Floating Rate Notes

Concepts and Buzzwords

- Floating Rate Notes
  - –Cash flows
  - –Valuation
  - –Interest Rate Sensitivity

–floater, FRN, ARN, VRN, benchmark interest rate, index

Reading

- Veronesi, Chapter 1
- Tuckman, Chapter 18

Introduction to Floating-Rate Notes

- A floating rate note is a bond with a coupon that is indexed to a benchmark interest rate.
- Possible benchmark rates include US Treasury rates, LIBOR, prime rate, municipal and mortgage interest rate indexes.
- Examples of floating-rate notes
  - Corporate (especially financial institutions)
  - Adjustable-rate mortgages (ARMs)
  - Governments (inflation-indexed notes)

Floating Rate Jargon

- Other terms used for floating-rate notes include
  - FRNs
  - Floaters and Inverse Floaters
  - Variable-rate notes (VRNs)
  - Adjustable-rate notes
- FRN usually refers to an instrument whose coupon is based on a short term rate (3-month T-bill, 6-month LIBOR)
- VRNs are based on longer-term rates
  - (1-year T-bill, 5-year T-bond)

Cash Flow Rule for Plain Vanilla Semi-Annual Floater

- The basic semi-annual coupon floating rate note has the coupon indexed to the 6-month interest rate.
- Each coupon date, the coupon is equal to the par value of the note times one-half the 6-month rate quoted 6 months earlier, at the beginning of the coupon period. In other words, the time *t* coupon payment as percent of par is $_{t\text{-}0.5}r_t$.
- The note pays par value at maturity.

Floating Rate Note Cash Flows

- Each coupon is based on the previous 0.5-year rate.
- Only the next coupon is known at the current date. The later ones are random.

Time	0	0.5	1	…	t	…	T
Cash flow		$_0r_{0.5}/2$	$_{0.5}\tilde{r}_1/2$		$_{t-0.5}\tilde{r}_1/2$		$1+{}_{T-0.5}\tilde{r}_T/2$

Example: Two-Year Semi-Annual Floater

What are the cash flows from $100 par of the note in this scenario?

- The first coupon on the bond is 100 x 0.0554/2=2.77.
- Later coupons set by the future 6-month interest rates.
- For example, suppose the future 6-month interest rates turn out as follows:

0	0.5	1	1.5	2
5.54%	6.00%	5.44%	6.18%	

Floater Cash Flows:

0	0.5	1	1.5	2
	2.77	3.00	2.72	103.09

100 x 0.06/2

Replicating a T-Year Floater with 0.5-Year Par Bonds

Consider the following trading strategy:

- At time 0, buy a 0.5-year par bond: pay $1.
- At time 0.5, buy another 0.5-year par bond:
  collect $1+ $r_{0.5}$/2, pay $1 = collect $$r_{0.5}$/2
- At time 1, buy another 0.5-year par bond:
  collect $1+${}_{0.5}r_1$/2, pay $1 = collect $${}_{0.5}r_1$/2)
- and so on, every six months until floater maturity date T
- At time T: collect $1+${}_{T-0.5}r_T$/2

Time 0 : Buy 0.5 - yr par bond

$-1 \qquad +(1+{}_0r_{0.5}/2)$

Time 0.5 : Buy 0.5 - yr par bond

$-1 \qquad +(1+{}_{0.5}r_1/2)$

Time 1 : Buy 0.5 - yr par bond

$-1 \qquad +(1+{}_1r_{1.5}/2)$

....

Time T - 0.5 : Buy 0.5 - yr par bond

$-1 \qquad +(1+{}_{T-0.5}r_T/2)$

Net : $-1 \qquad {}_0r_{0.5}/2 \qquad {}_{0.5}r_1/2 \qquad {}_1r_{1.5}/2 \qquad \ldots \qquad 1+{}_{T-0.5}r_T/2$

0 0.5 1 1.5 ... T

A Semi-Annual-Coupon Floater is Equivalent to a 0.5-Year Par Bond

- A dynamic strategy of strategy of rolling six-month par bonds until floater maturity, collecting the coupons along the way, replicates the cash flows of a floater.
- So as semi-annual coupon floater is equivalent to the six-month par bond in its replicating trading strategy.
- Like its replicating trading strategy, a floater is always worth par on the next coupon date with certainty.
- Its coupon is set to make it worth par today.
- The duration of the floater is therefore equal to the duration of a six-month par bond.
- Their convexities are the same too.

Class Problems

Assume the 0.5-year rate is 5.54%.

1) What is the duration of a semi-annual paying floating-rate note?
2) What is the dollar duration of $100 par of this note?
3) What is the convexity of this floater?
4) What is the dollar convexity?