



Introduction to Interest Rate Derivatives

February 2000

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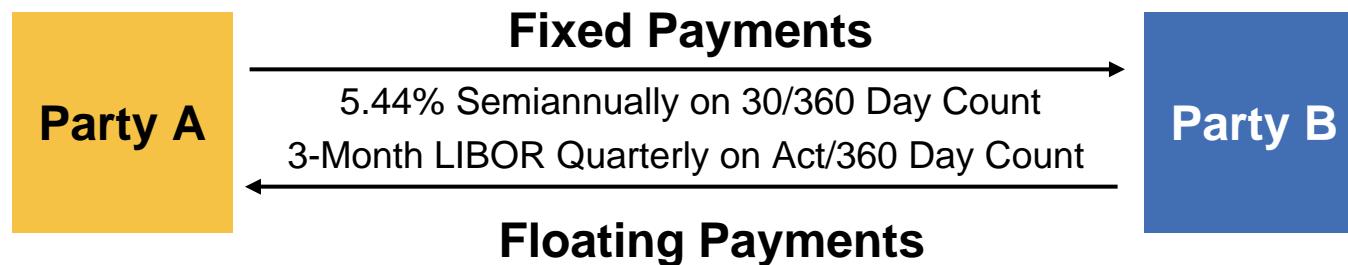
Topics to be Covered

- Section One – What are Interest Rate Derivatives?
- Section Two – Users of Interest Rate Derivatives
- Section Three – An Overview of Recent Market Activity (Why are Swaps Important?)
- Section Four – The Benchmark Issue
- Section Five – How to Execute and Unwind a Swap
- Section Six – Examples of Trades
- Section Seven – Following the Market

What are Interest Rate Derivatives?

What Is a Swap?

Spot-Starting 5-Year Fixed/Floating Swap (\$100MM Notional)



- Swap: Contractual agreement to exchange fixed for floating cash flows over a specified period of time
- Floating rate reference: USD LIBOR
- LIBOR: British Banker Association's (BBA) fixing of the London Inter-Bank Offered Rate. A contributor bank contributes the rate at which it could borrow funds, if it were to do so by asking for and accepting inter-bank offers in reasonable market size just prior to 11 AM London time. 16 banks contribute, the top and bottom 4 fixings are eliminated, and the remaining 8 fixings are averaged.

A Swap is Different than a AA Bank Bond

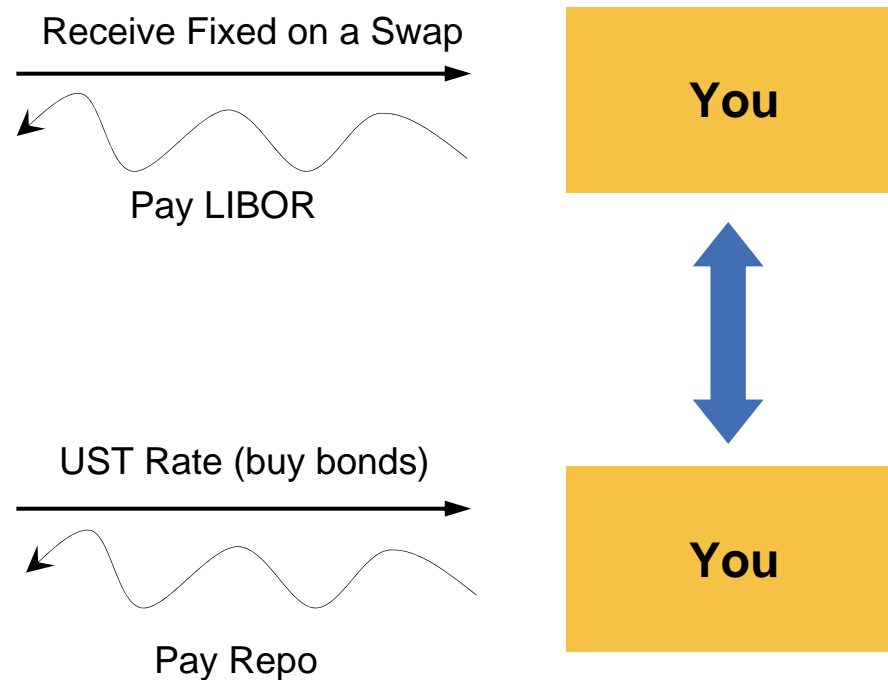
An interest rate swap has different characteristics compared to a AA bank bond

- Differences between a swap contract and a AA bank bond
 - Swap: No risk of principal loss or default
 - Swap: Less risk of downgrade (If a bank is downgraded, it will be thrown out of the LIBOR panel.)
 - Swap: Majority of trades are collateralized, thus reducing counterparty risk.
- Result: Swap rates trade richer than AA bank credits

What is a Swap?

Similar to a leveraged bond transaction

**Swap Transaction Is Similar to a Bond Transaction
Combined with 3-Month Financing**



What is a Swap?

Swap rate = average of expected LIBOR settings

Suppose You Pay Fixed on a 2-year Swap at a Rate of 4.42%

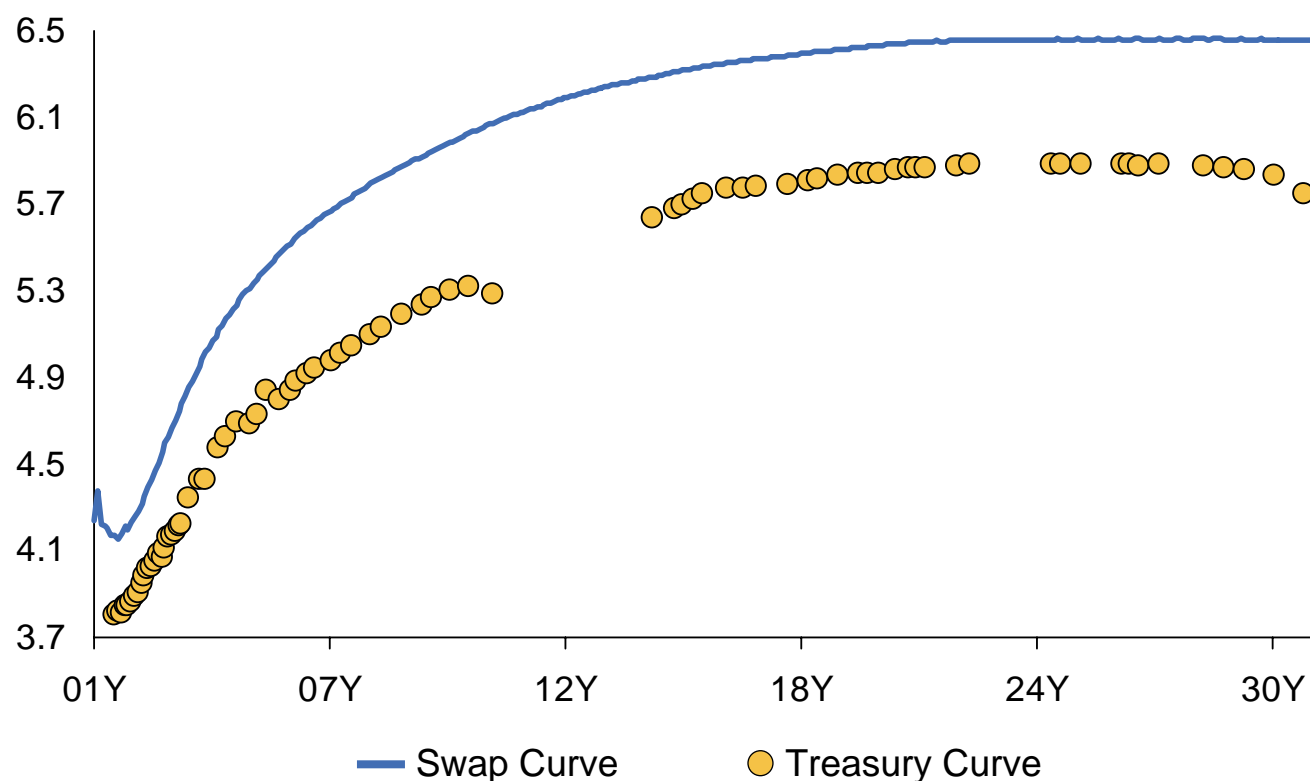
Floating Leg	Fixed Leg
3M LIBOR = 3.65% (Quarterly, Actual/360)	
3M LIBOR in 3 months	4.42% (Semi, 30/360)
3M LIBOR in 6 months	
3M LIBOR in 9 months	4.42% (Semi, 30/360)
3M LIBOR in 1 year	
3M LIBOR in 1YR 3M	4.42% (Semi, 30/360)
3M LIBOR in 1YR 6M	
3M LIBOR in 1YR 9M	4.42% (Semi, 30/360)

What is a Swap?

- How Do We Determine Expectations of Future 3M LIBOR Settings?
- Out to 5 years, we use Eurodollar contracts:
 - Forward contracts on 3M LIBOR
 - Liquidity exists out to 5 years
 - Convexity issue
- Beyond 5 years, expected 3M LIBOR settings are implied from the swap rates.

U.S. Interest Rate Swap Curve

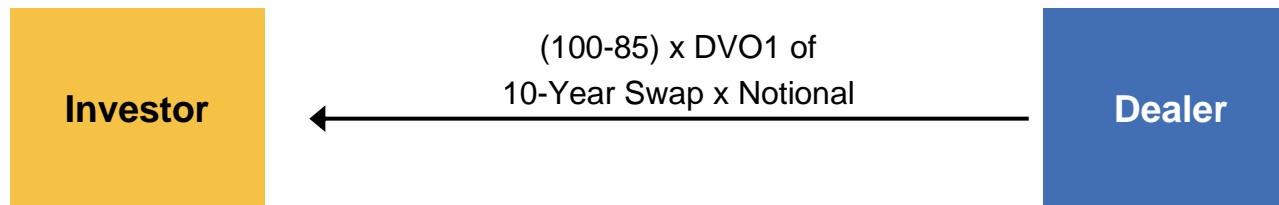
From the Eurodollar Futures and Market Traded Swap Rates, a Swap Curve is Generated



Note: The swap curve is smooth and continuous, with a rate existing at each point.

