

Bass Curve Growth

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“Bass Curve” is a growth curve frequently used to forecast new technology and durable product growth model. Bass curve considers that there is constant maximum amount of adopters and adoption rate influenced by two impacts. Internal impact illustrates word of mouth or imitation’s influence, while, external impact reflects the influence of marketing strategies and etc. \$ Number of customers who will purchase the product at time $t = p * \text{remaining potential} + Q * \text{adopters} * \text{remaining potential}$

Formula

Formula for the Bass Curve is:

$$n(t) = [p + \frac{q}{m}N(t-1)][m - N(t-1)]$$

- $n(t)$ is number of customers who will purchase the product at time t
- $N(t-1)$ is total number of adopters of the product at time $t-1$
- m is total number of potential buyers of the new product
- e is the base of the natural logarithms
- t is the time
- p is coefficient of innovation (external impact)
- q is coefficient of immitation (internal impact)

Curve Analysis

Cumulative number of adopters

$$N(t) = m \frac{1 - e^{-(p+q)t}}{1 + \frac{q}{p}e^{-(p+q)t}}$$

Noncumulative number of adopters

$$n(t) = \frac{dN(t)}{dt} = m \frac{p(p+q)^2 e^{-(p+q)t}}{[p + qe^{-(p+q)t}]^2}$$

Time of peak adoption

$$T = -\frac{1}{p+q} \ln\left(\frac{p}{q}\right)$$

Number of adopters at peak time

$$n(t) = \frac{1}{4q}(p+q)^2$$

Analogous Bass Curve

Analogous Bass Curve can provide growth curve based on provided the upper limit of growth, t the period of estimation, and the p and q coefficient according ot analogous case. Following is an example of Analogous Bass Curve. Bass_AC(0.16, 0.304, 100000, 20) calculates the growth over 20 periods, where the highest growth can be reached is 100000 And, p and q coefficients are 0.016 and 0.304 respectively. There coefficients are correspondence with the room air conditioning adoption pattern from 1950 to 1963. Ouput shows the cumulative growth and growth rate for a given period from 1 to 20.

```
library(pander)
pander(Bass_AC(0.016, 0.304, 100000, 20))
```

period	Adoption.Rate	Cumulative.Adoption
1	1600	1600
2	2053	3653
3	2612	6265
4	3285	9549
5	4073	13622
6	4959	18582
7	5902	24483
8	6829	31312
9	7637	38950
10	8206	47155
11	8421	55576
12	8216	63792
13	7601	71393
14	6666	78060
15	5557	83617
16	4427	88044
17	3391	91435
18	2518	93953
19	1824	95777
20	1297	97074

Bass_AC_Plot function plots the result of Bass_AC. For example, Bass_AC_Plot(0.016, 0.304, 100000, 20) plots the result of Bass_AC(0.016, 0.304, 100000, 20).

```
Bass_AC_Plot(0.016, 0.304, 100000, 20)
```



