Regression Equations and Real-World Data

How much does gas cost now and in the future?

by John Hinojosa

Activity Overview

In this activity, students will use data collected from the Energy Information Administration on the yearly price of regular gasoline and determine whether a relationship exists between our variables. Students will use the capabilities of the TI-Nspire to graph various regression equations and estimate future prices of gasoline.

Concepts

Entering data in a spreadsheet, plotting data points on a graph and determining various types of regression equations (linear, quadratic and power).

Teacher Preparation

This activity is designed for use in an Algebra classroom. Prior to this activity, students should have basic knowledge of various types of functions (linear, quadratic, etc…) and how to enter data into a spreadsheet.

Classroom Management Tips

This activity is teacher centered. The teacher will lead the activity so that students can develop and understand the relationships encountered with various regression equations. Students should be allowed to explore various types of regression equations.

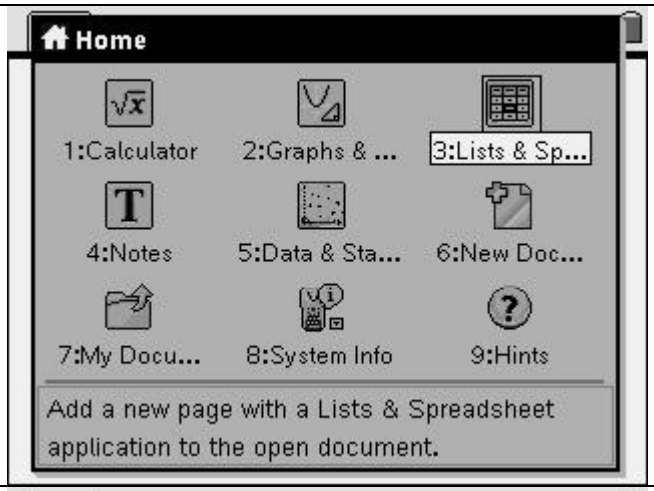
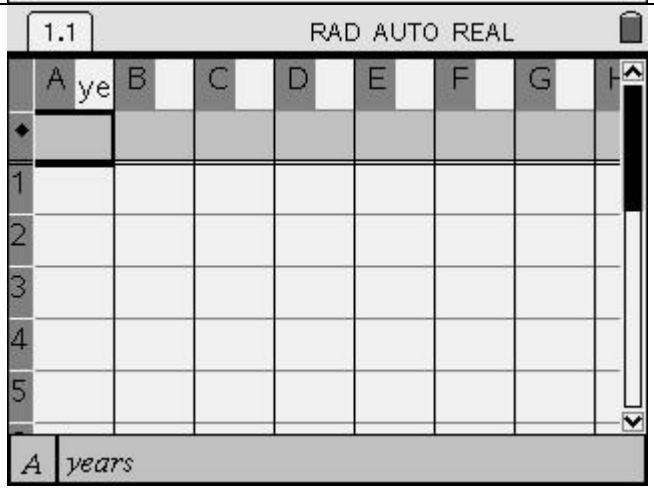
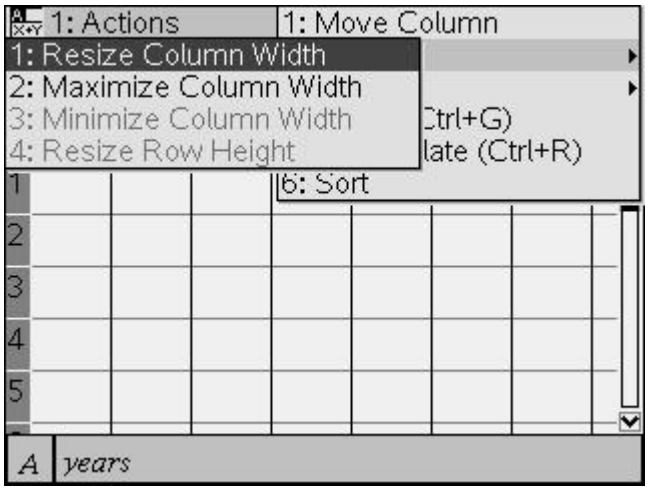
TI-Nspire Applications

