DATA SCIENCE

GAMS special functions and operators

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The $ operator

- $ is a binary operator that can be used to translate conditional expressions

- Example
  If y $>$ 1.5 then x=2
  x $(y > 1.5)=2

  If the condition is not satisfied, no assignment is made

- The effect of the dollar condition is significantly different depending on which side of the assignment it is in

The $ operator

- (Dollar on the left)
  For an assignment statement with a dollar condition on the left-hand side, no assignment is made unless the logical condition is satisfied.
- (Dollar on the right)
  For an assignment statement with a dollar condition on the right hand side, an assignment is always made. If the logical condition is not satisfied, the corresponding term that the logical dollar condition is operating on evaluates to 0.
- If y $>$ 1.5 then x=2 else x=0
  x=2 $ (y>1.5)
  x = 2 $ (y gt 1.5) + 0 $(y le 0)
- Dollar Control over the Domain of Definition of equations

Special Functions

- The *CARD* function takes a set name (or index) and returns the cardinality of the set, i.e. the number of elements in the set
  - SET i asset $/i1 * i4/$;
    SCALAR s; s = CARD(i);
- The CARD function is useful to compute the mean

The ORD function

- The *ORD* function takes as an argument the name of a set and returns the ordinate value of the index relative to the set.
- *ORD* can be used only with a one-dimensional, static, ordered set.
- Example
  SET t time periods /1985 * 1995/
  parameter val(t) ;
  val(t) = ord(t);
  As a result of the statements above, the value of val("1985") will be 1, val("1986") will be 2 and so on

Exercise

- Let us consider 4 assets. We assume to have the historical prices and we want to estimate the mean rate of return and the variance-covariance matrix
- We assume that the historical prices are stored in .inc file
- We include such a file in the .gms program
- Please pay attention to the path
  $INCLUDE "C: **path** / filename.inc";
- If the input file is in your working directory
  $INCLUDE "filename.inc";

Excel Interface

- GAMS communicates with Excel via GDX (GAMS Data Exchange) files.
- **Input**

```
$call "gdxxrw input1.xlsx par=Price rng=Foglio1!(a1:e5
rdim=1 cdim=1 )"
$ gdxin input1.gdx
$load Price
```

- The part between () is optional
- **Output**

```
execute_unload "result.gdx" mu;
execute "gdxxrw result.gdx o=result.xlsx par= mu
rng=foglio1! "
execute_unload "result.gdx" VarCov;
execute "gdxxrw result.gdx o=result.xlsx par= VarCov
rng=foglio2! "
```