ANDREW KALOTAY ASSOCIATES, INC.

Optimal Municipal Bond Portfolios For Dynamic Tax Management

Fourth Annual

Municipal Finance Conference

FEDERAL RESERVE BANK OF BOSTON™

BRANDEIS INTERNATIONAL BUSINESS SCHOOL

Rosenberg Institute of Global Finance

Boston, August 7, 2015

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Tax-Loss Selling: Basic Concepts

- Proceeds from sale are reinvested in a ‘like’ bond
  - Credit exposure and market risk unaffected
- Gain/loss depends on investor’s tax basis
  - Short-term (40% tax rate) or long-term (20%)
  - Losses need offsetting gains; otherwise carried forward
- Benefit: A/T proceeds – *Hold value*
  - Hold value is investor-specific
- Tax option: right to execute tax-beneficial transactions
  - Acquired automatically, *at no cost*, at time of purchase
  - *Multigenerational*: repeated sale and reinvestment provide additional optionality
  - *Tax-efficiency* signals optimum time to sell (discussed below)

Questions Addressed

Which bonds are best suited for tax-loss selling?

What is the expected excess return from dynamic tax management over buy-and-hold?

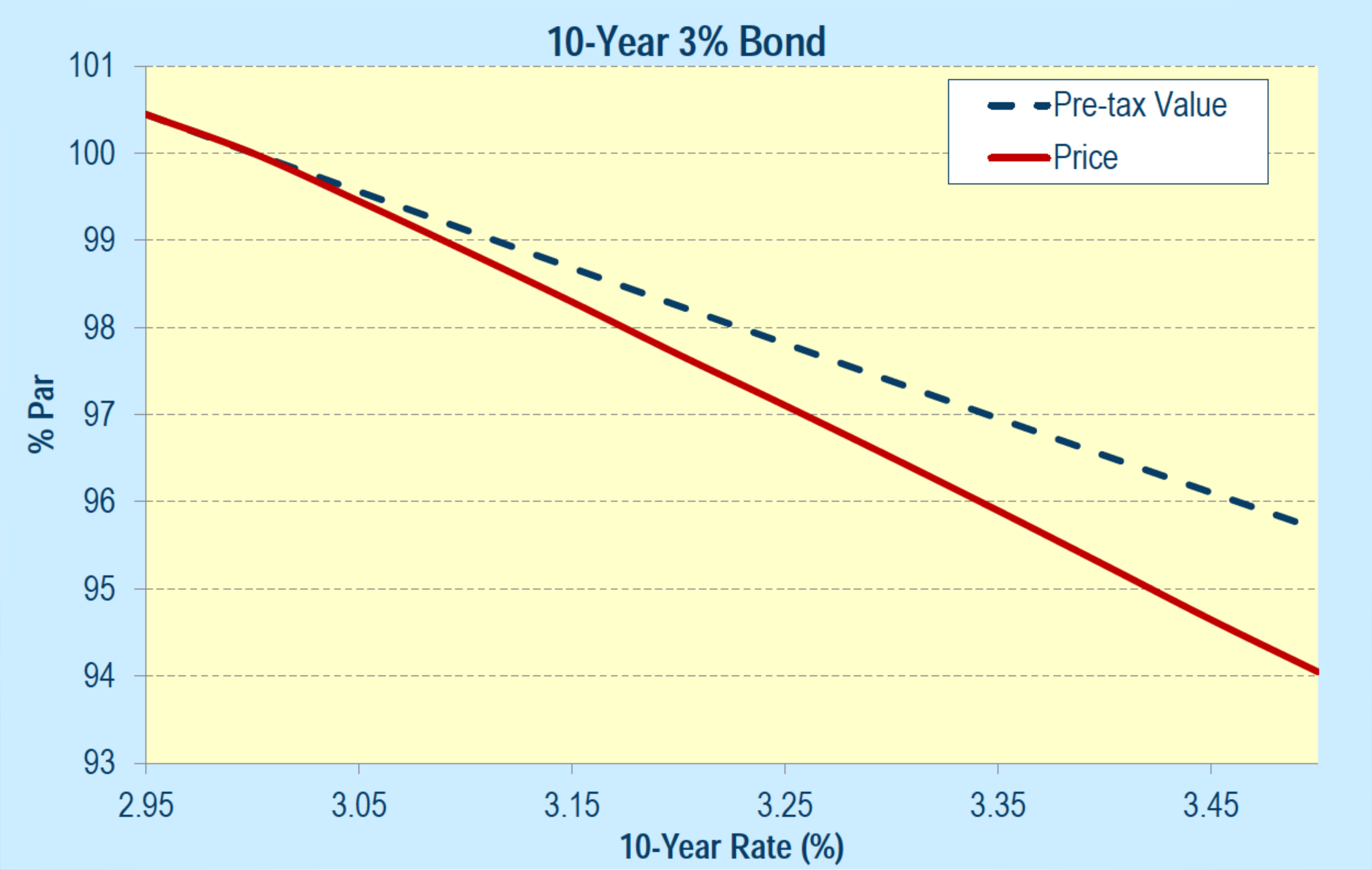
Note: Calculation of after-tax return requires suitable definition of *after-tax portfolio value*

