

```

/** ----- Log-Log Link Function used in generalised non-linear model -----
/** FILE NAME:   LogLog_Reg_tech.txt
/** AUTHOR:     Renee Schicker
/** CREATED:    19 NOVEMBER 2009
/**
/** The scripts may be supplied in a more readily useable format if the work is acknowledged
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/**
/** PURPOSE:    Apply intercept and beta values obtained through the statistical analysis.
/**              Variables have been utilised to make changes a lot easier to implement. All
/**              that has to be specified is the number of variables in the model, the
/**              variables themselves, and the obtained beta values.
/**
/** WHERE THIS SCRIPT FITS IN:  The Log-Log Link function was trialled in STATISTICA and the
/**                              output was applied to the data via script. The issues was
/**                              figuring out which link function and equation to implement.
/**                              The Log-Log was not chosen in the end, Logit was in keeping
/**                              with the literature and was also more appropriate, and gave
/**                              a better range of values.

```

Workspace D:\Renee_GIS\Output_data\Organised\15_Multi_Reg

&CALL CONTROLVARS

```

/*****
/** Variables to Alter
*****/

```

```

/* SET Number of Variables to use (Must be between 1 and 10)

```

```

&SETVAR .TotVars = 5

```

```

/* SET Variables (Chose from: Slope, Aspect, Elevation, AvRain, MaxRain, LandUse, Geology, Soil,
Faults, Rivers)

```

```

/* Enclose variable name in % signs!! e.g. %Slope%

```

```

/* Can comment out those not needed using /*

```

```

&SETVAR .Var1 = %Slope%

```

```

&SETVAR .Var2 = %Elevation%

```

```

&SETVAR .Var3 = %AvRain%

```

```

&SETVAR .Var4 = %LandUse%

```

```

&SETVAR .Var5 = %Geology%

```

```

/*&SETVAR .Var6 =

```

```

/*&SETVAR .Var7 =

```

```

/*&SETVAR .Var8 =

```

```

/*&SETVAR .Var9 =

```

```

/*&SETVAR .Var10 =

```

```

/* SET Beta Values

```

```

&SETVAR .B0 = 3.43756496710706          /* (p1) Intercept
&SETVAR .B1 = -0.00554239238380156     /* (p2) Var1 beta
&SETVAR .B2 = 0.0031996984806489      /* (p3) Var2 beta
&SETVAR .B3 = 0.024507965306347       /* (p4) Var3 beta
&SETVAR .B4 = 0.0683191930725491      /* (p5) Var4 beta
&SETVAR .B5 = 0.0165513281438226      /* (p6) Var5 beta
/*&SETVAR .B6 =          /* (p7) var6 beta
/*&SETVAR .B7 =          /* (p8) var7 beta
/*&SETVAR .B8 =          /* (p9) var8 beta
/*&SETVAR .B9 =          /* (p10) var9 beta
/*&SETVAR .B10 =         /* (p11) var10 beta

```

```

/*****
/**          Processes to Call
/*****

```

```

&CALL Kill_Temp
&CALL Betas
&CALL Z
&CALL LogLog
&CALL Kill_Temp

```

```

&RETURN

```

```

/*****
&ROUTINE Betas
&CALL Setup_Grid

```

```

BOGRID = (%Intercept% * %.B0%)
&TYPE INTERCEPT GRID CREATED

```

```

&IF %.TotVars% = 1 &THEN
  &CALL Calc_1_Beta
&ELSE

```

```

&IF %.TotVars% = 2 &THEN
  &CALL Calc_2_Betas
&ELSE

```

```

&IF %.TotVars% = 3 &THEN
  &CALL Calc_3_Betas
&ELSE

```

```

&IF %.TotVars% = 4 &THEN
  &CALL Calc_4_Betas
&ELSE

```

```

&IF %.TotVars% = 5 &THEN
  &CALL Calc_5_Betas
&ELSE

```

```
&IF %.TotVars% = 6 &THEN  
  &CALL Calc_6_Betas  
&ELSE
```

```
&IF %.TotVars% = 7 &THEN  
  &CALL Calc_7_Betas  
&ELSE
```

```
&IF %.TotVars% = 8 &THEN  
  &CALL Calc_8_Betas  
&ELSE
```

```
&IF %.TotVars% = 9 &THEN  
  &CALL Calc_9_Betas  
&ELSE
```

```
&IF %.TotVars% = 10 &THEN  
  &CALL Calc_10_Betas  
&ELSE  
  &Type number of variables not between 1 and 10
```

```
&TYPE Finished Calculating Betas  
&CALL Exit_Grid  
&RETURN
```

```
/*****  
&ROUTINE Z
```

```
&CALL Setup_Grid
```

```
&IF %.TotVars% = 1 &THEN  
  &CALL 1_Variable  
&ELSE
```

```
&IF %.TotVars% = 2 &THEN  
  &CALL 2_variables  
&ELSE
```

```
&IF %.TotVars% = 3 &THEN  
  &CALL 3_variables  
&ELSE
```

```
&IF %.TotVars% = 4 &THEN  
  &CALL 4_variables  
&ELSE
```

```
&IF %.TotVars% = 5 &THEN  
  &CALL 5_variables
```

