Midterm Exam #1 Formula Sheet

1. **Expected value ($E(W)$) and variance (σ_W^2)**

   - $E(W) = \sum_{s=1}^{n} p_s W_s$, where p_s = the probability of state s and W_s = state s wealth, and
   - $\sigma_W^2 = \sum_{s=1}^{n} p_s (W_s - E(W))^2$.

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

   - $E(U(W)) = \sum_{s=1}^{n} p_s U(W_s)$, where $U(W_s)$ = state-contingent utility of wealth.

3. **Certainty Equivalent of Wealth (W_{CE}) and Risk Premium (λ) - Two Methods**

   - <u>"Exact" Method</u>: Set $E(U(W)) = U(W_{CE})$ and solve for W_{CE}; then $\lambda = E(W) - W_{CE}$.
   - <u>Arrow-Pratt Method</u>: $\lambda = .5\sigma_W^2 R_A(E(W))$, where $R_A(W) = -U''(W)/U'(W)$. Then $W_{CE} = E(W) - \lambda$.

4. **Mean-Variance Model**

   If variance is a "complete" risk measure, then $E(U(X_i)) > E(U(X_j))$ for all risk averse utility functions under the following set of conditions:

   - $E(X_i) > E(X_j)$ and $\sigma_{X_i} < \sigma_{X_j}$;
   - $E(X_i) > E(X_j)$ and $\sigma_{X_i} = \sigma_{X_j}$; and
   - $E(X_i) = E(X_j)$ and $\sigma_{X_i} < \sigma_{X_j}$.

5. **Stochastic Dominance Model**

   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:

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