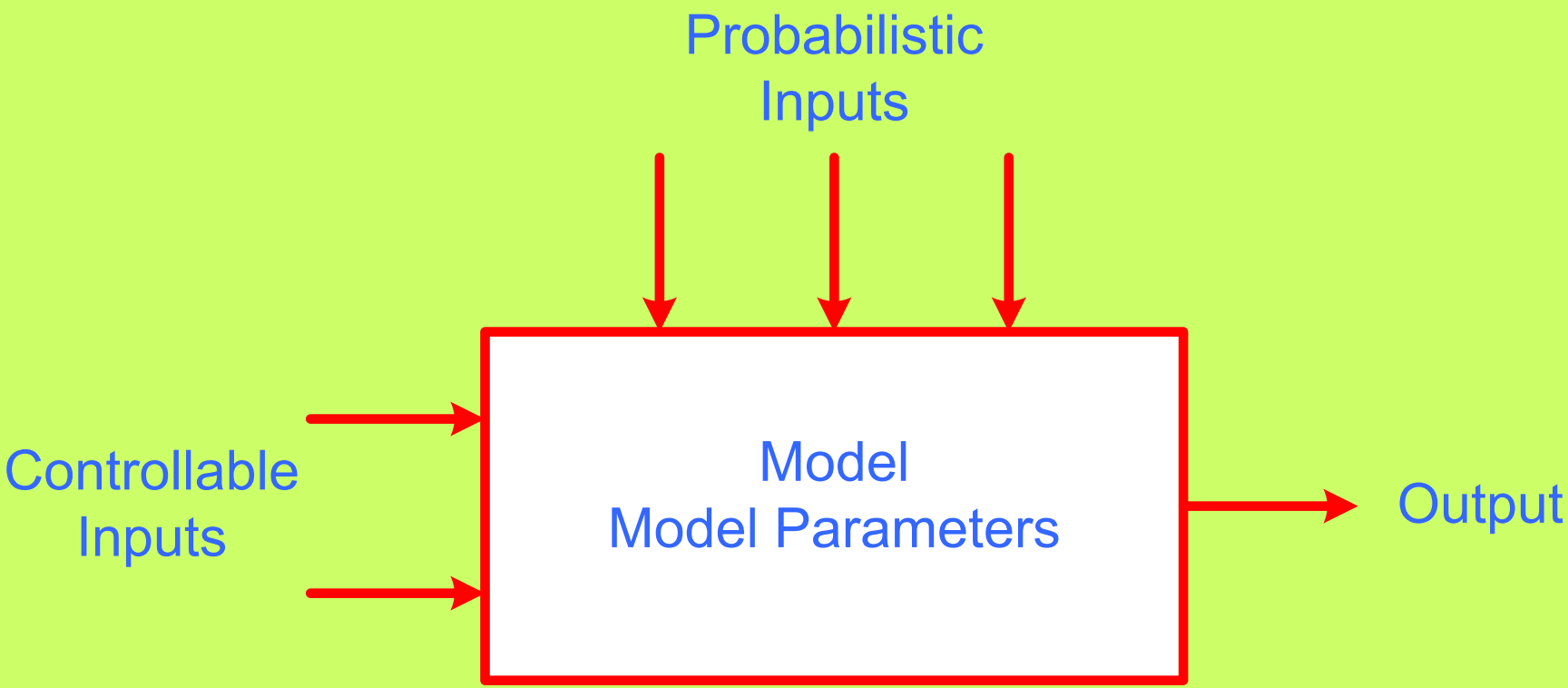

SIMULATION

Simulation: Definition

- Simulation is a mathematical model of a real system.
- The system consists of inputs and outputs and a mathematical expression.
- We obtain the outputs by manipulation of the inputs using the mathematical expression.

Simulation Model



Risk Analysis: Example

- PortaCom manufactures printers.
- These parameters apply:
  - Selling price = 249 per unit
  - Administrative Cost = 400,000
  - Advertising cost = 600,000
- Cost of direct labor, cost of parts, and the 1st year demand are probabilistic.
- PortaCom wishes to investigate its profitability

