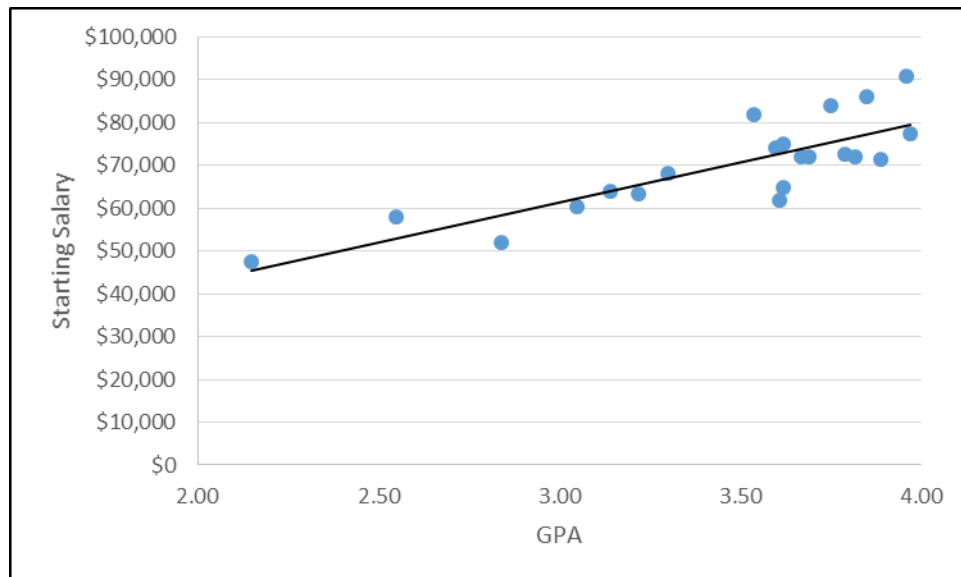


Quick Review of Regression

Introduction: This spreadsheet tutorial will give you practice with the regression tool in Excel that allow you to evaluate what factors have the greatest impact on a company's capital structure. Follow the instructions on this handout using the accompanying homework assignment (FIN415 HW3 Excel spreadsheet). The instructions are based on Excel 2013 for a PC, so you may need to make some adjustments if you are using a different spreadsheet, such as Excel for a Mac.

Quick Review of Regression: In regression analysis, we ask the question of how some variable X (the explanatory variable) affects some other variable Y (the dependent variable). This can be seen graphically, as in the chart pictured below.



This chart shows the relationship between a college student's GPA and their starting salary after college based on some hypothetical data. Each dot represents one student, showing the combination of their GPA and their starting salary. It's clear that the data show a positive relation between GPA and salary; generally speaking, the better your performance in college, the higher your salary after college. Regression analysis just allows us to quantify this relationship. It allows us to identify the "line of best fit" (shown in the chart) that best represents the relationship between GPA (the explanatory variable, X) and starting salary (the dependent variable, Y).

Excel has a regression tool that allows you to do this type of analysis very quickly. To use it you must have installed the Analysis Toolpak add-in (go to the Add-ins menu under Excel Options). When you go to Data | Data Analysis | Regression and use the regression dialog box (explained further below), you get some output that looks like this:

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.827812463							
R Square	0.685273475							
Adjusted R Square	0.668708921							
Standard Error	6292.659712							
Observations	21							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	1638146241	1.64E+09	41.36987	3.63259E-06			
Residual	19	752353758.8	39597566					
Total	20	2390500000						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	5075.393508	10187.06445	0.498219	0.624047	-16246.3774	26397.164	-16246.3774	26397.16445
GPA	18772.08779	2918.572519	6.431942	3.63E-06	12663.44531	24880.73	12663.44531	24880.73028

Even though the output contains lots of valuable information for a deeper analysis, we will base our quick analysis on two of the most important regression estimates. First, look at the coefficient on GPA (the explanatory variable), which is 18,772. This means that, according to the data, if a student has a one-point higher GPA (such as moving from 2.8 to 3.8), she will have a \$18,772 higher starting salary, on average.

Next, look at the t-stat on GPA, which is 6.4. This tells us whether the relationship we observe is statistically significant (the larger the t-stat, the more significant). To keep things simple, you can follow a rule of thumb that if the t-stat is greater than 2 (or less than -2), the relationship is statistically significant, meaning it's unlikely it occurred just by chance.

Finally look at the R-square of the regression. This tells us how well the explanatory variables do at explaining the variation in the dependent variable. The R-square of 0.69 means that variation in GPA explains about 69% of the variation in starting salary.

Instructions for HW3:

In HW3 we will ask the question, “What factors are significant determinants of a company’s capital structure?” The worksheet lists all 500 U.S. corporations from the S&P 500. The debt ratio of each is shown, which will be the dependent variable in this problem. To the right are four explanatory variables that may or may not show a significant impact on capital structure. To complete this assignment, follow the steps outlined in the work file and interpret your findings to discuss which factors seem to be playing a role in explaining the firms’ financing decisions.