to understand single API access point.

The components of ICE's Trading Analytics have been utilized for years in a variety of front, middle and back-office use cases. These include trading, price verification, business analysis, regulatory and risk management, among others. As market familiarity with the resultant data increased and new Trading Analytics components were added, new use cases have been developed. **Given the progression of fixed income markets and the openness to leverage content sets like Trading Analytics, firms on the buy side and sell side are looking to incorporate the data elements into more systematic processes and workflows.**

If a survey was conducted to include all the fixed income trading operations from all fixed income market participants, we would expect the results to show some similarities in processes, but each desk would have its own method for analyzing securities, markets, opportunities, etc. The market information employed would have many inconsistencies because different market participants would know different prices, yields and spreads for the same set of securities. The vast number of securities that comprise the fixed income market globally (millions versus thousands of equity securities) creates significant analytical challenges. The lack of centralized fixed income market data, along the lines of the Consolidated Tape in equities, exacerbates the inconsistencies seen in the fixed income market. This is the void that ICE Trading Analytics can help to fill.

## 1. ICE Trading Analytics

ICE has long been a leading provider of data to the financial industry. Primary among this data is end of day evaluated pricing for fixed income securities, used by the industry in several mission critical use cases. ICE's decades of experience in producing evaluated pricing have led to the development of rigorous methodologies that incorporate a variety of market and reference data, utilizing sophisticated data science and technology, overseen by a seasoned team of analysts.

