A MATLAB LIBRARY OF TEMPORAL DISAGGREGATION METHODS: SUMMARY

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1. INTRODUCTION

The library includes a set of function to perform temporal disaggregation (distribution, averaging and interpolation), according to the following structure:

Adjustment or quadratic programming methods:

- bfl
- denton_uni

served by: tduni_print (ASCII output), tduni_plot (graphic output)

Model-based (or BLUE) methods:

- chowlin
- fernandez
- litterman

served by: td_print (ASCII output), td_plot (graphic output)

Multivariate methods that include a transversal restriction:

- denton
- difonzo

served by: mtd_print (ASCII output), mtd_plot (graphic output)

Extrapolation is feasible using chowlin, fernandez, litterman and difonzo. Constrained extrapolation can be performed also by means of difonzo.

The presentation of the functions is self-contained: help text, script to run the function and output (ASCII file and plots).

Matlab source code is freely available if requested at: info@ine.es

2. BOOT-FEIBES-LISMAN

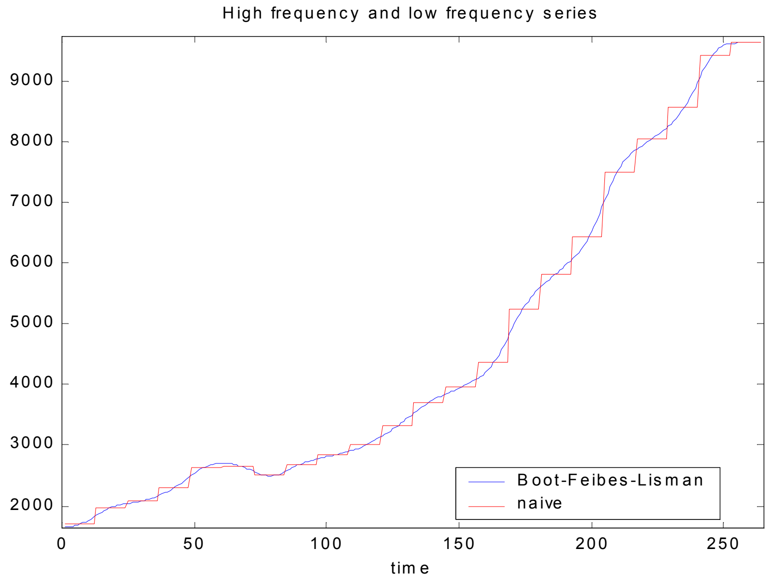
```
PURPOSE: Temporal disaggregation using the Boot-Feibes-Lisman method
---------------------------------------------------------------------
SYNTAX: res=bfl(Y,ta,d,s);
---------------------------------------------------------------------
OUTPUT: res: a structure
      res.meth  = 'Boot-Feibes-Lisman';
      res.N     = Number of low frequency data
      res.ta    = Type of disaggregation
      res.s     = Frequency conversion
      res.d     = Degree of differencing
      res.y     = High frequency estimate
      res.et    = Elapsed time
---------------------------------------------------------------------
INPUT: Y: Nx1 ---> vector of low frequency data
      ta: type of disaggregation
         ta=1 ---> sum (flow)
         ta=2 ---> average (index)
         ta=3 ---> last element (stock) ---> interpolation
      d: objective function to be minimized: volatility of ...
         d=0 ---> levels
         d=1 ---> first differences
         d=2 ---> second differences
      s: number of high frequency data points for each low frequency data point
         s= 4 ---> annual to quarterly
         s=12 ---> annual to monthly
         s= 3 ---> quarterly to monthly
---------------------------------------------------------------------
LIBRARY: aggreg
---------------------------------------------------------------------
SEE ALSO: tduni_print, tduni_plot
---------------------------------------------------------------------
REFERENCE: Boot, J.C.G., Feibes, W. y Lisman, J.H.C. (1967)
"Further methods of derivation of quarterly figures from annual data",
Applied Statistics, vol. 16, n. 1, p. 65-75.
```

Application:

```
Y=load('c:\x\td\data\Y.anu');
res=bfl(Y,1,1,12);
tduni_print(res,'td.sal');
tduni_plot(res);
edit td.sal
```

ASCII file containing detailed output:

```
 ****************************************************
 TEMPORAL DISAGGREGATION METHOD: Boot-Feibes-Lisman
 ****************************************************
----------------------------------------------------
 Number of low-frequency observations  :   22
 Frequency conversion                  :   12
 Number of high-frequency observations :  264
 ----------------------------------------------------
 Degree of differencing                :    1
 Type of disaggregation: sum (flow).
 ----------------------------------------------------
 High frequency series (columnwise):
 ----------------------------------------------------
 4972.2800
 4971.1389
 .........
 .........
 .........
 7898.7692
 7899.3631
 7899.6600
 ----------------------------------------------------
 Elapsed time:   0.3200
```



