
Pensions, Lotteries, Financial Markets: Measuring Statistical Risk

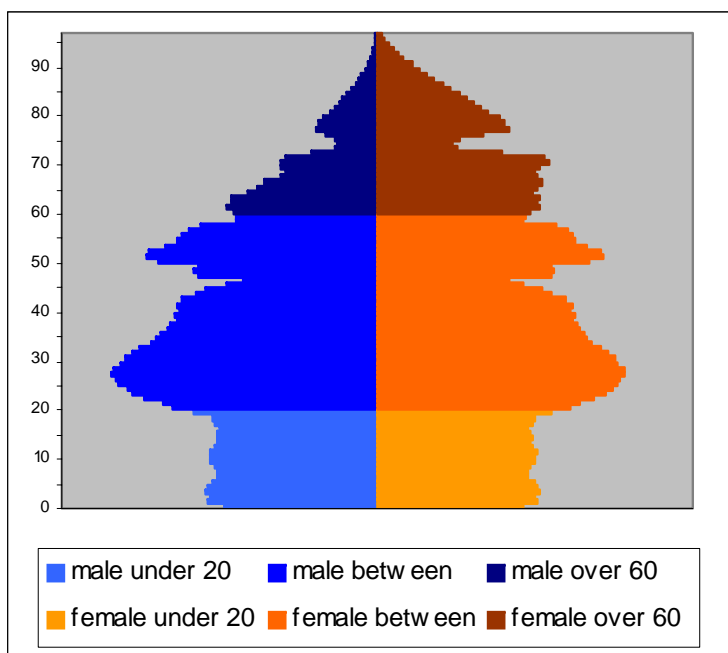
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Pension Systems

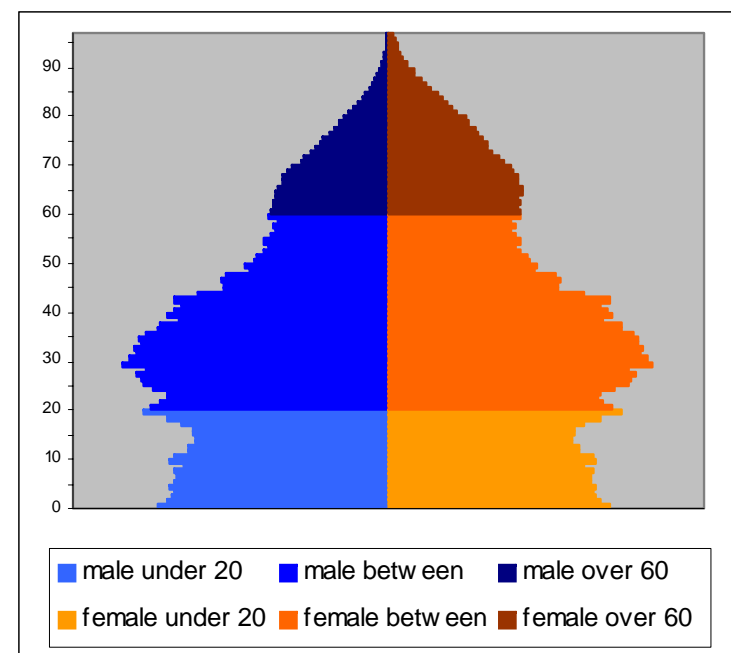
□ How risky are the demographics ?

Germany



1991

USA



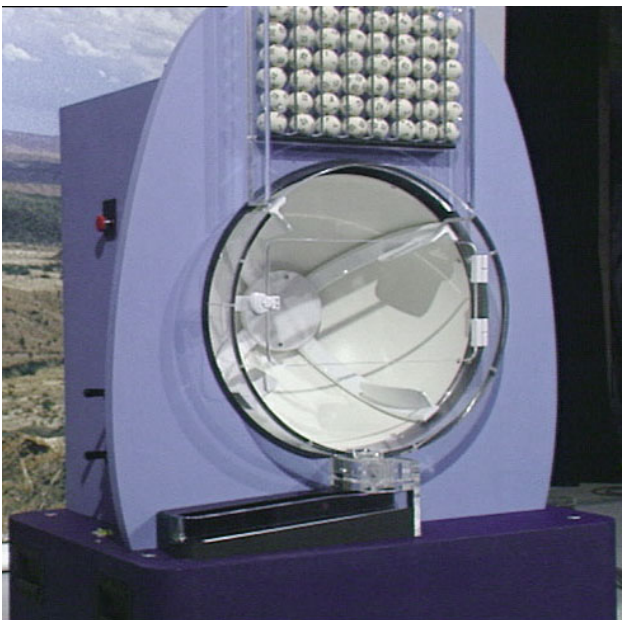
1991

Measuring Statistical Risk

- ▣ **Basis for rational decisions**
- ▣ **Dynamic Visualization**
- ▣ **Fast computing of different scenarios**

Lotteries

- ▣ Are there „winning numbers“ ?
- ▣ How much cash predicts the theory ?
- ▣ What are the odds ?



