Learning Across Alternatives II:

Communication

Org Econ Workshop
October 2020

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Motivating Example

- **Learning from a doctor.**

- Imagine you have recurring knee pain, so you see a doctor for diagnosis.

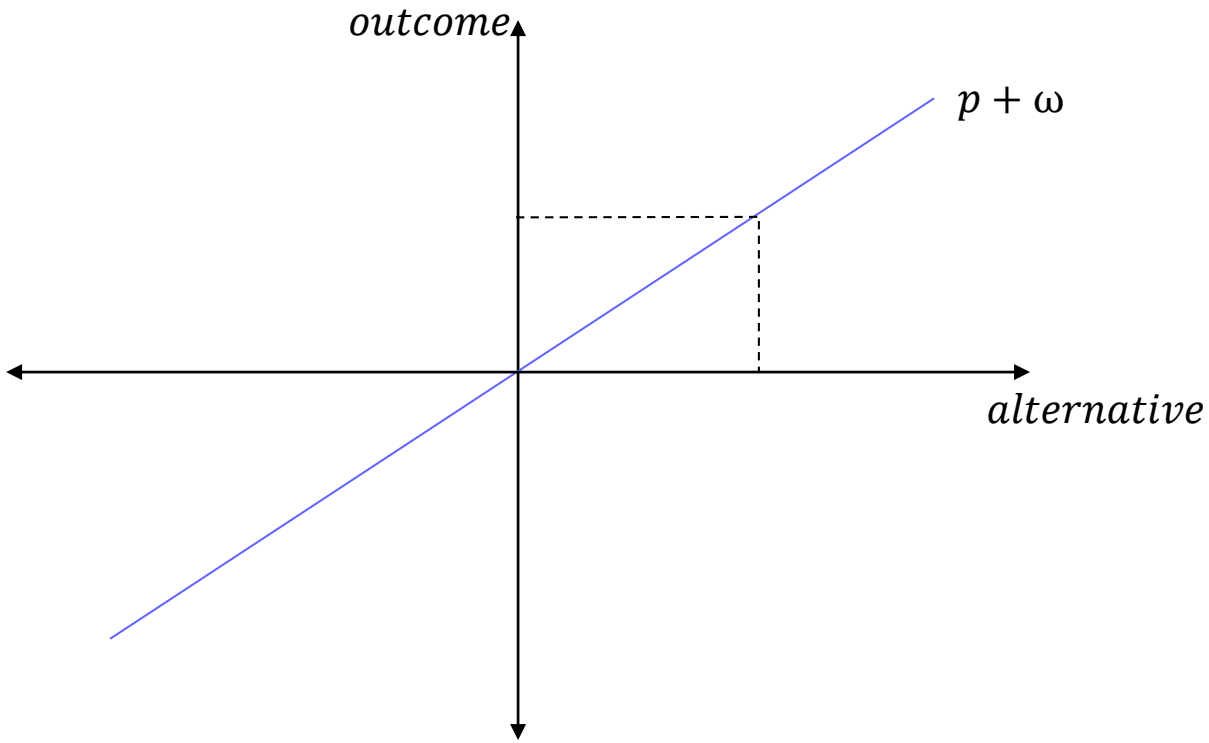
- The doctor recommends daily intense physical therapy and conveys to you the exact outcome of that treatment in terms of cost, time, effort and medical outcome (through verifiable info or as part of equilibrium).

- You update your beliefs. What do you know now?
  - Do you know the outcome from weekly (vs. daily) physical therapy?
  - From knee surgery? From taking aspirin and staying off the knee?
  - What about from open-heart surgery?

- The canonical models of strategic communication presume you now know the outcomes of all of these treatments.
  - Expertise is modeled as a single piece of information.
  - Once revealed for one treatment, known for all treatments.

The Canonical Models of Expertise

- Outcome function is line of slope 1.



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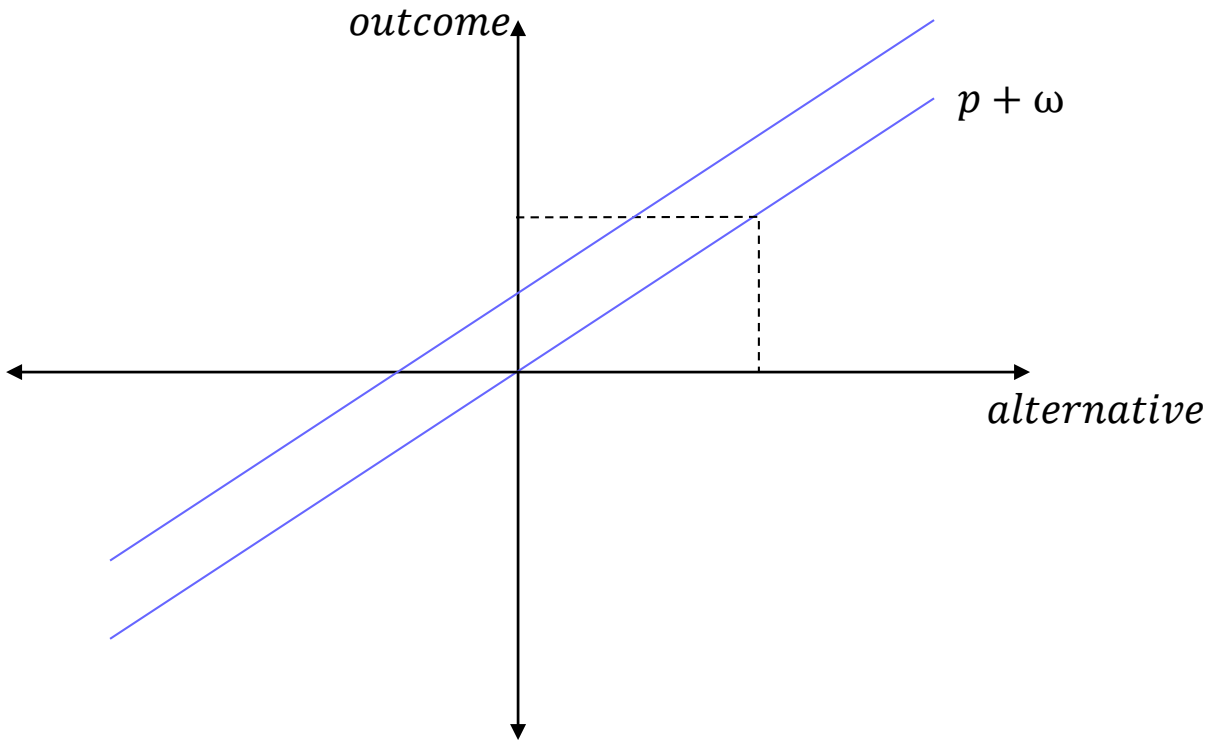

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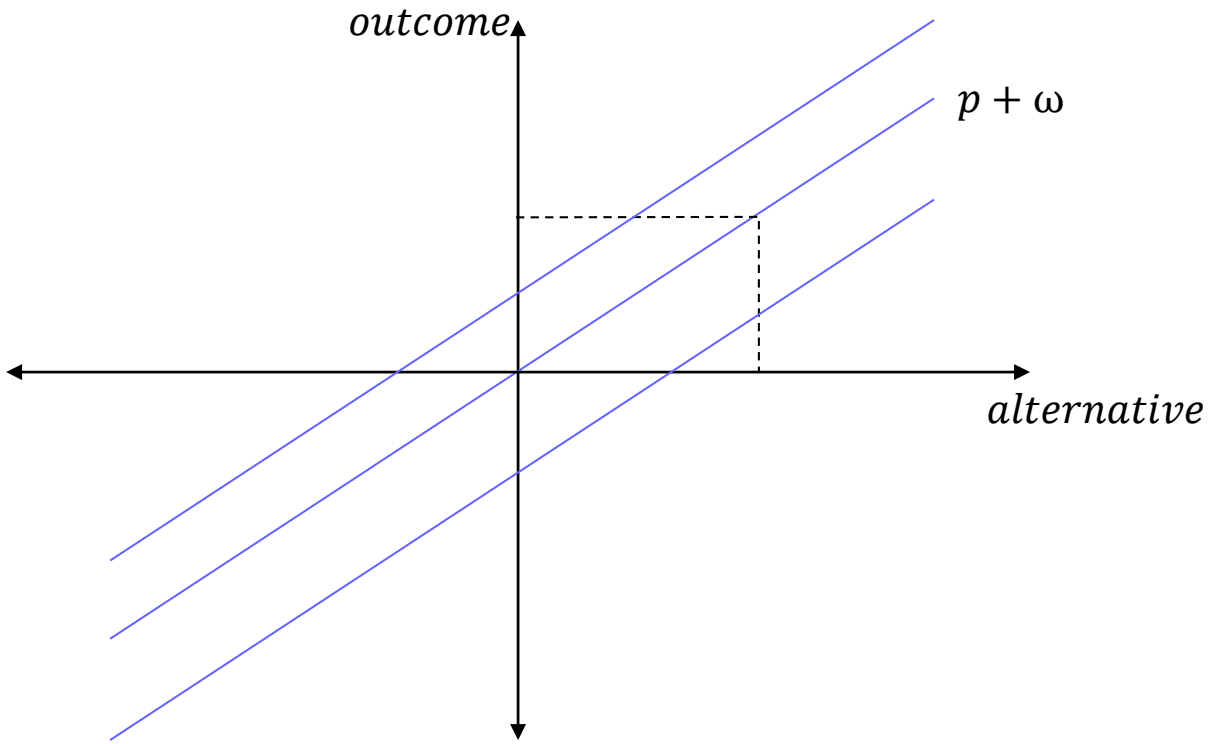

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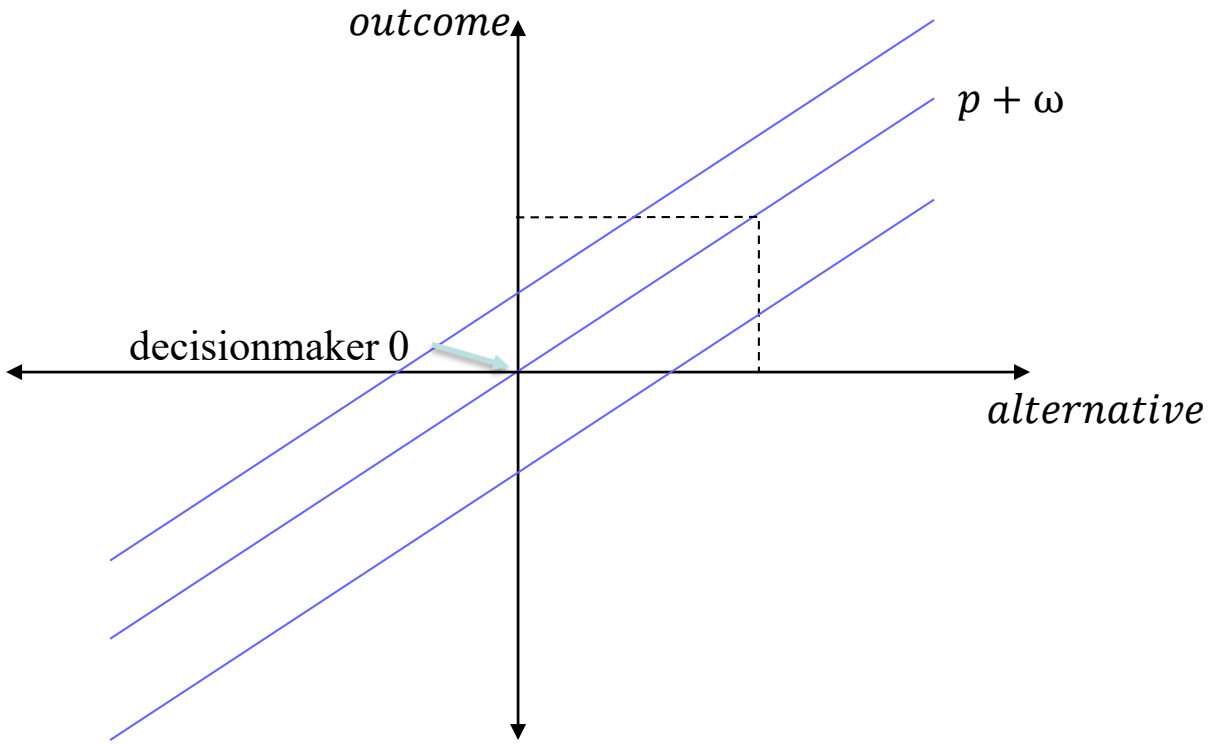

