Percent

YIELD CURVES[a]

June 25, 1999[b]

May 1999[c]

January 1999[c]

Years to maturity

Percent

YIELD CURVES

Zero-coupon

Duration-adjusted

Maturity or duration, years

Bond price

INTEREST RATES AND BOND PRICES

Basis points

Convexity

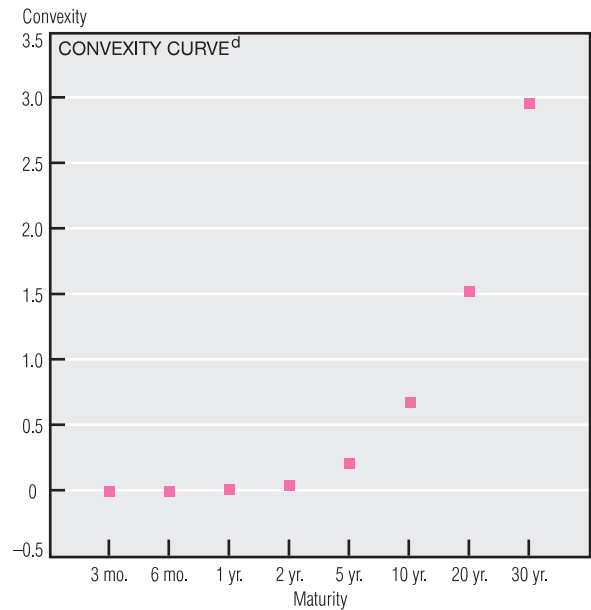### CONVEXITY CURVE[d]
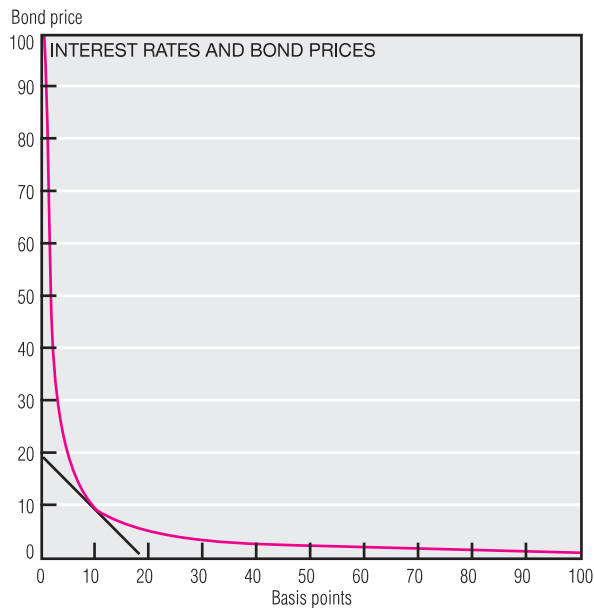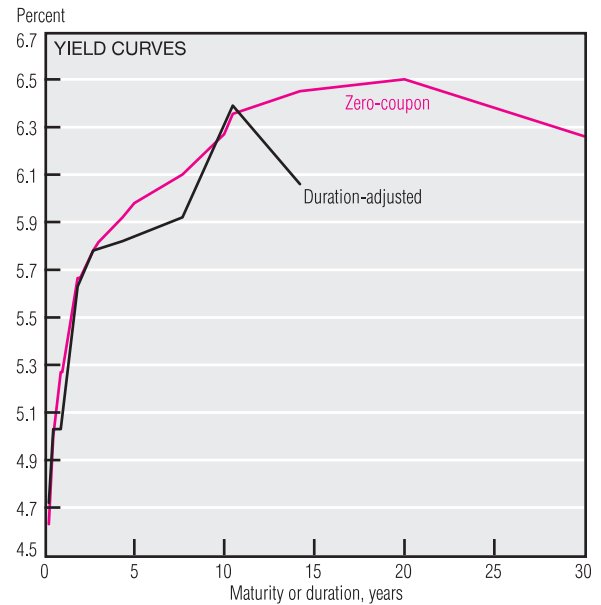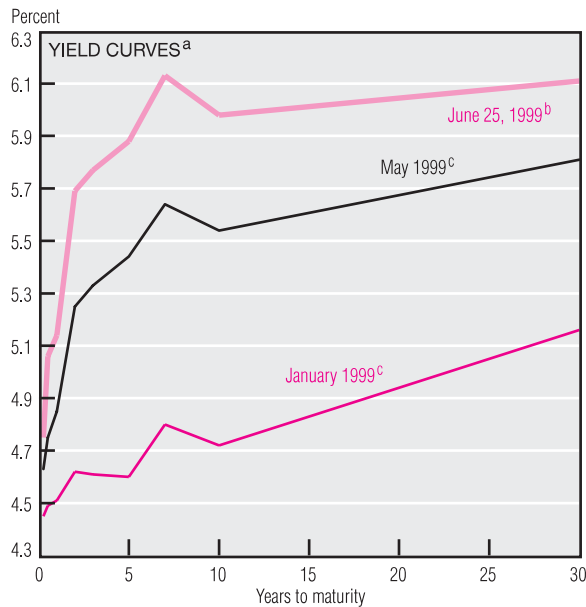
3 mo. 6 mo. 1 yr. 2 yr. 5 yr. 10 yr. 20 yr. 30 yr.

Maturity

a. All yields are from constant-maturity series.
b. Weekly average rates for the week of June 25, 1999.
c. Monthly averages.
d. For U.S. Treasury securities as of June 30, 1999.
NOTE: Duration and convexity are from Bloomberg Financial Information Services.
SOURCES: Board of Governors of the Federal Reserve System, "Selected Interest Rates," *Federal Reserve Statistical Releases,* H.15; Bloomberg Financial Information Services; and the *Wall Street Journal.*

Since last month, interest rates have risen across the board, with a surge in long rates steepening the yield curve. The 3-year, 3-month spread has increased from 70 to 102 basis points, finally moving above its long-run average of 80 basis points. Rates have shown an even larger change since the beginning of the year, with the 30-year rate rising 95 basis points since January. Many press accounts attribute these moves to expectations of Fed tightening, though Fed rate hikes generally flatten the yield curve, as long rates rise less than short rates.

Coupon payments mean that a bond is, in effect, a portfolio of many bonds, and the yield a corresponding average of yields on many maturities. One way to get a clearer view of the relation between yield and maturity is to look at zero-coupon bonds. Another way is to adjust the maturity of the bond to be an average of the principal and coupon payment dates, calculating the asset's duration. This allows a plot of yield against duration. The two approaches are similar but not identical: Both measures emphasize the hump in the yield curve, but they

place it in different areas.

Duration also measures how a permanent change in interest rates will affect the price of a bond. If one plots the bond price against interest rates (the chart shows this for a simple consol), the slope of that plot at a specific rate gives a good idea of the duration. The relation between price and rate is nonlinear, though, so that duration changes with the rate: The way it changes is a bond's *convexity*. Long bonds have significantly higher convexity than short bonds.