PROPER ANALYTICS FOR MUNIS NOW CRITICAL

QWAFAFEW

Quantitative Work Alliance for Applied Finance, Education and Wisdom

Kalotay Analytics

FIXED INCOME INNOVATION, PRECISION & PERFORMANCE

Bird’s Eye View of the Muni Market

- $3.8 trillion, over 1 million securities, over 50 thousand issuers
  - *Interest is tax-exempt, held in taxable accounts*
  - ***But capital gain is taxed at maturity/call***
    - *Large gain taxed as ordinary income (40%)*
    - *Small (de minimis) discount taxed as long-term gain (20%)*
- Bonds are callable after 10 years
  - Institutional investors buy 5% coupon
    - Premium provides cushion against ‘de minimis’ risk, discussed below
  - Retail investors prefer par bonds
- Benchmark curves represented by yields of 5% NC-10 bonds
  - *None live*
  - *Questionable methodologies*

Analytics: Taxes Are Conspicuously Absent

- ‘Yield to worst’ is common
  - *Required to quote prices to retail, but it is not a valuation tool*
- Option Adjusted Spread seldom used
  - *OAS is the standard for other FI products*
- Interest rate volatility never mentioned
  - *Although long-term munis are always callable*
- Tax effect (‘de minimis’) not incorporated explicitly
  - *Even though the prices of discount munis are tax-affected*
  - *Reporting after-tax yield is the ‘state of the art’*

But OAS methodology can be extended to incorporate tax effect on discount munis

Tax-Neutral Approach to OAS-Based Muni Valuation

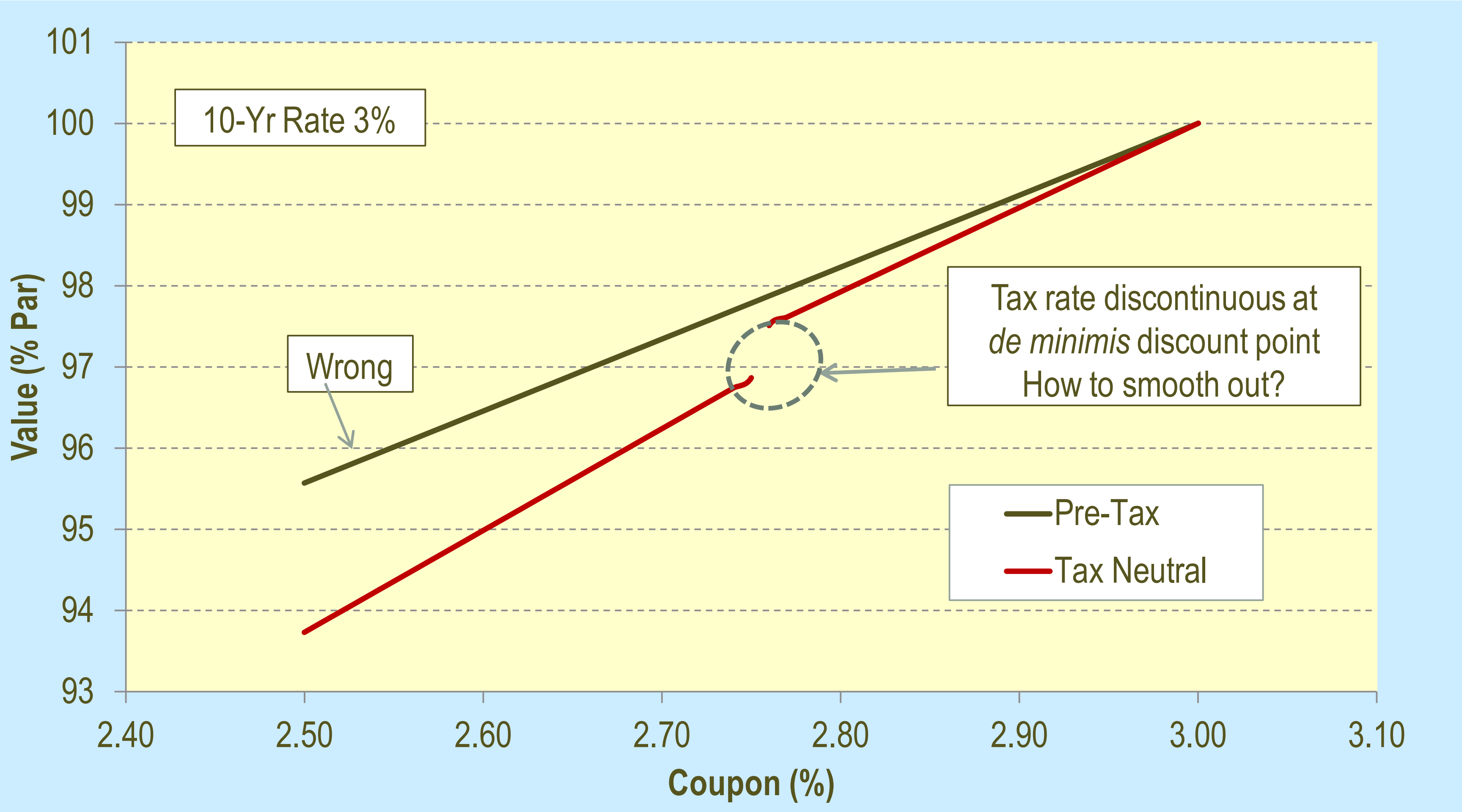
- Fundamental concept: Price equals PV of after-tax cashflows
  - *After-tax cashflows depend on price*
  - *Because tax at maturity depends on price, calculation of fair value is iterative*
  - *OAS is calculated from after-tax cashflows of specified price*

