Distribuições discretas

Distribuição	Parâmetros	F. probabilidade	Suporte	Valor médio	Variância	F. distribuição
$H(N,M,n)$	$N,M,n \in \mathbb{N}$	$\binom{M}{k}\binom{N-M}{n-k}/\binom{N}{n}$	–	nM/N	$n\frac{M}{N}\left(1-\frac{M}{N}\right)\frac{N-n}{N-1}$	–
$B(n,p)$	$n \in \mathbb{N}, p \in]0,1[$	$\binom{n}{k}p^k(1-p)^{n-k}$	$0 \leq k \leq n$	np	$np(1-p)$	–
$P(\lambda)$	$\lambda \in \mathbb{R}^+$	$e^{-\lambda}\lambda^k/k!$	$k \in \mathbb{N}_0$	λ	λ	–
$G(p)$	$p \in]0,1[$	$p(1-p)^{k-1}$	$k \in \mathbb{N}$	$1/p$	$(1-p)/p^2$	$1-(1-p)^{[x]}$

Distribuições absolutamente contínuas

Distribuição	Parâmetros	F. densidade	Suporte	Valor médio	Variância	F. distribuição
$U(a,b)$	$a,b \in \mathbb{R}$	$\frac{1}{b-a}$	$a \leq x \leq b$	$(a+b)/2$	$(b-a)^2/12$	$\frac{x-a}{b-a}$
$E(\lambda,\delta)$	$\lambda \in \mathbb{R},\ \delta \in \mathbb{R}^+$	$\frac{1}{\delta}e^{-(x-\lambda)/\delta}$	$x \geq \lambda$	$\lambda+\delta$	δ^2	$1-e^{-(x-\lambda)/\delta}$
$Par(\delta,\alpha)$	$\delta,\alpha \in \mathbb{R}^+$	$\frac{\alpha}{\delta}\left(\frac{x}{\delta}\right)^{-\alpha-1}$	$x \geq \delta$	$\frac{\alpha\,\delta}{\alpha-1}$	$\frac{\alpha\,\delta^2}{(\alpha-2)(\alpha-1)^2}$	$1-\left(\frac{x}{\delta}\right)^{-\alpha}$
$N(\mu,\sigma^2)$	$\mu \in \mathbb{R},\ \sigma \in \mathbb{R}^+$	$\frac{1}{\sqrt{2\pi}\,\sigma}\exp\left(-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right)$	$x \in \mathbb{R}$	μ	σ^2	–

Distribuições de estatísticas

Média amostral

$$\sqrt{n}\,\frac{\bar{X}-\mu}{\sigma} \sim N(0,1) \qquad \sqrt{n}\,\frac{\bar{X}-\mu}{S} \sim t_{n-1} \qquad \sqrt{n}\,\frac{\bar{X}-\mu}{\sigma} \overset{a}{\sim} N(0,1) \qquad \sqrt{n}\,\frac{\bar{X}-\mu}{S} \overset{a}{\sim} N(0,1)$$

Variância Amostral

$$\frac{(n-1)\,S^2}{\sigma^2} \sim \chi^2_{n-1}$$

Proporção amostral

$$\sqrt{n}\,\frac{\hat{P}-p}{\sqrt{p(1-p)}} \overset{a}{\sim} N(0,1) \qquad \sqrt{n}\,\frac{\hat{P}-p}{\sqrt{\hat{P}\left(1-\hat{P}\right)}} \overset{a}{\sim} N(0,1)$$

Ajustamento

$$\sum_{i=1}^{m}\frac{(O_i-E_i)^2}{E_i} \overset{a}{\sim} \chi^2_{(m-p-1)}$$

$$S^2 = \frac{1}{n-1}\sum_{i=1}^{n}\left(X_i-\bar{X}\right)^2 = \frac{1}{n-1}\left(\left(\sum_{i=1}^{n}X_i^2\right)-n\bar{X}^2\right)$$

