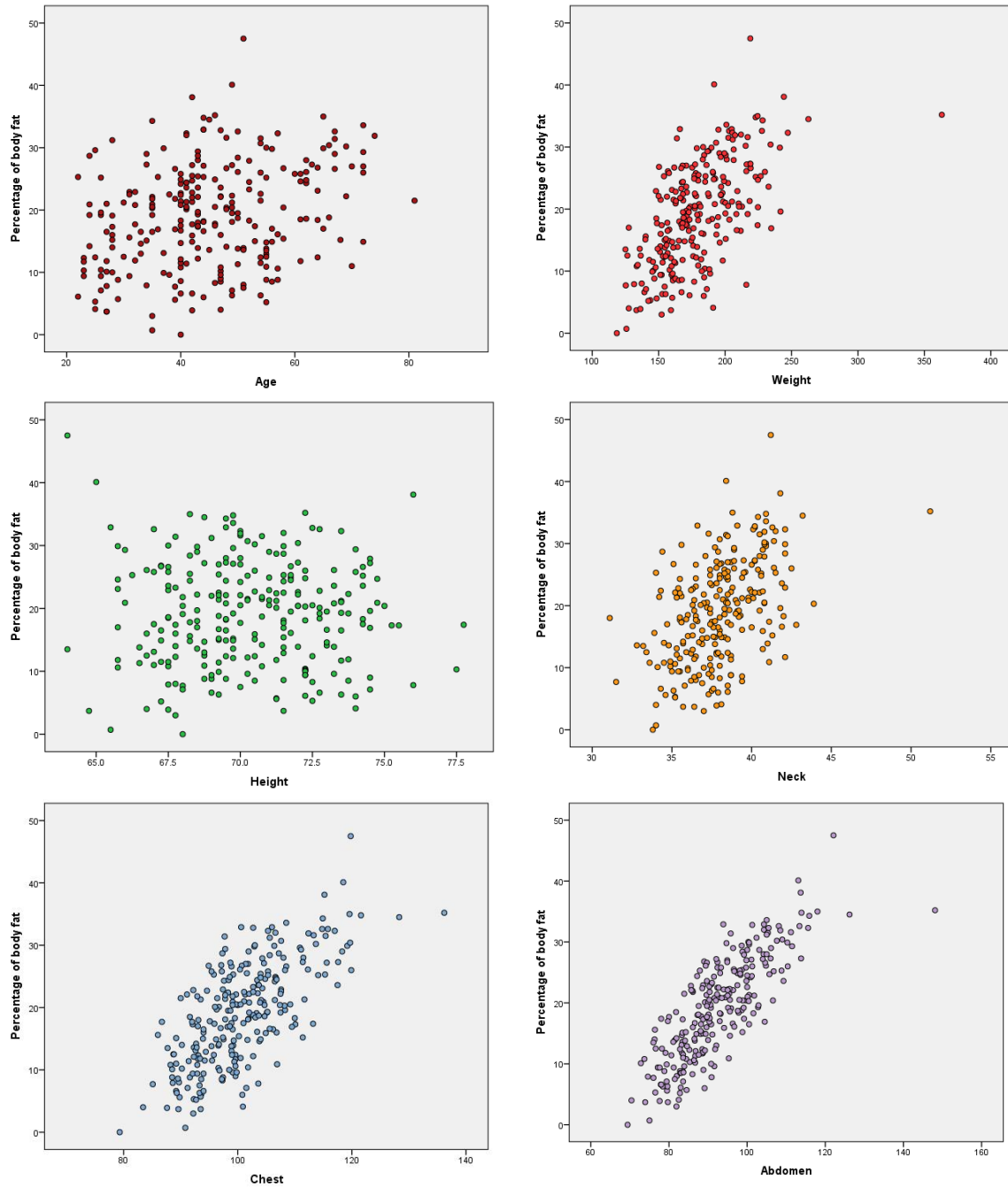


Practical Week 3 Solutions



Examples of the first few scatter plots. They all show some degree of linearity more or less, eg Abdomen more and Height less.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.865 ^a	.749	.735	4.309

a. Predictors: (Constant), Wrist, Age, Height, Ankle, Forearm, Abdomen, Biceps, Knee, Neck, Thigh, Chest, Hip, Weight

Adjusted R^2 points out a good fit. Particularly as we have cross-sectional data.

