

betaDelta: Staging

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Staging...

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
```

```
BetaDelta(object, type = "mvn")
```

```
#> Call:
#> BetaDelta(object = object, type = "mvn")
#>
#> Standardized regression slopes with MVN standard errors:
#>      est      se      t      p  0.05%  0.5%  2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0759 6.5272 0.000  0.2268 0.2905 0.3421 0.6482 0.6998 0.7635
#> PCTGRT  0.3915 0.0770 5.0824 0.000  0.1190 0.1837 0.2360 0.5469 0.5993 0.6640
#> PCTSUPP 0.2632 0.0747 3.5224 0.001 -0.0011 0.0616 0.1124 0.4141 0.4649 0.5276
```

```
BetaDelta(object, type = "adf")
```

```
#> Call:
#> BetaDelta(object = object, type = "adf")
#>
#> Standardized regression slopes with ADF standard errors:
#>      est      se      t      p  0.05%  0.5%  2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0674 7.3490 0.0000  0.2568 0.3134 0.3592 0.6311 0.6769 0.7335
#> PCTGRT  0.3915 0.0710 5.5164 0.0000  0.1404 0.2000 0.2483 0.5347 0.5830 0.6426
#> PCTSUPP 0.2632 0.0769 3.4231 0.0014 -0.0088 0.0558 0.1081 0.4184 0.4707 0.5353
```

```
out <- BetaDelta(object, type = "mvn")
print(out)
```

```
#> Call:
#> BetaDelta(object = object, type = "mvn")
#>
#> Standardized regression slopes with MVN standard errors:
#>      est      se      t      p  0.05%  0.5%  2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0759 6.5272 0.000  0.2268 0.2905 0.3421 0.6482 0.6998 0.7635
#> PCTGRT  0.3915 0.0770 5.0824 0.000  0.1190 0.1837 0.2360 0.5469 0.5993 0.6640
#> PCTSUPP 0.2632 0.0747 3.5224 0.001 -0.0011 0.0616 0.1124 0.4141 0.4649 0.5276
```

```
summary(out)

#> Call:
#> BetaDelta(object = object, type = "mvn")
#>
#> Standardized regression slopes with MVN standard errors:
#>      est      se      t      p    0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0759 6.5272 0.000   0.2268 0.2905 0.3421 0.6482 0.6998 0.7635
#> PCTGRT  0.3915 0.0770 5.0824 0.000   0.1190 0.1837 0.2360 0.5469 0.5993 0.6640
#> PCTSUPP 0.2632 0.0747 3.5224 0.001  -0.0011 0.0616 0.1124 0.4141 0.4649 0.5276

coef(out)

#>      NARTIC      PCTGRT      PCTSUPP
#> 0.4951451 0.3914887 0.2632477

vcov(out)

#>      NARTIC      PCTGRT      PCTSUPP
#> NARTIC  0.005754524 -0.003360334 -0.002166127
#> PCTGRT -0.003360334  0.005933462 -0.001769723
#> PCTSUPP -0.002166127 -0.001769723  0.005585256

confint(out)

#>      2.5%      97.5%
#> NARTIC  0.3420563 0.6482339
#> PCTGRT  0.2360380 0.5469395
#> PCTSUPP 0.1124272 0.4140682

out <- BetaDelta(object, type = "adf")
print(out)

#> Call:
#> BetaDelta(object = object, type = "adf")
#>
#> Standardized regression slopes with ADF standard errors:
#>      est      se      t      p    0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0674 7.3490 0.0000   0.2568 0.3134 0.3592 0.6311 0.6769 0.7335
#> PCTGRT  0.3915 0.0710 5.5164 0.0000   0.1404 0.2000 0.2483 0.5347 0.5830 0.6426
#> PCTSUPP 0.2632 0.0769 3.4231 0.0014  -0.0088 0.0558 0.1081 0.4184 0.4707 0.5353

summary(out)

#> Call:
#> BetaDelta(object = object, type = "adf")
#>
#> Standardized regression slopes with ADF standard errors:
```

