Recall

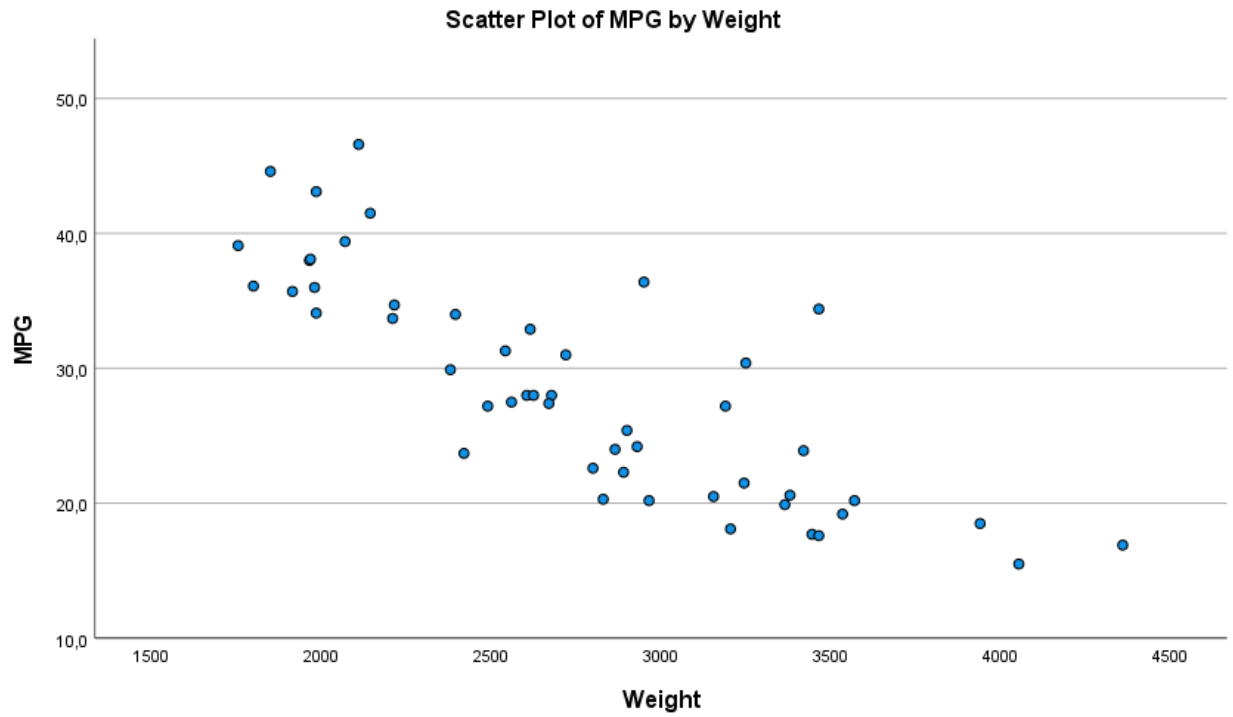
Example Miles_Per_Gallon.sav

Y = Miles per gallon

X1 = Weight

X2 = Horsepower

Scatterplot



r(MPG,Weight)=-0.825

r(MPG,Horsepower)=-0.788

Model MPG ≈ b0 + b1 * Weight

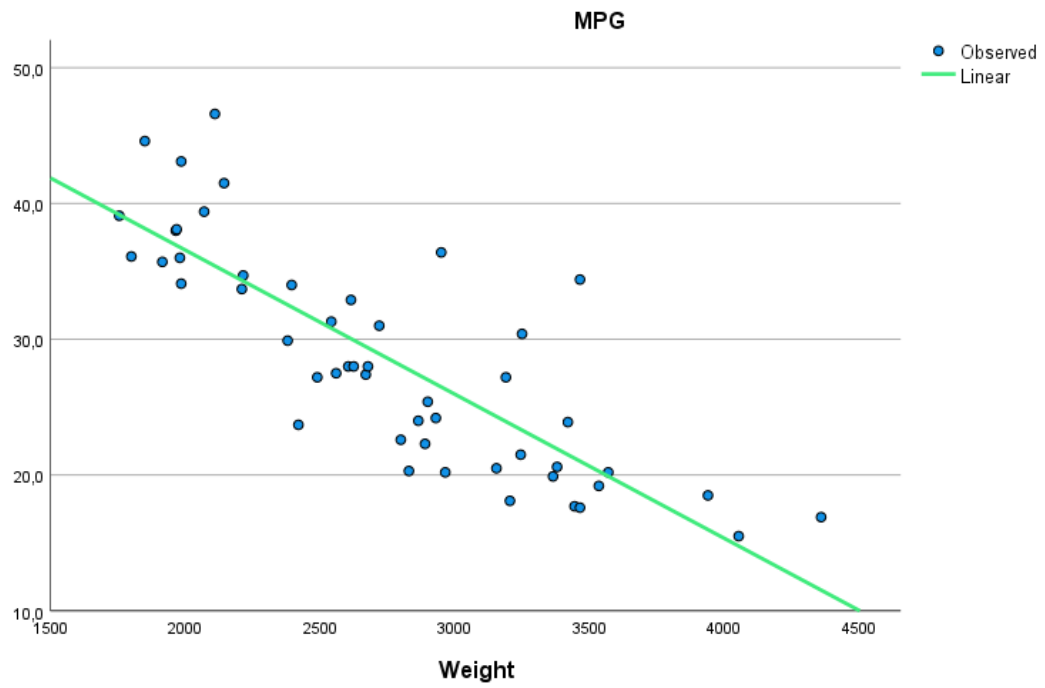
r(Weight, Horsepower)=+0.742, but partial correlation between Weight and Horsepower with MPG as control variable = +0.264

Scatterplot with regression line f(x) = 57.797 – 0.011 * Weight

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	57,797	2,969		19,467	,000
	Weight	-,011	,001	-,825	-10,107	,000

a. Dependent Variable: MPG



Homoscedasticity, not heteroscedasticity

Predicted values:

57.797 – 0.011 * 2.250 = 33.9 miles = interpolated value,

because 2.250 ∈ $[x_{min}; x_{max}]$ = [1.755;4.360]

57.797 – 0.011 * 4.500 = 10.0 miles = extrapolated value,

because 4.500 ∉ [1.755;4.360]

Leverage values (the four highest leverage values):

LEV(car with maximum weight of 4.360)=0.13011

LEV(second heaviest car with 4.054 weight) =0.08519

LEV(third heaviest car with 3.940 weight)=0.07088

LEV(car with minimum weight of 1.755)=0.05076

Model MPG ≈ b0 + b1 * Weight + b2*Horsepower

R(MPG,Weight,Horepower)=0.866