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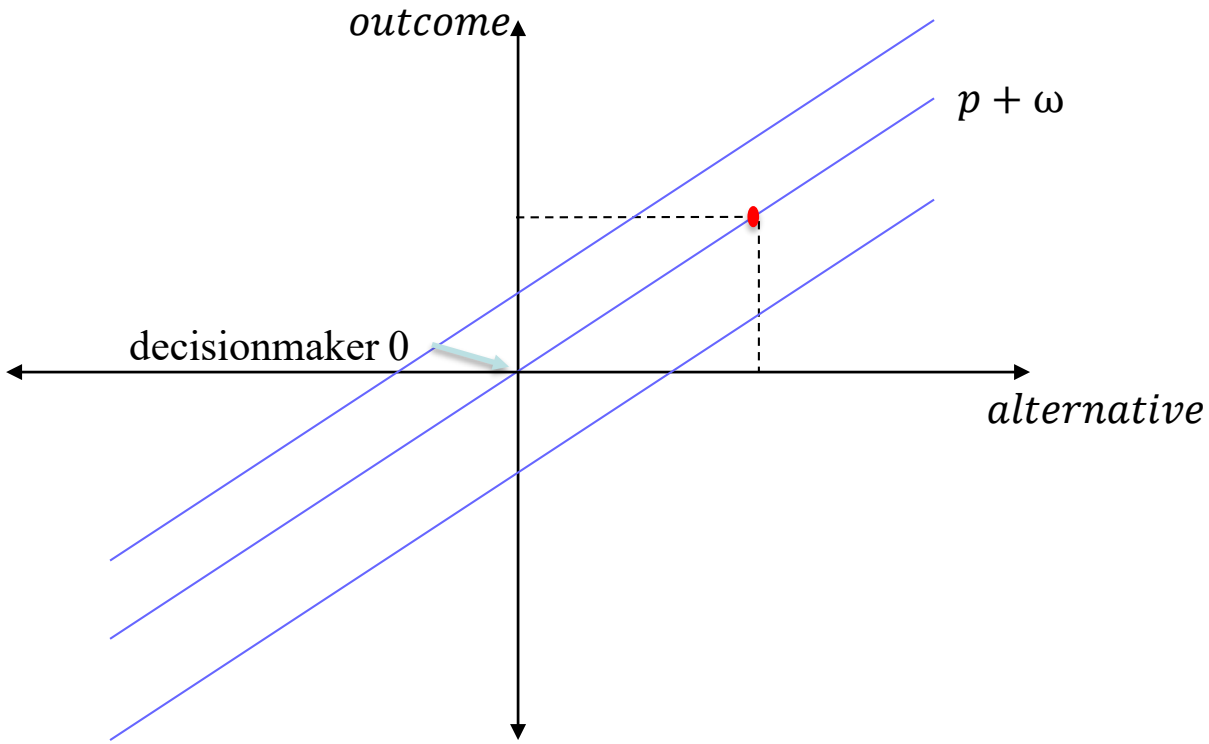

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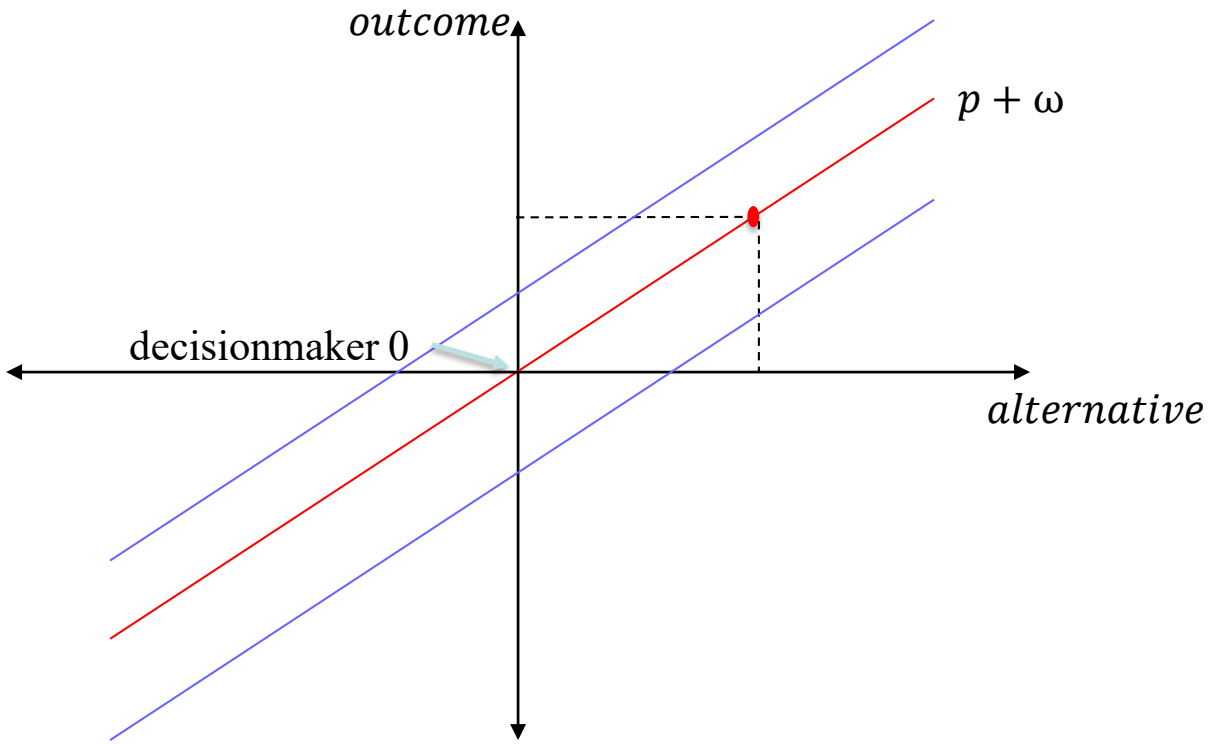

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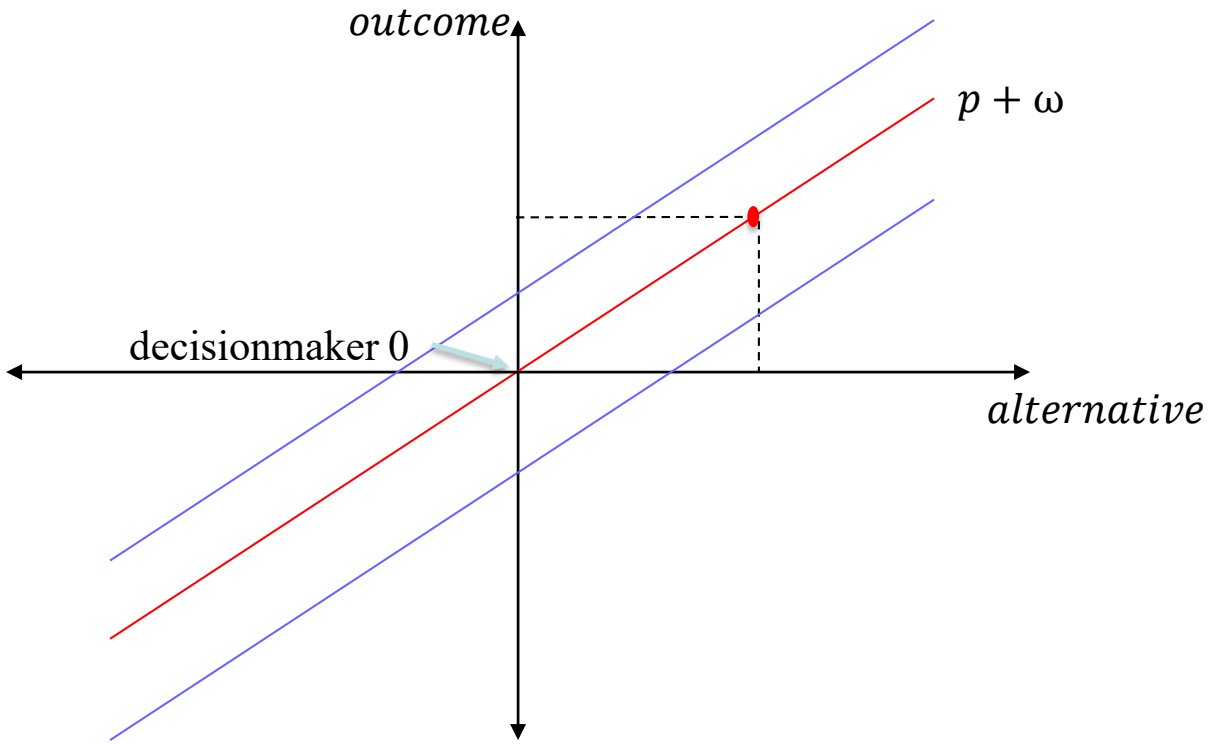

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- <u>Equilibrium Outcome:</u> Decisionmaker's ideal point with or w/out noise.

The Complexity of Expertise

- Cheap-talk: Partition equilibria.
  - Communication requires sender to bundle information.
  - Sender would rather <u>give</u> all of her information to the receiver.

- Verifiable information: Unique "unravelling" equilibrium.
  - Sender full reveals true state & "skeptical" off-path beliefs.

- Does this capture Max Weber's description of expert power?
  - "Under normal conditions, the power position of a fully developed bureaucracy is always overtowering. The "political master" finds himself in the position of the "dilettante" who stands opposite the "expert.""

    Max Weber, 1932.

- How to explain expert power? Two options:
  1. Add institutional structure, or
  2. Enrich information and expertise.

Plan for This Session

- Strategic Communication with:

  1. Hard Information (verifiable).
     - w/ Lambert and Matouschek

  2. Cheap talk.
     - "A Theory of Policy Expertise." QJPS (2008)

- ⇒ The expert is better off when her expertise is complex.

  - New insight into how experts strategically communicate.

- Some other modeling possibilities.

The Model

- Classic Sender-Receiver Game.
- Timing:
  1. Sender observes state of the world.
  2. Sender sends verifiable (hard info) message.
  3. Receiver updates beliefs and makes decision $\mathrm{d} \in \mathbb{R}$.
  4. Produces outcome $x \in \mathbb{R}$ and payoffs realized.

- Preferences:
  - Receiver's utility: $u_R(x) = -(x-b)^2$, where $b > 0$.
  - Sender's utility: $u_S(d) = -d$.
    - (results go through with more general preferences for both.)

The Model

- Information:
  - Mapping from policies to outcomes is Brownian motion of drift μ and variance σ^2.
    - Formally, discrete random walk → real line (max action).
  - Sender (expert) knows the entire path.
  - Receiver (decision maker) knows only (0,0), μ and σ^2.

- Communication:
  - The sender sends message $m(d) \in \{x(d), \emptyset\}$ for all $d > 0$.
    - i.e, a subset of points in the mapping.
  - Information is verifiable ("hard").

