Optimal Municipal Bond Portfolios
For Dynamic Tax Management

New York, October 12, 2015
Tax-Loss Selling: Basic Concepts

Cashflow benefit from sale: After-tax proceeds – *Hold value*
- Gain/loss depends on investor’s tax basis
- Short-term (40% tax rate) or long-term (20%)
- Losses need offsetting gains; otherwise carried forward

Proceeds are assumed to be reinvested in a similar bond
- Credit exposure and market risk unaffected

**Tax option:** right to execute tax-beneficial transactions
- Acquired automatically, *at no cost*, at time of purchase
  - *Multigenerational*: repeated sales and reinvestments provide additional optionality
  - *Tax-efficiency* signals optimum time to sell (discussed below)
Calculation of Hold Value

Assume bond held to maturity
Or until call by issuer

Hold value = Pre-Tax Value + PV (tax paid by current holder)
Tax determined by purchase date and purchase price

Pre-Tax Value = Market price + PV (tax paid by marginal investor)
Market price reflects tax liability of marginal investor

Discount rate for terminal tax flow can be inferred from current market information using standard analytics
Questions Addressed

Which bonds are best suited for tax-loss selling?
What are the implications for issuers?

What is the expected excess return from dynamic tax management over buy-and-hold?
Calculation requires definition of after-tax portfolio value; hold value is a reasonable choice
Tax-Loss Selling: Beware of Discount Munis

Tax on gain at maturity depresses market price
   Large gain taxed at 40%, small gain as capital gains at 20%

Sale at a lower price increases tax savings, but may decrease benefit
   Benefit depends on hold value

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 Pre-Tax Analytics
Market Price and Hold Value May Diverge
10-Year Bullets (Horizon=Maturity)

Value (% Par)

Coupon (%)

Hold Value Given Above-Par Purchase Price
Market Price
Hold Value Given Purchase at 90

10-Yr Rate 3%
Sale Decision Is a Two-Step Process

1. Is it cashflow 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

\[ \text{Tax Efficiency} = \frac{\text{Cashflow Benefit} \times}{\text{Net Loss of Tax Option Value}} \]

*After-tax Proceeds from Sale – Hold Value

Maximum 100%

See demo at http://analytics.kalotay.com/munisignal/
Identifying Tax-Efficient Sale Opportunities

**XYZ Wealth Management**

**Daily Tax Management Monitor**

3/15/2015

Jane Investor

Account No. SMA-436901-2

<table>
<thead>
<tr>
<th>Bond</th>
<th>Par Amount ($)</th>
<th>Purchase Date</th>
<th>Purchase Price</th>
<th>Current Basis</th>
<th>Sale Price*</th>
<th>After-Tax Benefit if Sold ($)</th>
<th>Tax Efficiency (%)</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>5539928A2 5% due 3/1/2039-Call 3/1/2018</td>
<td>60,000</td>
<td>8/15/2014</td>
<td>123.00</td>
<td>119.14</td>
<td>118.00</td>
<td>-66.00</td>
<td>N/A</td>
<td>No Benefit</td>
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<tr>
<td>319995AH6 5% due 6/15/2024</td>
<td>85,000</td>
<td>8/15/2014</td>
<td>112.00</td>
<td>111.40</td>
<td>108.00</td>
<td>365.50</td>
<td>97.93</td>
<td>Sell</td>
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<tr>
<td>297552QR5 3% due 3/1/2021</td>
<td>95,000</td>
<td>12/2/2012</td>
<td>108.00</td>
<td>105.91</td>
<td>100.50</td>
<td>788.50</td>
<td>99.48</td>
<td>Sell</td>
</tr>
<tr>
<td>615887YE5 3% due 3/1/2024</td>
<td>78,000</td>
<td>7/8/2014</td>
<td>104.00</td>
<td>103.62</td>
<td>101.00</td>
<td>210.60</td>
<td>85.84</td>
<td>Watch</td>
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<tr>
<td>977564HW5 2% due 5/1/2023</td>
<td>65,000</td>
<td>11/7/2012</td>
<td>80.00</td>
<td>80.00</td>
<td>94.00</td>
<td>552.50</td>
<td>100.00</td>
<td>Sell**</td>
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<tr>
<td>546787UX8 3% due 5/1/2023</td>
<td>80,000</td>
<td>10/1/2014</td>
<td>100.00</td>
<td>100.00</td>
<td>95.00</td>
<td>-544.00</td>
<td>N/A</td>
<td>No Benefit</td>
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<tr>
<td>855972ZA9 5% due 6/15/2043-Call 6/15/2024</td>
<td>90,000</td>
<td>8/15/2013</td>
<td>122.00</td>
<td>119.16</td>
<td>117.00</td>
<td>162.00</td>
<td>71.15</td>
<td>Hold</td>
</tr>
</tbody>
</table>

*Assumes 0.50 bid/ask spread.

