UNIVERSITÀ DEGLI STUDI DI BERGAMO
Dipartimento di Ingegneria Gestionale, dell'Informazione e della Produzione

22059 – APPLIED TOPICS IN MANAGEMENT ENGINEERING

Excel, Access and Matlab

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AGENDA

Lecture XII

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IMPORTING DATA

- Importing data is quite easy.
- You may import data from:
  - Excel spreadsheet
  - Text file
  - XML file

  and so on

How to import data from an Excel file

1. In the Variable Group, click on “Import Data”.

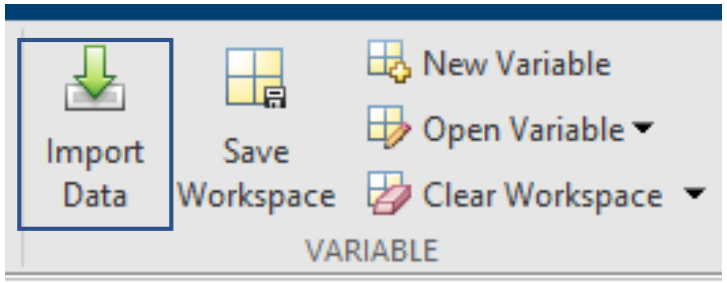

Fig.1: Import Data from VARIABLE group

2. The *Import Data* window will appear.
3. Select the Excel file to import and click Open.

How to import data from an Excel file

4. The *Import* window will appear.

5. You can select the range of data that you want to import:

Exercise.xlsx

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
									Exercise								
	Year	VarName2	VarName3	VarName4	VarName5	VarName6	VarName7	VarName8	VarName9	VarName10	VarName11	VarName12	VarName13	VarName14	VarName15	VarName16	VarName17
	Text	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
1	Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	Installment	-750000	200000	182000	165620	1.5071e+05	1.3715e+05	1.2481e+05	1.1357e+05	1.0335e+05	9.4051e+04	8.5586e+04	7.7883e+04	7.0874e+04	6.4495e+04	5.8691e+04	5.3408e+04

Fig.2: Data selection

5. In the Imported data group, choose the Output Type.

6. Then, click on “Import Selection” in the Import group:

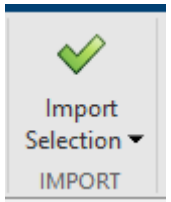

Fig.3: Import Selection

How to import data from an Excel file

7. The imported data will be shown in the Workspace as a matrix.

Fig.4:Workspace

8. In the Command Window, write the name of the matrix.
9. Then, Enter.

```
Exercise =

   1.0e+05 *

  Columns 1 through 12

       NaN         0    0.0000    0.0000    0.0000    0.0000    0.0001    0.0001    0.0001    0.0001    0.0001    0.0001
       NaN   -7.5000    2.0000    1.8200    1.6562    1.5071    1.3715    1.2481    1.1357    1.0335    0.9405    0.8559

  Columns 13 through 22

    0.0001    0.0001    0.0001    0.0001    0.0001    0.0002    0.0002    0.0002    0.0002    0.0002
    0.7788    0.7087    0.6450    0.5869    0.5341    0.4860    0.4423    0.4025    0.3662    0.3333
```

Fig.5:Imported data in the Command Window

CONDITIONAL INSTRUCTIONS

IF CONSTRUCT

Simple Selection

```
if espressione
    blocco_istruzioni
end
```

Block instructions are only executed if the expression is true

Example

```
x = input('Inserisci x: ');
y = input('Inserisci y: ');

if x > y
    disp('x è più grande di y');
end
```

CONDITIONAL INSTRUCTIONS

IF CONSTRUCT

Two-way Selection

```
if espressione
    blocco_istruzioni_1
else
    blocco_istruzioni_2
end
```

Block 1 instructions are only executed
if the expression is true,
otherwise block 2 instructions are executed.