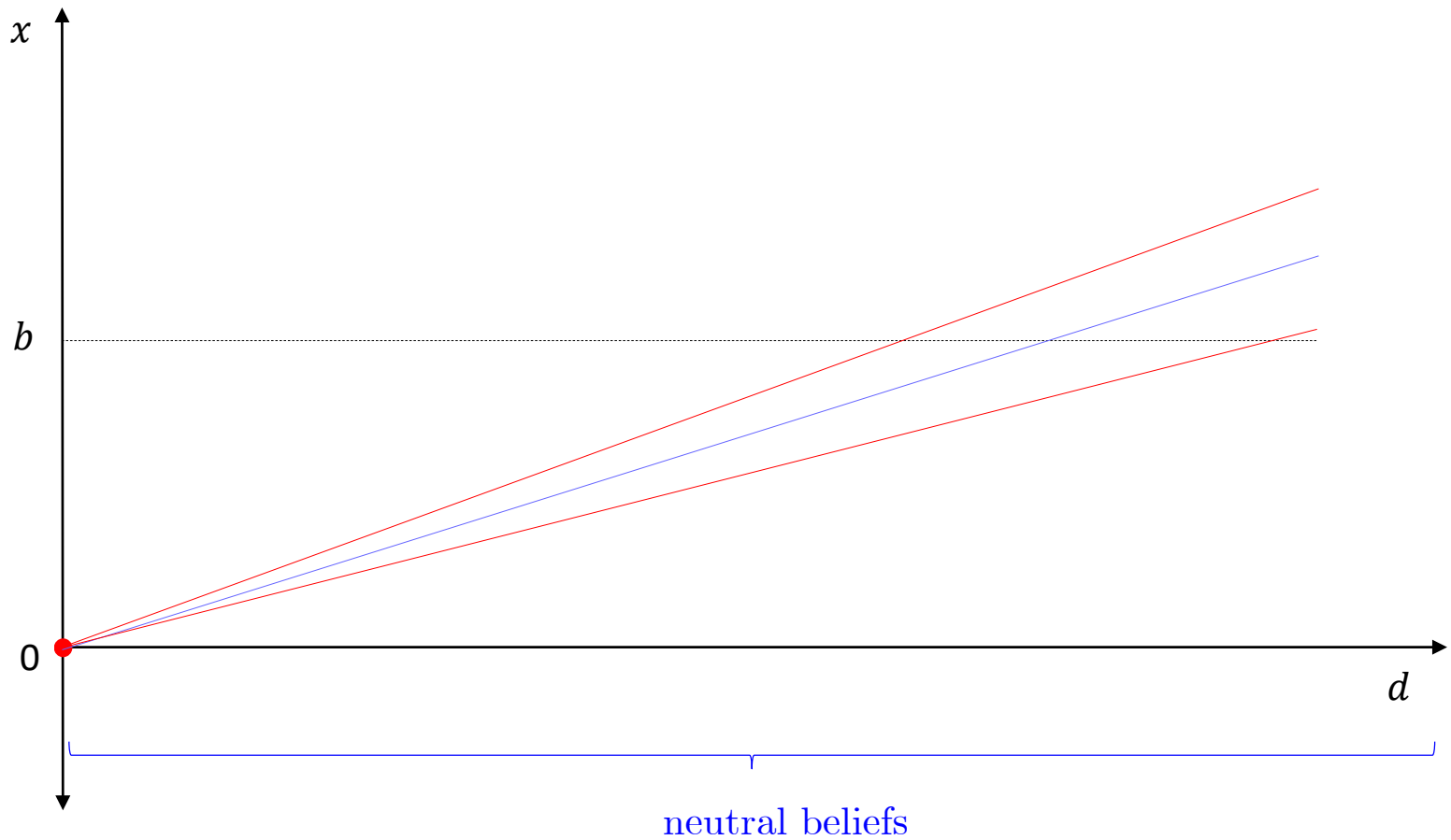
The Model

- Solution concept: Perfect Bayesian Equilibrium
  - Bayes' rule + respect hard information.
  - (Equilibria will have "conservative beliefs" off the equilibrium path
    - The worse case of which is Milgrom's "skeptical" beliefs.
    - We don't generally need extreme beliefs when info is rich.)

- Parameter restriction:

$$\frac{\sigma^2}{2\mu} < b$$

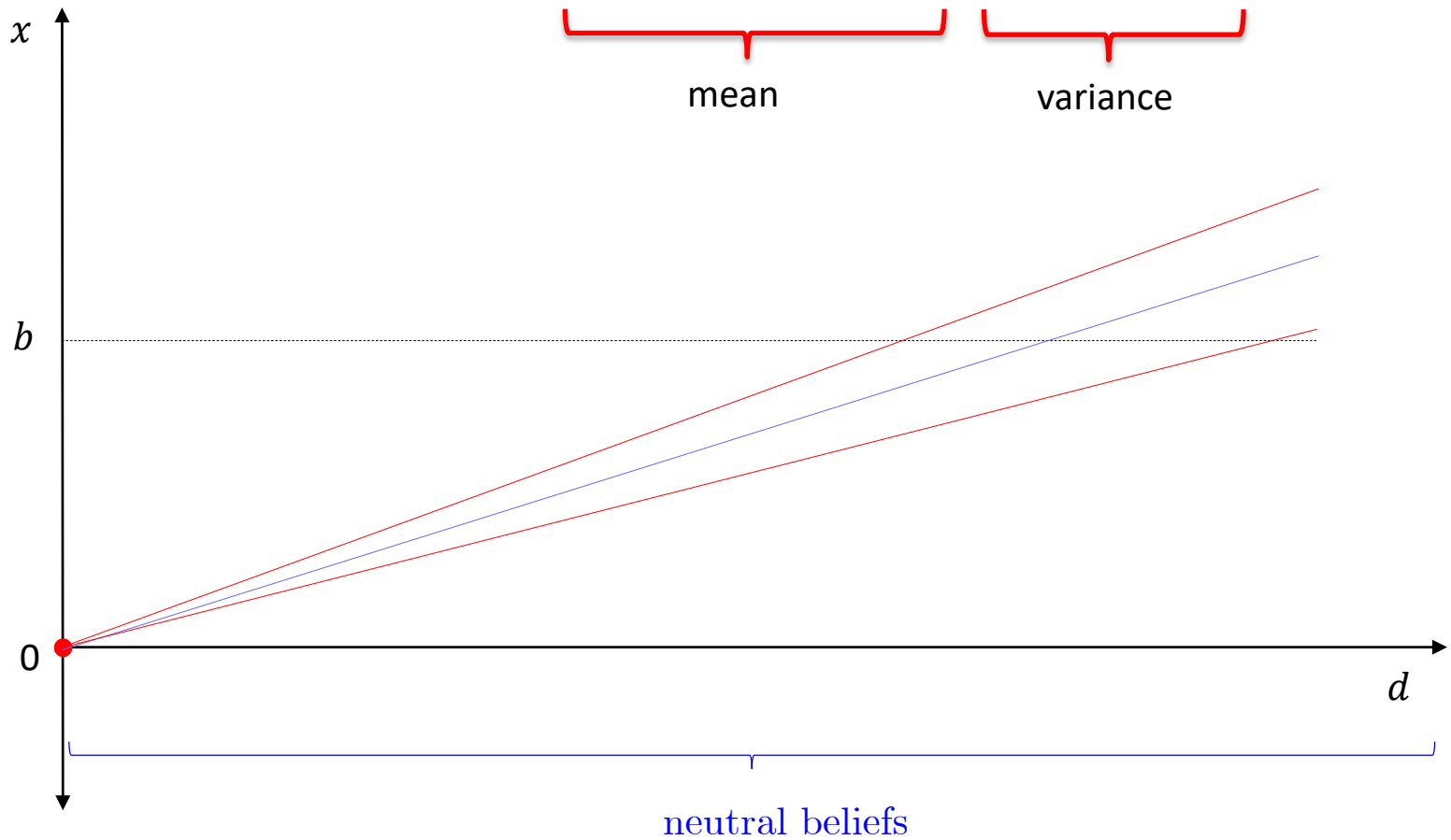
Decision making Without an Expert



Decision making Without an Expert

Receiver Expected Utility:

$$\mathrm{E}[u_R] = \underbrace{-(\mathrm{E}[x(d)|x(d')] - b)^2}_{\text{mean}} \underbrace{-\mathrm{Var}[x(d)|x(d')]}_{\text{variance}}$$



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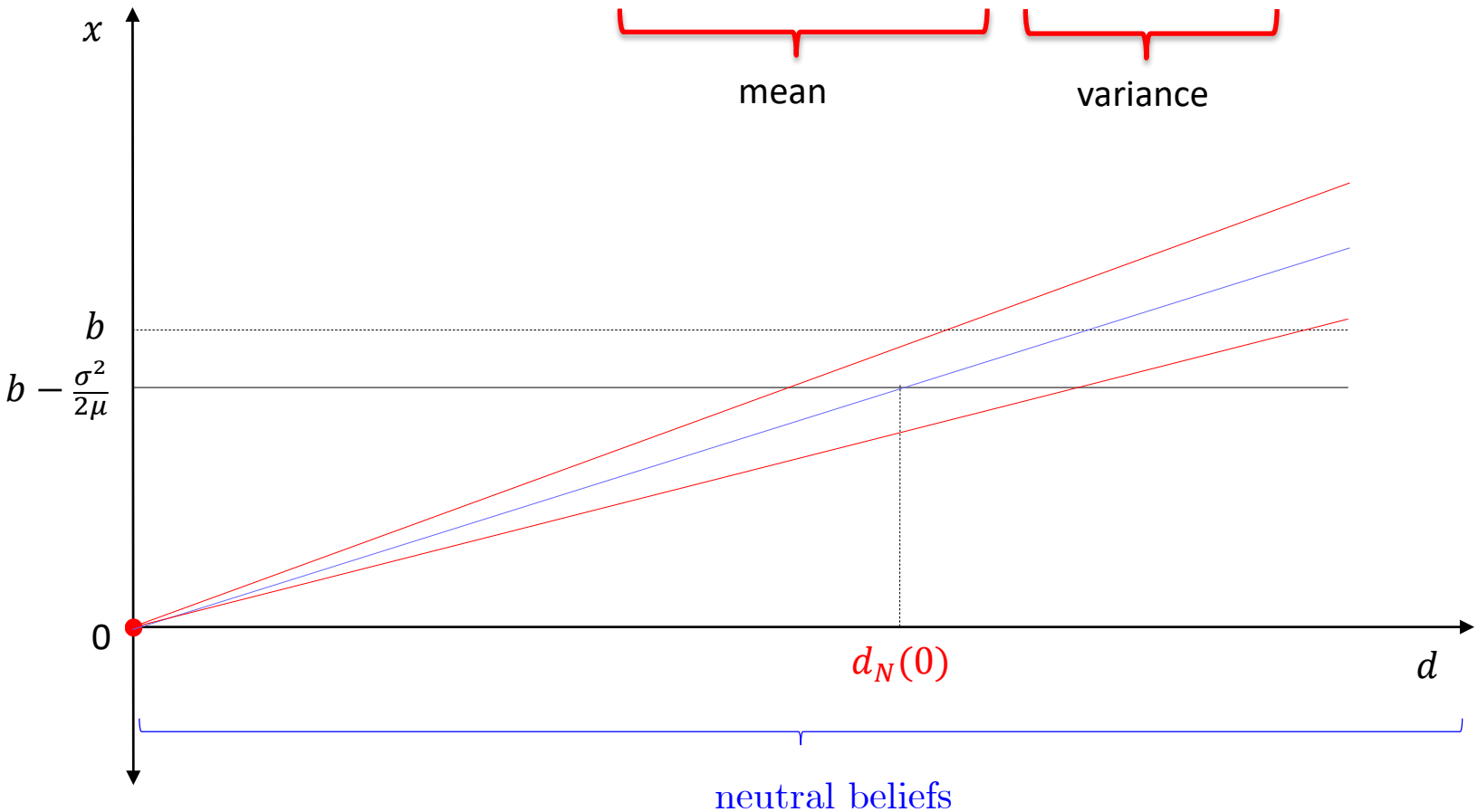

