Commands for fitting model in Stata

Logistic model

1. nl (India = {m} \* (exp(-{c}exp(-{b} \* Year)))), initial(m 5000 c 0.2 b 0.2)

Gomeprtz Model X(t) =

1. For Gompertz, there is a predefined function in Stata. Hence, there is no need to define function in the code. It is referred to as

nl gom3: China lChina

For fitting Bass model

* 1. nl (Germany = {m} \* (1-exp(-({p} + {q})\*year\_int))/ (1 + ({q}/{p}) \* exp (-({p} + {q}) \* year\_int))), initial (m 800000 p 0.001 q 0.1)

*Note*: Country name and parameters to be changed as per assumptions.

**\*SIMPLE LOGISTIC MODEL\***

**India**

Source SS df MS Number of obs = 23

Model 1.1710e+09 3 390332094 R-squared = 0.9964

Residual 4186202.17 20 209310.108 Adj R-squared = 0.9959

Root MSE = 457.5042

Total 1.1752e+09 23 51094890.6 Res. dev. = 343.8428

India Coef. Std. Err. t P>t [95% Conf. Interval]

/m 36590.66 6392.543 5.72 0.000 23256.05 49925.28

/c 699.5988 147.203 4.75 0.000 392.5388 1006.659

/b .2878737 .0215496 13.36 0.000 .242922 .3328254

**Denmark**

Source | SS df MS

-------------+------------------------------ Number of obs = 32

Model | 128208708 3 42736236.2 R-squared = 0.9944

Residual | 725075.534 29 25002.6046 Adj R-squared = 0.9938

-------------+------------------------------ Root MSE = 158.1221

Total | 128933784 32 4029180.75 Res. dev. = 411.7175

------------------------------------------------------------------------------

Denmark | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

/m | 3690.378 98.1644 37.59 0.000 3489.609 3891.146

/c | 665.0803 289.6608 2.30 0.029 72.6575 1257.503

/b | .3233224 .0239844 13.48 0.000 .2742688 .372376

------------------------------------------------------------------------------

**China**

Source | SS df MS

-------------+------------------------------ Number of obs = 23

Model | 1.2718e+10 3 4.2394e+09 R-squared = 0.9999

Residual | 1902695.63 20 95134.7813 Adj R-squared = 0.9998

-------------+------------------------------ Root MSE = 308.4393

Total | 1.2720e+10 23 553045404 Res. dev. = 325.7068

------------------------------------------------------------------------------

China | Coef. Std. Err. t P>|t| [95% Conf. Interval]-------------+----------------------------------------------------------------

/m | 90433.99 911.9565 99.16 0.000 88531.68 92336.3

/c | 1.24e+08 3.07e+07 4.03 0.001 5.97e+07 1.88e+08

/b | .8853275 .0128316 69.00 0.000 .8585612 .9120938

------------------------------------------------------------------------------

**Spain**

Source | SS df MS Number of obs = 22

Model | 2.6737e+09 3 891222231 R-squared = 0.9994

Residual | 1684507.79 19 88658.3049 Adj R-squared = 0.9993

-------------+------------------------------ Root MSE = 297.7554

Total | 2.6754e+09 22 121606873 Res. dev. = 309.844

------------------------------------------------------------------------------

Spain | Coef. Std. Err. t P>|t| [95% Conf. Interval]

----------+----------------------------------------------------------------

/m | 25260.16 464.3297 54.40 0.000 24288.31 26232.01

/c | 415.3952 59.20939 7.02 0.000 291.4686 539.3219

/b | .3746731 .0111695 33.54 0.000 .3512951 .398051

**Portugal**

Source SS df MS Number of obs = 15

Model 83861316 3 27953772 R-squared = 0.9964

Residual 299669.033 12 24972.4194 Adj R-squared = 0.9955

Root MSE = 158.0266

Total 84160985 15 5610732.33 Res. dev. = 191.1039

Portugal Coef. Std. Err. T P>t [95% Conf. Interval]