Example

```
x = input('Inserisci x: ');

if x > 0
    disp('Hai inserito un valore positivo');
else
    disp('Hai inserito un valore negativo');
end
```

CONDITIONAL INSTRUCTIONS

IF CONSTRUCT

Two-way Selection

```
if espressione
    blocco_istruzioni_1
else
    blocco_istruzioni_2
end
```

Block 1 instructions are only executed
if the expression is true,
otherwise block 2 instructions are executed.

Example

```
x = input('Inserisci x: ');

if x > 0
    disp('Hai inserito un valore positivo');
else
    disp('Hai inserito un valore negativo');
end
```

NB.
There are also
cascading selections
and if nested

ITERATIVE STRUCTURES

- If a section of code can potentially be repeated, it could be defined as a loop.
- In MATLAB, two there are two different types of loop:
  - FOR
  - WHILE

FOR

- The for loop is used when the number of repetitions, namely iterations, is known a priori.
- It can also be used for handling arrays and matrices.

Syntax

```
for variabile = valori_array
   blocco_istruzioni
end
```

WHILE

- The while loop is used when the number of iterations is not known a priori.

Syntax

```
while condizione
   blocco_istruzioni
end
```

Example 1

Calculate the NPV of a string of 20 cash flows, when r=10%.

- First of all, you have to import data with Numeric Matrix Output Type from the Excel file named “Exercise”.

Exercise.xlsx

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
									Exercise								
	Year	VarName2	VarName3	VarName4	VarName5	VarName6	VarName7	VarName8	VarName9	VarName10	VarName11	VarName12	VarName13	VarName14	VarName15	VarName16	VarName17
	Text	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
1	Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	Installment	-750000	200000	182000	165620	1.5071e+05	1.3715e+05	1.2481e+05	1.1357e+05	1.0335e+05	9.4051e+04	8.5586e+04	7.7883e+04	7.0874e+04	6.4495e+04	5.8691e+04	5.3408e+04

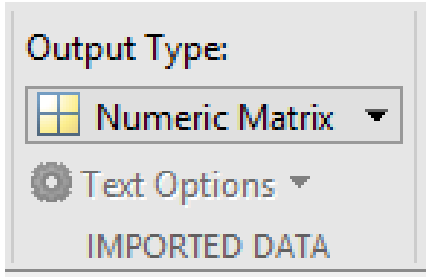

Fig.7: Cash flows and Output Type

Example 1

Calculate the NPV of a string of 20 cash flows, when r=10%.

- Then, you have to define a Function that calculates the NPV:

netpresentvalue.m

```
1   function [NPV] = netpresentvalue (cash_flow,tax)
2   %The function calculates the NPV of a string of n cash flows
3   n=max(size(cash_flow));%find the number of cash flows
4   NPV=0; %NPV initialization
5   for i= 2:1:n %starting from 1,it increases the value by one until n
6       NPV= NPV+((cash_flow(2,i))/((1+tax)^(i-2)));%NPV calculation
7   end
8   end
```

Fig.6: netpresentvalue function

Example 1

Calculate the NPV of a string of 20 cash flows, when r=10%.

- Finally, you have to call the function `netpresentvalue` by entering the correct input, namely the matrix with cash flows and the rate.

```
>> Result=netpresentvalue(Exercise,r)

Result =

   2.7890e+05
```

NPV

Fig.8: NPV calculation

Example 2

Calculate the Cumulated Discounted Cash Flows and find the payback period.

- First of all, you have to edit the `netpresentvalue` function:

netpresentvalue2.m

```
1   function [NPV] = netpresentvalue2 (cash_flow,tax)
2   %The function calculates the cumulated discounted cash flows
3   n=max(size(cash_flow));%find the number of cash flows
4   cumulated=0;%cumulated inizialization
5   NPV=[1,n-1]; %NPV initialization
6   for i= 2:1:n %starting from 2,it increases the value by one until n
7      NPV(1,i-1)= cumulated+((cash_flow(2,i))/((1+tax)^(i-2)));%NPV calculation
8      cumulated=NPV(1,i-1)%cumulated disconted cashflow
9   end
```

Fig.9: netpresentvalue2 function

Example 2

Calculate the Cumulated Discounted Cash Flows and find the payback period.