1	X	3	4	5	X	X	1	2	3	4	5	X	7	1	2	3	4	5	6	7
8	9	10	11	12	13	14	8	9	10	11	X	13	14	8	9	10	11	12	13	14
15	16	17	18	19	20	21	15	16	17	18	19	20	21	15	16	17	18	X	20	21
X	23	24	25	26	27	28	X	23	24	X	26	27	28	X	23	24	25	26	27	28
29	30	31	32	33	34	X	29	30	31	32	33	34	35	29	30	31	32	33	34	35
X	37	38	39	40	41	42	X	37	X	39	40	41	42	36	37	X	39	X	41	X
43	44	45	46	47	48	49	X	X	45	46	47	48	49	43	44	45	46	47	48	X

1	2	3	4	5	6	7	1	2	3	4	5	6	X	1	2	3	4	5	6	7
8	9	X	11	12	X	14	X	9	X	11	12	X	14	8	9	10	11	12	13	X
15	16	17	18	19	20	21	15	16	17	18	19	20	21	15	16	17	18	19	20	21
22	23	24	25	26	27	28	22	23	24	25	26	27	28	22	X	24	25	26	X	28
29	30	31	32	X	34	35	29	30	X	X	33	34	35	29	X	31	32	X	34	35
36	37	38	39	40	X	X	36	37	38	39	40	41	42	X	37	38	39	40	41	42
X	44	45	46	47	48	49	X	44	45	46	47	48	49	43	44	45	46	47	48	49

Lotteries

▣ What are the odds ?

s possible numbers. „s choose r“ .

$$\binom{s}{r} = \frac{s!}{r!(s-r)!}$$

D s=49, r=6

13 983 816

A, CH s=45, r=6

8 145 060

Lotteries

▣ Are there „winning numbers“ ?

(1, 8, 15, 22, 29, 36); (19, 27, 29, 31, 38, 44);

(2, 15, 14, 1, 16, 1, 18, 20, 5) = (B,O,N,A,P,A,R,T,E) ?

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49

1	2	3	4	5	6	7
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29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49

popular „9“
unpopular „43“

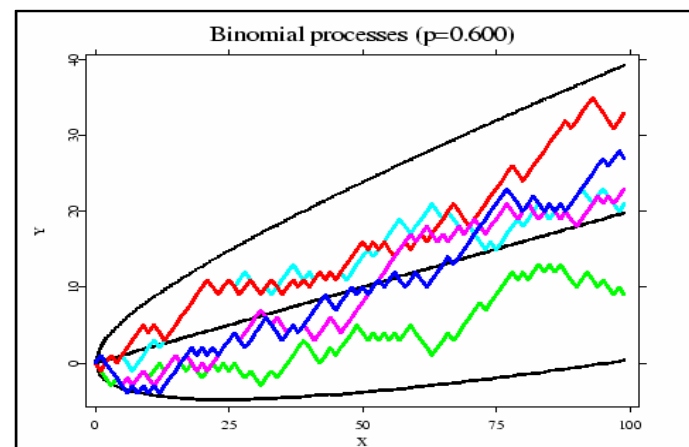
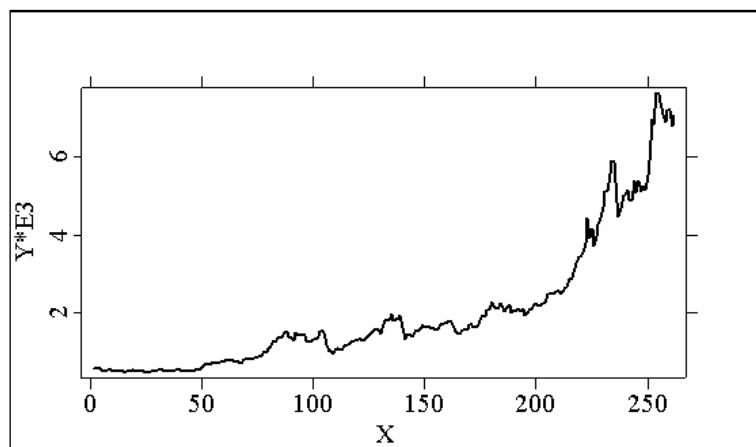
frequency=1.4
frequency=0.6

