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Part 1 of 2: Three-month SOFR Futures and Deferred FRA

Stage 1: Data collection and preparation

Chosen Business Day: **27th October 2025**

Three-Month SOFR

Futures and Options

GLOBEX CODE	LAST	CHANGE	VOLUME
SR3H6	96.585	-0.025 (-0.03%)	28,912

TRADING SIMULATOR

PURCHASE DATA

Last Updated 27 Oct 2025 03:11:51 AM CT. Market data is delayed by at least 10 minutes

MONTH	OPTIONS	CHART	LAST	CHANGE	PRIOR SETTLE	OPEN	HIGH	LOW	VOLUME	UPD
AUG 2025 SR3Q5	OPT		-	-	95.78	-	-	-	0	12:3 CT 26 O 2025
SEP 2025 SR3U5	OPT		95.9275	UNCH (UNCH)	95.9275	95.925	95.9275	95.925	4,900	01:5 CT 27 O 2025
OCT 2025 SR3V5	OPT		-	-	96.0875	-	-	-	0	12:3 CT 26 O 2025
NOV 2025 SR3X5	OPT		96.255	-0.0075 (-0.01%)	96.2625	96.255	96.255	96.255	104	01:5 CT 27 O 2025
DEC 2025 SR3Z5	OPT		96.36	-0.02 (-0.02%)	96.38	96.37	96.37	96.36	27,911	02:0 CT 27 O 2025
JAN 2026 SR3F6	OPT		-	-	96.49	-	-	-	0	12:3 CT 26 O 2025
FEB 2026 SR3G6	OPT		-	-	96.56	-	-	-	0	12:3 CT 26 O 2025
MAR 2026 SR3H6	OPT		96.58	-0.03 (-0.03%)	96.61	96.60	96.60	96.58	20,444	02:0 CT 27 O 2025
APR 2026 SR3J6			-	-	96.68	-	-	-	0	12:30:49 CT 26 Oct 2025
JUN 2026 SR3M6			96.79	-0.03 (-0.03%)	96.82	96.81	96.81	96.785	17,060	02:02:42 CT 27 Oct 2025
SEP 2026 SR3U6			96.93	-0.035 (-0.04%)	96.965	96.945	96.955	96.93	18,177	02:02:42 CT 27 Oct 2025
DEC 2026 SR3Z6			96.99	-0.035 (-0.04%)	97.025	97.005	97.015	96.99	26,365	02:02:42 CT 27 Oct 2025
MAR 2027 SR3H7			96.99	-0.035 (-0.04%)	97.025	97.025	97.025	96.99	12,081	02:02:42 CT 27 Oct 2025
JUN 2027 SR3M7			96.965	-0.035 (-0.04%)	97.00	96.995	96.995	96.965	15,469	02:02:42 CT 27 Oct 2025
SEP 2027 SR3U7			96.925	-0.035 (-0.04%)	96.96	96.955	96.955	96.925	11,283	02:02:42 CT 27 Oct 2025
DEC 2027 SR3Z7			96.875	-0.04 (-0.04%)	96.915	96.91	96.91	96.875	6,341	02:02:42 CT 27 Oct 2025
MAR 2028 SR3H8			96.82	-0.04 (-0.04%)	96.86	96.855	96.855	96.82	4,343	02:02:42 CT 27 Oct 2025
JUN 2028 SR3M8			96.77	-0.04 (-0.04%)	96.81	96.805	96.805	96.765	3,956	02:02:42 CT 27 Oct 2025
SEP 2028 SR3U8			96.72	-0.04 (-0.04%)	96.76	96.755	96.755	96.72	3,559	02:02:42 CT 27 Oct 2025
DEC 2028 SR3Z8			96.67	-0.045 (-0.05%)	96.715	96.705	96.705	96.67	2,961	02:02:42 CT 27 Oct 2025
MAR 2029 SR3H9			96.63	-0.045 (-0.05%)	96.675	96.66	96.66	96.63	1,816	02:02:42 CT 27 Oct 2025
JUN 2029 SR3M9			96.585	-0.045 (-0.05%)	96.63	96.62	96.62	96.585	2,610	02:02:42 CT 27 Oct 2025
SEP 2029 SR3U9			96.54	-0.045 (-0.05%)	96.585	96.575	96.575	96.54	1,385	02:02:42 CT 27 Oct 2025
DEC 2029 SR3Z9			96.50	-0.045 (-0.05%)	96.545	96.535	96.535	96.50	1,577	02:02:42 CT 27 Oct 2025