Spreadlock Transaction

- Forward contract on a specific swap spread
- “Long” a spreadlock: Investor makes money if swap spread at expiry is higher than strike
- Suppose you are long a spreadlock at 85 bps on the 10-year swap spread for expiry 11/8/01
- Suppose on 11/8/01, the 10-year swap spread is at 100 bps



- Spreadlock is cash settled based upon mid-market spread at expiry
- Spreadlocks are usually quoted relative to spot spreads (as a pickup or drop)
- Spreadlocks enable an investor to take a “cleaner” swap spread view
 - No accrued interest concerns
 - No exposure to initial LIBOR setting
 - No roll down effects on curve

Other Types of Swaps

- Basis Swaps Enable Investors to Swap a Floating Rate Index Versus LIBOR:
 - Commercial paper,
 - Fed Funds,
 - T-Bills,
 - Prime.
- Basis Swaps Also Exist that Enable Investors to Take Forward Views on CMT/CMS Rates Versus LIBOR:
 - Example: Pay 10-year CMS versus receive LIBOR
- Cross Currency Swaps
 - Combining the USD swap market with the swap market in another currency

Volatility Products

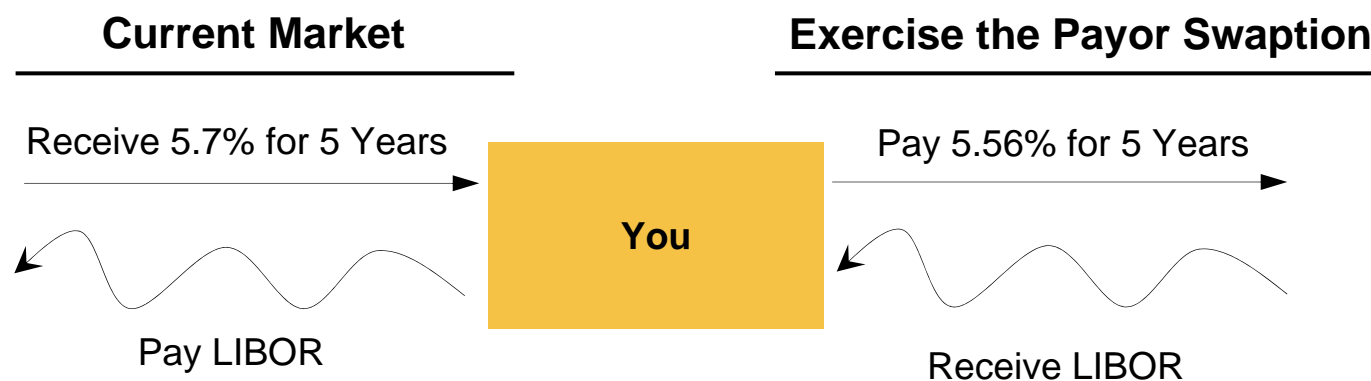
- Investors Can Purchase or Sell the Right to Pay or Receive on a Swap:
 - Payor swaption: the right to pay on a swap
 - Receiver swaption: the right to receive on a swap
- Investors Can Purchase or Sell Interest Rate Protection on 3M LIBOR and CMS/CMT Rates:
 - Cap: Protection against rate increases
 - Floor: Protection against rate decreases
- Investors Can Purchase the Right to Buy or Sell Treasuries:
 - Put: the right to sell Treasuries
 - Call: the right to buy Treasuries

Example of a Payor Swaption

- Suppose you want to make money if 5-year rates rise, but you want limited downside. Therefore, you purchase the following the following payor swaption:
 - You purchase the right to enter the following swap in 3 months (on 11/8/01):
 - Start date: 11/10/01
 - End date: 11/10/06
 - Investor pays 5.56% versus receiving 3M LIBOR
- This trade is comparable to buying a 3M put on the current 5-year note. In both cases, you make money if rates rise beyond the strike levels at expiry.

Example of a Payor Swaption

- Suppose it is now 11/8/01, and the 5-year swap rate is 5.70%. You are in-the-money by 14 basis points.