&ELSE

&IF %.TotVars% = 6 &THEN

&CALL 6_variables

&ELSE

&IF %.TotVars% = 7 &THEN

&CALL 7_variables

&ELSE

&IF %.TotVars% = 8 &THEN

&CALL 8_variables

&ELSE

&IF %.TotVars% = 9 &THEN

&CALL 9_variables

&ELSE

&IF %.TotVars% = 10 &THEN

&CALL 10_variables

&ELSE

&TYPE Error!

&TYPE Either %.TotVars% outside of 1-10 range => Check .TotVars variable

&TYPE Or Script has some other problem

&CALL Exit_Grid

&RETURN

&ROUTINE Calc_1_Beta

B1Grid = (%.Var1% * %.B1%)

&RETURN

&ROUTINE Calc_2_Betas

&CALL Calc_1_Beta

B2Grid = (%.Var2% * %.B2%)

&RETURN

&ROUTINE Calc_3_Betas

&CALL Calc_2_Betas

B3Grid = (%.Var3% * %.B3%)

&RETURN

&ROUTINE Calc_4_Betas

&CALL Calc_3_Betas

B4Grid = (%.Var4% * %.B4%)

&RETURN

&ROUTINE Calc_5_Betas

&CALL Calc_4_Betas

B5Grid = (%.Var5% * %.B5%)

```

&RETURN
*****

&ROUTINE Calc_6_Betas
&CALL Calc_5_Betas
B6Grid = (%.Var6% * %.B6%)
&RETURN
*****

&ROUTINE Calc_7_Betas
&CALL Calc_6_Betas
B7Grid = (%.Var7% * %.B7%)
&RETURN
*****

&ROUTINE Calc_8_Betas
&CALL Calc_7_Betas
B8Grid = (%.Var8% * %.B8%)
&RETURN
*****

&ROUTINE Calc_9_Betas
&CALL Calc_8_Betas
B9Grid = (%.Var9% * %.B9%)
&RETURN
*****

&ROUTINE Calc_10_Betas
&CALL Calc_9_Betas
B10Grid = (%.Var10% * %.B10%)
&RETURN

*****

&ROUTINE 1_variable
Z = (B0GRID + B1Grid)
&RETURN
*****

&ROUTINE 2_variables
Z = (B0GRID + B1Grid + B2Grid)
&RETURN
*****

&ROUTINE 3_variables
Z = (B0GRID + B1Grid + B2Grid + B3Grid)
&RETURN
*****

&ROUTINE 4_variables
Z = (B0GRID + B1Grid + B2Grid + B3Grid + B4Grid)
&RETURN
*****

&ROUTINE 5_variables
Z = (B0GRID + B1Grid + B2Grid + B3Grid + B4Grid + B5Grid)
&RETURN
*****

&ROUTINE 6_variables
Z = (B0GRID + B1Grid + B2Grid + B3Grid + B4Grid + B5Grid + B6Grid)
&RETURN