Regressão linear simples

$$S_{xx} = \sum_{i=1}^{n}(x_i-\bar{x})^2 \qquad S_{YY} = \sum_{i=1}^{n}\left(Y_i-\bar{Y}\right)^2 \qquad S_{xY} = \sum_{i=1}^{n}(x_i-\bar{x})\left(Y_i-\bar{Y}\right) = \sum_{i=1}^{n}x_iY_i - n\bar{x}\bar{Y}$$

Estimadores para os parâmetros do modelo

$$\hat{\beta}_1 = \frac{S_{xY}}{S_{xx}} \qquad \hat{\beta}_0 = \bar{Y}-\hat{\beta}_1\bar{x} \qquad \hat{\sigma}^2 = \frac{SQ_R}{n-2} = \frac{S_{YY}-\hat{\beta}_1^2S_{xx}}{n-2}$$

Distribuição dos estimadores

$$\sqrt{\frac{n\,S_{xx}}{\sum x_i^2}}\,\frac{\hat{\beta}_0-\beta_0}{\hat{\sigma}} \sim t_{n-2} \qquad \sqrt{S_{xx}}\,\frac{\hat{\beta}_1-\beta_1}{\hat{\sigma}} \sim t_{n-2} \qquad \frac{(n-2)\,\hat{\sigma}^2}{\sigma^2} \sim \chi^2_{n-2}$$

Predição

$$\frac{\hat{E}(Y(x_o))-E(Y(x_o))}{\hat{\sigma}\sqrt{\frac{1}{n}+\frac{(x_o-\bar{x})^2}{S_{xx}}}} \sim t_{n-2} \qquad \frac{\hat{Y}(x_o)-Y(x_o)}{\hat{\sigma}\sqrt{1+\frac{1}{n}+\frac{(x_o-\bar{x})^2}{S_{xx}}}} \sim t_{n-2}$$

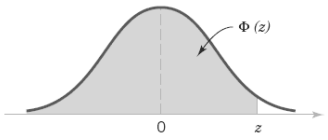
Coeficiente determinação

$$R^2 = \hat{\beta}_1^2\frac{S_{xx}}{S_{YY}}$$

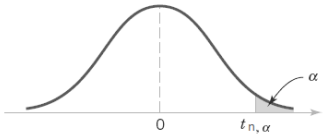
Tabelas

1. Função de distribuição do modelo Normal reduzido

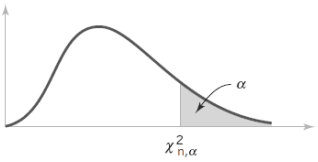
$$\Phi(z) = P(Z \leq z) = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{1}{2}t^2\right) dt$$



2. Quantis da distribuição t de Student



3. Quantis da distribuição do Qui Quadrado



(1)

z	0	1	2	3	4	5	6	7	8	9
.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.	.9987	.9990	.9993	.9995	.9997	.9998	.9998	.9999	.9999	1.0000

Nota: Para $z \geq 4$, $\Phi(z) \approx 1$.

(2)