Recommendation: hold value

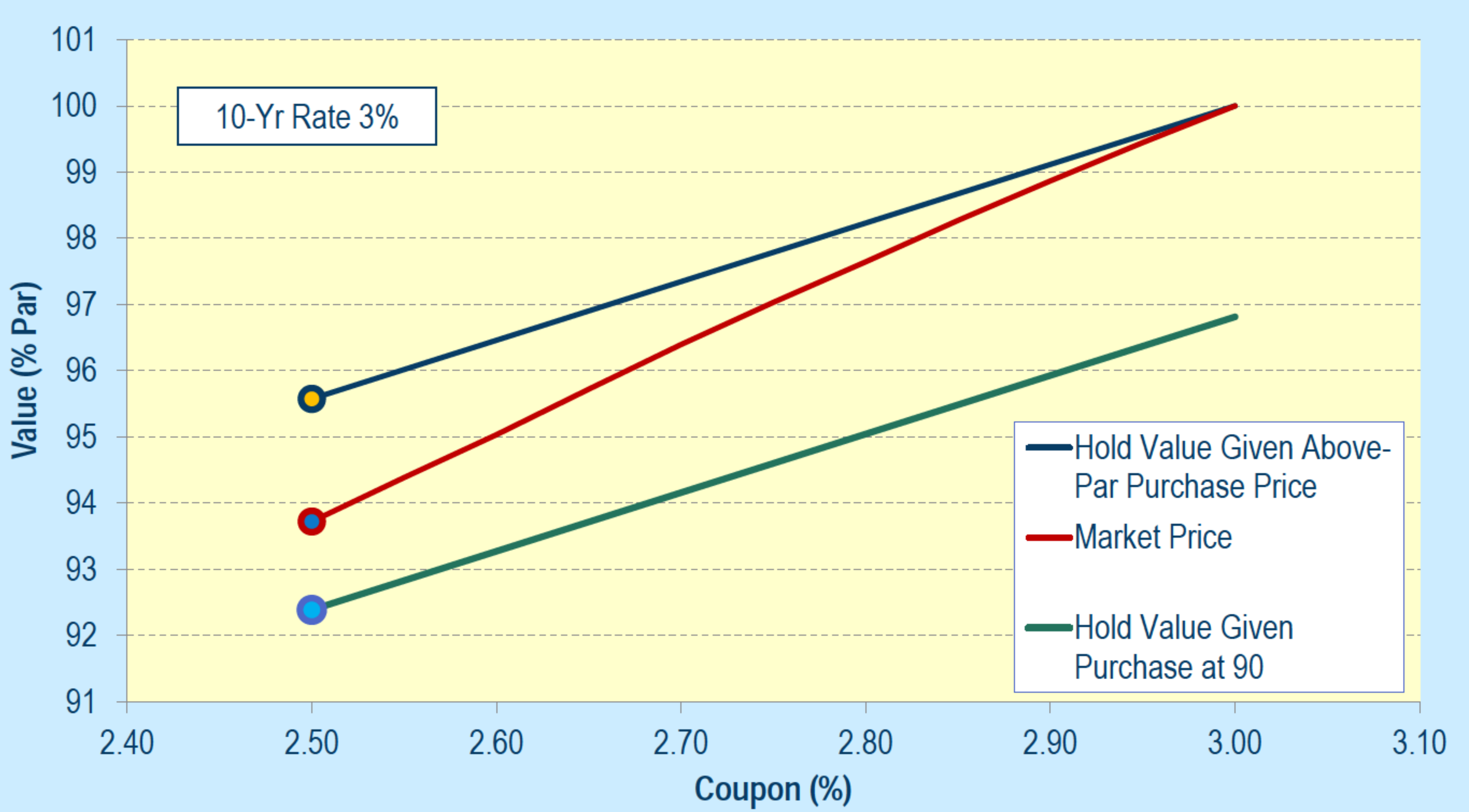
The Challenge of Discount Munis

- Tax on gain at maturity depresses market price
  - Large gain taxed at 40%, small gain as capital gains at 20%
- Tax-aware analytics needed to optimize timing of sale
  - Standard systems ignore taxes; overestimate scenario-dependent prices of discounts (shown below)
- Solution: tax-neutral valuation
  - Overlay taxes on OAS framework
  - T/N value is the PV of after-tax cashflows
  - T/N OAS adjusts for both call option and taxes

When Rates Rise Muni Prices Decline More Than Predicted by Standard Systems



Market Price and Hold Value Can Diverge
10-Year Bullets



Sale Decision Is a Two-Step Process

1. Is it beneficial?
   Excess of after-tax proceeds over hold value

   Independent of reinvestment; like bond maintains risk exposure

2. Do it now or wait?
   Optimal timing depends on reinvestment strategy
   Dynamic tax management (as below) or one-time sale

Tax Efficiency Signals When to Sell

$$Tax\ Efficiency = \frac{Cashflow\ Benefit\ *}{Net\ Loss\ of\ Tax\ Option\ Value}$$

**After-tax Proceeds from Sale – Hold Value*

Maximum 100%