3. DENTON

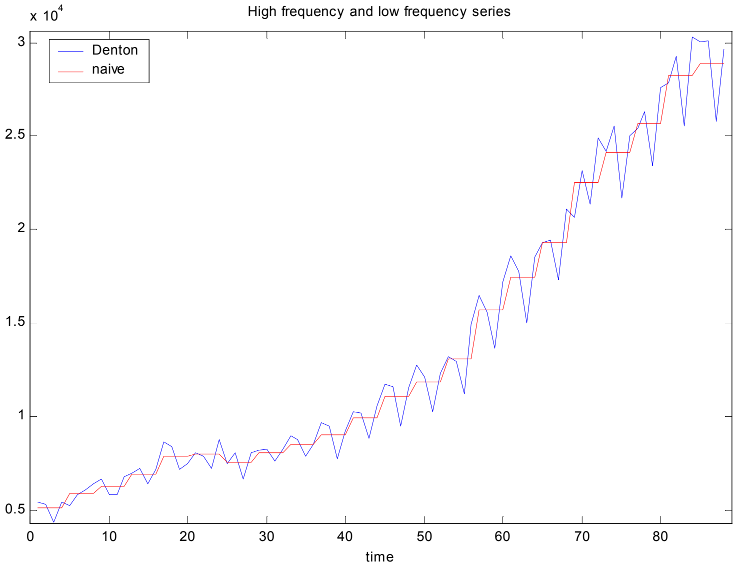
```
 PURPOSE: Temporal disaggregation using the Denton method
 ---------------------------------------------------------------------
 SYNTAX: res=denton_uni(Y,x,ta,d,s);
 ---------------------------------------------------------------------
 OUTPUT: res: a structure
         res.meth  = 'Denton';
         res.N     = Number of low frequency data
         res.ta    = Type of disaggregation
         res.s     = Frequency conversion
         res.d     = Degree of differencing
         res.y     = High frequency estimate
         res.U     = Low frequency residuals
         res.u     = High frequency residuals
         res.et    = Elapsed time
 ---------------------------------------------------------------------
 INPUT: Y: Nx1 ---> vector of low frequency data
        x: nx1 ---> vector of low frequency data
        ta: type of disaggregation
            ta=1 ---> sum (flow)
            ta=2 ---> average (index)
            ta=3 ---> last element (stock) ---> interpolation
        d: objective function to be minimized: volatility of ...
            d=0 ---> levels
            d=1 ---> first differences
            d=2 ---> second differences
        s: number of high frequency data points for each low frequency data point
            s= 4 ---> annual to quarterly
            s=12 ---> annual to monthly
            s= 3 ---> quarterly to monthly
---------------------------------------------------------------------
 LIBRARY: aggreg, bfl
 ---------------------------------------------------------------------
 SEE ALSO: tduni_plot, tduni_print
 ---------------------------------------------------------------------
 REFERENCE: Denton, F.T. (1971) "Adjustment of monthly or quarterly
 series to annual totals: an approach based on quadratic minimization",
 Journal of the American Statistical Society, vol. 66, n. 333, p. 99-102.
```

Application:

```
Y=load('c:\x\td\data\Y.prn');
x=load('c:\x\td\data\x.ind');
res=denton_uni(Y,x,1,1,4);
tduni_print(res,'td.sal');
tduni_plot(res);
edit td.sal
```

ASCII file containing detailed output:

```
 ***************************************************
 TEMPORAL DISAGGREGATION METHOD: Denton
 ***************************************************
---------------------------------------------------
 Number of low-frequency observations  :   22
 Frequency conversion                  :    4
 Number of high-frequency observations :   88
 ---------------------------------------------------
 Degree of differencing                :    1
 Type of disaggregation: sum (flow).
 ---------------------------------------------------
 High frequency series (columnwise):
 ---------------------------------------------------
 15374.9285
 15169.7571
 ..........
 ..........
 ..........
 24883.3098
 20609.0705
 24415.4509
 ---------------------------------------------------
 Elapsed time:   0.0500
```



