semmcci: Staging

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```r
library(semmcci)
library(lavaan)

# Data ------------------------------------------------------------------------
data("Tal.Or", package = "psych")
df <- mice::ampute(Tal.Or)$amp

# Monte Carlo -----------------------------------------------------------------
## Fit Model in lavaan --------------------------------------------------------
model <- "
  reaction ~ cp * cond + b * pmi
  pmi ~ a * cond
  cond ~~ cond
  indirect := a * b
  direct := cp
  total := cp + (a * b)
"
fit <- sem(data = df, model = model, missing = "fiml")

## MC() ------------------------------------------------------------------------
unstd <- MC(
  fit,
  R = 100L, # use a large value e.g., 20000L for actual research
  alpha = 0.05
)

## Standardized Monte Carlo ----------------------------------------------------
MCStd(unstd, alpha = 0.05)
```

```
#> Standardized Monte Carlo Confidence Intervals
#>                        est     se   R    2.5%  97.5%
#> cp                  0.1007 0.0929 100 -0.0907 0.2472
#> b                   0.4437 0.0845 100  0.2533 0.5908
#> a                   0.1730 0.0921 100 -0.0229 0.3734
#> cond~~cond          1.0000 0.0000 100  1.0000 1.0000
#> reaction~~reaction 0.7775 0.0704 100  0.6306 0.8857
```

```
#> pmi~~pmi           0.9701 0.0342 100  0.8606 0.9996
#> indirect           0.2243 0.0411 100 -0.0102 0.1598
#> direct             4.1748 0.0929 100 -0.0907 0.2472
#> total              0.9194 0.0995 100 -0.0321 0.3529


# Monte Carlo (Multiple Imputation) ----------------------------------------
## Multiple Imputation ------------------------------------------------------
mi <- mice::mice(
  data = df,
  print = FALSE,
  m = 5L, # use a large value e.g., 100L for actual research,
  seed = 42
)

## Fit Model in lavaan ------------------------------------------------------
fit <- sem(data = df, model = model) # use default listwise deletion

## MCMI() -------------------------------------------------------------------
unstd <- MCMI(
  fit,
  mi = mi,
  R = 100L, # use a large value e.g., 20000L for actual research
  alpha = 0.05
)

## Standardized Monte Carlo -------------------------------------------------
MCStd(unstd, alpha = 0.05)

#> Standardized Monte Carlo Confidence Intervals
#>                       est     se   R    2.5%  97.5%
#> cp                 0.0885 0.0862 100 -0.0322 0.2702
#> b                  0.4214 0.0843 100  0.2399 0.5693
#> a                  0.1412 0.0879 100  0.0361 0.3440
#> cond~~cond         1.0000 0.0000 100  1.0000 1.0000
#> reaction~~reaction 0.8040 0.0735 100  0.6219 0.8997
#> pmi~~pmi           0.9801 0.0329 100  0.8814 0.9979
#> indirect           0.0595 0.0441 100  0.0101 0.1698
#> direct             0.0885 0.0862 100 -0.0322 0.2702
#> total              0.1480 0.0859 100  0.0275 0.3474
```

References

Pesigan, I. J. A., & Cheung, S. F. (2023). Monte Carlo confidence intervals for the indirect effect with missing data. *Behavior Research Methods*. https://doi.org/10.3758/s13428-023-02114-4

R Core Team. (2023). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. https://www.R-project.org/