

Callables/Structured Notes: Behind the Curtain Discussion with a Trading Desk



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Ever wonder how the Government Agencies decide what maturity, call structure, and step coupons they issue?

This session will provide insight on issuance as well as analysis to see if callable agency debt is a fit for your portfolio.

GSE Callables

- Quick Refresh
- Market Update
- A Look Behind the Curtain
- Additional Analysis, Features and Uses
- Recommendations

What is a Callable?

- What is a callable bond?
 - A bond that can be redeemed by the issuer prior to maturity.
- The purchaser of a callable bond effectively buys a bullet bond and sells a call option on the bond to the issuer.
- Selling the right but not the obligation to call the bond allows the investor to earn incremental yield.
- Callable debt can ONLY be called by the issuer.
- When rates are falling, the issuer benefits from being able to call the bond and issue new debt at lower yields.
- Callable debt is used extensively by the GSEs to hedge the prepay option that mortgage borrowers have.

Why Buy Callables?

- Yield enhancement without additional credit risk
- Yield enhancement to mitigate additional interest rate risk
- Large, liquid, and active markets
- Opportunities for customization to meet specific investor objectives

Credit Quality

- Callables are issued under the GSE's Senior Debt programs

Moody's	Aaa
S&P	AA+
Fitch	AAA

Benefits and Risks

- Callable agency benefits include:

- Positive spread vs. agency bullets
- Parallel credit quality (no additional credit risk for additional spread)
- Liquidity (bid/offer spread) varies with one-time calls being the narrowest
- Custom structures with ability to set deal size, call frequency, dates and maturity date
- One-time calls have positive performance characteristics if they extend beyond the call date and should tighten relative to the agency bullet curve

- Callable agency risks include:

- Call options result in negative convexity, lessening the ability of the bond to participate in a falling rate environment and increasing the likelihood of extending in a rising rate scenario
- Callables are less liquid than global benchmark bullets but have similar liquidity as negotiated bullet deals of similar size
- Prepayment Risk – All principal returned when favorable for issuer, forcing re-investment at lower rates

Callable Marketplace

- Participants
 - State and Local Governments
 - Broker/Dealers
 - Domestic Depository Institutions
 - Investment Managers
 - Insurance Companies, Pension Funds
 - Corporate Treasury Accounts
 - Foreign Banks/Governments
- Daily Trading Volumes = \$500mm - \$1b+

Primary Market Activity

- 2014-2018: 25,000+ Issues totaling \$1.9T
- 75% (\$1.4T) 1-5yr Maturities
- More than 50 Active Underwriters

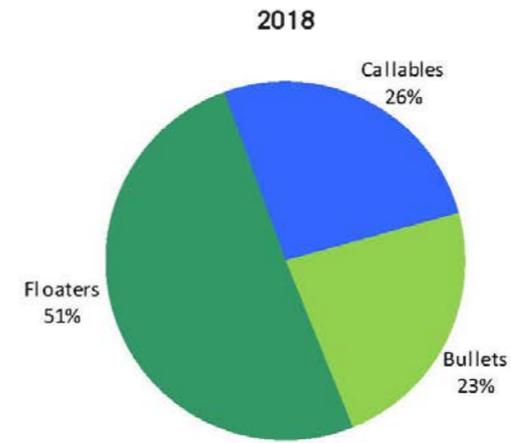
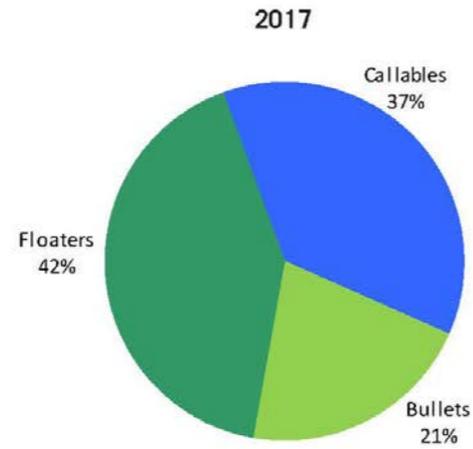


Yield Curve: A Picture is Worth a Thousand Words

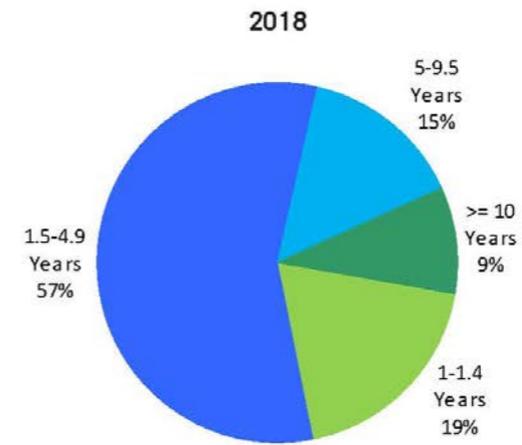
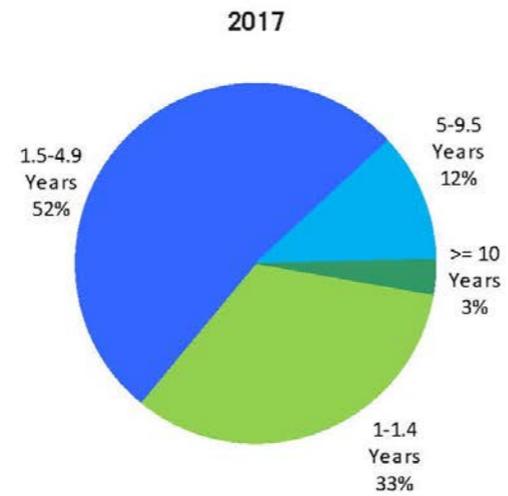