Lists and Spreadsheets
Data and Statistics
Calculator

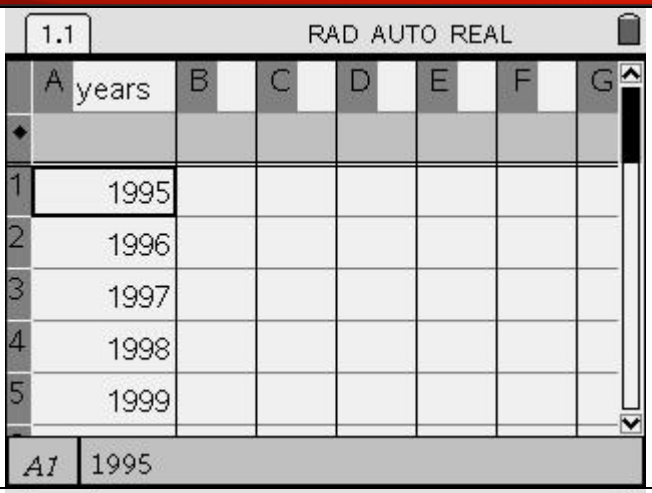
Materials needed:

TI Nspire calculator
Excel worksheet with data

Step-by-step directions

Press the ⌂ button and open a new **Lists and Spreadsheets** document	
You will now use the "Nav Pad" to move the cursor up to the text box next to the letter "A" in the first column. You will now label the column "years"	
If you want to resize the row, click on the menu button, select "Actions", 2:Resize, and then 1: Resize Column Width. Then press the right side of the "Nav pad" to widen the column. Once set to desired size, click the middle of "Nav pad" and then press bottom of "Nav pad."	

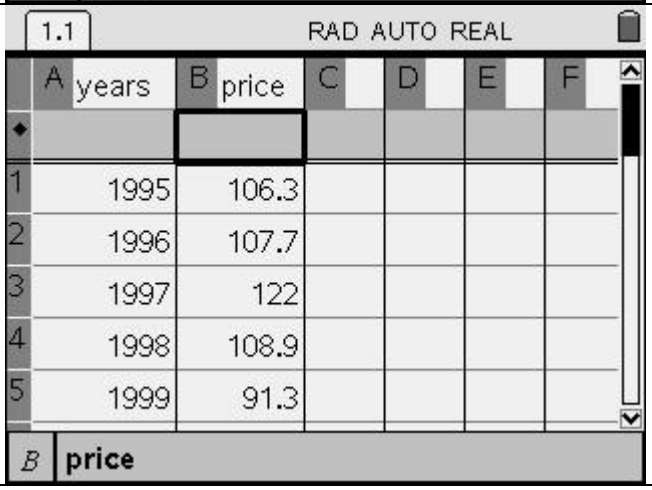
Beginning with A1, you will now enter the data (TABLE 1) from the included excel data sheet provided to you.



Once completed, you will need to use the "Nav pad" to move the cursor to the text box next to the letter "B". Label the column "price"

Resize as needed following the same steps previously given.

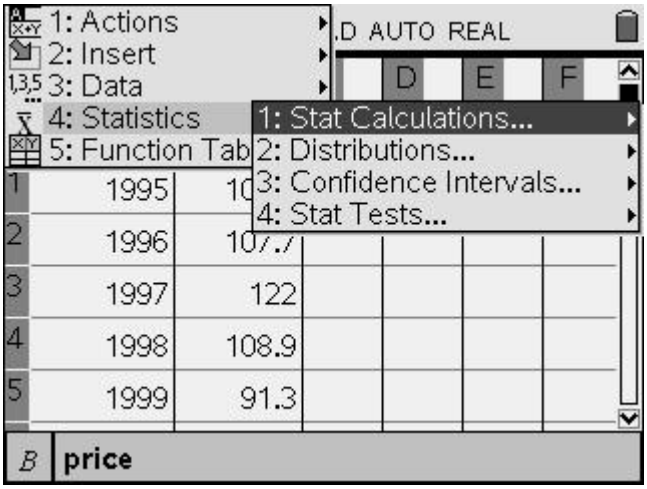
Beginning with B1, you will now enter the data (TABLE 1) from the included excel data sheet provided to you.