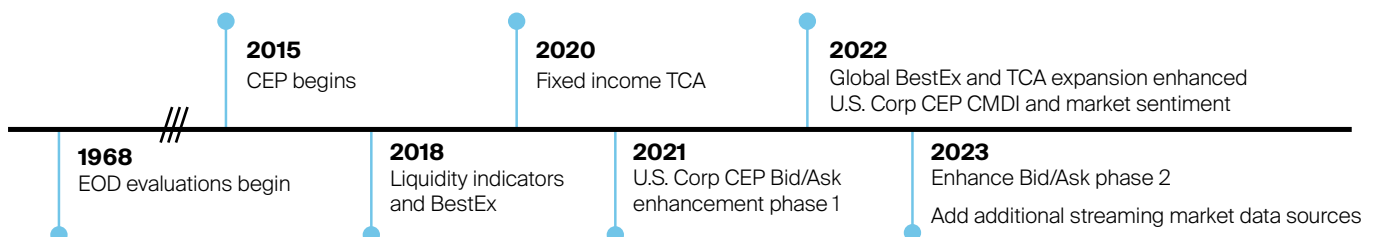


Image 1: Timeline for illustration purposes only

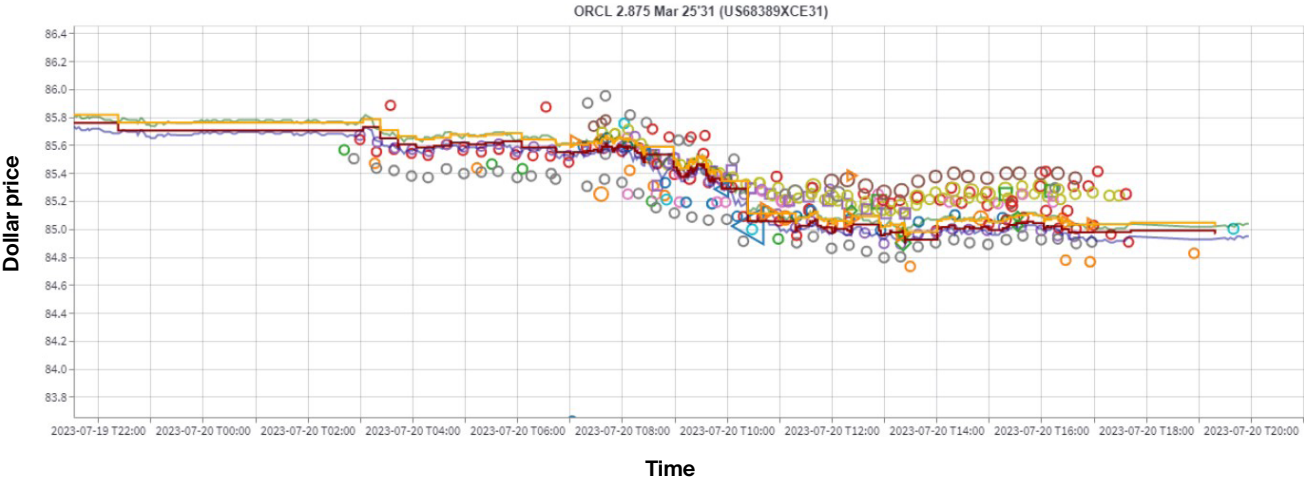
As that experience of producing end of day evaluations grew and the implementation of technology rose, ICE realized that it could develop other data and analytics from the same market information it used to generate its end of day evaluations. Building on ICE’s extensive experience generating EOD evaluations, ICE then developed its Continuous Evaluated Pricing (CEP) dataset which was an extension of our EOD evaluations. After the introduction of CEP, our data scientists started to explore additional ways our evaluated pricing data could be used to generate additional analytics of value to our clients. For example, we introduced our ICE Liquidity Indicators service, which uses our evaluations information, including CEP, to generate metrics to help clients assess the liquidity of their investments and is used by clients to assist in their trading, risk management and compliance workflows. Next, ICE introduced its Best Execution and Transaction Cost Analysis (TCA) services, which give both buy and sell side trading operations deeper transparency and helps firms measure their execution quality. More recently, ICE introduced its Continuous Market Depth Indicators (CMDI) service which provides clients a view into the information available for evaluations of individual fixed income instruments and Market Sentiment (MS) scores which provide context on underlying market data flowing through the marketplace. ICE’s team regularly looks for new ways in which our data can help clients improve their processes and decision-making workflows.

**The components of ICE Trading Analytics:**

**Continuous Evaluated Pricing (CEP)** extends the reach of our evaluations to support intra-day applications. Coverage includes US, EMEA and Asia Pacific corporate and sovereign bonds, US TBA MBS, US MBS pass-through, US Agency/ government sponsored enterprise (GSE) debentures, money market instruments, and Bank Loans in the US, EMEA, and Asia Pacific, as well as US Municipal bonds. Our CEP offers evaluations for fixed income instruments throughout the trading day. Through rules-based logic (relevant to how the market calculates valuations for that asset class or instrument), these evaluations are continuously updated as market information, including dealer quotes and trades, are received, and processed.

Our innovative rules-based pricing applications, overseen by a team of evaluators, have the capability to systematically capture and incorporate market information and are designed to produce a streamlined evaluations process that is

responsive to market conditions. Image 2 represents a graphical representation of bid side market data, including quotes, firm markets, and trades overlaid on top of the CEP value. The complexity on this chart is reflective of the complexities in the fixed income market in which pricing and trading can involve many different data points at the same moment in time.



**Image 2:** Based on a sample security and is for illustration purposes only.

**Best Execution (BestEx)** service for the fixed income markets provides scores that reflect a trade-by-trade measure of execution quality relative to comparable transactions in the market. BestEx scores are currently available for the following asset classes:

ICE asset class	Region	ICE asset class	Region
U.S. Treasury bills, notes and bonds	North America	U.S. Municipal	North America
U.S. Corporate investment grade	North America	U.S. MBS Pass-throughs and SBA	North America
U.S. Corporate high yield	North America	U.S. MBS TBAs	North America
European fixed income	Europe	U.S. Agency debentures	North America
Asian fixed income	Asia Pacific	Agency CMO / CMBS	North America
EM & Cross regional bonds	Global	ABS / CMBS	North America
Latin America	South America	Canadian Corp / Government	North America
Bank loans	Global	Non-agency CMO	North America
Convertibles	Global	U.S. Preferred	North America

