Finding quantiles with qnorm

Definition of qnorm

The `qnorm()` function gives the theoretical value of a quantile with probability `p` of observing a value equal to or less than that quantile value given a normal distribution with mean `mu` and standard deviation `sigma`:

```
qnorm(p, mu, sigma)
```

By default, `mu`=0 and `sigma`=1. Therefore, calling `qnorm()` with no arguments gives quantiles for the standard normal distribution.

```
qnorm(p)
```

Recall that quantiles are defined such that p is the probability of a random observation less than or equal to the quantile.

Relation to pnorm

The `pnorm()` function gives the probability that a value from a standard normal distribution will be less than or equal to a z-score value z. Consider:

`pnorm(-1.96)` ≈ 0.025

The result of `pnorm()` is the quantile. Note that:

`qnorm(0.025)` ≈ -1.96

`qnorm()` and `pnorm()` are inverse functions:

`pnorm(qnorm(0.025))` $= 0.025$

Theoretical quantiles

You can use `qnorm()` to determine the *theoretical quantiles* of a dataset: that is, the theoretical value of quantiles assuming that a dataset follows a normal distribution. Run the `qnorm()` function with the desired probabilities p, mean mu and standard deviation sigma.

Suppose male heights follow a normal distribution with a mean of 69 inches and standard deviation of 3 inches. The theoretical quantiles are:

```
p <- seq(0.01, 0.99, 0.01)
theoretical_quantiles <- qnorm(p, 69, 3)
```

Theoretical quantiles can be compared to sample quantiles determined with the quantile function in order to evaluate whether the sample follows a normal distribution.

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