Testing a Gamma Mean

```
> gammatestmWL
function (xx, mu0H, shape0)
{
    n <- length(xx)
    xbar <- mean(xx)
    logxbar <- mean(log(xx))
    theta <- shape0
    repeat {
        theta0 <- theta
        shape <- theta0
        S <- n * (log(shape/mu0H) + 1 - digamma(shape) + logxbar -
            xbar/mu0H)
        I <- n * (trigamma(shape) - 1/shape)
        theta <- theta0 + S/I
        repeat {
            if (theta > 0)
                break
            theta <- (theta0 + theta)/2
        }
        if (abs(theta - theta0) < 1e-08)
            break
    }
    shapehathat <- theta
    thetahathat <- c(mu0H, shapehathat)
    theta <- c(mu0H, shapehathat)
    repeat {
        theta0 <- theta
        mu <- theta0[1]
        shape <- theta0[2]
        S <- n * c(shape * (xbar - mu)/mu^2, log(shape/mu) +
            1 - digamma(shape) + logxbar - xbar/mu)
        I <- n * diag(c(shape/mu^2, trigamma(shape) - 1/shape))
        theta <- theta0 + solve(I) %*% S
        repeat {
            if (min(theta) > 0)
                break
            theta <- (theta0 + theta)/2
        }
        if (max(abs(theta - theta0)) < 1e-08)
            break
    }
    thetahat <- as.vector(theta)
    ChisqW <- t(thetahathat - thetahat) %*% I %*% (thetahathat -
        thetahat)
    PW <- 1 - pchisq(ChisqW, 1)
    ChisqL <- -2 * (sum(log(dgamma(xx, thetahathat[2], thetahathat[2]/thetahathat[1]))) -
        sum(log(dgamma(xx, thetahat[2], thetahat[2]/thetahat[1]))))
    PL <- 1 - pchisq(ChisqL, 1)
    list(thetahathat = thetahathat, thetahat = thetahat, ChisqW = ChisqW,
        "P(>ChisqW)" = PW, ChisqL = ChisqL, "P(>ChisqL)" = PL)
}
```

First, try the inverse Gaussian data from Test #1.

```
> gammatestmWL(xxig1, 10, 1)
$thetahathat
[1] 10.00000  1.43526

$thetahat
[1] 12.260425  1.515261
```

```
$ChisqW
          [,1]
[1,] 1.063700

$"P(>ChisqW)"
            [,1]
[1,] 0.3023728

$ChisqL
[1] 1.312348

$"P(>ChisqL)"
[1] 0.25197

> gammatestmWL(xxig1, 20, 1)
$thetahathat
[1] 20.000000   1.209427

$thetahat
[1] 12.260425   1.515261

$ChisqW
          [,1]
[1,] 12.56729

$"P(>ChisqW)"
              [,1]
[1,] 0.0003925573

$ChisqL
[1] 5.52823

$"P(>ChisqL)"
[1] 0.01871202

>
```

Now try a sample of gamma data with n = 20, mu = 10 and shape = 1.

```
> xxg <- rgamma(20, 1, 1/10)

> gammatestmWL(xxg, 10, 1)
$thetahathat
[1] 10.000000   1.343791

$thetahat
[1] 10.990739   1.357494

$ChisqW
           [,1]
[1,] 0.2218626

$"P(>ChisqW)"
           [,1]
[1,] 0.6376244

$ChisqL
[1] 0.2488371

$"P(>ChisqL)"
[1] 0.6178951

> gammatestmWL(xxg, 20, 1)
$thetahathat
```

```
[1] 20.000000  1.027917

$thetahat
[1] 10.990739  1.357494

$ChisqW
          [,1]
[1,] 18.96508

$"P(>ChisqW)"
              [,1]
[1,] 1.331327e-05

$ChisqL
[1] 6.973283

$"P(>ChisqL)"
[1] 0.008273558

>
```