Measuring Statistical Risk

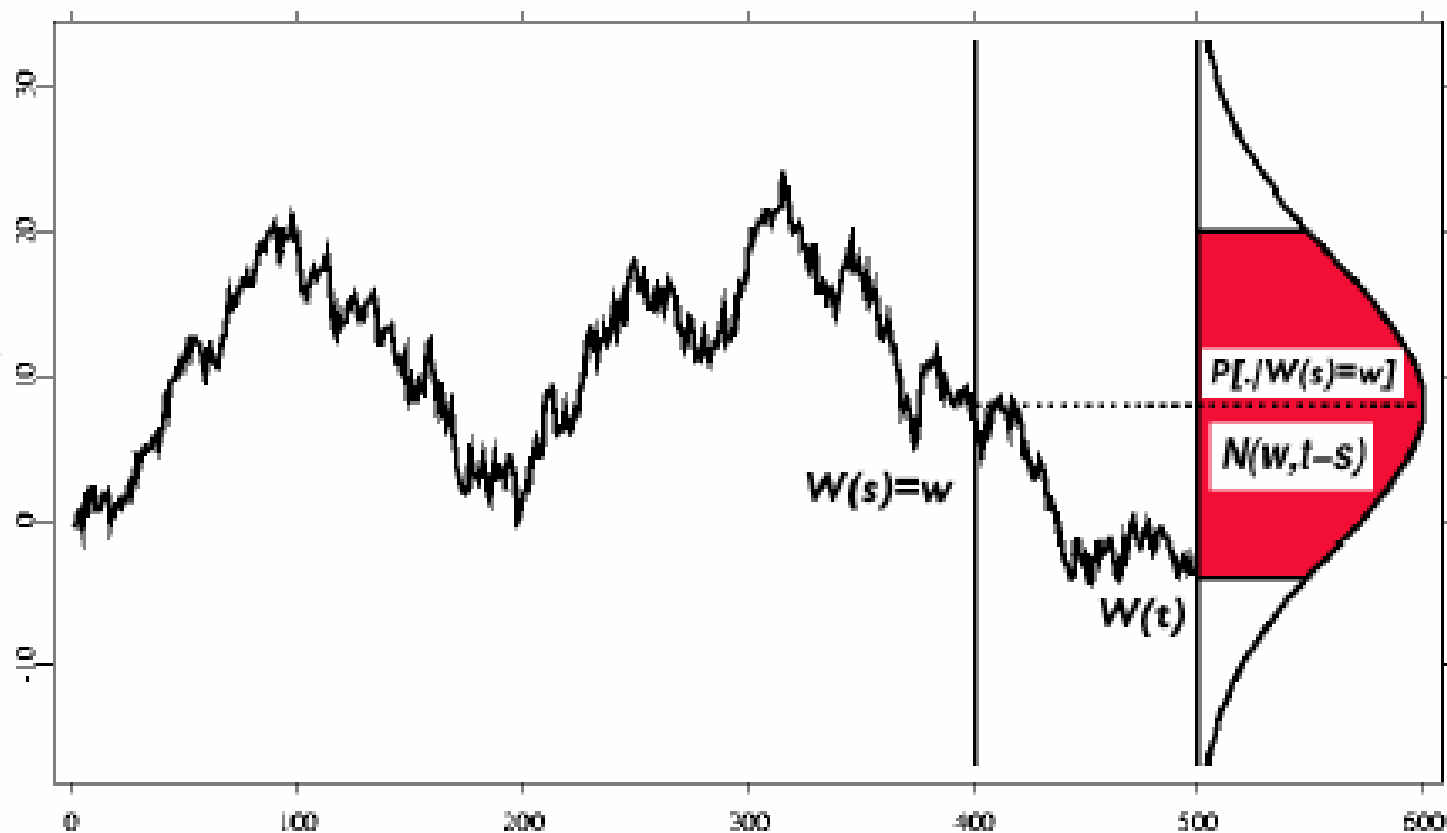
- ▣ Numbers below 31 have lower payment
- ▣ Test on uniform distribution (quality control)
- ▣ Different random mechanisms (D, A, USA)