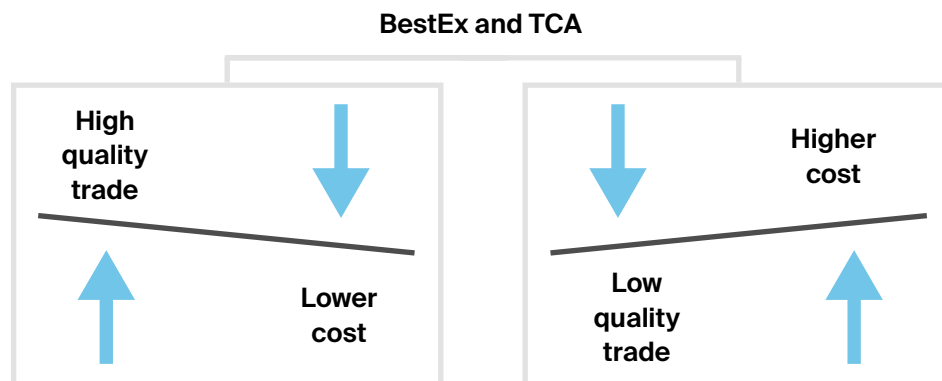
**Image 3:** BestEx coverage

ICE's BestEx service was developed to help clients answer the following questions: Was the execution fair, reasonable and within the context of the market? Furthermore, was the execution done outside of an expected range compared to an independent, but relevant reference price (CEP when available)? The range in this case is a distribution around CEP which varies depending on the type of instrument, the time to maturity, the side and size of the execution.

In a literal sense, best execution in fixed income would involve market participants who come together at the same place at the same time with the same size and with the same level of urgency to buy and sell an instrument. However, this scenario is difficult to achieve, and some might say may be impossible to accomplish at all in fixed income investing, because there are too many instruments held by too few people.

ICE has developed BestEx to help clients assess execution quality across their business and understand trends within their fixed income orders. It is designed to help identify outliers and apply a consistent, easy to understand approach to gauging execution quality across a wide range of fixed income assets.

Additionally, ICE provides Transaction Cost Analysis (TCA), which considered alongside an instrument's BestEx score can help to better gauge the quality of execution and maximize the applicability of the BestEx score. TCA is a natural extension of BestEx and the outcome ICE sees is best summarized using the following illustration:



**Image 4:** Execution quality and how it relates to transaction costs or TCA.

Our data generally shows that high quality execution will most likely result in lower costs related to trade activity. Whereas, if execution quality is poor that will most likely increase costs related to trade activity.

**Transaction Cost Analysis (TCA)** was created based on observing the relationship between BestEx scores and the ICE Liquidity Indicators™ liquidity scores.

The TCA service delivers three different types of metrics:

- Benchmark Data (Expected TCA)
- Transaction Compare Data (Trade Impact and Reference TCA)
- Results (Net Trade Impact and Loss or Gain)

**Benchmark data** provides the Expected TCA which is the cost ICE calculates representing an estimated cost to trade based on the type of security, time to maturity and size of the transaction.

**Transaction compare data** also estimates the transaction costs of a trade but takes the price point of the transaction into consideration and compares it to one of three reference prices (CEP, the ICE market implied size-adjusted price, or a reference price input by the user).

The **results** compare the transaction compare data to the benchmark data. This calculation provides a way for clients to measure the transaction cost difference of a trade based on its execution performance.

As a provider of fixed income content and specifically trading analytics information like TCA, it is important to understand the nuanced nature of fixed income markets. Considering these complexities ICE breaks down transaction cost using a multipart, but easy to understand approach. As seen in image 5, the illustration relates to Expected TCA, Trade Impact and Net Trade impact. These are the core components used to break down TCA for fixed income.

TCA is important to understand the impact of execution quality. For example, if execution can improve from a BestEx Score of 25 to a BestEx Score of 50 to a BestEx Score of 75, as the charts below demonstrate, the quality of execution can help lower overall transactions costs:

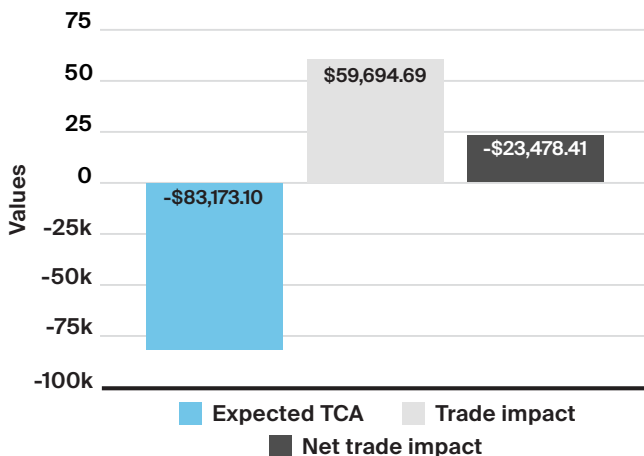


Image 5: Illustration of fixed income TCA cost implications.