See demo at http://analytics.kalotay.com/munisignal/

Identifying Opportunities to Boost Performance

XYZ Wealth Managment	Daily Tax Management Monitor 3/15/2015									
Jane Investor										Your Wealth Manager
Account No. SMA-436901-2								Peter W. Manager, CFA		(212) 999-5432
Bond		Par Amount ($)	Purchase Date	Purchase Price	Current Basis	Sale Price*	After-Tax Benefit if Sold ($)	Tax Efficiency (%)	Signal	
5539928A2	5% due 3/1/2039-Call 3/1/2018	60,000	8/15/2014	123.00	119.14	118.00	-66.00	N/A	No Benefit	
319995AH6	5% due 6/15/2024	85,000	8/15/2014	112.00	111.40	108.00	365.50	97.93	Sell	
297552QR5	3% due 3/1/2021	95,000	12/2/2012	108.00	105.91	100.50	788.50	99.48	Sell	
615887YE5	3% due 3/1/2024	78,000	7/8/2014	104.00	103.62	101.00	210.60	85.84	Watch	
977564HW5	2% due 5/1/2023	65,000	11/7/2012	80.00	80.00	94.00	552.50	100.00	Sell**	
546787UX8	3% due 5/1/2023	80,000	10/1/2014	100.00	100.00	95.00	-544.00	N/A	No Benefit	
855972ZA9	5% due 6/15/2043-Call 6/15/2024	90,000	8/15/2013	122.00	119.16	117.00	162.00	71.15	Hold	

Short-term losses offset against long-term gains (20%). Income tax rate: 40%. **Assumes 0.50 bid/ask spread.* ***Bifurcated tax treatment.*