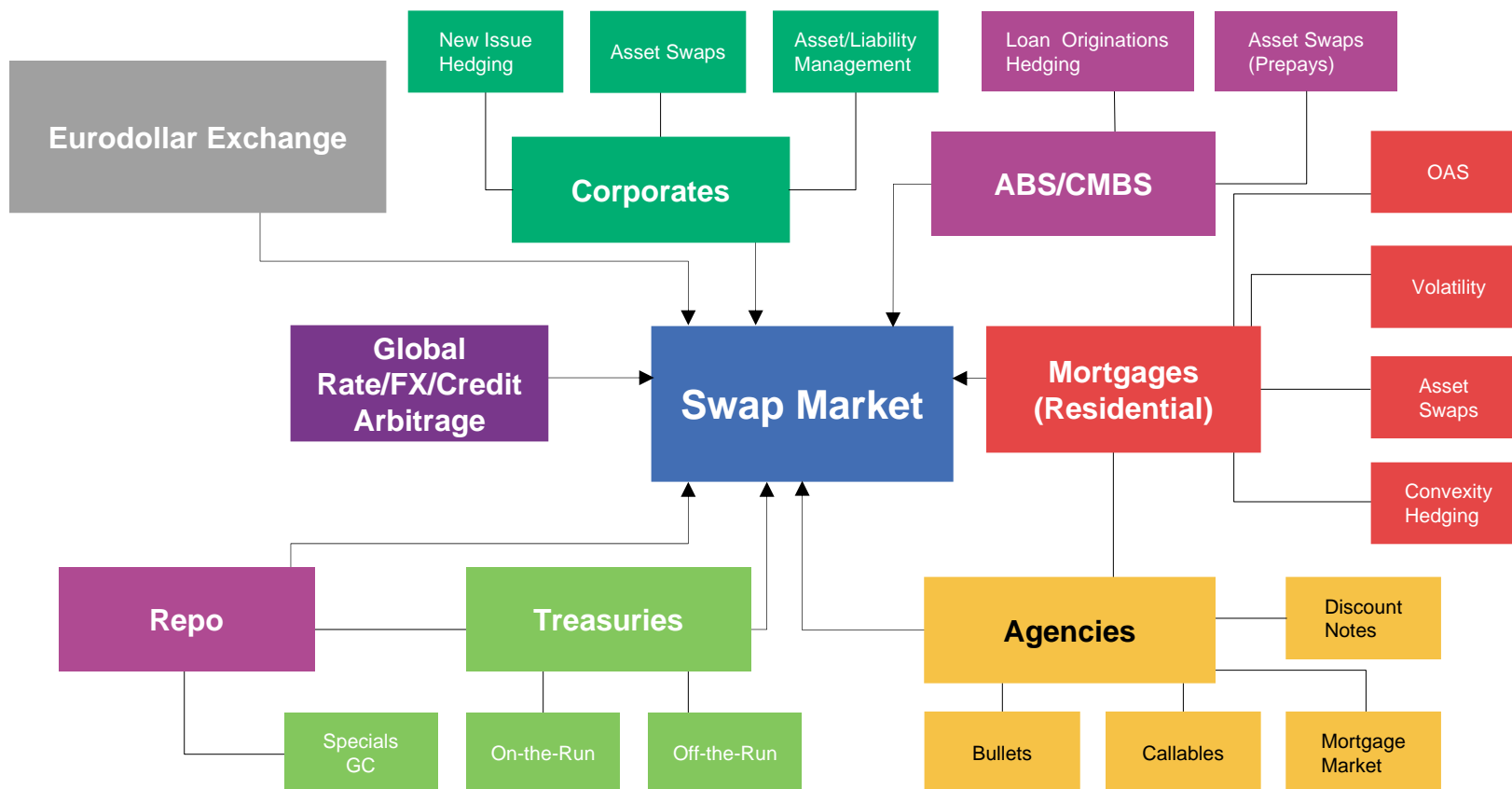


- Net gain on the option settlement: 14 bps per annum for 5 years

Users of Interest Rate Derivatives

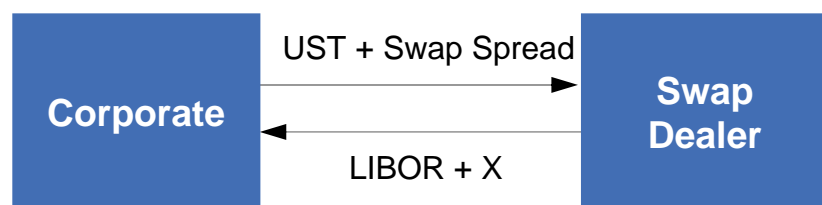
Major Players in the Swap Market

Web of Interdependence



Corporate Hedging

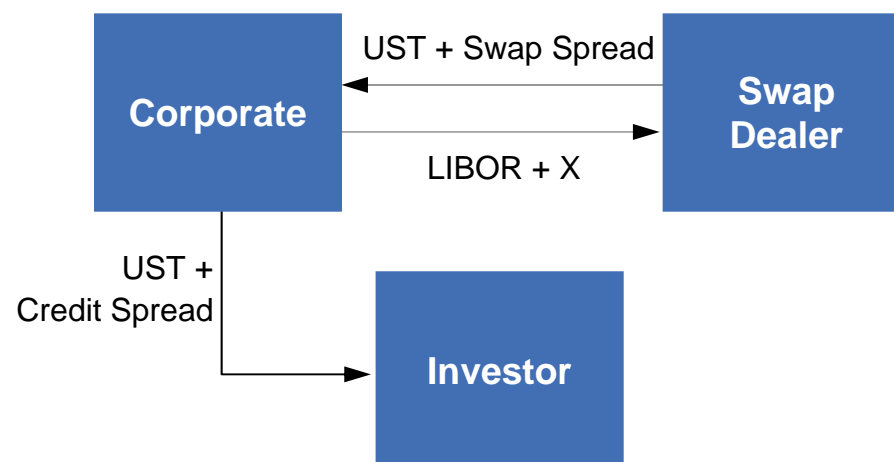
Rate Lock New Issuance



Swap Spreads Widen

- Corporates pay fixed to hedge future debt issuance

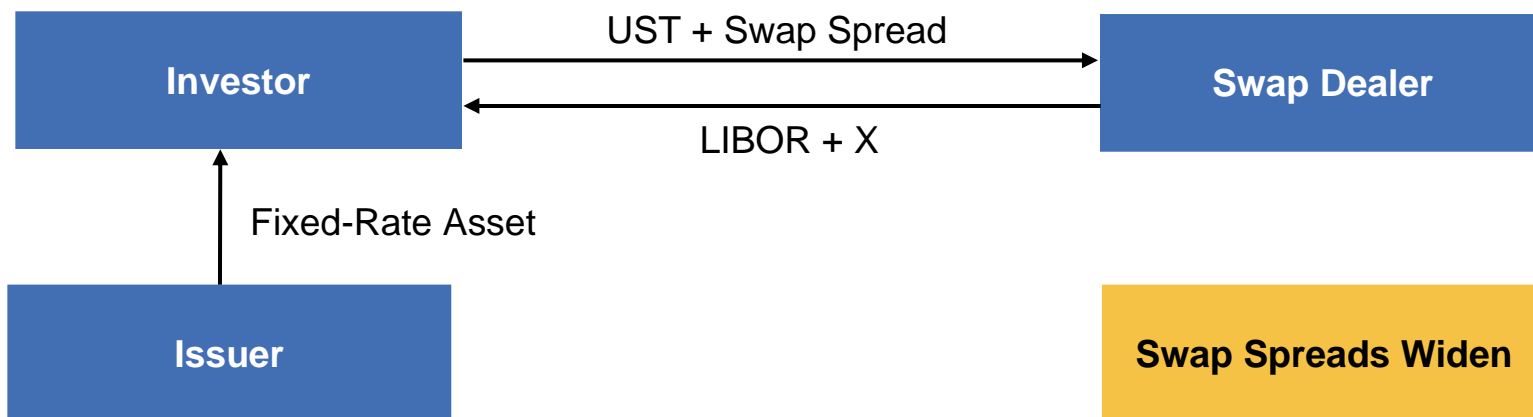
Asset/Liability Management Swap



Swap Spreads Tighten

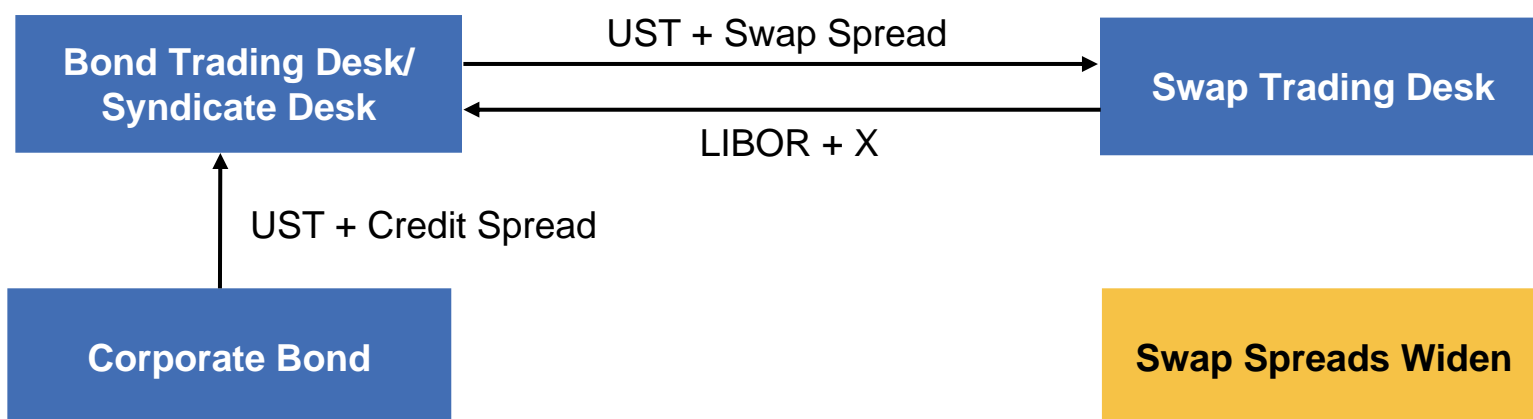
- Corporates receive fixed to achieve floating rate exposure

Investor Asset Swap



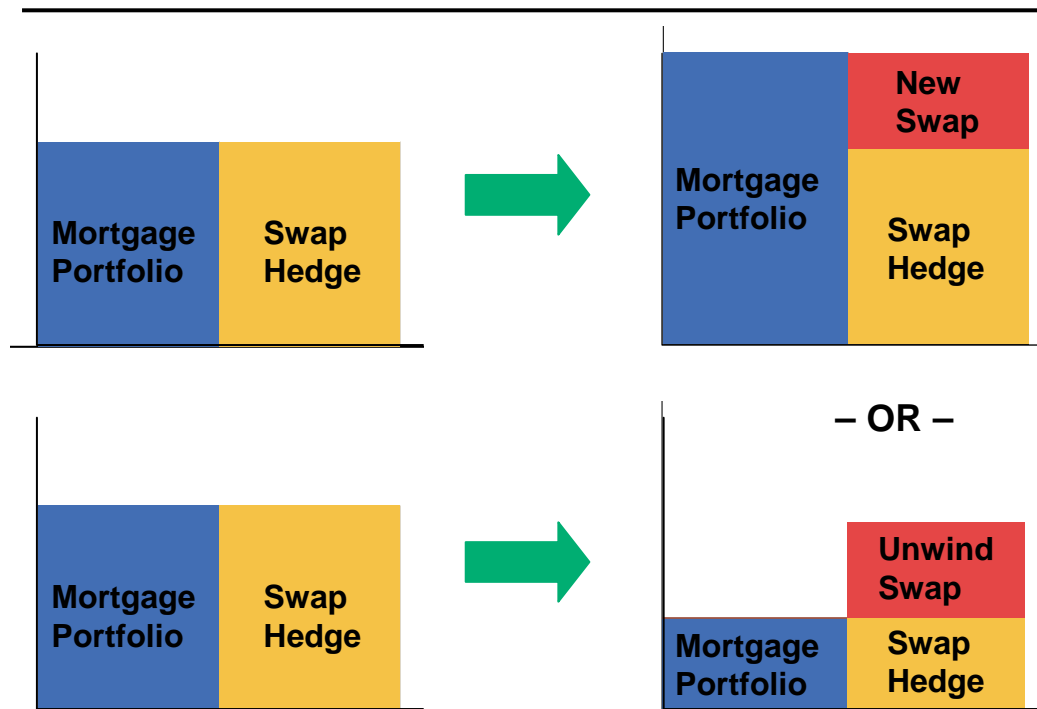
- Active users: Hedge funds, pension funds, banks, and insurance companies
- **Asset swap strategy: Valuing fixed rate assets relative to LIBOR curve**

Dealer Inventory Hedging

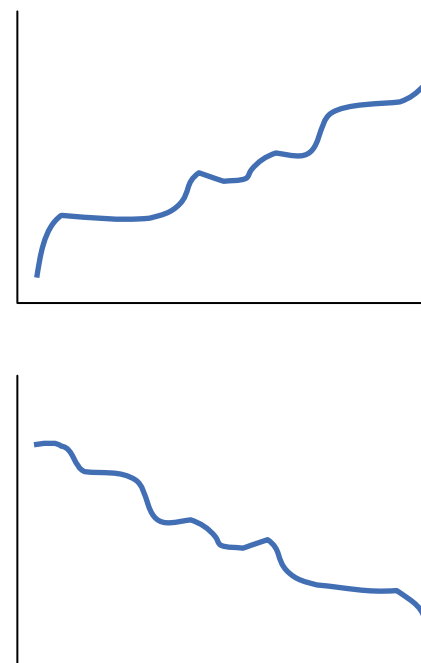


Mortgage Convexity Hedging

Duration Profile



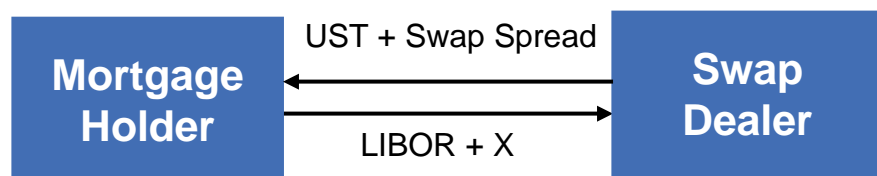
Interest Rate Scenario



- Because of prepayment characteristics, a pool of mortgages has negative convexity
- Interest rate swaps are actively used to dynamically manage the convexity exposure as interest rates change

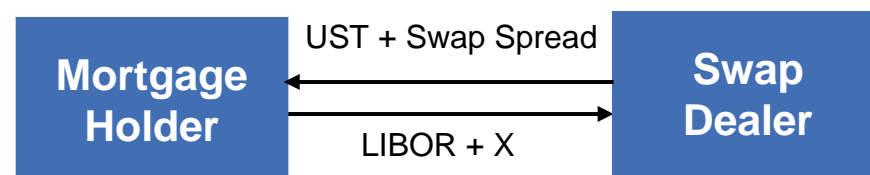
Mortgage Convexity Hedging

Market Sells Off



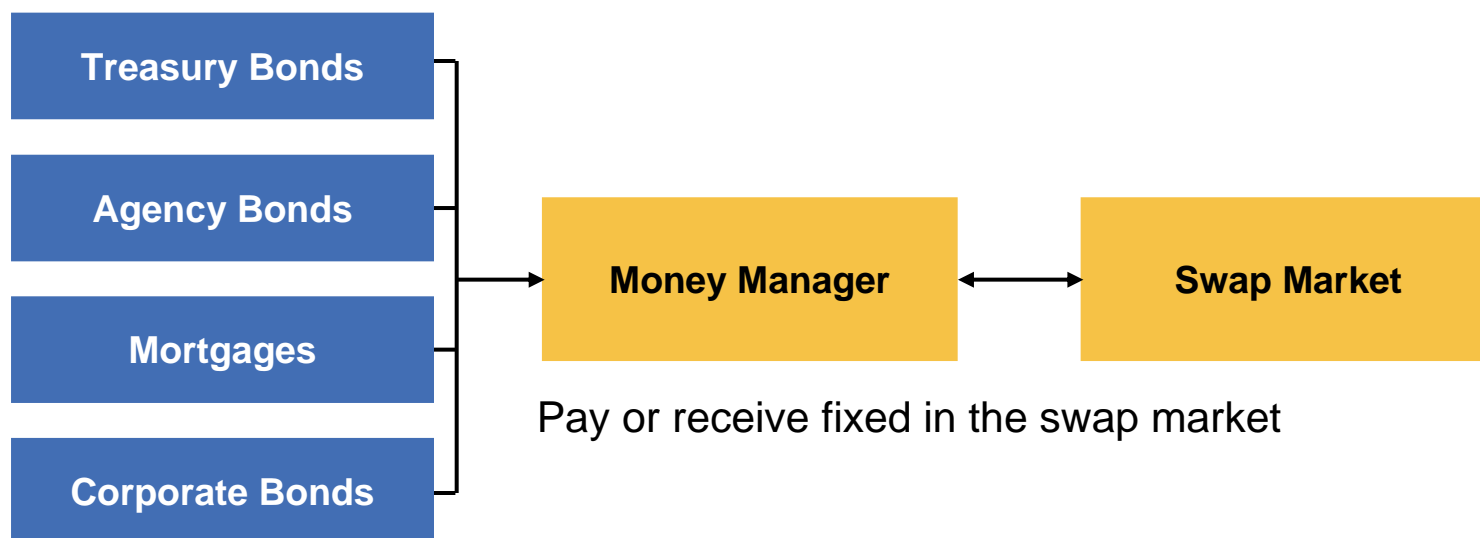
Swap Spreads Widen

Market Rallies



Swap Spreads Tighten

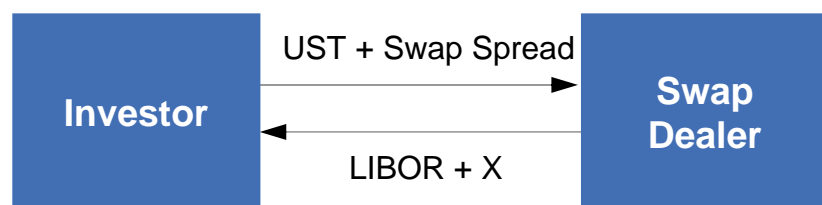
Money Managers Managing Portfolio Exposure



- Money Manager Transacts with the Swap Market to:
 - Increase and reduce spread exposure
 - Lengthen or shorten duration

Investors Taking Long/Short Market Positions

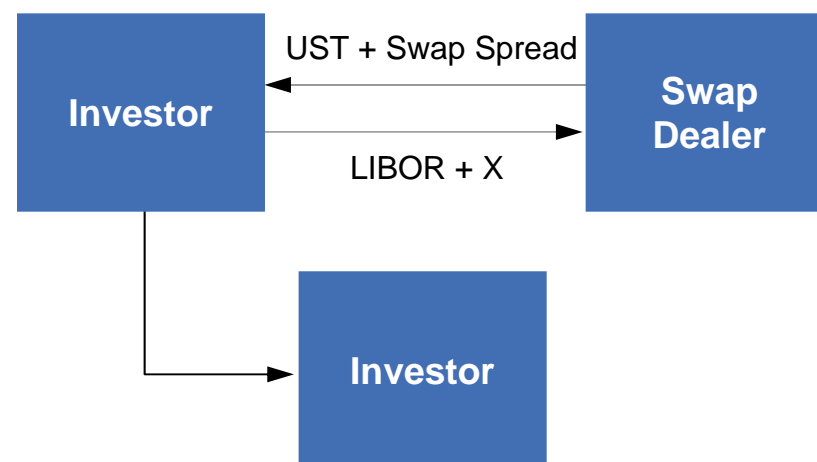
Short the Market



Swap Spreads Widen

- Investors pay fixed in expectation of higher rates

Long the Market



Swap Spreads Tighten

- Investors receive fixed in expectation of lower rates.