/m 5035.223 254.8254 19.76 0.000 4480.006 5590.44

/c 267.2766 106.9468 2.50 0.028 34.25951 500.2936

/b .5290637 .0474253 11.16 0.000 .4257329 .6323946

**Germany**

Source SS df MS Number of obs = 26

Model 5.8313e+09 3 1.9438e+09 R-squared = 0.9977

Residual 13686953.2 23 595084.921 Adj R-squared = 0.9974

Root MSE = 771.4175

Total 5.8450e+09 26 224808440 Res. dev. = 416.3051

Germany Coef. Std. Err. t P>t [95% Conf. Interval]

/m 31386 829.108 37.86 0.000 29670.85 33101.14

/c 428.3527 113.4898 3.77 0.001 193.5812 663.1243

/b .3379006 .0176783 19.11 0.000 .3013302 .374471

\***GOMEPRTZ MODEL**\*

**India**

Source SS df MS Number of obs = 23

Model 1.1701e+09 3 390020415 R-squared = 0.9956

Residual 5121236.68 20 256061.834 Adj R-squared = 0.9950

Total 1.1752e+09 23 51094890.6 Root MSE = 506.0255

Res. dev. = 348.4797

India Coef. Std. Err. t P>t [95% Conf. Interval]

/m 425438 508578.9 0.84 0.413 -635438.9 1486315

/c 10.58976 .3523925 30.05 0.000 9.854679 11.32483

/b .0534471 .0165988 3.22 0.004 .0188226 .0880717

**Denmark**

Source SS df MS Number of obs = 32

Model 127941907 3 42647302.4 R-squared = 0.9923

Residual 991876.739 29 34202.6462 Adj R-squared = 0.9915

Total 128933784 32 4029180.75 Root MSE = 184.9396

Res. dev. = 421.7438

Denmark Coef. Std. Err. t P>t [95% Conf. Interval]

/m 4137.473 221.5171 18.68 0.000 3684.419 4590.526

/c 26.96372 8.719495 3.09 0.004 9.130348 44.79709

/b .1755485 .0198941 8.82 0.000 .1348605 .2162366

**Germany**

Source SS df MS Number of obs = 26

Model 5.8395e+09 3 1.9465e+09 R-squared = 0.9991

Residual 5531136.16 23 240484.181 Adj R-squared = 0.9989

Root MSE = 490.3919

Total 5.8450e+09 26 224808440 Res. dev. = 392.7478

Germany Coef. Std. Err. t P>t [95% Conf. Interval]

/m 37292.38 1179.241 31.62 0.000 34852.93 39731.82

/c 19.53578 2.167537 9.01 0.000 15.05189 24.01968

/b .1746359 .008487 20.58 0.000 .1570792 .1921925

**Spain**

Source SS df MS Number of obs = 22

Model 2.6727e+09 3 890904223 R-squared = 0.9990

Residual 2638532.17 19 138870.114 Adj R-squared =0.9989

Root MSE =372.6528

Total 2.6754e+09 22 121606873 Res. dev. = 319.7165

Spain Coef. Std. Err. t P>t [95% Conf. Interval]

/m 32957.39 1661.566 19.84 0.000 29479.69 36435.09

/c 15.29439 1.677933 9.12 0.000 11.78243 18.80634

/b .1722506 .0103465 16.65 0.000 .1505951 .1939061

**Portugal**

Source SS df MS Number of obs = 15

Model 83943754.2 3 27981251.4 R-squared = 0.9974

Residual 217230.834 12 18102.5695 Adj R-squared = 0.9968

Total 84160985 15 5610732.33 Root MSE = 134.5458

Res. dev. = 186.2781

Portugal Coef. Std. Err. t P>t [95% Conf. Interval]