Financial Markets

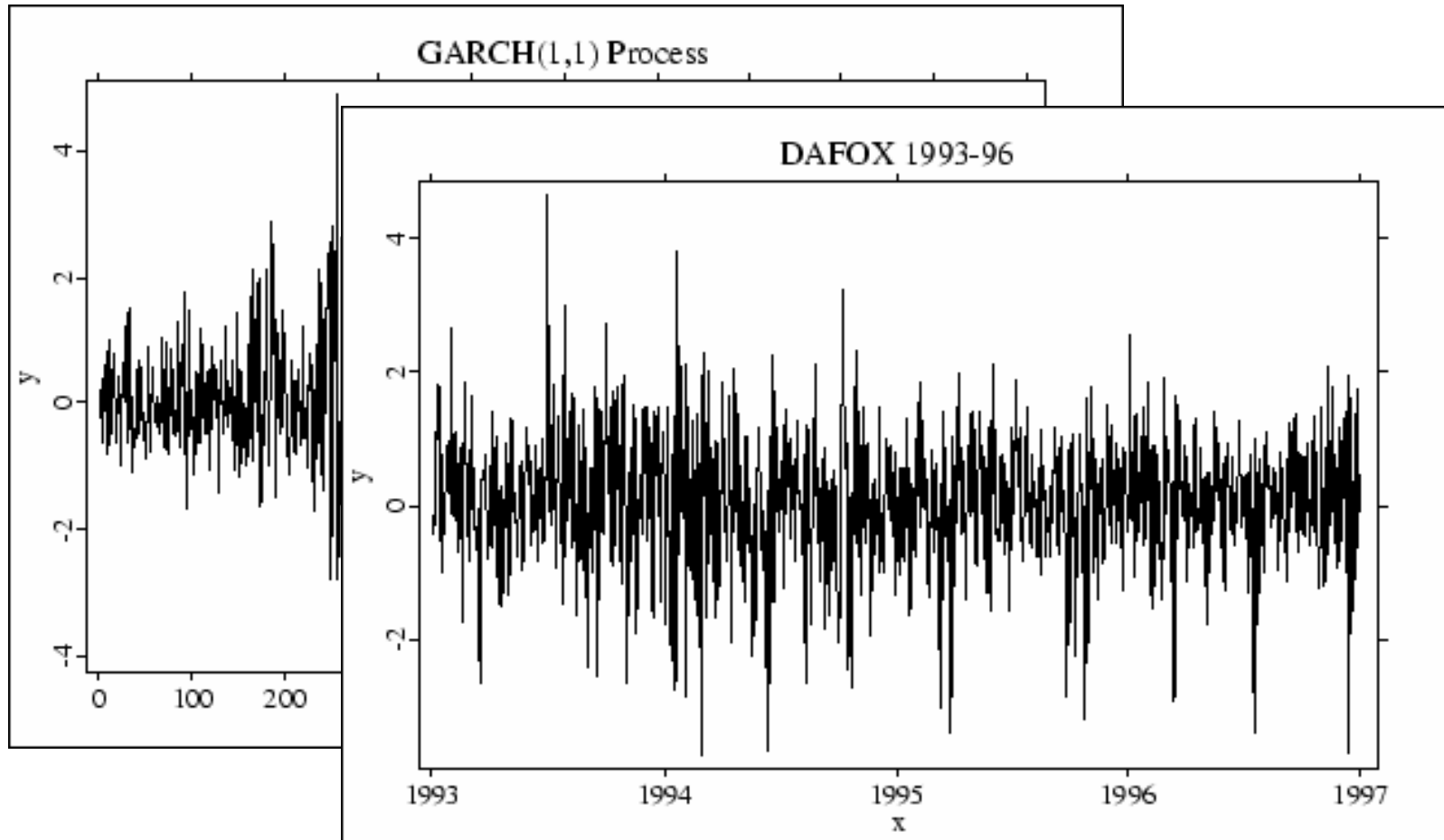
- ▣ How volatile is a portfolio ?
- ▣ Risk Management
- ▣ Option pricing