An Overview of Recent Market Activity

Three Wake Up Calls...

- Three wake up calls of the past three years:
- Russia/Hedge fund crisis of 1998,
- Y2K fears, and
- Reduction of Treasury supply.

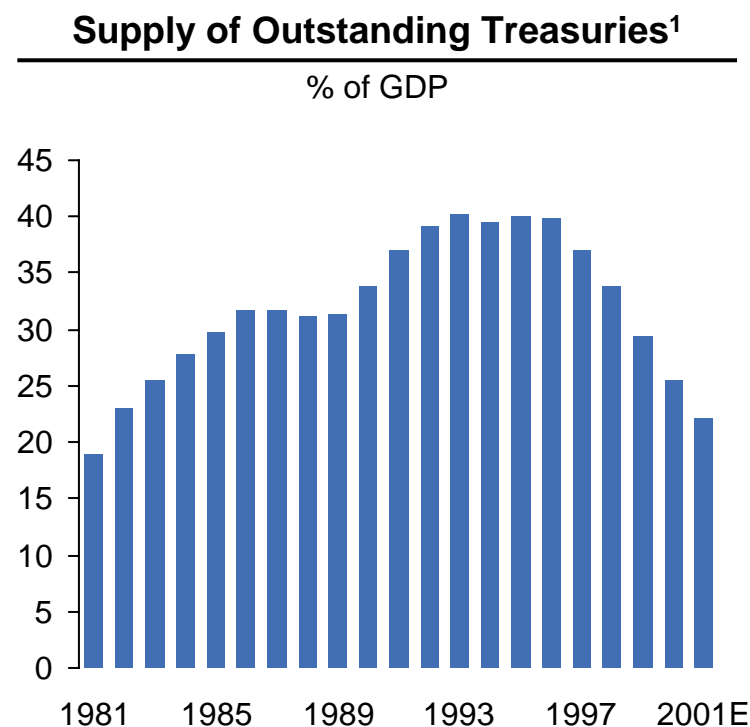
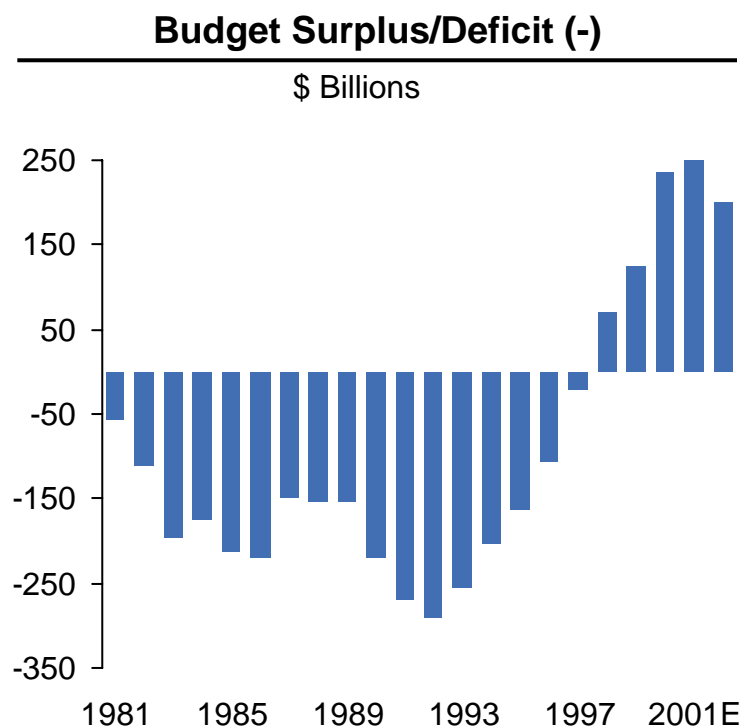
The Market Effects...

Primary effects on the swap and Treasury markets:

- Wider swap spreads,
- Technically driven Treasury curve,
- Increase in swap spread (credit spread) volatility,
- New users in the swap market,
- Increasing interest to use alternative products (swaps, Agencies) as a method of hedging and valuation,
- Increasing correlation between swap spreads and credit spreads, and
- The increasing development of the U.S. swap market trading on an outright rate basis rather than as a spread to Treasuries.

Budget Surplus and Treasury Supply

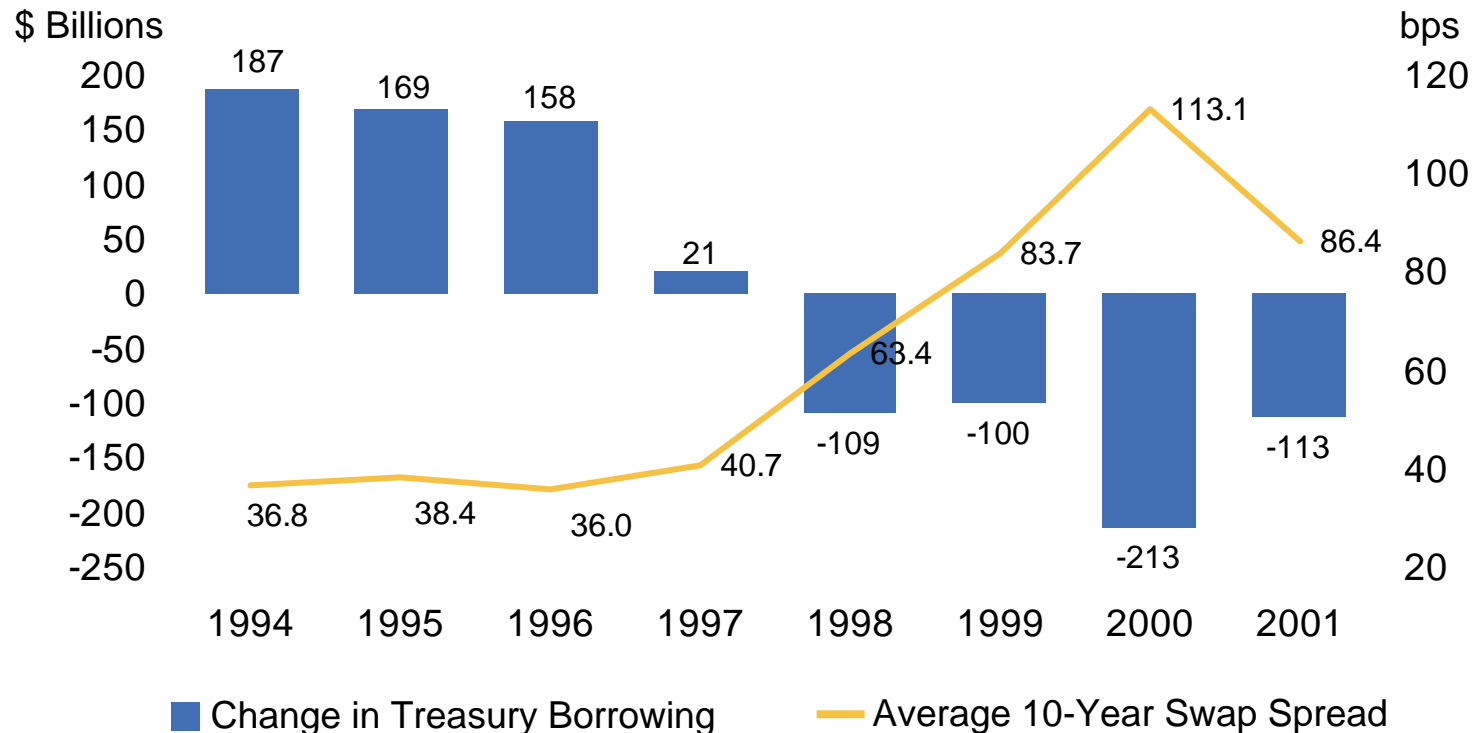
- The recent emergence of a budget surplus has led to a sharp drop in Treasury supply in the U.S.



¹Excludes Federal Reserve holdings

Change in the Treasury Supply

Relationship Between Swap Spreads and Change in Treasury Borrowing

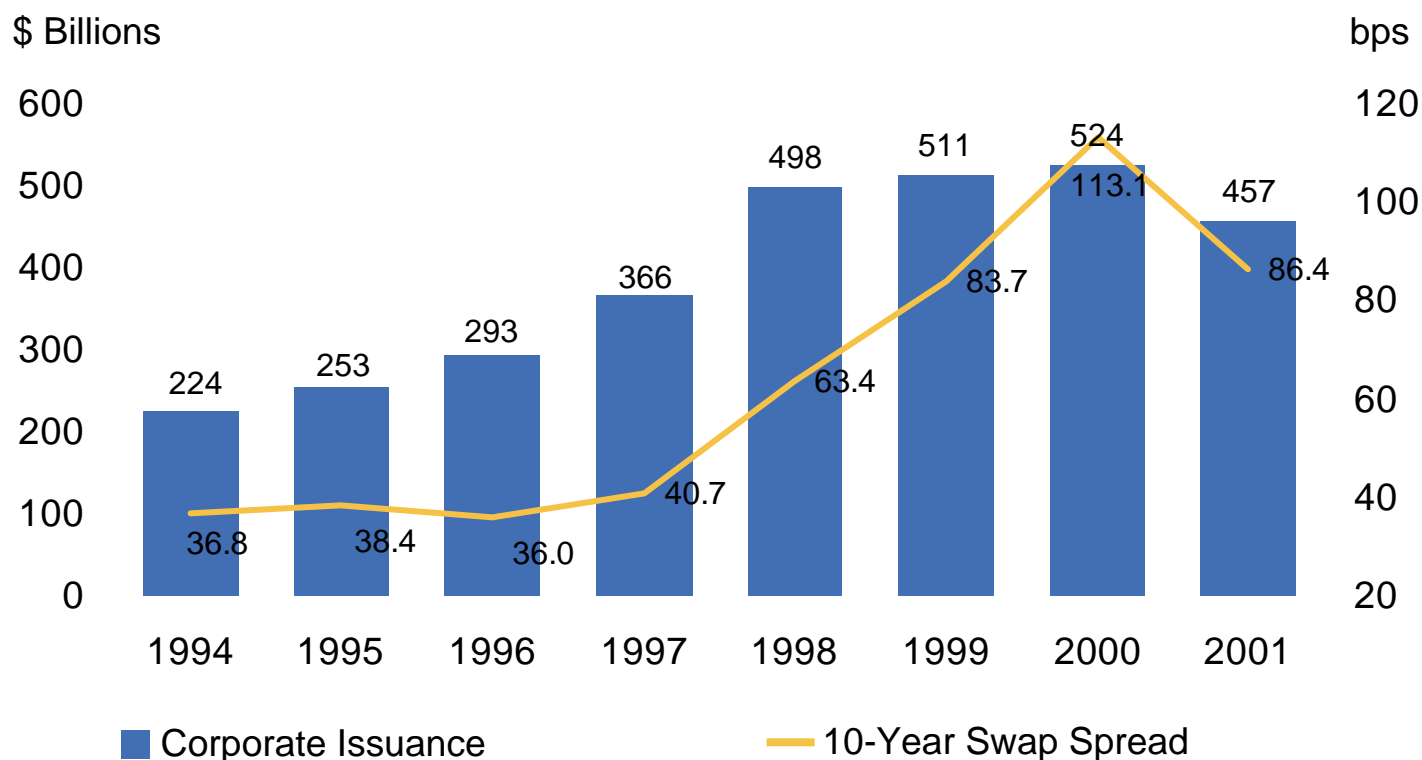


Notes: Change in Treasury borrowing is for the fiscal year (ended September). Change in borrowing includes change in total public marketable debt outstanding.
Swap spread calculation is the unweighted average of daily swap spread closes on each business day of the calendar.
Source: MSDW, Bloomberg, U.S. Treasury

