

Fixed Income

Problem set on forward discount factors, forward rates, and swaps.

**Short Answer questions. Be concise, precise and direct.**

1. Suppose that you observe the following bid and ask quotes on US Treasury STRIPS (prices in % terms):

Term (Yrs)	Bid	Ask
0.25	99.37	99.38
0.5	98.7	98.71
0.75	97.99	98.00
1	97.28	97.29
1.25	96.56	96.58
1.5	95.88	95.90
1.75	95.22	95.25
2	94.55	94.56
2.5	93.19	93.22
3	91.66	91.70
4	89.40	89.42

- (a) Use linear interpolation to fill in all 16 quarterly bid and ask continuously compounded spot rates over the 4-year term.
  - (b) Determine bid and ask quotes for all 16 quarterly forward discount factors.
  - (c) Determine bid and ask quotes for all 16 quarterly continuously compounded forward rates.
  - (d) Determine bid and ask quotes for all 15 6-month forward discount factors.
  - (e) Determine bid and ask quotes for all 15 6-month continuously compounded forward rates.
  - (f) Determine bid and ask quotes for all 13 1-year forward discount factors.
  - (g) Determine bid and ask quotes for all 13 1-year continuously compounded forward rates.
  - (h) Suppose that Key Bank offers a 2-year forward continuously compounded 90-day rate of 3.21% bid – 3.11% ask. Show an arbitrage trade – including cash flows on all relevant dates – using Treasuries and this rate. Discuss the effects of using the repo markets to finance and short the STRIPS.
  - (i) Suppose that Key Bank offers a 3.5-year forward continuously compounded 90-day rate of 2.25% bid – 2.15% ask. Show an arbitrage trade – including cash flows on all relevant dates – using Treasuries and this rate. Discuss the effects of using the repo markets to finance and short the STRIPS.
2. Suppose that you observe the following spot Libor rates (expressed on a quarterly-compounded basis):

Term (Yrs)	Libor
0.25	0.03
0.5	0.029
0.75	0.028
1	0.0275
1.25	0.027
1.5	0.0265
1.75	0.026
2	0.026
2.5	0.025
3	0.024
4	0.023

- (a) Use linear interpolation to fill in all 16 quarterly spot rates over the 4-year term.
- (b) Show all 16 1-quarter forward discount factors.

- (c) Show all 16 1-quarter forward quarterly-compounded rates.
- (d) What is the value of a 2-year plain vanilla interest rate swap—receive floating/ pay fixed— with a coupon rate of 2.8%? This swap has standard terms: \$10 million notional principal; floating rate index is 90-day Libor; the floating side has quarterly tenor; the fixed side makes semi-annual payments with semi-annual tenor.
- (e) Based on your answer to the preceding question, what can you say about the current market swap rate for a new swap with the same terms, without doing any additional calculations?
- (f) What is the current market swap rate for a new swap with the same terms as in the preceding questions?