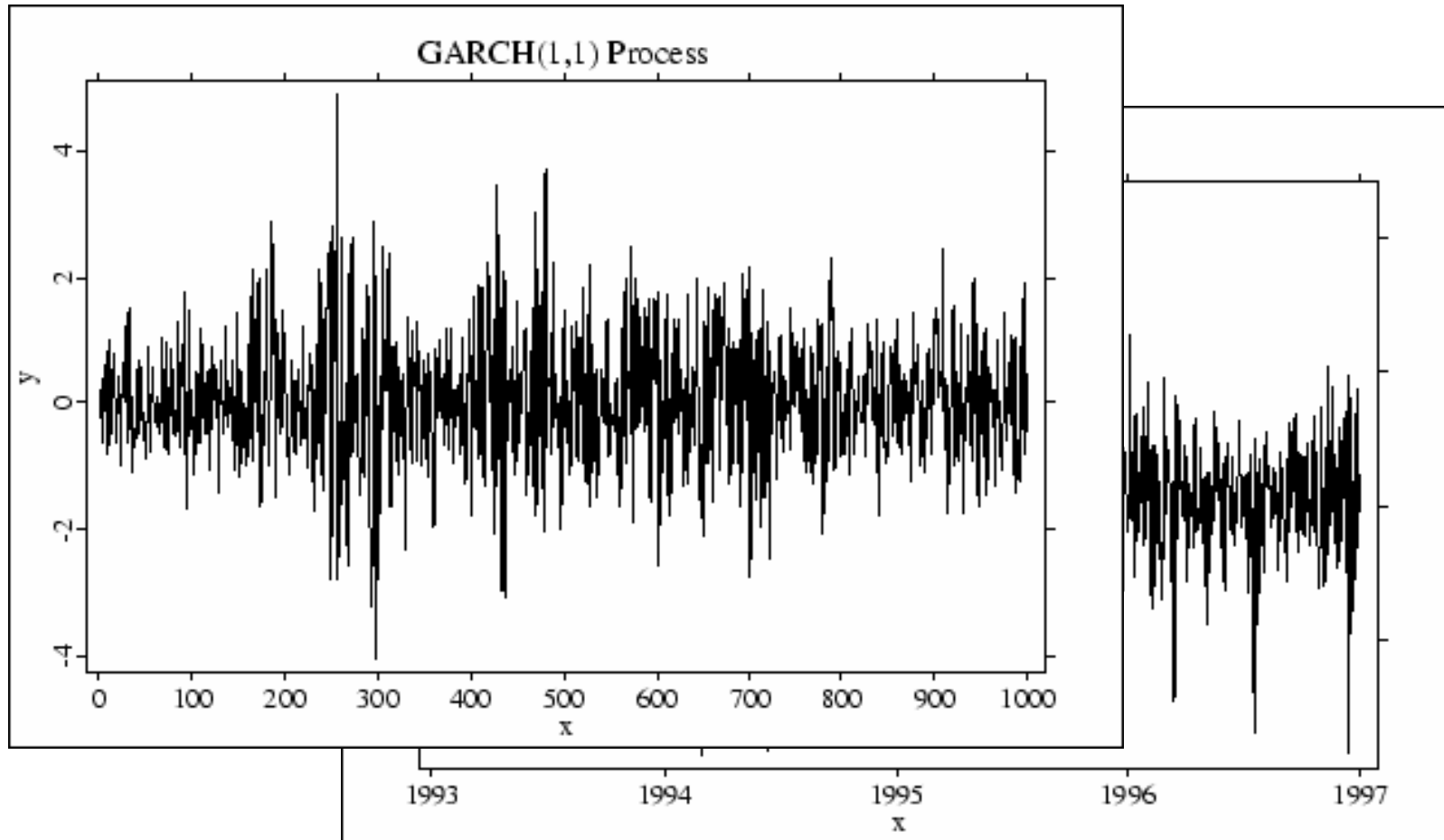
Financial Markets



Financial Markets



Financial Markets



Financial Markets

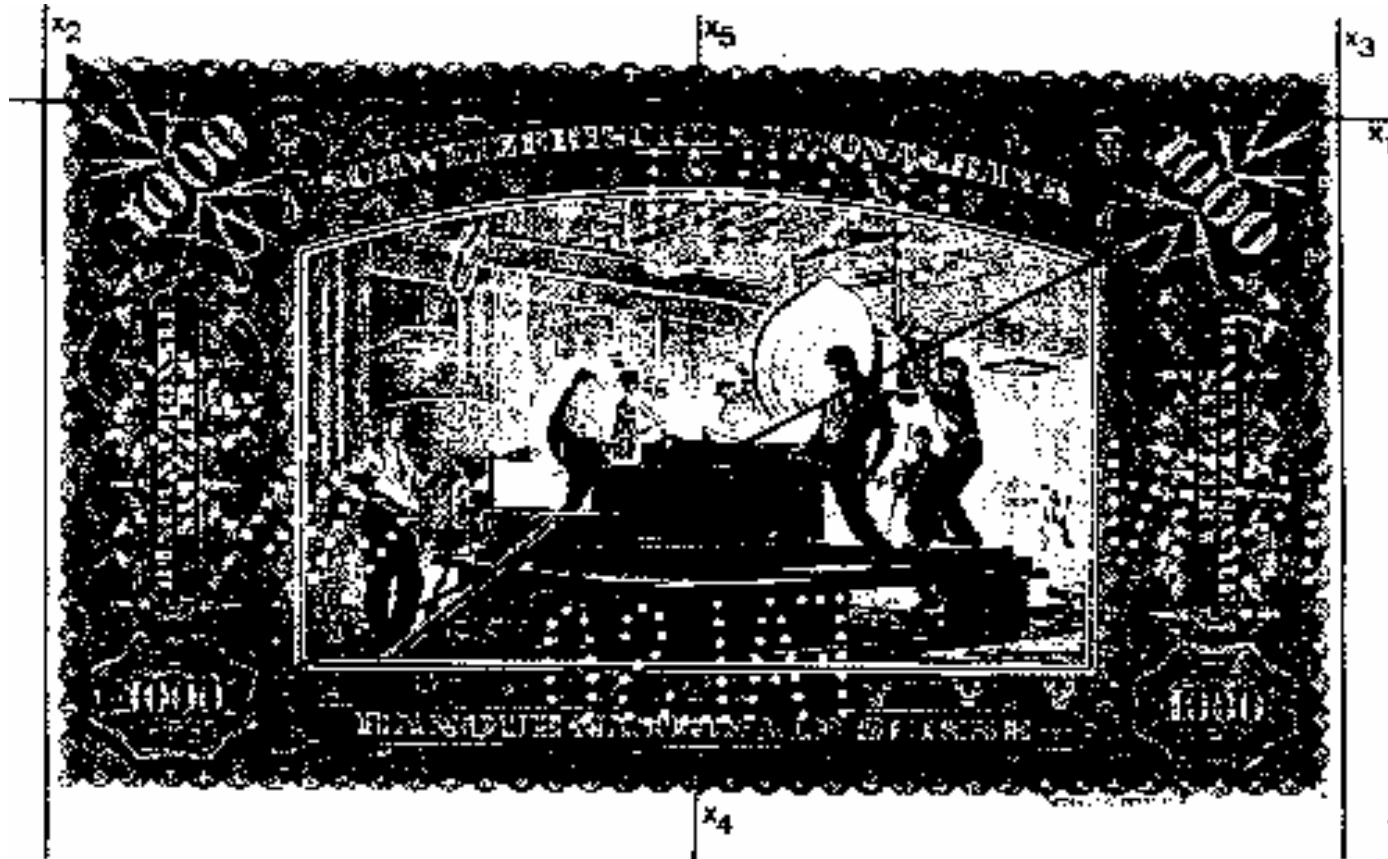
- ▣ **Credit Scoring**
- ▣ **Real estate valuation**



Measuring Statistical Risk

- ▣ **Valuation in the presence of uncertainty**
- ▣ **Volatility prognosis**
- ▣ **Transparency for developers and investors**