	α											
n	.45	.4	.35	.3	.25	.2	.15	.1	.05	.025	.01	.005
1	.158	.325	.510	.727	1.00	1.38	1.96	3.08	6.31	12.7	31.8	63.7
2	.142	.289	.445	.617	.816	1.06	1.39	1.89	2.92	4.30	6.96	9.92
3	.137	.277	.424	.584	.765	.978	1.25	1.64	2.35	3.18	4.54	5.84
4	.134	.271	.414	.569	.741	.941	1.19	1.53	2.13	2.78	3.75	4.60
5	.132	.267	.408	.559	.727	.920	1.16	1.48	2.02	2.57	3.36	4.03
6	.131	.265	.404	.553	.718	.906	1.13	1.44	1.94	2.45	3.14	3.71
7	.130	.263	.402	.549	.711	.896	1.12	1.41	1.89	2.36	3.00	3.50
8	.130	.262	.399	.546	.706	.889	1.11	1.40	1.86	2.31	2.90	3.36
9	.129	.261	.398	.543	.703	.883	1.10	1.38	1.83	2.26	2.82	3.25
10	.129	.260	.397	.542	.700	.879	1.09	1.37	1.81	2.23	2.76	3.17
11	.129	.260	.396	.540	.697	.876	1.09	1.36	1.80	2.20	2.72	3.11
12	.128	.259	.395	.539	.695	.873	1.08	1.36	1.78	2.18	2.68	3.05
13	.128	.259	.394	.538	.694	.870	1.08	1.35	1.77	2.16	2.65	3.01
14	.128	.258	.393	.537	.692	.868	1.08	1.35	1.76	2.14	2.62	2.98
15	.128	.258	.393	.536	.691	.866	1.07	1.34	1.75	2.13	2.60	2.95
16	.128	.258	.392	.535	.690	.865	1.07	1.34	1.75	2.12	2.58	2.92
17	.128	.257	.392	.534	.689	.863	1.07	1.33	1.74	2.11	2.57	2.90
18	.127	.257	.392	.534	.688	.862	1.07	1.33	1.73	2.10	2.55	2.88
19	.127	.257	.391	.533	.688	.861	1.07	1.33	1.73	2.09	2.54	2.86
20	.127	.257	.391	.533	.687	.860	1.06	1.33	1.72	2.09	2.53	2.85
21	.127	.257	.391	.532	.686	.859	1.06	1.32	1.72	2.08	2.52	2.83
22	.127	.256	.390	.532	.686	.858	1.06	1.32	1.72	2.07	2.51	2.82
23	.127	.256	.390	.532	.685	.858	1.06	1.32	1.71	2.07	2.50	2.81
24	.127	.256	.390	.531	.685	.857	1.06	1.32	1.71	2.06	2.49	2.80
25	.127	.256	.390	.531	.684	.856	1.06	1.32	1.71	2.06	2.49	2.79
26	.127	.256	.390	.531	.684	.856	1.06	1.31	1.71	2.06	2.48	2.78
27	.127	.256	.389	.531	.684	.855	1.06	1.31	1.70	2.05	2.47	2.77
28	.127	.256	.389	.530	.683	.855	1.06	1.31	1.70	2.05	2.47	2.76
29	.127	.256	.389	.530	.683	.854	1.06	1.31	1.70	2.05	2.46	2.76
30	.127	.256	.389	.530	.683	.854	1.05	1.31	1.70	2.04	2.46	2.75
∞	.126	.253	.385	.524	.674	.842	1.04	1.28	1.64	1.96	2.33	2.58

(3)

