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Accessing the QEPE program system

by T. Jasko

Signing on

Switch on the terminal and type "?" (question mark). Enter your username and key, separated by a comma or space. New users should apply to I. White in EDP for a username and key.

The Computer responds with the TSM> prompt. Type "QEPE" to access the Prospect Evaluation System.

Project Area Set-Up

This program is channelling the user into one of the project (area) usernames for access to the data flies of that area and checks some initial run parameters e.g. project code.

The program displays the area corresponding to the project code used. If files from other areas are to be used, type in the new code, otherwise press Return and it will be left unchanged.

Once entered, the project code/area name parameters remain in effect through the session until signing off the QEPE menu.

The QEPE Menu

Following the initial stage, the QEPE menu appears on the screen.

Select a function by typing in its abbreviated name (2 or 3 characters, as displayed). After the Service is performed the menu will return for the next command until you exit the system by typing X (or pressing Return). Presently available options:

ENT: Entering a new file. The file is created empty then filled with model parameters of a reservoir entered from the terminal.

MOD: Modifying an existing file. Updating the contents of a file or creating new version in new file.

SRX: Single reservoir expectancy curve (Monte-Carlo). Using a reservoir data file, expectancy curves are computed by Monte-Carlo modelling and plotted (if required).

ATP: Monte-Carlo Addition of reservoirs with Total Positive Dependency. Uses results from SRX

AI: Monte-Carlo Addition of independent reservoirs. Uses results from SRX.

MM: Matrix multiplication

DIS: Display the contents of a QEPE reservoir file on the screen

PRI: Print the contents of a reservoir file on the line printer in 220. The file will be also displayed on the screen.

ARE: List all files (of an area). Lists filename, reservoir, prospect and update date.

DEL: Delete a file. The named file is deleted from the index and its contents discarded.

X: Exit from the system (pressing Return has the same effect).

For the use of
ENT, MOD - see section on Model Parameters
SRX, MM - see Models for Single Reservoir Expectancy
AI, ATP - see Addition of Reservoirs
[Software Update no.26: 7 October 1983]

PEDE : Entering QEPE Model Parameters
Options ENT, MOD

by T. Jasko

Creating a new data file

To enter a new reservoir data set select menu option ENT.

The program will prompt for a filename = 8-character name composed of the abbreviation of prospect & reservoir - this will be the name under which the data are stored.

Each reservoir needs a new file; and if a reservoir contains both oil and gas, these are to be put in separate files, too. The filename should consist of letters (upper case only) and/or numbers, starting with a letter. No internal blanks are permitted.

N.B. the Data Editor program does not work on Tektronix graphic terminals.

Model Parameters are entered more or less in the same order as they appear in the printed QEPE forms.

Reservoir description

Reservoir name, and
Prospect name: enter names in the form as these should appear on the expectation curve plots
0il or Gas: enter 'O' or 'G'
File under: this is the name of the file (used for checks)
Chance factor: enter as percentage.

Definition of factors

Up to 12 factors can be entered, one by one. For each factor enter the following

- the *name* of the factor (can be abbreviated)
- the *unit* used
- the *probability model* choice
- up to 6 pairs of representative *values* with associated probabilities.

While the number of factors used and their names etc. can be entered at the users discretion, there is an option to use a template of predefined factors when ENTering a new data set.

Even so, any factor can be added to or deleted from the set, just as in MODifying.

Units and conversions

Enter the unit of measurement for factor values abbreviated to 4 characters. The specification of unit is important for rock volume and for percentage values only.

Volume data input are assumed to be in million cubic meters and automatically multiplied by a conversion factor to give results in million barrels (oil) or in billion scf (gas).

If gross volume is given in thousands of acre feet, enter ACFT (capital letters) and the values will be converted to millions of cubic metres.

If the unit of a factor is % (percent sign) values will be divided by 100.