Source: Bloomberg

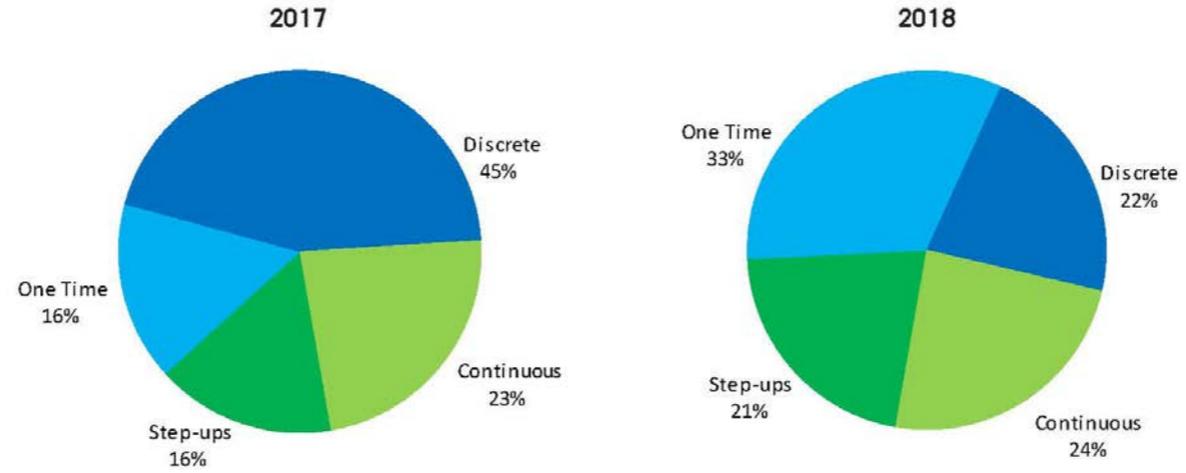
US AGENCY ISSUANCE BY TYPE



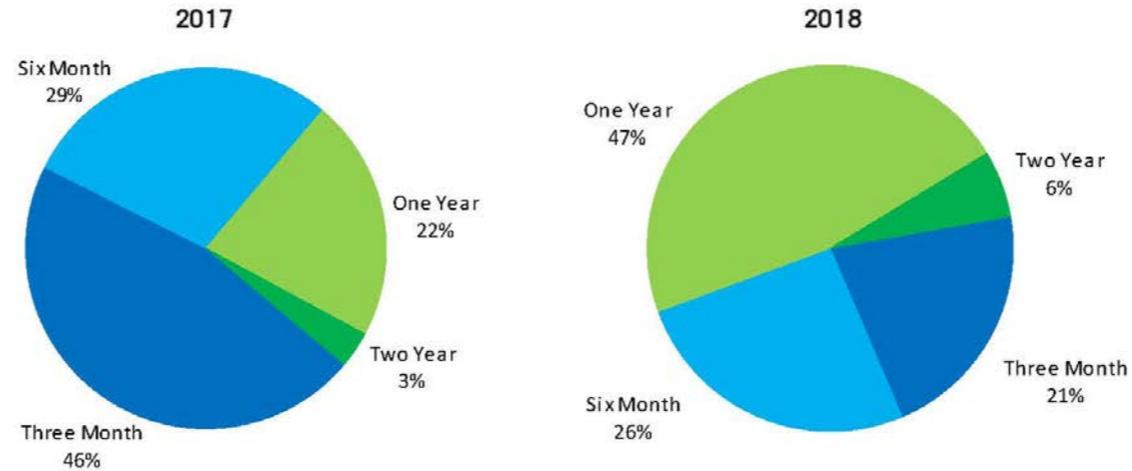
US AGENCY ISSUANCE BY MATURITY



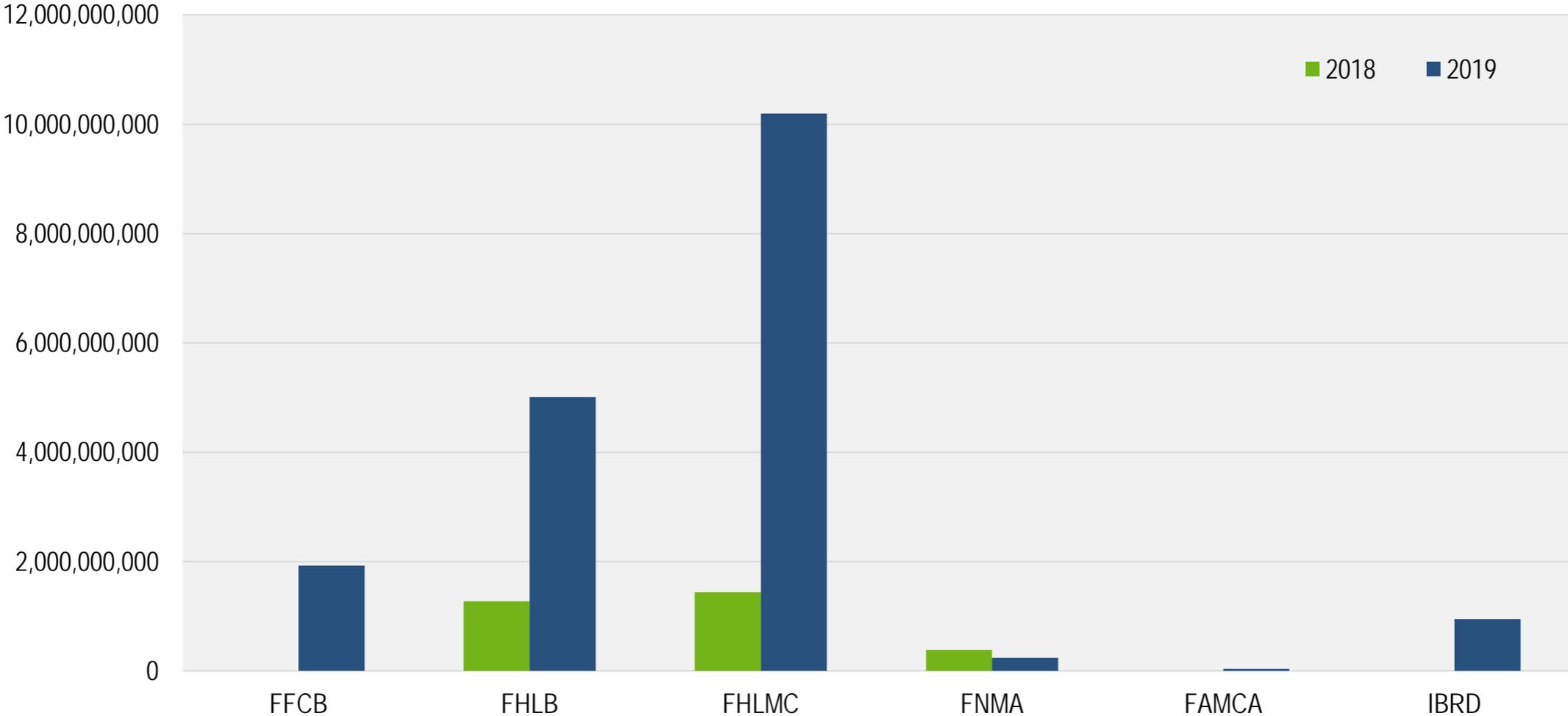
US AGENCY ISSUANCE BY CALL TYPE



US AGENCY ISSUANCE BY FIRST CALL DATE



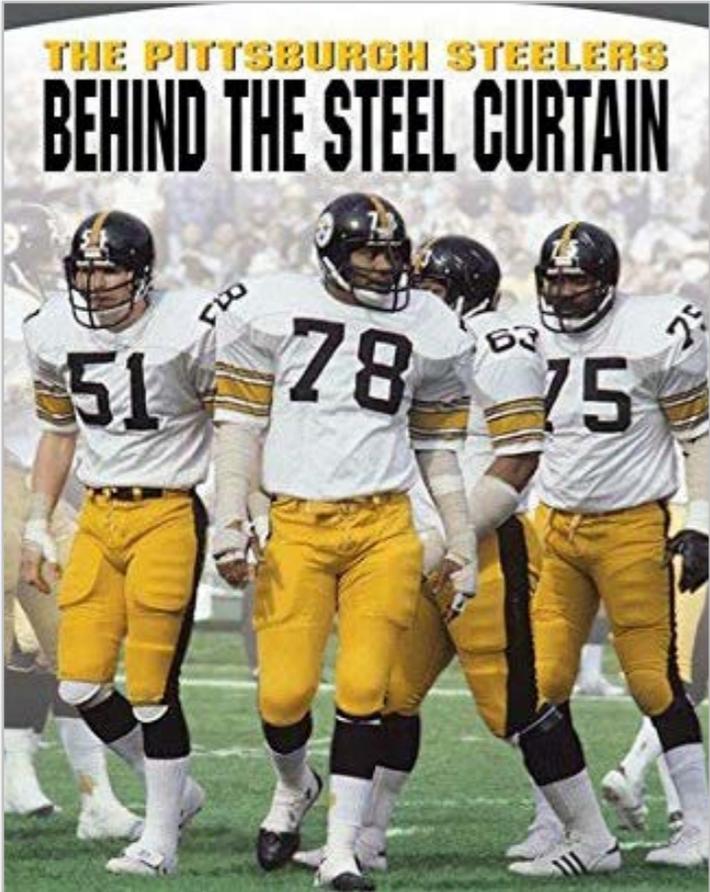
GSE Calls for 2018 & 2019*



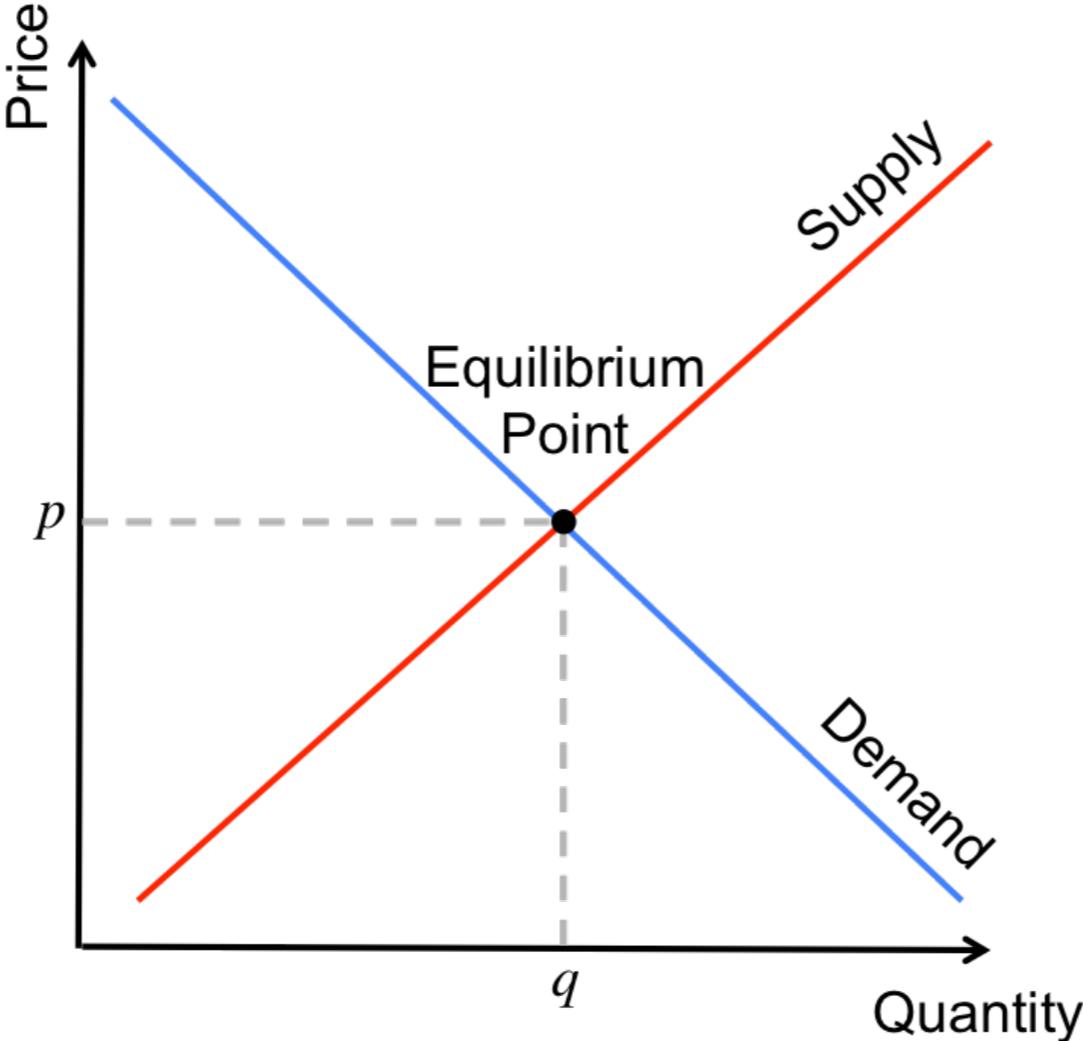
*As of March 10, 2019



A Look Behind the Curtain



Supply and Demand



Issuers

- Asset/Liability Matching
 - Issuers have floating rate assets so they need floating rate liabilities
- Post daily LIBOR funding levels based on funding needs
- Duration and term fit is driven by assets they are funding
- Buying a call option from investors allows issuers to retain control of supply in exchange for paying a higher coupon (incremental yield for investors)
- Issue bonds negotiated (reverse inquiry) or through an auction bidding process

Underwriter

- Negotiated Deals
 - Reverse inquiry
 - Issuer demand for funding
 - Market offering value
 - Gaps in the market
- Callable Auctions
- Secondary market liquidity

Types of Structures

- Coupon Types
 - Fixed rate
 - Variable or floating rate bonds
 - Callable bonds with step coupons
 - Zero coupon bonds
 - Discount Notes
- Optionality
 - Callable or Non-Callable (“Bullets”)
 - Types of Embedded Call Features
 - American
 - Bermudan
 - European
 - Canary (combines Bermudan and European call options)
- Cushion (premium) vs. Discount
- Maturities range from overnight to 30 years

Underwriting Process

- Negotiated
 - Customer and/or dealer driven
 - Fannie Mae, Freddie Mac, FHLBanks, Farmer Mac
 - The World Bank, Asian Development Bank, IADB and other Supranationals
- Callable Auction
 - Issuer driven
 - FHLBanks, FFEB, and Farmer Mac

