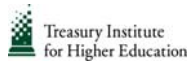


# Treasury Symposium 2006

Analytical and Practical  
Guide to Refundings  
January 2006

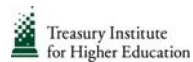


## Contact Information

**Scott Douglass**  
*Vice President for Finance and  
Treasurer  
University of Pennsylvania  
ph (215) 898-1005  
douglass@pobox.upenn.edu*

**Patrick Hennigan**  
*Managing Director, Higher Education and  
Not-for-Profit Group  
Morgan Stanley  
ph (212) 762-8262  
Patrick.Hennigan@morganstanley.com*

**Eric Wild**  
*Managing Director, Higher Education and  
Not-for-Profit Group  
Morgan Stanley  
ph (212) 762-8293  
Eric.Wild@morganstanley.com*



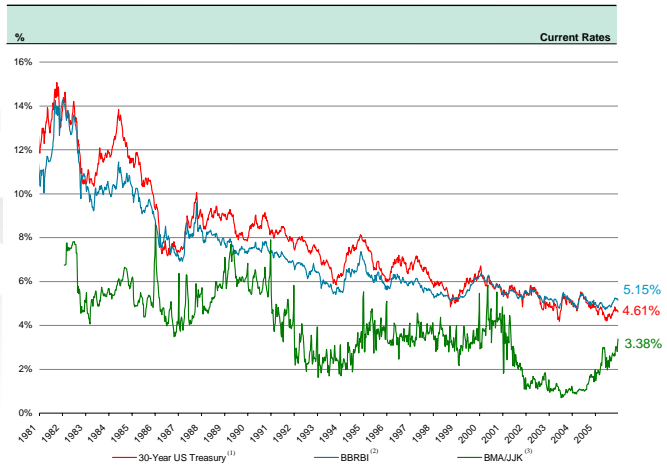
# Table of Contents

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<b>Section 4</b>	Synthetic Refundings
<b>Section 5</b>	Practical (& Tactical) Issues
<b>Section 6</b>	In Conclusion...

## Market Overview – Changes Since Last Year

## Historical Review of Interest Rates As of December 23, 2005

Historical Averages			
%	Treasury	BBRBI	BMA
1-Yr Average	4.50%	4.90%	2.41%
2-Yr Average	5.00%	5.21%	3.76%
10-Yr Average	5.60%	5.48%	2.67%
High	15.07%	14.32%	7.89%
Low	0.18%	0.72%	0.70%

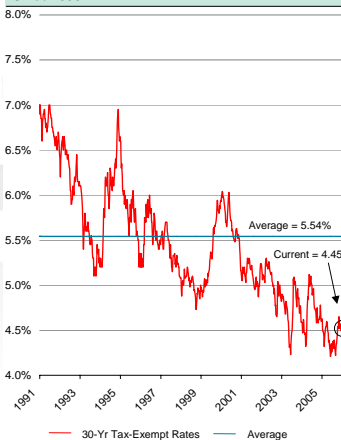


Notes  
 1. 30-year Treasury Historical Data since January 1, 1981.  
 2. The Bond Buyer Revenue Bond Index is the arithmetic average of the yields to maturity for 25 A1 rated, 30 year revenue bonds. BBRBI began in 1979.  
 3. JJ Kenny Index began 1982. The Bond Market Association Municipal Swap Index (formerly the PSA Index) tracks non-AMT, weekly-reset bonds and began in 1989.

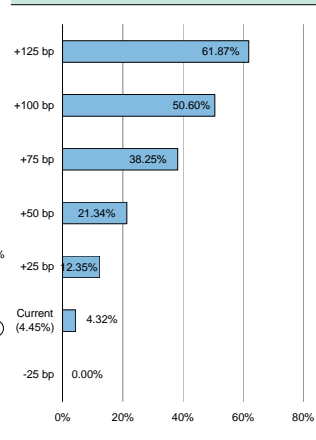
## Tax-Exempt Fixed Rates Are Near Historic Lows As of December 23, 2005

- 30-year tax-exempt fixed rates have been below current rates 4.32% of the time since 1990