Fed is Preparing to Adapt

- Decline in Treasury debt presents a challenge to implementation of monetary policy
- Fed will need acceptable substitutes if Treasury supply continues to decline
- Results of recent study:
 - Will expand collateral accepted on repo trades
 - Will be buying GNMA's for open market operations in the near future
 - Consider changing the Federal Reserve Act to expand further in the future

Corporate Supply Increasing

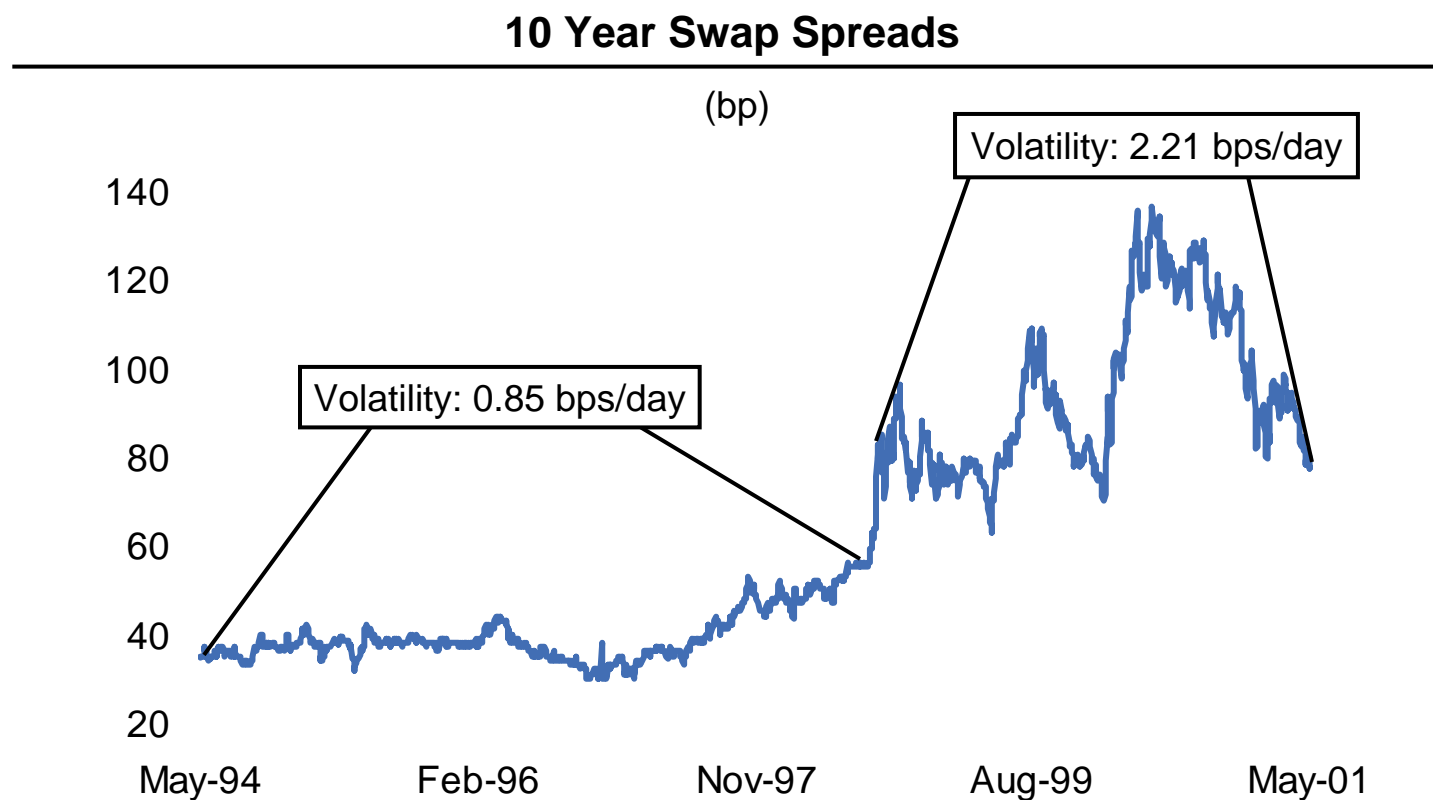


Notes: Corporate debt includes all investment grade public & 144A debt (excludes private placement, convertible, ABS, MBS, high yield, municipals, CDs, and MTNs under \$50mm).

Swap spread calculation is the unweighted average of daily swap spread closes on each business day of the calendar.

Source: MSDW, Bloomberg, U.S. Treasury

Increase in Credit Spread Volatility

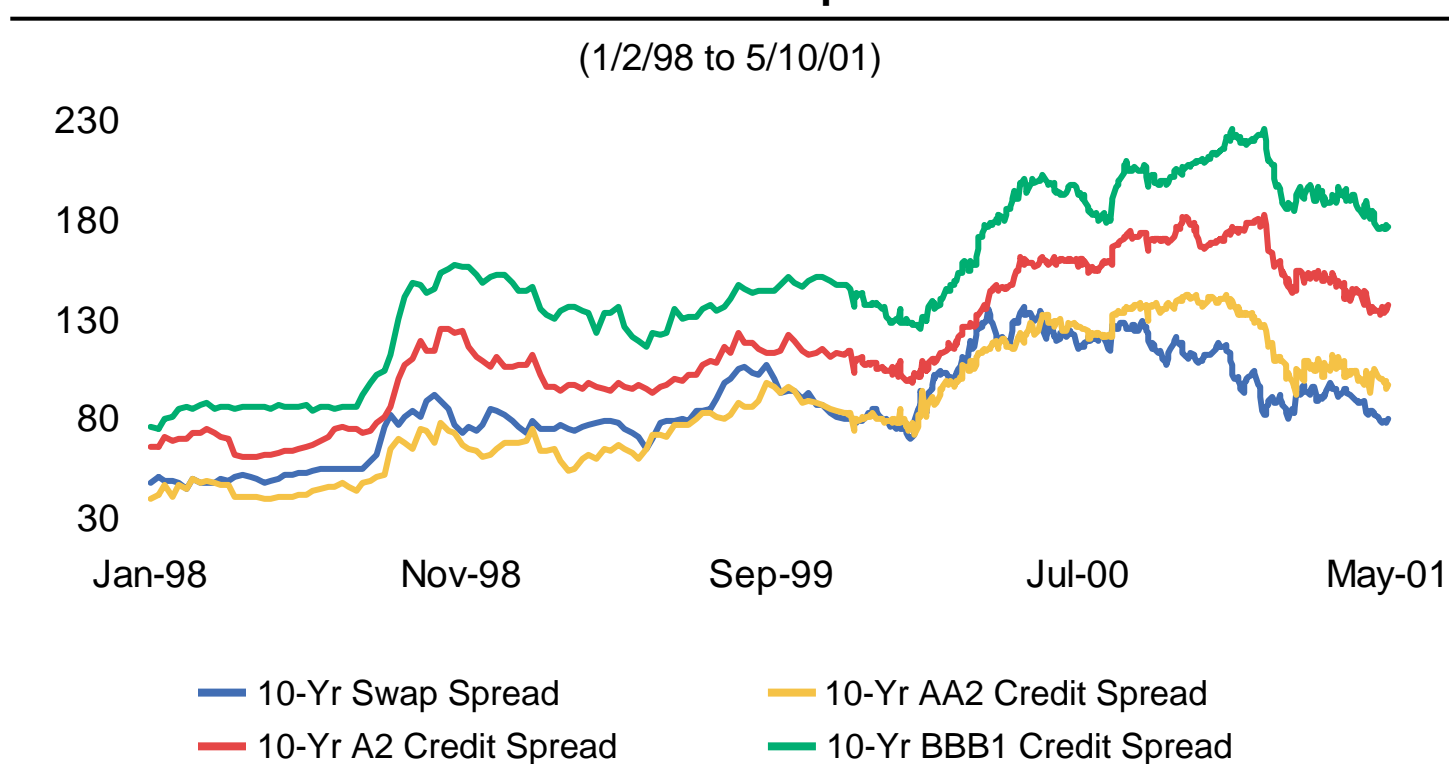


Source: MSDW, Bloomberg

Swap Spreads: A Benchmark for Credit Spreads

Swap spreads serve as an indicator of the general level of credit spreads

Historical 10-Year Spread Data



Source: MS, Bloomberg

New Swap Market Participants

We have observed increasing interest in the swap market by:

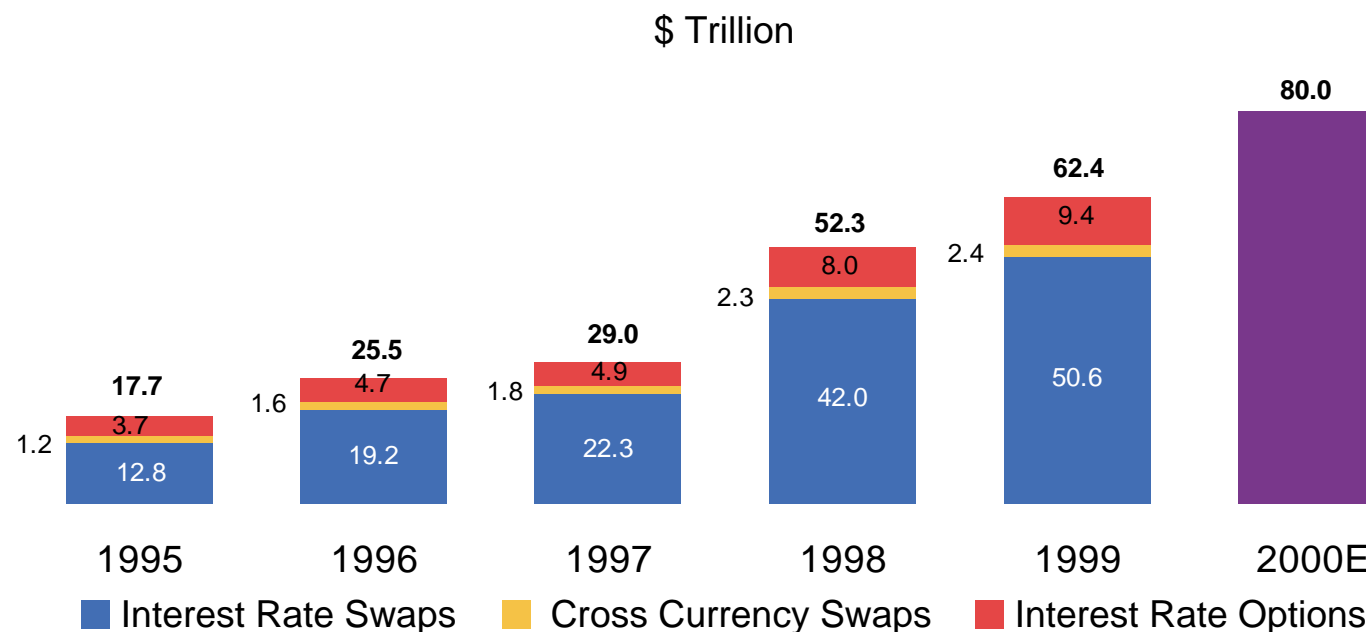
- Internal credit trading desks, and
- The account base, including
 - Money managers,
 - Insurance companies and banks,
 - Corporations, and
 - Hedge funds.
- As a result of the increased interest in the swap market by typical participants in the credit markets (as these participants search for an alternative method of hedging, valuation, and speculation), correlations between swap spreads and credit spreads are increasing.