- Patent-pending methodology adopted by
  - *BlackRock, including Aladdin*
  - *Investortools*
  - *Major asset managers*
  - *Bloomberg app RVMunis --- APPS RVMUNIS <GO>*

See: *The Interest Rate Sensitivity of Tax-Exempt Bonds Under Tax-Neutral Valuation*
Journal of Investment Management, 2014

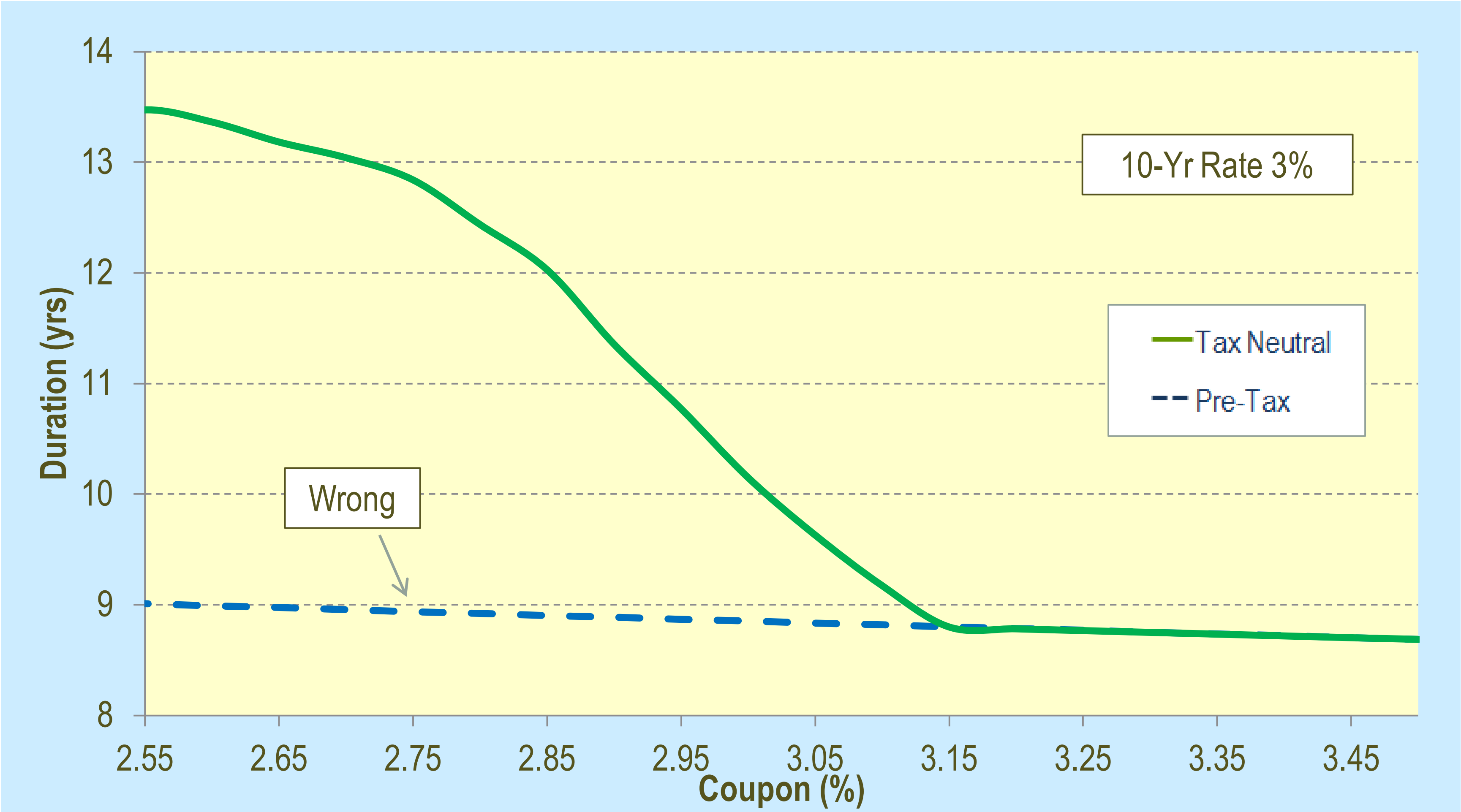
Tax at Maturity Depresses Price of Discount Muni