Interest Rate Swap

**Swap
Counterparty**

Pays Floating Rate: LIBOR minus X
←
→
Pays Fixed Coupon Schedule

Issuer

Interest Rate Swap

**Swap
Counterparty**

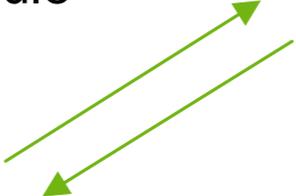
Pays Floating Rate: LIBOR minus X



Pays Fixed Coupon Schedule

Issuer

Underwriter



Interest Rate Swap

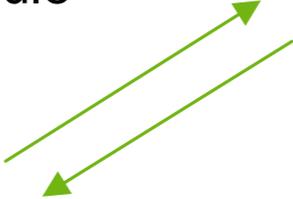
**Swap
Counterparty**

Pays Floating Rate: LIBOR minus X

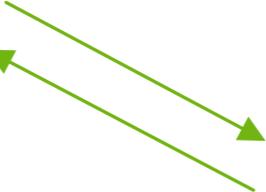


Issuer

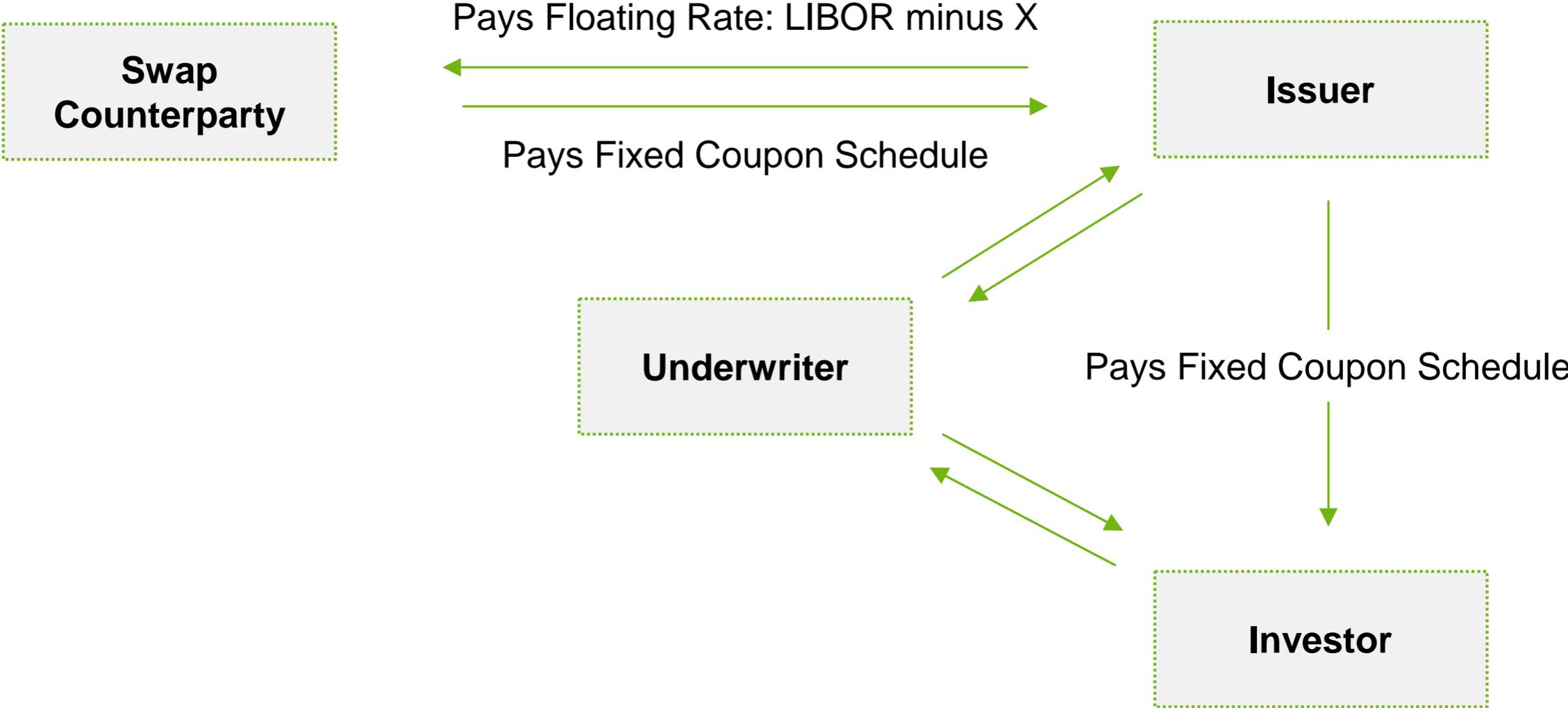
Underwriter



Investor



Interest Rate Swap



Quick Refresh on Important Terms

- Duration/Effective Duration
- Convexity
- Expected Life
- Book Yield
- Total Return

Duration and Expected Life

- **Duration** is one measure of a fixed income security's interest rate risk. It gives us a close approximation of how much a bond's price will increase given small, uniform decreases in its yield, or how much it will decrease when its yield goes up.
- Bonds with prepayment options, like callables, are typically evaluated using their effective duration. **Effective duration** is an adjusted duration that reflects the probability that principal will be returned before its maturity date.

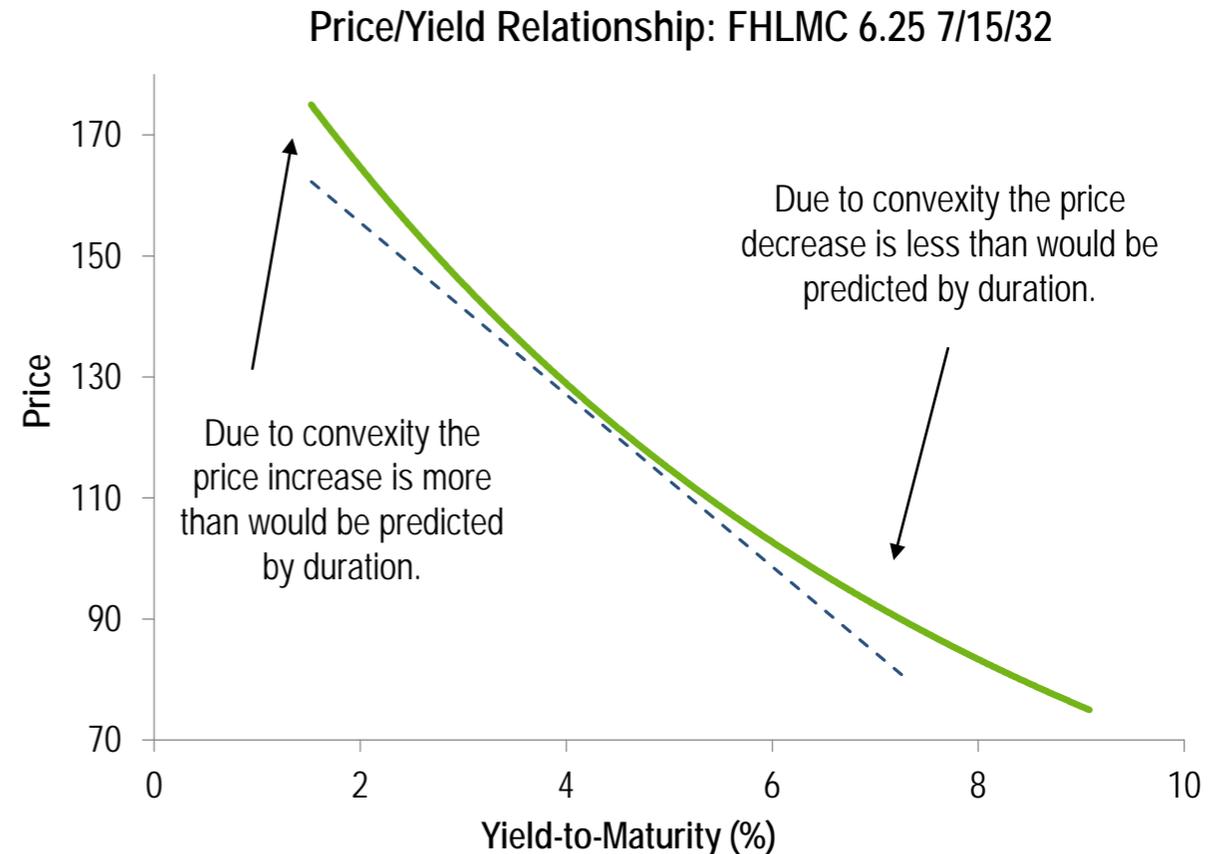
5yr Non-Callable: approx 4.7

5yr nc 1yr: approx 3.1

- **Expected Life** is the date in the future that market participants expect redemption of callable bonds using assumptions for the overall level of interest rates and market spreads.