- Then, you have to import data with Numeric Matrix Output Type from the Excel file named “Exercise” (for more details, see Example 1).
- Finally, you have to call the function `netpresentvalue2` by entering the correct input.

```
>> Result2=netpresentvalue2(Exercise,r)
```

Fig.10: Call the function

Example 2

Calculate the Cumulated Discounted Cash Flows and find the payback period.

```
Result2 =

   1.0e+05 *

  Columns 1 through 12

   -7.5000   -5.6818   -4.1777   -2.9334   -1.9040   -1.0524   -0.3479    0.2349    0.7171    1.1160    1.4459    1.7189

  Columns 13 through 21

    1.9447    2.1315    2.2861    2.4140    2.5197    2.6072    2.6796    2.7395    2.7890
```

Payback period
Year=7

NPV

Fig.11: CDCFs

CHARTS

- Creating a chart is quick and easy.
- MATLAB provides various functions in order to graphically represent in 2D or even 3D a set of data on a Cartesian plane.
- You may carry out:
  - x,y diagrams
  - Histograms
- Showing data in a chart can help you evaluate your data and make comparisons between different values.

CHARTS

How to make a chart

- To make a chart you can use:
- `plot(x,y)`

  MATLAB generates a chart based on the x array for the X axis and the y array for the Y axis.

  NB. Arrays must be the same length

- `plot(x)`

  MATLAB generates a linear graph based on the x-array for both the X-axis and the Y-axis.

CHARTS - How to make a chart

Example

```
>> n=max(size(Exercise));
>> x=Exercise(1,2:n);
>> plot(Result2',x)
```