Alternative Definitions of After-Tax Value
Needed for After-Tax Performance

Market Value

Liquidation Value

Hold Value *Used below; basis for duration calculation*

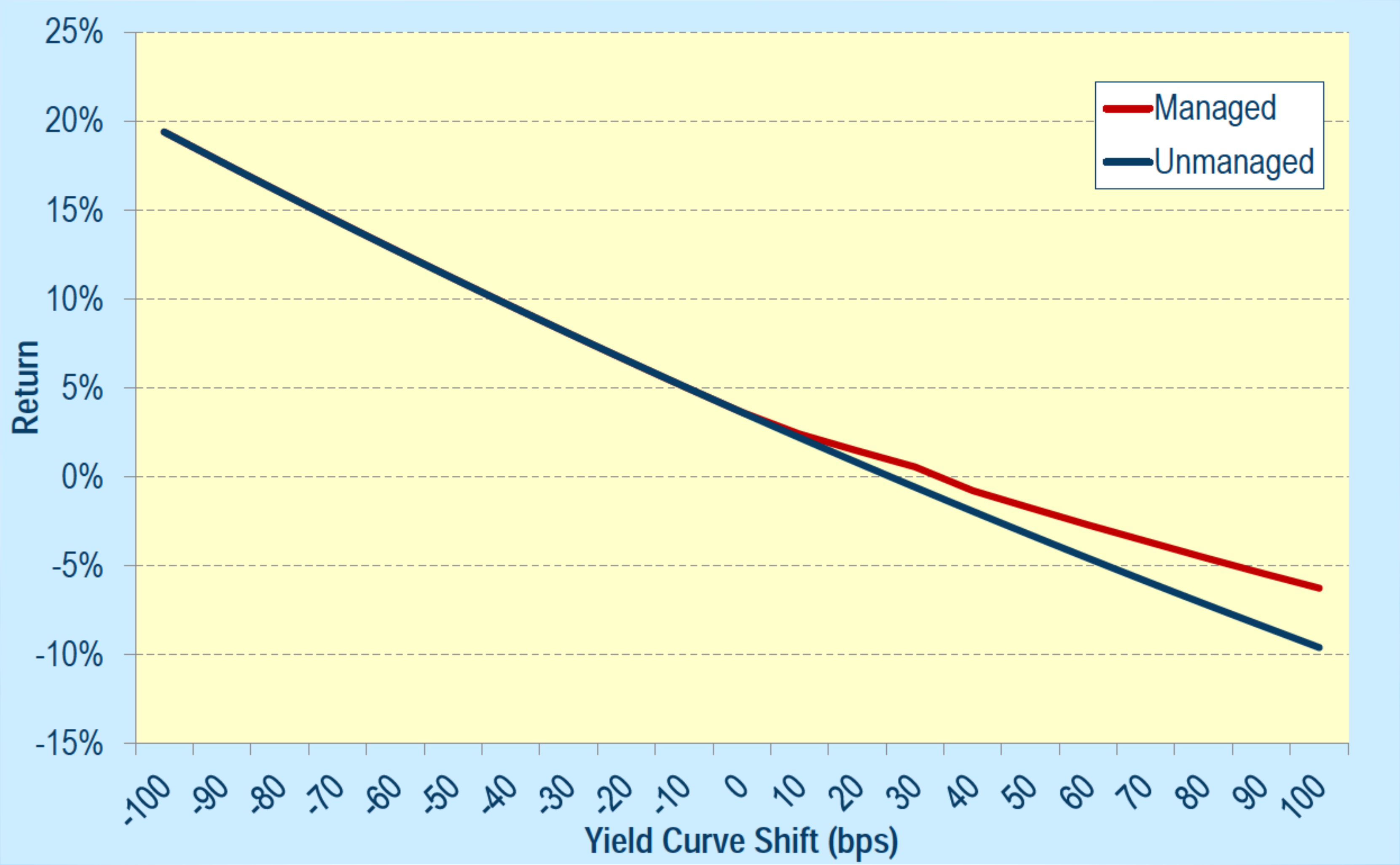
Hold Value + Exercise Value of Tax Option