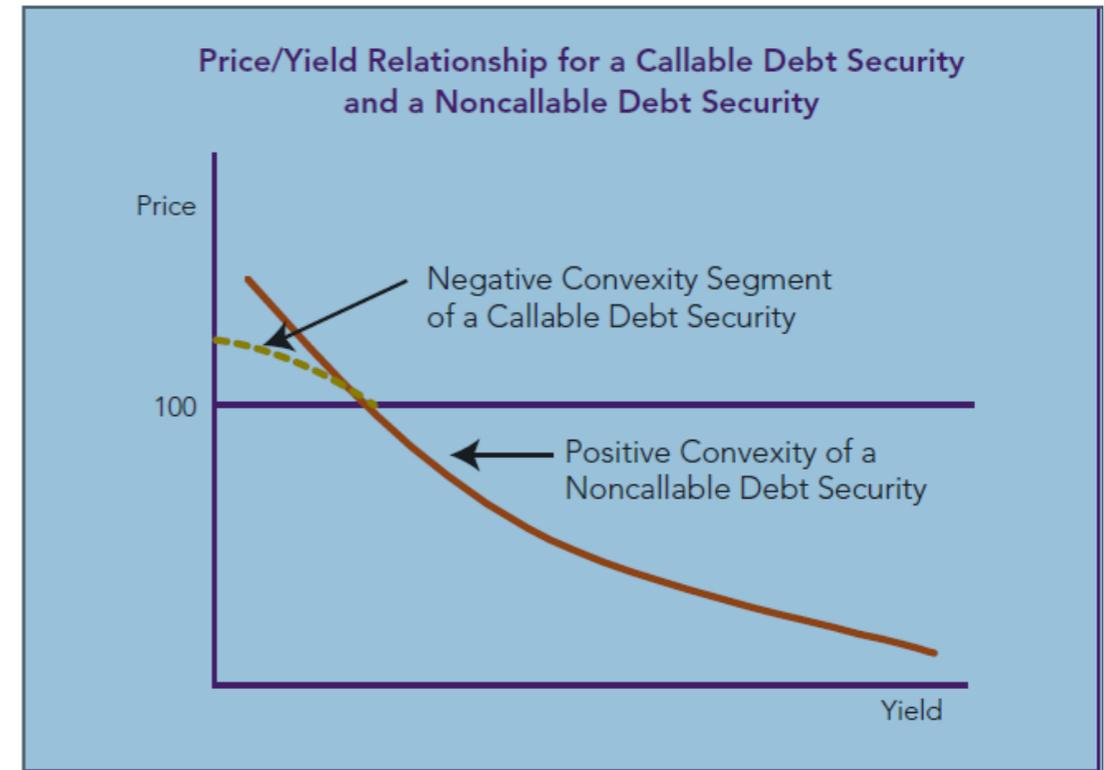
Convexity

- Convexity is the second main interest rate risk measure for bonds.
- Since the price/yield relationship is not linear, we need a second term to capture the curvature of the price yield function.
- Convexity is valuable to investors. The more convex a bond's price/yield function, the smaller (larger) the price decline (increase) for a large increase (decrease) in interest rates.

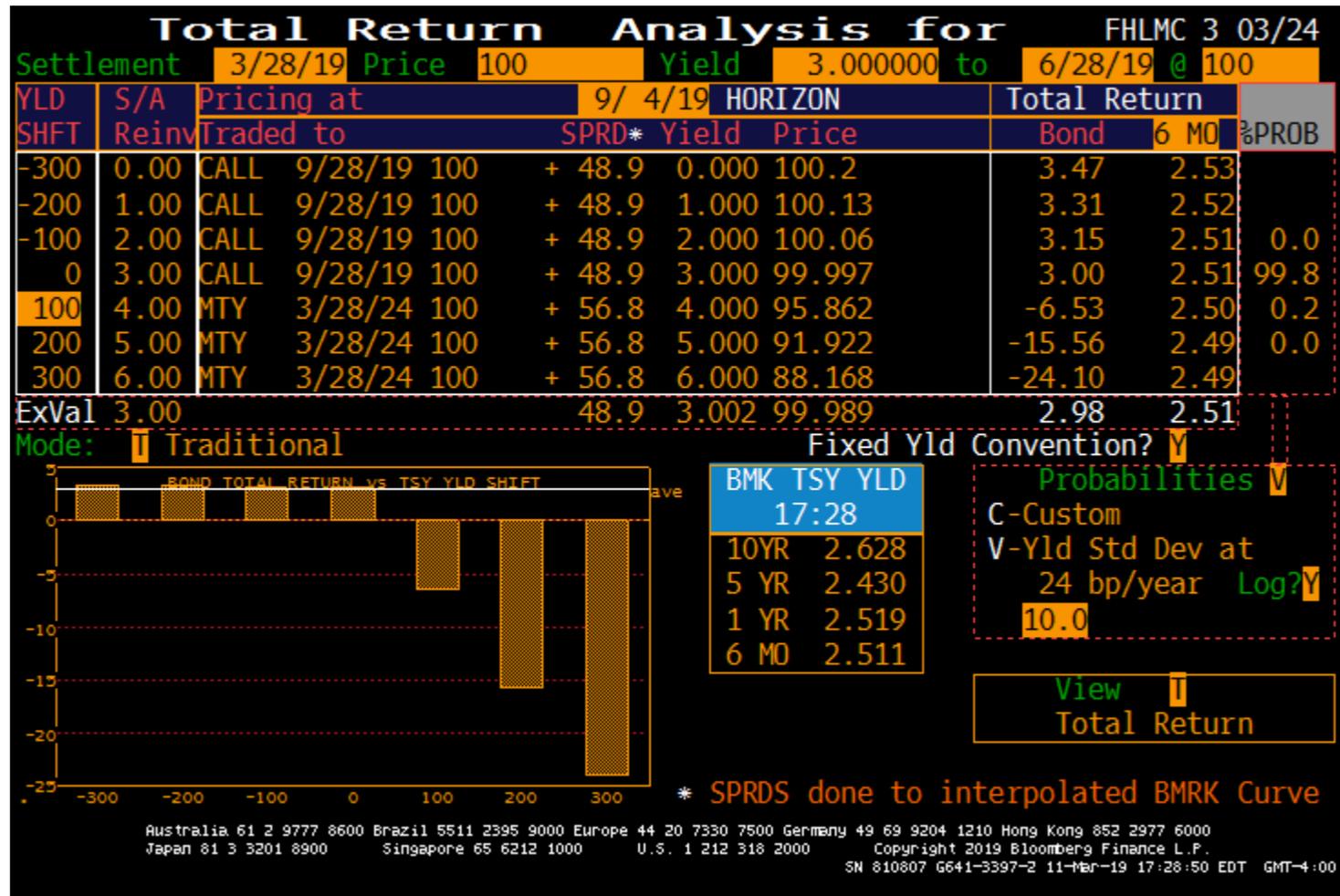


Negative Convexity

- Callable bonds exhibit negative convexity. Underperform non-callable bonds in a falling interest rate environment.
- When interest rates fall, a callable bond's price will not rise much above par since the bond is likely to be called at par.
- Convexity is valuable to investors, but negative convexity is a drag. Thus, investors will demand a higher yield for owning a negatively convex security such as a callable bond.