Tax-Neutral Value of 10NCL



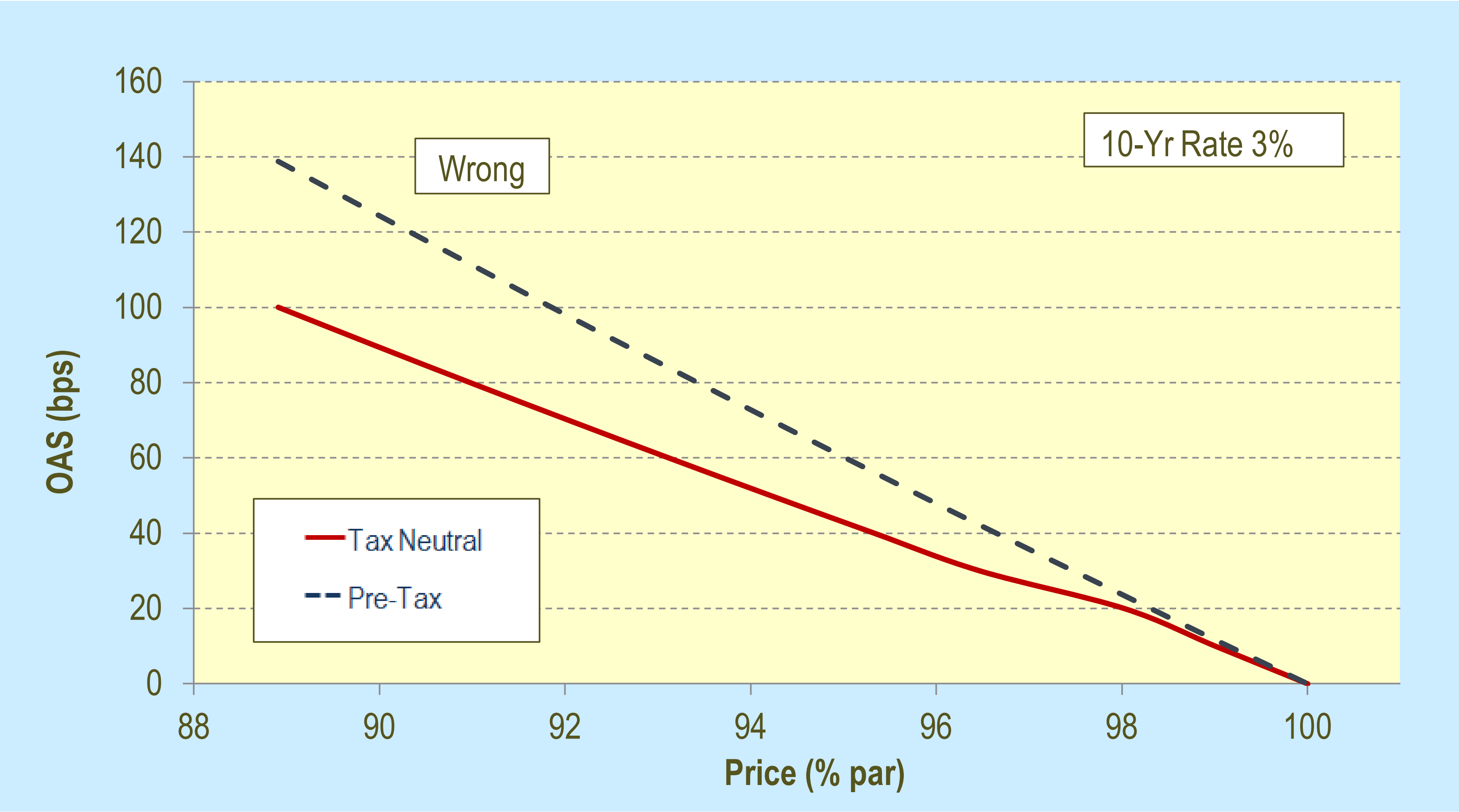
Ignoring Taxes ➔ Interest Rate Sensitivity Underestimated