MAR 2030 SR3H0	96.45	-0.05 (-0.05%)	96.50	96.49	96.49	96.45	1,032	02:02:42 CT 27 Oct 2025
JUN 2030 SR3M0	96.405	-0.045 (-0.05%)	96.45	96.43	96.43	96.40	2,026	02:02:42 CT 27 Oct 2025
SEP 2030 SR3U0	96.355	-0.045 (-0.05%)	96.40	96.37	96.38	96.355	1,180	02:02:42 CT 27 Oct 2025
DEC 2030 SR3Z0	-	-	96.355	-	-	-	370	01:04:17 CT 27 Oct 2025
MAR 2031 SR3H1	-	-	96.305	-	-	-	0	12:30:49 CT 26 Oct 2025
JUN 2031 SR3M1	-	-	96.255	-	-	-	0	12:30:49 CT 26 Oct 2025
SEP 2031 SR3U1	-	-	96.205	-	-	-	0	12:30:50 CT 26 Oct 2025
DEC 2031 SR3Z1	-	-	96.165	-	-	-	0	12:30:50 CT 26 Oct 2025
MAR 2032 SR3H2	-	-	96.12	-	-	-	0	12:30:49 CT 26 Oct 2025
JUN 2032 SR3M2	-	-	96.075	-	-	-	0	12:30:49 CT 26 Oct 2025
SEP 2032 SR3U2	-	-	96.035	-	-	-	0	12:30:49 CT 26 Oct 2025
DEC 2032 SR3Z2	-	-	95.995	-	-	-	0	12:30:49 CT 26 Oct 2025
MAR 2033 SR3H3	-	-	95.955	-	-	-	0	12:30:49 CT 26 Oct 2025
JUN 2033 SR3M3	-	-	95.915	-	-	-	0	12:30:49 CT 26 Oct 2025
SEP 2033 SR3U3	-	-	95.885	-	-	-	0	08:05:10 CT 26 Oct 2025
DEC 2033 SR3Z3	-	-	95.84	-	-	-	0	12:30:49 CT 26 Oct 2025
MAR 2034 SR3H4	-	-	95.83	-	-	-	0	08:04:36 CT 26 Oct 2025
JUN 2034 SR3M4	-	-	95.805	-	-	-	0	12:30:49 CT 26 Oct 2025
SEP 2034 SR3U4	-	-	95.79	-	-	-	0	08:04:51 CT 26 Oct 2025
DEC 2034 SR3Z4	-	-	95.745	-	-	-	0	08:04:34 CT 26 Oct 2025
MAR 2035 SR3H5	-	-	95.735	-	-	-	0	08:05:01 CT 26 Oct 2025

Contract	Prior Settle
Dec-25	96.38
Mar-26	96.61
Jun-26	96.82
Sep-26	96.93
Dec-26	97.025
Mar-27	96.99
Jun-27	97
Sep-27	96.96
Dec-27	96.915
Mar-28	96.86
Jun-28	96.81
Sep-28	96.76
Dec-28	96.715
Mar-29	96.675
Jun-29	96.63
Sep-29	96.585
Dec-29	96.545
Mar-30	96.5
Jun-30	96.45
Sep-30	96.4
Dec-30	96.355
Mar-31	96.305
Jun-31	96.255
Sep-31	96.205
Dec-31	96.165
Mar-32	96.12
Jun-32	96.075
Sep-32	96.035
Dec-32	95.995
Mar-33	95.955
Jun-33	95.915
Sep-33	95.885
Dec-33	95.84
Mar-34	95.83
Jun-34	95.805
Sep-34	95.79
Dec-34	95.745