If a unit is not specified (blank) or any other than ACFT or % the values will be used as entered.

Choice of probability distribution model

The model to be used can be defined either in the input stage by entering the appropriate code in the corresponding field of the factor or, with the field left blank, the model can be chosen during the calculation of Single reservoir expectancy.

Predefined model choices:

1. Normal distribution fitted to input values/probabilities
2. Lognormal distribution fitted to input values and probabilities
3. Use the better of normal/lognormal fits i.e. the one with smaller residual error

Expectation values to be computed/displayed

To specify an economic cutoff, enter value as million barrels of oil (or billion scf gas). The program will compute the chance of finding a volume bigger than this and also the average of all values above the cutoff.

Up to 6 quantiles e.g. P90, P50, ... can be requested. (The usual set is P90, P50, P10.) If these fields are left blank only the unrisked average and expectation curve will be computed.

Definition of dependencies

The last screen in the editing process, a numbered list of factors will be presented for the entry of dependency relations. E.g. the screen will list

1. Gross volume [ ]
2. Porosity [ ]
3. N/G ratio [ ]

Known dependencies between factors can be specified by filling the blanks to the right of the list.

Using the above example, if Porosity (Factor 2) depends on Gross volume (Factor 1) enter 1 in line 2. The name of the corresponding factor will be automatically added by the program. Then the strength of dependency can be entered as a number between -10 and +10. Here +10 corresponds to total positive dependency, -10 to total negative dependency. 0 means no dependency (i.e. the factors are independent) - same as leaving the entry blank.

If the dependency between Porosity and Gross volume is weakly positive, it can be entered as +3 ... and the display will show

1. Gross volume [ ]
2. Porosity [1] Gross volume [+3]
3. N/G ratio [ ]

How to enter a data item

The QEPE Data Editor program will prompt for entering data from the QEPE form into the bracketed fields. Whether a field is blank or contains some predefined information it can be

changed by overtyping or left unchanged by pressing CR to jump to the next data field.

N.B. Enter zeroes as 0 not as O (letter O) in numbers.

Special (control) characters

The following characters, when typed in alone in a field and followed by presslng Return, perform Special functions;

! - blank out the contents of the data field
@ - skip to the end of page
/ - skip to the end of file

All data skipped by @ and # remain unchanged. In MOD option these parts of the old file will be copied over to the new file.

At the end of a page

Reaching the end of a page the program asks whether the page is OK giving a chance to check the data entered. Enter Y (for yes) if OK to proceed, enter N otherwise and the same page can be edited again.

To delete a page (e.g. to get rid of an unwanted factor) type D, then this page will not be passed to the output.

Saving the edited data file

The newly entered or modified data are kept in a temporary workfile till the (successful) completion of editing and only

then are written to the 'new' file. If the program is stopped at this stage, the file will be left unchanged.

Modifying existing PE data (MOD Option)

Proceed as for entering ‘new' data but select menu option MOD and specify a file created previously. This will be the "old" (input) file. Next, enter then name of the 'new' (output) file if different. Entering the same filename again, or just a CR will cause the old file being overwritten with the updated contents.
[Software Update no.27: 7 October 1983]

ANOVA: Mean, Variance and Regression Analysis

by T. Jasko

This set of statistical routines calculates standard statistics, performs analysis of variance (ANOVA), linear and polynomial regression and data smoothing.

Access is through the CRISTAN menu (option ANOVA) or directly from TSM> by typing ANOVA.

To select a particular function, type its name. Function names can be abbreviated to 3 characters e.g. COR for CORRELATION.

Program options (parameters) are input interactively (I/O unit 5). The simpler statistical routines are designed for entering data interactively; others read data from files (I/O unit 17).

After performing the required function the program returns to the main CRISTAN menu.