Hold Value + Value of Tax Option

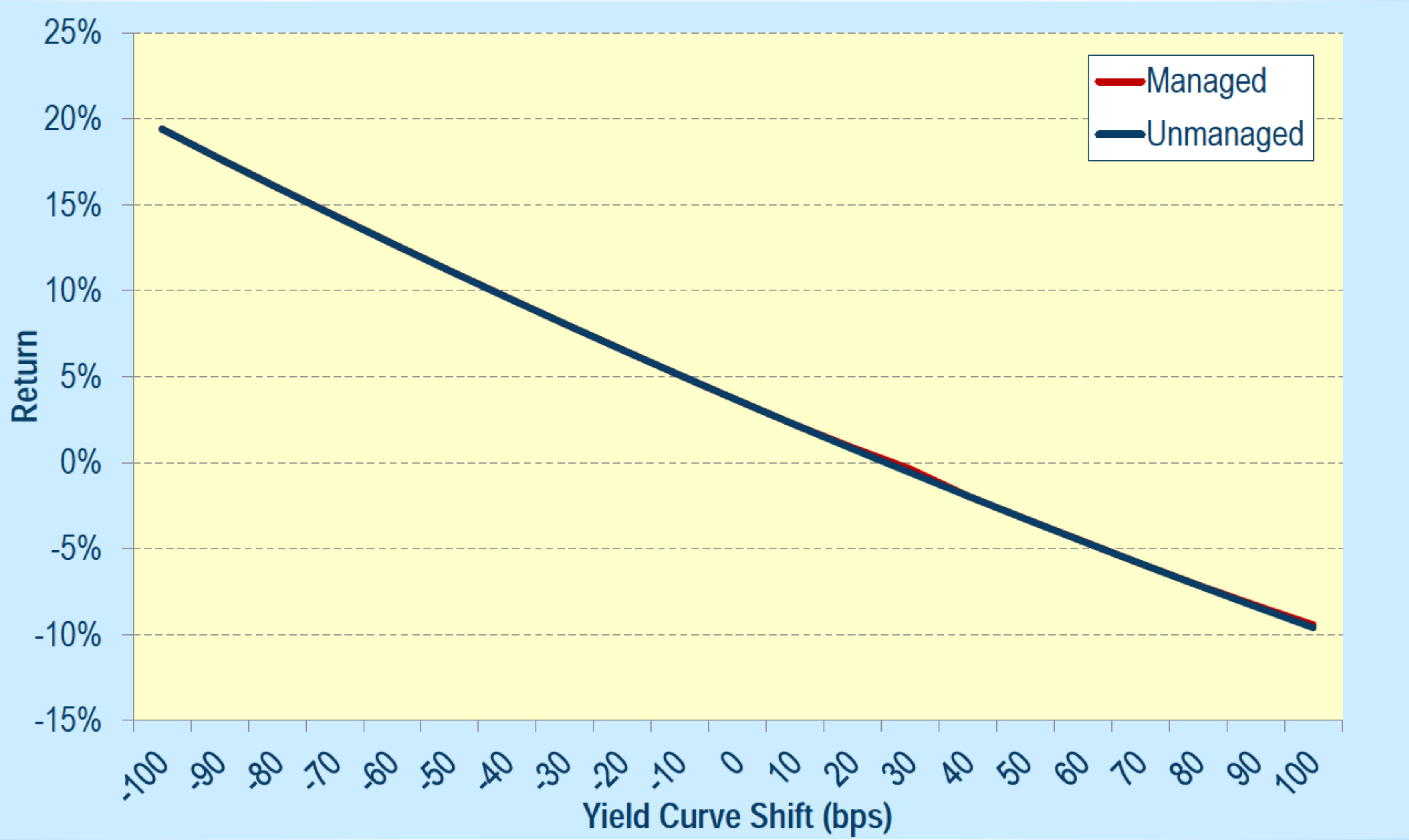
Assumptions for Exhibits Below

Interest Rate Process	Black-Karasinski				
Initial Optionless Yield Curve	1y 2.0%	5y 2.4%	10y 3.0%	20y 3.25%	30y 3.50%
Short Rate Volatility	15%				
Mean Reversion	2				
Tax Rate Assumptions	Income 40% Short-term gain/loss 40% Long-term gain/loss 20%				
Transaction Cost	0.25% of par				