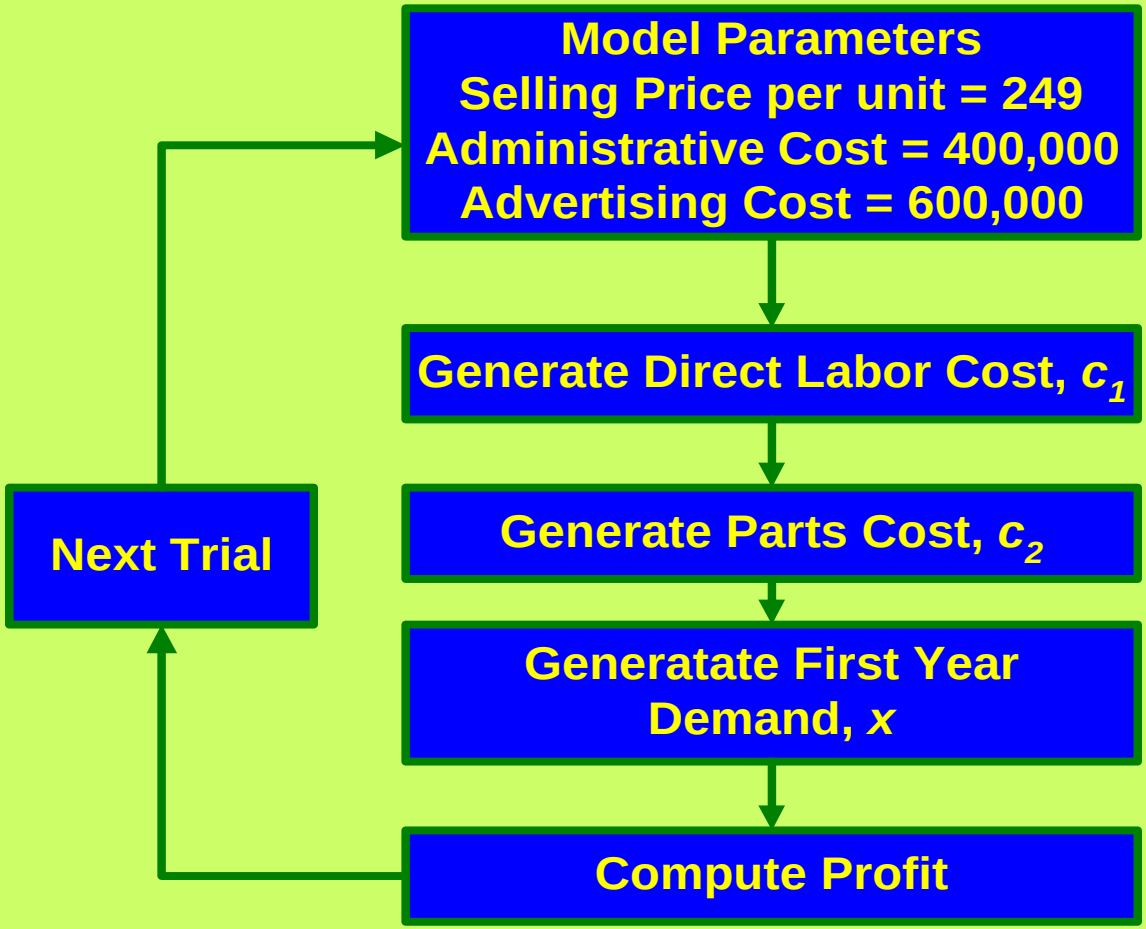
Profit Model

Profit = (249 – Direct labor cost per unit –
parts cost per unit) (Demand) – 1,000,000