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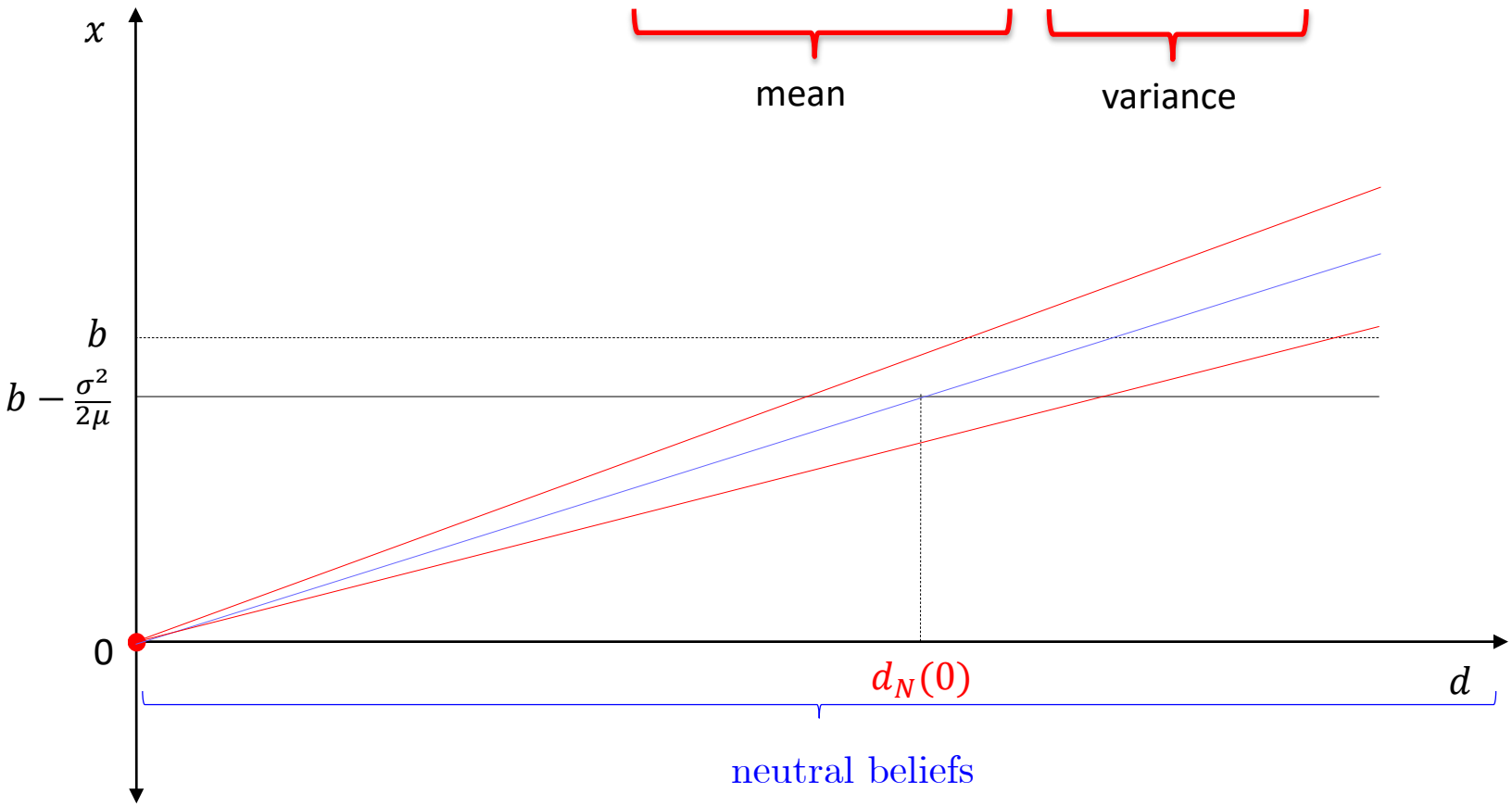
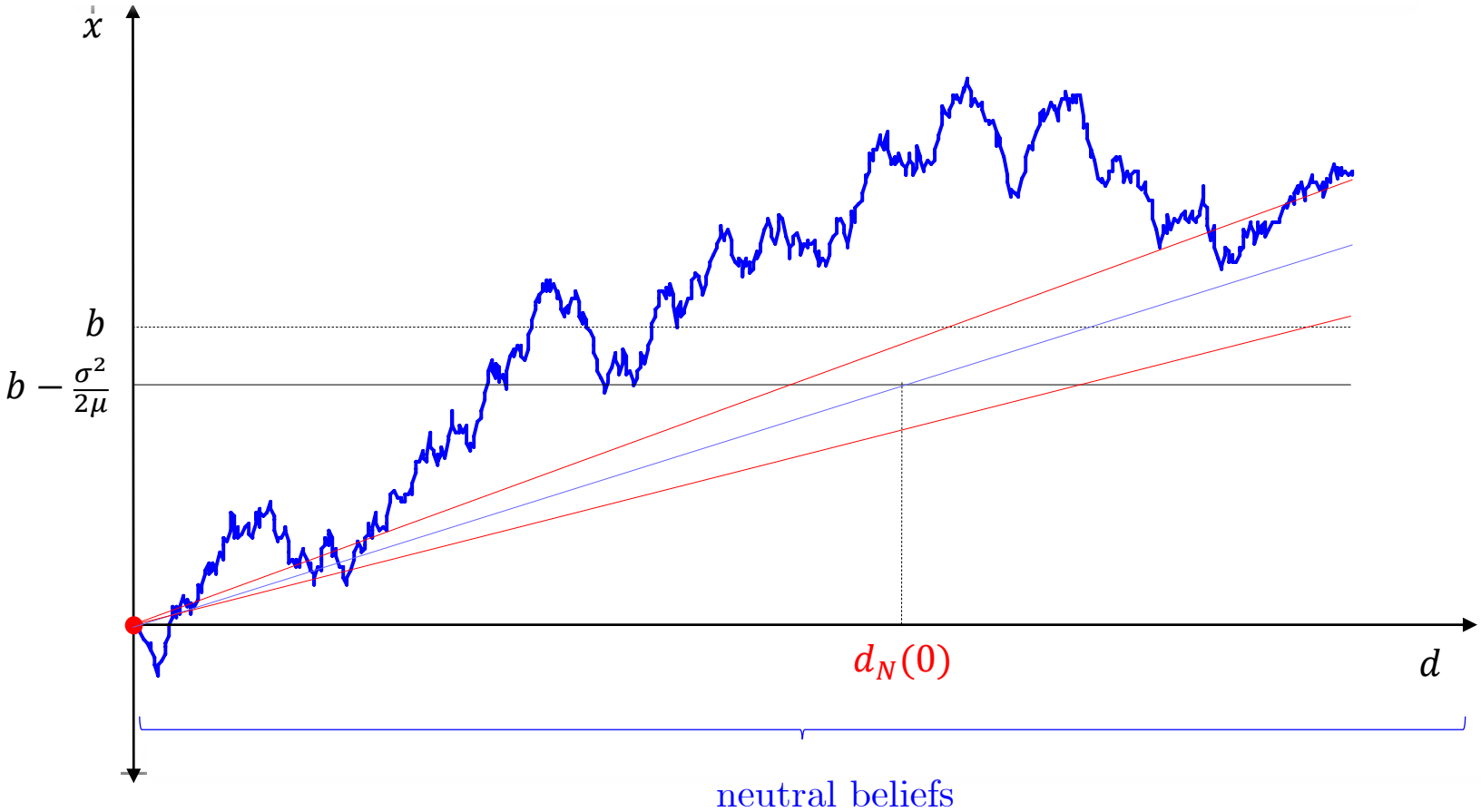


<u>Key question</u>: When, why, and how can the sender induce a decision that is smaller than $d_N(0)$?

- Decision Making With an Expert – Strategic Advice
  - No Advice is <u>not</u> an equilibrium
  - Receiver optimal equilibria
  - Can the Expert do better?
    - "Conative" Advice
    - "Referential" Advice

No Advice



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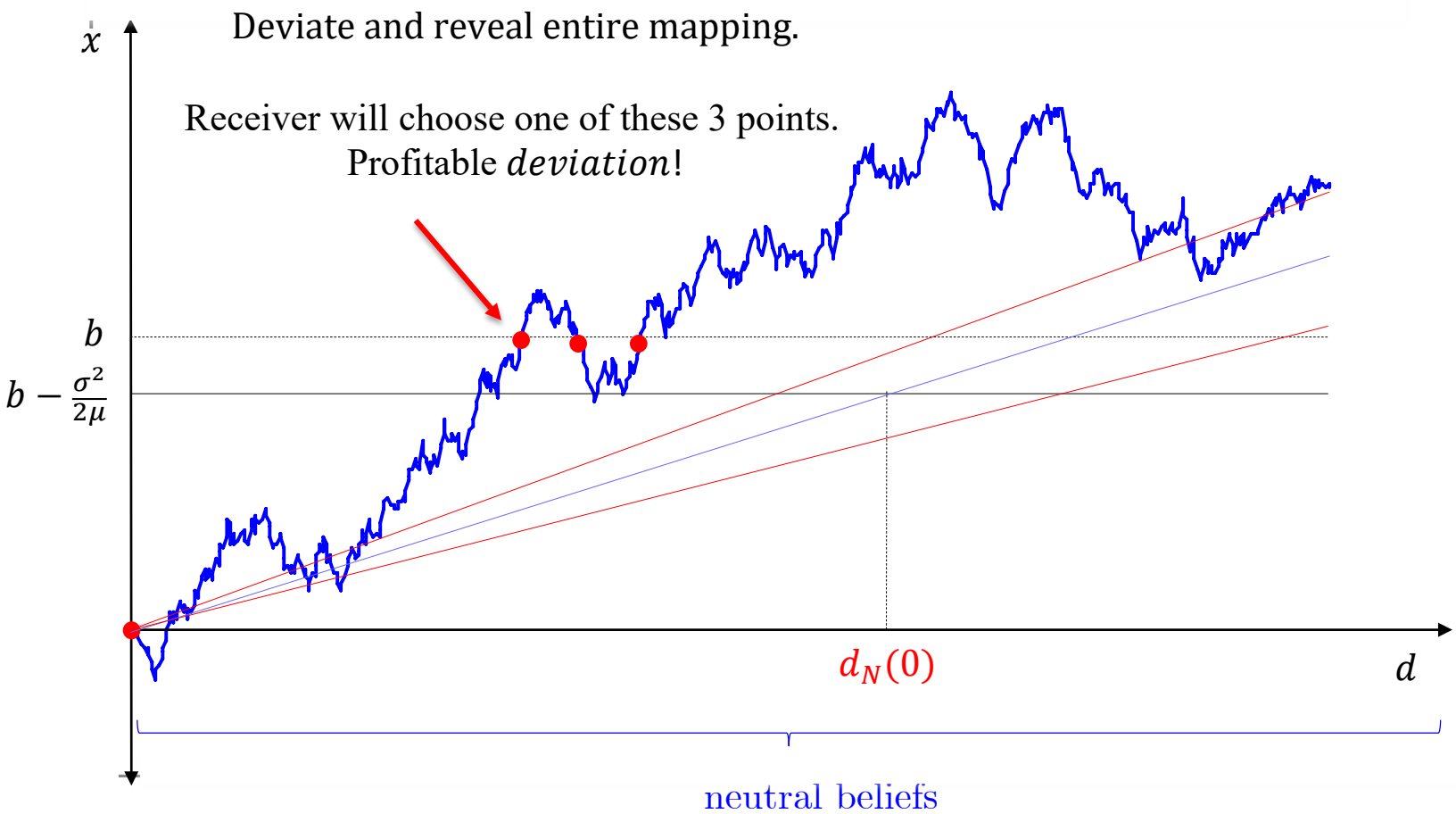
Deviate and reveal entire mapping.
Receiver will choose one of these 3 points.
Profitable *deviation*!
$\dot{x}$
b
$b - \frac{\sigma^2}{2\mu}$
$d_N(0)$
d
neutral beliefs

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Full Revelation is an Equilibrium

Many Receiver Optimal Equilibria

Revealing final crossing & every point to the right is an equilibrium.

Receiver Optimal Equilibria

- Why doesn't the sender reveal less information?
  - Strategy creates an expectation for that information.
  - Sender cannot deviate without being detected.
  - This is an important class of strategies.
    - We prove that "non-deceptive" strategies = neutral beliefs.

- The extra information the sender reveals is "referential"
  - (terminology borrowed from Jakobson's six functions of language).

- Referential advice creates an expectation that binds the sender.
  - It can hurt the sender when compelled to reveal too much.

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Intuition For Simple Advice

- Problem: In the classic model the problem is that the Expert can't **use** her information and **protect** it at the same time.
- Intuition: Expert wants to protect info as much as possible.
- There is an equilibrium in which the Expert reveals only a single point!
  - Receiver "rubber stamps" and implements revealed point.

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- But: This equilibrium doesn't help the Expert at all!
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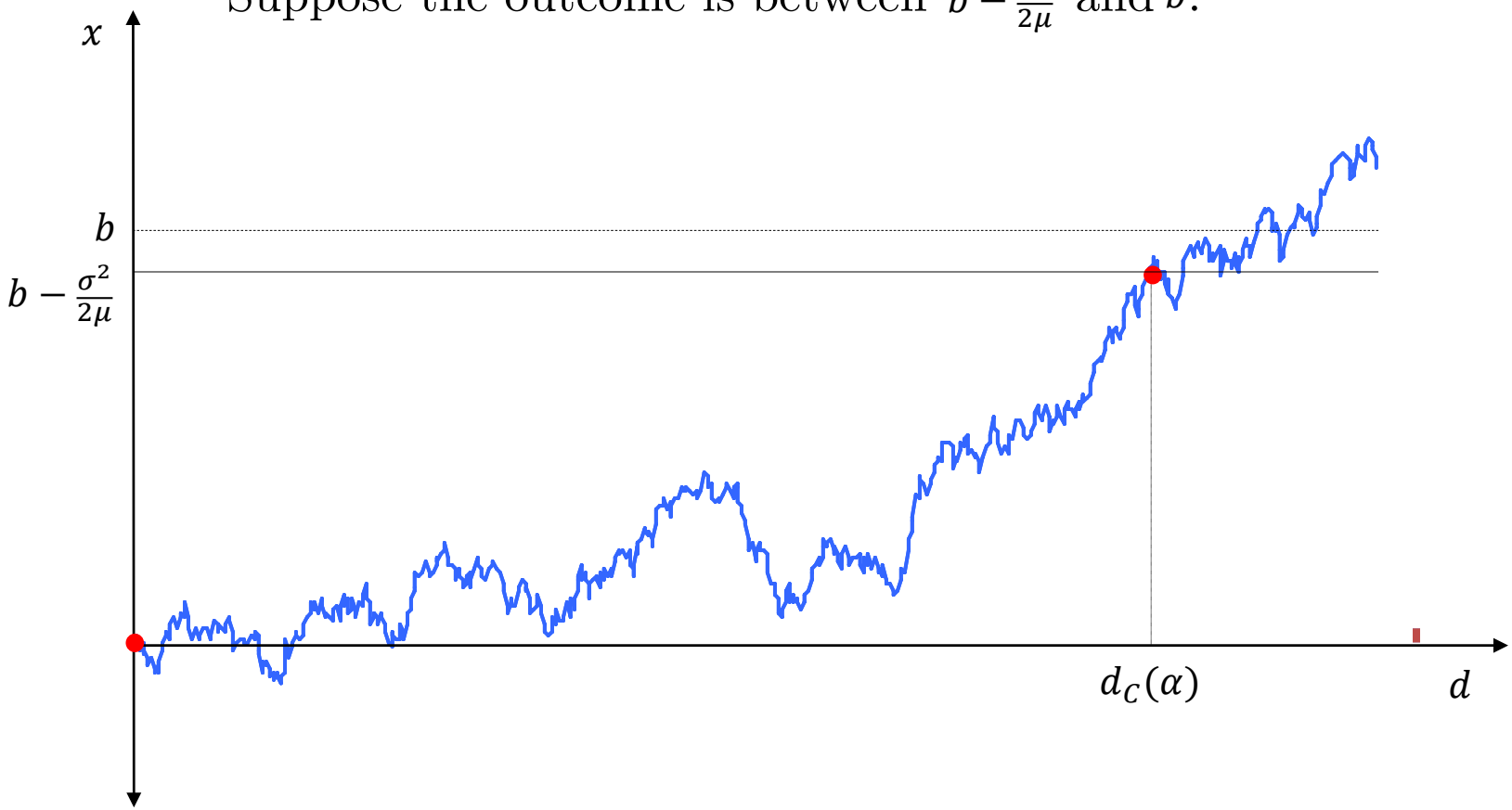
- This as "conative" advice.
  - Language as a recommendation (Jakobson 1960).
  - Simple form of communication

Conative Equilibrium

- Conative strategy: Reveal the <u>first</u> decision to produce some outcome.
  - Suppose the outcome is between $b - \frac{\sigma^2}{2\mu}$ and b.