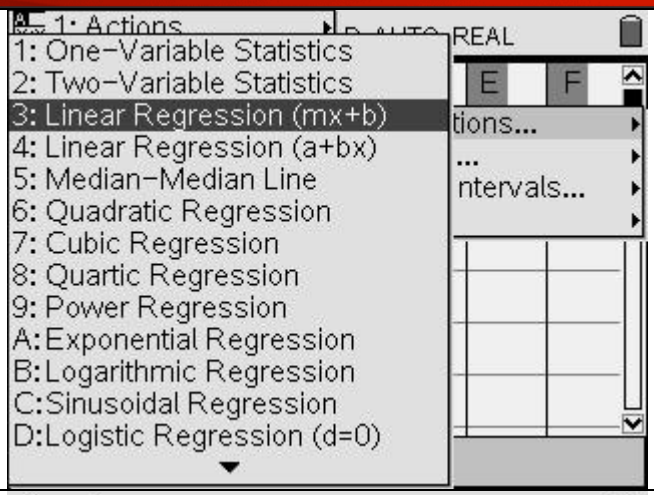


Discovery Question:
Does the data show any type of relationship? What types of Regression Equations do you believe will fit the data?

Now we will calculate a linear regression.

While in "Lists and Spreadsheet", press the (menu) button. Select "4: Statistics", "1: Stat Calculations" and then select Linear regression (mx+b).





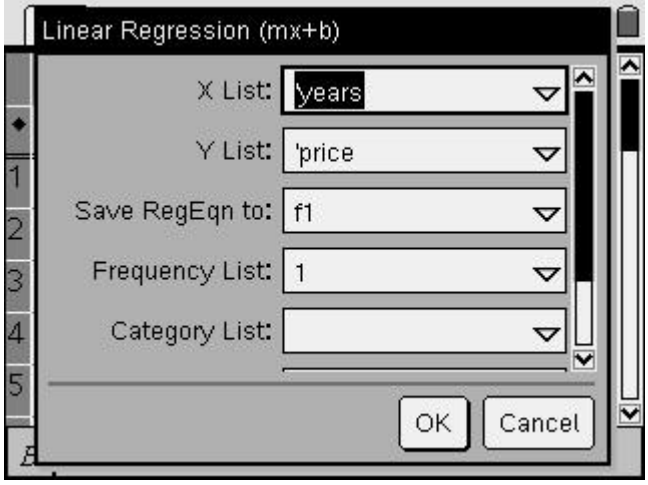
You will now select the parameters of the linear regression.

On the "X List:" press down with your "Nav pad" and select "years".

Tab to the next item "Y List:". Again press down with your "Nav pad" and select "price"

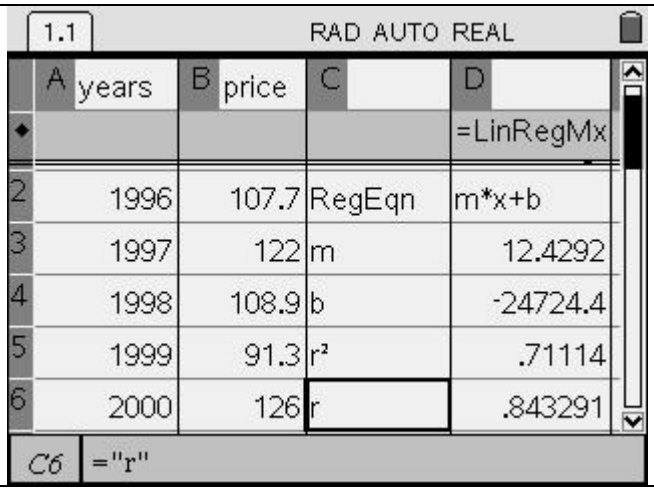
Tab to the next item "Save RegEqn to:" and make sure *f1*is selected.

Tab to the last item, "1st Result Column" and make sure that "c[]" is selected.

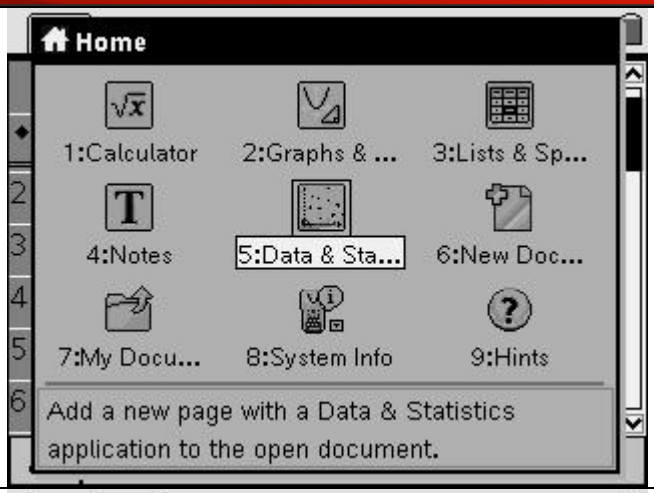


Select "OK" and your Linear Regression Equation will be listed and labeled using columns C and D.

