In development, incomplete..

Time Series Analyzer

Used math formulas

Version 1.1.0

[Web pages]

Sorry for my English :-)

Context

Base statistics

Variance

Name	Variance. (Sample variance).
Used formula	$$s^2 = \frac{\sum_{t=1}^{N} (y_t - \overline{y})^2}{N}$$
Parameters	N = count of values
Conditions	If Yt is null, observation is omitted.
History	Added 2010.
Sources	*MONTGOMERY, D. Introduction to Time Series Analysis and Forecasting. Published by John Wiley & Sons. 2008.* *ISBN 978-0-471-65397-4.* *Page 28.*

Measure of accuracy

Mean absolute error (MAE, MAD)

Name	MAE (Mean absolute error). Can be named as mean absolute deviation (MAD) too.
Used formula	$MAE = \frac{1}{n}\sum_{t=1}^{n}\lvert e_t\rvert$
Parameters	e_t = forecast error (residuals)
Conditions	
History	Added 2011.
Sources	*MONTGOMERY, D. Introduction to Time Series Analysis and Forecasting. Published by John Wiley & Sons. 2008.* *ISBN 978-0-471-65397-4.* *Page 49.*

Mean absolute percentage error (MAPE)

Name	MAPE (Mean absolute percent error).
Used formula	$MAPE = \frac{1}{n}\sum_{t=1}^{n}\left|\left(\frac{y_t - \hat{y}_t}{y_t}\right) * 100\right|$
Parameters	Result in percent.
Conditions	
History	Added 2010.
Sources	*MONTGOMERY, D. Introduction to Time Series Analysis and Forecasting. Published by John Wiley & Sons. 2008.* *ISBN 978-0-471-65397-4.* *Page 180.*

Mean error (ME)

Name	ME (Mean error). Can be named as agerage error too.
Used formula	$ME = \frac{1}{n}\sum_{t=1}^{n} e_t$
Parameters	e_t = forecast error (residuals)
Conditions	
History	Added 2011.
Sources	*MONTGOMERY, D. Introduction to Time Series Analysis and Forecasting. Published by John Wiley & Sons. 2008.* *ISBN 978-0-471-65397-4.* *Page 49.*

Mean percent error (MPE)

Name	MPE (Mean percent error).
Used formula	$MPE = \frac{1}{n}\sum_{t=1}^{n}\left(\left(\frac{y_t - \hat{y}_t}{y_t}\right) * 100\right)$
Parameters	Result in percent.
Conditions	
History	Added 2010.
Sources	*MONTGOMERY, D. Introduction to Time Series Analysis and Forecasting. Published by John Wiley & Sons. 2008.* *ISBN 978-0-471-65397-4.* *Page 51.*

Mean squared error (MSE)

Name	MSE (Mean squared error).
Used formula	$MSE = \frac{1}{n}\sum_{t=1}^{n}(e_t)^2$
Parameters	e_t = forecast error (residuals)
Conditions	
History	Added 2011.
Sources	*MONTGOMERY, D. Introduction to Time Series Analysis and Forecasting. Published by John Wiley & Sons. 2008.* *ISBN 978-0-471-65397-4.* *Page 50.*

Sum of squares error (SSE)

Name	SSE (Sum of squares error).
Used formula	$SSE = \frac{1}{n}\sum_{t=1}^{n} {e_t}^2$
Parameters	e_t = forecast error (residuals)
Conditions	
History	Added 2011.
Sources	*http://www.wikihow.com/Calculate-the-Sum-of-Squares-for-Error-%28SSE%29*

Information criteria

Akaike`s information criteria (AIC)

Name	AIC (Akaike`s information criteria)
Used formula	$AIC = n * \ln\left(\frac{SSE}{n}\right) + 2k$
Parameters	SSE = sum of squares, k = number of parameters in the model.
Conditions	
History	Added 2011.
Sources	*http://coopunit.forestry.uga.edu/Coop_Wkshop/inference_effects/aic_reg.pdf*

Akaike`s information criteria - corrected (AICc)

Name	AIC (Akaike`s information criteria - corrected)
Used formula	$AIC_c = n * \ln\left(\frac{SSE}{n}\right) + 2k + \frac{2k * (k+1)}{n-k-1}$
Parameters	SSE = sum of squares, k = number of parameters in the model.
Conditions	
History	Added 2011.
Sources	*http://coopunit.forestry.uga.edu/Coop_Wkshop/inference_effects/aic_reg.pdf*

Bayesian information criteria (BIS)

Name	BIS (Bayesian information criteria)
Used formula	$BIC = n * \ln\left(\frac{SSE}{n}\right) + k * ln(n)$
Parameters	SSE = sum of squares, k = number of parameters in the model.
Conditions	
History	Added 2011.
Sources	*http://www.google.cz/url?sa=t&rct=j&q=Bayesian%2Binformation%2Bcriterion&source=web&cd=2&ved=0CDIQFjAB&url=http%3A%2F%2Fwww.chichen6.tcu.edu.tw%2Fteaching%2F%25E8%25AC%259D%25E7%25B4%25B9%25E9%2599%25BD%25E7%25AD%2589_2nd_BIC-AIC.ppt&ei=Ke-8ToLxNoKCtgfLpvivBg&usg=AFQjCNGHalUvrAL1XIUXEHptClIlmT7EnA&sig2=GaZSSj1k9DvcXS4ezOeqCg*