**Bifurcated tax treatment.

Short-term losses offset against long-term gains (20%). Income tax rate: 40%.
Alternative Definitions of A/T Portfolio Value Needed to Calculate A/T Performance

Market Value $X$

Liquidation Value (Indiscriminate sale)

**Hold Value** *Used below; also for duration calculation*

Intrinsic Value (H.V. + Exercise Value of Tax Option)

Option Enhanced Value (H.V. + Full Value of Tax Option)
## Assumptions for Exhibits Below

<table>
<thead>
<tr>
<th>Interest Rate Process</th>
<th>Black-Karasinski</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Optionless</td>
<td>1y 5y 10y 20y 30y</td>
</tr>
<tr>
<td>Yield Curve</td>
<td>2.0% 2.4% 3.0% 3.25% 3.50%</td>
</tr>
<tr>
<td>Short Rate Volatility</td>
<td>15%</td>
</tr>
<tr>
<td>Mean Reversion</td>
<td>2</td>
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<tr>
<td>Tax Rate Assumptions</td>
<td>Income 40%</td>
</tr>
<tr>
<td></td>
<td>Short-term gain/loss 40%</td>
</tr>
<tr>
<td></td>
<td>Long-term gain/loss 20%</td>
</tr>
<tr>
<td>Transaction Cost</td>
<td>0.25% of par</td>
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</tbody>
</table>
After-Tax Return for 20-NCL 3.25% Par Bond
Held 1 Year – 1 Day

Return vs. Yield Curve Shift (bps)

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

Return vs. Yield Curve Shift (bps)

-15% -10% -5% 0% 5% 10% 15% 20% 25%

Managed
Unmanaged

No benefit
After-Tax Return for 20-NCL 5% Bond
Held 1 Year – 1 Day

Graph showing the relationship between Return and Yield Curve Shift (bps) for Managed and Unmanaged scenarios.
Tax Management Improves Expected Return* Par Bonds of Various Maturities (Held 1 Year – 1 Day)

*Monte Carlo simulation, Black-Karasinski process @15% vol. Transaction cost 0.25% par.
Performance Boost From Tax Management*
Held 1 Year – 1 Day

*Monte Carlo simulation, Black-Karasinski process @15% vol. Transaction cost 0.25% par.
### Setting Up For Success: Maximize Tax Option Value

**10-Year Target Duration**

<table>
<thead>
<tr>
<th>Bond</th>
<th>Purchase Price</th>
<th>Hold Value Duration (Yrs)</th>
<th>Tax Option Value (% par)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Short-Term Losses Offset Short-Term Gains</td>
</tr>
<tr>
<td>5% 13-year NC-L</td>
<td>120.83</td>
<td>10.04</td>
<td>2.91</td>
</tr>
<tr>
<td>5% 20-year NC-10</td>
<td>116.18</td>
<td>10.04</td>
<td>2.90</td>
</tr>
<tr>
<td>3.05% 12-year NC-L</td>
<td>100.00</td>
<td>10.15</td>
<td>0.79</td>
</tr>
</tbody>
</table>
**Tax Option Value is a Good Predictor Of Tax-Managed Performance – 1-Yr Horizon**

<table>
<thead>
<tr>
<th>Bond</th>
<th>Purchase Price</th>
<th>Un-managed Return (%)</th>
<th>Excess Return From Tax Management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Short-Term Loss @ 40%</td>
</tr>
<tr>
<td>5% 13-year NC-L</td>
<td>120.83</td>
<td>1.95</td>
<td>+83bps</td>
</tr>
<tr>
<td>5% 20-year NC-10</td>
<td>116.18</td>
<td>2.14</td>
<td>+76bps</td>
</tr>
<tr>
<td>3.05% 12-year NC-L</td>
<td>100.00</td>
<td>1.96</td>
<td>+36bps</td>
</tr>
</tbody>
</table>
Recap

Expected excess return of optimized portfolio is significant
As much as 80 bps for intermediate-duration portfolio

Long-duration premium bonds are best poised to achieve superior after-tax return
Bonds purchased near par are unsuitable for sale after 1 year
Consideration for issuers: tax-aware investors may prefer optionless bonds to callable bonds

Reducing variance of excess return is a challenge
Feast if market worsens, famine if it improves
Tax Management Today: Missed Opportunities

SMA managers reluctant to advise on taxes

Mutual funds and ETF’s measured on pretax performance

Banks and insurance companies focus on regulatory and accounting matters
References

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“How to Take a Tax Loss and Then Profit From Obamacare” Bond Buyer, (December 11, 2013)

“Why Buy-and-Hold Is Dead” Bond Buyer, (February 24, 2015)

“After-Tax Portfolio Value: The Missing Tax Option” (Unpublished)