Historical 30-Year Tax-Exempt Fixed Rates Since 1990



Percent of Time 30-Year Rate Has Been Below Current Level Since 1990



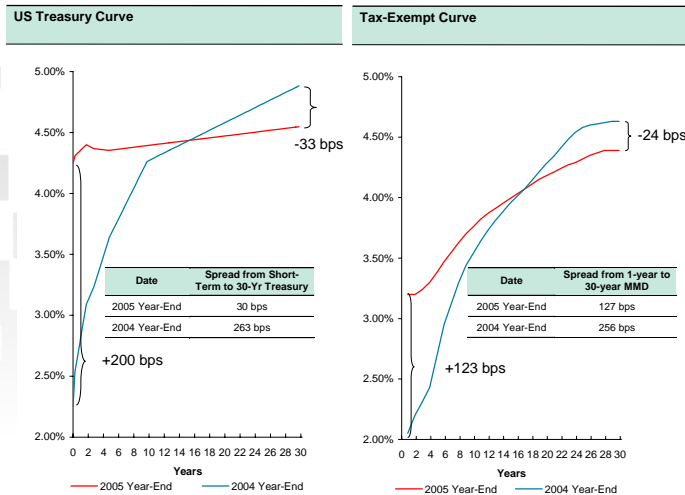
## Yield Curve Shift Comparison between Year-End 2004 and 2005

Year-End Comparison: 2004 vs. 2005						
	Taxable - Treasuries			Tax-Exempt - AAA		
	2004	2005	Spread (bps)	2004	2005	Spread (bps)
<b>Rates</b>						
Short-term <sup>(1)</sup>	2.25%	4.25%	200	1.69%	2.92%	123
2-Year	3.09%	4.40%	131	2.20%	3.20%	100
3-Year	3.25%	4.37%	112	2.31%	3.24%	93
5-Year	3.64%	4.35%	71	2.69%	3.38%	69
10-Year	4.26%	4.39%	13	3.54%	3.76%	22
30-Year	4.88%	4.55%	-33	4.63%	4.39%	-24
<b>Spreads</b>						
2's-3's	16	-3	-19	11	4	-7
3's-5's	39	-2	-41	38	14	-24
5's-10's	62	4	-58	85	38	-47
10's-30's	62	16	-46	109	63	-46
2's-30's	179	15	-164	243	119	-124

1. The short-term index used is the Fed Funds rate for the taxable section and the BMA Index for the tax-exempt section

## Yield Curve Shift Comparison between Year-End 2004 and 2005

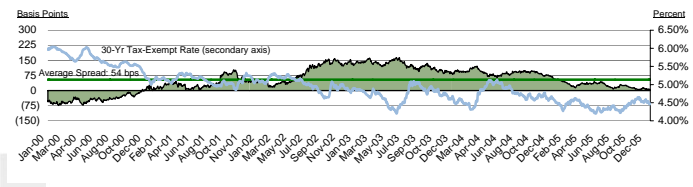
- The yield curve has flattened significantly over the past year



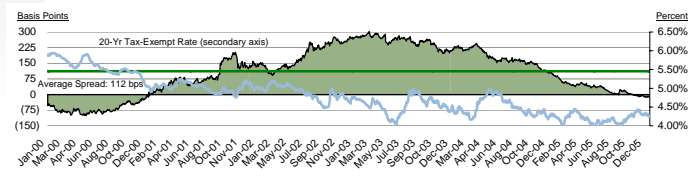
# Refunding Driven by Tax-Exempt and Taxable Markets

- Savings are a function of available tax-exempt rates as well as taxable reinvestment rates (for advance refundings)