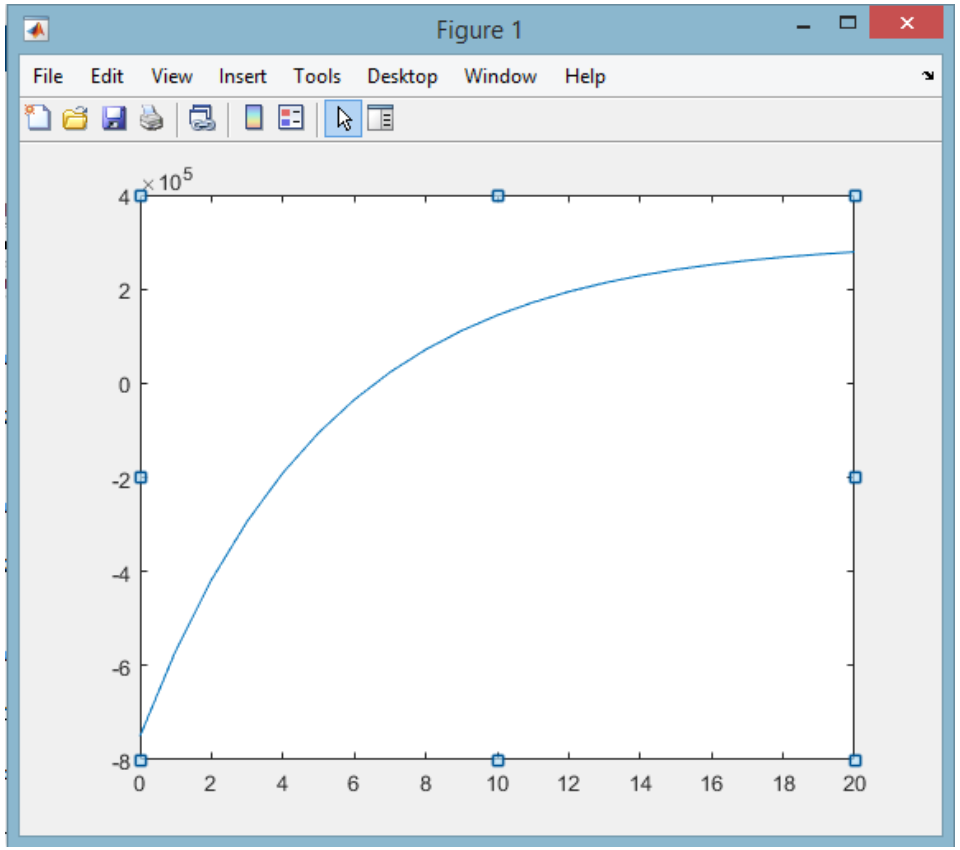

Fig.12: CDCFs chart

CHARTS - How to make a chart

Example

- Moreover, you can change the properties of the chart:
  - Title
  - Aces labels
  - Font
  - Legend
  - Colors