Smoothing

Simple exponential smoothing (first-order)

Name	Simple exponential smoothing
Used formula	$\widehat{y_T} = \alpha y_T + (1 - \alpha)\ \widehat{y_{T-1}}$
Parameters	alpha = discount factor
Conditions	First value is (by global/section setting): a) NULL b) copy of original first value c) average of values
History	Added 2010.
Sources	*MONTGOMERY, D. Introduction to Time Series Analysis and Forecasting. Published by John Wiley & Sons. 2008.* *ISBN 978-0-471-65397-4.* *Page 177.*

Simple exponential smoothing (Brown)

Name	Simple exponential smoothing (Brown`s)
Used formula	$\widehat{y_T} = \alpha y_{T\text{-}1} + (1 - \alpha)\ \widehat{y_T}_{-1}$
Parameters	alpha = discount factor
Conditions	First value is (by global/section setting): a) copy of original first value b) average of values
History	Added 2011.
Sources	*http://fsi.uniza.sk/kkm/old/publikacie/pp/pp_kap_8.pdf, page 151-152* *http://en.wikipedia.org/wiki/Exponential_smoothing*

Double exponential smoothing (Holt`s)

Name	Double exponential smoothing (Holt`s)
Used formula	$L_t = \alpha y_t + (1 - \alpha)(L_{t-1} + T_{t-1})$ $T_t = \beta(L_t - L_{t-1}) + (1 - \beta)T_{t-1}$ $\hat{y}_{t+p} = L_t + pT_t$
Parameters	alpha, beta = discount factors
Conditions	First value: Copy of first original Y value, trend part = 0
History	Added 2011.
Sources	*http://www-rocq.inria.fr/axis/modulad//Workshop_Franco_Bresilien/programme/MaiaDeCarvalho_WFB2009.pdf* *http://fsi.uniza.sk/kkm/old/publikacie/pp/pp_kap_8.pdf*

Triple Holt-Winters Exponential Smoothing

Name	Holt-Winters triple exponential smoothing
Used formula	$L_t = \alpha\left(\frac{y_t}{S_{t-s}}\right) + (1-\alpha) * (L_{t-1} + T_{t-1})$ $T_t = \beta(L_t - L_{t-1}) + (1-\beta) * T_{t-1}$ $S_t = \gamma\left(\frac{y_t}{L_t}\right) + (1-\gamma) * S_{t-s}$
Parameters	alpha, beta, gama = discount factors
Conditions	Only if seasonal support is active in project. First value: L = Copy of first original Y value T = 0 S = 1 s = seasonal length
History	Added 2011.
Sources	*http://fsi.uniza.sk/kkm/old/publikacie/pp/pp_kap_10.pdf* *http://www.it.iitb.ac.in/~praj/acads/seminar/04329008_ExponentialSmoothing.pdf* *http://artax.karlin.mff.cuni.cz/~venco2am/vyuka/pms3/Holt-Winters.pdf*

Regressions

Gompertz curve

Name	Gompertz curve
Used formula	$Y = k \times \alpha^{\beta^x}$
Information	Computed by the partial sum method.
Conditions	Original data Y > 0 (no negative values).
History	Added 2010.
Sources	*http://mathworld.wolfram.com/GompertzCurve.html*

Modified exponential regression

Name	Modified exponential regression
Used formula	$Y = \gamma + A \times B^x$
Parameters	
Conditions	
History	Added 7 / 2011.
Sources	*SMITH, K. TIME SERIES ANALYSIS, U.S. Agency for international Development Manila, Philippines, 1975. Page 29.* *http://pdf.usaid.gov/pdf_docs/PNABI046.pdf*

Polynomial regression

Name	Polynomial regression
Used formula	$y = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \ldots + a_m x^m$
Parameters	Maximum model degree is possible change in regression section settings.
Conditions	
History	Added 2010.
Sources	*http://en.wikipedia.org/wiki/Polynomial_regression*

Transformations

Ln (y)

Name	Transformation - Ln(y)
Used formula	$f(y) = ln\, y$
Conditions	y > 0
History	Added 5/2011.
Sources	*SAS:* *Link: http://support.sas.com/documentation/cdl/en/etsug/60372/HTML/default/viewer.htm#etsug_similarity_sect015.htm*
	HANZAK, TOMAS: Decomposition methods for time series with irregular observations, page 65. *Link: www.quantitative.cz/.../decomposition-methods-for-time-series-with-irregular-observations-tomas-hanzak-2007-in-czech.pdf*

Square root (y)

Name	Transformation - Square root (y)
Used formula	$f(y) = \sqrt{y}$
Conditions	y >= 0
History	Added 5/2011.
Sources	*SAS:* *Link: http://support.sas.com/documentation/cdl/en/etsug/60372/HTML/default/viewer.htm#etsug_similarity_sect015.htm*