**Longer-Duration Escrows**  
Spread Between 30-year Tax-Exempt and 7-year US Treasuries

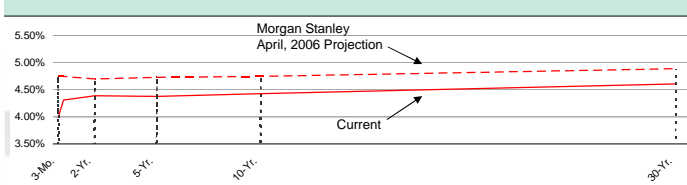


**Shorter-Duration Escrows**  
Spread Between 20-year MMD and 3-year US Treasuries

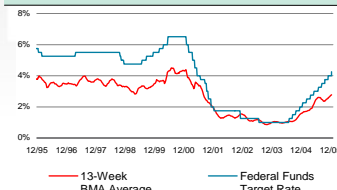


# Interest Rate Outlook December 23, 2005

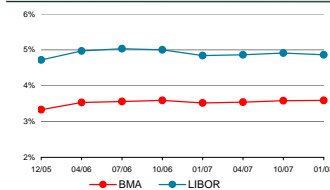
**US Treasury Yield Curve Projection**



**Historical Federal Funds Rate Movement**  
December 1995 - Present




**3 Month BMA and LIBOR Projections**  
(Based on the forward BMA and LIBOR swap curves)





## Common Refunding Savings Criteria



## Common Criteria for Executing Refunding

- Incremental Savings Test
- Minimum Savings Threshold Test
- Sliding Scale Savings Threshold Test
- Opportunity Cost Test
- Theoretical Option Value Threshold Test

## Incremental Savings Test

Criteria: **Any bond generating savings is refunded**

### Application

- Restructurings
  - Cash Flow
  - Indenture
- Substantially higher interest rate outlook
- Maximize savings

### Comments

- Opportunity cost
- Efficiency

## Minimum Savings Threshold Test

Criteria: **Any bond generating 3% savings (per maturity) is refunded**

### Application

- Very Common
- Ranges of 2% - 5%

### Comments

- Works well for medium term and longer maturities
- “High hurdle” for shorter maturities

## Sliding Scale Threshold Test

Criteria:

**Each maturity must have a targeted savings percentage based on years between call date and maturity**

<u>Term in years (Maturity vs. Call)</u>	<u>Minimum % Savings</u>
0 – 2	1.0%
2 – 4	2.0%
4 – 7	2.5%
7 – 10	3.0%
10+	3.5%

### Comments

- Selection reflects potential opportunity
- May produce better results over time than other tests

## Opportunity Cost Test

Criteria:

**Any bond is excluded from refinancing if a decrease in rates of 25 bps increases savings by 50% or more**

### Application

- Frequent Borrowers with quick market access
- Used by states of Ohio and Wisconsin

### Comments

- Context of rate environment
- Shape of curve

## Theoretical Option Value Test

Criteria:

**Any bond that generates savings greater than 65% of the theoretical option value is refunded**

### Comments

- Captures “opportunity cost” of refunding today vs. waiting
- Incorporates “time value” of the call option

## Screen Shot of Option Value Model

GRAB Muni OAS1

**OPTION-ADJUSTED SPREAD ANALYSIS**

PA HGR ED TRUSTE (PA) PASHGR 4 1/2 7/15/21 DATED: 1/15/98

Calculate Price OAS (bp)  
(P, O, V) P 100.196491 0) -18.38

Cusip / ID# 7091713K6 Option Px Value: 4.69  
Settle 1/ 9/2006 Vega: 0.33

2) Customize  
Curve #49 Sem  
"AAA" GO Yield Cu  
Dated 1/ 4/2006  
Settle 1/ 9/2006

Shift +10(bps)  
Yield YldVol

(NUM)<GD> for:	OAS	Option	To Call on	To	
	Method	Free	7/15/2008	Mtu	
3) Call Schedule					
7/15/ 8 100.00	Yld	4.072	4.416	4.482	3m 3.210 17.28
7/15/ 9 100.00	Sprd	-18.9	102.5	22.1	6m 3.230 13.61
7/15/10 100.00	M Dur	5.46	2.31	10.85	1y 3.270 11.42
7/15/11 100.00	Risk	5.58	2.36	11.11	2y 3.350 10.08
7/15/12 100.00	Cvx	-2.00	0.07	1.51	3y 3.430 11.67
7/15/13 100.00					4y 3.510 13.10
7/15/14 100.00					5y 3.580 13.48
7/15/15 100.00					7y 3.730 13.49
7/15/16 100.00					10y 3.930 12.47
					20y 4.390 9.10
					30y 4.460 9.81

Model B B=Black-Derman-Toy  
Exercise Premium 0.00

BB) REFRESH

Australia 61 2 3777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 730410  
Hong Kong 852 2977 6000 Japan 81 3 3201 8500 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2006 Bloomberg L.P.  
6783-483-0 04-Jan-06 18:34:48

## Sample Results

### Assumptions

- Refunded Fixed Rate Bonds
  - 5% coupon on all bonds
  - Callable 2007 at 100%
- Savings discount rate: arbitrage yield