/m 6210.148 532.5838 11.66 0.000 5049.748 7370.549

/c 14.37338 3.149064 4.56 0.001 7.512156 21.2346

/b .2627806 .0306474 8.57 0.000 .1960057 .3295556

**China**

Source | SS df MS

-------------+------------------------------ Number of obs = 23

Model | 1.2709e+10 3 4.2362e+09 R-squared = 0.9991

Residual | 11494380.4 20 574719.02 Adj R-squared = 0.9990

-------------+------------------------------ Root MSE = 758.1022

Total | 1.2720e+10 23 553045404 Res. dev. = 367.0743

------------------------------------------------------------------------------

China | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

/m | 126724.9 7532.746 16.82 0.000 111011.9 142437.9

/c | 3367.858 1459.642 2.31 0.032 323.0977 6412.618

/b | .3841971 .0235566 16.31 0.000 .3350589 .4333353

**\*BASS MODEL\***

**China**

Source | SS df MS

-------------+------------------------------ Number of obs = 23

Model | 1.2718e+10 3 4.2394e+09 R-squared = 0.9999

Residual | 1902699.69 20 95134.9846 Adj R-squared = 0.9998

-------------+------------------------------ Root MSE = 308.4396

Total | 1.2720e+10 23 553045404 Res. dev. = 325.7068

------------------------------------------------------------------------------

China | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

/m | 90434 911.9763 99.16 0.000 88531.65 92336.34

/p | 7.16e-09 1.67e-09 4.28 0.000 3.67e-09 1.06e-08

/q | .8853274 .0128307 69.00 0.000 .858563 .9120917

**Portugal**

Source | SS df MS

-------------+------------------------------ Number of obs = 15

Model | 83865988.7 3 27955329.6 R-squared = 0.9965

Residual | 294996.309 12 24583.0258 Adj R-squared = 0.9956

-------------+------------------------------ Root MSE = 156.7898

Total | 84160985 15 5610732.33 Res. dev. = 190.8682

------------------------------------------------------------------------------

Portugal | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

/m | 5073.763 270.99 18.72 0.000 4483.326 5664.199

/p | .0021499 .0007102 3.03 0.011 .0006026 .0036972

/q | .5158674 .0506218 10.19 0.000 .4055719 .6261629

**Denmark**

Source | SS df MS

-------------+------------------------------ Number of obs = 32

Model | 128203461 3 42734487 R-squared = 0.9943

Residual | 730323.002 29 25183.5518 Adj R-squared = 0.9937

-------------+------------------------------ Root MSE = 158.6933

Total | 128933784 32 4029180.75 Res. dev. = 411.9483

------------------------------------------------------------------------------

Denmark | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

/m | 3691.152 99.54793 37.08 0.000 3487.553 3894.75

/p | .0004931 .000185 2.66 0.012 .0001146 .0008715

/q | .3221155 .0249033 12.93 0.000 .2711825 .3730486

**Spain**

Source | SS df MS

-------------+------------------------------ Number of obs = 22

Model | 2.6738e+09 3 891267376 R-squared = 0.9994

Residual | 1549073 19 81530.158 Adj R-squared = 0.9993

-------------+------------------------------ Root MSE = 285.5349

Total | 2.6754e+09 22 121606873 Res. dev. = 308

------------------------------------------------------------------------------

Spain | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

/m | 25400.45 468.824 54.18 0.000 24419.19 26381.71

/p | .0009613 .0001096 8.77 0.000 .0007319 .0011906

/q | .3682482 .0113113 32.56 0.000 .3445734 .3919231