Standardization (y)

Name	Transformation - Standardization(y)
Used formula	$f(y) = \frac{y-\mu}{\sigma}$
Parameters	μ - average (y) σ - standard deviation(y)
Conditions	Standard deviation <> 0.
History	Added 5/2011.
Sources	*SAITTA, SANDRO: Link:* *http://www.dataminingblog.com/standardization-vs-normalization/*

Normalization (y)

Name	Transformation - Normalization(y)
Used formula	$f(y) = \frac{y - y_{min}}{y_{max} - y_{min}}$
Parameters	
Conditions	Denominator <> 0, if is, then f(y) = null.
History	Added 5/2011.
Sources	*SAITTA, SANDRO: Link: http://www.dataminingblog.com/standardization-vs-normalization/*

Hypothesis testing

Kolmogorov-Smirnov

Name	Kolmogorov-Smirnov
Used formula	Test value based on: $D_i = \lvert rel\ F_i - rel\ \hat{F}_i \rvert$ $D_i^{'} = \lvert rel\ F_{i-1} - rel\ \hat{F}_i \rvert$
Parameters	Critical values: *http://www.kmt.zcu.cz/person/Kohout/info_soubory/letnisem/ruzne/KSjednovyber.pdf*
Conditions	
History	Added 8/2011.
Sources	*MARR, PAUL: http://webspace.ship.edu/pgmarr/Geo441/Examples/Normality%20Tests.pdf* *http://webspace.ship.edu/pgmarr/Geo441/Lectures/Lec%204%20-%20Normality%20Testing.pdf*

Kolmogorov-Smirnov (Lilliefors variant)

Name	Kolmogorov-Smirnov (Lilliefors variant)
Used formula	Test value based on: $D_i = \lvert rel\ F_i - rel\ \hat{F}_i \rvert$ $D_i^{'} = \lvert rel\ F_{i-1} - rel\ \hat{F}_i \rvert$
Parameters	Critical values: *http://www.utdallas.edu/~herve/Abdi-Lillie2007-pretty.pdf*
Conditions	
History	Added 8/2011.
Sources	*MARR, PAUL:* *http://webspace.ship.edu/pgmarr/Geo441/Examples/Normality%20Tests.pdf* *http://webspace.ship.edu/pgmarr/Geo441/Lectures/Lec%204%20-%20Normality%20Testing.pdf*

W/S

Name	W/S
Used formula	Test value based on: $q = \frac{w}{s}$
Parameters	w - data range (max-min) s - standard deviation (-1) Critical values: *http://www.watpon.com/table/normality.pdf*
Conditions	
History	Added 8/2011.
Sources	*MARR, PAUL: http://webspace.ship.edu/pgmarr/Geo441/Examples/Normality%20Tests.pdf* *http://webspace.ship.edu/pgmarr/Geo441/Lectures/Lec%204%20-%20Normality%20Testing.pdf*

D`Agostino

Name	D`Agostino
Used formula	Test value (D) based on: $T = \sum \left(i - \frac{n+1}{2} \right) X_i$ $D = \frac{T}{\sqrt{n^3 SS}}$ where: SS - sum of squeres of the data, n - sample size, i - order of observation.
Parameters	Critical values: *http://webspace.ship.edu/pgmarr/Geo441/Tables/D%27Agostino%20D%20Test.pdf*
Conditions	
History	Added 9/2011.
Sources	*MARR, PAUL: http://webspace.ship.edu/pgmarr/Geo441/Lectures/Lec%204%20-%20Normality%20Testing.pdf*

Shapiro-Wilk

Name	Shapiro-Wilk
Used formula	Test value (SW) based on: $$SW = \frac{\left(\sum_{i=1}^{m} a_i(n)(X_{(n-i+1)} - X_{(i)}\right)^2}{\sum_{i=1}^{n}\left(X_i - \overline{x}\right)^2}$$ where: ai - is coefficients.
Parameters	Critical values, coefficients: *http://sci2s.ugr.es/keel/pdf/algorithm/articulo/shapiro1965.pdf*
Conditions	
History	Added 9/2011.
Sources	*http://sci2s.ugr.es/keel/pdf/algorithm/articulo/shapiro1965.pdf* *http://dspace.upce.cz/bitstream/10195/32424/1/CL299.pdf*

Jarque-Bera

Name	Shapiro-Wilk
Used formula	Test value (JB) based on: $JB = \frac{n}{6}\left((Skew\ x_S)^2 + \frac{(Kurt\ x_S)^2}{4} \right)$
Parameters	Critical values: Normal*: chi-square, df=2:* *http://www.psychstat.missouristate.edu/introbook/chisq.htm* Lagrange multiplier (LM), Advanced Lagrange multiplier (ALM)*:* *http://mpra.ub.uni-muenchen.de/19155/1/MPRA_paper_19155.pdf*
Conditions	
History	Added 9/2011.
Sources	*http://www.alglib.net/hypothesistesting/jarqueberatest.php*