```

```

*****
&ROUTINE 7_variables
Z = (B0GRID + B1Grid + B2Grid + B3Grid + B4Grid + B5Grid + B6Grid + B7Grid)
&RETURN
*****

&ROUTINE 8_variables
Z = (B0GRID + B1Grid + B2Grid + B3Grid + B4Grid + B5Grid + B6Grid + B7Grid + B8Grid)
&RETURN
/*****

&ROUTINE 9_variables
Z = (B0GRID + B1Grid + B2Grid + B3Grid + B4Grid + B5Grid + B6Grid + B7Grid + B8Grid + B9Grid)
&RETURN
/*****

&ROUTINE 10_variables
Z = (B0GRID + B1Grid + B2Grid + B3Grid + B4Grid + B5Grid + B6Grid + B7Grid + B8Grid + B9Grid +
B10Grid)
&RETURN
/*****

&ROUTINE LogLog

&IF [EXIST NegZ -GRID] &THEN KILL NegZ ALL
&IF [EXIST ExpZ -GRID] &THEN KILL ExpZ ALL
&IF [EXIST Eq1P -GRID] &THEN KILL Eq1P ALL
&IF [EXIST Eq2P -GRID] &THEN KILL Eq2P ALL
&IF [EXIST Eq3P -GRID] &THEN KILL Eq3P ALL
&IF [EXIST Eq4P -GRID] &THEN KILL Eq4P ALL

&CALL Setup_Grid

NegZ = (-1 * Z)

/***** EQUATION 1 *****/
&TYPE Calculating Equation 1: EXP(- EXP(Z))
/* Idea from White and Burnham (1999)

Eq1P = EXP(- EXP(Z))

/***** EQUATION 2 *****/
&TYPE Calculating Equation 2: EXP(- EXP(- Z))
/* Idea from Chen and Shao (2000)

Eq2P = EXP(- EXP(NegZ))

/***** EQUATION 3 *****/
&TYPE Calculating Equation 3: EXP(Z) / (1 + EXP (Z))
/* Idea from Lee et al. (2006); Menard (1995)

ExpZ = Exp(Z)
Eq3P = (ExpZ / (1 + ExpZ))

/***** EQUATION 4 *****/

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```
&TYPE Calculating Equation 4:  $1 / (1 + \text{EXP}(-Z))$ 
/* Idea from Can et al. (2005); Suzen & Doyuren (2004); Lee (2004); Lee & Sambath (2006);
/* Dai et al. (2001); Dai & Lee (2002); Ohlmacher & Davis (2003).
```

```
Eq4P = (1 / (1 + EXP(NegZ)))
```

```
&CALL Exit_Grid
&RETURN
```

```
/******
&ROUTINE Kill_Temp
```

```
&IF [EXIST Z -GRID] &THEN KILL Z ALL
&IF [EXIST B0Grid -GRID] &THEN KILL B0Grid ALL
&IF [EXIST B1Grid -GRID] &THEN KILL B1Grid ALL
&IF [EXIST B2Grid -GRID] &THEN KILL B2Grid ALL
&IF [EXIST B3Grid -GRID] &THEN KILL B3Grid ALL
&IF [EXIST B4Grid -GRID] &THEN KILL B4Grid ALL
&IF [EXIST B5Grid -GRID] &THEN KILL B5Grid ALL
&IF [EXIST B6Grid -GRID] &THEN KILL B6Grid ALL
&IF [EXIST B7Grid -GRID] &THEN KILL B7Grid ALL
&IF [EXIST B8Grid -GRID] &THEN KILL B8Grid ALL
&IF [EXIST B9Grid -GRID] &THEN KILL B9Grid ALL
&IF [EXIST B10Grid -GRID] &THEN KILL B10Grid ALL
&RETURN
```

```
/******
&ROUTINE Setup_Grid
&RUN D:\renee_gis\scripts\checkproggrid.txt
&TYPE set window to rain98av...
SETWINDOW D:\Renee_gis\output_data\Organised\13_Rain\rain98av
```

```
&TYPE Set mask to rain98av...
SETMASK D:\Renee_gis\output_data\Organised\13_Rain\rain98av
&TYPE Mask Set
&RETURN
```

```
/******
```

```
&ROUTINE Exit_Grid
```

```
SETMASK OFF
```

```
Q
```

```
&RETURN
```

```
/******
```

```
/*
```

```
/*
```

```
/******
```

```
/** Variables to remain constant (Determines File paths for variables)
```

```
/******
```

```
&ROUTINE CONTROLVARS
```

```
&SETVAR .Drive = D:
```

```
&SETVAR .F1 = \Renee_GIS
```

```
&SETVAR .F2 = \output_data
```

```
&SETVAR .F3 = \Organised
```

```
&SETVAR .FPMain = %.Drive%%.F1%%.F2%%.F3%
&SETVAR .F4a = \03_DEM
&SETVAR .F4b = \05_Geology
&SETVAR .F4c = \06_Soil
&SETVAR .F4d = \07_Landcover
&SETVAR .F4e = \10_Faults
&SETVAR .F4f = \12_Rivers
&SETVAR .F4g = \13_Rain
&SETVAR .v0 = \dembounds
&SETVAR .v1 = \slopeint
&SETVAR .v2 = \aspectint
&SETVAR .v3 = \dem25int
&SETVAR .v4 = \rain98av
&SETVAR .v5 = \rain98max
&SETVAR .v6 = \lcdb2grid
&SETVAR .v7 = \geolgrid
&SETVAR .v8 = \soilsgrid
&SETVAR .v9 = \Faultgrid
&SETVAR .v10 = \Rivergrid
```

```
&SETVAR Intercept = %.FPMAIN%%.F4a%%.v0%
&SETVAR Slope = %.FPMAIN%%.F4a%%.v1%
&SETVAR Aspect = %.FPMAIN%%.F4a%%.v2%
&SETVAR Elevation = %.FPMAIN%%.F4a%%.v3%
&SETVAR AvRain = %.FPMAIN%%.F4g%%.v4%
&SETVAR MaxRain = %.FPMAIN%%.F4g%%.v5%
&SETVAR LandUse = %.FPMAIN%%.F4d%%.v6%
&SETVAR Geology = %.FPMAIN%%.F4b%%.v7%
&SETVAR Soil = %.FPMAIN%%.F4c%%.v8%
&SETVAR Faults = %.FPMAIN%%.F4e%%.v9%
&SETVAR Rivers = %.FPMAIN%%.F4f%%.v10%
&TYPE Permanent Variables set
&RETURN
```