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                  0.0180 0.0888 100 -0.1360 0.1988
#> b                   0.4824 0.0745 100  0.3142 0.6278
#> a                   0.1727 0.0773 100  0.0336 0.3144
#> cond~~cond          1.0000 0.0000 100  1.0000 1.0000
#> reaction~~reaction 0.7639 0.0697 100  0.5948 0.8805
```

```
#> pmi~~pmi           0.9702 0.0276 100  0.9011 0.9989
#> indirect           0.2835 0.0390 100  0.0147 0.1586
#> direct             3.9922 0.0888 100 -0.1360 0.1988
#> total              0.9449 0.0894 100 -0.0569 0.2750


# 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                 0.0354 0.0785 100 -0.1235 0.1697
#> b                  0.4924 0.0702 100  0.3273 0.6179
#> a                  0.1780 0.0874 100 -0.0286 0.3179
#> cond~~cond         1.0000 0.0000 100  1.0000 1.0000
#> reaction~~reaction 0.7501 0.0673 100  0.6192 0.8675
#> pmi~~pmi           0.9683 0.0271 100  0.8990 0.9997
#> indirect           0.0876 0.0433 100 -0.0142 0.1609
#> direct             0.0354 0.0785 100 -0.1235 0.1697
#> total              0.1230 0.0854 100 -0.0661 0.2359
```

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/