Once again, you may resize column widths.

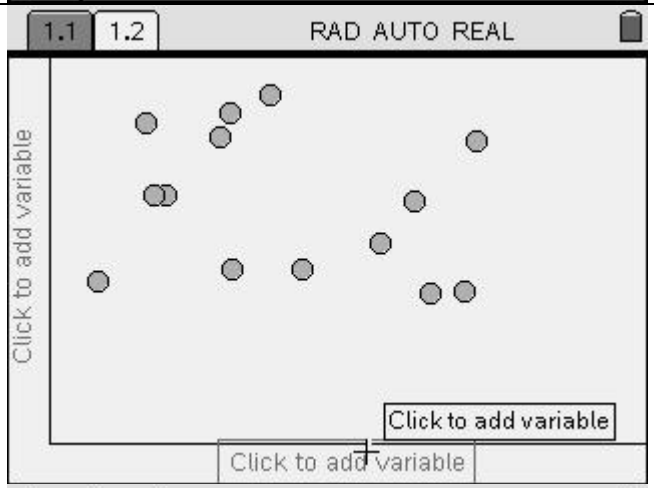


We will now select the ⌂ and add a new page with a "Data and Statistics" Application to the open document.

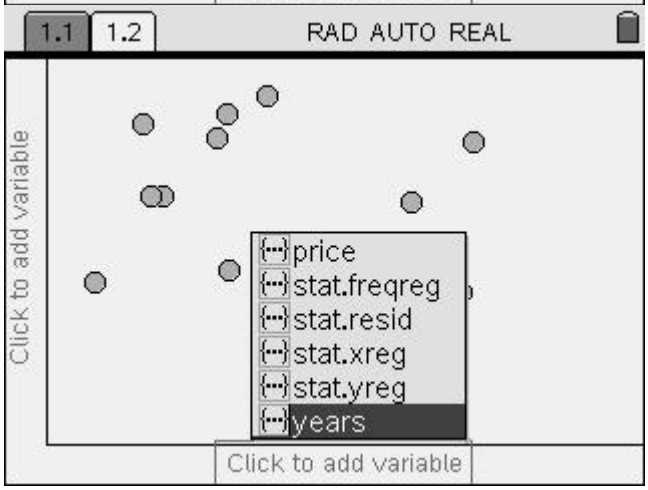


We now need to select the variables we wish to plot on the graph.

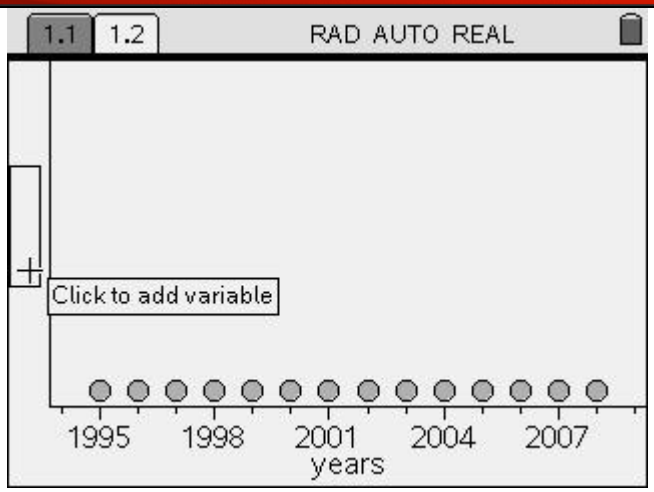
Use the "Nav pad" to move the cursor toward the bottom, middle of the screen (x axis).



When "Click to change variable" appears select "years".