Sample Refunding Analysis Results

Refunded Bond		Refunding Bond	Results				
Maturity	Coupon	Yield	Incremental Savings Test	Minimum Savings Test	Sliding Scale Test	Opportunity Cost Test	Theoretical Option Value Test
1/15/2008	5.00%	3.34%	✓			✓	
1/15/2009	5.00%	3.40%	✓		✓	✓	✓
1/15/2010	5.00%	3.50%	✓	✓	✓	✓	✓
1/15/2011	5.00%	3.62%	✓	✓	✓	✓	✓
1/15/2012	5.00%	3.70%	✓	✓	✓	✓	✓
1/15/2013	5.00%	3.80%	✓	✓	✓	✓	✓
1/15/2014	5.00%	3.87%	✓	✓	✓	✓	✓
1/15/2015	5.00%	3.93%	✓	✓	✓	✓	✓
1/15/2016	5.00%	3.99%	✓	✓	✓	✓	✓
1/15/2017	5.00%	4.04%	✓	✓	✓	✓	✓
1/15/2018	5.00%	4.08%	✓	✓	✓	✓	✓
1/15/2019	5.00%	4.12%	✓	✓	✓	✓	✓
1/15/2020	5.00%	4.15%	✓	✓	✓	✓	✓
1/15/2021	5.00%	4.18%	✓	✓	✓	✓	✓
1/15/2022	5.00%	4.21%	✓	✓	✓	✓	✓
1/15/2023	5.00%	4.24%	✓	✓	✓	✓	✓
1/15/2024	5.00%	4.27%	✓	✓	✓	✓	✓
1/15/2025	5.00%	4.29%	✓	✓		✓	✓
1/15/2026	5.00%	4.31%	✓	✓			✓
1/15/2027	5.00%	4.33%	✓	✓			✓
1/15/2028	5.00%	4.35%	✓	✓			✓
1/15/2029	5.00%	4.36%	✓				✓
1/15/2030	5.00%	4.37%	✓				✓
1/15/2031	5.00%	4.40%	✓				✓
1/15/2032	5.00%	4.42%	✓				✓

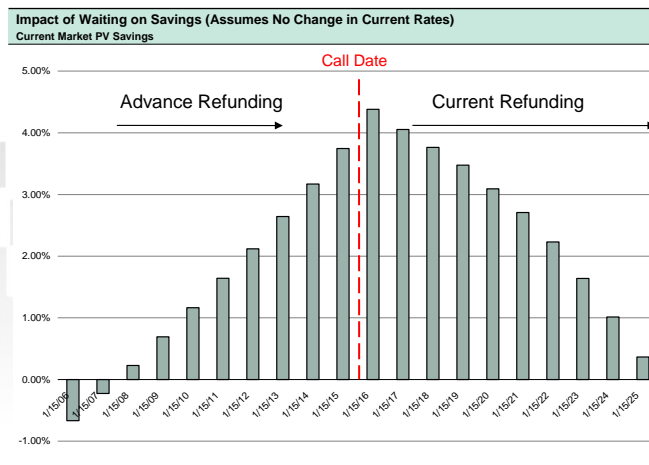
## Refunding Analysis

## Advance Refunding vs. Current Refunding

- A current refunding means that the first call date is within 90 days
  - Little or no reinvestment of proceeds
  - Generally ten years from issuance
- An “advance” refunding means that the call date is more than 90 days away
  - Can be many years in advance of call date
  - Escrow is created to defease obligations
  - Tax rules on reinvestment impact savings
  - Available rates impact savings (i.e. “negative arbitrage”)

## Advanced vs. Current Refunding Overview

- Refunding of a 20-year maturity using today's interest rates
- Percent savings of refunded bonds are based on today's present value



## Savings Analysis – Current Refunding

- For a current refunding, savings is primarily driven by:
  - existing coupon
  - absolute level of rates
  - remaining term of the bonds
  - refunding bond costs (including call premium)
- Present value savings equals:

$$PV\left(\sum_{t=1}^m [Par(bond1) \times (Cpn(bond1) - YTM(bond2)) / 2]\right)$$

- Yield to Maturity used to calculate savings
- For a 10 year bond with a 5% coupon, and a replacement yield of 4.00%, savings equal:
  - the present value of 100 bps (5%-4%) over 10 years
  - less any costs (including credit enhancement)
  - less call premium on the to be refunded debt