And so on

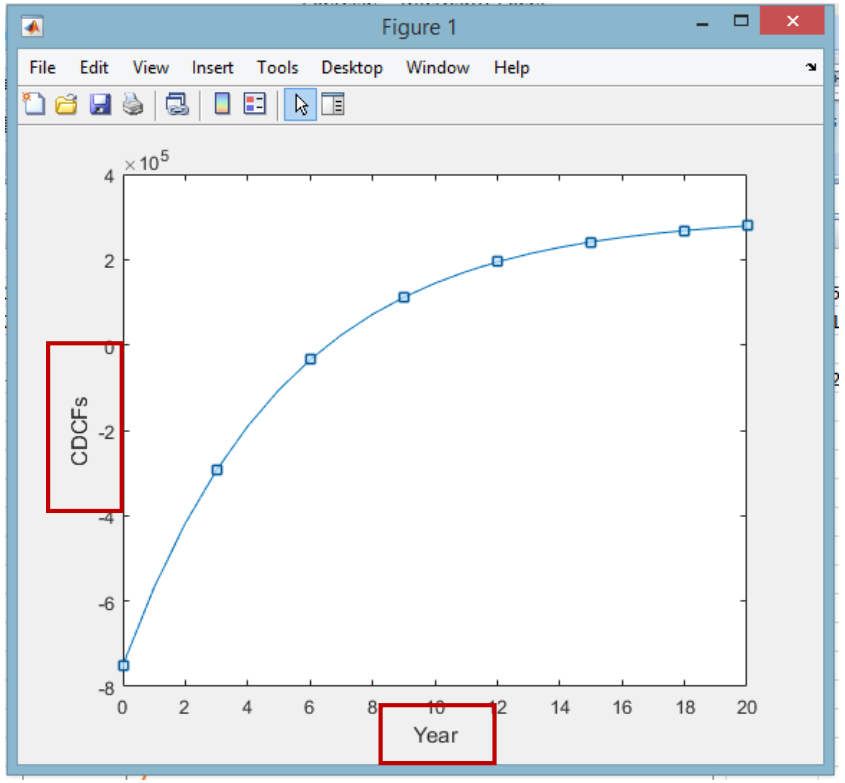

Fig.13: Modified chart

CHARTS

How to save a chart

1. Click on File.
2. Then, Save as.
3. Choose the Format.
4. Finally Save.

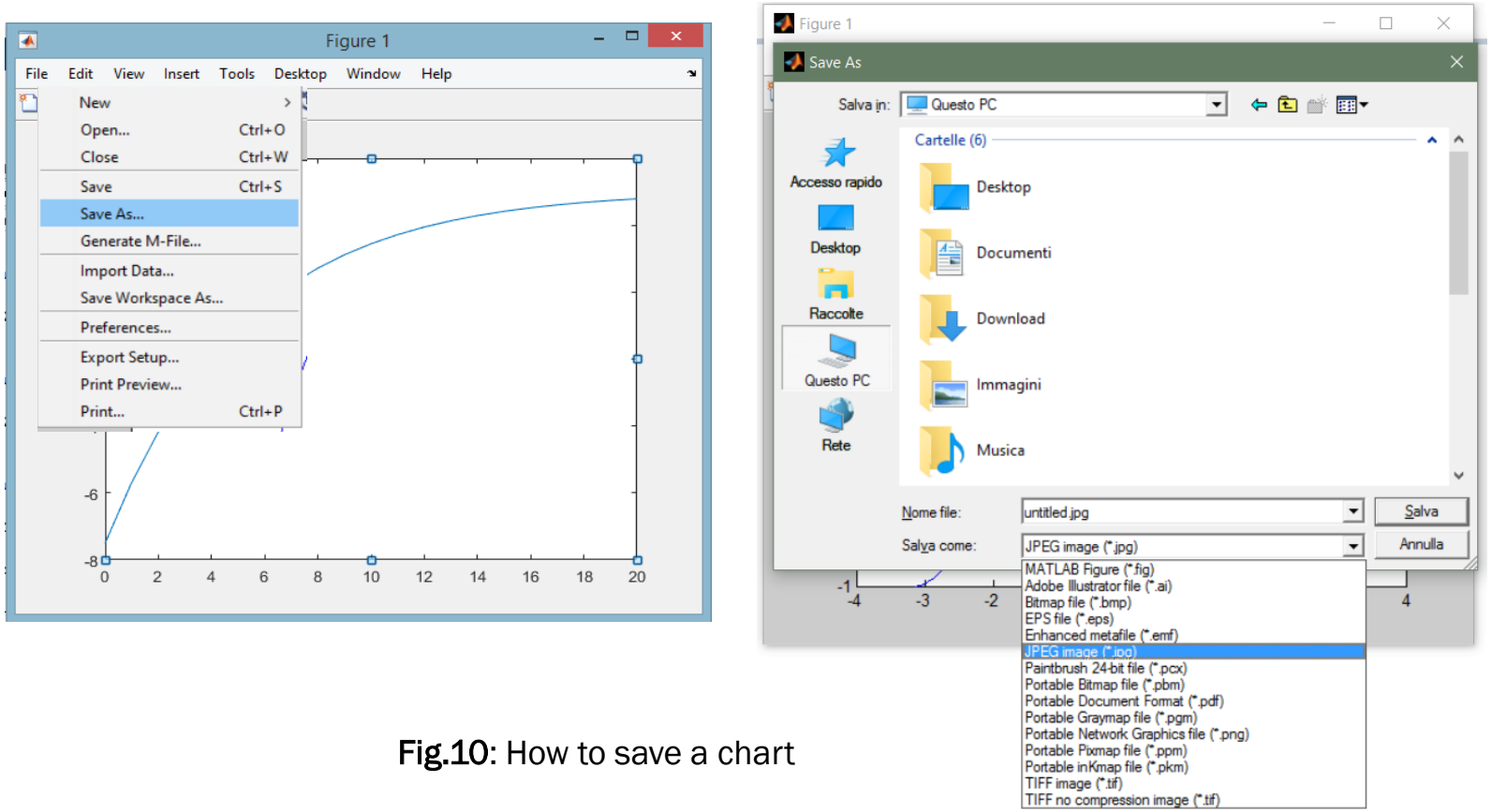

Fig.10: How to save a chart

MONTE CARLO SIMULATION

How to implement in MATLAB

Assessing a company's performance in terms of expected profit

1. First of all, you have to define the number of iterations.

```
>> number_of_runs=1000;
```

2. Second, you have to define the variables used to calculate the profit:
   - Price
   - Sold quantity
   - Variable unit cost
   - Fixed costs
   - Turnover

MONTE CARLO SIMULATION - How to implement in MATLAB

Assessing a company's performance in terms of expected profit

- All the variables can only assume positive values.
  - For this reason, the chisquare probability distribution has been chosen to run the simulation.