Example: 5yr nc 3mo FHLMC 3.00%



Book Yield vs. Total Return

- **Book Yield** is simply the yield rate that corresponds to the price that was paid for a specific bond or portfolio of bonds. Fixed rate bonds purchased at par have book yields equal to their coupon rate.
- **Total Return** considers a security's cash flows as well as its change in price over some period of time. These values are usually expressed as an annualized rate.

Book Yield Comparison

5yr “Bullet”

Effective Duration	4.7
Book Yield	2.55%

3yr “Bullet”

Effective Duration	2.8
Book Yield	2.47%

5yr nc 3mo Callable

Effective Duration	1.3
Book Yield	3.00%

3yr nc 3mo Callable

Effective Duration	1.0
Book Yield	2.85%

Spread and OAS

Spread

- The difference in percentage or basis points between the yield of a security versus a benchmark (i.e. non-U.S. Treasury debt security being priced and the yield of a comparable U.S. Treasury security). Also refers generally to the difference in yields or coupons between any two debt securities. Usually noted in basis points.

Option-Adjusted Spread (OAS)

- A reference tool for comparing alternative debt securities that contain embedded options. OAS refers to the yield premium over comparable U.S. Treasury securities that a callable debt security would have if it were non-callable—that is, if the value of the embedded option in the callable debt security were removed from the value of the debt security.

Callable Agency Analysis

Callable agencies offer investors additional yield (spread) as compensation for uncertain cash flows due to the embedded call options. Several factors need to be evaluated to determine what precise type of callable bond is appropriate for the portfolio in light of the interest rate and volatility environments and expectations. Some useful steps in callable agency analysis include:

- Selecting Maturity, Call Protection (lockout) and Call Frequency
- Calculating Yield Pick-up
- Determining Likelihood / Probability of Call
- Analyzing the trade based on yield pick-up, likelihood of call, reinvestment risk, extension risk, TRR all in light of current interest rate expectations

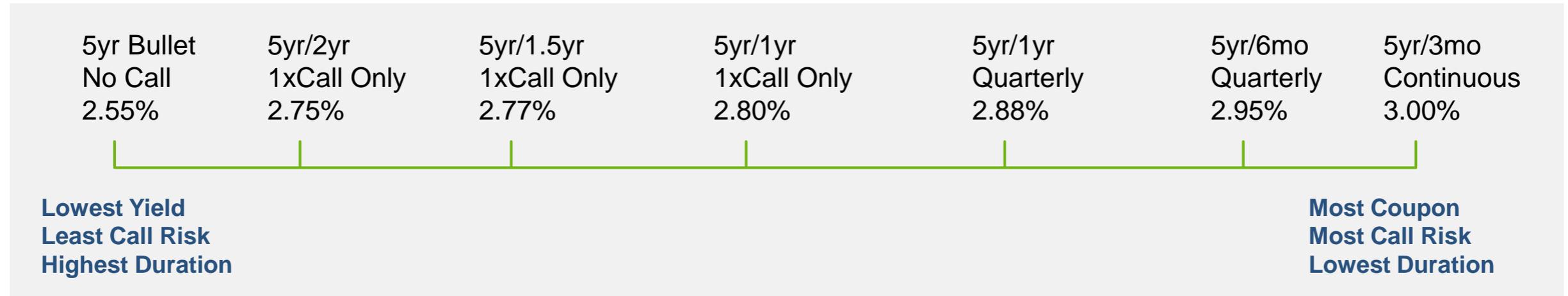
Selecting Maturity, Call Protection (lockout) and Call Frequency

- Key determinants: relative value vs. bullets, interest rate view and cash flow needs
- Compare yield/spread differences between differing lockouts and call frequencies
- Bullish investors prefer longer maturity, longer lockout callables
- Bearish investors prefer higher yielding, shorter lockout, higher frequency of call with shorter maturities
- Importance of cash flow timing

Customizable Features

Lockout Period and Call Frequency

- Longer Lockout → More Call Protection
- Shorter Lockout → Higher Coupon
- Fewer Call Options → More Call Protection
- More Call Options → Higher Coupon



Example: 5yr nc 3mo FHLMC 3.00%

FHLMC 3 03/28/24 Corp		Settings	Yield and Spread Analysis			
100.000/100.000	3.000/3.000	MFI@ 17:25	95) Buy	96) Sell		
1) Yield & Spread		2) Yields		3) Graphs		4) Pricing
5) Description		6) Custom		7) Calls		
Settlement Date	03/28/19	Price	100.00	Blend	<input checked="" type="checkbox"/> Full Screen	
YTC (3134GS4R3)	Date	Price	Yield			
Yield to Maturity	03/28/2024	100.00	3.000000			
Yield to Custom	06/28/2019	100.00	3.000000			
Yield to Next Call	06/28/2019	100.00	3.000000			
Yield to Worst Call	06/28/2019	100.00	3.000000			
May be called quarterly starting 06/28/2019						
Date	Price	Yield	Treas Crv	Spr	Adj Dur	Risk
06/28/19	100.0000	3.0000	2.448	0.552	0.248	0.248
09/28/19	100.0000	3.0000	2.517	0.483	0.493	0.493
12/28/19	100.0000	3.0037	2.521	0.482	0.735	0.735
03/28/20	100.0000	3.0000	2.520	0.480	0.978	0.978
06/28/20	100.0000	3.0022	2.508	0.494	1.217	1.217
09/28/20	100.0000	3.0000	2.496	0.504	1.456	1.456
12/28/20	100.0000	3.0016	2.483	0.518	1.692	1.692
03/28/21	100.0000	3.0000	2.473	0.527	1.927	1.927
06/28/21	100.0000	3.0012	2.466	0.535	2.159	2.159
09/28/21	100.0000	3.0000	2.460	0.540	2.391	2.391
<small> Australia 61 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2019 Bloomberg Finance L.P. SN 810807 G641-3397-2 11-Mar-19 17:27:19 EDT GMT-4:00 </small>						

Example: 5yr nc 3mo FHLMC 3.00%

OPTION-ADJUSTED SPREAD ANALYSIS
 FREDDIE MAC FHLMC 3 03/28/24 /100.000 (/3.000) MFI

Calculate **Price** **OAS (bp)** **Volatility**
 (P,O,V) P) 100 0) +12.23 V) 14.00