**India**

Source | SS df MS

-------------+------------------------------ Number of obs = 23

Model | 1.1709e+09 3 390283628 R-squared = 0.9963

Residual | 4331598.82 20 216579.941 Adj R-squared = 0.9958

-------------+------------------------------ Root MSE = 465.3815

Total | 1.1752e+09 23 51094890.6 Res. dev. = 344.6281

------------------------------------------------------------------------------

India | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

/m | 37160.46 7147.616 5.20 0.000 22250.8 52070.13

/p | .0004281 .0000699 6.13 0.000 .0002824 .0005738

/q | .2838846 .0238258 11.92 0.000 .234185 .3335843

**Germany**

Source | SS df MS

-------------+------------------------------ Number of obs = 26

Model | 5.8318e+09 3 1.9439e+09 R-squared = 0.9977

Residual | 13177054.7 23 572915.422 Adj R-squared = 0.9975

-------------+------------------------------ Root MSE = 756.9118

Total | 5.8450e+09 26 224808440 Res. dev. = 415.318

------------------------------------------------------------------------------

Germany | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

/m | 31554.75 852.1596 37.03 0.000 29791.92 33317.57

/p | .0008459 .000184 4.60 0.000 .0004652 .0012266

/q | .3317131 .0181584 18.27 0.000 .2941495 .3692766

1. **India**

**Simple Logistic** - ; **Gompertz** -

**Bass** -

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter/ Model | *Simple Logistic* | Bass | Gompertz |
| m (ultimate no. of adopters) | *36590\*\*\** | 37160\*\*\* | 425438 |
| b - (growth rate, imitation factor) | *0.2879\*\*\** | 0.2839\*\*\* | 0.0534\*\*\* |
| c1 – [m/X(0) -1] | *699\*\*\** |  |  |
| c2 - [ln (X(0)/m)] |  |  | 10.6\*\*\* |
| a (coefficient of innovation) |  | 0.0042\*\*\* |  |
| AIC | ***349.84*** | 350.63 | 354.48 |
| BIC | ***353.25*** | 354.03 | 357.89 |
| Adj. R2 | ***0.9964*** | 0.9958 | 0.995 |

1. **Denmark**

**Simple Logistic** - ; **Gompertz** -

**Bass** -

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter/ Model | *Simple Logistic* | Gompertz | Bass |
| m (ultimate potential) | *3690\*\*\** | 4137\*\*\* | 3691.15\*\*\* |
| c | *665* | 27\*\*\* |  |
| b | *0.3233\*\*\** | 0.1755\*\*\* | 0.3221\*\*\* |
| p |  |  | 0.0004 |
| AIC | ***417.718*** | 427.74 | 417.94 |
| BIC | ***422.115*** | 432.14 | 422.35 |
| Adj. R2 | ***0.9938*** | 0.9915 | 0.9937 |

1. **China**

**Simple Logistic** - ; **Gompertz** -

**Bass** -

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter/ Model | Simple Logistic | Gompertz | *Bass* |
| m | 90434\*\*\* | 126724\*\*\* | *90434\*\*\** |
| c | 1.24e+08\*\*\* | 3367.85\*\* |  |
| b | 0.8853\*\*\* | 0.384\*\*\* |  |
| p |  |  | *7.16e-09\*\*\** |
| q |  |  | *0.8853\*\*\** |
| AIC | 331.71 | 373.07 | ***329.71*** |
| BIC | 335.11 | 376.48 | ***331.98*** |
| Adj. R2 | 0.9998 | 0.999 | ***0.9998*** |

1. **Spain**

**Simple Logistic** - ; **Gompertz** -

**Bass** -

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter/ Model | Simple Logistic | Gompertz | *Bass* |
| m | 25260\*\*\* | 32957\*\*\* | *25400\*\*\** |
| c | 415.39\*\*\* | 15.29\*\*\* |  |
| b | 0.3747\*\*\* | 0.1723\*\*\* |  |
| p |  |  | *0.0009\*\*\** |
| q |  |  | *0.3682\*\*\** |
| AIC | 315.84 | 325.72 | ***314*** |
| BIC | 319.12 | 328.99 | ***317.27*** |
| Adj. R2 | 0.9993 | 0.9989 | ***0.9993*** |

