GEOP 501 - Fall 2017 - HW 5 - Due: 31/11/2017

The provided Excel workbook offers a list of offset (X in meters) versus amplitude (a) values picked on a reflector between a shale (VP1=1800 m/s) overlying a sandstone (VP2=3000 m/s). The reflector's depth is 2000 m and its RMS velocity is 3000 m/s.

1. Calculate $\sin^2\theta$ at all offset locations.
2. Fit a 2-term Shuey's AVO equation to the $\{\sin^2\theta, a(\theta)\}$.
3. Estimate the corresponding AVO intercept (A) and gradient (B).
4. Use Gardner's rule to calculate the densities.
5. Calculate the scaling factor (s) between the observed amplitudes ($a(\theta)$) and reflection coefficients ($R(\theta)$) using the relation: $a(\theta)=s \times R(\theta)$.
6. Use Castagna's relations to calculate the S-wave velocities.
7. Calculate the Poisson's ratios from the P- and S-wave velocities (find it in any reference book).
8. Calculate the exact A and B using equation 14 in Shuey (1985).
9. Plot the reflection coefficient as a function of θ using the exact values of A and B.
10. Plot the reflection coefficient as a function of θ using the estimated values of A and B.
11. Find the absolute percentage errors in A and B between the exact and estimated values.
12. What are the possible sources of error in estimating A and B?