10NCL Bonds



Ignoring Taxes ➔ Spread Overestimated

3% 10-Year Bullet



Tax-Neutral Valuation is Indispensable for …

- Proper hedging and risk management
  - *Standard duration may miss the mark by a mile*
- Rich/cheap analysis
  - *Discounts look deceptively cheap*
- SEC N-Port Regulation
  - *Accurate shock analysis required*
- Disclosure to retail customers
  - *To avoid unpleasant surprises*

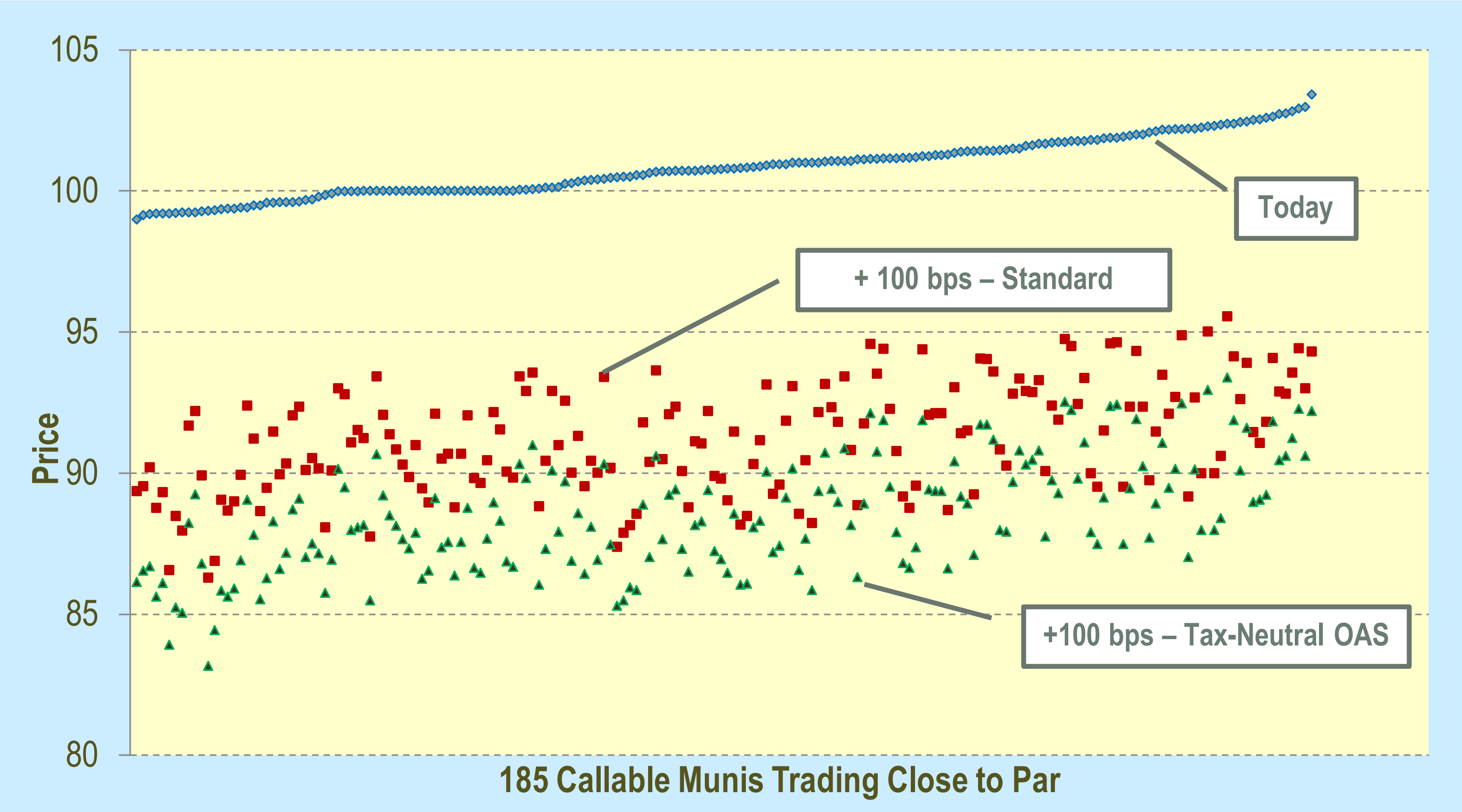
SEC N-Port Requirement

> *"… provide the change in value of the portfolio resulting from a 100 basis point change in interest rates, for each of the following maturities: 3 month, 1 year, 5 years, 10 years, and 30 years"*
> — SEC Form N-Port Guidelines (effective April 30, 2019 for large funds)

- If rates increase 100 bps, even premium bonds decline below par, and experience the knock-on effect of taxes
- Shocking result: Combined effect of shocked key rates may be less than that of shocked benchmark curve
  - *Because applicable tax rate depends on price*
  - *Price from individual rate shift may be 'de minimis', even when effect of shifting entire curve is not*

What Happens When Rates Rise 100 bps?

Downside Risk Is Worse Than You Think



Retail Disclosure Fails to Mention ‘De Minimis’ Risk

- Munis near par have more downside risk than standard analytics indicate
  - *See “Coming Disclosure Issues with Discount Munis”* – Bond Buyer, *Feb 7, 2019*

No reference to *de minimis* on typical retail platform

– Details about municipal bond risk

Call
If a bond issuer repays the principal (calls) of the bond before its stated maturity date, the investor could miss out on future interest income payments.