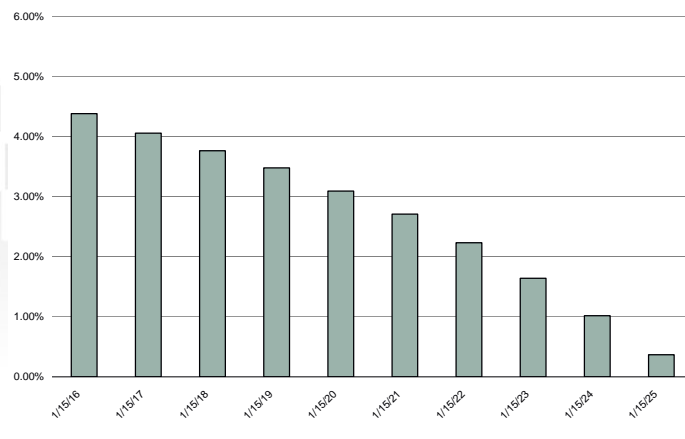
## Savings Analysis – Current Refunding

- For a bond at its call date, each day it is not called represents lost savings opportunity
- Over time, rates must generally decline in order for a borrower to "break-even"

### Assumptions

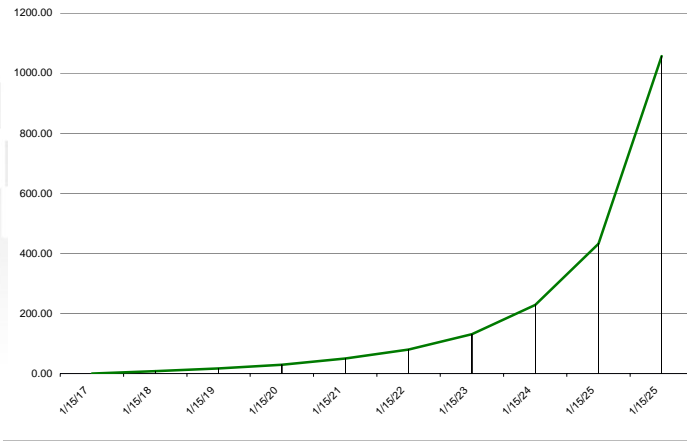
- Hypothetical refunded bond
  - 20 year maturity issued today
  - 5% coupon, 10-year par call
- Savings discount rate: 5.00%

Impact of Waiting on Savings (Assumes No Change in Current Rates)  
Current Market PV Savings



## Savings Analysis - Current Refunding

**Uniform Decrease in Yield Curve Needed to Break-Even with Savings on Call Date**  
(Uniform shift in yield curve in basis points)



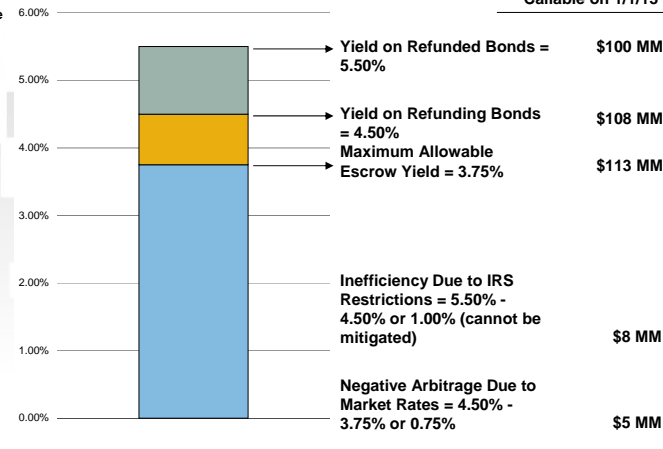
## Savings Analysis - Advance Refunding

### Escrow Economics

- Escrow created
- Increase in par
- Potential for negative arbitrage

**Escrow Economics**

**Escrow Cost Assuming  
\$100 MM of Refunded Par  
Callable on 1/1/13 @ Par**

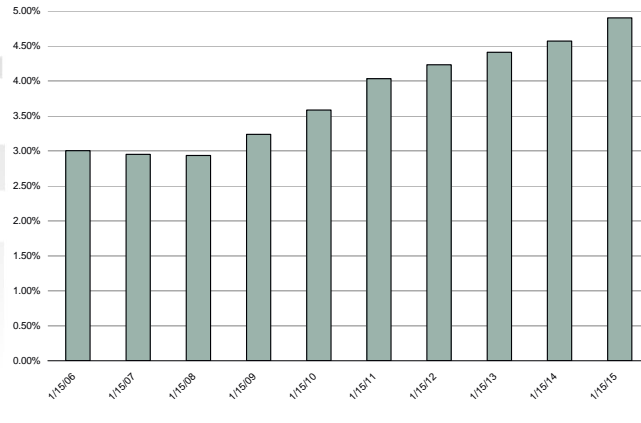


## Savings Analysis - Advance Refunding

- Assuming no change in rates, in a refunding the economics improve as the call date approaches as a result of declining cost of escrow inefficiency