Rounding of values

Probability – array composed by 1000 rows and 1 colum of random numbers

```
>> price=round(chi2inv(rand(number_of_runs,1),200));
>> variableunitcost=round(chi2inv(rand(number_of_runs,1),80));
>> soldquantity=round(chi2inv(rand(number_of_runs,1),1100));
>> fixedcosts=ones(number_of_runs,1)*80000;

>> turnover= price.*soldquantity
```

Degrees of freedom

Assessing a company's performance in terms of expected profit

3. Third, you have to calulate the expected total profit.

```
>> profit= turnover – (variableunitcost.*soldquantity) - fixedcost
```

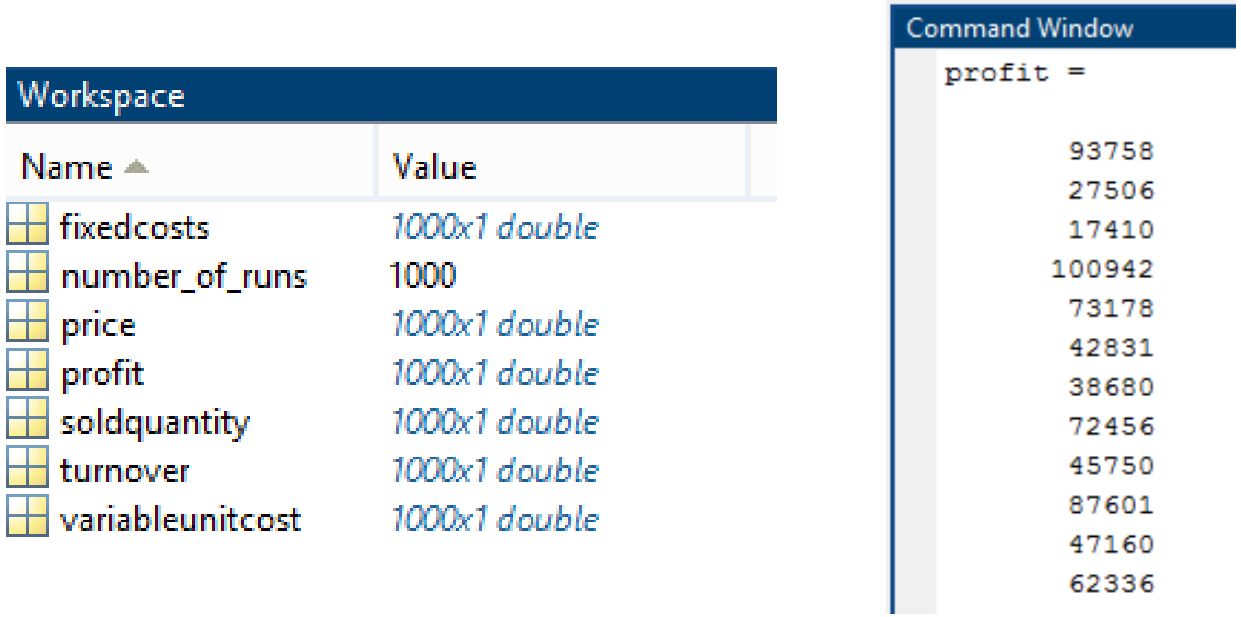

Fig.11: Variables and Profit values

