



## The impact of Pareto Principle on the sale in automobile companies and airlines

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Received: 20 October 2021

Revised: 21 November 2021

Accepted: 19 December 2021

### Abstract

The Pareto Principle (also known as the 80-20 rule) states that for many sight, about 80% of the consequences are produced by 20% of the causes. In this article we discuss the Pareto Principle and its importance in real life problems, describe some mathematical model related to it. We tested two sets of real life data to see if the Pareto principle applies to these aspects. For the Forbes list in 2017, we found that 20% of the air line in that list own 45% of the sell. And 20% of the automobile company in that list 62% of the all automobile sell In both cases results have a really to the Pareto principle but not perfectly matched.

**Keywords:** Pareto Principle, sale, automobile companies, airlines, Forbes.

### How to cite the article:

H. Karevan, M. Ranjbar, S. Keshtmand, *The impact of Pareto Principle on the sale in automobile companies and airlines*, J. Practical Buss. Law, 2021; 2(6): 01-04

### Introduction

More than Centuries ago the Italian economist and sociologist Vilfredo Pareto made the famous observation that 20% of the population owned 80% of the property in Italy. (Pareto, 1897) In first, Pareto developed the principle by observing that about 20% of the peapods in his garden contained 80% of the peas. (Narula And Narula, 2004) The Pareto principle (also known as the 80/20 rule, the law of the vital few, or the principle of factor sparsely, (Kiremire, 2011) plates that, for many events, roughly 80% of the effects come from 20% of the causes, (Nick, 2008) later on, he created a mathematical formula to describe the unequal distribution of wealth in his country, which is known as the Pareto distribution. In the late 1940s, business-management consultant J.M. Juran generalized Pareto's findings into the 80-20 rule, which is also known as the Pareto Principle ( Wikipedia, 2013) . The Pareto Principle states that for many phenomena 80% of the output or consequences are produced by 20% of the input or causes. (Wikipedia, 2013) It is often used in management, economic and business to improve productivity and make better decisions, but is also

used in computer science and human activity. It helps to realize that often the majority of results come from a minority of inputs. Here are some examples of the Pareto Principle as it applies to various situations: 80% of the revenue comes from 20% of the customers, 20% of products yield 80% of sales, 20% of society hold 80% of its wealth and so on. (Wikipedia, 2013). The Pareto Principle is a simplified version of the mathematics behind the Pareto distribution. It is also not important that the two numbers add up to 100%. The numbers 20 and 80 are not mathematically fixed, but are used as a rule of thumb. It could be 80-20, 90-10, or even 90-20. In this paper, we will describe some mathematical models related to the Pareto Principle beginning with analyze two sets of real life data in Section 3, i.e. the 2017 Forbes list of the 2000. (Forbes, 2017) We try to fit them with Pareto distribution models to see if the Pareto Principle applies to these data. To visualize the results, the different distributions are plotted in Pareto charts and histograms.

### Mathematical Models

Pareto Distribution the Pareto principle is a special case of the wider phenomenon of Pareto

distributions. Pareto stated in his book that there is a simple law which governs the distribution of income in all countries and at all times. (Pareto, 1897) Briefly, if N represents the number of people with wealth larger than a certain income limit x, and A and α are constants, then  $N = A/x^\alpha$ , therefore,

$\log(N) = \log(A) - \alpha \log(x)$ . (Pareto, 1897)

In other words, if the logarithm of the number of persons with incomes bovid finite amount is plotted against the logarithm of these incomes, the resulting graph will be a straight line. Its slope will be α, which is also known as the Pareto index. A more general description of the statement above is given by the Pareto distribution. The classical Pareto distribution is defined in terms of its cumulative distribution function. ( Dun ford etal, 2014)

$$F_P(x) = \begin{cases} 1 - \left(\frac{x_m}{x}\right)^\alpha & \text{for } x \geq x_m, \\ 0 & \text{for } x < x_m. \end{cases}$$

(Wikipedia, 2013)

Where  $x_m$  is a scale which indicates the (necessarily positive) minimum value of x, and α,

the Pareto index, is a positive shape parameter. The density function is given by  $f_P = F_0 P$  or

$$f_P(x) = \begin{cases} \alpha \frac{x_m^\alpha}{x^{\alpha+1}} & \text{for } x \geq x_m, \\ 0 & \text{for } x < x_m. \end{cases}$$