```

#>      est      se      t      p  0.05%  0.5%  2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0674 7.3490 0.0000  0.2568 0.3134 0.3592 0.6311 0.6769 0.7335
#> PCTGRT  0.3915 0.0710 5.5164 0.0000  0.1404 0.2000 0.2483 0.5347 0.5830 0.6426
#> PCTSUPP 0.2632 0.0769 3.4231 0.0014 -0.0088 0.0558 0.1081 0.4184 0.4707 0.5353

coef(out)

#>      NARTIC      PCTGRT      PCTSUPP
#> 0.4951451 0.3914887 0.2632477

vcov(out)

#>      NARTIC      PCTGRT      PCTSUPP
#> NARTIC  0.004539472 -0.002552698 -0.001742698
#> PCTGRT -0.002552698  0.005036538 -0.001906216
#> PCTSUPP -0.001742698 -0.001906216  0.005914088

confint(out)

#>      2.5%      97.5%
#> NARTIC  0.3591757 0.6311146
#> PCTGRT  0.2482683 0.5347091
#> PCTSUPP 0.1080509 0.4184444

```

```

BetaDelta(object, type = "mvn")

#> Call:
#> BetaDelta(object = object, type = "mvn")
#>
#> Standardized regression slopes with MVN standard errors:
#>      est      se      t      p  0.05%  0.5%  2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0759 6.5272 0.000  0.2268 0.2905 0.3421 0.6482 0.6998 0.7635
#> PCTGRT  0.3915 0.0770 5.0824 0.000  0.1190 0.1837 0.2360 0.5469 0.5993 0.6640
#> PCTSUPP 0.2632 0.0747 3.5224 0.001 -0.0011 0.0616 0.1124 0.4141 0.4649 0.5276

BetaDelta(object, type = "adf")

#> Call:
#> BetaDelta(object = object, type = "adf")
#>
#> Standardized regression slopes with ADF standard errors:
#>      est      se      t      p  0.05%  0.5%  2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0674 7.3490 0.0000  0.2568 0.3134 0.3592 0.6311 0.6769 0.7335
#> PCTGRT  0.3915 0.0710 5.5164 0.0000  0.1404 0.2000 0.2483 0.5347 0.5830 0.6426
#> PCTSUPP 0.2632 0.0769 3.4231 0.0014 -0.0088 0.0558 0.1081 0.4184 0.4707 0.5353

out <- rsq(BetaDelta(object, type = "mvn"))
print(out)

```

```

#> R-squared with MVN standard errors:
#>           est      se      t p 0.05%  0.5%  2.5% 97.5% 99.5% 99.95%
#> R-squared 0.8045 0.0517 15.5608 0 0.6216 0.6650 0.7002 0.9089 0.944 0.9874
#> Adjusted 0.7906 0.0554 14.2713 0 0.5946 0.6411 0.6788 0.9024 0.940 0.9865

summary(out)

#> R-squared with MVN standard errors:
#>           est      se      t p 0.05%  0.5%  2.5% 97.5% 99.5% 99.95%
#> R-squared 0.8045 0.0517 15.5608 0 0.6216 0.6650 0.7002 0.9089 0.944 0.9874
#> Adjusted 0.7906 0.0554 14.2713 0 0.5946 0.6411 0.6788 0.9024 0.940 0.9865

coef(out)

#> R-squared  Adjusted
#> 0.8045263 0.7905638

vcov(out)

#>           R-squared  Adjusted
#> R-squared 0.002673125 0.002864062
#> Adjusted 0.002864062 0.003068638

confint(out)

#>           2.5%      97.5%
#> R-squared 0.7001868 0.9088657
#> Adjusted 0.6787716 0.9023561

out <- rsq(BetaDelta(object, type = "adf"))
print(out)

#> R-squared with ADF standard errors:
#>           est      se      t p 0.05%  0.5%  2.5% 97.5% 99.5% 99.95%
#> R-squared 0.8045 0.0519 15.4910 0 0.6208 0.6644 0.6997 0.9093 0.9447 0.9883
#> Adjusted 0.7906 0.0556 14.2073 0 0.5937 0.6404 0.6783 0.9029 0.9407 0.9874

summary(out)