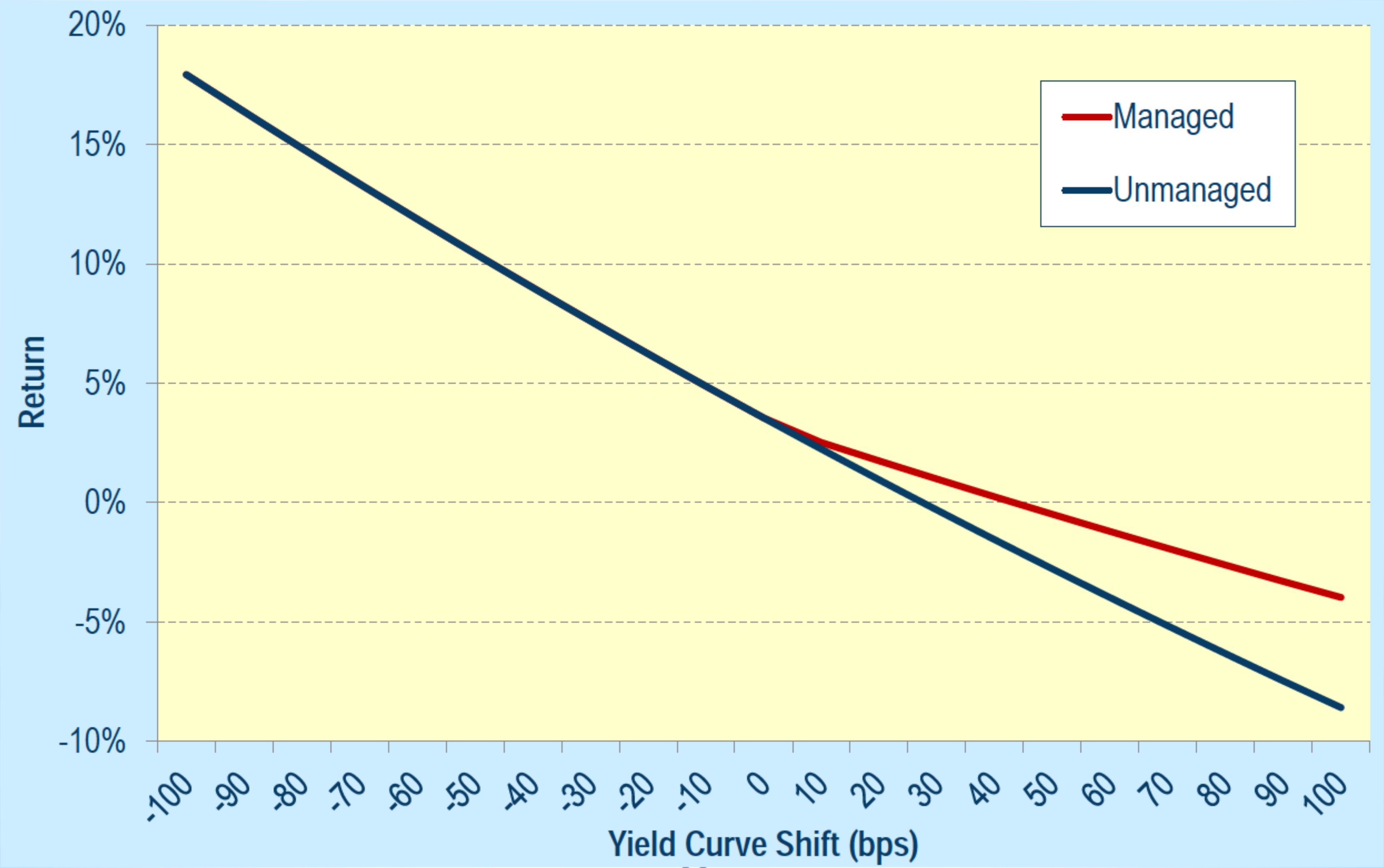
After-Tax Return for 20-NCL 3.25% Par Bond
Held 1 Year – 1 Day