1. **Portugal**

**Simple Logistic** - ; **Gompertz** -

**Bass** -

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter/ Model | Simple Logistic | *Gompertz* | Bass |
| m | 5035\*\*\* | *6210.15\*\*\** | 5073\*\*\* |
| c | 267.28 | *14.37\*\*\** |  |
| b | 0.5291\*\*\* | *0.2628\*\*\** |  |
| p |  |  | 0.002 |
| q |  |  | 0.516\*\*\* |
| AIC | 197.1 | ***192.28*** | 196.87 |
| BIC | 199.23 | ***192.40*** | 198.99 |
| Adj. R2 | 0.9955 | ***0.9968*** | 0.9956 |

1. **Germany**

**Simple Logistic** - ; **Gompertz** -

**Bass** -

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter/ Model | Simple Logistic | *Gompertz* | Bass |
| m | 31386\*\*\* | *37292.38\*\*\** | 31554.75\*\*\* |
| c | 428.35\*\* | *19.54\*\*\** |  |
| b | 0.3379\*\*\* | *0.175\*\*\** |  |
| p |  |  | 0.0008\*\*\* |
| q |  |  | 0.3317\*\*\* |
| AIC | 422.31 | ***398.75*** | 421.32 |
| BIC | 426.08 | ***402.52*** | 425.09 |
| Adj. R2 | 0.9974 | ***0.9989*** | 0.9975 |

1. **US**

**Simple Logistic** - ; **Gompertz** -

**Bass** -

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter/ Model | Simple Logistic | Gompertz | *Bass* |
| m | 129025.5\*\*\* | 6448593 | *127572.6\*\*\** |
| c | 51944.84\* | 20.37\*\*\* |  |
| b | .3242\*\*\* | .0446\*\*\* |  |
| p |  |  | *6.09e-6\*\** |
| q |  |  | *0.3257\*\*\** |
| AIC | 573.9807 | 579.79 | ***573.29*** |
| BIC | 578.4702 | 584.28 | ***577.78*** |
| Adj. R2 | 0.9936 | 0.9924 | ***0.9938*** |

1. **Japan**

**Simple Logistic** - ; **Gompertz** -

**Bass** -

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter/ Model | Simple Logistic | *Gompertz* | Bass |
| m | 2835.53\*\*\* | *3446.44\*\*\** | 2839.064\*\*\* |
| c | 1893.594 \*\*\* | *37.59\*\*\** |  |
| b | . 4192\*\*\* | *.2089\*\*\** |  |
| p |  |  | 0.00022\*\*\* |
| q |  |  | 0.4175\*\*\* |
| AIC | 254.73 | ***244.21*** | 254.39 |
| BIC | 258.27 | ***247.75*** | 257.93 |
| Adj. R2 | 0.9986 | ***0.9991*** | 0.9986 |

1. **UK**

**Simple Logistic** - ; **Gompertz** -

**Bass** -

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter/ Model | Simple Logistic | *Gompertz* | Bass |
| m | 56866.36 |  | 62257.61 |
| c | 2486.58\*\* |  |  |
| b | .2762\*\*\* |  |  |
| p |  |  | 0.0001 |
| q |  |  | 0.2721\*\*\* |
| AIC | 275.19 |  | 277.41 |
| BIC | 278.46 |  | 280.68 |
| Adj. R2 | 0.9986 |  | 0.9981 |

1. **Italy**

**Simple Logistic** - ; **Gompertz** -

**Bass** -

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter/ Model | *Simple Logistic* | Gompertz | Bass |
| m | *10522.44\*\*\** | 31047.27\*\* | 10571.22\*\*\* |
| c | *1130.54\*\*\** | 12.74\*\*\* |  |
| b | *.3589\*\*\** | 0.0999\*\*\* |  |
| p |  |  | 0.00033\*\*\* |
| q |  |  | 0.3564\*\*\* |
| AIC | ***277.73*** | 292.93 | 278.1 |
| BIC | ***281*** | 296.2 | 281.37 |
| Adj. R2 | ***0.9984*** | 0.9963 | 0.9981 |