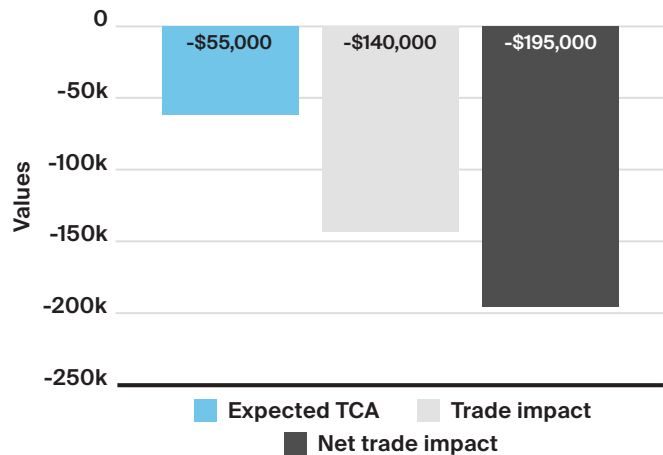


Image 6: TCA at a BestEx score of 25.

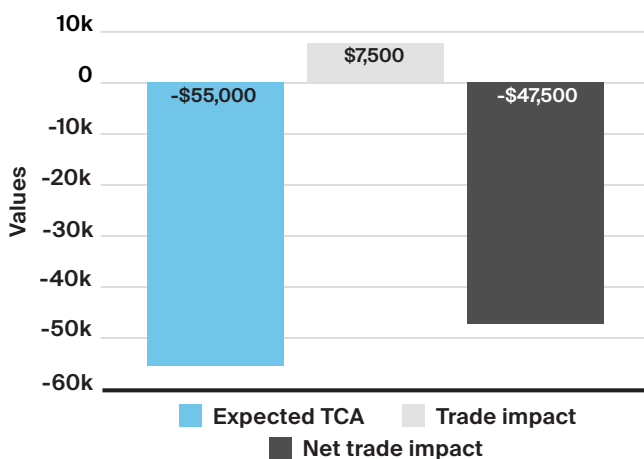


Image 7: TCA at a BestEx score of 50.

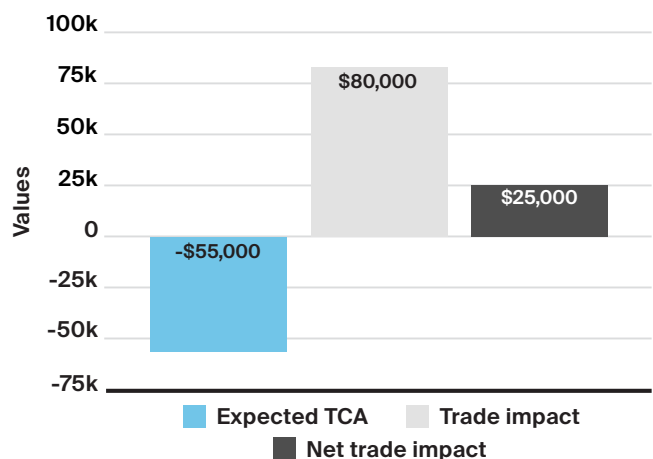


Image 8: TCA at a BestEx score of 75.

Using Image 6 we see an added cost contributing to the Net Trade Impact reflected by the light blue bar. As the BestEx Score shifts from 25 to 50 to 75, the Net Trade Impact shifts from a net negative number to a net positive number.

In addition to providing clients a quantifiable approach to TCA, ICE also provides flexibility in process of requesting execution quality and TCA data. BestEx and TCA data can be observed using the BestEx & TCA request/response API. Through this mechanism clients can request data and default to ICE CEP for benchmark information related to the trade or a client can override ICE CEP and enter an alternative reference price. This would override the ICE evaluation within this process and allow for flexibility and customizability for TCA calculations.

