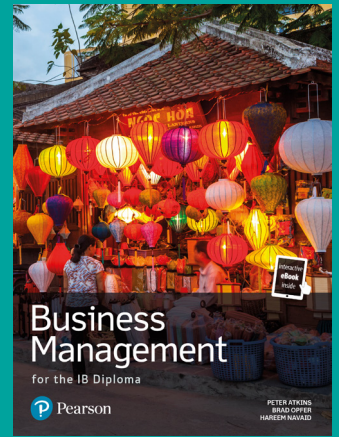




DIPLOMA

FREE LESSON PLAN

IB DP Business Management: Integrating and applying the business management toolkit



Simple linear regression

Integrating and applying the business management toolkit involves the seamless utilisation of various tools and techniques to make informed decisions, solve problems, and enhance overall organizational efficiency. By combining strategies such as SWOT analysis, Boston Consulting Group Matrix, breakeven analysis, and statistical methods like simple linear regression, businesses can gain a comprehensive understanding of their internal and external environments, adapt to market dynamics, and optimize their operations at different scales, be it local, national, or global. This holistic approach empowers businesses to remain agile and responsive, ensuring their long-term success and growth in a rapidly evolving business landscape.

Let's apply the **simple linear regression** tool to different contexts at local, national, and global scales to gain valuable insights and make data-driven decisions.

Local case study: **Coffee shop sales**

Tool: Simple linear regression

Scenario: A local coffee shop wants to understand the relationship between daily temperature and coffee sales. They use simple linear regression to analyze historical data.

Local context: Temperature in the city over a month and daily coffee sales.

Regression analysis: It reveals a positive correlation between higher temperatures and increased coffee sales locally.

Result: The coffee shop uses this information to plan seasonal promotions and tailor their menu for the local climate, boosting their sales during hot and cold months.



National case study: **Auto manufacturer's fuel efficiency**

Tool: Simple linear regression

Scenario: A national automobile manufacturer is interested in predicting fuel efficiency based on vehicle weight. They use simple linear regression.

National context: Weight and fuel efficiency data for various car models across the country.

Regression analysis: It shows that as vehicle weight increases, fuel efficiency decreases.

Result: The manufacturer uses this insight to develop and market fuel-efficient models, meeting the national demand for more environmentally friendly vehicles.

Global case study: **Smartphone battery life**

Tool: Simple linear regression

Scenario: A global smartphone manufacturer wants to determine the impact of screen brightness on battery life. They use simple linear regression with data from various countries.

Global context: Data from users across multiple countries regarding screen brightness settings and corresponding battery life.

Regression analysis: It indicates that higher screen brightness settings lead to shorter battery life globally.

Result: The company uses this information to optimize user experience by suggesting power-saving settings for different regions, saving battery life for global users.



Using technology to perform simple linear regression

Microsoft Excel

Microsoft Excel is a widely used tool for performing simple linear regression analysis. Here's a step-by-step guide on how to conduct simple linear regression in Excel

Step 1: Prepare your data

Open Microsoft Excel.

Organize your data in two columns: one for the independent variable (X) and the other for the dependent variable (Y).

Step 2: Calculate the regression

Click on an empty cell where you want the regression results to appear.

Go to the "Data" tab in the Excel ribbon.

Click on "Data Analysis" in the "Analysis" group. If you don't see this option, you may need to install the Data Analysis ToolPak. You can do this by going to "File" > "Options" > "Add-Ins" > "Excel Add-ins" and selecting "Analysis ToolPak."

In the Data Analysis dialog box, select "Regression" and click "OK."

Step 3: Set up the regression analysis dialog box

In the "Regression" dialog box, you need to specify the following:

Input Y Range: Click the "Input Y Range" box and select the range of your dependent variable (Y).

Input X Range: Click the "Input X Range" box and select the range of your independent variable (X).

Output Range: Specify where you want the regression results to appear.

You can choose to include labels in your data by checking the "Labels" box if your data has headers.

Choose whether you want to display confidence intervals or residuals. If you're performing a basic regression, you may not need these options.

Click "OK" to run the regression.

Step 4: Review the regression results

Excel will generate the regression output in your specified location, including:

- regression coefficients (intercept and slope)
- R-squared (coefficient of determination) which tells you the goodness of fit
- the standard error of the regression
- ANOVA table for overall significance
- residuals and predicted Y-values.

You can use this output to interpret the results of your simple linear regression analysis. The coefficients 'Intercept' and 'X Variable' represent the equation for the regression line:

$$Y = \text{Intercept} + (\text{X Variable} * X).$$

Step 5: Create a scatterplot (optional)

It's often helpful to create a scatterplot of your data points along with the regression line.

Highlight your X and Y data.

Go to the "Insert" tab in the Excel ribbon.

Click on "Scatter" and select a scatterplot type.

Your scatterplot will be created, and you can add the regression line by right-clicking on the data series, selecting "Add Trendline," and choosing the linear regression option.

This step allows you to visualize how well the regression line fits your data.



How to use graphing calculator such as the Casio CG50 for simple linear regression

To use the Casio CG50 graphing calculator for simple linear regression, you can follow these step-by-step instructions. Simple linear regression involves finding the best-fitting line to model the relationship between two variables, typically denoted as X and Y. In this guide, we'll assume X is the independent variable and Y is the dependent variable.

Step 1: Enter your data

Turn on the Casio CG50 calculator.

Press the "MENU" button, and then select "Statistics" by navigating to it and pressing the "EXE" button.

Choose "Data Editor" and press "F1 (Edit)" to enter your data pairs. You'll need two lists, one for X-values and one for Y-values.

Enter your X-values in one list and your Y-values in another.

Exit the data editor by pressing "EXIT."

Step 2: Perform simple linear regression

Press "MENU" again, go to "Statistics," and choose "Reg." This is where you'll find the regression analysis functions.

Select "LinReg (a + bX)" (for simple linear regression) and press "F1".

The Casio CG50 will prompt you for the input. Enter the list containing the Y-values (the dependent variable) and then the list containing the X-values (the independent variable).

Press "F2 (Execute)" to perform the regression analysis.

Step 3: View regression results

After performing the regression, you will see the following results on the calculator screen:

- a: The intercept value (where the regression line crosses the Y-axis).

- b: The slope of the regression line, representing the change in Y for a unit change in X.
- r: The correlation coefficient (r-value) which indicates the strength and direction of the relationship.
- r^2 : The coefficient of determination (R-squared), which tells you the proportion of the variance in Y that is explained by the regression model.
- n: The number of data points.

Step 4: View the regression line on a scatterplot (optional)

You can also visualize the regression line on a scatterplot.

Return to the "Statistics" menu.

Choose "Graph," and you'll see the scatterplot of your data points.

Press "Goto," and it will show the regression line on the graph.

Use the "DRAW" function to display the scatterplot and the regression line together.

This will allow you to see how well the regression line fits your data points visually.

With these steps, you can use the Casio CG50 graphing calculator for simple linear regression analysis and obtain regression parameters and insights into your data's linear relationship.

Did you know?

You can access the complete Pearson Business Management for the IB Diploma eBook when you sign up for a free trial!

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