Graphical Methods



Graphical Methods

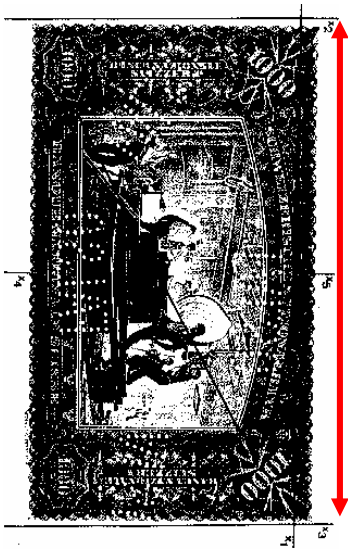
X1	X2	X3	X4	X5	X6
214,5	129,5	129,3	7,4	10,7	141,5
214,7	129,6	129,5	8,3	10,0	142,0
215,6	129,9	129,9	9,0	9,5	141,7
215,0	130,4	130,3	9,1	10,2	141,1
214,4	129,7	129,5	8,0	10,3	141,2
215,1	130,0	129,8	9,1	10,2	141,5
214,7	130,0	129,4	7,8	10,0	141,2
214,4	130,1	130,3	9,7	11,7	139,8
214,9	130,5	130,2	11,0	11,5	139,5
214,9	130,3	130,1	8,7	11,7	140,2
215,0	130,4	130,6	9,9	10,9	140,3
214,7	130,2	130,3	11,8	10,9	139,7
215,0	130,2	130,2	10,6	10,7	139,9
215,3	130,3	130,1	9,3	12,1	140,2

X1 length
X2 height (left)
X3 height (right)
X4 distance (low)
X5 distance (up)
X6 diagonal