MEAN

Computes the mean of *n* samples
Input:

- number of samples to be used
- samples (one at a time)

Output: mean

VARIANCE

Computes the variance of *n* samples
Input:

- number of samples to be used
- samples (one at a time)

Output:

- variance
- Standard deviation and mean

COVARIANCE

Computes

a. variance of each variable
b. mean of each variable
c. covariance between variables

Input:

- number of samples to be used
- samples (one at a time)

Output:

- sums
- mean, variance and Standard deviation of variable *x1*
- mean, variance and Standard deviation of variable *x2*
- covariance between *x1* and *x2*

CORRELATION

Computes

a. variance of each variable
b. mean of each variable
c. covariance between variables
d. correlatlon between variables

Input:

- number of samples to be used
- samples (one at a time)

Output:

- sums
- mean, variance and Standard deviation of variable *x1*
- mean, variance and Standard deviation of variable *x2*
- covariance between *x1* and *x2*
- correlation between *x1* and *x2*

ANOVA (analysis of variance)

Input:

- number of samples and number of replications
- samples (one at a time)

Output:

- sst
- ssa
- ssw
- mean squares
- F-ratio

2WA (Two-way Analysis of Variance)

Input:

- number of samples and number of replications
- samples (one at a time)

Output:

- sst
- ssa
- ssb
- sse
- mean squares
- F-test results

STAndardise Data Set

Input:

- number of samples to be used
- samples (one at a time; real numbers with decimal point)

Output:

- number of samples, mean and Standard deviation
- standardised samples

EQL - Equal Spacing with Linear Interpolation

Interpolation.

The data sequence *xin()* is converted to points equally spaced *xi* units apart, from initial point *xb* to final point *xl*. The equally spaced data sequence is *xout()*. Here
xin(js,l) is the *x* co-ordinate of a point in the input array,
xin(js,2) is the *y* co-ordinate of a point in the input array,
xout(is,l) is the *x* co-ordinate of a point in the output array, and
xout(is,2) is the *y* co-ordinate of a point in the output array.

The maximum length of the input and output sequences is 100 points. The *x* co-ordinates stored in the input array must be in ascending order.

Input:

- starting value *(xb)*
- spacing *(xi)*
- end value *(xl)*
- data file

Procedure:

Finds the two data points of *xin()* such that *xout(is,l)* lies in the interval *(xln(js,1),xln(js+1,1))*. Uses the *y* values of these two data points to interpolate the value of *xout(is,2)*.

Output: equally spaced points

EQR - Equal Spacing with Rectangular Integration

Rectangular integration. The data sequence *xin()* is converted to points equally spaced *xi* units apart, from initial point *xb* to final point *xl*. Here
xin(js,l) is the *x* co-ordinate of a point in the input array,
xin(js,2) is the *y* co-ordinate of a point in the input array,
xout(is,l) is the *x* co-ordinate of a point in the output array, and
xout(is,2) is the *y* co-ordinate of a point in the output array.

The maximum length of the input and output sequences is 100 points. The *x* co-ordinates stored in the input array must be in ascending order.

Input:

- starting value *(xb)*
- spacing *(xi)*
- end value *(xl)*
- data file

Output: equally spaced points

LINear Regression

Input: data file with *x* and *y* data
The maximum number of observations is 100.

Output:

- sums for least squares solution
- coefficients of the regression equation
- error measures

POLynomial Regression

Regression of order *iord*. Maximum number of observations is 100.

Input:

- order of equation
- *x, y* data

Output:

- sums for least squares solution
- coefficients of the regression equation
- predicted values
- error measures
- points equally spaced along regression line
- statistical analysis

SMOOTHING

The data sequence *xin* of length *n* is to be smoothed by *m*-term moving average. Length of output is *le=n-m+l*. *xout(l)* = the smoothed estimate for *xin(i+(m-l)/2)*. *m* must be an odd number.

Input:

- number of terms to be used in the moving average
- data sequence to be smoothed

Output: smoothed data sequence.

[Software Update no.28: 24 March 1983]