Dramatic Growth in Derivatives Usage

OTC Derivative Contracts

- Since the first wake-up call of 1998, the use of interest rate derivatives has increased dramatically

Outstanding at Fiscal Year End – Notional Amounts

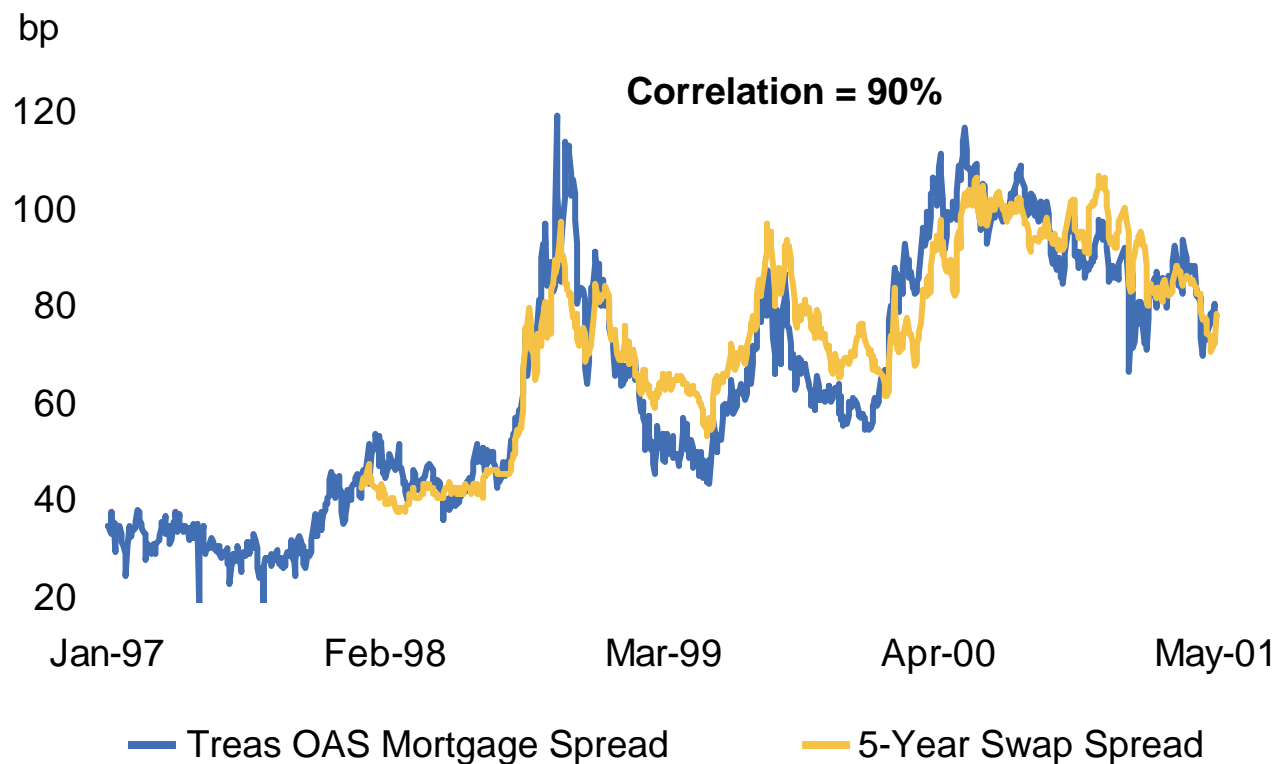


Note: 2000 total value is an estimate of MS Swap's trading desk

Source: ISDA, BIS, Morgan Stanley

OAS Mortgage Spreads¹ vs. 5-Yr Swap Spreads

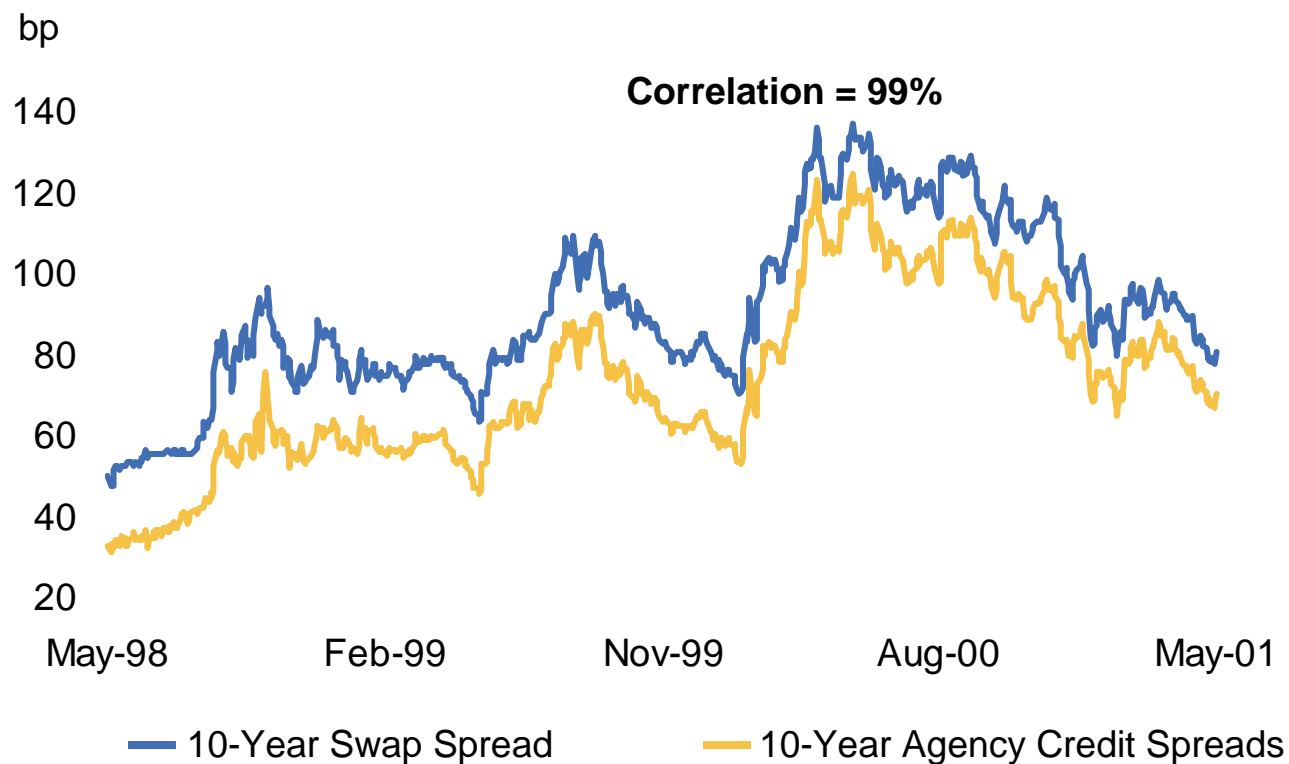
Strong correlation with other markets



Note: (1) OAS Mortgage Spreads = A representative basket of Government/Agency Mortgages that are individually option adjusted and weighted by their total outstanding amounts

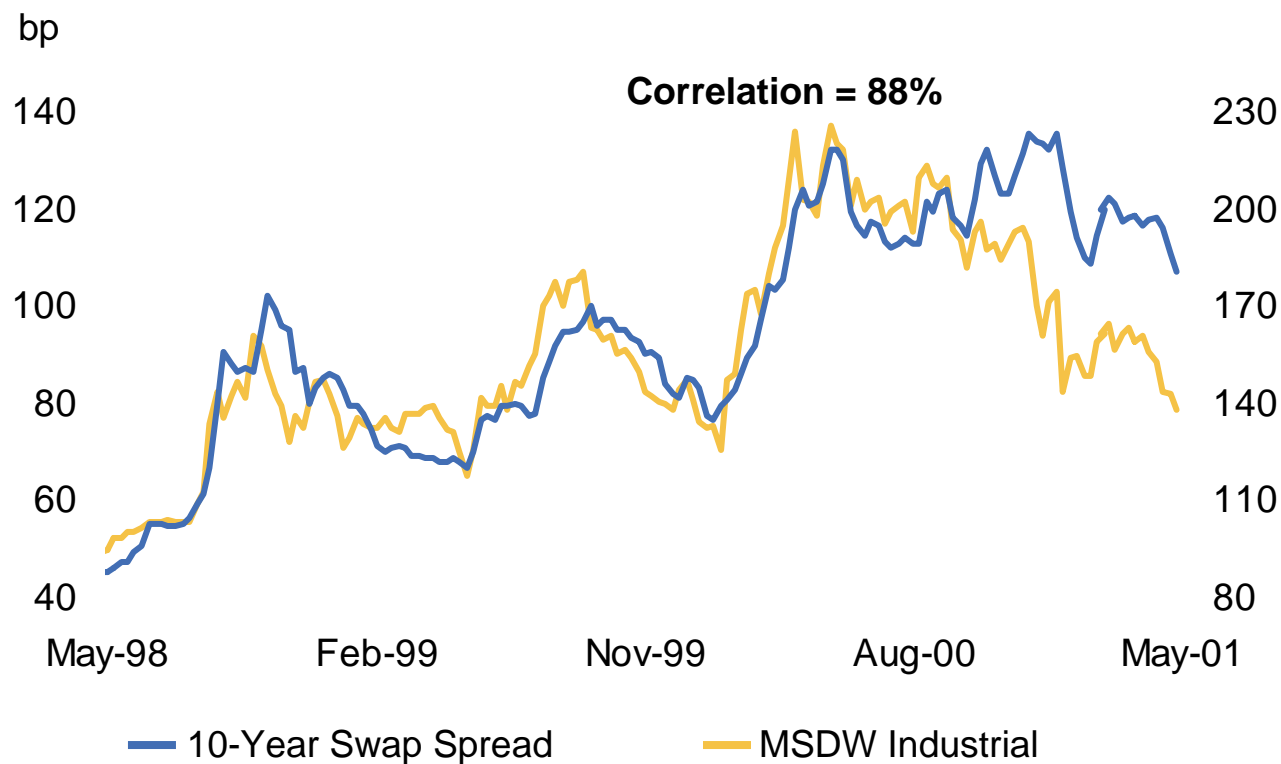
Source: Morgan Stanley

Swap Spreads Versus FHLMC Credit Spreads



Source: Morgan Stanley

MSDW Industrial¹ Spreads and Swap Spreads



Note: MSDW Industrials - A representative basket of investment grade bullets marked by our trading desk with an average duration of 10 years.

