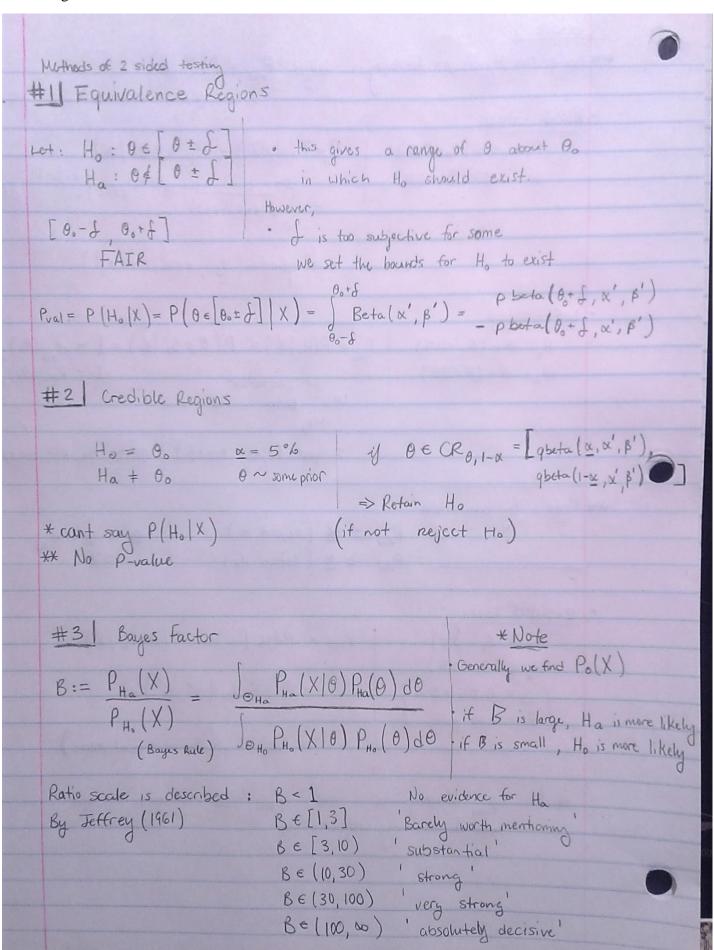
```
_ecture 9
· Bayesian Hypothesis testing: Bayes Pual = P(Ho/X)
  · Right-sided
                                                 P=P(H. IX) = P(0 < 0. /X)
           Ho: 0 < (0 = 0.5)
                                                    = \int_{0}^{\theta_{0}} \frac{1}{B(x+\alpha,n-x+\beta)} e^{\alpha+x-1} (1-\theta)^{n-x+\beta-1} d\theta
            Ha: 0>(00=05)
                                                      = gbeta (Oo, x+a, n-x+B)
   · Left - sided
                                           P_{\text{val}} = P(H_0 \mid X) = P(0 \ge G_0 \mid X) = 1 - \mathcal{F}_{\text{olx}}(\theta_0)
= \int_{\theta_0}^{1} \text{posterior} \qquad 1 - P_{\text{val}}(\theta_0)
= \int_{\theta_0}^{1} \text{posterior} \qquad 1 - P_{\text{val}}(\theta_0)
Side
         H: 0 = (0, =0.5)
          Ha: 0 < (0 = 0.5)
                                                  = qbeta (1, x+a, n-x+B) - qbeta (80, x+a, n-x+B)
 ** Note: By convention
                               if Pval < & (Reject Ho)
                                                                                    · a is generally:
                                       Pyal = a (Retain Ho)
        2-sided testing
            H_0 = (\theta_0 = 0.5)
                                                Pval = P(Ho | X) = P(0=0 | X)
           Ha + (00 = 0.5)
                                                    = \int_0^{\infty} Beta(\alpha', \beta')
           \left\{\begin{array}{l} \underline{\alpha} = 0.05 = 5\% \\ 0 \sim \text{ some prior} \end{array}\right\}
                                                        = 0 ( Oo is a point value )
         * So Pray always = 0 and Pray < & always so we would always reject to
```



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```
Example
                              W.= 0.05 = 5%
           H. 10 = 0.5
           Ha: 0 + 05
                               n= 100
                                x = 61
                                               Z25% \( \frac{\text{0(1-0)}}{\text{n}} \)
freq: Ret. Region = [0.1 ] = [0.5 t 2 ( \( \frac{0.5 \cdot 0.5}{0.00} \) = [0.5 t 0.1] = [0.4, 0.6]
       8 = 61 = 0.61 ; 0 = [0.4, 0.6] ; reject Ho
      Prod = 0.0278 = 0.05; reject to
Bayes Let Ha: 0 ~ U(0,1) so 0 could be any value
         0 ~ Beta(11) => 0/x ~ Beta(62,40)
     - Method #1/
Ho: \theta = [\theta = 0.5 \pm f] let f = 0.01
               Ha: 0 + [0 = 05 ± f] equivalence Region
         p-val = pbeta (0.51, 62, 40) - pbeta (0.49, 62, 40) = 0.0147
         0.0147 < 0.05 > reject Ho
     - method #2/
                                 X.= 0.05
                                 6 ~ U(0,1) O|X ~ Beta (62,40)
                  Ha: 0 + 0.5
        CR = [ qbeta (0.025, 62, 40), qbeta (0.975, 62, 40)] = [0.511, 0.700]
            Ho: 0 = 0.5 € CRe, 1-x Reject Ho
```

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