4. CHOW-LIN

```
PURPOSE: Temporal disaggregation using the Chow-Lin method
------------------------------------------------------------
SYNTAX: res=chowlin(Y,x,ta,s,type);
------------------------------------------------------------
OUTPUT: res: a structure
         res.meth    ='Chow-Lin';
         res.ta      = type of disaggregation
         res.type    = method of estimation
         res.N       = nobs. of low frequency data
         res.n       = nobs. of high-frequency data
         res.pred    = number of extrapolations
         res.s       = frequency conversion between low and high freq.
         res.p       = number of regressors (including intercept)
         res.Y       = low frequency data
         res.x       = high frequency indicators
         res.y       = high frequency estimate
         res.y_dt    = high frequency estimate: standard deviation
         res.y_lo    = high frequency estimate: sd - sigma
         res.y_up    = high frequency estimate: sd + sigma
         res.u       = high frequency residuals
         res.U       = low frequency residuals
         res.beta    = estimated model parameters
         res.beta_sd = estimated model parameters: standard deviation
         res.beta_t  = estimated model parameters: t ratios
         res.rho     = innovational parameter
         res.aic     = Information criterion: AIC
         res.bic     = Information criterion: BIC
         res.val     = Objective function used by the estimation method
         res.r       = grid of innovational parameters used by the estimation method
------------------------------------------------------------
INPUT: Y: Nx1 ---> vector of low frequency data
       x: nxp ---> matrix of high frequency indicators (without intercept)
       ta: type of disaggregation
           ta=1 ---> sum (flow)
           ta=2 ---> average (index)
           ta=3 ---> last element (stock) ---> interpolation
       s: number of high frequency data points for each low frequency data points
           s= 4 ---> annual to quarterly
           s=12 ---> annual to monthly
           s= 3 ---> quarterly to monthly
       type: estimation method:
           type=0 ---> weighted least squares
           type=1 ---> maximum likelihood
------------------------------------------------------------
LIBRARY: aggreg
------------------------------------------------------------
SEE ALSO: litterman, fernandez, td_plot, td_print
------------------------------------------------------------
REFERENCE: Chow, G. y Lin, A.L. (1971) "Best linear unbiased
distribution and extrapolation of economic time series by related
series", Review of Economic and Statistics, vol. 53, n. 4, p. 372-375.
```

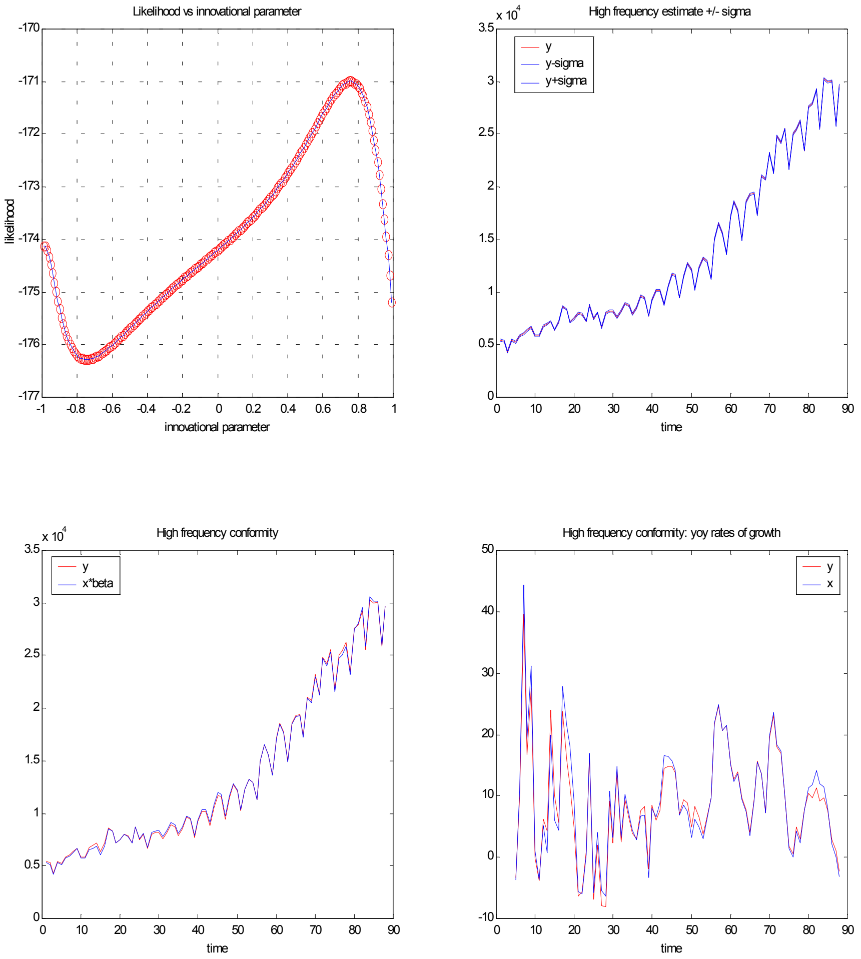
Application:

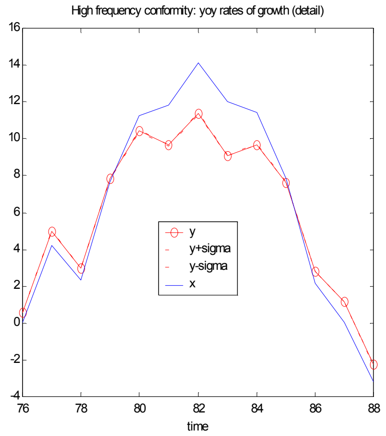
```
Y=load('c:\x\td\data\Y.prn');
x=load('c:\x\td\data\x.ind');
res=chowlin(Y,x,1,4,1);
td_print(res,'td.sal',1);     % op1=1: series are printed in ASCII file
td_plot(res);
edit td.sal
```

