Example

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Data Description

```
data <- data.frame(
  WGT = c(64,71,53,67,55,58,77,57,56,51,76,68),
  HGT = c(57,59,49,62,51,50,55,48,42,42,61,57),
  AGE = c(8 ,10, 6,11, 8, 7,10, 9,10, 6,12, 9))
pander(data, caption = "8.1, Page 137")
```

Table 1: 8.1, Page 137

WGT	HGT	AGE
64	57	8
71	59	10
53	49	6
67	62	11
55	51	8
58	50	7
77	55	10
57	48	9
56	42	10
51	42	6
76	61	12
68	57	9

```
#stargazer(data, type = "latex")
```

F test

```
la <- lm(WGT ~ AGE, data = data)
#pander(summary(la))
pander(anova(la))
```

Table 2: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
AGE	1	526.4	526.4	14.55	0.003407
Residuals	10	361.9	36.19	NA	NA

```r
lh <- lm(WGT ~ HGT, data = data)
#pander(summary(lh))
pander(anova(lh))
```

Table 3: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
HGT	1	588.9	588.9	19.67	0.001263
Residuals	10	299.3	29.93	NA	NA

```r
l1.1 <- lm(WGT ~ HGT + AGE, data = data)
#pander(summary(l1))
pander(anova(l1.1))
```

Table 4: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
HGT	1	588.9	588.9	27.12	0.0005582
AGE	1	103.9	103.9	4.785	0.05649
Residuals	9	195.4	21.71	NA	NA

```r
l1.2 <- lm(WGT ~ AGE + HGT, data = data)
#pander(summary(l1))
pander(anova(l1.2))  ##SS/MS changed with the position of variable
```

Table 5: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
AGE	1	526.4	526.4	24.24	0.0008205
HGT	1	166.4	166.4	7.665	0.02181
Residuals	9	195.4	21.71	NA	NA

```r
l2 <- lm(WGT ~ .+ poly(AGE,2), data = data)
pander(anova(l2), caption = "Table 9.1")
```

Table 6: Table 9.1

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
HGT	1	588.9	588.9	24.14	0.001174
AGE	1	103.9	103.9	4.258	0.07295
poly(AGE, 2)	1	0.2379	0.2379	0.009749	0.9238
Residuals	8	195.2	24.4	NA	NA

```r
#pander(summary(l2))
```

Variables-added-in-order tests

```
data$hgt.c <- scale(data["HGT"], center = TRUE, scale = FALSE)
data$age.c <- scale(data["AGE"], center = TRUE, scale = FALSE)

ll1 <- lm(WGT ~ hgt.c, data = data)  # Add variable one by one
ll2 <- lm(WGT ~ hgt.c + age.c, data = data)
ll3 <- lm(WGT ~ hgt.c + age.c + I(age.c^2), data = data)

pander(anova(ll1), caption = "HGT centered")
```

Table 7: HGT centered

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
hgt.c	1	588.9	588.9	19.67	0.001263
Residuals	10	299.3	29.93	NA	NA

```
pander(anova(ll2), caption = "Addition of AGE centered")
```

Table 8: Addition of AGE centered

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
hgt.c	1	588.9	588.9	27.12	0.0005582
age.c	1	103.9	103.9	4.785	0.05649
Residuals	9	195.4	21.71	NA	NA

```
pander(anova(ll3), caption = "Addition of Poly(AGE)")
```

Table 9: Addition of Poly(AGE)

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
hgt.c	1	588.9	588.9	24.14	0.001174
age.c	1	103.9	103.9	4.258	0.07295
I(age.c^2)	1	0.2379	0.2379	0.009749	0.9238
Residuals	8	195.2	24.4	NA	NA

```
#stargazer(ll1, ll2, ll3, type = "latex")
```

Variables-added-last tests

- Residual substraction

```
lll0 <- lm(WGT ~ age.c + I(age.c^2) + hgt.c, data = data)
lll1 <- lm(WGT ~ age.c + I(age.c^2), data = data)
lll2 <- lm(WGT ~ hgt.c + I(age.c^2), data = data)
```

```
lll3 <- lm(WGT ~ hgt.c + age.c, data = data)

pander(anova(lll0))  # full model
```