R²(MPG,Weight,Horsepower)=0.739

Adjusted R Square

Ra²(Model MPG=b0+b1*Weight)=0.674

Ra²(Model MPG=b0+b1*Weight+b2*Horsepower)=0.739

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,825[a]	,680	,674	4,6681

a. Predictors: (Constant), Weight

b. Dependent Variable: MPG

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,866[a]	,749	,739	4,1766

a. Predictors: (Constant), Horsepower, Weight

b. Dependent Variable: MPG

Multicollinearity

Model Weight = b0+b1*Horsepower with R_1 = r(Weight, Horsepower)=+0.742

VIF= $\frac{1}{1-R_1^2} = \frac{1}{1-0.742^2}$ = 2.224 < 10 no multicollinearity (only if VIF ≥ 10)

Model Horsepower = b0+b1*Weight with R_2 = r(Horsepower, Weight)=+0.742

VIF = $\frac{1}{1-R_2^2} = \frac{1}{1-0.742^2}$ = 2.224 < 10

Predicted value

58.157 - 0.007*2.500 – 0.118*80 = 31.57843 miles

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	58,157	2,658		21,878	,000					
	Weight	-,007	,001	-,534	-4,903	,000	-,825	-,582	-,358	,450	2,224
	Horsepower	-,118	,033	-,392	-3,600	,001	-,788	-,465	-,263	,450	2,224

a. Dependent Variable: MPG

partial correlation r(MPG,Weight)=-0.582 with Horsepower=control

partial correlation r(MPG,Horsepower)=-0.465 with Weight=control