# Testing an Inverse Gaussian Mean

```
> IGtestWL
function (xx, mu0H)
{
    n = length(xx)
    xbar <- mean(xx)
    xbar1 <- mean(1/xx)
    lambdahathat <- mu0H/(xbar/mu0H - 2 + mu0H * xbar1)
    thetahathat <- c(mu0H, lambdahathat)
    muhat <- xbar
    lambdahat <- 1/(xbar1 - 1/xbar)
    thetahat <- c(muhat, lambdahat)
    I <- n * diag(c(lambdahat/muhat^3, 1/(2 * lambdahat^2)))
    ChisqW <- t(thetahathat - thetahat) %*% I %*% (thetahathat -
        thetahat)
    PW <- 1 - pchisq(ChisqW, 1)
    ChisqL <- neg2LLRIG(mu0H, lambdahathat, n, xbar, xbar1)
    PL <- 1 - pchisq(ChisqL, 1)
    list(thetahathat = thetahathat, thetahat = thetahat, ChisqW = ChisqW,
        "P(>ChisqW)" = PW, ChisqL = ChisqL, "P(>ChisqL)" = PL)
}
```

The Wald and LLR tests give comparable results when the null hypothesis is true (mu = 10), but very different results in this example when the null hypothesis is false (mu = 20).

```
> IGtestWL(xxig1, 10)
$thetahathat
[1] 10.00000 13.13152

$thetahat
[1] 12.26042 13.89175

$ChisqW
          [,1]
[1,] 0.8002319

$"P(>ChisqW)"
          [,1]
[1,] 0.3710240

$ChisqL
[1] 1.125597

$"P(>ChisqL)"
[1] 0.2887164

> IGtestWL(xxig1, 20)
$thetahathat
[1] 20.00000 11.87656

$thetahat
[1] 12.26042 13.89175

$ChisqW
         [,1]
[1,] 9.240786

$"P(>ChisqW)"
            [,1]
[1,] 0.002366833
```

```
$ChisqL
[1] 3.134571

$"P(>ChisqL)"
[1] 0.07664856
```

```
> t.test(xxig1, mu=10)
```

Assuming normality instead of inverse Gaussian gives the *t*-test; the results are comparable to the IG Wald and LLR tests when the null hypothesis is true and in between the IG Wald and LLR results in this example when the null hypothesis is false.

```
        One Sample t-test

data:  xxig1
t = 0.8277, df = 19, p-value = 0.4181
alternative hypothesis: true mean is not equal to 10
95 percent confidence interval:
  6.544381 17.976468
sample estimates:
mean of x
 12.26042

> t.test(xxig1, mu=20)

        One Sample t-test

data:  xxig1
t = -2.834, df = 19, p-value = 0.01061
alternative hypothesis: true mean is not equal to 20
95 percent confidence interval:
  6.544381 17.976468
sample estimates:
mean of x
 12.26042
```