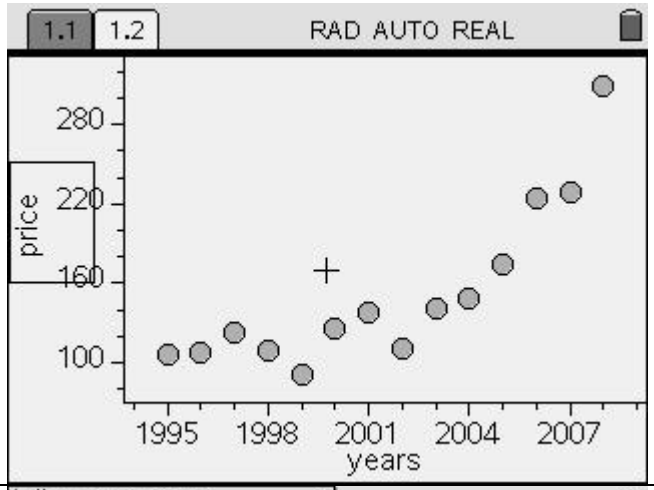


You will now use the “Nav pad” to move the cursor the the “y axis”.

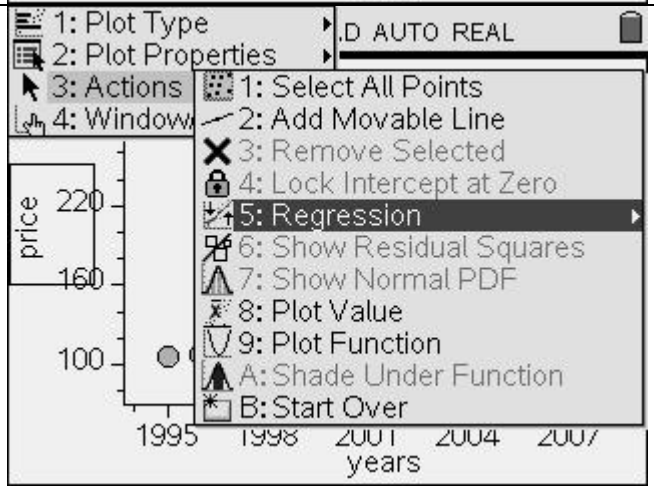


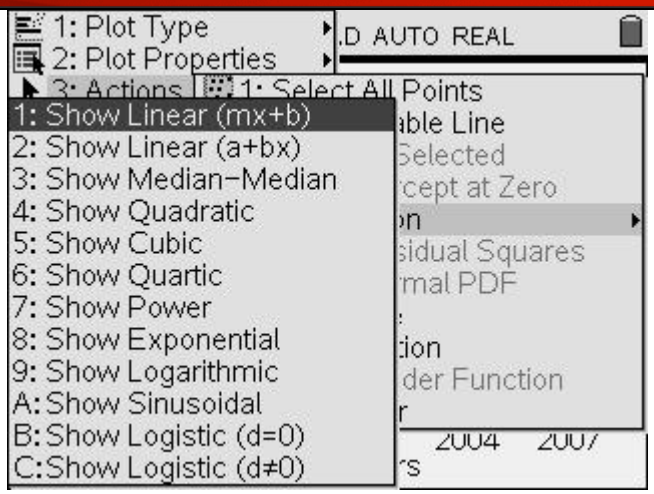
Once again, when “Click to change variable” appears, select “price”.

You will now see your data points from your spreadsheet plotted.

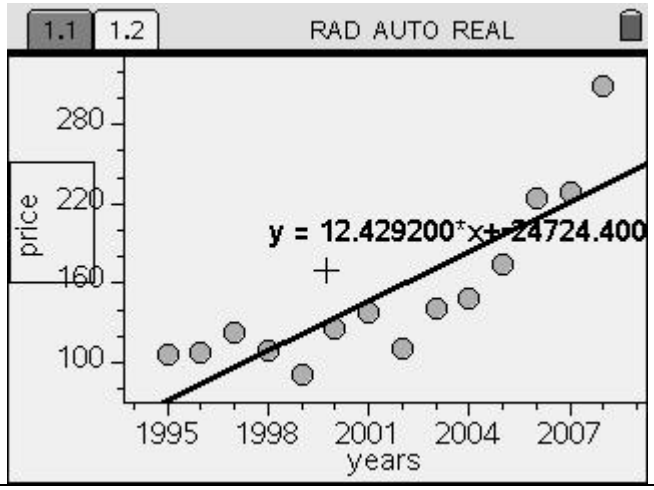


At this point, select (menu) and scroll down (using your “Nav pad”) to “3: Actions”, select “5: Regression” and then “1: Show linear (mx + b).