Source: Morgan Stanley

The Benchmark Issue

Treasury Market

- Advantages:
 - Historical benchmark
 - Large, liquid, transparent market
 - Availability of research and analysis
 - Comfort level
- Disadvantages:
 - Technicals / Fundamental analysis put in question
 - Scarcity premium
 - On-the-run vs. off-the-run
 - Repo discrepancies

Swap Market

- Advantages:
 - Can value almost any security
 - Smooth, continuous curve
 - Common hedging tool by the street
 - Large, liquid market
- Disadvantages:
 - Transparency
 - Lack of market information and research
 - Systems requirements
 - Credit / Documentation

Agency Market

- Advantages:
 - Effort by Agencies to become the benchmark
 - Liquid, transparent market
 - Accepted globally
 - Existence of repo and futures market
- Disadvantages:
 - Dependent upon ability to grow
 - On-the-run vs. off-the-run
 - Repo discrepancies

Greenspan's Comments

Monetary Policy Report to Congress (February 13, 2001)

- “In the corporate bond market, yield spreads on high-yield and lower rated investment-grade bonds, measured relative to the ten-year swap rate, began rising sharply in September and by year-end were at levels well above those seen in the fall of 1998.”
- “Given the possibility that liquidity could deteriorate further as the Treasury continues to pay down its debt, market participants reportedly increased their reliance on alternative investments - including interest rate swaps and debt securities issued by government-sponsored housing agencies and other corporations - for some of the hedging and pricing functions historically provided by Treasury securities.”

How to Execute and Unwind a Swap

Long 10-Year Swap Spread Trade

Suppose you go long 10-year swap spreads at 80 bps

- Steps:
 - 1. Buy 10-year notes
 - 2. Pay fixed on a 10-year swap
 - 3. Duration weight the notionals
 - 4. Set initial LIBOR
 - 5. Handle the repo

Unwind 10-Year Swap

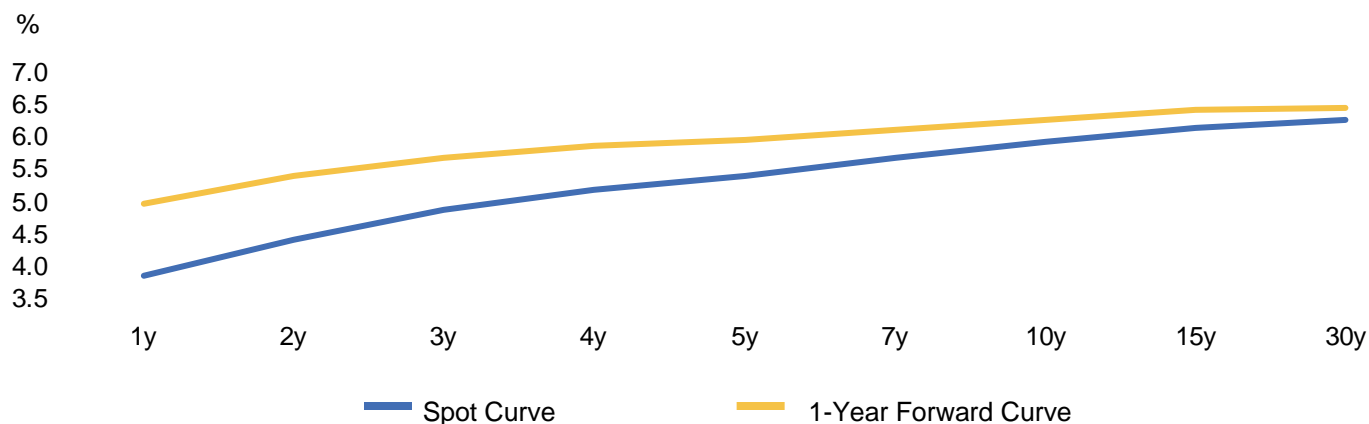
- 3 Components of an Unwind Value:
 - 1. Gain/loss on the fixed leg of the swap
 - 2. Accrued interest
 - 3. Gain/loss on the LIBOR setting

Example Trades

Forward Curve View

As of August 2, 2001

Swap Tenor	Years Forward										
	Spot	0.5	1	2	3	4	5	7	10	15	20
2y	4.415	4.922	5.433	6.093	6.369	6.460	6.589	6.610	6.854	6.831	6.610
5y	5.426	5.712	5.979	6.342	6.489	6.563	6.682	6.733	6.928	6.846	6.538
10y	5.936	6.113	6.282	6.506	6.621	6.693	6.755	6.815	6.894	6.717	6.486
30y	6.296	6.391	6.480	6.591	6.639	6.657	6.665	6.657	6.621	6.419	6.182
Spreads (bps)											
2-5	101.1	79.0	54.5	24.9	12.0	10.4	4.3	12.2	7.5	1.5	-7.2
2-10	152.1	119.1	84.9	41.3	25.2	23.3	16.6	20.5	4.0	-11.4	-12.4
2-30	188.1	146.9	104.7	49.9	26.9	19.7	7.6	4.7	-23.3	-41.2	-42.8
5-10	51.0	40.1	30.3	16.4	13.2	12.9	12.4	8.2	-3.4	-12.9	-5.2
5-30	87	67.9	50.2	24.9	14.9	9.4	3.4	-7.5	-30.7	-42.7	-35.6
10-30	36.1	27.8	19.8	8.5	1.8	-3.6	-9.0	-15.8	-27.3	-29.8	-30.4

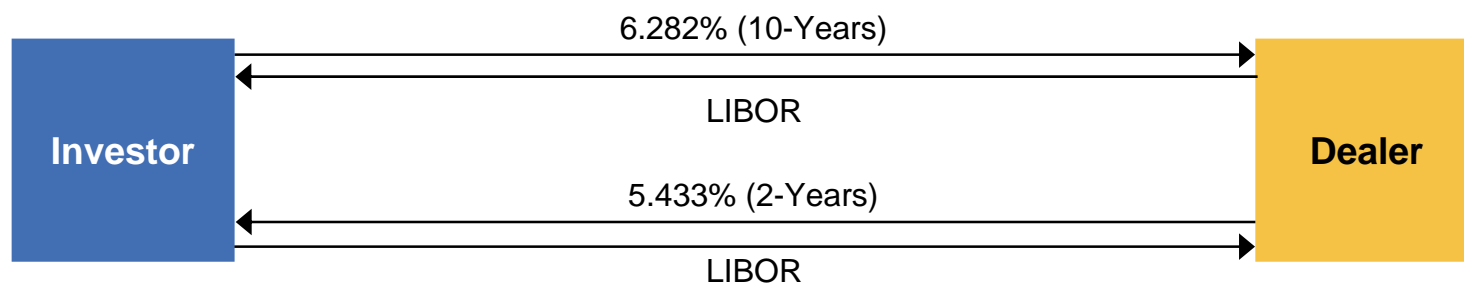


Forward Curve View

As of close 2/1/00

Swap Curve		
	Spot	1 Year Forward
2yr Rate	4.415%	5.433%
10yr Rate	5.936%	6.282%
Differential	152.1 bps	84.9 bps

- Suppose you believe the 2s-10s swap curve will not flatten as much as implied by forward swap curve
- You can enter into a 2s-10s steepener 1 year forward at flat (notionals are DV01 weighted)
- In 1-Year:

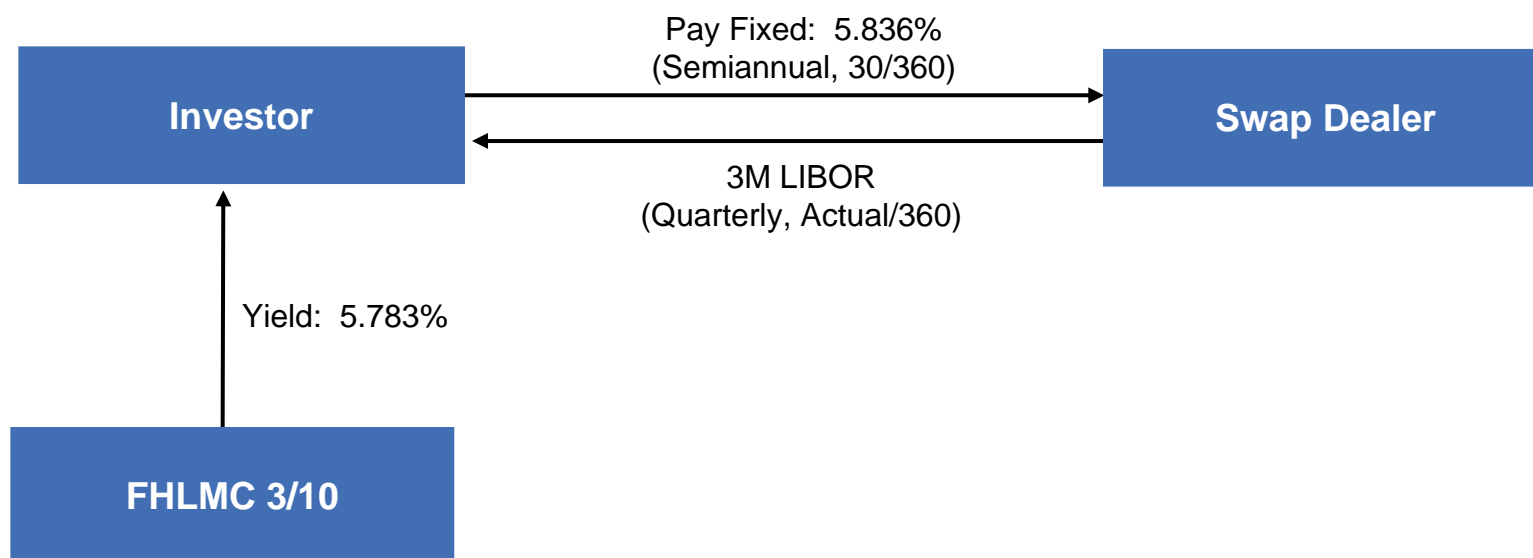


Hedging a Bond with Swaps

Suppose you buy \$100mm FHLMC 7.0% 3/15/10 and we want to hedge this position with swaps:

- Hedge: Pay fixed on a swap to 3/15/10
- DV01 of FHLMC 3/10: 7.04
- DV01 of swap: 6.80
- Hedge ratio: \$103.5mm swaps

Hedging a Bond with Swaps



- Yield/yield swap spread: -5.3 bps (5.783% - 5.836%)

Hedging the Optionality in a Callable Bond

- Suppose you are long \$100mm of FHLMC 7.625% 9/9/09 callable in 9/9/02 and you want to hedge out the optionality.
- You have sold the right to buy the bonds, so you need to buy the right to be long the market. This requires buying an American receiver swaption.
- In essence, you are buying the call back embedded in the bond through the swaption market. The effectiveness of the trade is dependent upon the correlation between swap rates and the yield on the bond as well as the correlation between swap vol and vol on the bond.