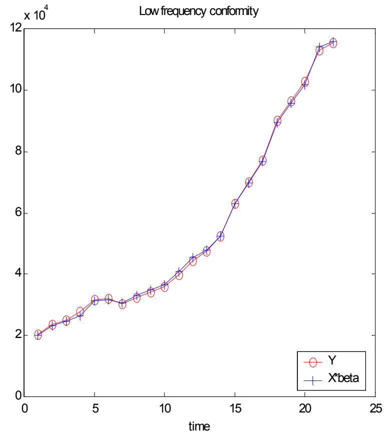
ASCII file containing detailed output:

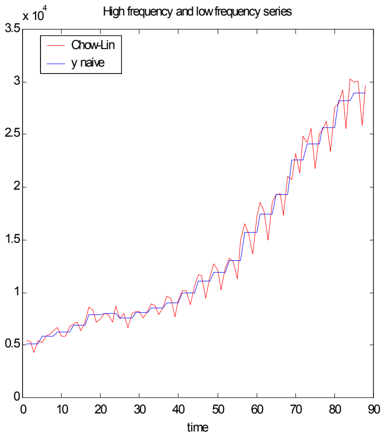
```
 ****************************************************
 TEMPORAL DISAGGREGATION METHOD: Chow-Lin
 ****************************************************
----------------------------------------------------
 Number of low-frequency observations :   22
 Frequency conversion                 :    4
 Number of high-frequency observations:   88
 Number of extrapolations             :    0
 Number of indicators (+ constant)    :    2
 ----------------------------------------------------
 Type of disaggregation: sum (flow).
 ----------------------------------------------------
 Estimation method: Maximum likelihood.
 ----------------------------------------------------
 Beta parameters (columnwise):
   * Estimate
   * Std. deviation
   * t-ratios
 ----------------------------------------------------
  215.4518        111.7079          1.9287
    0.9828          0.0069        142.0272
 ----------------------------------------------------
 Innovational parameter:   0.7600
 ----------------------------------------------------
 AIC:  10.0340
 BIC:  10.1828
 ----------------------------------------------------
 Low-frequency correlation
  - levels     : 0.9998
  - yoy rates  : 0.9617
 ----------------------------------------------------
 High-frequency correlation
  - levels     : 0.9998
  - yoy rates  : 0.9812
 ----------------------------------------------------
 High-frequency volatility of yoy rates
  - estimate   : 8.4282
  - indicator  : 9.0226
  - ratio      : 0.9341
 ----------------------------------------------------
```

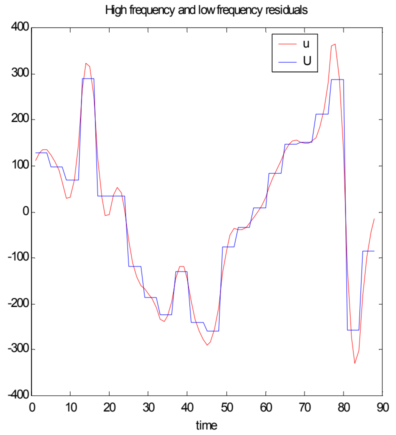
```
High frequency series (columnwise):
   * Estimate
   * Std. deviation
   * 1 sigma lower limit
   * 1 sigma upper limit
   * Residuals
 ---------------------------------------------------
  5400.9896         114.8247         5286.1649         5515.8143         112.3095
  5311.2409          83.7296         5227.5112         5394.9705         128.7034
  .........          .......         .........         .........         ........
  .........          .......         .........         .........         ........
  .........          .......         .........         .........         ........
 30079.6885          86.7557        29992.9328        30166.4443         -97.4913
 25874.7702          86.2867        25788.4835        25961.0569         -43.9249
 29614.4998         116.3242        29498.1756        29730.8240         -16.2417
 ---------------------------------------------------
 ---------------------------------------------------
 Elapsed time:   1.8100
```











A variant to be applied with a fixed innovational parameter:

```
PURPOSE: Temporal disaggregation using the Chow-Lin method
      rho parameter is fixed (supplied by the user)
---------------------------------------------------
SYNTAX: res=chowlin_fix(Y,x,ta,s,type,rho);
---------------------------------------------------
```

