Baylor University
Hankamer School of Business
Department of Finance, Insurance & Real Estate

Risk Management
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Sample Midterm Exam 1

Name: ______________________

Notes:

1. Please read these instructions carefully.
2. This test consists of 2 problems worth 32 points each and a 3^{rd} problem worth 36 points; thus, the maximum number of points possible for this exam is 100.
3. If you need extra space for solving any of the problems on this exam, use the extra pages provided.
4. You may have the entire class period in order to complete this examination. Be sure to show your work as well as provide a complete answer for each problem; i.e., in addition to producing numerical results, also explain your results in plain English.

Good luck!

Problem #1 (32 points)

Consider the following four lotteries, A through D. Note that the rows indicate the state-contingent probabilities ($f(W_s)$) associated with receiving the cash payments indicated at the top of each column. For example, lottery A provides a 1/3 chance at \$1,000, a 1/3 chance at \$2,000, and a 1/3 chance at \$3,000, whereas lottery B provides a 3/10 chance at \$1,000, a 1/2 chance at \$2,000, and a 1/5 chance at \$3,000, and so forth:

	Cash Payments		
Lottery	**\$1,000**	**\$2,000**	**\$3,000**
A	1/3	1/3	1/3
B	.3	.5	.2
C	.12	.7	.18
D	.5	.3	.2

A. (8 points) If given a choice between lottery A or lottery D, which of these two lotteries would an arbitrarily risk averse decision-maker select? Explain why.

B. (8 points) If given a choice between lottery B or lottery C, which of these two lotteries would an arbitrarily risk averse person select? Explain why.

C. (8 points) If given a choice between lottery A or lottery C, which of these two lotteries would an arbitrarily risk averse person select? Explain why.

D. (8 points) Which of these four lotteries is most preferred by an arbitrarily risk averse decision-maker? Explain why.

Extra Space for solving Problem #1:

Problem #2 (32 points)

Rocketman has a parabolic utility function; i.e., $U(W) = W^2$ and initial wealth $W_0 = \$0$. He is offered a lottery involving a fair coin toss; i.e., $p_{heads} = p_{tails}$ =50%. If heads come up, then Rocketman receives \$64, but if tails come up, he receives \$9.

A. (8 points) Assume that Rocketman decides to take this risk. Compute the following: 1) expected value of wealth, 2) expected utility of wealth, 3) utility of the expected value of wealth, and 4) the certainty equivalent of wealth.

B. (8 points) Compare the expected utility of wealth with the utility of the expected value of wealth and explain *why* there is a difference between these two values.

C. (8 points) Compare the expected value of wealth with its certainty equivalent and explain *why* there is a difference between these two values.

D. (8 points) At what price is Rocketman indifferent between gambling and not gambling?

Extra Space for solving Problem #2:

Problem 3 (36 points)

Neo has the following utility function: $U(W) = \ln W$. His initial wealth is \$100 and he is offered a coin toss which pays \$60 (with probability .5) if the coin comes up heads and -\$60 (also with probability .5) if the coin comes up tails.

A. (12 points) What is Neo's certainty equivalent of wealth and risk premium?

B. (12 points) Suppose that Morpheus is offered this same gamble. Like Neo, Morpheus has $W_0 = \$100$. However, Morpheus's utility $U(W) = W^{.5}$. What is Morpheus's certainty equivalent of wealth and risk premium?

C. (12 points) Who is more risk averse, Neo or Morpheus? Explain why.

Extra Space for solving Problem #3:

Midterm Exam #1 Formula Sheet

1. **Expected Utility ($E(U(W))$)**

$$E\left(U(W)\right) = \sum_{s=1}^{n} p_s U(W_s), \text{ where } U(W) = \text{utility of wealth.}$$

2. **Arrow-Pratt Risk Aversion Coefficients**

Absolute Risk Aversion: $R_A(W) = -U''(W)/U'(W)$; and

Relative Risk Aversion: $R_R(W) = WR_A(W)$.

3. **Risk Premium (λ)**

   There are two methods for calculating a risk premium:

   - "Exact" method: 1) calculate $E(W)$ and $E\left(U(W)\right)$, 2) set $E\left(U(W)\right) = U(W_{CE})$ and solve this equation for W_{CE}, and 3) $\lambda = E(W) - W_{CE}$.
   - "Approximate" method: $\lambda = .5\sigma_W^2 R_A(E(W))$.

4. **Stochastic Dominance Rules**

   If X_i stochastically dominates X_j, then $E(U(X_i)) > E(U(X_j))$ for all risk averse utility functions. Here are the formal definitions for first and second order stochastic dominance:

   - First Order Stochastic Dominance: Investment i First Order Stochastic Dominates (FOSD) investment j if $F(X_{j,s}) \geq F(X_{i,s})$ for all s.
   - Second Order Stochastic Dominance: Investment i Second Order Stochastic Dominates (SOSD) investment j if $\sum_{s=1}^{n} \left(F(X_{js}) - F(X_{is})\right) > 0$.