In the past we've run into this problem when we exponentiate large negative LLik values, such as when we need to do a summation of the probability of the set of possible outcomes.

For example, imagine $p_i = \exp[_i]/(\sum_j \exp[_j])$. If the values are all < -312, exponentiating these terms will lead to 0s and the sum of these 0s will also be 0.

This is a numerical issue, not a fundamental problem with the model. The best solution for this is to define

max=max($\vec{}$)

and then rescale terms by subtracting off $_{\max}$. Let $'_i$ represent the rescaled terms, such that $'_i =_i -_{\max}$. They key result is that one of these terms $'_i$ term will always evaluate to 1 when exponentiated and the rest will always evaluate to < 1 when exponentiated.

Why does this work? Well, subtracting a constant term from all the exponents is equvalent to dividing all of them by $\exp[_m ax]$ and if we apply this division to both the numerator and denominator terms of p_i, its value will be unchanged (but evaluatable). That is,

$p_i = \exp[_i]/(\sum_j \exp[_j]) = \exp['_i]/(\sum_j \exp['_j])$