5. FERNÁNDEZ

```
 PURPOSE: Temporal disaggregation using the Fernandez method
 ------------------------------------------------------------
 SYNTAX: res=fernandez(Y,x,ta,s);
 ------------------------------------------------------------
 OUTPUT: res: a structure
           res.meth    ='Fernandez';
           res.ta      = type of disaggregation
           res.type    = method of estimation
           res.N       = nobs. of low frequency data
           res.n       = nobs. of high-frequency data
           res.pred    = number of extrapolations
           res.s       = frequency conversion between low and high freq.
           res.p       = number of regressors (including intercept)
           res.Y       = low frequency data
           res.x       = high frequency indicators
           res.y       = high frequency estimate
           res.y_dt    = high frequency estimate: standard deviation
           res.y_lo    = high frequency estimate: sd - sigma
           res.y_up    = high frequency estimate: sd + sigma
           res.u       = high frequency residuals
           res.U       = low frequency residuals
           res.beta    = estimated model parameters
           res.beta_sd = estimated model parameters: standard deviation
           res.beta_t  = estimated model parameters: t ratios
           res.aic     = Information criterion: AIC
           res.bic     = Information criterion: BIC
 ------------------------------------------------------------
 INPUT: Y: Nx1 ---> vector of low frequency data
        x: nxp ---> matrix of high frequency indicators (without intercept)
        ta: type of disaggregation
            ta=1 ---> sum (flow)
            ta=2 ---> average (index)
            ta=3 ---> last element (stock) ---> interpolation
        s: number of high frequency data points for each low frequency data points
            s= 4 ---> annual to quarterly
            s=12 ---> annual to monthly
            s= 3 ---> quarterly to monthly
 ------------------------------------------------------------
 LIBRARY: aggreg
 ------------------------------------------------------------
 SEE ALSO: chowlin, litterman, td_plot, td_print
 ------------------------------------------------------------
 REFERENCE: Fernández, R.B.(1981)"Methodological note on the
 estimation of time series", Review of Economic and Statistics,
 vol. 63, n. 3, p. 471-478.
```

Application:

```
Y=load('c:\x\td\data\Y.prn');
x=load('c:\x\td\data\x.tri');
res=fernandez(Y,x,1,4);
 td_print(res,'td.sal',1);      % op1=1: series are printed in ASCII file
td_plot(res);
edit td.sal
```

ASCII file containing detailed output:

```
 ****************************************************
 TEMPORAL DISAGGREGATION METHOD: Fernandez
 ****************************************************
 ----------------------------------------------------
 Number of low-frequency observations :   22
 Frequency conversion                 :    4
 Number of high-frequency observations:   90
 Number of extrapolations             :    2
 Number of indicators (+ constant)    :    2
 ----------------------------------------------------
 Type of disaggregation: sum (flow).
----------------------------------------------------
 Estimation method: Maximum likelihood.
----------------------------------------------------
 Beta parameters (columnwise):
   * Estimate
   * Std. deviation
   * t-ratios
 ----------------------------------------------------
  564.9834        195.9404          2.8834
    0.9360          0.0292         32.0284
 ----------------------------------------------------
 Innovational parameter:   1.0000
 ----------------------------------------------------
 AIC:   9.6079
 BIC:   9.7567
 ----------------------------------------------------
 Low-frequency correlation
  - levels     : 0.9998
  - yoy rates  : 0.9617
 ----------------------------------------------------
 High-frequency correlation
  - levels     : 0.9997
  - yoy rates  : 0.9817
 ----------------------------------------------------
 High-frequency volatility of yoy rates
  - estimate   : 8.3477
  - indicator  : 9.1506
  - ratio      : 0.9123
 ----------------------------------------------------
```

```
High frequency series (columnwise):
  * Estimate
  * Std. deviation
  * 1 sigma lower limit
  * 1 sigma upper limit
  * Residuals
----------------------------------------------------
 5396.6742        91.6250       5305.0492       5488.2992        -0.0000
 5297.9198        60.8871       5237.0327       5358.8069         2.3349
 .........        .......       .........       .........         ......
 .........        .......       .........       .........         ......
 .........        .......       .........       .........         ......
30021.1833        73.6977      29947.4856      30094.8810       920.9566
26022.3844       108.3992      25913.9852      26130.7837       977.8951
29586.1687        92.9937      29493.1750      29679.1625       1006.3644
----------------------------------------------------
28366.5459       140.8431      28225.7028      28507.3889       1006.3644
29461.6792       176.5235      29285.1557      29638.2027       1006.3644
----------------------------------------------------
Elapsed time:   0.0500
```

Graphs are the same than in the Chow-Lin case, except that the first one (objective function vs innovational parameter) is not generated.