Image 1: Extracted Prior Settle values for each contract date

Stage 2: Implied Forward SOFR Term Structure

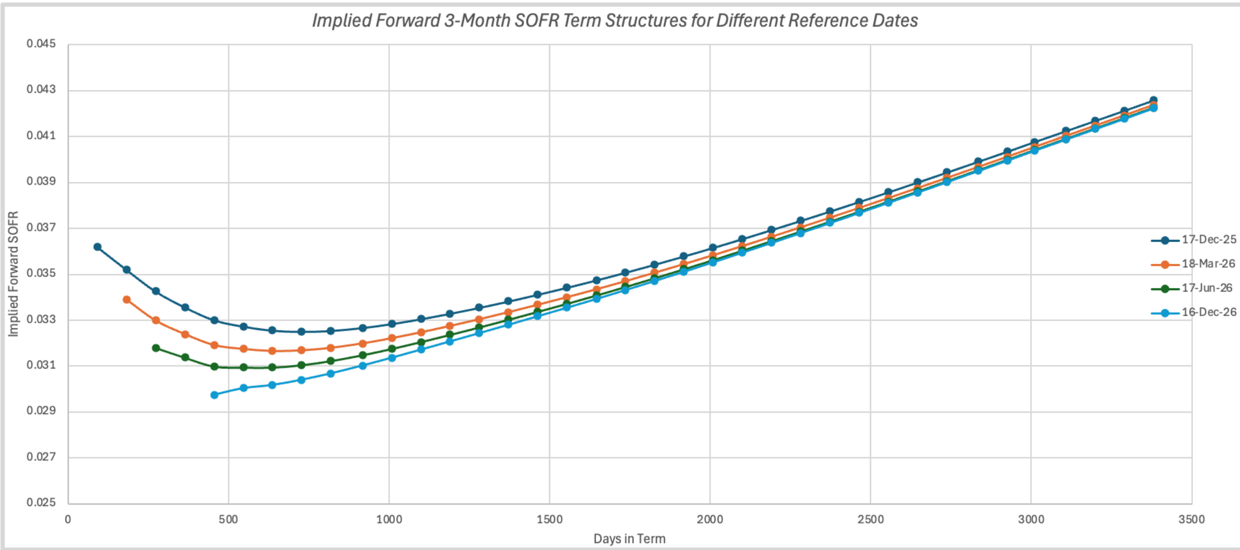


Image 2: ***Implied Forward 3-Month SOFR Term Structures for Different Reference Dates***

Market-implied term-SOFR curves across the five reference dates reveal a consistent pattern: a mild decline in short-horizon rates (reflecting anticipated near-term easing), followed by a gradually rising slope toward higher long-run levels (reflecting normalisation and term premium).

Economically, the initial downward segment stems from expectations that the Federal Reserve will begin cutting its policy rate, supported by recent Fed communications and futures pricing showing a ~96% probability of a cut in the near term.

Beyond the trough, the upward climb reflects the market's view that once the cutting cycle ends, interest rates will gradually rise back toward a neutral or pre-crisis level, and further include a term premium for uncertainty in the longer horizon.

Stage 3: Pricing Deferred Forward Rate Agreement

Fixed n, l varies:

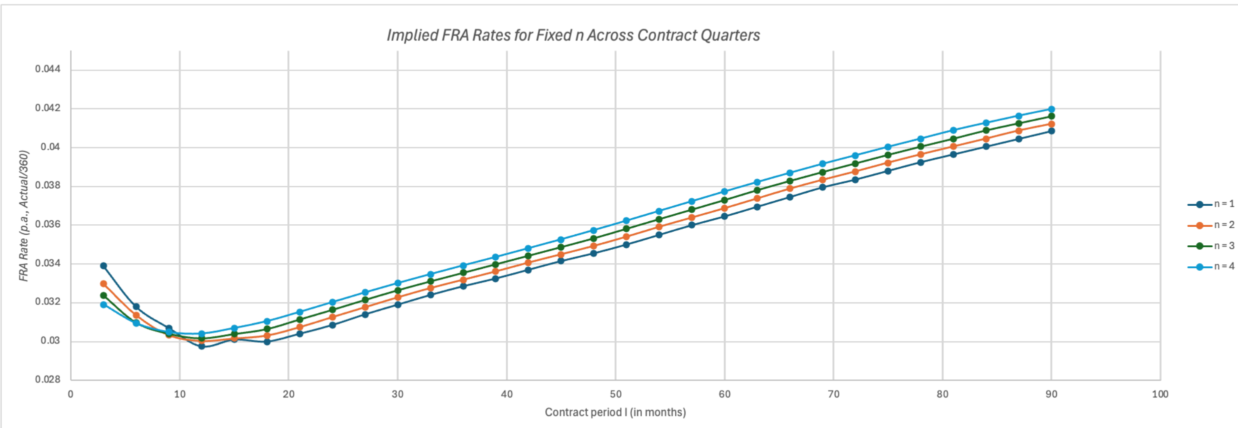


Image 3: Implied FRA Rates for fixed n across contract Quarters

All four FRA curves exhibit a clear "tick-shaped" pattern. FRA rates decline initially—from about 3.3 % to near 3.0 %—over the first 12 to 15 months, marking a decreasing interval that reflects market expectations of near-term policy easing.

The turning point occurs around a deferment of 12–15 months, where the curves reach their trough, consistent with investors anticipating the end of the upcoming Fed rate-cut cycle.

Beyond this trough, FRA rates rise steadily toward 4.1–4.3 % by 90 months, forming an increasing interval that signals expectations of gradual normalization toward the economy's longer-run neutral rate.

Across tenors, longer FRAs (n = 3, 4) lie slightly above and are smoother than shorter ones (n = 1, 2), as they average more of the higher forward rates further out the curve.

The upward separation between curves widens modestly with l, consistent with an upward-sloping long-term forward curve and embedded term-premia.

Overall, the FRA structure aligns with current market sentiment: moderate rate cuts over the next year, a trough around mid-2026, and a slow return to a stable 4% region thereafter.

Fixed I, n varies:

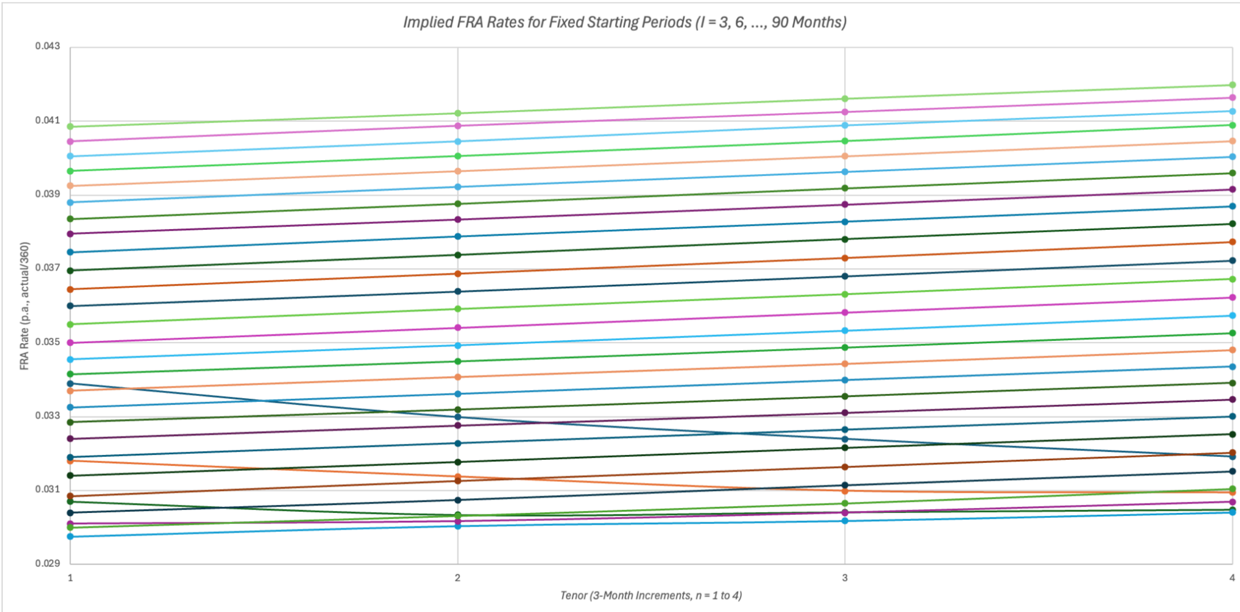


Image 3: Implied FRA Rates for fixed starting periods and varying tenor

The fixed-I FRA curves exhibit a clear evolution that mirrors the underlying term-SOFR structure.

For near-term starts (I = 3–6 months), FRA rates decline with tenor, reflecting expectations of imminent policy easing.

Around I = 9–15 months, the curves flatten near 3 %, signifying the anticipated trough of the rate-cut cycle.

Beyond 18 months, slopes turn positive. Longer-tenor FRAs rise steadily, consistent with forecasts of gradual monetary normalization and embedded term-premium.

As the deferred start I increases, the entire curve shifts upward while retaining its shape, highlighting a stable long-run expectation for SOFR around 4 %.

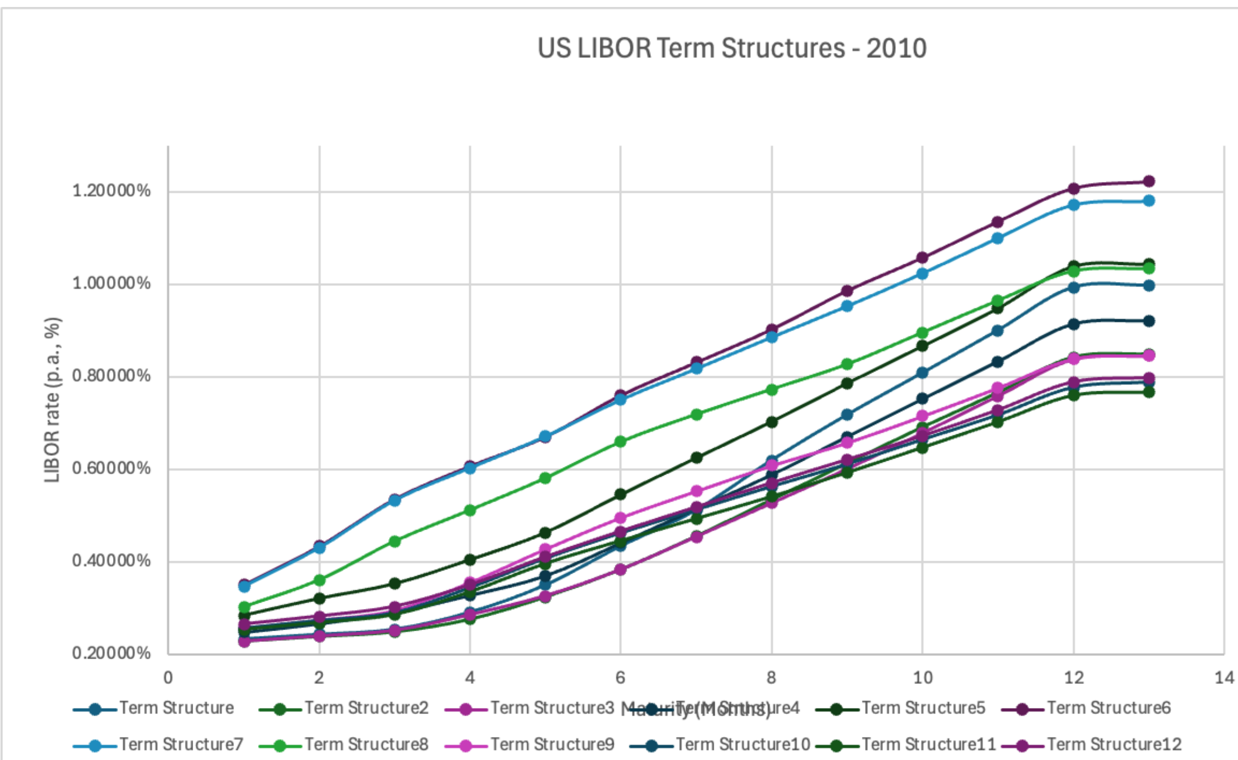
Collectively, the FRA surface indicates that markets foresee a short-term easing phase followed by a prolonged return toward neutral rates, with minimal volatility in long-horizon expectations.

