Midterm Review

(October 15, 1998)

Bond Arithmetic

1. Interest rates are a way of expressing the time value of money: the value now of known payments at future dates.
2. Prices of zeros, discount factors, spot rates, and forward rates contain the same information.
3. The yield on a coupon bond is its internal rate of return.
4. The yield is not generally the return.
5. Conventions (arbitrary rules) govern (a) the relation between price and yield (compounding, for example) and (b) the computation of the invoice price from the quoted price (day counts). Both vary across markets.
6. We "replicate" an asset when we find a combination of other assets that has the same cash flows.
7. Example: coupon bonds are combinations of zeros (and vice versa).
8. The principal of arbitrage suggests that an asset and its synthetic replication should have (roughly) the same price.

Macrofoundations of Interest Rates

1. Interest rates reflect supply and demand for capital.
2. They also reflect expectations of the future.
3. An example is future inflation.
4. One version is the expectations hypothesis: the shape of the forward rate curve reflects the expected path of the short rate.

Quantifying Interest Rate Risk

1. Bond prices fall when yields rise. Prices of long bonds fall more.
2. DV01 and duration are measures of the sensitivity of price to yield changes. Both are based on the slope of the price-yield relation.
3. The duration of a combination of assets is the value-weighted average of the durations of the individual assets.
4. Duration comes in many flavors. We use modified duration — period.
5. Interest rate risk management can be approached in several ways: by matching the cash flows, by matching duration or DV01, or by minimizing statistical measures of risk.
6. Duration is "80-90% right." It misses nonparallel shifts in the spot rate curve: unequal variability and imperfect correlation of spot rates of different maturities.
7. Statistical risk measures quantify risk with estimates of standard deviations and correlations of returns and are easily applied beyond the world of fixed income.

Floaters and Swaps

1. Floating rate notes have interest payments that are tied to market interest rates.
2. A standard FRN pays a short rate (commonly LIBOR) and trades at par on reset dates.
3. An inverse floater pays a rate that varies inversely with a market rate (LIBOR, for example). Its cash flows can often be replicated with combinations of fixed and floating rate notes.
4. A "plain vanilla" interest rate swap is equivalent to a long position in a note with fixed payments and a short position in a bond with floating payments — or the reverse.
5. Swap rates are par yields: the fixed rate that equates the value of the fixed leg to that of the floating leg, typically par (the notional principal).
6. Many other swaps can be valued with appropriate manipulation of discount factors.
7. Swaps are useful tools for managing interest rate risk. They can be used, for example, to modify the duration of existing positions.
8. Swaps are custom-made OTC products and come in many varieties.
9. Credit risk has been a concern with swaps and other OTC derivatives, but contract design and legal developments tend to minimize its effects.