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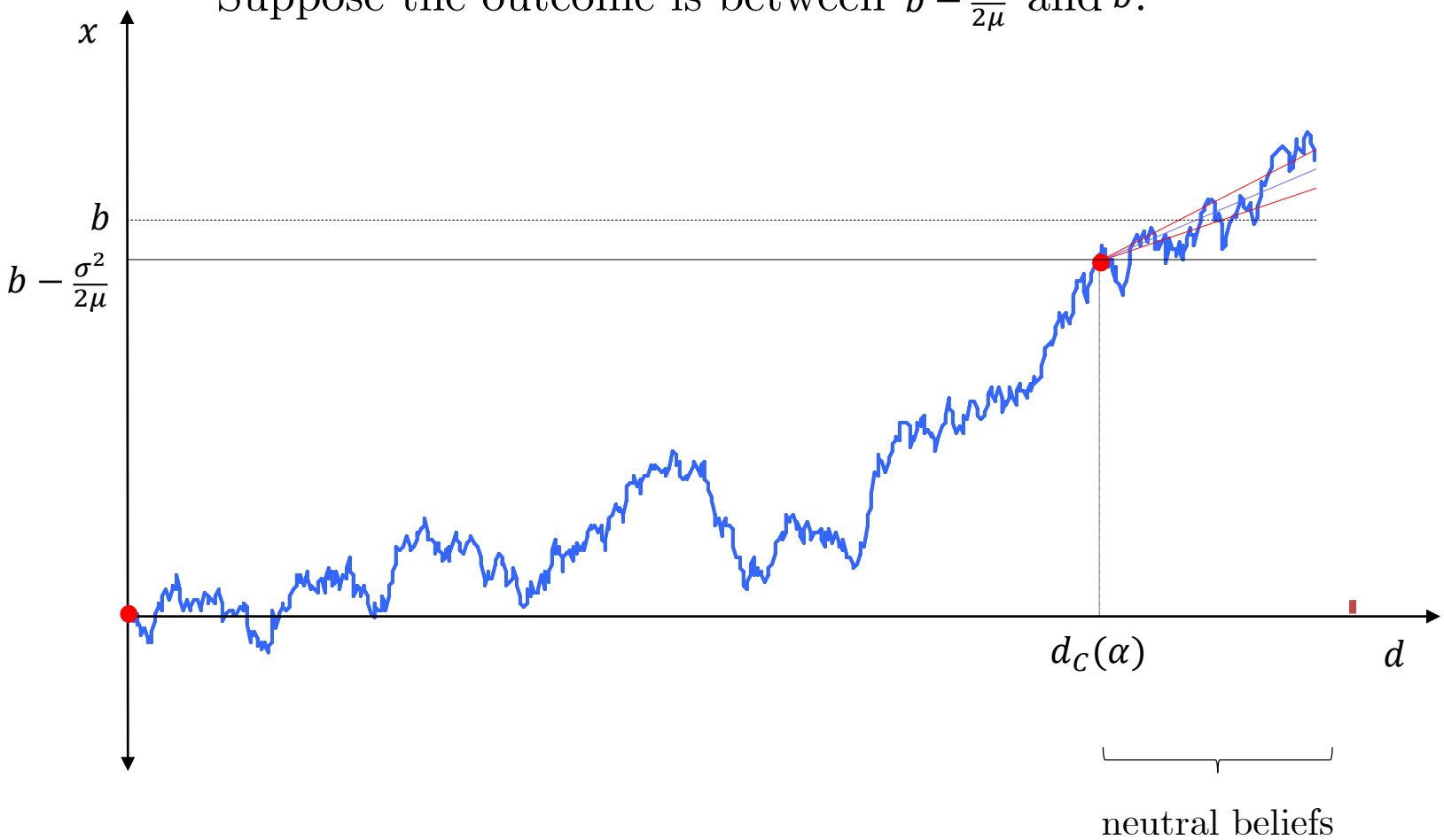

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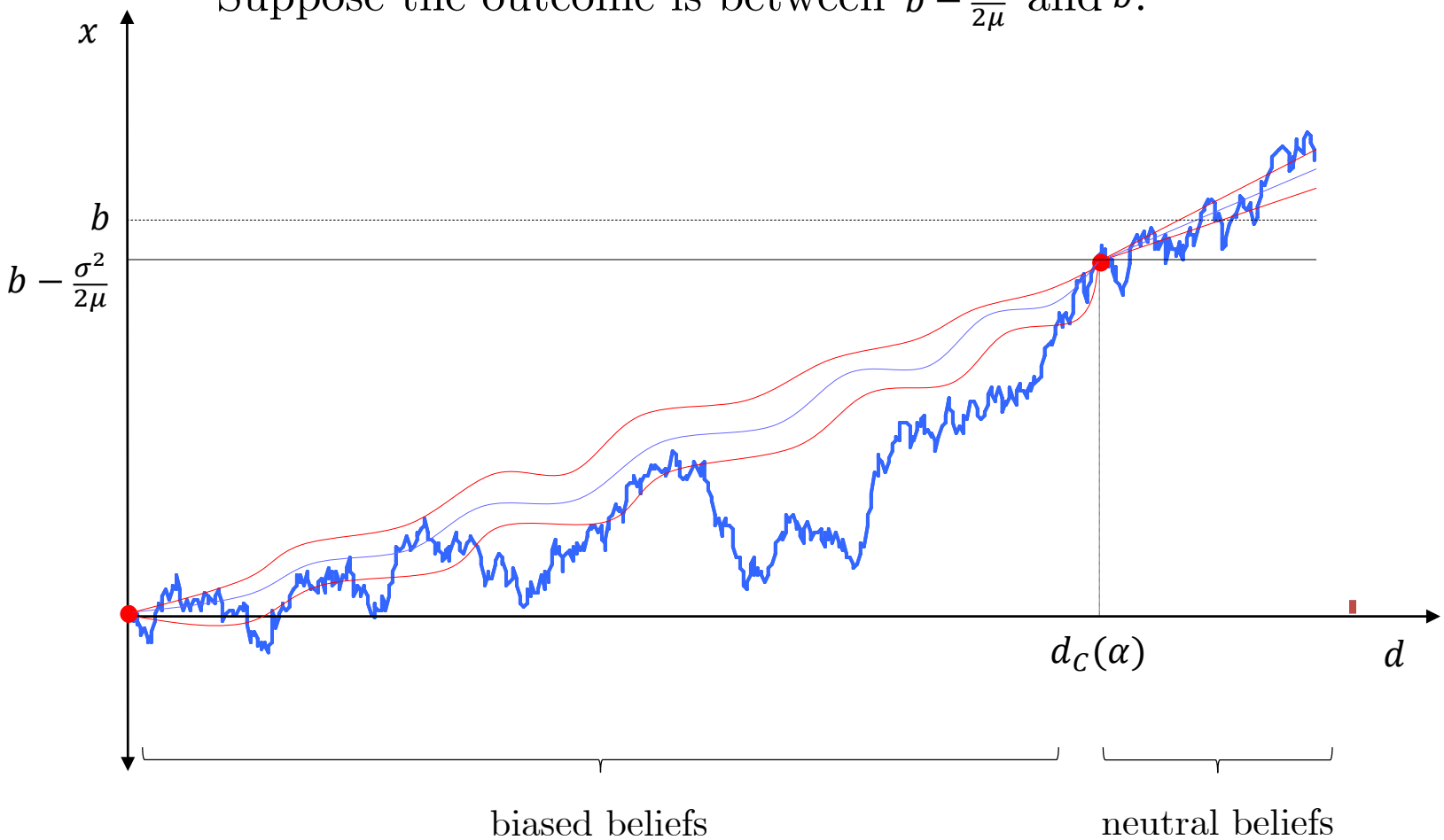

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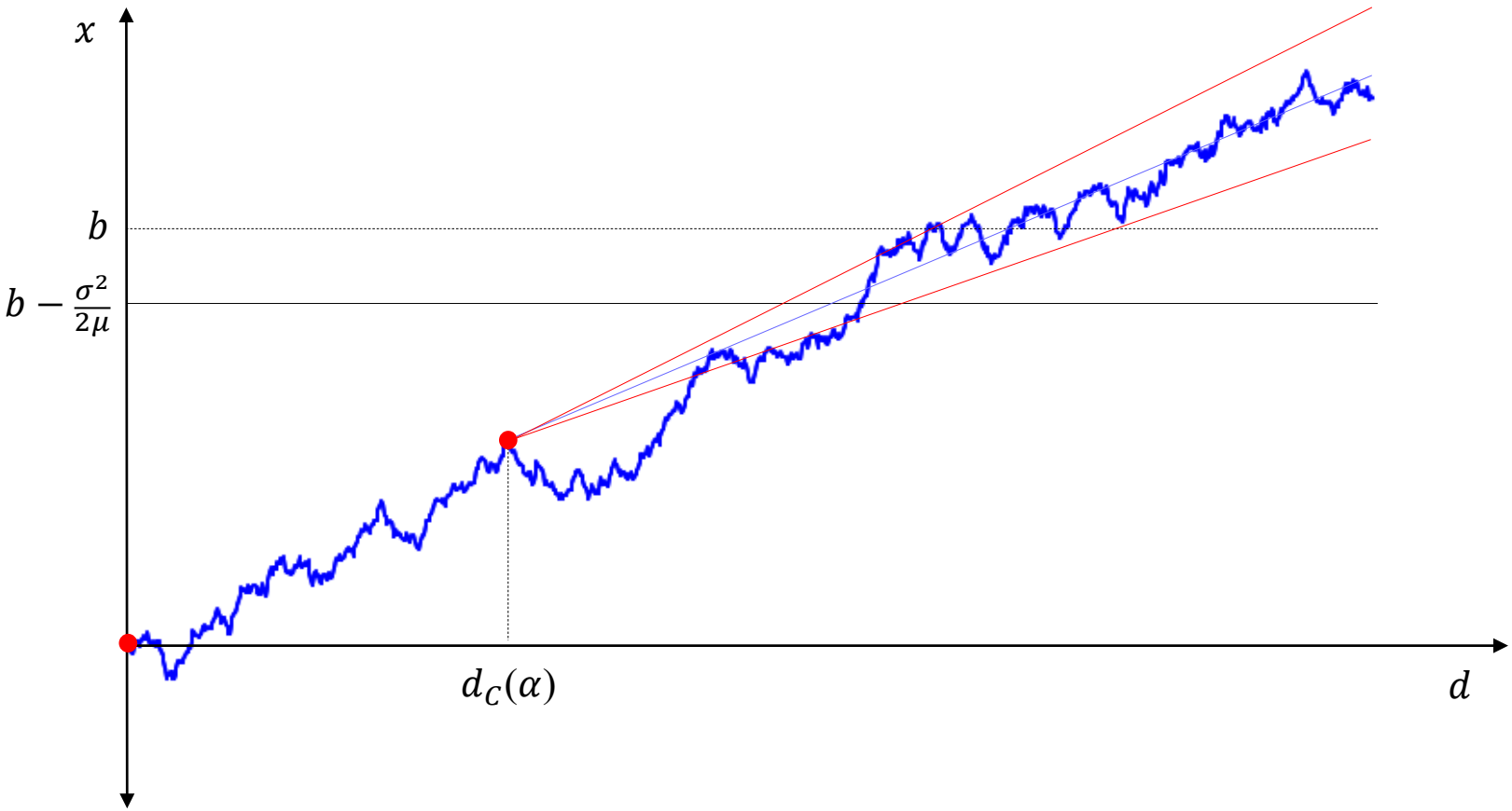