Direct Labor Cost per Unit

Direct Labor Cost per Unit	Probability
43	0.1
44	0.2
45	0.4
46	0.2
47	0.1

Flow Chart for PortaCom Simulation



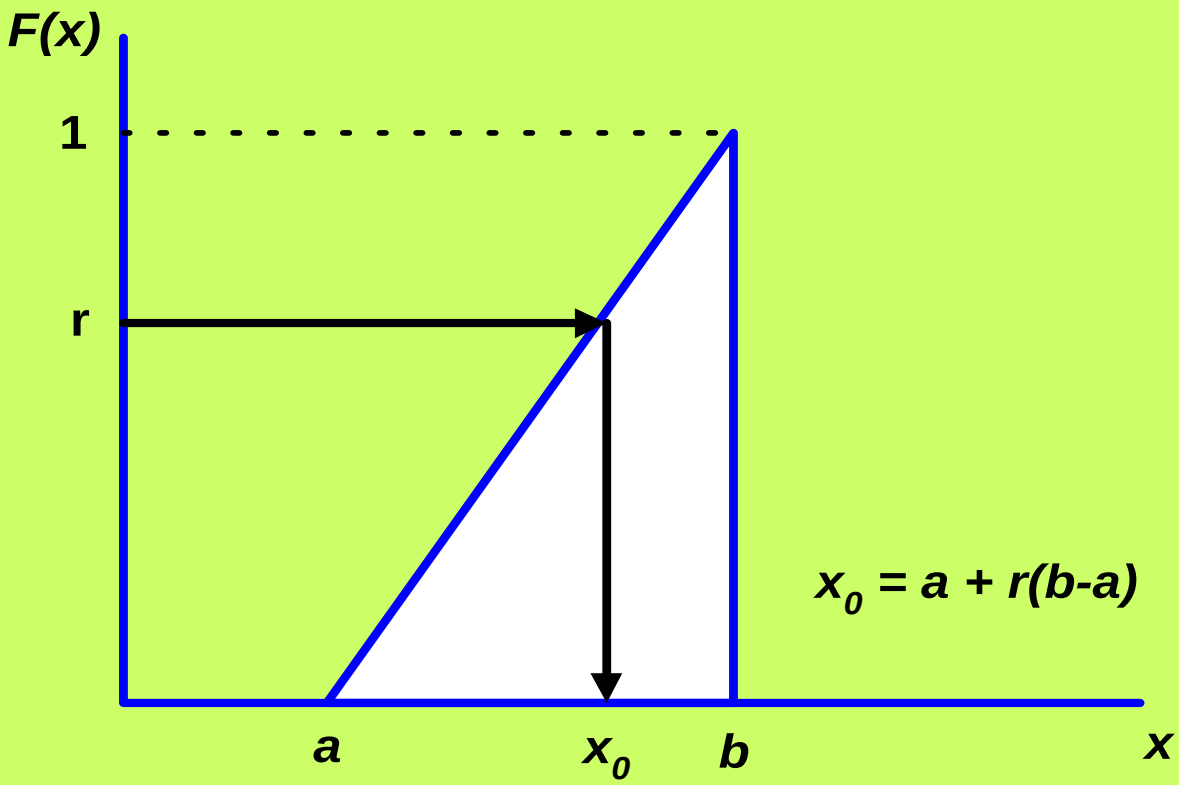
Random Process Generator

- In order to generate values from the probability distributions of each RV, we rely on generating Random Numbers.
- When a random number is generated we can associate it with a value from the probability distribution of the RV.

Associating RN to Direct Labor Cost per Unit

Direct Labor Cost per Unit	Probability	Assign this row cost if RN lies within this interval
43	0.1	0.0 – 0.0999
44	0.2	0.1 – 0.2999
45	0.4	0.3 – 0.6999
46	0.2	0.7 – 0.8999
47	0.1	0.9 – 0.9999

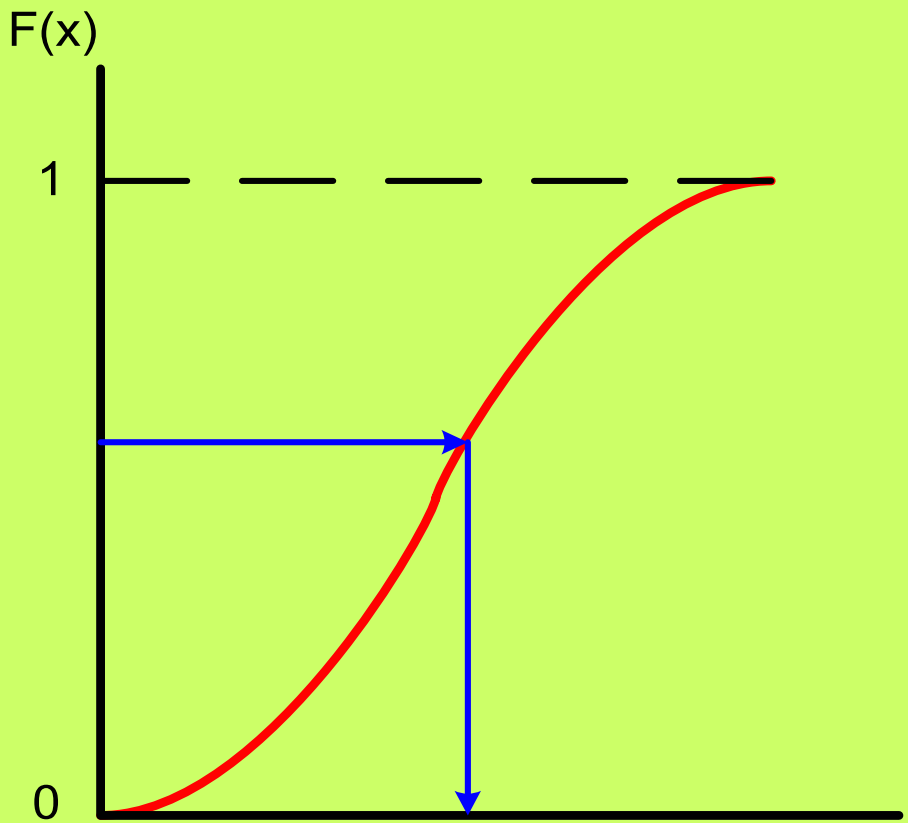
Associating RN to a Value from a Uniform Distribution



