

# Comparison between `lm.beta` and `scale`

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In the following, three basic examples of standardizing coefficients using (1) `lm` and `lm.beta` (left column) and using (2) `lm` and `scale` (right column) are shown.

Standardized regression coefficients can be estimated in two different ways:

1. by standardizing the variables before estimating the coefficients or
2. by standardizing the coefficients after estimating them.

Both procedures, and therefore each of the examples below, result in the same standardized coefficients.

The quality of the estimates is also—nearly—equal, because both solutions depend on the same algorithm of `lm`.

Differences between the two methods are:

1. When using `lm.beta`, both the standardized and unstandardized coefficients are available simultaneously, whereas the `scale`-method requires the specification of the desired coefficient.
2. In the case of `scale`, using terms in the regression formula leads to unstandardized coefficients although the variables are standardized.
3. Differences between the estimates may occur, being caused by numerical inaccuracy. They are usually so small that they can be ignored.

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*Example 1.* Regression model with intercept

```
lm.beta(lm(y ~ x, data = dat))
```

```
lm(y ~ x, data = scale(dat))
```

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*Example 2.* Regression model without intercept (uncentered solution/ incomplete standardization)

```
lm.beta(lm(y ~ 0 + x, data = dat))
```

```
lm(y ~ 0 + x, data = scale(dat, center = F))
```

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*Example 3.* Regression model without intercept (centered solution/ complete standardization)

```
lm.beta(lm(y ~ 0 + x, data = dat), complete.standardization = T)
```

```
lm(y ~ 0 + x, data = scale(dat))
```