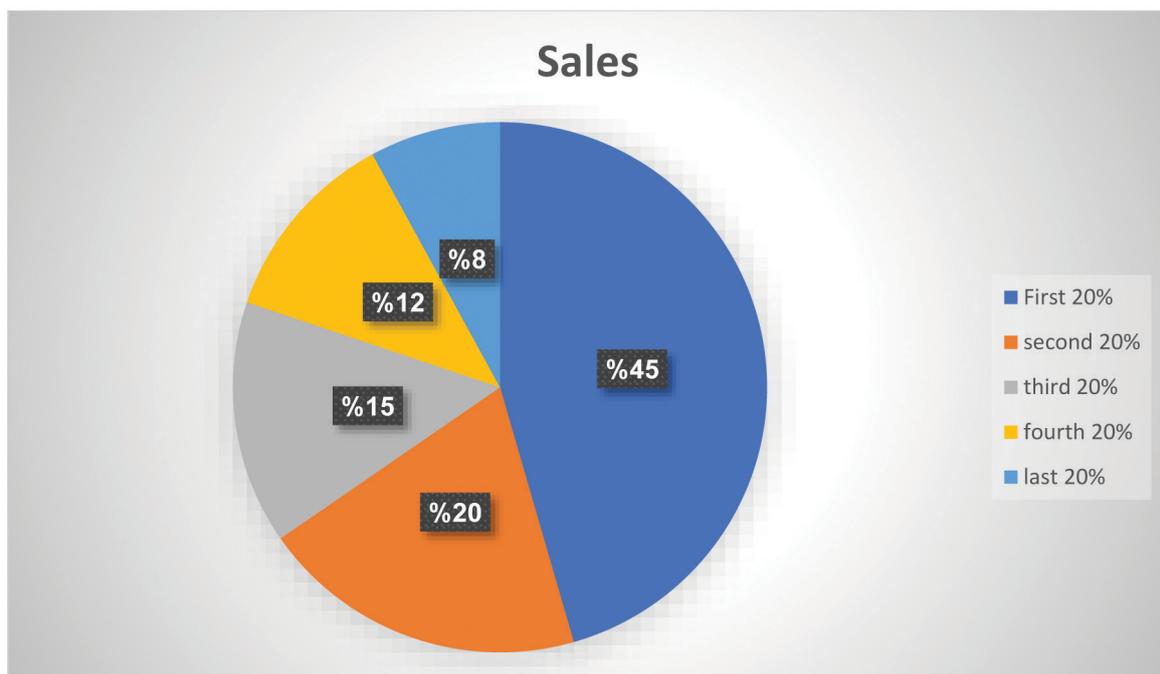
(Gastwirth, 1972)

When the Pareto index is  $\alpha_0 = \log_4 5$ , approximately 1.16, then one has 80% of effects coming from 20% of causes, which leads to the 80-20 rule.

### Our test result

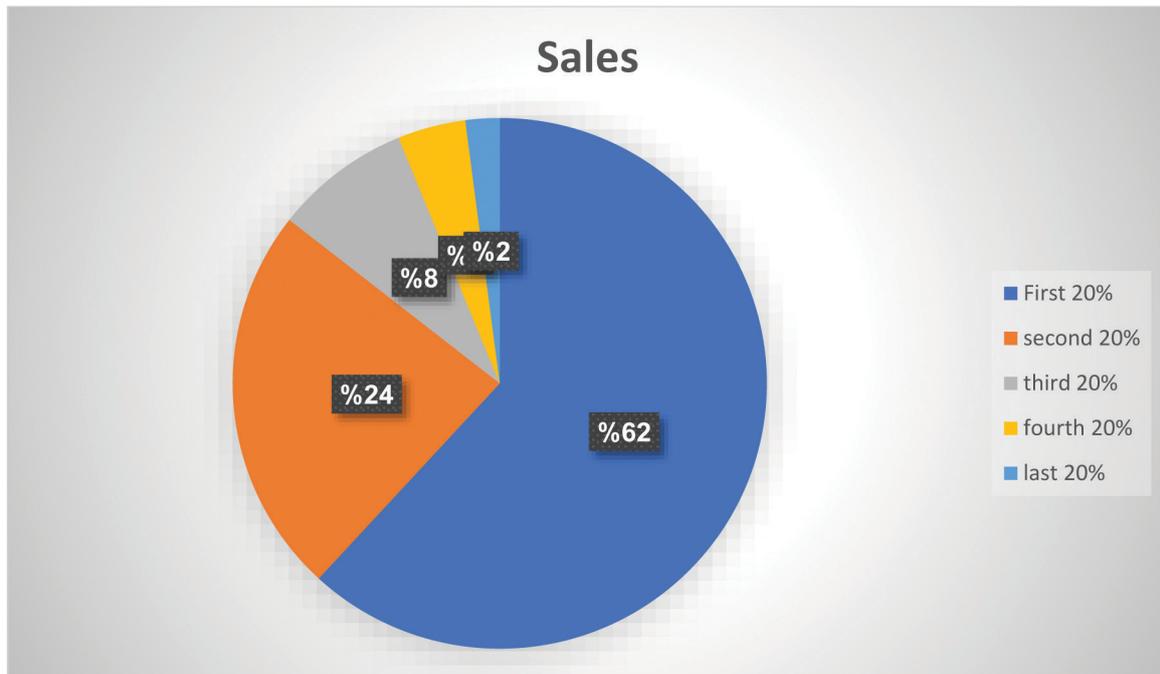
In this section, the Pareto principle will be tested against two real life data sets which are the 2017 Forbes list of global2000 and we want to know how match or match not Pareto Principle with this 2 situation. Example 1: Forbes list of global 2000 air Line Company. We use 24 airlines company sale and we find that 20 percent of them have 45% of sell However, this does follow the Pareto principle, as the top 20% of the airline company on the list do have a rather large percentage of the total wealth, it just does not obey the (rather particular) 80-20 case.

**Table 1:** Percent of Airline Company sales



Example 2: Forbes list of global 2000 automobile company. We use 31 company in Forbes global 2000 which sell car we found 20 percent of those company have 62% of sell. We see this percent near to Pareto principle. (Forbes, 2017)

**Table 2:** Percent of automobile company sales



### Conclusion

The examples show that a majority of wealth is with a small percentage of the population. Although the real data considered did not exactly follow the 80-20 rule, they never the less support Pareto's principle. One reason why the Forbes list may not precisely follow the 80-20 rule could be that the fewer airlines becoming more sold and the ones at the top of the list are earning at a slower pace now that they have become so successful company. But in second chart is very near to Pareto's principle because in auto company in 100 century always change top of the list and that change show us maybe first in list be 10 in next 10 year so that change athwart the airline company make the auto company follow Parto principle.

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