Problem Set 3.

I. Expected Return, Return Standard Deviation, Covariance and Portfolios:

<table>
<thead>
<tr>
<th>State</th>
<th>Probability</th>
<th>Asset A</th>
<th>Asset B</th>
<th>Riskless Asset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom</td>
<td>0.25</td>
<td>24%</td>
<td>14%</td>
<td>7%</td>
</tr>
<tr>
<td>Normal Growth</td>
<td>0.5</td>
<td>18%</td>
<td>9%</td>
<td>7%</td>
</tr>
<tr>
<td>Recession</td>
<td>0.25</td>
<td>2%</td>
<td>5%</td>
<td>7%</td>
</tr>
</tbody>
</table>

A. What is the expected return on each asset?
B. What is the standard deviation of return on each asset?
C. What is the correlation and covariance between the returns on
   1. assets A and B?
   2. asset A and the riskless asset?
   3. asset B and the riskless asset?

II. Using Dividend Yield Information: Suppose the following data is to be used by Ms Q (a risk-averse investor) to form a portfolio that consists of the small firm fund and T-bills.

\[
E[R_{Small}(t)] = 1.369\% \\
\sigma[R_{Small}(t)] = 8.779\% \\
E[DP(start t)] = 4.446\% \\
\sigma[DP(start t)] = 1.513\% \\
\sigma[DP(start t),R_{Small}(t)] = 1.967
\]

where \( DP(start t) \) is the dividend yield on the S&P 500 known at the start of month \( t \).
\( R_{Small}(t) \) is the return on the small firm fund in month \( t \).

A. What is the intercept and slope coefficients from a regression of \( R_{Small}(t) \)
   (dependent variable) on \( DP(start t) \)?
B. What is the standard deviation of the residual from the regression of \( R_{Small}(t) \) on
   \( DP(start t) \)?
C. Suppose it is the end of March 1997, Ms Q does not know DP and the return on
   T-bills for April is 0.3%.
   1. What is the April return on the small firm fund that Ms Q expects?
   2. What is the volatility of the April return on the small firm fund, given Ms Q’s information?
D. Suppose it is the end of March 1997, Ms Q knows that DP is 2% and the return on
   T-bills for April is 0.3%.
   1. What is the April return on the small firm fund that Ms Q expects?
   2. What is the volatility of the April return on the small firm fund, given Ms Q knows DP is 2%?
E. Suppose it is the end of October 1997, Ms Q does not know DP and the return on T-bills for November is 0.4%.
   1. What is the November return on the small firm fund that Ms Q expects?
   2. What is the volatility of the April return on the small firm fund, given Ms Q’s information?

F. Suppose it is the end of October 1997, Ms Q knows that DP is 5% and the return on T-bills for November is 0.4%.
   1. What is the November return on the small firm fund that Ms Q expects?
   2. What is the volatility of the April return on the small firm fund, given Ms Q’s information?