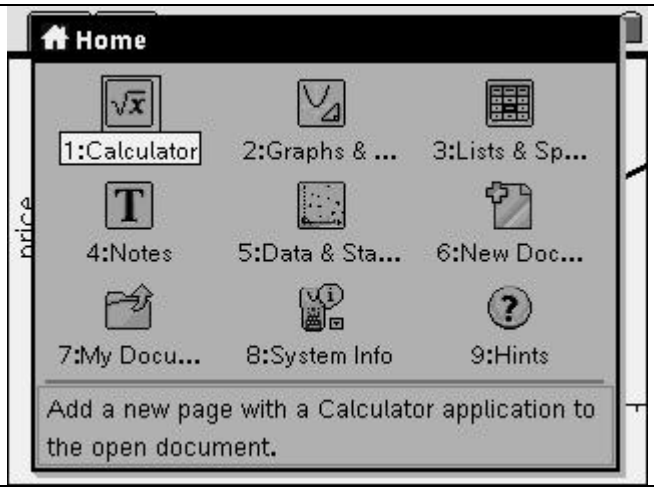


Your regression is now plotted along with your data points.



Discovery Question:
Does the "Linear Regression" model the data points? Why or why not?

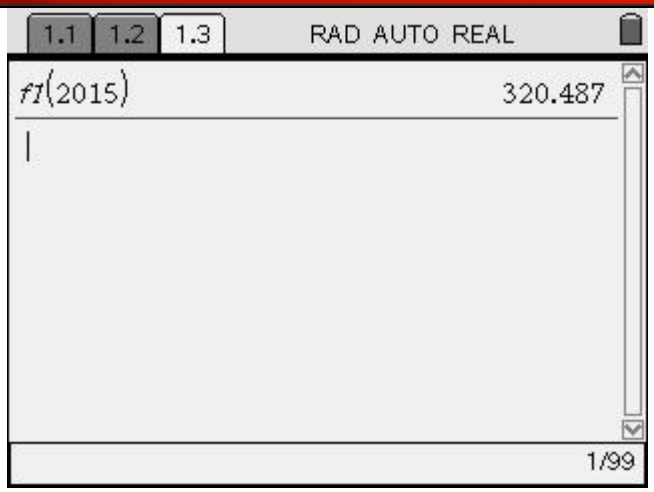
We will now select the ⌂ and add a new page with a "Calculator" Application to the open document.

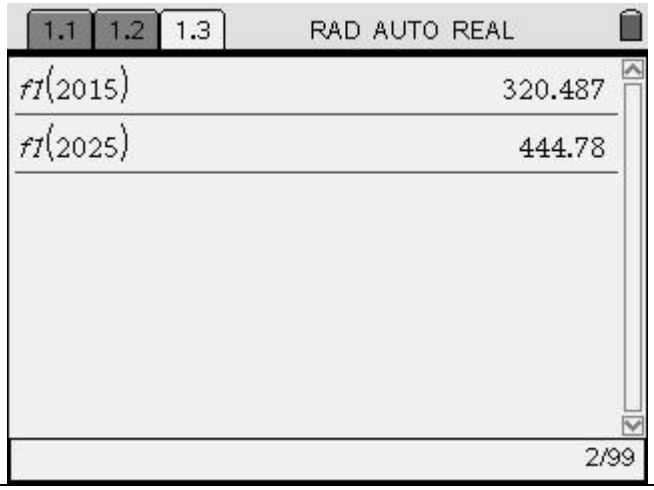


You can know use the linear regression equation saved in f1 to "guess" what the price of gas might be for other years.

In the Calculator application, type *f1*(2015) and press enter to calculate "guess" the price of gas in the year 2015.

Follow the same steps to view the price of gas for various years.





Discovery Question:
What other types of Regression Equations might model this data more accurately? Why?

You can follow the same procedures to find a quadratic regression, exponential regression and power regression equations. Discussion can then lead to which regression equation is better suited to model the data.

EXTENSION:

The attached Excel data sheet contains a separate set of data (TABLE 2) that may be used as an extension. Students can work in groups and compare the regression models with the different data sets.