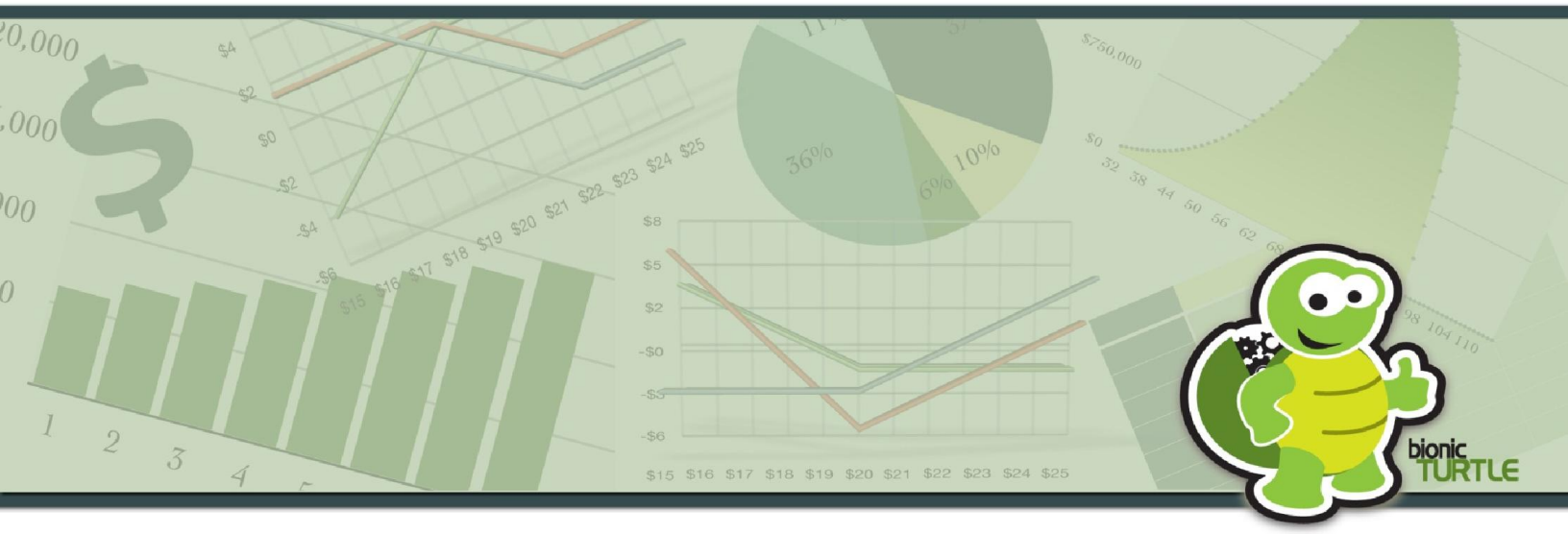

P1.T4. Valuation & Risk Models

Chapter 1. Measures of Financial Risk

Bionic Turtle FRM Practice Questions

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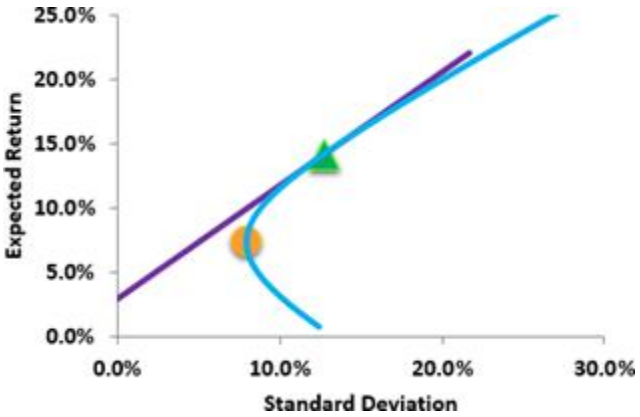
P1.T4.807. Classical value at risk (VaR)

Learning objectives: Describe the mean-variance framework and the efficient frontier. Explain the limitations of the mean-variance framework with respect to assumptions about return distributions.

807.1. Displayed below is a plot of the Capital Market Line (CML) according to the mean-variance framework. There are only two risky assets:

- Risky Asset A has an expected return and volatility of 8.0%
- Risky Asset B has an expected return and volatility of 20.0%



Please note the graph also contains an Orange Circle and a Green Triangle. About this situation, each of the following is true **EXCEPT** which is false?

a) If the risk-free rate is constant at 3.0%, then the slope of the CML is invariant to the correlation between A & B returns
b) An investor can achieve an expected return greater than 20.0%, which is the expected return of Risky Asset B, if she is willing to borrow at the risk-free rate
c) The Green Triangle represents the Market Portfolio: it is entirely allocated between Risky Assets A & B but without any allocation to the risk-free asset
d) The Orange Circle represents the Minimum Variance portfolio: it generates a Sharpe ratio that in inferior to (less than) the Sharpe ratio of any position on the CML

807.2. Dowd[1] explains that daily financial data can be expressed in either loss(+)/profit(-) format, or profit(+)/loss(-) format. For example, in profit(+)/loss(-) format which is more natural to the actual math, a asset's expected gain is represented by a positive value while it's loss is represented by a negative. However, in risk it is also convenient to use loss(+)/profit(-) format such that losses are expressed by positive values.

Assume our chosen format is loss(+)/profit(-), which is also just called "L/P." Our position's profits are normally distributed and given by the following two parameters:

- The drift, μ, is equal to -$15.0 per annum, and
- The volatility, σ is equal to $35.0 per annum.

If the daily returns are i.i.d. with 250 trading days per year, which is **nearest** to the 20-day 95.0% confident absolute value at risk (aVaR)?

a) -9.35
b) 15.08
c) 21.83
d) 42.57

807.3. Rebecca has determined that her equity portfolio's 25-day 95.0% confident absolute value at risk (aVaR) is given by -μ*Δt + σ*α*sqrt(Δt) = -12,000 + 208,000 = $196,000. She subsequently decides that she wants to translate this into a 10-day 99.0% confident aVaR. If the returns are i.i.d. and normally distributed, which of the following is **nearest** to the translated VaR?

a) 133,300
b) 150,000
c) 181,530
d) 195,400

[1] Kevin Dowd, Measuring Market Risk, 2nd Edition (West Sussex, England: John Wiley & Sons, 2005)

Answers:

807.1. A. False: a change in correlation (Between Risky Asset A & B) will change the optimal Market Portfolio and therefore the slope of the CML

In regard to (B), (C) and (D) each is TRUE.

807.2. B. 15.08. As the 95.0% normal deviate is abotu 1.645, the 95.0% 20-day aVaR is given by -15*(20/250) + 35*sqrt(20/250)*1.645 = $15.08.

807.3. C. 181,530.

The drift translates linearly: 12,000 * 10/25 = 4,800. The volatility translation includes two components:

- The time scales per the square root rule, sqrt(10/25, and further
- The confidence changes the deviate from ~1.645 to ~2.33, proportionally per 2.33/1.645

Consequently, the volatility shock translates to 208,000*sqrt(10/25)*2.33/1.645 = $186,330. Therefore the new 10-day 99.0% confident aVaR is given by -4,800 + 186,330 = 181,530.

Discuss here in forum: *https://www.bionicturtle.com/forum/threads/p1-t4-807-classical-value-at-risk-var-dowd-ch-2.13916/*