Parts cost = 80 + 20r

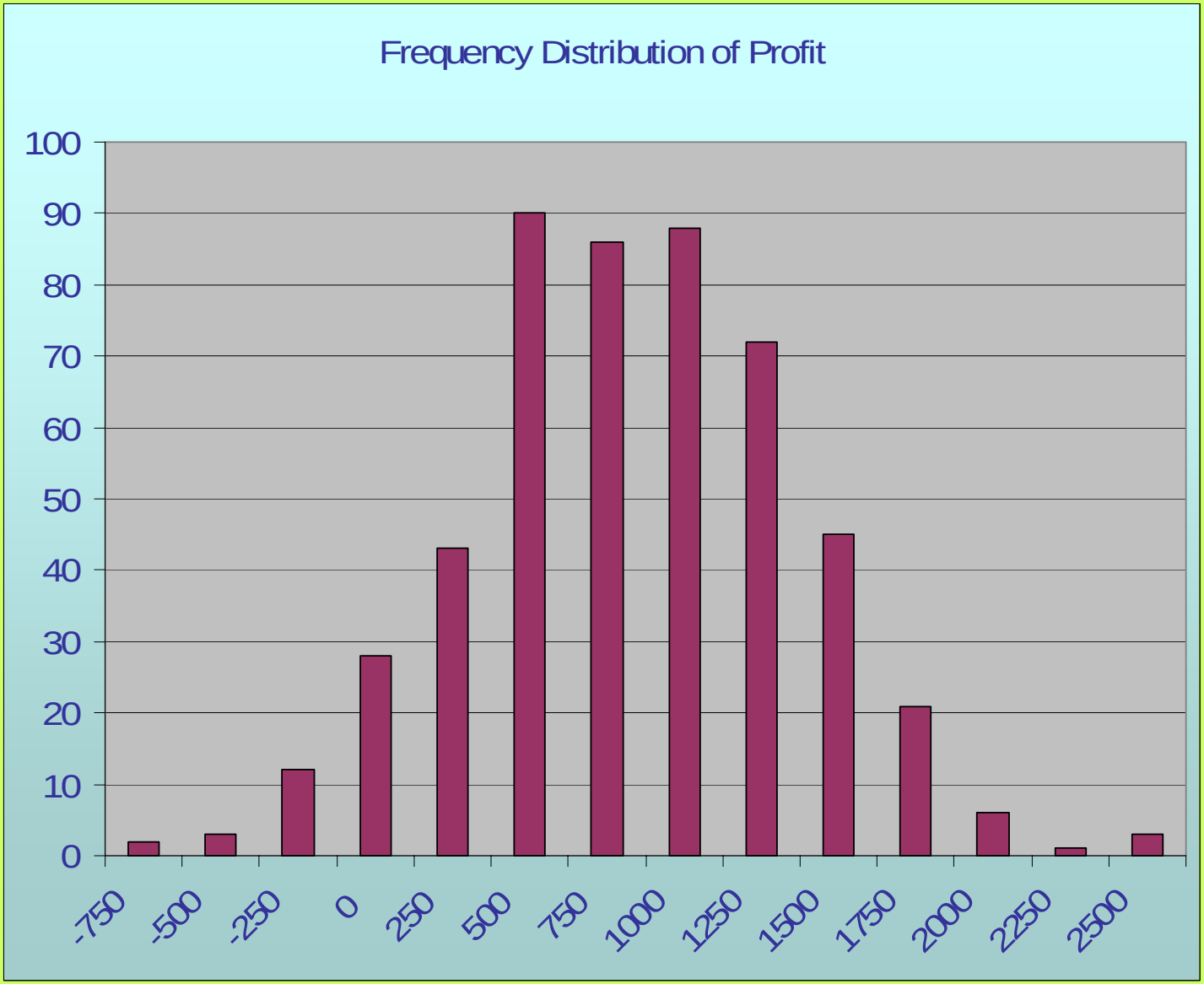
Trial	RN	Parts Cost
1	0.6836	93.67
2	0.7417	94.83
3	0.9401	98.80
4	0.2894	85.79
5	0.7866	95.73
6	0.4248	88.50
7	0.3342	86.68
8	0.0445	80.89
9	0.9042	98.08
10	0.5910	91.82
11	0.1122	82.24

Associating RN to a Value from a Normal Distribution



Demand = N(15,000,4500)

Trial	RN	Demand
1	0.4371	13,635
2	0.4338	13,336
3	0.6412	16,659
4	0.1974	14,019
5	0.4896	18,516
6	0.5279	14,228
7	0.1603	19,994
8	0.8459	19,454
9	0.2146	13,271
10	0.0383	19,209
11	0.4968	18,923


Frequency Distribution of Profit
100
90
80
70
60
50
40
30
20
10
0
-750
-500
-250
0
250
500
750
1000
1250
1500
1750
2000
2250
2500