**Continuous Market Depth Indicators (CMDI)** are designed to provide more transparency into fixed income markets intraday. The service continuously counts market data sources that are observed by ICE Data Pricing & Reference Data including, but not limited to, the number of bids, offers, buy trades, and sell trades. Fixed income asset types covered are U.S. corporates, U.S. municipals, emerging markets corporates and sovereigns, european corporates and sovereigns and asian corporates and sovereigns.

**Market Sentiment** service provides scores that are intended to help clients identify when there may be greater dislocation and differences of opinion in the market as to what an asset's value may be. The Market Sentiment service covers U.S. dollar denominated corporate bonds and U.S. municipal bonds. The service is provided on an issuer, industry, and asset class basis.

**ICE Liquidity Indicators™** provides metrics designed to help support a firm's risk management program, including, but not limited to, a portfolio's days to liquidate projections, relative liquidity to a variety of benchmarks, transaction cost estimates, and liquidity classifications designed to help support a firm's risk management in connection with a variety of global regulatory obligations, including the SEC's Liquidity Risk Management rule (i.e. Rule 22e-4) among other use cases.

## 2. Trading analytics in action

A multi-billion-dollar portfolio manager (PM) must execute on a series of investment decisions to ensure the portfolio is optimized and it is within the fund's mandate. The PM's options are limited to what can be put into action. The limitations will be based on what information is available in the market to execute on. The PM may have a great idea, but if it cannot be put into action then it doesn't really matter how good of an idea it is. However, on any given day there will still be plenty of opportunity, but firms struggle to sift through the markets that are available to them. With the use of ICE Trading Analytics, the fund manager can work closely with their trading desk to make sure the portfolio strategy can be implemented. The portfolio management strategy involves buying and selling a variety of fixed income instruments. The portfolio manager and trading desk want to have the widest range of options when deciding how best to execute on the strategy of the fund. In the past, the PM may be able to identify a handful of instruments and, if available (within a fair and reasonable context of the market), would provide the characteristics needed to complete the portfolio management process. This process is inefficient, manual and it limits what the PM could achieve compared to if they had access to information on a wider range of assets. With so many instruments to pick from across so many platforms it is difficult for firms to analyze and identify a more complete range of available options.

A comprehensive solution to this process would be to:

1. Scan what is available in the investible universe.
2. Identify the instruments with the most suitable characteristics.
3. Compare those instruments to what is available in the open market.
4. Calculate what the outcome would be in terms of price, size and cost.

All of this must be done with a minimum amount of information leakage as that may disrupt the implementation of the strategy. Additionally, as time passes the target strategy becomes increasingly difficult to execute.

The PM realizes the delicate balance of this process. They must execute on the strategy quickly and efficiently while protecting against information leakage. The first few steps to the comprehensive solution remain intact: scan what is available in the investible universe, identify the instruments with the most suitable characteristics, compare that to what's available in the open market then try to calculate what the outcome would be in terms of pricing, size, and cost. There is, however, a fundamental difference to the outcome of this process when using additional data like ICE's Trading Analytics.

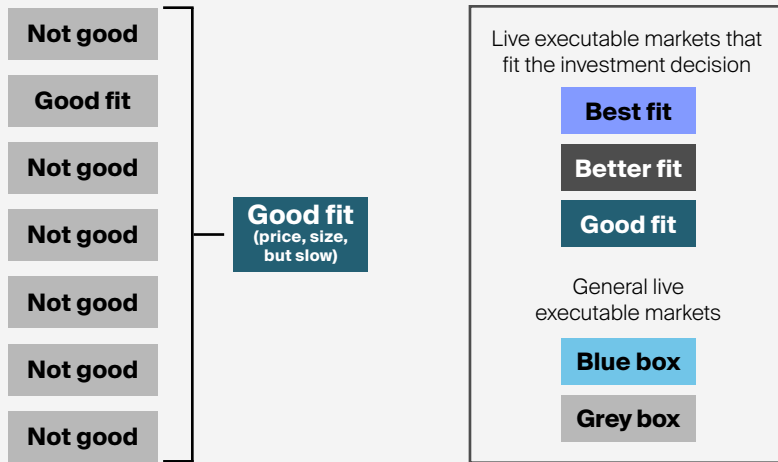
Trading analytics can help support fixed income order flow management by helping to identify trading opportunities or trading risks. By leveraging trading analytics, traders/PMs may be able to engage on a wider range of orders or markets.