Cusip / ID# 3134GS4R3 Option Px Value: -2.03
 Settle 3/28/2019 Bench settle 3/12/2019 Vega: -0.03
 Spread 47.6bp vs1Y B 0 02/27/20 Govt @2.445 (2.524)

2) Customize
 Curve I111 Semi
 US On/Off The Run
 Dated 3/11/2019
 Settle 3/28/2019
 None
 Shift +0(bps)

Yield Spread

	3m	6m	1y	2y	3y	4y	5y	7y	10y	20y	30y
	2.427	2.516	2.524	2.475	2.450	2.446	2.442	2.529	2.639	2.845	3.027

{NUM}<GO> for:
 3) Call Schedule

	OAS Method	Option Free	To Call on 6/28/2019	To Mty
6/28/19 100.00	Yld	2.566	3.000	3.000
9/28/19 100.00	Sprd	12.4	57.2	55.8
12/28/19 100.00	M Dur	1.32	0.25	4.61
3/28/20 100.00	Risk	1.32	0.25	4.61
6/28/20 100.00	Cnvx	-3.40	0.00	0.24
9/28/20 100.00				
12/28/20 100.00				
3/28/21 100.00				
6/28/21 100.00				
9/28/21 100.00				
...more...				

Model L=Lognormal
 Exercise Premium 0.00

88) REFRESH

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Determining Yield Pickup

- Compare the yield pickup to risk-free rate
- Compare the yield pickup to agency bullets
- Compare yield to calls and duration
- Compare to similar duration securities

Valuation

- Spread vs. Matched Maturity Bullet

5yr nc 1yr vs 5yr bullet +25bps

- Spread vs. Matched Duration Bullet

5yr nc 1yr vs 3yr bullet +40bps

5yr nc 1yr Effective Duration ~3.1

3yr bullet Effective Duration ~2.8

Determining Likelihood / Probability of Call

- An issuer will usually call a bond if it can replace the existing debt for the remaining term at a lower cost of funds. Looking at where a new issue of a similar term and call structure can be issued will give a rough estimate of how “in the money” (likely to be called) or “out of the money” (likely to extend), the current structure is.
- The forward interest rate curve can be used to provide a rough estimate of the issue’s probability of call at future call dates
- The probability of call influences the yield pick-up
 - **Rising rates will cause the bond to move “out of the money,”** and the call option will usually not be exercised. The bond will take on more bullet-like characteristics as duration extends with the passing of call dates and it trades at a discount to par. Spreads will tighten relative to bullets as it is viewed as being less callable.
 - **Falling rates will push the bond “in the money,”** increasing the probability of call and the ensuing yield to call
 - Rising or falling interest rate **volatility is an input in determining spread.** Higher interest rate uncertainty equals higher volatility and thus wider spreads

Issuer Calls

- For negotiated or swapped deals, calls are determined primarily by the swap counterparty



- For auction or unswapped deals, calls are determined primarily by the market

Calculating Call and Extension Probabilities

- Determine how much rates need to change versus current levels for the bond to be called or extend to maturity
- Determine how much rates need to change versus implied forward interest rates for the bond to be called or extend to maturity

Custom-Made

“Reverse Inquiry” allows investors to tailor their investments to meet their unique portfolio needs

- Maturity/Call/Coupon Dates
- Call Types (European/Bermudan/American etc.)
- Discount or Premium at Issuance
- Variable Coupons (Fixed, Floating, Stepping etc.)

Rising Interest Rates

- Options are less likely to be exercised, extending the “expected life” of callable bond
- Increased probability that callable will remain outstanding to the maturity date
- Callables provide more cash flow that can be re-invested at better rates or otherwise deployed as investors’ needs dictate

Falling Interest Rates

- Call options are likely to be exercised, shortening the “expected life” of callable bond
- Decreased probability that callable will remain outstanding to maturity date
- Callable bond returns principal early, forcing investor to re-invest at lower rates
- Bullets continues to pay stated coupon until maturity date, while increasing in market value

For the Bearish Investor

- Premiums “Cushion Bonds”
- Step-Ups

Premiums “Cushion Bonds”

- Investor pays above par for callable with high likelihood of redemption. Yields to expected call dates exceed those of other short term investments.
- Above-market coupons provide investor with protection if rates rise above their expectations.

Example: 5yr nc 1yr 1x 3.25% Price: 100.6375
2.60% Yield to Call (+10bps to Bills)
3.11% Yield to Maturity (+35bps to 5nc1yr 1x at Par)

Customization – Tailoring to Investor’s Market Expectations

Example: 5yr nc 3mo Semi-Annual Step

Coupons

2.65% for 6 months

2.75 % for 6 months

2.875% for 6 months

3.00% for 6 months

3.125% for 6 months

3.25% for 6 months

3.50% for 6 months

4.00% for 6 months

5.00% for 6 months

6.00% for 6 months

Customization of Step-Ups

Investor accepts below-market starting coupon in return for higher coupons in later periods.

Example: 5yr nc 3mo Annual Step-Up

2.75% - 3.00% - 3.50% - 4.00% - 5.00%

3m Yield to Call:	2.75%	(+32.5bps to 3mo bullet)
1yr Yield to Call:	2.75%	(+23bps to 1yr bullet)
2yr Yield to Call:	2.87%	(+27bps to 2yr callable)
3yr Yield to Call:	3.07%	(+27bps to 3yr callable)
4yr Yield to Call:	3.29%	(+44bps to 3yr callable)
Yield to Maturity:	3.61%	(+61bps to 5yr nc 3mo at Par)

Example: 5yr nc 3mo Annual Step-Up

.FHLMC 2 3 4 03/28/24 Corp		Settings	Yield and Spread Analysis					
Not Priced			95 Buy	96 Sell				
1) Yield & Spread		2) Graphs	3) Pricing		4) Description		5) Custom	6) Calls
Settlement Date	03/28/19	Price	100.00		Blend	Full Screen		
YTC (PP30GS387)	Date	Price	Yield					
Yield to Maturity	03/28/2024	100.00	3.610848					
Yield to Custom	06/28/2019	100.00	2.750000					
Yield to Next Call	06/28/2019	100.00	2.750000					
Yield to Worst Call	06/28/2019	100.00	2.750000					
Callable								
Date	Price	Yield	Treas Crv	Spr	Adj Dur	Risk		
06/28/19	100.0000	2.7500	2.448	0.302	0.248	0.248		
09/28/19	100.0000	2.7500	2.517	0.233	0.493	0.493		
12/28/19	100.0000	2.7531	2.521	0.232	0.736	0.736		
*03/28/20	100.0000	2.7500	2.520	0.230	0.980	0.980		
06/28/20	100.0000	2.8014	2.509	0.293	1.219	1.219		
09/28/20	100.0000	2.8322	2.497	0.335	1.459	1.459		
12/28/20	100.0000	2.8571	2.485	0.372	1.695	1.695		
*03/28/21	100.0000	2.8732	2.475	0.398	1.931	1.931		
06/28/21	100.0000	2.9422	2.468	0.474	2.163	2.163		
09/28/21	100.0000	2.9948	2.461	0.534	2.396	2.396		

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Example: 5yr nc 3mo Annual Step-Up