After-Tax Return for 20-NCL 3.25% Par Bond
Held 1 Year + 1 Day

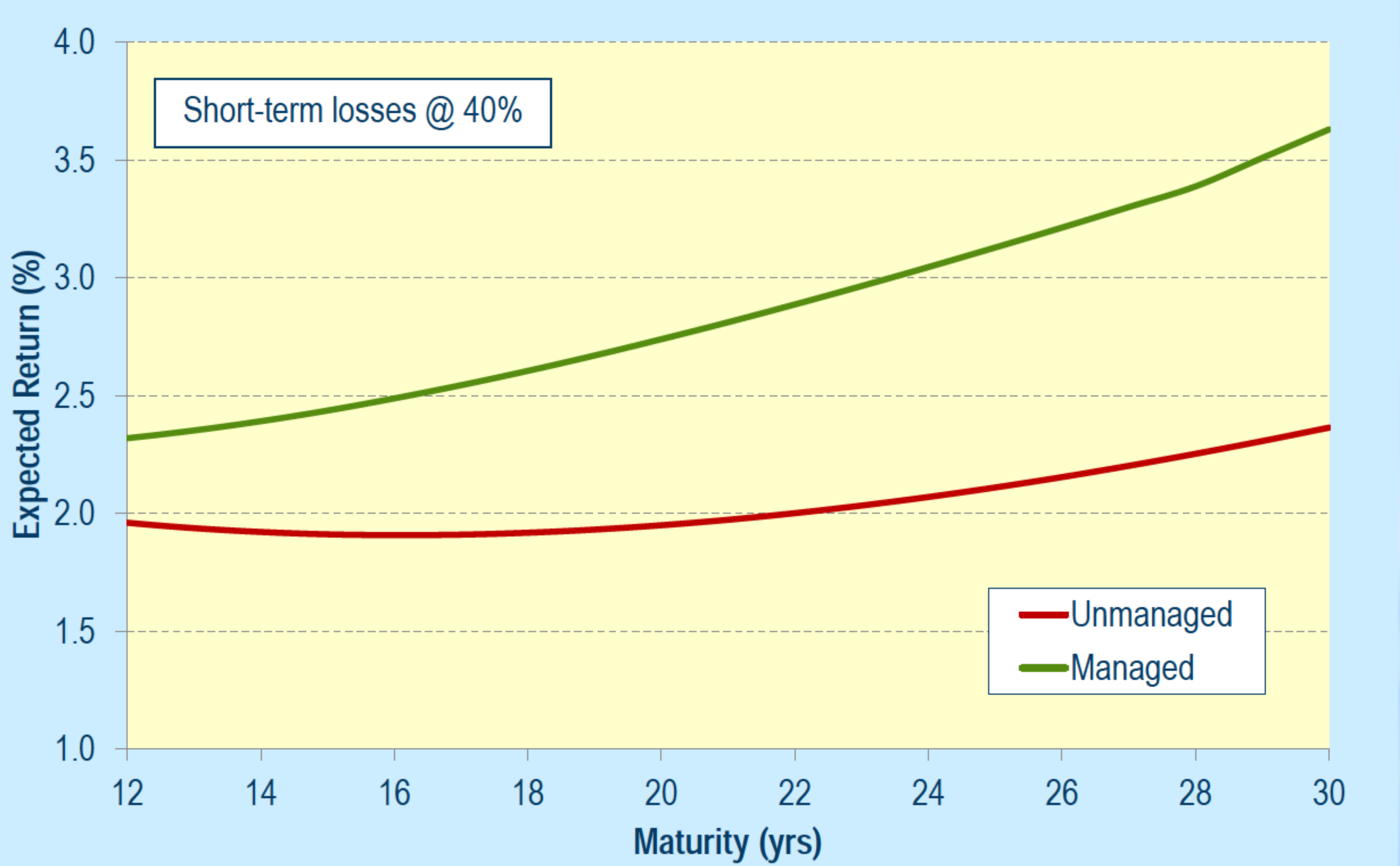


After-Tax Return for 20-NCL 5% Bond
Held 1 Year – 1 Day



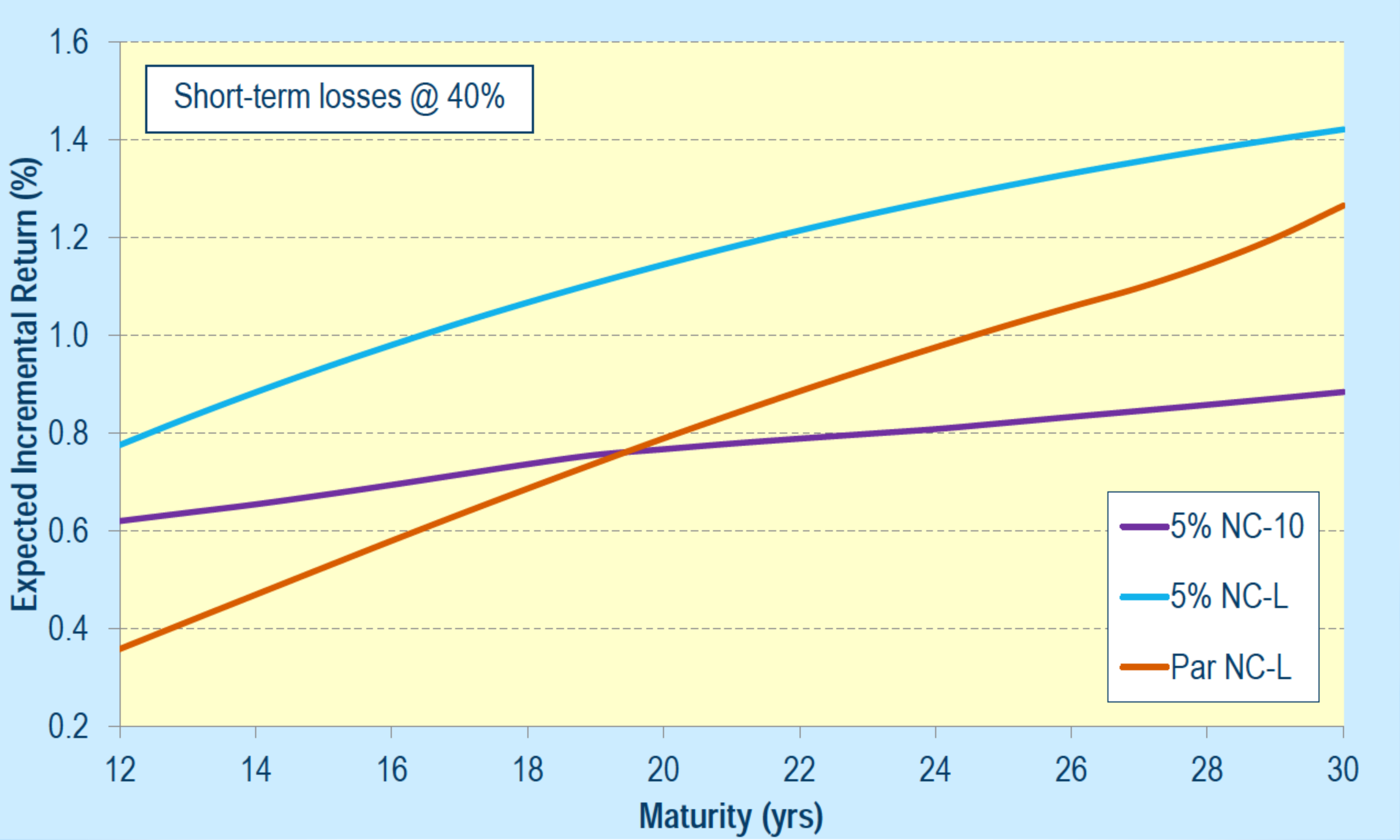
Tax-Driven Sales Improve Expected Return*

Par Bonds of Various Maturities – Held 1 Year - 1 Day



*Based on simulated rate scenarios using Black-Karasinski process @15% vol. Transaction cost 0.25% par.

Performance* Boost From Tax Management
Offsetting Short-Term Gains Available (Held 1 Year – 1 Day)



*Based on simulated rate scenarios using Black-Karasinski process @15% vol. Transaction cost 0.25% par.

Setting Up For Success: Buy Premium Bonds
Optimizing Portfolio of 10-Year Target Duration

Bond	Purchase Price	*Hold Value Duration* (Yrs)	Tax Option Value (% par)	
			Short-Term Losses Offset Short-Term Gains	Short-Term Losses Offset Long-Term Gains
5% 13-year NC-L	120.83	10.04	2.91	1.17
5% 20-year NC-10	116.18	10.04	2.90	1.32
3.05% 12-year NC-L	100.00	10.15	0.79	0.00

Tax Option Value is a Good Predictor Of Tax-Managed Performance

Bond	Purchase Price	One-Year Expected Returns (%)		
		Buy and Hold	Tax-Managed	
			Short-Term Loss @ 40%	Short-Term Loss @ 20%
5% 13-year NC-L	120.83	1.95	2.78	2.30
5% 20-year NC-10	116.18	2.14	2.90	2.46
3.05% 12-year NC-L	100.00	1.96	2.32	*1.96*

Recap: Tax-Driven Sales Enhance Performance

Value of tax option is significant

- Expected increase in annual return of intermediate-duration portfolio is 30 to 80 bps

Premium bonds are best poised to achieve superior return

- With obvious ramifications for issuers

"It's important and surprising that the concepts described are not common knowledge at this late state of the investment game"

Anonymous reviewer

Closing Observations

Potentially very profitable tax management opportunities are largely ignored in practice

- SMA managers are reluctant to advise on taxes
- Mutual funds and ETF's focus on pretax performance
- Banks and insurance companies are more concerned with regulatory and accounting matters than tax-driven trades

Variance of excess return is quite large

- Feast if market worsens, famine if it improves
- What can be done to reduce variance?

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