## Fixed income orders vs. live executable markets

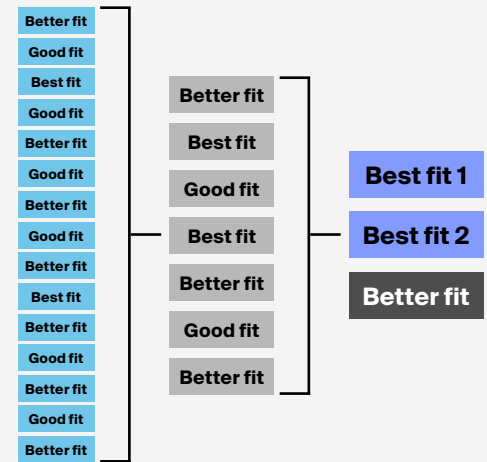
### Without trading analytics

A trader reviews their screens to help identify a good market to engage



### With trading analytics

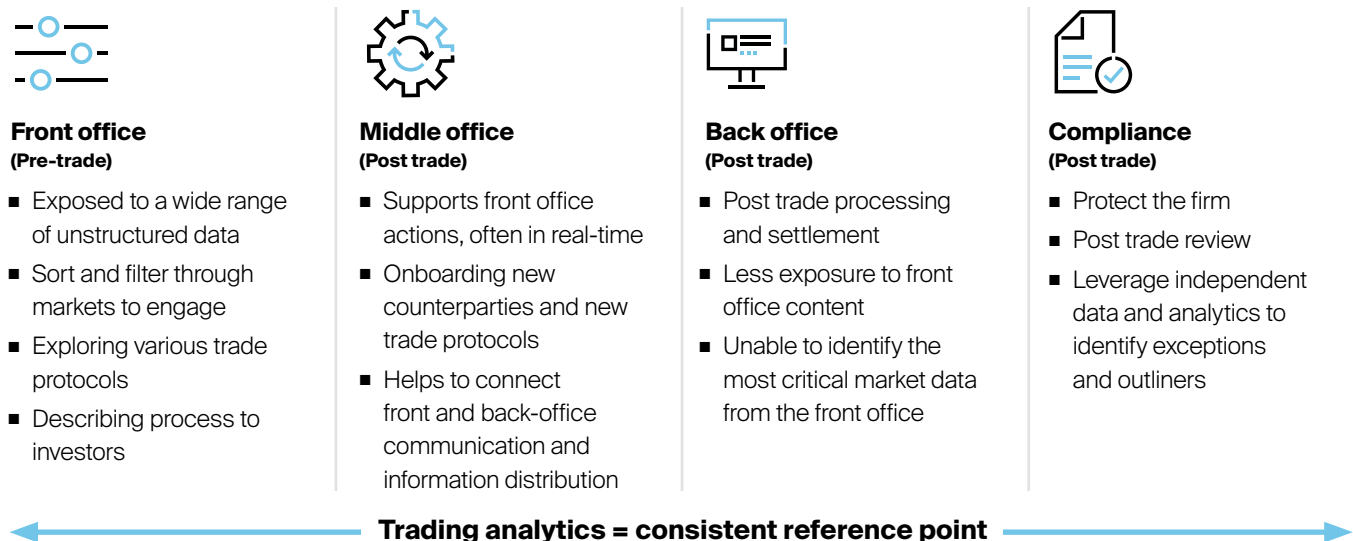
Trader systematically selects instrument, size and price to identify better fits



**Image 9:** For illustrative purposes only to help describe how clients can use data to scan more markets to engage to help identify execution options and execution within the fixed income marketplace.