Assessing a company's performance in terms of expected profit

4. Moreover, you can generate an histogram of the distribution of the expected profit.

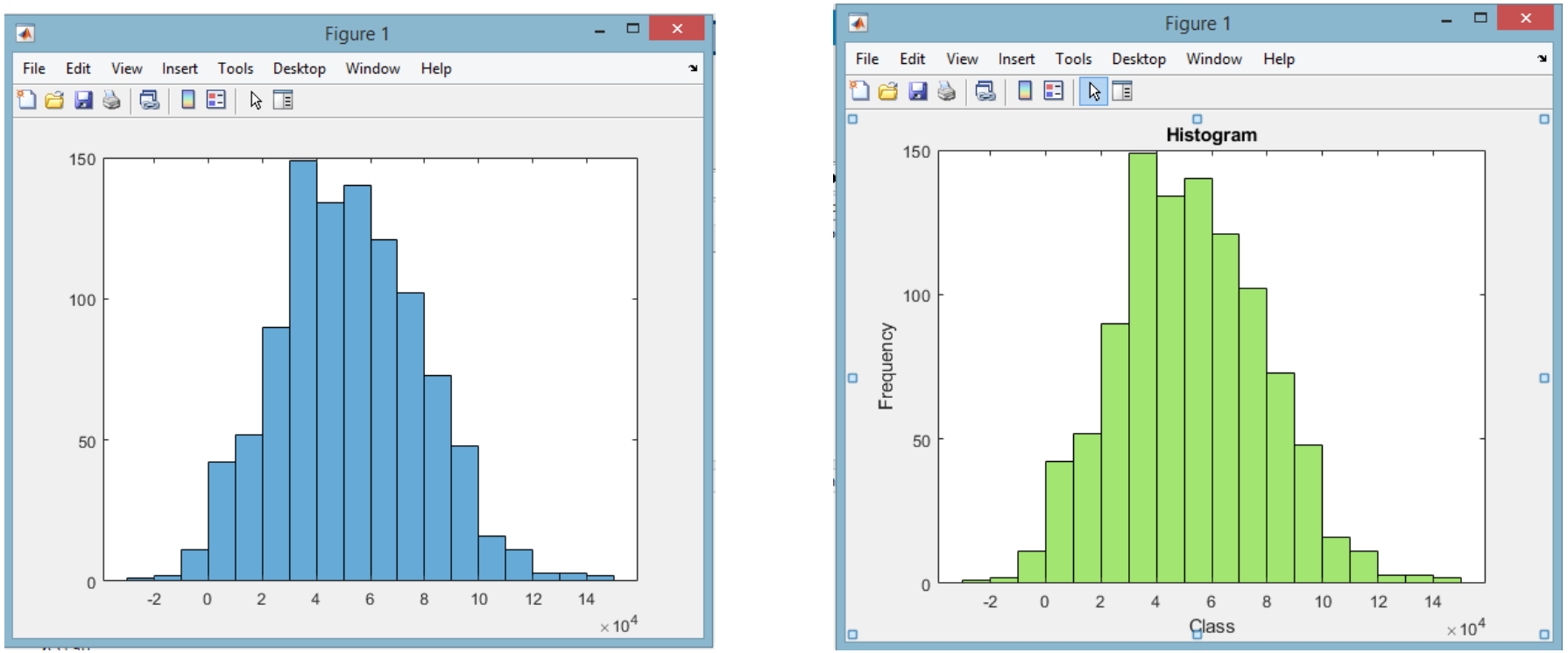

Fig.12: Histogram before and after changes

Assessing a company's performance in terms of expected profit

5. Finally, you can calculate descriptive statistics:

```
>> mean(profit)

ans =

   5.2242e+04
```

```
>> min(profit)

ans =

      -25198
```

```
>> max(profit)

ans =

      149446
```

```
>> median(profit)

ans =

       51293
```

```
>> std(profit)

ans =

   2.6451e+04
```

```
>> sum(profit)

ans =

     52241572
```