6. LITTERMAN

```
PURPOSE: Temporal disaggregation using the Litterman method
------------------------------------------------------------
SYNTAX: res=litterman(Y,x,ta,s,type);
------------------------------------------------------------
OUTPUT: res: a structure
         res.meth    ='Litterman';
         res.ta      = type of disaggregation
         res.type    = method of estimation
         res.N       = nobs. of low frequency data
         res.n       = nobs. of high-frequency data
         res.pred    = number of extrapolations
         res.s       = frequency conversion between low and high freq.
         res.p       = number of regressors (including intercept)
         res.Y       = low frequency data
         res.x       = high frequency indicators
         res.y       = high frequency estimate
         res.y_dt    = high frequency estimate: standard deviation
         res.y_lo    = high frequency estimate: sd - sigma
         res.y_up    = high frequency estimate: sd + sigma
         res.u       = high frequency residuals
         res.U       = low frequency residuals
         res.beta    = estimated model parameters
         res.beta_sd = estimated model parameters: standard deviation
         res.beta_t  = estimated model parameters: t ratios
         res.rho     = innovational parameter
         res.aic     = Information criterion: AIC
         res.bic     = Information criterion: BIC
         res.val     = Objective function used by the estimation method
         res.r       = grid of innovational parameters used by the estimation method
------------------------------------------------------------
INPUT: Y: Nx1 ---> vector of low frequency data
       x: nxp ---> matrix of high frequency indicators (without intercept)
       ta: type of disaggregation
           ta=1 ---> sum (flow)
           ta=2 ---> average (index)
           ta=3 ---> last element (stock) ---> interpolation
       s: number of high frequency data points for each low frequency data points
           s= 4 ---> annual to quarterly
           s=12 ---> annual to monthly
           s= 3 ---> quarterly to monthly
       type: estimation method:
           type=0 ---> weighted least squares
           type=1 ---> maximum likelihood
------------------------------------------------------------
LIBRARY: aggreg
------------------------------------------------------------
SEE ALSO: chowlin, fernandez, td_plot, td_print
------------------------------------------------------------
REFERENCE: Litterman, R.B. (1983a) "A random walk, Markov model
for the distribution of time series", Journal of Business and
Economic Statistics, vol. 1, n. 2, p. 169-173.
```

Application:

```
Y=load('c:\x\td\data\Y.prn');
x=load('c:\x\td\data\x.tri');
res=litterman(Y,x,1,4,0);
td_print(res,'td.sal',0); % op1=0: series are not printed in ASCII file
td_plot(res);
edit td.sal
```

ASCII file containing detailed output:

```
****************************************************
TEMPORAL DISAGGREGATION METHOD: Litterman
****************************************************
----------------------------------------------------
Number of low-frequency observations :   22
Frequency conversion                 :    4
Number of high-frequency observations:   90
Number of extrapolations             :    2
Number of indicators (+ constant)    :    2
----------------------------------------------------
Type of disaggregation: sum (flow).
----------------------------------------------------
Estimation method: Weighted least squares.
----------------------------------------------------
Beta parameters (columnwise):
  * Estimate
  * Std. deviation
  * t-ratios
----------------------------------------------------
 1205.4851        233.5241          5.1621
    0.7910          0.0480         16.4821
----------------------------------------------------
Innovational parameter:   0.9700
----------------------------------------------------
AIC:   7.9478
BIC:   8.0966
----------------------------------------------------
Low-frequency correlation
 - levels     : 0.9998
 - yoy rates  : 0.9617
----------------------------------------------------
High-frequency correlation
 - levels     : 0.9994
 - yoy rates  : 0.9735
----------------------------------------------------
High-frequency volatility of yoy rates
 - estimate   : 7.6249
 - indicator  : 9.1506
 - ratio      : 0.8333
----------------------------------------------------
Elapsed time:   2.5300
```

A variant to be applied with a fixed innovational parameter:

```
PURPOSE: Temporal disaggregation using the Litterman method
         mu parameter is fixed (supplied by the user)
-----------------------------------------------------------------
SYNTAX: res=litterman(Y,x,ta,s,type,mu);
```

Graphical output contains the same information than in the Chow-Lin case.

7. MULTIVARIATE DENTON

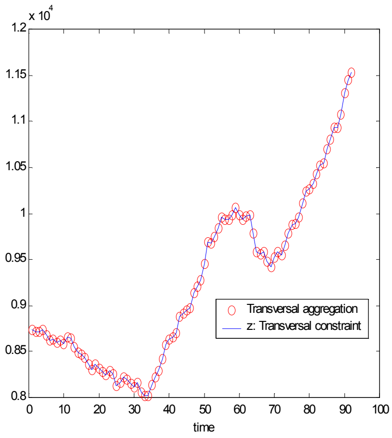
```
PURPOSE: Multivariate temporal disaggregation with transversal constraint
---------------------------------------------------------------------------
SYNTAX: res = denton(Y,x,z,ta,s,d);
---------------------------------------------------------------------------
OUTPUT: res: a structure
        res.meth  = 'Multivariate Denton';
        res.N     = Number of low frequency data
        res.n     = Number of high frequency data
        res.pred  = Number of extrapolations (=0 in this case)
        res.ta    = Type of disaggregation
        res.s     = Frequency conversion
        res.d     = Degree of differencing
        res.y     = High frequency estimate
        res.et    = Elapsed time
---------------------------------------------------------------------
INPUT: Y: NxM ---> M series of low frequency data with N observations
       x: nxM ---> M series of high frequency data with n observations
       z: nx1 ---> high frequency transversal constraint
       ta: type of disaggregation
           ta=1 ---> sum (flow)
           ta=2 ---> average (index)
           ta=3 ---> last element (stock) ---> interpolation
       s: number of high frequency data points for each low frequency data points
           s= 4 ---> annual to quarterly
           s=12 ---> annual to monthly
           s= 3 ---> quarterly to monthly
       d: objective function to be minimized: volatility of ...
           d=0 ---> levels
           d=1 ---> first differences
           d=2 ---> second differences
---------------------------------------------------------------------
LIBRARY: aggreg, dif, vec, desvec
---------------------------------------------------------------------
SEE ALSO: difonzo, mtd_print, mtd_plot
---------------------------------------------------------------------
REFERENCE: di Fonzo, T. (1994) "Temporal disaggregation of a system of
time series when the aggregate is known: optimal vs. adjustment methods",
INSEE-Eurostat Workshop on Quarterly National Accounts, Paris, december
```