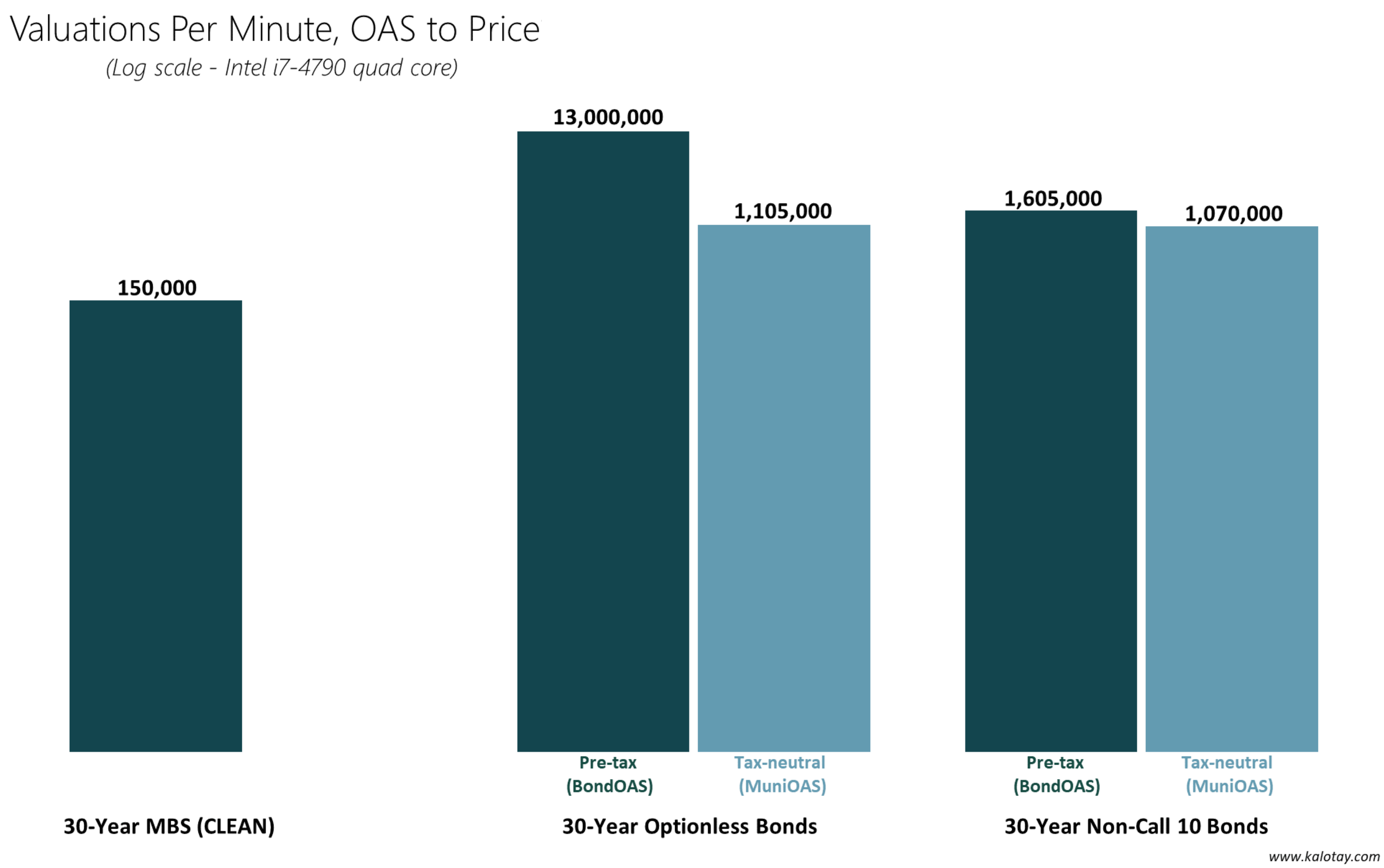
Credit
If the credit rating of the municipal bond changes to a lower rating, the value of the bond may decrease. This can occur if the issuer defaults.

Interest rate
If interest rates rise, the market value of the municipal bond may decline, which could be a risk to the investor trying to sell before the maturity date.

Reinvestment
If interest rates are low and a bond reaches its maturity date or the issuer calls the bond, the investor could be left with a lower yielding reinvestment option and possible reduction in cash flow.

Inflation (purchasing power)
If prices rise at a higher rate than investment returns, then money buys less in the future. The risk is greatest if the bond has a long time before its maturity.

Speed of Calculations Will Surprise You



Speed Demos at: https://analytics.kalotay.com/realtimeagency/ and https://analytics.kalotay.com/clean/

Information & Contacts

Live MuniOAS Demo: https://analytics.kalotay.com/munianalyzer/

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