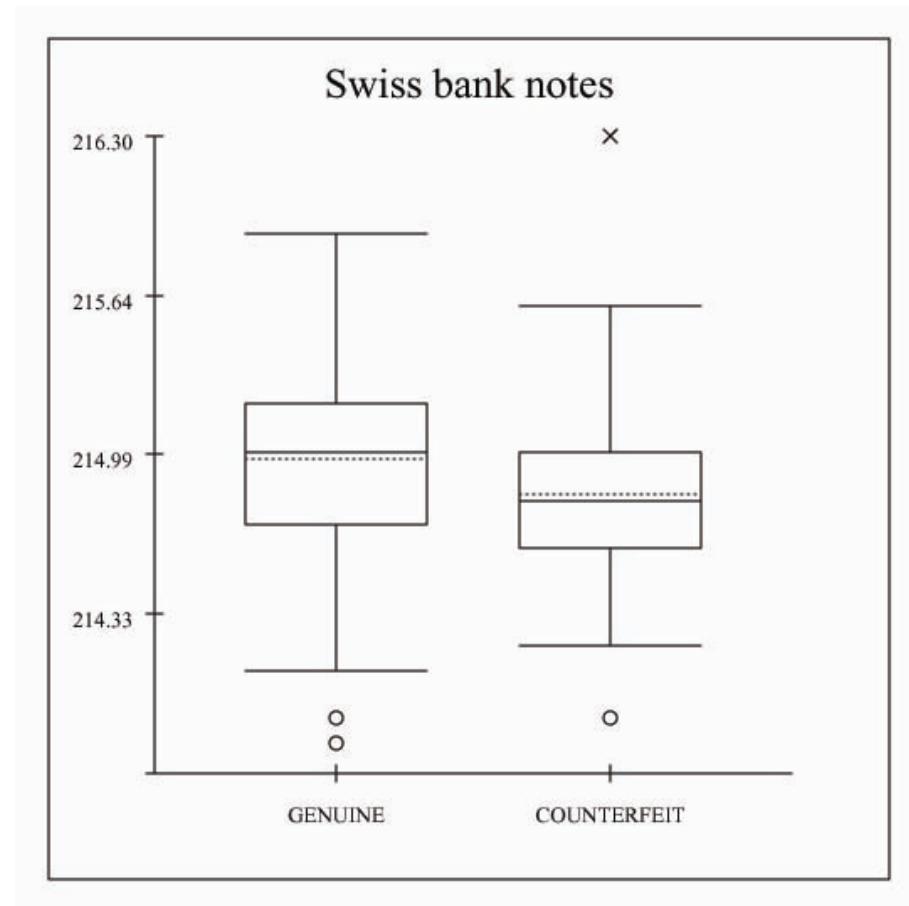
measured in mm

Graphical Methods

▣ Boxplots

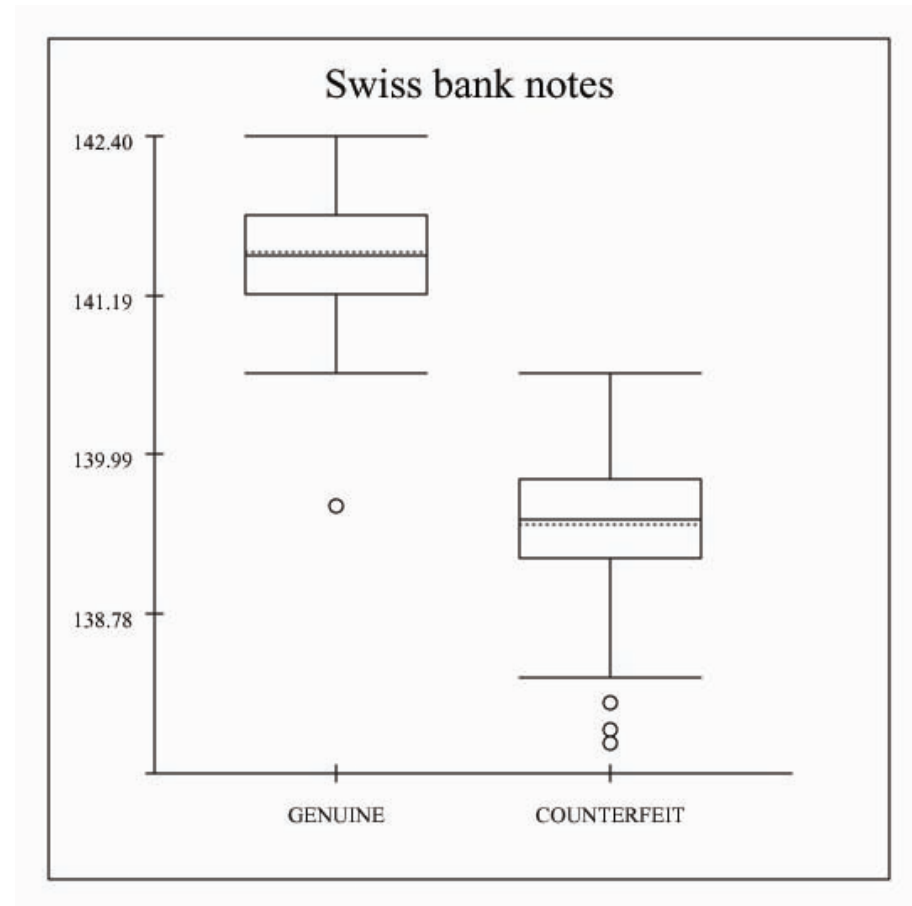
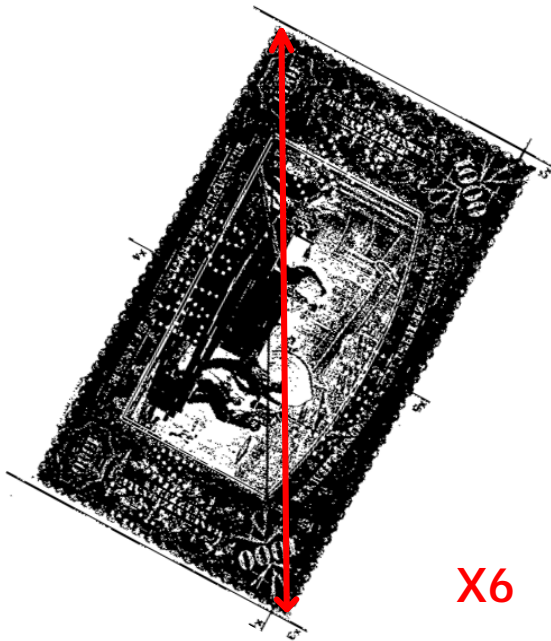


