

betaDelta: Staging

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1 Standardized Slopes

```
df <- nas1982
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = df)
mvn <- BetaDelta(object, type = "mvn")
adf <- BetaDelta(object, type = "adf")
summary(mvn)
```

#>		est	se	t	df	p	0.05%	0.5%	2.5%	97.5%	99.5%
#>	NARTIC	0.4951	0.0759	6.5272	42	0.000	0.2268	0.2905	0.3421	0.6482	0.6998
#>	PCTGRT	0.3915	0.0770	5.0824	42	0.000	0.1190	0.1837	0.2360	0.5469	0.5993
#>	PCTSUPP	0.2632	0.0747	3.5224	42	0.001	-0.0011	0.0616	0.1124	0.4141	0.4649
#>		99.95%									
#>	NARTIC	0.7635									
#>	PCTGRT	0.6640									
#>	PCTSUPP	0.5276									

```
summary(adf)
```

#>		est	se	t	df	p	0.05%	0.5%	2.5%	97.5%	99.5%
#>	NARTIC	0.4951	0.0674	7.3490	42	0.0000	0.2568	0.3134	0.3592	0.6311	0.6769
#>	PCTGRT	0.3915	0.0710	5.5164	42	0.0000	0.1404	0.2000	0.2483	0.5347	0.5830
#>	PCTSUPP	0.2632	0.0769	3.4231	42	0.0014	-0.0088	0.0558	0.1081	0.4184	0.4707
#>		99.95%									
#>	NARTIC	0.7335									
#>	PCTGRT	0.6426									
#>	PCTSUPP	0.5353									

```
coef(mvn)
```

#>	NARTIC	PCTGRT	PCTSUPP
#>	0.4951451	0.3914887	0.2632477

```
coef(adf)
```

#>	NARTIC	PCTGRT	PCTSUPP
#>	0.4951451	0.3914887	0.2632477

```

vcov(mvn)

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

vcov(adf)

#>               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(mvn)

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

confint(adf)

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

```

2 Differences of Standardized Slopes

```

df <- nas1982
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = df)
std_mvn <- BetaDelta(object, type = "mvn")
std_adf <- BetaDelta(object, type = "adf")
mvn <- DiffBetaDelta(std_mvn)
adf <- DiffBetaDelta(std_adf)
summary(mvn)

#>           est      se      z      p  0.05%   0.5%   2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.1357 0.7640 0.4449 -0.3428 -0.2458 -0.1623 0.3696
#> NARTIC-PCTSUPP 0.2319 0.1252 1.8524 0.0640 -0.1800 -0.0906 -0.0135 0.4773
#> PCTGRT-PCTSUPP 0.1282 0.1227 1.0451 0.2960 -0.2755 -0.1878 -0.1123 0.3688
#>           99.5% 99.95%
#> NARTIC-PCTGRT  0.4531 0.5501
#> NARTIC-PCTSUPP 0.5544 0.6438

```

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#> PCTGRT-PCTSUPP 0.4443 0.5320

summary(adf)

#>               est      se      z      p    0.05%    0.5%    2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.1212 0.8555 0.3923 -0.2950 -0.2084 -0.1338 0.3411
#> NARTIC-PCTSUPP 0.2319 0.1181 1.9642 0.0495 -0.1566 -0.0722  0.0005 0.4633
#> PCTGRT-PCTSUPP 0.1282 0.1215 1.0555 0.2912 -0.2716 -0.1847 -0.1099 0.3664
#>               99.5% 99.95%
#> NARTIC-PCTGRT  0.4158 0.5024
#> NARTIC-PCTSUPP 0.5360 0.6204
#> PCTGRT-PCTSUPP 0.4412 0.5281

coef(mvn)

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

coef(adf)

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

vcov(mvn)

#>               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

vcov(adf)

#>               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(mvn)

#>               2.5 %    97.5 %
#> NARTIC-PCTGRT  -0.16226855 0.3695814
#> NARTIC-PCTSUPP -0.01346652 0.4772614
#> PCTGRT-PCTSUPP -0.11226950 0.3687516

confint(adf)

#>               2.5 %    97.5 %
#> NARTIC-PCTGRT  -0.1338262589 0.3411391
#> NARTIC-PCTSUPP  0.0004975295 0.4632974
#> PCTGRT-PCTSUPP -0.1099011119 0.3663832

```