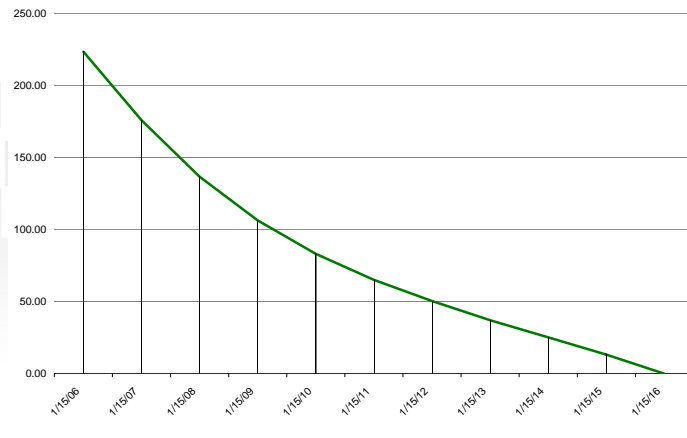
- Assumptions**
- Hypothetical refunded Bond
    - 20 year maturity issued today
    - 5% coupon, 10-year par call
  - Savings discount rate: 5.00%

**Impact of Waiting on Savings (Assumes No Change in Current Rates)**  
Current Market PV Savings



## Savings Analysis - Advance Refunding

**Uniform Decrease in Yield Curve Needed to Break-Even with Savings on Call Date**  
(Uniform shift in yield curve in basis points)



## Increasing Refunding Savings by Blending New Money and Advance Refunding

- "Blend" of yields
- Higher arbitrage yield results in fewer refunding bonds issued, thereby increasing savings

### Assumptions

- Hypothetical Series 1999 (Refunded Fixed Rate Bonds)
  - \$100 million amortizing from 2010 – 2019 (final maturity)
  - 5% coupon on all bonds
  - Callable 2009 at 100%
- Savings discount rate: 5.00%

### Impact of Blending New Money With Refunding

Description of New Issue	Standalone Refunding	Refunding Combined with New Money Issuance
	Fixed rate refunding of \$100 million of outstanding bonds	Same refunding plus \$100 million new money 30 year level debt issue
Total Bond Proceeds	\$103,855,636	\$208,267,708
Refunding Bond Proceeds	\$103,855,636	\$103,121,285
Par of Bonds Refunded	\$100,000,000	\$100,000,000
Standalone Refunding Arbitrage Yield	3.99%	N/A
Blended Arbitrage Yield	N/A	4.20%
Escrow Yield	3.99%	4.20%
Avg. annual cash flow savings	\$400,000	\$495,000
Gross cash flow savings	\$4,536,454	\$5,525,360
Present value cash flow savings @ 5%	\$3,146,394	\$3,883,096
Present value cash flow savings as a % of refunded par	3.15%	3.83%
Incremental gross savings over standalone refunding		\$988,906
Incremental present value savings over standalone refunding		\$736,702

## Synthetic Refundings

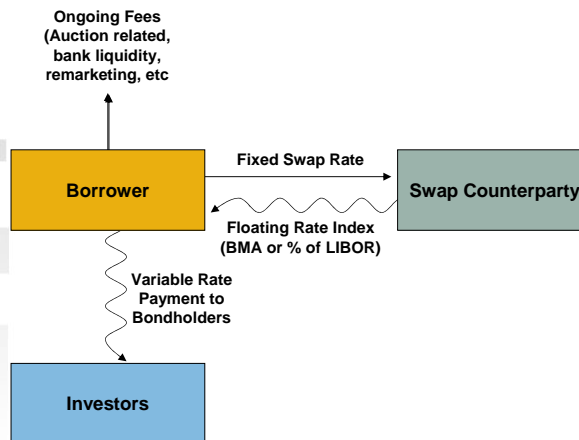
## Synthetic Refunding Considerations

- Understand the “why” of savings vs. conventional bonds
- Assess the administration of variable rate program
- As rates rise...
  - There may be more efficient refunding vehicles than % of LIBOR synthetic fixed
  - Consider Basis Swaps as a substitute

