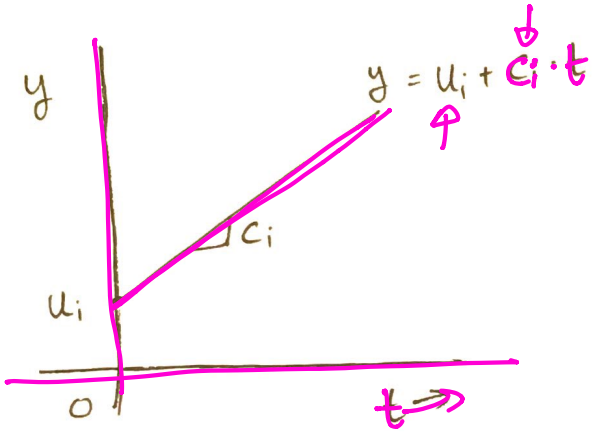
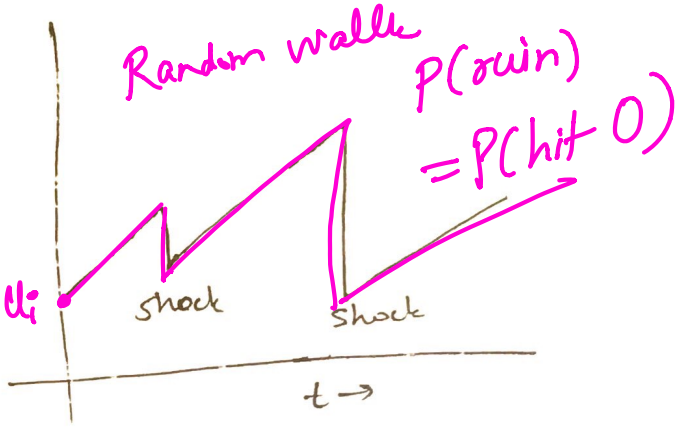
Akeke et al. 2020.

(n agents (i.e. families we would like to assist) family.

c_i "income" of agent i (i.e. earned income − expenses) per unit time.

(u_i "reserve" i.e. initial wealth.





Income shocks: A shock is something that causes a sudden expense or loss of income. (e.g. illness, heath bill, parking ticket, job loss, delayed paycheck...). Say each agent experiences income shocks. Agent i experiences a shock of (expected) magnitude μ_i, and there are β_i shocks per unit time.

Now, per unit time I'm only growing as $c_i - \beta_i \mu_i$ on arg.

If $c_i - \beta_i \mu_i < 0$, I will go negative ⇒ my ruin probability is 1.

This process is doing a random walk. If $c_i > \beta_i \mu_i$, on arg it is going up. What is P(hit 0)? This is called the ruin probability.

$$P(\text{ruin}) = \frac{\beta_i \mu_i}{c_i}$$

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$u_i = 0$

Minimize $\sum \frac{\beta_i u_i}{c_i + x_i}$

$\sum_{i=1}^{n} x_i \leq B$ =

"Water-filling"

$\sum P(\text{ruin}_i)$

Say I can give subsidy x_i to each person.

The $P(\text{ruin}) = \frac{\beta_i u_i}{c_i + x_i}$