Dude

- Has device 1 year
- Device may fail within the year with prob p.
- If device fails, Dude pays $\$_0$
- Actually dude has m devices

Prob that i devices fail dude :D

$$P_i^d = C_m^i p^i (1-p)^{m-i} = Bin(p, i, m)$$

Money that dude will most likely pay

$$\langle \$ \rangle = \$_0 \cdot m \cdot p$$

Insurance

- Have n dudes $\rightarrow$ $n \cdot m$ devices
- Prob. of j devices fail

$$P_j^I = Bin(p, j, n \cdot m)$$

$$\langle \$^I \rangle = \$_0 n m p = n \langle \$^d \rangle$$

Assume I has infinite money, and wants to earn α from that money

$$\$_2^I = (1+\alpha) \$_0 n m p = (1+\alpha) \$_1^I$$

$\Rightarrow$ Each dude has to pay

$$\$_2^D = \frac{\$_2^I}{n} = (1+\alpha) \$_0 m p = (1+\alpha) \$_1^d$$

- Is this good for Dude?
- Is this good for I?

Assume Equi-Distr Comm

1 Dude pays self

2 Dude pay 1/2

4 Dude pay 1/4

⋮

Assume really a lot of people

$$P[i] = \mathrm{Bin}(p, i, n) \approx \mathcal{N}(pn, np(1-p))$$

$$\langle i \rangle = np$$

$$\sigma^2 = np(1-p)$$

Say $k\sigma$ is a reasonable confidence interval, such that system can not fail reasonably within its lifetime

then worst-case scenario

$$\$^I = np + k\sqrt{np(1-p)}$$

$$\$^d = np + k\sqrt{\frac{np(1-p)}{n}}$$

$$\$^{d_0} = p + k\sqrt{\frac{p(1-p)}{n}}$$

in 1 year expect n events

$P \sim \mathrm{Bin}(p, n)$

in 1000 years expect 1000n events

$P \sim \mathrm{Bin}(p, 1000n) \approx \mathcal{N}(1000pn, 1000np(1-p))$

Call system fail-safe if in its lifetime the total confidence is 5σ

worst-case scenario

$$\$^I_{1000} = 1000np + 5\sqrt{1000np(1-p)}$$

$$\$^I_1 = np + 5\sqrt{\frac{np(1-p)}{1000}}$$ bad

Say dudes pay same money every year. Then @ year Y the total cash would be

$$\$^m_Y = n \cdot Y \cdot \$ \qquad \$ = p(1+\alpha)$$

the k-interval at year Y is

$$\$^I_Y = (npY + k\sqrt{nYp(1-p)})$$

$$= nYp + \alpha nYp \quad \Rightarrow k = \frac{\alpha nYp}{\sqrt{nYp(1-p)}} = \alpha\sqrt{\frac{nYp}{1-p}}$$

$$\Rightarrow \alpha = 7\sqrt{\frac{1-p}{np}} \quad \Rightarrow n \approx 490000$$

$$(1-p)^n = \left(1 - \frac{np}{n}\right)^n \approx e^{-np} \approx \frac{1}{1+np} \approx 1-np$$

$$\left(1+\frac{1}{n}\right)^n = e$$

For tiny probabilities p,

$$P[n \text{ fails}] \approx np$$

10 5 1 Mai

$W_1 + W_2 + D = 1$

$0 = \sum_{i=j} p_i^1 p_j^2$

$W_1 = \sum_{i>j} p_i^1 p_j^2$

$W_2 = \sum_{i<j} p_i^1 p_j^2$

GNAP

	S P	123		
1 turn too short inconsistent defence →	Q W	1234	Dr P	1
	PW	12	Ly P	1
EZ →	T H	123456	JR	12
LOL →	G P	1	FM	1
	A S	12	JD	12
	Q R	1234	MP	1
tempo heal by copying heal elemental with taunt →	E S	1		
	T M	1		
	J S	1		
	W R	1		