

Oppgave 3 - Avsluttende eksamen 2014

Binomisk fordelt var N
 $N \sim \text{Bin}(n, p)$

- ① Først ant obs. n
- ② Hver av de n obs. er uavh.
- ③ To (2) mulige utfall av hver obs: suksess eller ikke suksess
- ④ Suksess-sanns. p for hver av obs

$N =$ ant suksesser

$$N = S_1 + S_2 + \dots + S_n$$

$S_i = 1$ hvis obs i suksess
 $S_i = 0$ ellers

$$3a) \mu_N = \mu_{S_1 + S_2 + \dots + S_n} = \mu_{S_1} + \mu_{S_2} + \dots + \mu_{S_n} \\ = p + p + \dots + p = \underline{n \cdot p}$$

$$\mu_{S_i} = 0 \cdot (1-p) + 1 \cdot p = p$$

$$\sigma_N^2 = \sigma_{S_1 + S_2 + \dots + S_n}^2 \stackrel{\text{uavh.}}{=} \sigma_{S_1}^2 + \sigma_{S_2}^2 + \dots + \sigma_{S_n}^2 \\ = n \cdot p(1-p)$$

$$\sigma_{S_i}^2 = (0-p)^2 \cdot (1-p) + (1-p)^2 \cdot p \\ = p^2(1-p) + (1-p)^2 p = p(1-p) \cdot [p + (1-p)]$$

$$3b) \begin{cases} X \sim \text{Bin}(n=5, p=0.3) \\ Y \sim \text{Bin}(n=5, p=0.5) \end{cases}$$

uavh.

$$Z = X + Y$$

$$Z \leq 1 \cdot Z = 0 \text{ eller } Z = 1$$

$$\begin{matrix} \downarrow & & \downarrow \\ X=0, Y=0 & & X=0, Y=1 \\ & & X=1, Y=0 \end{matrix}$$

$$P(Z \leq 1) = P(Z=0) + P(Z=1) \\ = P(X=0, Y=0) + (P(X=0, Y=1) + P(X=1, Y=0))$$

$$X, Y \text{ uavh.} \\ \underline{\underline{=}} P(X=0) \cdot P(Y=0)$$

$$+ P(X=0) \cdot P(Y=1)$$

$$+ P(X=1) \cdot P(Y=0)$$

$$= 0.1681 \cdot 0.0313$$

$$+ 0.1681 \cdot 0.1563$$

$$+ 0.3607 \cdot 0.0313$$

$$= \underline{\underline{0.0428}}$$

Tables T-7

TABLE C

Binomial probabilities (continued)

Entry is $P(X = k) = \binom{n}{k} p^k (1 - p)^{n-k}$

n	k	p								
		.10	.15	.20	.25	.30	.35	.40	.45	.50
2	0	.8100	.7225	.6400	.5625	.4900	.4225	.3600	.3025	.2500
	1	.1800	.2550	.3200	.3750	.4200	.4550	.4800	.4950	.5000
	2	.0100	.0225	.0400	.0625	.0900	.1225	.1600	.2025	.2500
3	0	.7290	.6141	.5120	.4219	.3430	.2746	.2160	.1664	.1250
	1	.2430	.3251	.3840	.4219	.4410	.4436	.4320	.4084	.3750
	2	.0270	.0574	.0960	.1406	.1890	.2389	.2880	.3341	.3750
	3	.0010	.0034	.0080	.0156	.0270	.0429	.0640	.0911	.1250
4	0	.6561	.5220	.4096	.3164	.2401	.1785	.1296	.0915	.0625
	1	.2916	.3685	.4096	.4219	.4116	.3845	.3456	.2995	.2500
	2	.0486	.0975	.1536	.2109	.2646	.3105	.3456	.3675	.3750
	3	.0036	.0115	.0256	.0469	.0756	.1115	.1536	.2005	.2500
	4	.0001	.0005	.0016	.0039	.0081	.0150	.0256	.0410	.0625
5	0	.5905	.4437	.3277	.2373	.1688	.1189	.0778	.0503	.0313
	1	.3280	.3915	.4096	.3955	.3607	.3124	.2592	.2059	.1563
	2	.0729	.1382	.2048	.2637	.3087	.3344	.3456	.3369	.3125
	3	.0081	.0244	.0512	.0879	.1323	.1811	.2304	.2757	.3125
	4	.0004	.0022	.0064	.0146	.0284	.0488	.0768	.1128	.1562
	5		.0001	.0003	.0010	.0024	.0053	.0102	.0185	.0312
6	0	.5314	.3771	.2621	.1780	.1176	.0754	.0467	.0277	.0156
	1	.3543	.3993	.3932	.3560	.3025	.2437	.1866	.1359	.0938
	2	.0984	.1762	.2458	.2966	.3241	.3280	.3110	.2780	.2344
	3	.0146	.0415	.0819	.1318	.1852	.2355	.2765	.3032	.3125
	4	.0012	.0055	.0154	.0330	.0595	.0951	.1382	.1861	.2344
	5	.0001	.0004	.0015	.0044	.0102	.0205	.0369	.0609	.0937
	6			.0001	.0002	.0007	.0018	.0041	.0083	.0156
7	0	.4783	.3206	.2097	.1335	.0824	.0490	.0280	.0152	.0078
	1	.3720	.3960	.3670	.3115	.2471	.1848	.1306	.0872	.0547
	2	.1240	.2097	.2753	.3115	.3177	.2985	.2613	.2140	.1641
	3	.0230	.0617	.1147	.1730	.2269	.2679	.2903	.2918	.2734
	4	.0026	.0109	.0287	.0577	.0972	.1442	.1935	.2388	.2734
	5	.0002	.0012	.0043	.0115	.0250	.0466	.0774	.1172	.1641
	6		.0001	.0004	.0013	.0036	.0084	.0172	.0320	.0547
	7				.0001	.0002	.0006	.0016	.0037	.0078
8	0	.4305	.2725	.1678	.1001	.0576	.0319	.0168	.0084	.0039
	1	.3826	.3847	.3355	.2670	.1977	.1373	.0896	.0548	.0313
	2	.1488	.2376	.2936	.3115	.2965	.2587	.2090	.1569	.1094
	3	.0331	.0839	.1468	.2076	.2541	.2786	.2787	.2568	.2188
	4	.0046	.0185	.0459	.0865	.1361	.1875	.2322	.2627	.2734
	5	.0004	.0026	.0092	.0231	.0467	.0808	.1239	.1719	.2188
	6		.0002	.0011	.0038	.0100	.0217	.0413	.0703	.1094
	7			.0001	.0004	.0012	.0033	.0079	.0164	.0312
	8					.0001	.0002	.0007	.0017	.0039

(Continued)

X sukses
sans

Y sukses
sans

$P(X=0)$

$P(X=1)$

$P(Y=0)$

$P(Y=1)$