With the use of trading analytics, the PM and trading desk now improve their ability to assess all of the options which are available to them and depending on the overall market conditions, time constraints and motives, they are better able to identify and isolate the higher quality options. The user will sort and filter based on the results of the data analysis within their execution management process. As a result, the user may realize several benefits including:

1. The PM and trading desks are aligned, and expectations are in sync as it relates to time, size and price of execution.
2. The trading desk can leverage independent data to help support fixed income trade decisions; perhaps identify trade risks as well.
3. This pre-trade use of data naturally aligns with post trade execution analysis and support provided by ICE.
4. Trading analytics used in the front office can flow through the organization and can be used as a consistent reference point for all departments to leverage to help support and protect the business.



**Image 10:** For illustrative purposes only showing how ICE can provide data that can be used across different areas of an organization.

When approaching a trade decision in fixed income, market participants take into consideration many elements including, but not limited to:

**What is the context of the market for this instrument?**

**Who is involved?**

**How does this instrument trade?**

**How hard will it be to trade this asset?**

**What is the liquidity profile of this instrument?**

**What is the tone of the market?**

Trading analytics provides additional transparency that helps to answer many of these questions.

- CEP provides up to date pricing (bid/mid/ask on price/yield/spread) which helps to identify the context of the institutional market for a given security.
- CMDI helps to demonstrate the number of contributors involved in the instrument. The service also provides additional statistics on trade count and trade volumes.
- BestEx & TCA along with Liquidity Indicators can help clients guide the likelihood to get a trade done and helps to highlight an expected price range for the execution. TCA helps quantify the impact a trade may have as it relates to expected transaction costs.
- Liquidity scores provide information related to the liquidity profile of an instrument and projected trade volumes help clients understand how their trade size compares to an independent estimate of what may trade for that instrument on a given day.
- Market Sentiment scores provide content to help identify when there may be greater dislocation and differences of opinion in the market as to what an asset's value may be.

### 3. Conclusion

Firms looking to modernize the management of their fixed income order flow should be looking to inject the process with additional information in the form of trading analytics. Approaching the market without this added content and transparency may result in missed opportunity or expose the desk to greater risk. An analogy may be drawn to buying a vehicle without some of the standard features based on today's standards. In addition to some of the new controls that exist, many vehicles include things like backup cameras, parking sensors and lane sensors. These advancements are used to help increase safety and help protect the asset itself, the vehicle.

This may be a simplistic analogy, but trading analytics is designed to provide transparency (think sensors and backup cameras) around the fixed income order management process. The analytics can help provide a clearer picture and understanding of what's around you as a market participant. The content is available in a programmatic way so the information can be implemented seamlessly similar to the backup camera seamlessly integrated on the tailgate or bumper of your vehicle. It does not change the look of the vehicle but does add a layer of visibility and safety that is now required by US automobile manufacturers.

Not to belabor the point, but lane sensors are another feature designed to help people stay safe and keep their vehicle moving ahead - within their lane. Trading analytics can be viewed in a similar way. When using trading analytics, clients can gain insight as to whether they are executing a trade within the context of the market - within the driving lane. As the fixed income market evolves and becomes more systematic, firms need independent information to help identify the context of the market for each order and help identify where the metaphorical lane exists.

Fixed income execution and fixed income order flow in general is a like a three-lane highway right now. Some firms are exploring new ways to transact in fixed income using electronic venues, new protocols, new applications, and new workflow tools. These are the firms traveling down the highway in the right lane (in the US) - proceeding with caution and maybe falling short of keeping up with the speed limit (some may say the slow lane). Other firms have embraced some new data and techniques and have had success leveraging these new features using a more robust implementation. These are the firms in the middle lane, keeping up with traffic traveling at the speed limit. Then there are the select few firms who started this journey a while ago. These are firms who started in the right lane, but who have worked hard to incorporate new data and analytics to incrementally improve their fixed income order flow management. They have made the commitment; they are aware of their surroundings and have leveraged the right content to protect against lane drift and can sense if there is congestion ahead. These firms have injected new features into an existing process and workflow and can now systematically execute more well-informed trade decisions.



Just like the open road where there are a variety of vehicles, fixed income has a rich blend of market participants who have different and unique characteristics. Variation comes in the form of what the firm invests in, but what is common amongst them is the need to use as much information as possible when executing on the investment decision. Fixed income market structure is changing fast and as it evolves, we continue to evolve our trading analytics to help clients better manage their business.

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