

7.

Changes to Model	BIC	Change in BIC
No Change	784.20	-
Include change	788.38	4.18
Include wind	788.71	4.51
Include week	789.62	5.42
Exclude PAT	790.27	6.07
Include type	791.30	7.10
Include elap30	791.36	7.16
Include field	791.46	7.26
Exclude distance	848.93	64.73

17a) `y <- c(0:10)`

`yhat <- 2`

`pear <- (y-yhat)/sqrt(yhat)`

b) `pp <- 1-ppois(y,yhat)`

`pn <- 1-norm(pear)`

c) `cbind(y,pear,pp,pn)`

There are no Pearson residuals below 2 with probability <0.05.

There are no Pearson residuals above 2 with probability >0.05.

d) The Normal probabilities are lower than the Poisson probabilities.

The normal approximation makes the Pearson residuals appear to be more extreme than they should be.

e) The 2-3-4 guidelines are acceptable. The 2-3-4 guideline will make the residuals appear to be more extreme than they really are, but it will not happen too often.

1a) $P(W_1 = w_1) = \binom{n_1}{w_1} \pi^{w_1} (1 - \pi)^{n_1 - w_1}$

$$P(W_2 = w_2) = \binom{n_2}{w_2} \pi^{w_2} (1 - \pi)^{n_2 - w_2}$$

b) $P(W_1 = w_1, W_2 = w_2) = \binom{n_1}{w_1} \pi^{w_1} (1 - \pi)^{n_1 - w_1} \cdot \binom{n_2}{w_2} \pi^{w_2} (1 - \pi)^{n_2 - w_2}$

c) Since there are a total of $n_+ = n_1 + n_2$ independent trials (remember W_1 and W_2 are two independent binomial distributions) with $w_+ = w_1 + w_2$ successes with common probability of success π .

$$P(W_+ = w_+) = \binom{n_+}{w_+} \pi^{w_+} (1 - \pi)^{n_+ - w_+}$$

d)
$$P(W_1 = w_1 | W_+ = w_+) = \frac{P(W_1 = w_1, W_2 = w_2)}{P(W_+ = w_+)} = \frac{\binom{n_1}{w_1} \pi^{w_1} (1 - \pi)^{n_1 - w_1} \cdot \binom{n_2}{w_2} \pi^{w_2} (1 - \pi)^{n_2 - w_2}}{\binom{n_+}{w_+} \pi^{w_+} (1 - \pi)^{n_+ - w_+}}$$

$$= \frac{\binom{n_1}{w_1} \binom{n_2}{w_2}}{\binom{n_+}{w_+}} = \frac{\binom{n_1}{w_1} \binom{n_2}{w_2}}{\binom{n_1 + n_2}{w_1 + w_2}}$$

This is the PMF of a hypergeometric distribution.

4) Fisher's Exact Test: p-value=0.0239

Permutation Test: p-value=0.0434