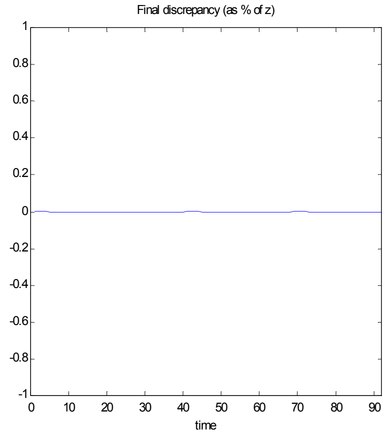
Application:

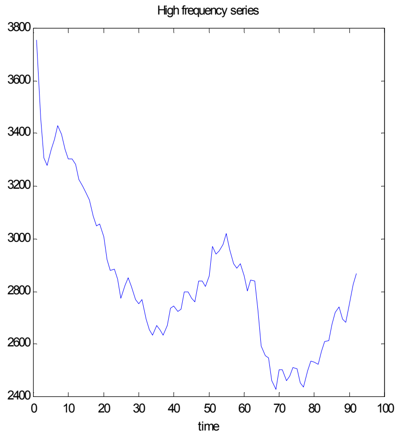
```
        Y=load('YY.anu'); % Loading low frequency data
        x=load('x.tri'); % Loading high frequency data
        z=load('z.prn'); % Loading high frequency transversal restriction
        res=denton(Y,x,z,2,4,1);
        mtd_print(res,'mtd.sal');
        edit mtd.sal;
        mtd_plot(res,z);
```

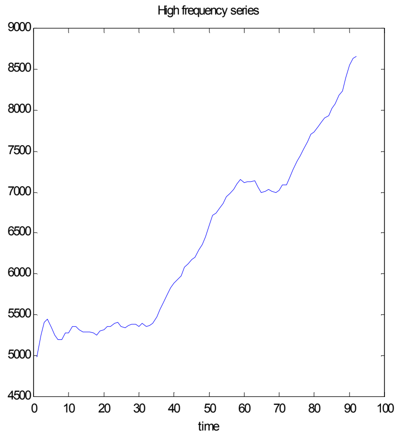
ASCII file containing detailed output:

```
 *******************************************************
 TEMPORAL DISAGGREGATION METHOD: Multivariate Denton
 *******************************************************
 -------------------------------------------------------
 Number of low-frequency observations  :   23
 Frequency conversion                  :    4
 Number of high-frequency observations :   92
 Number of extrapolations              :    0
 -------------------------------------------------------
 Degree of differencing                :    1
 Type of disaggregation: average (index).
 -------------------------------------------------------
 High frequency series (columnwise):
   * Point estimate
 -------------------------------------------------------
 3752.9096  4982.6505
 3459.3681  5257.1693
 .........  .........
 .........  .........
 .........  .........
 2757.8458  8545.8074
 2825.1411  8624.4561
 2867.5816  8657.9733
-------------------------------------------------------
Elapsed time:   0.2800
```






High frequency series
3800
3600
3400
3200
3000
2800
2600
2400
0
10
20
30
40
50
60
70
80
90
100
time


High frequency series
9000
8500
8000
7500
7000
6500
6000
5500
5000
4500
0
10
20
30
40
50
60
70
80
90
100
time

8. DI FONZO

```
PURPOSE: Multivariate temporal disaggregation with transversal constraint
---------------------------------------------------------------------------
SYNTAX: res = difonzo(Y,x,z,ta,s,type);
---------------------------------------------------------------------------
OUTPUT: res: a structure
        res.meth  = 'Multivariate di Fonzo';
        res.N     = Number of low frequency data
        res.n     = Number of high frequency data
            res.pred  = Number of extrapolations
        res.ta    = Type of disaggregation
        res.s     = Frequency conversion
        res.type  = Model for high frequency innovations
        res.beta  = Model parameters
        res.y     = High frequency estimate
        res.d_y   = High frequency estimate: std. deviation
        res.et    = Elapsed time
---------------------------------------------------------------------
INPUT: Y: NxM ---> M series of low frequency data with N observations
       x: nxM ---> M series of high frequency data with n observations
       z: nx1 ---> high frequency transversal constraint with nz obs.
       ta: type of disaggregation
           ta=1 ---> sum (flow)
           ta=2 ---> average (index)
           ta=3 ---> last element (stock) ---> interpolation
       s: number of high frequency data points for each low frequency data points
           s= 4 ---> annual to quarterly
           s=12 ---> annual to monthly
           s= 3 ---> quarterly to monthly
       type: model for the high frequency innovations
           type=0 ---> multivariate white noise
           type=1 ---> multivariate random walk
---------------------------------------------------------------------
NOTE: Extrapolation is automatically performed when n>sN.
      If n=nz>sN restricted extrapolation is applied.
      Finally, if n>nz>sN extrapolation is perfomed in constrained
      form in the first nz-sN observatons and in free form in
      the last n-nz observations.
---------------------------------------------------------------------
LIBRARY: aggreg, dif, vec, desvec
---------------------------------------------------------------------
SEE ALSO: denton, mtd_print, mtd_plot
---------------------------------------------------------------------
REFERENCE: di Fonzo, T.(1990)"The estimation of M disaggregate time
series when contemporaneous and temporal aggregates are known", Review
of Economics and Statistics, vol. 72, n. 1, p. 178-182.
```

