$R < 1$ as an Economic Constraint: Can We "Expand the Frontier" in the Fight Against Covid-19?

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IGM Conference on the Covid-19 Crisis
April 9th, 2020

Two Simple Points

1. It may be <u>useful</u> to conceptualize $R < 1$ as a constraint, with traditional economic and social goals as the objective
   - Simple way to incorporate the dynamics of the problem we face into widely-familiar static optimization
   - Simple way to talk about:
     - Tradeoffs — what activities maximize welfare subject to $R < 1$
     - Expanding the production possibilities frontier

2. We <u>urgently</u> need to figure out how to "expand the frontier"
   - Lockdown vs. laissez faire: both are terrible choices
     - Lockdown: 16 million unemployed in U.S. in last 3 weeks, widespread business distress
     - Ignore: 2 million plus deaths in U.S. not even factoring in overwhelmed medical system (Imperial study)
   - Could some relatively simple interventions meaningfully expand the frontier?

$R < 1$ as a Constraint

- ► Economists:
$$\max \text{ Social Welfare} \qquad (1)$$
$$\text{subject to}$$
$$\text{Technological Constraints}$$
$$\text{Incentive Constraints}$$

- ► Health response:
$$\min \text{ Spread of Covid-19} \qquad (2)$$
$$\text{subject to}$$
$$\text{Keep Society Functioning}$$

- ► Possibly useful:
$$\max \text{ Social Welfare} \qquad (3)$$
$$\text{subject to}$$
$$\text{Technological Constraints}$$
$$\text{Incentive Constraints}$$
$$R < 1$$

Important Notes on the Formulation

- Is $R < 1$ possible?
  - Yes. Multiple examples.
  - Intuition: R_0 est'd 2.5-3.0 with unaware population, no interventions
  - We know a fair amount about how the virus spreads
  - So 2/3 reduction (i.e., $\frac{3-1}{3} = \frac{2}{3}$) not crazy

- Is $R < 1$ enough?
  - If current Infected population already very high then may want a period of $R \ll 1$ to reduce Infected pop'n, then transition to $R < 1$, to satisfactorily approximate health objective in (2)
  - "Hammer and Dance", AEI "Road Map to Reopening"

- Is $R < 1$ too much?
  - This formulation implicitly assumes mortality rate is high and Susceptible population is high.
  - If not (e.g., Atkeson and Stock re asymptomatic rate and mortality rate) then $R < 1$ likely too restrictive

Tradeoffs, Frontier

▶ The $R < 1$ formulation makes it simple to talk about two important economic ideas:

1. Tradeoffs
    ▶ $R < 1$ constraint places a shadow cost on activities that increase transmission (λr_i for activity i)
    ▶ Evaluate actions by <u>ratio of social-welfare benefits to disease-transmission costs</u> ($\frac{v_i' - c_i'}{r_i}$)
    ▶ Policy question: <u>what activities maximize social welfare while keeping $R < 1$?</u>

2. Production Possibilities Frontier
    ▶ Once we have a shadow cost, leaps out how valuable it is to expand the frontier
    ▶ Policy question: <u>are there technologies that increase how much social welfare we can achieve while keeping $R < 1$?</u>

Could Masks and Gloves Save the Economy?

- ▶ Caveats: not a medical expert, science rapidly evolving

- ▶ We know a fair amount how the virus spreads. Spread is primarily through:
    - ▶ Droplets from an Infected person (cough, sneeze) directly reaching a Susceptible's nose or mouth
    - ▶ Susceptible touching a surface contaminated by Infected, then touching their face before they wash their hands
    - ▶ Close personal contact (talking, singing) between Infected and Susceptible for non-trivial duration (Gawande discusses 15 or 30 minutes)
    - ▶ Asymptomatic can spread without knowing they are infected

- ▶ Masks and Gloves:
    - ▶ Infecteds less likely to spread
    - ▶ Susceptibles less likely to get infected

Could Masks and Gloves Save the Economy?

- ▶ Given this understanding of how the virus spreads, hypothetically suppose that some variation on the following set of policies can reduce R to below 1
    1. Widespread public education: "Wash your hands", "Don't touch your face", "Keep your distance"
    2. Mandatory home-or-hotel quarantine for those with potential virus symptoms – supported by testing / contact-tracing and compensation
    3. Mandatory use of masks in many situations outside the home — e.g., all contexts where it is unavoidable to come within 6 feet of others for non-trivial duration
    4. Mandatory use of gloves in many situations outside the home — e.g., all contexts where it is unavoidable to touch surfaces that strangers will also touch without being able to quickly disinfect

- ▶ If these kinds of policies could together reduce $R < 1$, then we could have a mostly-functioning economy
    - ▶ Albeit with masks and gloves for a while
    - ▶ (until treatment or vaccine)

Can We Expand the Frontier?

- ▶ My point of course is not this specific list of policies

- ▶ My point is that the urgent priority should be figuring out whether some combination of these kinds of policies could succeed.
    - ▶ Some policies seem like "free lunches"
    - ▶ Others are not costless but do not shut down the economy

- ▶ We need to get more creative about ways to bring $R < 1$ without an indefinite period of severe lockdown

- ▶ If R_0 were 10 this would seem helpless
- ▶ But with
    - ▶ R_0 on order of 2.5-3
    - ▶ Relatively clear understanding of how the virus spreads
    - ▶ Several empirical examples to learn from
- ▶ Maybe it's achievable. Maybe medical experts and economists can together help the economy and society return to some semblance of normalcy.