Part 2 of 2: Pricing an Interest Rate Swap and Tracking its Value

<u>Stage 1: Data collection and preparation (provided)</u>

D	4-Jan-10	1-Feb-10	1-Mar-10	1-Apr-10	3-May-10	1-Jun-10	1-Jul-10	2-Aug-10	1-Sep-10	1-Oct-10	1-Nov-10	1-Dec-10
Maturity(month	Term Structure	Term Structure2	Term Structure3	Term Structure4	Term Structure5	Term Structure6	Term Structure7	Term Structure	Term Structure9	Term Structu	Term Structu	Term Structure12
1 month rate	0.23344%	0.22906%	0.22813%	0.24863%	0.28469%	0.35088%	0.34719%	0.30281%	0.25781%	0.25688%	0.25375%	0.26531%
2 month rate	0.24344%	0.23906%	0.23938%	0.26694%	0.32125%	0.43438%	0.43063%	0.36094%	0.27469%	0.27359%	0.26859%	0.28250%
3 month rate	0.25438%	0.24906%	0.25169%	0.29150%	0.35313%	0.53625%	0.53331%	0.44469%	0.29563%	0.29063%	0.28594%	0.30344%
4 month rate	0.29125%	0.27625%	0.28563%	0.32850%	0.40500%	0.60775%	0.60338%	0.51213%	0.35594%	0.34469%	0.33500%	0.35031%
5 month rate	0.35025%	0.32438%	0.32669%	0.37063%	0.46375%	0.67119%	0.67163%	0.58125%	0.42819%	0.40813%	0.39625%	0.41094%
6 month rate	0.43438%	0.38375%	0.38375%	0.44156%	0.54578%	0.76113%	0.75100%	0.65994%	0.49625%	0.46313%	0.44563%	0.46656%
7 month rate	0.51250%	0.45563%	0.45481%	0.51563%	0.62531%	0.83213%	0.81819%	0.71944%	0.55350%	0.51344%	0.49350%	0.51875%
8 month rate	0.62000%	0.53438%	0.52750%	0.58906%	0.70375%	0.90363%	0.88656%	0.77375%	0.60888%	0.56375%	0.54125%	0.57125%
9 month rate	0.71813%	0.61313%	0.60138%	0.67125%	0.78688%	0.98719%	0.95375%	0.82781%	0.65813%	0.61203%	0.59313%	0.62156%
10 month rate	0.80875%	0.69125%	0.67931%	0.75294%	0.86719%	1.05863%	1.02500%	0.89656%	0.71575%	0.66531%	0.64750%	0.67313%
11 month rate	0.90063%	0.76563%	0.75938%	0.83375%	0.94906%	1.13675%	1.10125%	0.96563%	0.77688%	0.71844%	0.70281%	0.72906%
12 month rate	0.99375%	0.84250%	0.83938%	0.91500%	1.04000%	1.20875%	1.17313%	1.02975%	0.83988%	0.77838%	0.76038%	0.79000%

<u>Image 4: USD LIBORs for maturities 1 to 12 months for set of dates in D</u>



<u>Image 5: USD LIBORs Term Structures for 2010</u>

The twelve term structures of USD LIBOR for 2010 display a consistently upward-sloping shape, typical of a normal yield curve, with rates rising steadily from the 1-month to the 12-month maturity. Throughout 2010, overall LIBOR levels remained exceptionally low, between about 0.2 % and 1.2 %, reflecting the Federal Reserve's post-crisis zero-interest-rate policy and abundant liquidity conditions.