Table 10: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
age.c	1	526.4	526.4	21.57	0.001656
I(age.c^2)	1	0.08565	0.08565	0.00351	0.9542
hgt.c	1	166.6	166.6	6.827	0.03099
Residuals	8	195.2	24.4	NA	NA

```
pander(anova(lll1))  # delete hgt.c
```

Table 11: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
age.c	1	526.4	526.4	13.1	0.005583
I(age.c^2)	1	0.08565	0.08565	0.002131	0.9642
Residuals	9	361.8	40.2	NA	NA

```
pander(anova(lll2))  # delete age.c
```

Table 12: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
hgt.c	1	588.9	588.9	17.85	0.002225
I(age.c^2)	1	2.329	2.329	0.07058	0.7965
Residuals	9	297	33	NA	NA

```
pander(anova(lll3))  # delete age.c^2
```

Table 13: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
hgt.c	1	588.9	588.9	27.12	0.0005582
age.c	1	103.9	103.9	4.785	0.05649
Residuals	9	195.4	21.71	NA	NA

- Last added

```
llll1 <- lm(WGT ~ age.c + I(age.c^2) + hgt.c, data = data)
llll2 <- lm(WGT ~ hgt.c + I(age.c^2) + age.c, data = data)
llll3 <- lm(WGT ~ hgt.c + age.c + I(age.c^2), data = data)
```

```
pander(anova(lllll))  # hgt.c last
```

Table 14: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
age.c	1	526.4	526.4	21.57	0.001656
I(age.c^2)	1	0.08565	0.08565	0.00351	0.9542
hgt.c	1	166.6	166.6	6.827	0.03099
Residuals	8	195.2	24.4	NA	NA

```
pander(anova(llll2))  # age.c last
```

Table 15: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
hgt.c	1	588.9	588.9	24.14	0.001174
I(age.c^2)	1	2.329	2.329	0.09546	0.7652
age.c	1	101.8	101.8	4.173	0.07535
Residuals	8	195.2	24.4	NA	NA

```
pander(anova(llll3))  # age.c^2 last
```

Table 16: Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
hgt.c	1	588.9	588.9	24.14	0.001174
age.c	1	103.9	103.9	4.258	0.07295
I(age.c^2)	1	0.2379	0.2379	0.009749	0.9238
Residuals	8	195.2	24.4	NA	NA

```
pander(summary(lll0)) # Compare P value
```

	Estimate	Std. Error	t value	Pr(>|t|)
age.c	2.04	0.9987	2.043	0.07535
I(age.c^2)	-0.04171	0.4224	-0.09874	0.9238
hgt.c	0.7237	0.277	2.613	0.03099
(Intercept)	62.89	1.996	31.51	1.119e-09

Table 18: Fitting linear model: WGT ~ age.c + I(age.c^2) + hgt.c

Observations	Residual Std. Error	R^2	Adjusted R^2
12	4.94	0.7803	0.6978

```
stargazer(llll1, llll2, llll3, type = "latex")
```

% Table created by stargazer v.5.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Thu, Jan 28, 2016 - 7:10:55 PM

Table 19:

	Dependent variable:		
	WGT		
	(1)	(2)	(3)
age.c	2.040*	2.040*	2.040*
	(0.999)	(0.999)	(0.999)
I(age.cˆ2)	−0.042	−0.042	−0.042
	(0.422)	(0.422)	(0.422)
hgt.c	0.724**	0.724**	0.724**
	(0.277)	(0.277)	(0.277)
Constant	62.888***	62.888***	62.888***
	(1.996)	(1.996)	(1.996)
Observations	12	12	12
R^2	0.780	0.780	0.780
Adjusted R^2	0.698	0.698	0.698
Residual Std. Error (df = 8)	4.940	4.940	4.940
F Statistic (df = 3; 8)	9.469***	9.469***	9.469***
Note:			*p<0.1; **p<0.05; ***p<0.01