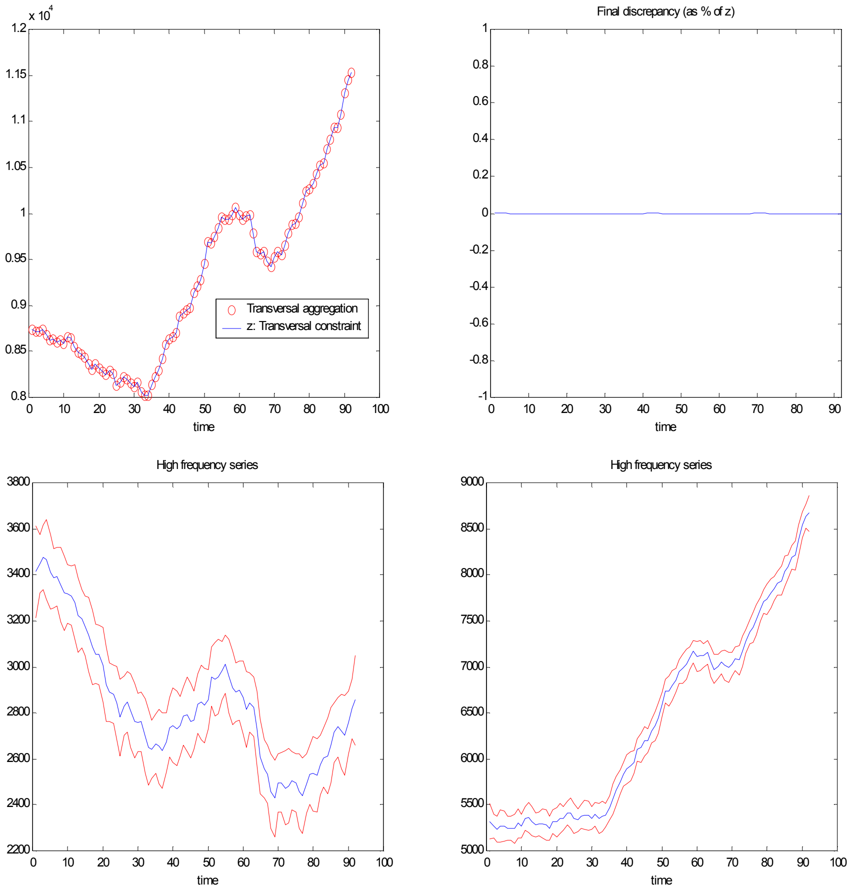
Application:

```
Y=load('YY.anu'); % Loading low frequency data
x=load('x.tri'); % Loading high frequency data
z=load('z.prn'); % Loading high frequency transversal restriction
res = difonzo(Y,x,z,2,4,1);
mtd_print(res,'mtd.sal');
edit mtd.sal;
mtd_plot(res,z);
```

ASCII file containing detailed output:

```
********************************************************
TEMPORAL DISAGGREGATION METHOD: Multivariate di Fonzo
********************************************************
--------------------------------------------------------
Number of low-frequency observations  :   23
Frequency conversion                  :    4
Number of high-frequency observations :   92
Number of extrapolations           :     0
--------------------------------------------------------
Model for the innovations: random walk.
Type of disaggregation: average (index).
--------------------------------------------------------
High frequency series (columnwise):
  * Point estimate
--------------------------------------------------------
3413.3839  5322.1762
3447.4092  5269.1282
.........  .........
.........  .........
.........  .........
2758.4657  8545.1875
2817.9882  8631.6090
2856.1605  8669.3944
```

```
-----------------------------------------------------
 High frequency series (columnwise):
   * Std. desviation
 -----------------------------------------------------
  197.8732   197.8732
  127.3900   127.3900
  .........  .........
  .........  .........
  .........  .........
  137.9397   137.9397
  128.1006   128.1006
  194.9112   194.9112
-----------------------------------------------------
Elapsed time:   0.3300
```


x 10^4
time
Transversal aggregation
z: Transversal constraint
Final discrepancy (as % of z)
time
High frequency series
time
High frequency series
time