Early-year curves (January–March) are very flat at the front end, indicating market expectations of sustained near-zero short-term rates. As the year progresses, the curves become slightly steeper, especially beyond the 6-month maturity, suggesting that investors anticipated a gradual economic recovery and possible tightening in the medium term.

By mid- to late-2010, term premiums widened modestly, consistent with improving credit conditions but continuing policy accommodation.

Overall, the 2010 LIBOR term structures show a low-rate environment with mild upward shifts over the year, driven by slow recovery from the 2008–09 financial crisis and cautious expectations of future rate normalisation.

Stage 2: Swap rate of a one-year interest rate swap

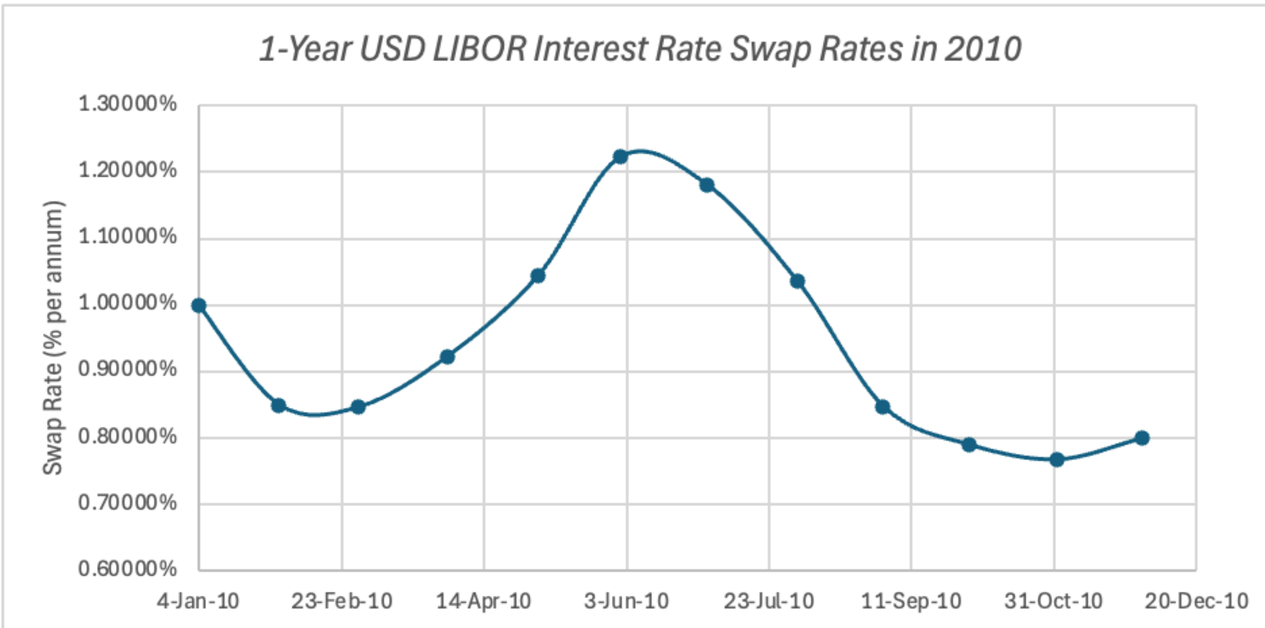


Image 6: 1-Year USD LIBOR Interest Rate Swap Rates in 2010

The 1-year USD LIBOR swap rate in 2010 followed a clear cyclical pattern. It began near 1.0 % in January, fell to around 0.85 % by March–April, then rose sharply to a mid-year peak of roughly 1.25 % in June, before declining again through late summer and autumn to about 0.75–0.80 % by October, with a modest rebound toward year-end.

This movement mirrors the shifting economic sentiment of 2010. Early in the year, growth was subdued (U.S. GDP grew only ~2.3 % in Q1) and unemployment hovered near 10 %, anchoring expectations for prolonged monetary easing and low floating rates.

As data improved in Q2, with GDP growth accelerating to ~4.8 % and stronger corporate performance, investors anticipated policy tightening, pushing swap rates higher. However, by mid-to-late 2010, renewed concerns about the U.S. recovery and eurozone debt instability prompted the Federal Reserve's second round of quantitative easing (QE2), which drove yields and swap rates back down.