#> R-squared with ADF standard errors:
#>           est      se      t p 0.05%  0.5%  2.5% 97.5% 99.5% 99.95%
#> R-squared 0.8045 0.0519 15.4910 0 0.6208 0.6644 0.6997 0.9093 0.9447 0.9883
#> Adjusted 0.7906 0.0556 14.2073 0 0.5937 0.6404 0.6783 0.9029 0.9407 0.9874

coef(out)

#> R-squared  Adjusted
#> 0.8045263 0.7905638

```

```
vcov(out)
```

```
#>           R-squared    Adjusted  
#> R-squared 0.002697266 0.002889927  
#> Adjusted  0.002889927 0.003096351
```

```
confint(out)
```

```
#>           2.5%    97.5%  
#> R-squared 0.6997168 0.9093357  
#> Adjusted  0.6782680 0.9028597
```

```
BetaDelta(object, type = "mvn")
```

```
#> Call:  
#> BetaDelta(object = object, type = "mvn")  
#>  
#> Standardized regression slopes with MVN standard errors:  
#>      est      se      t      p  0.05%  0.5%  2.5%  97.5%  99.5% 99.95%  
#> NARTIC  0.4951 0.0759 6.5272 0.000  0.2268 0.2905 0.3421 0.6482 0.6998 0.7635  
#> PCTGRT  0.3915 0.0770 5.0824 0.000  0.1190 0.1837 0.2360 0.5469 0.5993 0.6640  
#> PCTSUPP 0.2632 0.0747 3.5224 0.001 -0.0011 0.0616 0.1124 0.4141 0.4649 0.5276
```

```
BetaDelta(object, type = "adf")
```

```
#> Call:  
#> BetaDelta(object = object, type = "adf")  
#>  
#> Standardized regression slopes with ADF standard errors:  
#>      est      se      t      p  0.05%  0.5%  2.5%  97.5%  99.5% 99.95%  
#> NARTIC  0.4951 0.0674 7.3490 0.0000  0.2568 0.3134 0.3592 0.6311 0.6769 0.7335  
#> PCTGRT  0.3915 0.0710 5.5164 0.0000  0.1404 0.2000 0.2483 0.5347 0.5830 0.6426  
#> PCTSUPP 0.2632 0.0769 3.4231 0.0014 -0.0088 0.0558 0.1081 0.4184 0.4707 0.5353
```

```
out <- dif(BetaDelta(object, type = "mvn"))  
print(out)
```

```
#> Difference between standardized regression coefficients with MVN standard errors:  
#>      est      se      t      p  0.05%  0.5%  2.5%  97.5%  
#> NARTIC-PCTGRT  0.1037 0.1357 0.7640 0.4491 -0.3763 -0.2624 -0.1702 0.3775  
#> NARTIC-PCTSUPP 0.2319 0.1252 1.8524 0.0710 -0.2110 -0.1059 -0.0207 0.4845  
#> PCTGRT-PCTSUPP 0.1282 0.1227 1.0451 0.3020 -0.3059 -0.2028 -0.1194 0.3759  
#>           99.5% 99.95%  
#> NARTIC-PCTGRT  0.4697 0.5837  
#> NARTIC-PCTSUPP 0.5697 0.6748  
#> PCTGRT-PCTSUPP 0.4593 0.5624
```

```
summary(out)
```

```
#> Difference between standardized regression coefficients with MVN standard errors:
```

	est	se	t	p	0.05%	0.5%	2.5%	97.5%
#> NARTIC-PCTGRT	0.1037	0.1357	0.7640	0.4491	-0.3763	-0.2624	-0.1702	0.3775
#> NARTIC-PCTSUPP	0.2319	0.1252	1.8524	0.0710	-0.2110	-0.1059	-0.0207	0.4845
#> PCTGRT-PCTSUPP	0.1282	0.1227	1.0451	0.3020	-0.3059	-0.2028	-0.1194	0.3759