OPTION-ADJUSTED SPREAD ANALYSIS
 5YR ANNUAL STEP .FHLMC2 3/4 03/24 NOT PRICED

Calculate **Price** **OAS (bp)** **Volatility**
 (P,O,V) P) 100.0000 0) +6.46 V) 14.00

Cusip / ID# PP30GS387 Option Px Value: -5.21
 Settle 3/28/2019 Bench settle 3/12/2019 Vega: -0.01
 Spread 108.7bp vs1Y B 0 02/27/20 Govt @2.445 (-2.524)

2) Customize
 Curve I111 Semi
 US On/Off The Run
 Dated 3/11/2019
 Settle 3/28/2019
 None
 Shift +0(bps)

Yield Spread

	3m	6m	1y	2y	3y	4y	5y	7y	10y	20y	30y
	2.427	2.516	2.524	2.477	2.450	2.446	2.442	2.529	2.639	2.844	3.026

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 3) Call Schedule

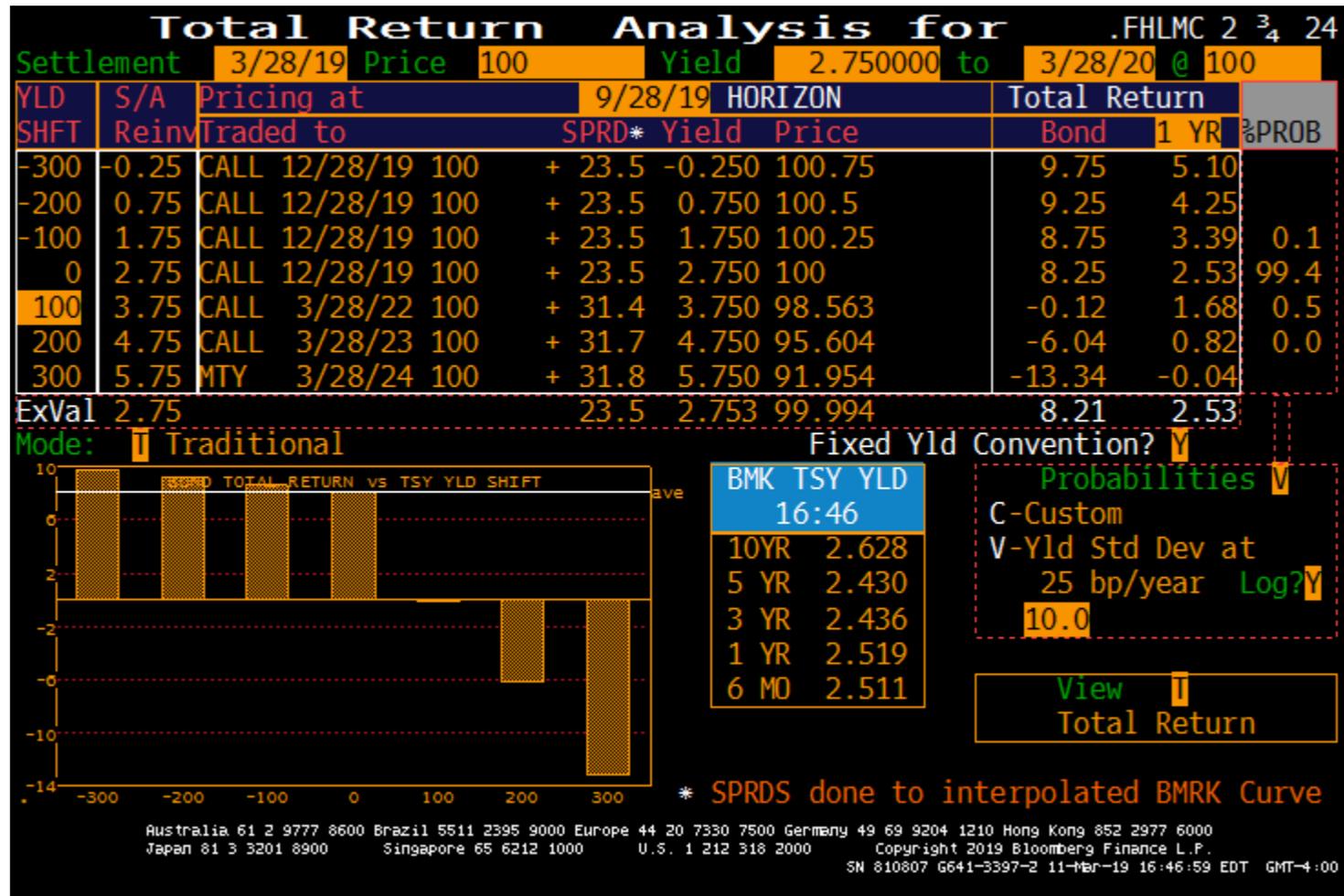
	OAS Method	Option Free	To Call on 6/28/2019	To Mty
6/28/19 100.00	Yld	2.508	2.750	3.611
9/28/19 100.00	Sprd	6.6	32.2	116.9
12/28/19 100.00	M Dur	0.82	0.25	4.59
3/28/20 100.00	Risk	0.82	0.25	4.59
6/28/20 100.00	Cnvx	-1.81	0.00	0.24
9/28/20 100.00				
12/28/20 100.00				
3/28/21 100.00				
6/28/21 100.00				
9/28/21 100.00				
...more...				

Model L=Lognormal
 Exercise Premium 0.00

88) REFRESH

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Example: 5yr nc 3mo Annual Step-Up



For the Bullish Investor

Discounts:

- Investor purchases lower coupon/longer duration callables at prices below Par and at yields that exceed matched maturity bullets.
- Falling rates increase the likelihood of redemption at Par, where Investor would enjoy above-market returns.

Example:

5yr nc 1yr 2.50%

3.86% Yield to 1yr Call

2.78% Yield to Maturity

Price: 98.67

(+134bps to 1yr bullet)

(+23bps to 5yr bullet)

Building a Portfolio

Maturity Ladder Approach

- Maturities are “laddered” out to supply steady cash flow
- Mitigates some reinvestment risk because you always have money “rolling off”
- Popular strategy with community banks with some risk aversion

Bullet Approach

- Selected point(s) on the yield curve are targeted for maturities
- Less liquidity and more risky

Barbell Strategy

- Portion of portfolio invested in short maturities to provide liquidity
- Portion of portfolio invested in longer maturities to increase yield
- Advantageous for non parallel rate shifts (flattening long end)
- Popular strategy with community banks

Determining the buy based on yield pick-up, likelihood of call, reinvestment risk, and extension risk in light of current interest rate expectations

Callable Bond Comparison Table			
Description	Callable Agency #1	Callable Agency #2	Difference
Structure			
Coupon			
Maturity			
Settle			
1st Call Date			
Call Frequency			
Price			
AOAS/OAS1			
Yield to 1st Call			
Yield to Maturity			
YTC Pick (1st Call)			
YTM Pick			
Effective Duration			
Effective Convexity			
Forwards at Call Date			
Forwards vs. Coupon			
BP In/Out of the Money			

Specialists in Capital Markets and Investment Banking

To learn more about our Capital Markets and Investment Banking capabilities, please contact George Barbar, Senior Managing Director, at gbarbar@mesirowfinancial.com.

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