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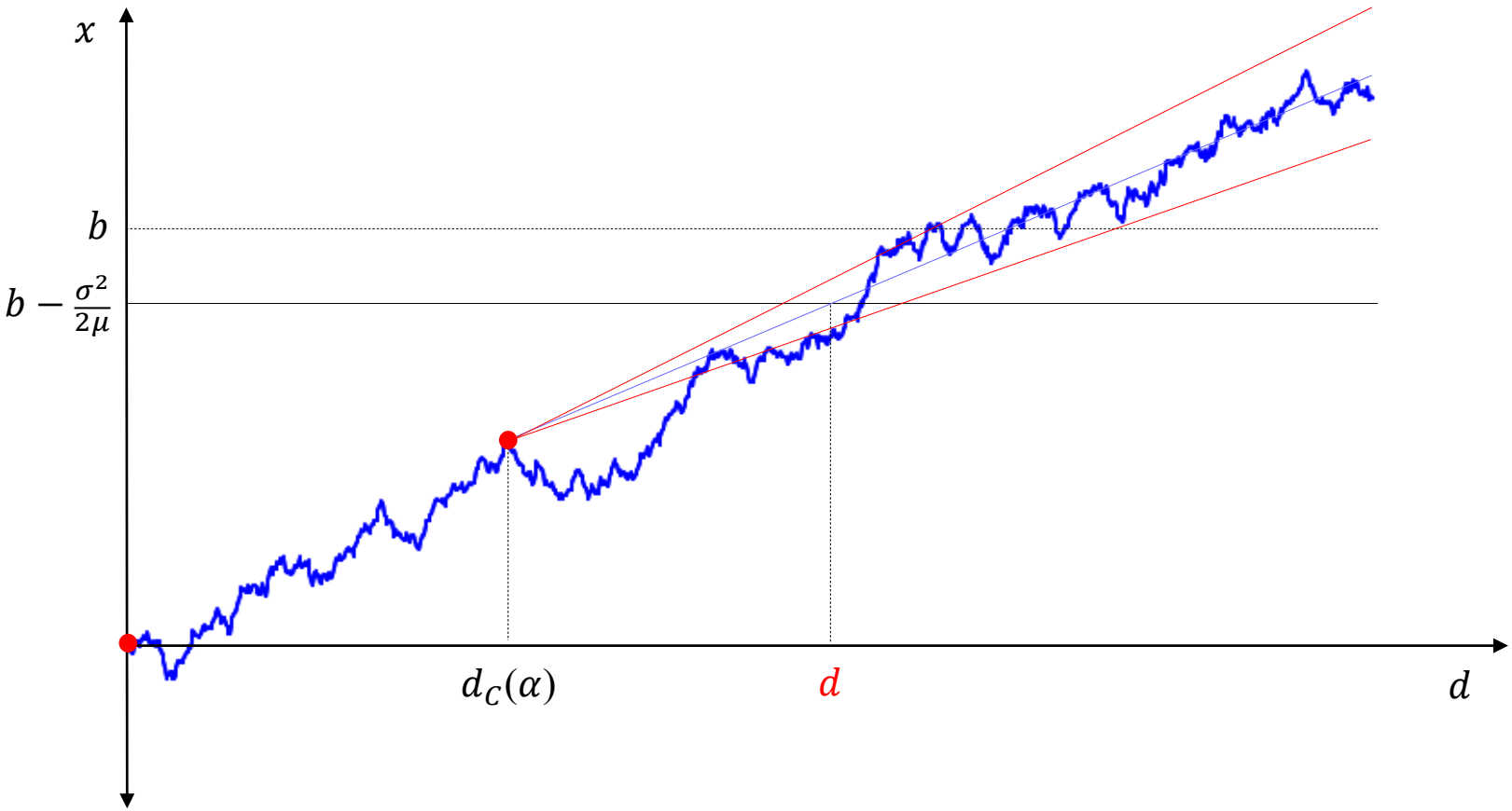

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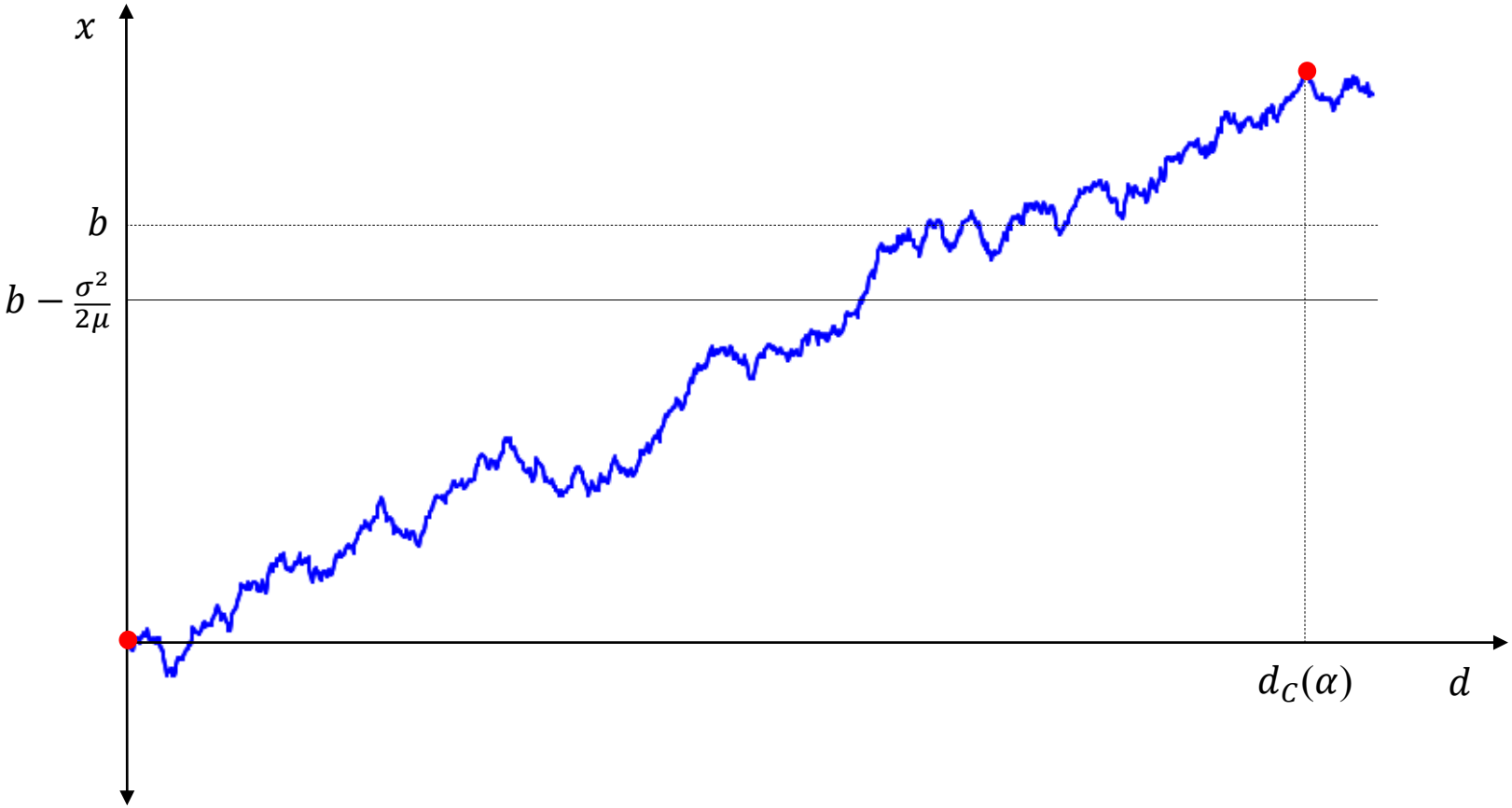

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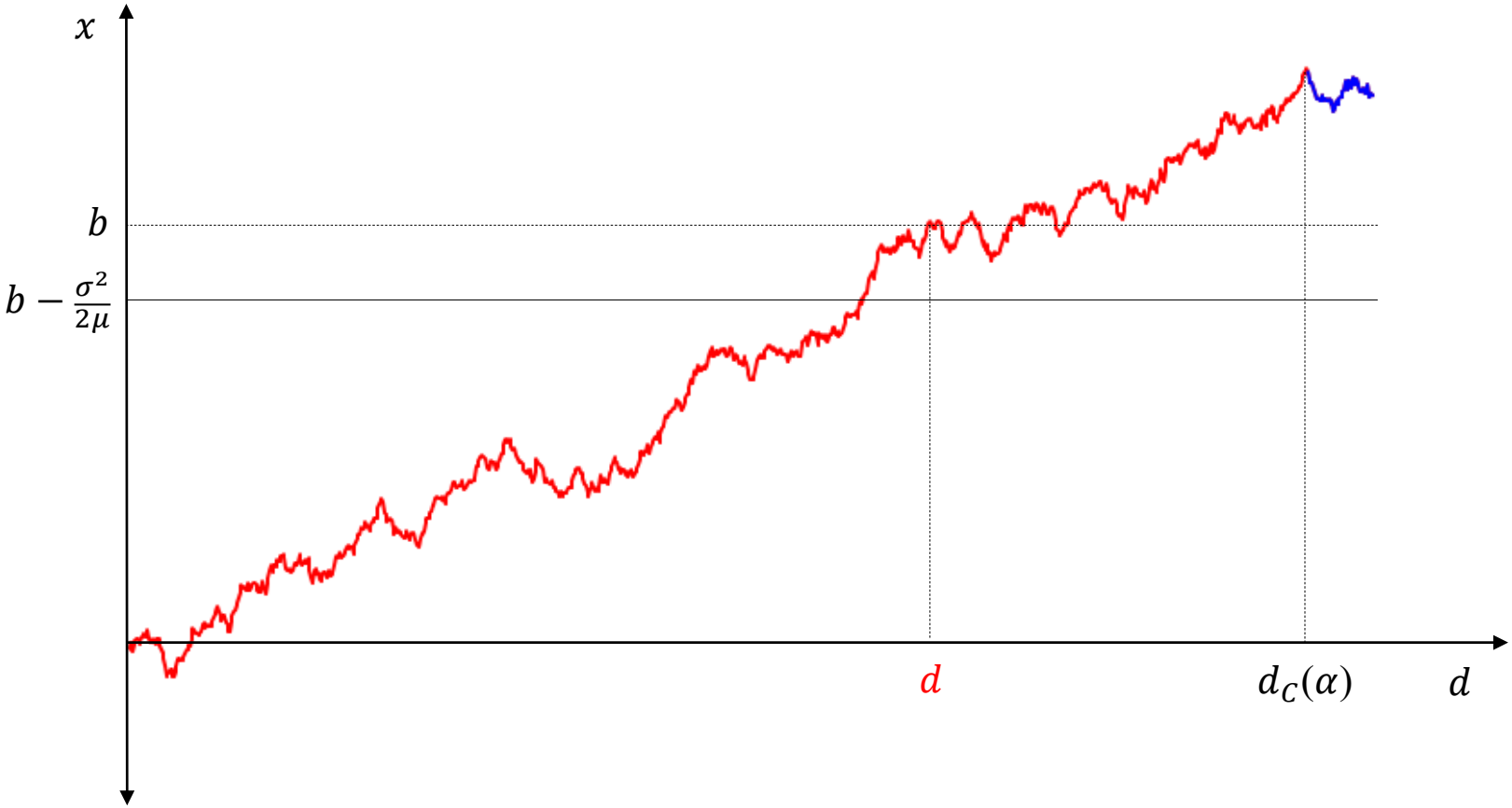
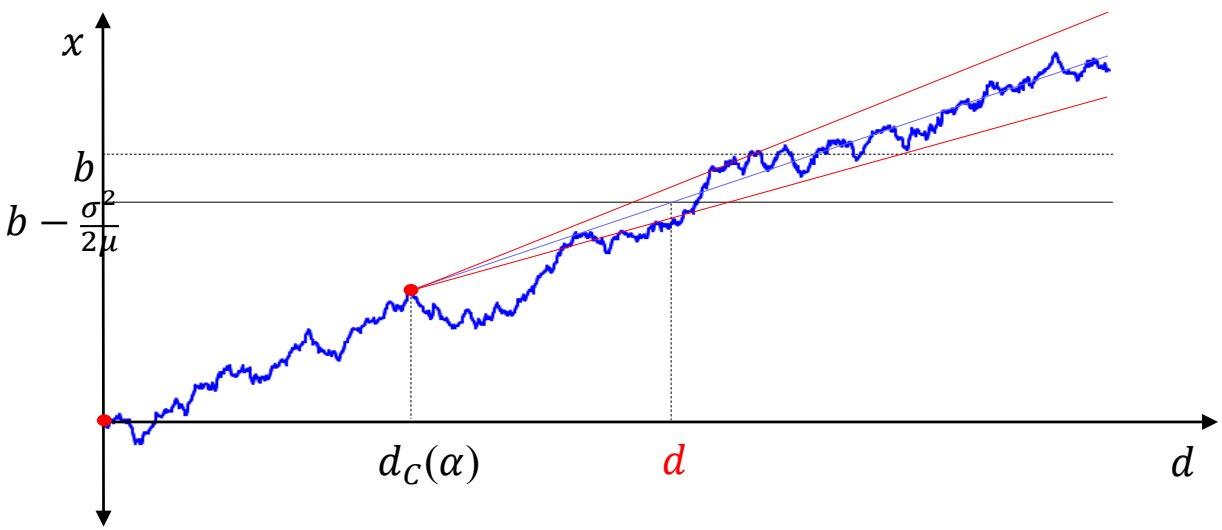


The Futility of Conative Advice

- Why can't the sender do better?
  - Why can't the sender reveal an outcome $x^* < b - \frac{\sigma^2}{2\mu}$ that leaves the receiver indifferent to no-advice and extract all surplus?
- The reason: Information spillovers.
  - If the Sender reveals this point, the Receiver uses the info for own gain.
  - Sender can't stop informational spillover as in canonical models.