Fig.13: Some descriptive statistics

EXPORTING DATA

How to export data into an Excel file

1. You have to use the following function:

```
>> xlswrite('Cartel1.xlsx',abcde)
```

Excel file name with extension .xlsx

Name of the Matrix,Array etc. that you want to export in the Excel file

Example

Exporting Monte Carlo Simulation data

- First, you have to insert into a single matrix all the variables already defined.
- To do so, write in the Command Window:

```
>> companyassessment=[price,variableunitcost,soldquantity,
fixedcosts,turnover,profit]
```

```
companyassessment =

   223    60  1066  80000  237718   93758
   184    86  1097  80000  201848   27506
   168    83  1146  80000  192528   17410
   227    68  1138  80000  258326  100942
   221    82  1102  80000  243542   73178
   202    89  1087  80000  219574   42831
   194    74   989  80000  191866   38680
   198    62  1121  80000  221958   72456
```

Fig.14: Company assessment matrix

Example

Exporting Monte Carlo Simulation data

- Then, use the `xlswrite` function:

```
>> xlswrite('Montecarlo.xlsx',companyassessment)
```

- After a short period of time, in the Current Folder, the Montecarlo.xlsx file will appear.

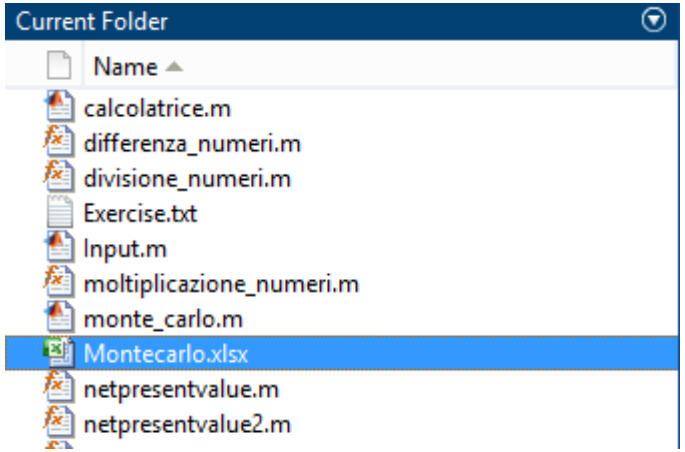

Fig.15: Current Folder

Example

- Now, if you open the Montecarlo file, you will find the 'companyassessment matrix'.

	A	B	C	D	E	F
1	price	variableunitcost	soldquantity	fixedcosts	turnover	profit
2	223	60	1066	80000	237718	93758
3	184	86	1097	80000	201848	27506
4	168	83	1146	80000	192528	17410
5	227	68	1138	80000	258326	100942
6	221	82	1102	80000	243542	73178
7	202	89	1087	80000	219574	42831
8	194	74	989	80000	191866	38680
9	198	62	1121	80000	221958	72456
10	205	80	1006	80000	206230	45750
11	208	47	1041	80000	216528	87601
12	194	84	1156	80000	224264	47160
13	203	75	1112	80000	225736	62336
14	206	71	1103	80000	227218	68905

Fig.17: Final Montecarlo Excel file

	A	B	C	D	E	F
1	223	60	1066	80000	237718	93758
2	184	86	1097	80000	201848	27506
3	168	83	1146	80000	192528	17410
4	227	68	1138	80000	258326	100942
5	221	82	1102	80000	243542	73178
6	202	89	1087	80000	219574	42831
7	194	74	989	80000	191866	38680
8	198	62	1121	80000	221958	72456
9	205	80	1006	80000	206230	45750
10	208	47	1041	80000	216528	87601
11	194	84	1156	80000	224264	47160
12	203	75	1112	80000	225736	62336
13	206	71	1103	80000	227218	68905
14	196	63	1102	80000	215992	66566

Fig.16: Montecarlo Excel file

- You can edit the spreadsheet to make it more readable.

FURTHER MATERIAL

To review and deepen the topics of this lecture

1. MATLAB online help.
2. https://www.youtube.com/watch?v=B2EnxvW6wVs
3. https://www.youtube.com/watch?v=cyxFsSJSxwE
4. https://www.youtube.com/watch?v=1WcHz_JqnJ8