This homework asks you to estimate the volatility of Intel and Home Depot returns and the S&P index over time. USE THE DATA SET HW3 on my homepage to get the data!!!

Page 1. Graph the return for Intel from 1988 through 1999.
Page 2. a. What is ARCH (in your own words)?
   b. Is there any evidence that an ARCH model is needed from your graph of the Intel returns

Page 3. Consider the model:
\[
\begin{align*}
    r_t &= \mu + \varepsilon_t \\
    \varepsilon_t &= \sigma_t \sqrt{h_t} \\
    h_t &= \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta h_{t-1}
\end{align*}
\]
   a. What is the order of this GARCH model?
   b. In your own words, what key feature of the data are we trying to capture?

Page 4. Estimate the model discussed on page 4 for Intel, Home Depot and the S&P Index and:
   a. fill out the following table

<table>
<thead>
<tr>
<th>Coefficients from GARCH Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel</td>
</tr>
<tr>
<td>( \alpha_0 )</td>
</tr>
<tr>
<td>( \alpha_1 )</td>
</tr>
<tr>
<td>( \beta )</td>
</tr>
</tbody>
</table>
   Note: P-values are in ( ).

   b. Discuss the evidence in favor or against ARCH effects for each returns series.

Page 5. Graph the conditional Standard Deviation for Intel.

Page 6. Forecast the conditional variance from the last day included in your data set to untended observation 3500. Turn in a graph of the forecasted volatility for Home Depot.
Page 7. Consider the model:

\[ r_i = \mu + \delta h_i + \epsilon_i, \]
\[ \epsilon_i = \nu_i \sqrt{h_i}, \]
\[ h_i = \alpha_0 + \alpha_r \epsilon_{i-1}^2 + \beta h_{i-1} \]

a. What is the name of this model?
b. What is it trying to capture that was not captured in our previous model.

Page 8. Estimate the model above and:

a. Report the results in a table like the one below:

<table>
<thead>
<tr>
<th></th>
<th>Intel</th>
<th>Home Depot</th>
<th>S&amp;P 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \delta )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Discuss the meaning of your results.

Page 9. Estimate a TARCH model for all three returns. DO NOT TURN IN THE RESULTS. Instead, discuss the evidence of asymmetric news from returns (citing numbers from your results).