```
#>          99.5% 99.95%
```

	est	se
#> NARTIC-PCTGRT	0.4697 0.5837	
#> NARTIC-PCTSUPP	0.5697 0.6748	
#> PCTGRT-PCTSUPP	0.4593 0.5624	

```
coef(out)
```

```
#> NARTIC-PCTGRT NARTIC-PCTSUPP PCTGRT-PCTSUPP
```

	est	se
#> NARTIC-PCTGRT	0.1036564	0.2318974
#> NARTIC-PCTSUPP	0.2318974	0.1282410
#> PCTGRT-PCTSUPP	0.1282410	0.1282410

```
vcov(out)
```

	NARTIC-PCTGRT	NARTIC-PCTSUPP	PCTGRT-PCTSUPP
#> NARTIC-PCTGRT	0.018408653	0.009511262	-0.008897391
#> NARTIC-PCTSUPP	0.009511262	0.015672035	0.006160773
#> PCTGRT-PCTSUPP	-0.008897391	0.006160773	0.015058164

```
confint(out)
```

	2.5%	97.5%
#> NARTIC-PCTGRT	-0.17015387	0.3774667
#> NARTIC-PCTSUPP	-0.02074216	0.4845371
#> PCTGRT-PCTSUPP	-0.11940123	0.3758833

```
out <- dif(BetaDelta(object, type = "adf"))
print(out)
```

```
#> Difference between standardized regression coefficients with ADF standard errors:
```

	est	se	t	p	0.05%	0.5%	2.5%	97.5%
#> NARTIC-PCTGRT	0.1037	0.1212	0.8555	0.3971	-0.3250	-0.2233	-0.1409	0.3482
#> NARTIC-PCTSUPP	0.2319	0.1181	1.9642	0.0561	-0.1858	-0.0866	-0.0064	0.4702
#> PCTGRT-PCTSUPP	0.1282	0.1215	1.0555	0.2973	-0.3016	-0.1996	-0.1170	0.3734

```
#>          99.5% 99.95%
```

	est	se
#> NARTIC-PCTGRT	0.4306 0.5323	
#> NARTIC-PCTSUPP	0.5504 0.6496	
#> PCTGRT-PCTSUPP	0.4561 0.5581	

```
summary(out)
```

```

#> Difference between standardized regression coefficients with ADF standard errors:
#>           est      se      t      p    0.05%    0.5%    2.5%   97.5%
#> NARTIC-PCTGRT  0.1037 0.1212 0.8555 0.3971 -0.3250 -0.2233 -0.1409 0.3482
#> NARTIC-PCTSUPP 0.2319 0.1181 1.9642 0.0561 -0.1858 -0.0866 -0.0064 0.4702
#> PCTGRT-PCTSUPP 0.1282 0.1215 1.0555 0.2973 -0.3016 -0.1996 -0.1170 0.3734
#>           99.5% 99.95%
#> NARTIC-PCTGRT  0.4306 0.5323
#> NARTIC-PCTSUPP 0.5504 0.6496
#> PCTGRT-PCTSUPP 0.4561 0.5581

coef(out)

#>   NARTIC-PCTGRT NARTIC-PCTSUPP PCTGRT-PCTSUPP
#>      0.1036564      0.2318974      0.1282410

vcov(out)

#>           NARTIC-PCTGRT NARTIC-PCTSUPP PCTGRT-PCTSUPP
#> NARTIC-PCTGRT      0.014681407      0.006928651     -0.007752755
#> NARTIC-PCTSUPP      0.006928651      0.013938955      0.007010303
#> PCTGRT-PCTSUPP     -0.007752755      0.007010303      0.014763058

confint(out)

#>           2.5%      97.5%
#> NARTIC-PCTGRT  -0.140868200 0.3481810
#> NARTIC-PCTSUPP -0.006364043 0.4701589
#> PCTGRT-PCTSUPP -0.116962608 0.3734447

```

References

R Core Team. (2022). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. <https://www.R-project.org/>