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	13158.926	13	1012.225	54.504	.000 ^b
Residual	4420.064	238	18.572		
Total	17578.990	251			

a. Dependent Variable: Percentage of body fat

b. Predictors: (Constant), Wrist, Age, Height, Ankle, Forearm, Abdomen, Biceps, Knee, Neck, Thigh, Chest, Hip, Weight

The overall significance of coefficients (regression) $H_0 : \beta_2 = \dots = \beta_{13} = 0$ is tested:

($F = 54.504$, $p\text{-value} < .001$).

Reject the null hypothesis and conclude that at least one slope is not equal to zero.

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-21.353	22.186		-.962	.337
Age	.065	.032	.097	2.006	.046
Weight	-.096	.062	-.338	-1.558	.120
Height	-.044	.179	-.014	-.246	.806
Neck	-.475	.236	-.138	-2.018	.045
Chest	-.017	.103	-.017	-.166	.868
Abdomen	.955	.090	1.231	10.592	.000
Hip	-.189	.145	-.161	-1.302	.194
Thigh	.248	.146	.156	1.699	.091
Knee	.014	.248	.004	.056	.955
Ankle	.178	.223	.036	.799	.425
Biceps	.182	.172	.066	1.057	.292
Forearm	.456	.199	.110	2.287	.023
Wrist	-1.654	.533	-.185	-3.103	.002

a. Dependent Variable: Percentage of body fat

For several variables the individual significance tests, $H_0 : \beta_j = 0, (j = 1, \dots, 13)$, cannot be rejected. Few of the signs can also be wrong. You will need the knowledge of the subject to comment on magnitudes as well.

We may reduce the model by eliminating the variable with the highest p -value, ie Knee.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.865 ^a	.749	.736	4.300

a. Predictors: (Constant), Wrist, Age, Height, Ankle, Forearm, Abdomen, Biceps, Neck, Thigh, Chest, Hip, Weight

A slight improvement in adjusted R^2 !

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-21.302	22.121		-.963	.337
Age	.065	.031	.098	2.093	.037
Weight	-.096	.061	-.337	-1.564	.119
Height	-.042	.174	-.013	-.240	.811
Neck	-.477	.234	-.139	-2.042	.042
Chest	-.017	.103	-.017	-.168	.867
Abdomen	.955	.090	1.230	10.614	.000
Hip	-.188	.144	-.161	-1.304	.193
Thigh	.251	.139	.157	1.808	.072
Ankle	.180	.218	.036	.825	.410
Biceps	.182	.172	.066	1.058	.291
Forearm	.457	.198	.110	2.304	.022
Wrist	-1.652	.531	-.184	-3.114	.002

a. Dependent Variable: Percentage of body fat

The next variable to drop is Chest.

You will carry on with this process until all coefficients stay significance. Note that during this process, significant coefficients may become insignificant and vice versa.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.857 ^a	.735	.731	4.343

a. Predictors: (Constant), Wrist, Forearm, Abdomen, Weight

ANOVA ^a					
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	12920.754	4	3230.189	171.279	.000 ^b
Residual	4658.236	247	18.859		
Total	17578.990	251			

a. Dependent Variable: Percentage of body fat

b. Predictors: (Constant), Wrist, Forearm, Abdomen, Weight

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-34.854	7.245		-4.811	.000
Weight	-.136	.025	-.476	-5.480	.000
Abdomen	.996	.056	1.283	17.760	.000
Forearm	.473	.182	.114	2.603	.010
Wrist	-1.506	.443	-.168	-3.401	.001

a. Dependent Variable: Percentage of body fat

The final model is:

$$\text{Body fat} = -34.854 - .136 * \text{Weight} + .996 * \text{Abdomen} + .473 * \text{Forearm} - 1.506 * \text{Wrist}$$