The slight uptick at year-end likely reflects modest optimism for 2011 and year-end positioning. Overall, the graph captures a "valley-hump-valley" profile, showing how market expectations for growth and Fed policy shaped the term structure even in a low-rate environment.

Stage 3: Tracking Swap Value of a one-year interest rate swap

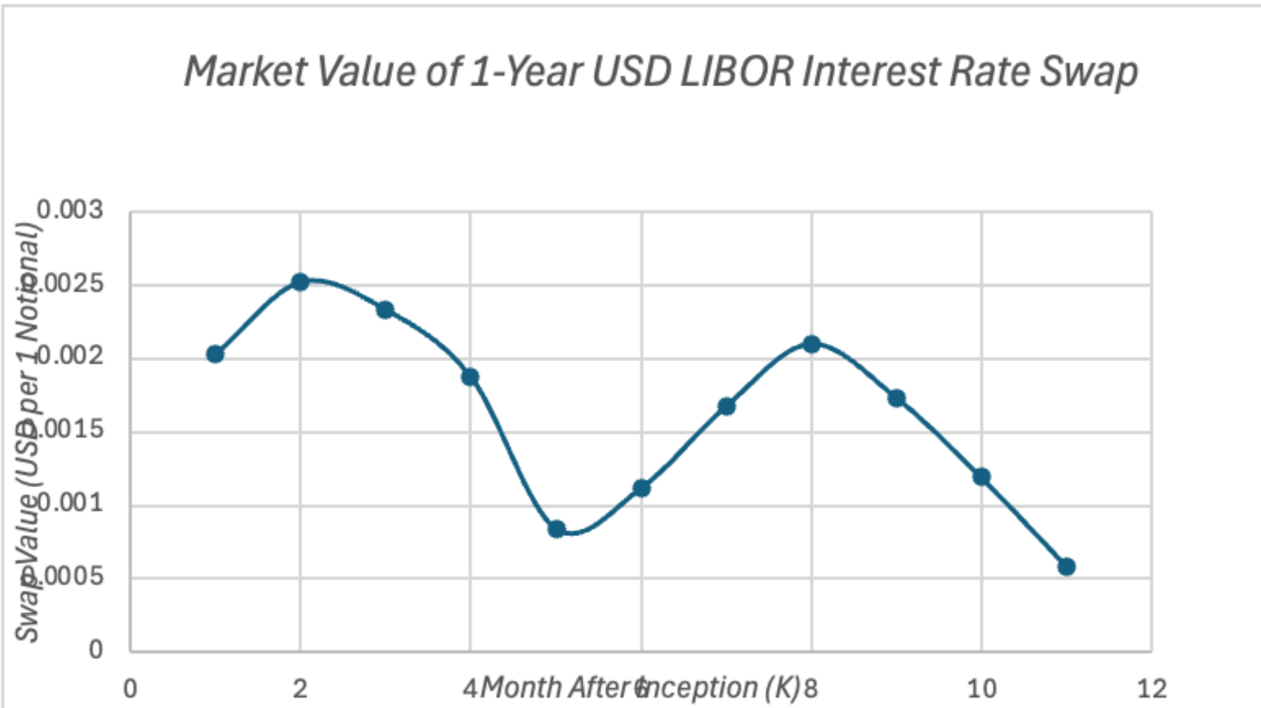


Image 7: Market Value of a 1-Year USD LIBOR Interest Rate Swap

The swap’s value curve exhibits a clear hump–valley–hump shape, perfectly mirroring the valley–hump–valley pattern of 1-year swap rates in 2010 in step 2.

Early declines in market rates boosted the value of the fixed-receiving position, while the mid-year rise in rates reduced it. As rates fell again late in the year amid Federal Reserve easing, the swap’s value recovered before fading toward zero near maturity.

The fluctuations in swap value thus directly reflect the inverse relationship between fixed-rate bond prices and market yields, and mirror the changing macroeconomic outlook throughout 2010.