Sauder School of Business **COMM 371 Sep-Dec 2012**
Finance Division **Gonzalo Morales**

Marked Problem Set 2

The work has to be done in groups of 3 to 5 students. Write **all names and the section number**. Solutions must be **typed**. The deadline for submission is on Wednesday November 28th. **Submit your solution at HA-884F**.

1. Suppose that you can trade a riskless asset that yields 5% and two risky assets A and B. The expected return of asset A is 8% and that of asset B is 11%, while the standard deviation of asset A is 14% and that of asset B is 23%. The covariance between assets A and B is -0.0322.

   Describe a trading strategy that leads to an arbitrage profit. Be specific. Describe what assets you buy/sell and compute the arbitrage profit per one unit of arbitrage trade.

2. You are the risk manager in a major investment bank. The bank's current portfolio consists of U.S. stocks (50%), bonds (20%), and derivatives (30%). The expected returns and standard deviations of these investments are

	Stocks	Bonds	Derivatives
Expected Return	13%	7%	25%
Standard Deviation	25%	9%	50%

   A trader comes with a idea about investing in some new emerging markets: the markets of Polynesia, Micronesia, and New Caledonia. These markets have the following characteristics:

	Polynesia	Micronesia	New Caledonia
Expected Return	18%	20%	22%
Standard Deviation	30%	35%	28%
Correlation with Stocks	0.4	0.2	0.6
Correlation with Bonds	0.3	0.1	0.2
Correlation with Derivatives	0.2	0.3	0.4

   Your job as risk manager is to determine how this investment would affect the overall risk of the bank's portfolio. Based on *risk considerations alone*, which of the three emerging markets is the best investment? Assume that the investment in the new market is financed by borrowing on the riskless asset, and that it is a very small part of the bank's overall investment.

3. Stocks X, Y, and Z have the same expected return 8% and the same standard deviation 19%.

   (a) Compute the standard deviation of the equally weighted portfolio if the correlation between all pairs of stocks is 1.0. Explain the intuition behind this result.

   (b) Compute the standard deviation of the equally weighted portfolio if the correlation between all pairs of stocks is 0.5.

   (c) Compute the standard deviation of the equally weighted portfolio if the correlation between all pairs of stocks is 0.0.

   (d) Compute the standard deviation of the equally weighted portfolio if the correlation between all pairs of stocks is -0.5.

   (e) Explain intuitively in which case above (a) to (d) (if any) is the equally weighted portfolio the minimum variance portfolio? (No computation is needed.)

   (f) How does your answer to part (e) change if stocks X, Y, and Z have the same expected return 11% instead of 8% and nothing else is changed?

   (g) How does your answer to part (e) change if stocks X, Y, and Z have the same standard deviation 15% instead of 19% and nothing else is changed?

4. Your rich uncle asks you for financial advice. He is currently holding a portfolio of 30% T-bills and 70% Microsoft stock. The beta of Microsoft is 1.2 and the standard deviation is 37.95%. You decide to base your advice on the CAPM. The T-bill rate is 5%. The market portfolio has expected return 15% and standard deviation 20%.

   (a) What is the expected return of your uncle's portfolio?

   (b) What is the standard deviation of your uncle's portfolio?

   (c) You decide to recommend to your uncle a portfolio that has the same expected return as his portfolio but the lowest possible standard deviation. Which is this portfolio, and what is its standard deviation?

5. Consider market portfolio and three risky assets: A, B, and C. Over the next year, only three scenarios of how the economy will develop can happen with equal probability. The table below describes, in each scenario, returns predicted by analysts for the market portfolio and for the three risky assets.

Economy	Market	A	B	C
Boom	17%	11%	3%	2%
Mediocre	6%	11%	3%	2%
Recession	-2%	2%	7%	4%

   (a) What are the expected returns and the standard deviations of returns from investing into the market portfolio and into each of the three risky assets?

(b) Covariance of returns of the market portfolio with asset A is

$$\begin{aligned} Cov(R_M, R_A) &= p^{Boom}\left(R_M^{Boom} - E[R_M]\right)\left(R_A^{Boom} - E[R_A]\right) \\ &+ p^{Mediocre}\left(R_M^{Mediocre} - E[R_M]\right)\left(R_A^{Mediocre} - E[R_A]\right) \\ &+ p^{Recession}\left(R_M^{Recession} - E[R_M]\right)\left(R_A^{Recession} - E[R_A]\right), \end{aligned}$$

where p^{Boom}, $p^{Mediocre}$, and $p^{Recession}$ are the probabilities of the three scenarios to occur. The correlation of returns of the market portfolio with the returns of asset A is

$$\rho(R_M, R_A) = \frac{Cov(R_M, R_A)}{\sigma(R_M)\,\sigma(R_A)}.$$

Use the formulas above to find the covariances and correlations of returns of assets A, B, and C with the returns of the market portfolio.

(c) What are the betas of assets A, B, and C?

(d) If the riskless rate is 3.5%, what are the expected returns of A, B, and C as predicted by the CAPM?

(e) Draw a graph that contains the riskless asset, the market portfolio, and the three risky assets A, B, and C. Draw the SML in this graph.

(f) Find alphas of risky assets A, B, and C. Indicate alphas of each risky asset in the graph from part (e).