Accessing the Credit Markets in Other Countries

- Suppose a corporation based in the USD needs 10-year dollar funding.
- However, US investors are full on the name and are not eager to further invest in this corporation. The corporation locates an opportunity in Japan, as Japanese investors are very keen to buy this corporation's paper.
- **Solution:** Corporation can issue in JPY and swap the issuance back to USD through the use of a cross-currency swap.

Following the Market

Sources of Information

- Derivatives Strategy and Marketing Online
- Telerate: 19901
- Reuters: ICAP1
- Bloomberg:
 - Current levels and historical data
 - \$\$SWAP10 Index <GO>
 - USSWAP5 Index <GO>
 - IRSB <GO>
 - Pricing:
 - BCSW <GO>
 - SWPL <GO>
- LIBOR Settings: Telerate 3750

Sources of Information

- Interest Rate Strategy Online
 - Trade ideas / Market commentary
 - Real time swap rates and swap spreads
 - Historical data
- Telerate: 19901 and 19902
- Reuters: ICAP1
- Bloomberg:
 - Current levels and historical data
 - \$\$SWAP10 Index <GO>
 - USSWAP5 Index <GO>
 - IRSB <GO>
 - Pricing:
 - BCSW <GO>
 - SWPL <GO>
- LIBOR Settings: Telerate 3750

Interest Rate Derivative Products Online

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INTEREST RATE DERIVATIVE PRODUCTS

IRDP Contacts

[Home](#) | [Strategy & Marketing](#) | [Corporates](#)

Headlines

Commentary

[Market Update](#): May 11, 2001

Call it the afternoon rush. The market traded down in the morning after unemployment claims fell more than expected, bringing rates higher by 4 to 6 bps across the curve.

[Fixed Income Perspectives](#) (May 7, 2001)

[Archive...](#)

Trade Ideas

[Opportunity in the Forward Curve](#) (April 9, 2001)

[Agency Butterfly Opportunity](#) (April 5, 2001)

[Archive...](#)

Structured Notes

[10 Yr NC 1 Yr Callable Capped 6-Month USD Libor Floater](#) (May 1, 2001)

[10 Year Non-Call 1 Year 3 Month USD LIBOR Range Accrual Note](#) (April 20, 2001)

[5 Non-Call 2 Partial Floating Rate Agency Note](#) (April 12, 2001)

Current Trades

[Alan Says "Buy GNMA's"](#)
(April 30, 2001)

[Sell 2-Year into 10-Year Swaption Straddles](#)
(April 26, 2001)

Mortgage Backed Securities

[Mortgage Data / Analytics](#)

Swap Indication

[USD Swap Indication](#)
Live USD swap spread, swap rate, and on-the-run Treasury yield indication screen.

[Non-USD Swap Indication and LIBOR settings](#)
Live Euro, Sterling, and Yen swap rate indication screen.

Interest Rate Derivative Products Online

Swap Indication

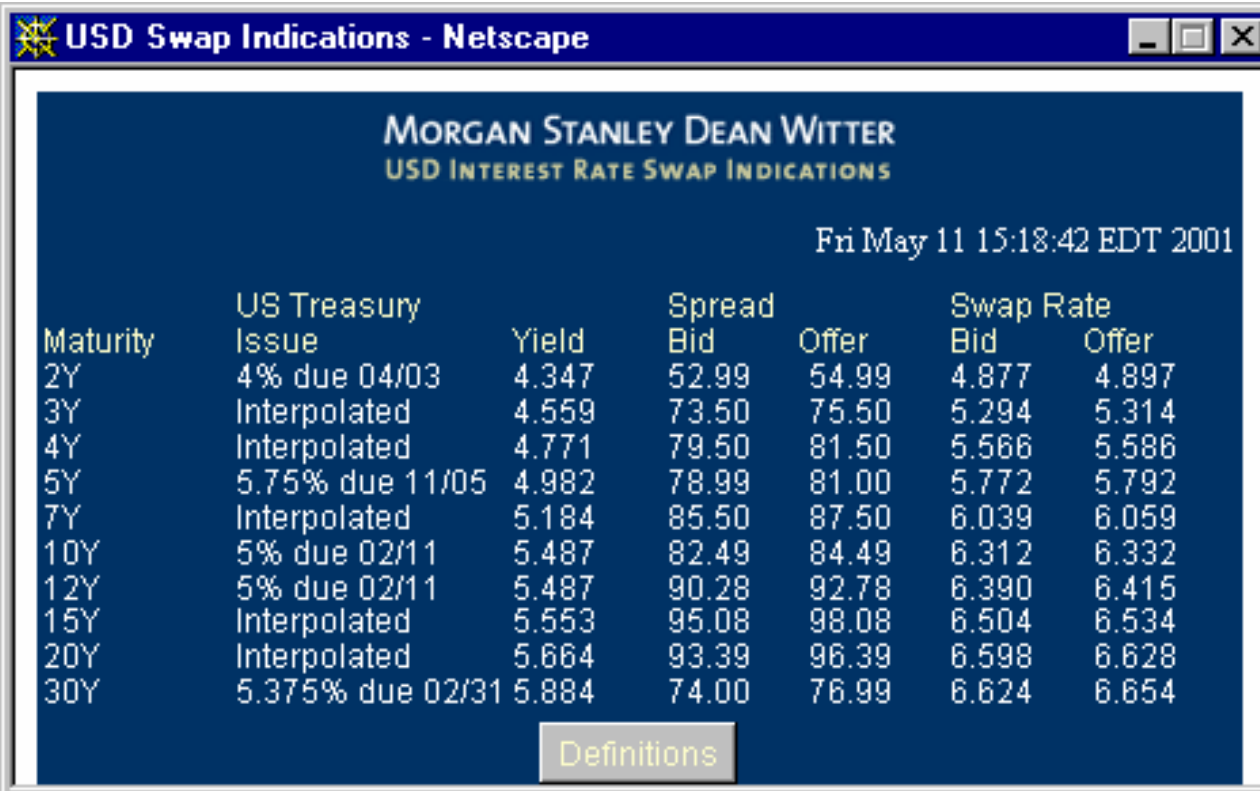
[USD Swap Indication](#)

Live USD swap spread, swap rate, and on-the-run Treasury yield indication screen.

[Non-USD Swap Indication and LIBOR settings](#)

Live Euro, Sterling, and Yen swap rate indication screen.

Click



Maturity	US Treasury Issue	Yield	Spread		Swap Rate	
			Bid	Offer	Bid	Offer
2Y	4% due 04/03	4.347	52.99	54.99	4.877	4.897
3Y	Interpolated	4.559	73.50	75.50	5.294	5.314
4Y	Interpolated	4.771	79.50	81.50	5.566	5.586
5Y	5.75% due 11/05	4.982	78.99	81.00	5.772	5.792
7Y	Interpolated	5.184	85.50	87.50	6.039	6.059
10Y	5% due 02/11	5.487	82.49	84.49	6.312	6.332
12Y	5% due 02/11	5.487	90.28	92.78	6.390	6.415
15Y	Interpolated	5.553	95.08	98.08	6.504	6.534
20Y	Interpolated	5.664	93.39	96.39	6.598	6.628
30Y	5.375% due 02/31	5.884	74.00	76.99	6.624	6.654

Definitions

Telerate 19901

Telerate 19901									
05/11 15:27 EDT (C)2001 MKT DATA CORP SOURCE:TULLETT&TOKYO LIBERTY PLC 19901									
US GOVS- CANTOR FITZGERALD			YL MID	SPREAD	SA 30/360	ANN A/360	BI YIELDS		
2Y	99.12	-122 4.335-331	4.333	56.00/52.00	4.893-853	4.884-844			
3Y		**	4.549	76.50/72.50	5.314-274	5.305-264			
4Y		**	4.764	82.50/78.50	5.589-549	5.585-544			
5Y	98.14	-146 4.982-976	4.979	82.00/78.00	5.799-759	5.798-758			
6Y		**	5.079	86.75/82.75	5.947-907	5.949-908	VS 3M		
7Y	** INTERPOLATED **		5.180	88.50/84.50	6.065-025	6.066-026	LIBOR		
8Y	YIELD		5.280	88.50/84.50	6.165-125	6.169-128	[4.07000]		
9Y		**	5.380	87.00/83.00	6.250-210	6.256-215			
10Y	96.12+-13	5.481-479	5.480	85.50/81.50	6.335-295	6.343-302			
11Y	\		5.480	92.00/88.00	6.400-360	6.407-367			
12Y	\		5.480	97.50/93.50	6.455-415	6.464-423	INDEX		
13Y	\	SPREAD TO	5.480	101.50/97.50	6.495-455	6.505-464	PG 19900		
14Y	/	10-YEAR NOTE	5.480	105.25/101.2	6.533-493	6.543-503	PHONE #S		
15Y	/		5.480	108.50/104.5	6.565-525	6.575-535	PG 19925		
20Y	/		5.480	116.75/112.7	6.648-608	6.660-619			
30Y	92.30	-30+ 5.880-878	5.879	77.50/73.50	6.654-614	6.666-626			
* * * (B) --U. MICH EARLY MAY SENTIMENT SAID 92.6 VS 88.4 APRILSET									
Displaying Telerate: Main 19901									

Bloomberg Historical Data

Swap Rate



Bloomberg Historical Data

Swap Spread




Bloomberg Swap Model

GRAB Curncy BCSW

Curve Source: CMPN

SWAP VALUATION

Settlement 5/16/01 Calculate 3

R Receive Currency US 1-Fixed Coupon 

Maturity 5/16/06 2-Spread

Effective Date 5/16/01 3-Premium

Notional 10,000,000

FIXED FLOATING

Coupon 5.72500% Index 4.07000%

Nominal Payment Date 5/16 + Spread 0.0 bp

First Cpn Date 11/16/01 8/16/01

Next to Last Cpn Dt 11/16/05 2/16/06

Freq/DayCount S 30/360 Q/Q ACT/360

Business Day Adjustment: 1

Swap Premium 0.0000

Prin. Value 0.00

Accrued 0.00

Market Value 0.00

Swap Curve

B Bid/Ask/Mid US Curve # 23

BGN CURVE DATED 5/13/01

Rates as of 5/13/01

Deposit Rates	Swap Rates
1 Wk 4.151	2 Yr 4.832
1 Mo 4.122	3 Yr 5.254
2 Mo 4.095	4 Yr 5.521
Reset 4.070	Mty 5.725
4 Mo 4.069	7 Yr 5.991
5 Mo 4.062	10Yr 6.255
6 Mo 4.060	15Yr 6.485
9 Mo 4.133	20Yr 6.570
1 Yr 4.225	30Yr 6.580

Enter:

- 1 <Go> Update Swap Curve
- 2 <Go> View Cashflows
- 3 <Go> Horizon Analysis
- 4 <Go> To Save Swap

	10 DV01 (Eqv)	4 Mod. Dur. (Eqv)
FIXED	4338.12	4.34
FLOATING	-252.92	-0.25
NET	4085.20	4.09

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 Princeton: 609-279-3000 Singapore: 65-212-1000 Sydney: 2-9777-8686 Tokyo: 3-3201-8900 Sao Paulo: 11-3048-4500
 1787-809-0 13-May-01 16:26:27

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