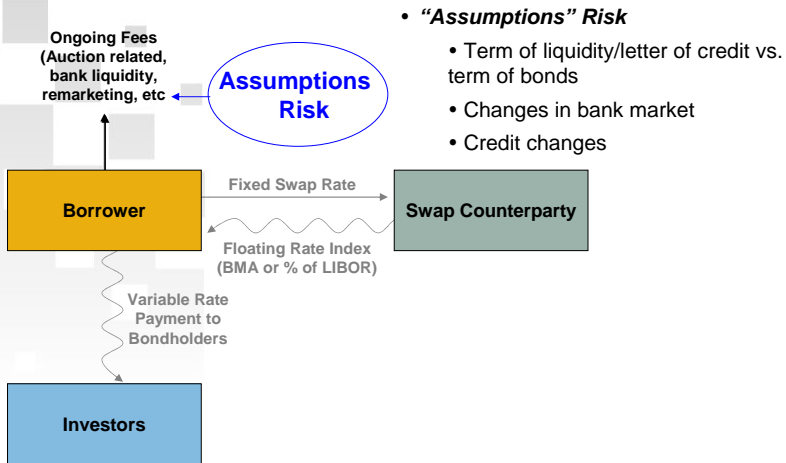
## Synthetic Refunding Mechanics

Variable rate issue with swap

- The fixed rate and all-in TIC of the synthetic refunding is generally lower than a traditional fixed rate bond refunding



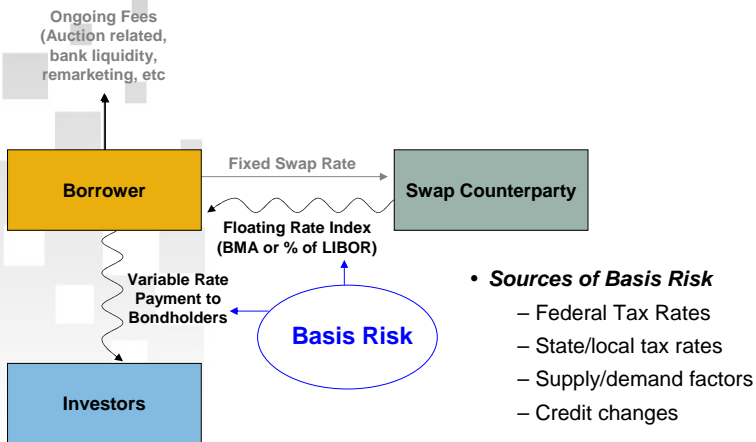
## Synthetic Refunding Mechanics



### • "Assumptions" Risk

- Term of liquidity/letter of credit vs. term of bonds
- Changes in bank market
- Credit changes

## Synthetic Refunding Mechanics

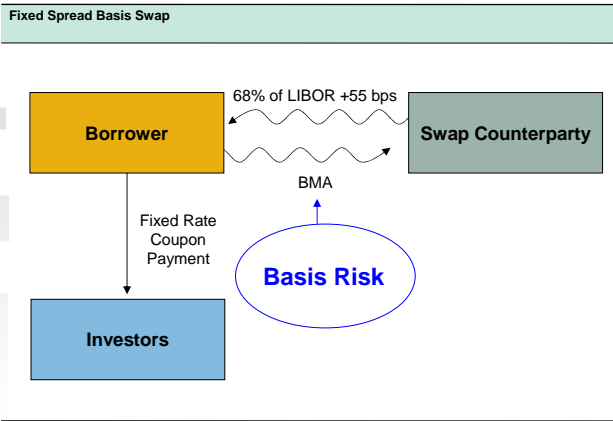


### • Sources of Basis Risk

- Federal Tax Rates
- State/local tax rates
- Supply/demand factors
- Credit changes

## Basis Swap as a Refunding Alternative

- If most of the savings from the synthetic refunding is attributable to the assumption of tax risk, a basis swap is a compelling alternative to a refunding
  - Comparable or better economics
  - No time or expense of a bond issue
  - Preserves underlying call option and future refinancing flexibility on the outstanding bonds