X1



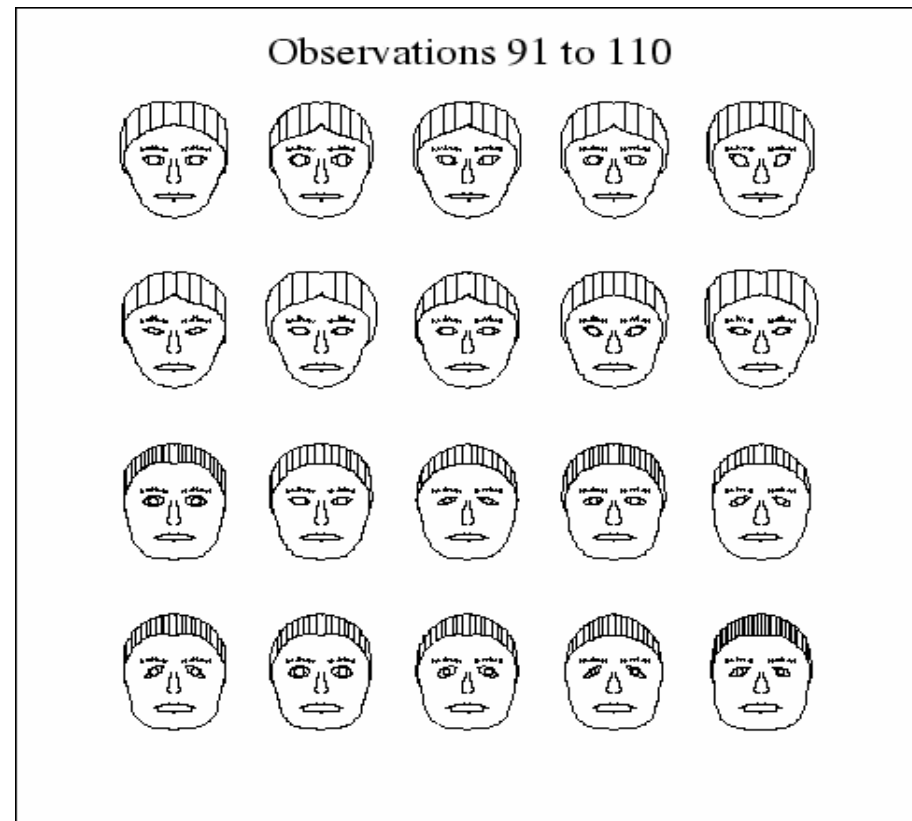
Graphical Methods

▣ Boxplots



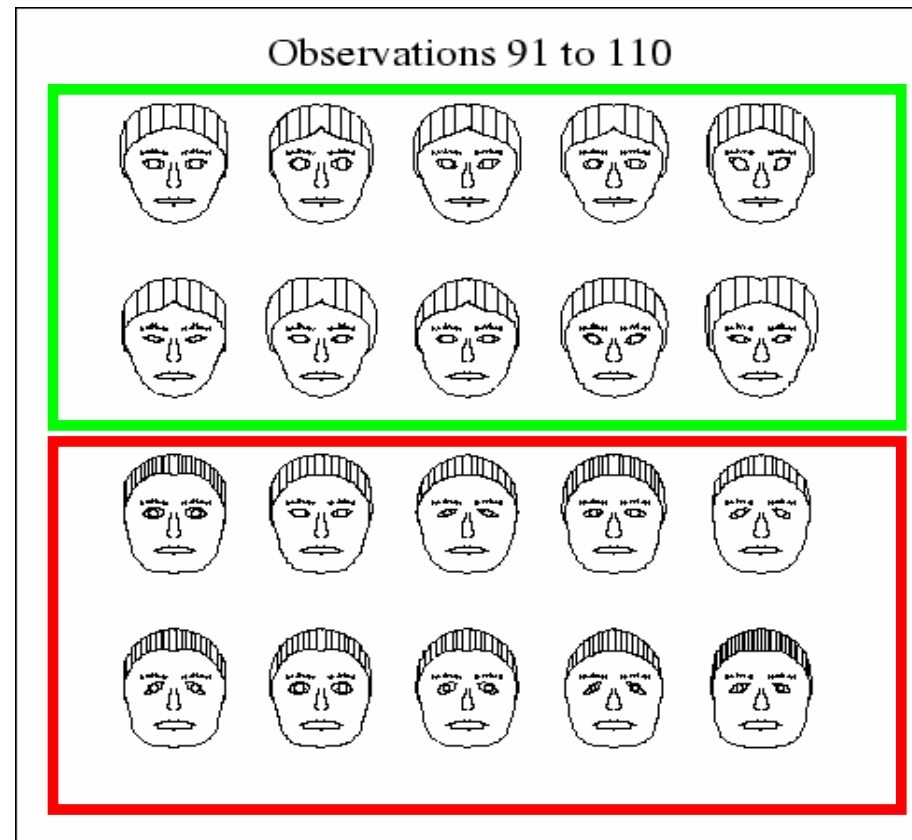
Graphical Methods

▣ Flury-Faces



Graphical Methods

▣ Flury-Faces

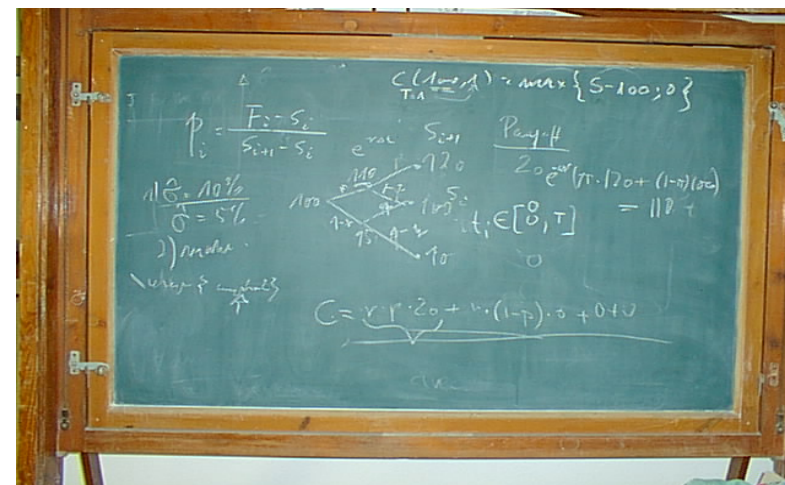


Measuring Statistical Risk

- ▣ **Simple and computer intensive methods**
- ▣ **Graphical and numerical procedures**
- ▣ **Static and dynamic presentations**

Conclusion

May we enjoy
our luxurious pensions
in well furnished houses
in best locations
(financed from jackpot hits)
and correctly visualize
and evaluate our portfolio risks ?



**Certainly not without a solid
statistical risk measurement!**