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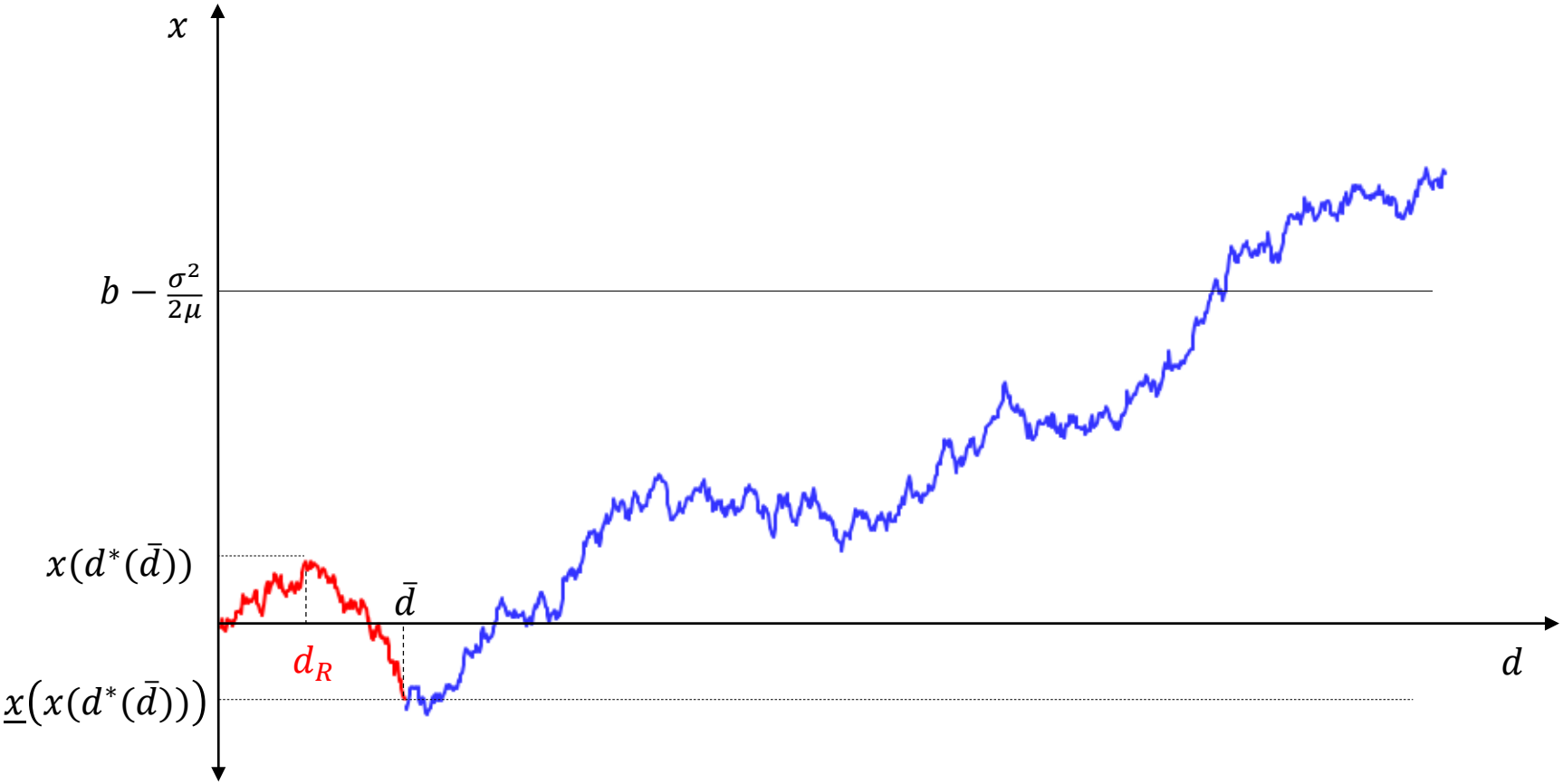
      - Better to send <u>**more**</u> information!
      - How? Need to control informational spillovers.

Interval Equilibrium



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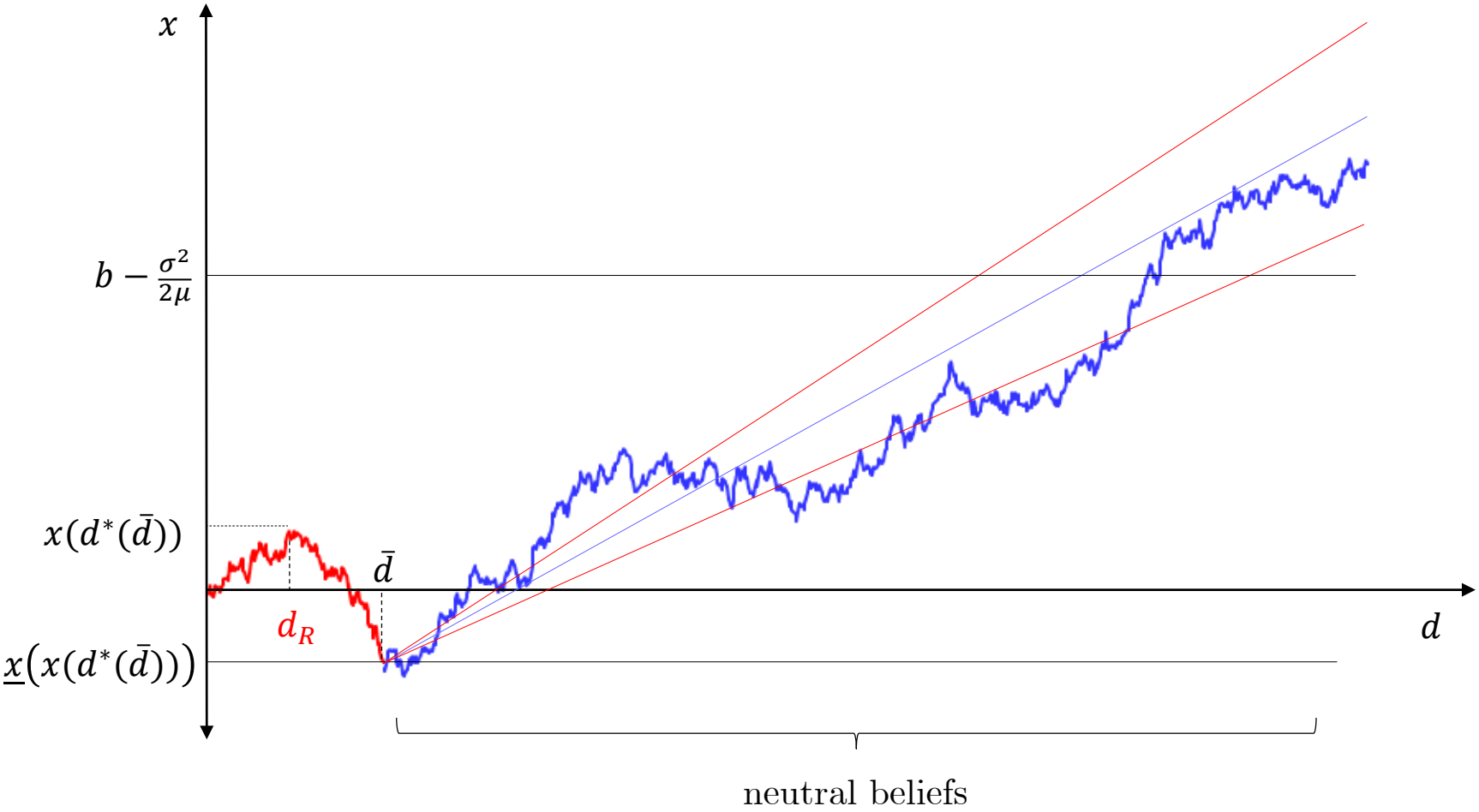

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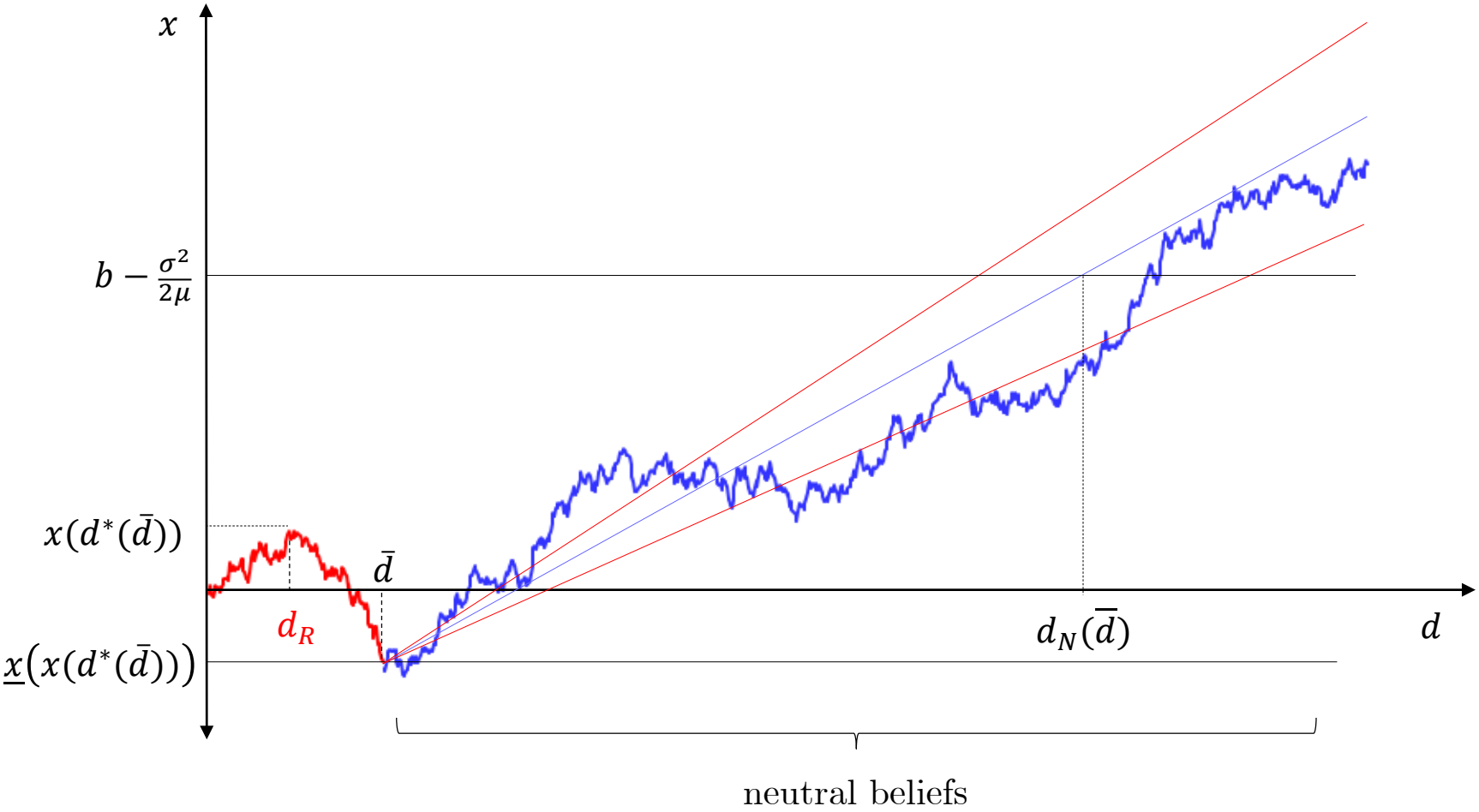