## Basis Swap as an Alternative to Synthetic Refunding

### Refunding Assumptions

- Hypothetical Series 2003 (Refunded Fixed Rate Bonds)
  - \$100 million amortizing from 2014 – 2033 (final maturity)
  - 5% coupon on all bonds
  - Callable 2013 at 100%
- Savings discount rate: 5.00%

### Basis Swap as an Alternative to Refunding

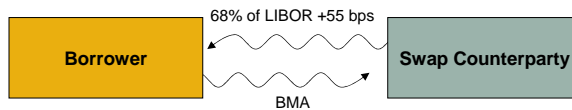
Description	Advance Refunding BMA Swap	Advance Refunding 68% of LIBOR Swap	Fixed Spread Basis Swap on Refunding Candidates
Par Amount of Refunding Bonds	\$105,700,000	\$109,650,000	N/A
Par of Bonds Refunded	\$100,000,000	\$100,000,000	N/A
Borrower Pays	4.23%	3.60%	BMA
Borrower Receives	BMA	68% of LIBOR	68% of LIBOR plus 50 basis points
Annual cash flow savings	\$50,000	\$310,000	\$490,000 in 1st year, declining as notional amount amortizes
Gross cash flow savings	\$1,291,229	\$8,652,600	\$9,178,995
Present value cash flow savings @ 5%	\$778,297	\$4,817,720	\$5,723,556
Present value cash flow savings as a % of refunded par	0.78%	4.82%	5.72%
Retained option value (theoretical)	\$0	\$0	\$5,020,000
<b>Total NPV (expected)</b>	<b>\$778,297</b>	<b>\$4,817,720</b>	<b>\$10,743,556</b>

## Basis Sensitivity Analysis

- Table to the right illustrates the impact of entering a 68% of LIBOR swap under different absolute LIBOR levels and BMA/LIBOR ratios
- Shaded areas indicate the average +/- 1 standard deviation over the last 20 years
- For example, if LIBOR = 5% and BMA as % of LIBOR = 60% then the counterparty would receive a net surplus of 95 basis points inclusive of the benefit of 55 basis points from entering into a % of LIBOR swap
- If, however, BMA as a % of LIBOR=90% the counterparty would experience a net cost of 55 basis points including the benefit of 55 basis points from entering into a % of LIBOR swap

**Cost Analysis of 68% of LIBOR:**  
68% of LIBOR plus/(minus) spread, including 55 basis point benefit of a % of LIBOR Swap

LIBOR	Variable Rate Bond Trading Level (% of LIBOR)				
	60%	68%	80%	90%	100%
1.00%	63 bps	55 bps	43 bps	33 bps	23 bps
2.00%	71 bps	55 bps	31 bps	11 bps	(9 bps)
3.00%	79 bps	55 bps	19 bps	(11 bps)	(41 bps)
4.00%	87 bps	55 bps	7 bps	(33 bps)	(73 bps)
5.00%	95 bps	55 bps	(5 bps)	(55 bps)	(105 bps)
6.00%	103 bps	55 bps	(17 bps)	(77 bps)	(137 bps)
7.00%	111 bps	55 bps	(29 bps)	(99 bps)	(169 bps)
8.00%	119 bps	55 bps	(41 bps)	(121 bps)	(201 bps)
9.00%	127 bps	55 bps	(53 bps)	(143 bps)	(233 bps)
10.00%	135 bps	55 bps	(65 bps)	(165 bps)	(265 bps)



## Practical (& Tactical) Issues

## Cashflow Restructuring

- Improve debt service coverage
- Can be used to “re-allocate” average life
- What is an institution’s “cost of funds”?
- Borrowing cost vs. operating cost
- How to measure savings

## Covenant Change/Elimination – At What Cost?

- Escrow to call vs. tender
- Bonds must be called on first date where savings result
- Fixed to variable issue
- “Springing” covenant changes
- How critical are changes versus cost/exercise of a call?



## In Conclusion...



## In Conclusion

- Institutions use different criteria for choosing when and if to execute refinancings
- Establish criteria/goals
- Use new money financings as an opportunity to selectively refinance
- Understand risks and mitigants of structures
- Use sensitivity analyses to understand what could “go wrong”
- Ask about “alternatives”