	α														
n	.995	.99	.975	.95	.9	.8	.7	.5	.3	.2	.1	.05	.025	.01	.005
1	.000	.000	.001	.004	.016	.064	.148	.455	1.07	1.64	2.71	3.84	5.02	6.63	7.88
2	.010	.020	.051	.103	.211	.446	.713	1.39	2.41	3.22	4.61	5.99	7.38	9.21	10.6
3	.072	.115	.216	.352	.584	1.01	1.42	2.37	3.66	4.64	6.25	7.81	9.35	11.3	12.8
4	.207	.297	.484	.711	1.06	1.65	2.19	3.36	4.88	5.99	7.78	9.49	11.1	13.3	14.9
5	.412	.554	.831	1.15	1.61	2.34	3.00	4.35	6.06	7.29	9.24	11.1	12.8	15.1	16.7
6	.676	.872	1.24	1.64	2.20	3.07	3.83	5.35	7.23	8.56	10.6	12.6	14.4	16.8	18.5
7	.989	1.24	1.69	2.17	2.83	3.82	4.67	6.35	8.38	9.80	12.0	14.1	16.0	18.5	20.3
8	1.34	1.65	2.18	2.73	3.49	4.59	5.53	7.34	9.52	11.0	13.4	15.5	17.5	20.1	22.0
9	1.73	2.09	2.70	3.33	4.17	5.38	6.39	8.34	10.7	12.2	14.7	16.9	19.0	21.7	23.6
10	2.16	2.56	3.25	3.94	4.87	6.18	7.27	9.34	11.8	13.4	16.0	18.3	20.5	23.2	25.2
11	2.60	3.05	3.82	4.57	5.58	6.99	8.15	10.3	12.9	14.6	17.3	19.7	21.9	24.7	26.8
12	3.07	3.57	4.40	5.23	6.30	7.81	9.03	11.3	14.0	15.8	18.5	21.0	23.3	26.2	28.3
13	3.57	4.11	5.01	5.89	7.04	8.63	9.93	12.3	15.1	17.0	19.8	22.4	24.7	27.7	29.8
14	4.07	4.66	5.63	6.57	7.79	9.47	10.8	13.3	16.2	18.2	21.1	23.7	26.1	29.1	31.3
15	4.60	5.23	6.26	7.26	8.55	10.3	11.7	14.3	17.3	19.3	22.3	25.0	27.5	30.6	32.8
16	5.14	5.81	6.91	7.96	9.31	11.2	12.6	15.3	18.4	20.5	23.5	26.3	28.8	32.0	34.3
17	5.70	6.41	7.56	8.67	10.1	12.0	13.5	16.3	19.5	21.6	24.8	27.6	30.2	33.4	35.7
18	6.26	7.01	8.23	9.39	10.9	12.9	14.4	17.3	20.6	22.8	26.0	28.9	31.5	34.8	37.2
19	6.84	7.63	8.91	10.1	11.7	13.7	15.4	18.3	21.7	23.9	27.2	30.1	32.9	36.2	38.6
20	7.43	8.26	9.59	10.9	12.4	14.6	16.3	19.3	22.8	25.0	28.4	31.4	34.2	37.6	40.0
21	8.03	8.90	10.3	11.6	13.2	15.4	17.2	20.3	23.9	26.2	29.6	32.7	35.5	38.9	41.4
22	8.64	9.54	11.0	12.3	14.0	16.3	18.1	21.3	24.9	27.3	30.8	33.9	36.8	40.3	42.8
23	9.26	10.2	11.7	13.1	14.8	17.2	19.0	22.3	26.0	28.4	32.0	35.2	38.1	41.6	44.2
24	9.89	10.9	12.4	13.8	15.7	18.1	19.9	23.3	27.1	29.6	33.2	36.4	39.4	43.0	45.6
25	10.5	11.5	13.1	14.6	16.5	18.9	20.9	24.3	28.2	30.7	34.4	37.7	40.6	44.3	46.9
26	11.2	12.2	13.8	15.4	17.3	19.8	21.8	25.3	29.2	31.8	35.6	38.9	41.9	45.6	48.3
27	11.8	12.9	14.6	16.2	18.1	20.7	22.7	26.3	30.3	32.9	36.7	40.1	43.2	47.0	49.6
28	12.5	13.6	15.3	16.9	18.9	21.6	23.6	27.3	31.4	34.0	37.9	41.3	44.5	48.3	51.0
29	13.1	14.3	16.0	17.7	19.8	22.5	24.6	28.3	32.5	35.1	39.1	42.6	45.7	49.6	52.3
30	13.8	15.0	16.8	18.5	20.6	23.4	25.5	29.3	33.5	36.3	40.3	43.8	47.0	50.9	53.7
40	20.7	22.2	24.4	26.5	29.1	32.3	34.9	39.3	44.2	47.3	51.8	55.8	59.3	63.7	66.8
50	28.0	29.7	32.4	34.8	37.7	41.4	44.3	49.3	54.7	58.2	63.2	67.5	71.4	76.2	79.5
60	35.5	37.5	40.5	43.2	46.5	50.6	53.8	59.3	65.2	69.0	74.4	79.1	83.3	88.4	92.0