

FINM3033 Risk Management in Finance

Assignment 2

Problem 1.

The most recent estimate of the daily volatility of the dollar-sterling exchange rate is 0.6% and the exchange rate at 4:00 p.m. yesterday was 1.5000. The parameter λ in the EWMA model is 0.9. Suppose that the exchange rate at 4:00 p.m. today proves to be 1.4950. How would the estimate of the daily volatility be updated?

Problem 2.

Suppose that the parameters in a GARCH(1,1) model are $\alpha = 0.03$, $\beta = 0.95$ and $\omega = 0.000002$.

- a) What is the long-run average volatility?
- b) If the current volatility is 1.5% per day, what is your estimate of the volatility in 20, 40, and 60 days?
- (c) What volatility should be used to price 20-, 40-, and 60-day options?
- (d) Suppose that there is an event that increases the volatility from 1.5% per day to 2% per day. Estimate the effect on the volatility in 20, 40, and 60 days.
- (e) Estimate by how much the event increases the volatilities used to price 20-, 40-, and 60-day options.

Problem 3.

Suppose that each of two investments has a 4% chance of a loss of \$10 million, a 2% chance of a loss of \$1 million, and a 94% chance of a profit of \$1 million. The investments are independent of each other.

- (a) What is the VaR for one of the investments when the confidence level is 95%?
- (b) What is the expected shortfall for one of the investments when the confidence level is 95%?
- (c) What is the VaR for a portfolio consisting of the two investments when the confidence level is 99%?
- (d) What is the expected shortfall for a portfolio consisting of the two investments when the confidence level is 95%?
- (e) Show that in this example VaR does not satisfy the subadditivity condition, whereas expected shortfall does.

Problem 4.

Suppose that the change in the value of a portfolio over a one-day time

period is normal with a mean of zero and a standard deviation of \$2 million; what is

- (a) the one-day 97.5% VaR,
- (b) the five-day 97.5% VaR, and
- (c) the five-day 99% VaR?