seeing some starting or ending points. The timescale is probably not much larger than 0.3 years, otherwise we would only rarely see such a transition. Assuming that a QSO has a relatively "quiescent" phase distinct from its variable phase, we can calculate the probability of seeing a transition, P_{trans}. If the characteristic variation timescale is Δv (and is the same for all QSOs), and the observation timespan is ΔT, then $P_{trans} = 1$ for Δv<ΔT, and $P_{trans} = 2/(1 + \Delta v/\Delta T)$ for Δv>ΔT, neglecting the finite separation between epochs and the error in the relative flux. Considering a subset of QSOs with the most significant variations (log(P)< -5.0), from figure 8-1 we qualitatively find that ~50% (6/11) appear to show a relatively quiescent phase. Since ΔT for our data set ranges from 0.4 to 1.0 years (QSO rest frame), this implies Δv $\simeq$1 to 3 years for P_{trans} $\simeq$50%. In practice, the apparent P_{trans} tends to be reduced by uneven sampling and low S/N data points.

From the above statements we estimate: $0.3 \lesssim \Delta v \lesssim 3.0$ years. Since this implies timescales of 1 to 9 years (Earth frame) for QSOs with z_e ~2, and our project has only run for a little more than 3 years, substantially longer observation timespans are required to accurately determine the variation timescale.

<u>8.3.5 : Structure Function</u>

Another common tool for characterizing the timescale and magnitude of variability is the use of a *structure function* (*cf.* Simonetti *et al.* 1985). Basically, structure function analysis compares the deviations as a function of time lag, giving us an indication of the timescale of variation as well as the maximum deviation. We expect the deviations to increase with time lag until the characteristic timescale for variations and maximum deviation is reached. In figure 8-4, we have plotted the absolute value in the difference between every pair of observations versus the time lag (Δt) in the QSO rest frame. We have again excluded objects with a median calculated error greater than 0.028 magnitudes and each object with N epochs contributes $N(N-1)/2$ pairs.