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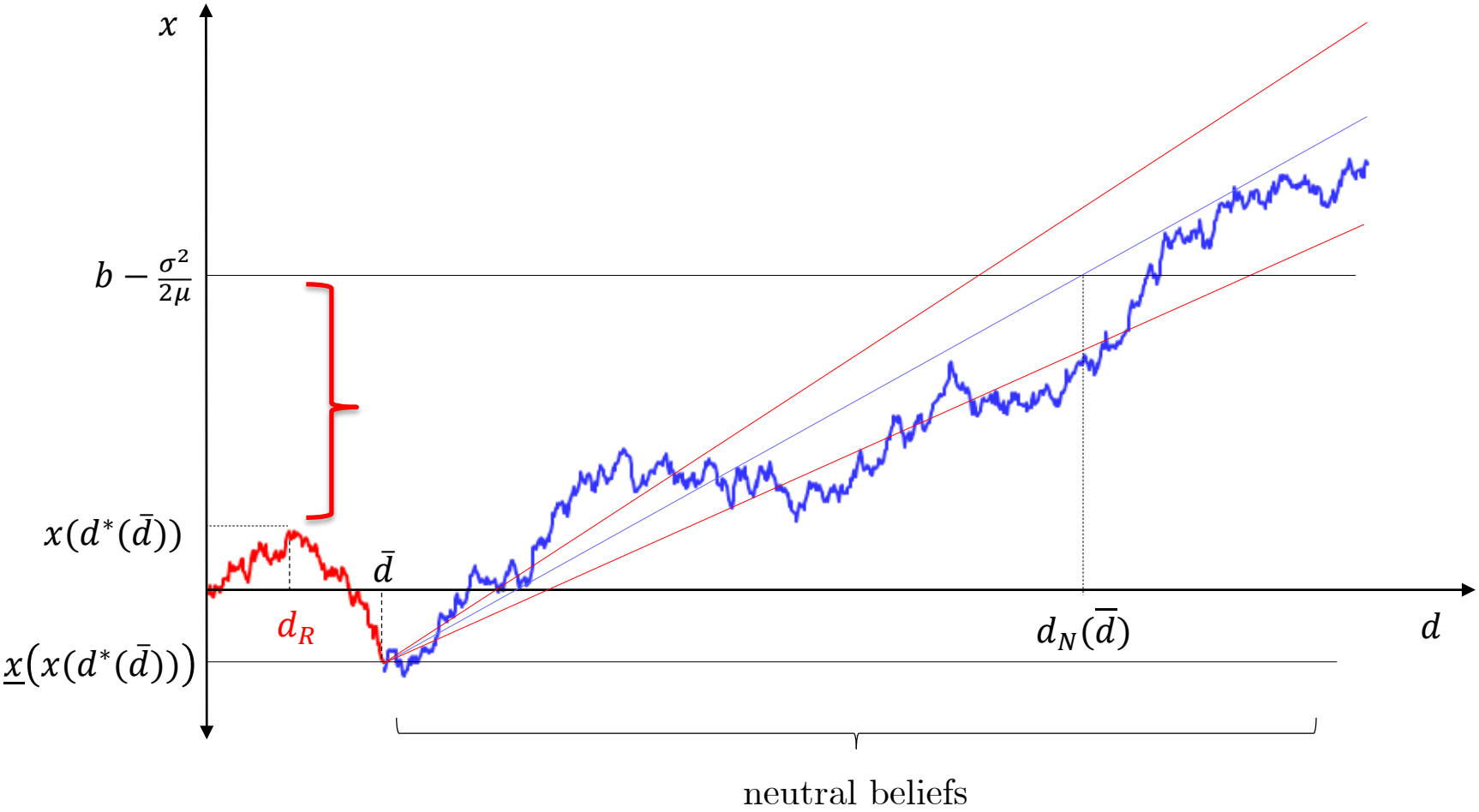

Interval Equilibrium

- <u>Interval Strategy:</u> Reveal (i) until peak-bottom condition is satisfied, or (ii) outcome $b - \frac{\sigma^2}{2\mu}$ is reached.

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- <u>Proposition:</u> With **probability one** such a peak and bottom are reached before the path reaches $b - \frac{\sigma^2}{2\mu}$.

Why Does the Interval Equilibrium Work?

- Referential information increases the uncertainty about the Receiver's best alternative.
  - Good alternatives continue to exist (path hits b with prob. 1)
  - Uncertainty about where good alternatives are induces the Receiver to choose a safe but unappealing alternative.

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- The abundance of referential info makes the recommendation credible.

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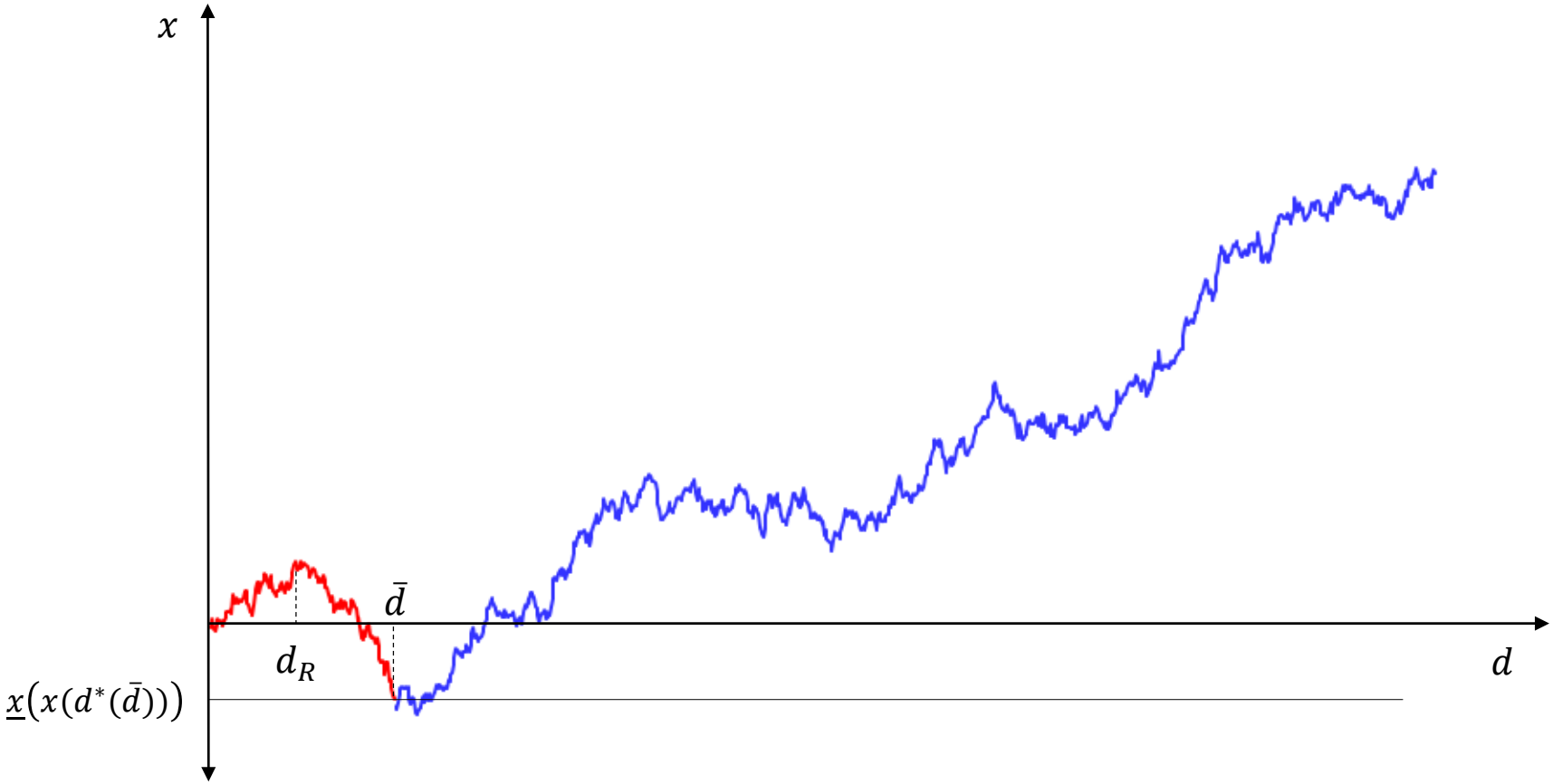

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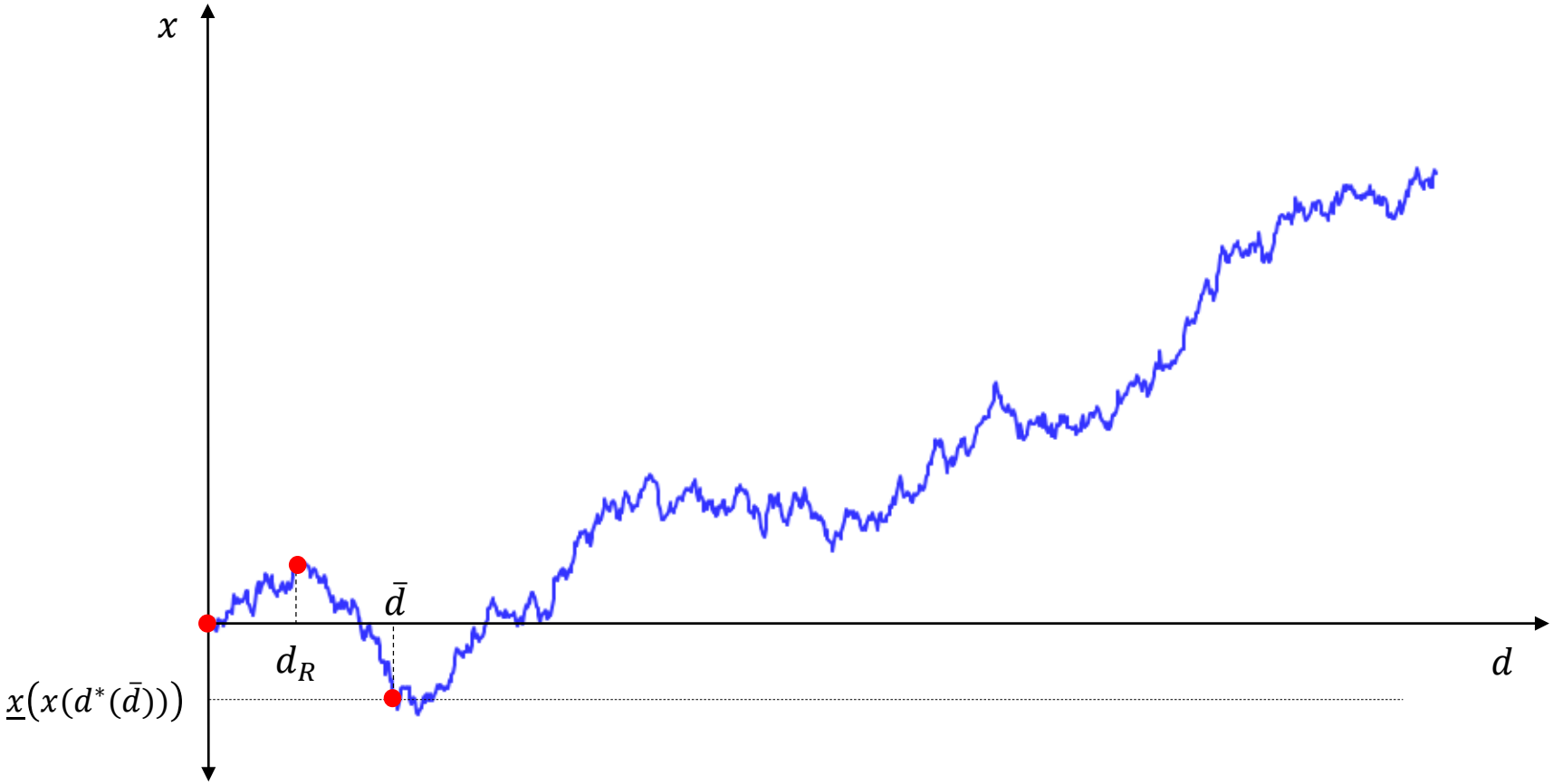

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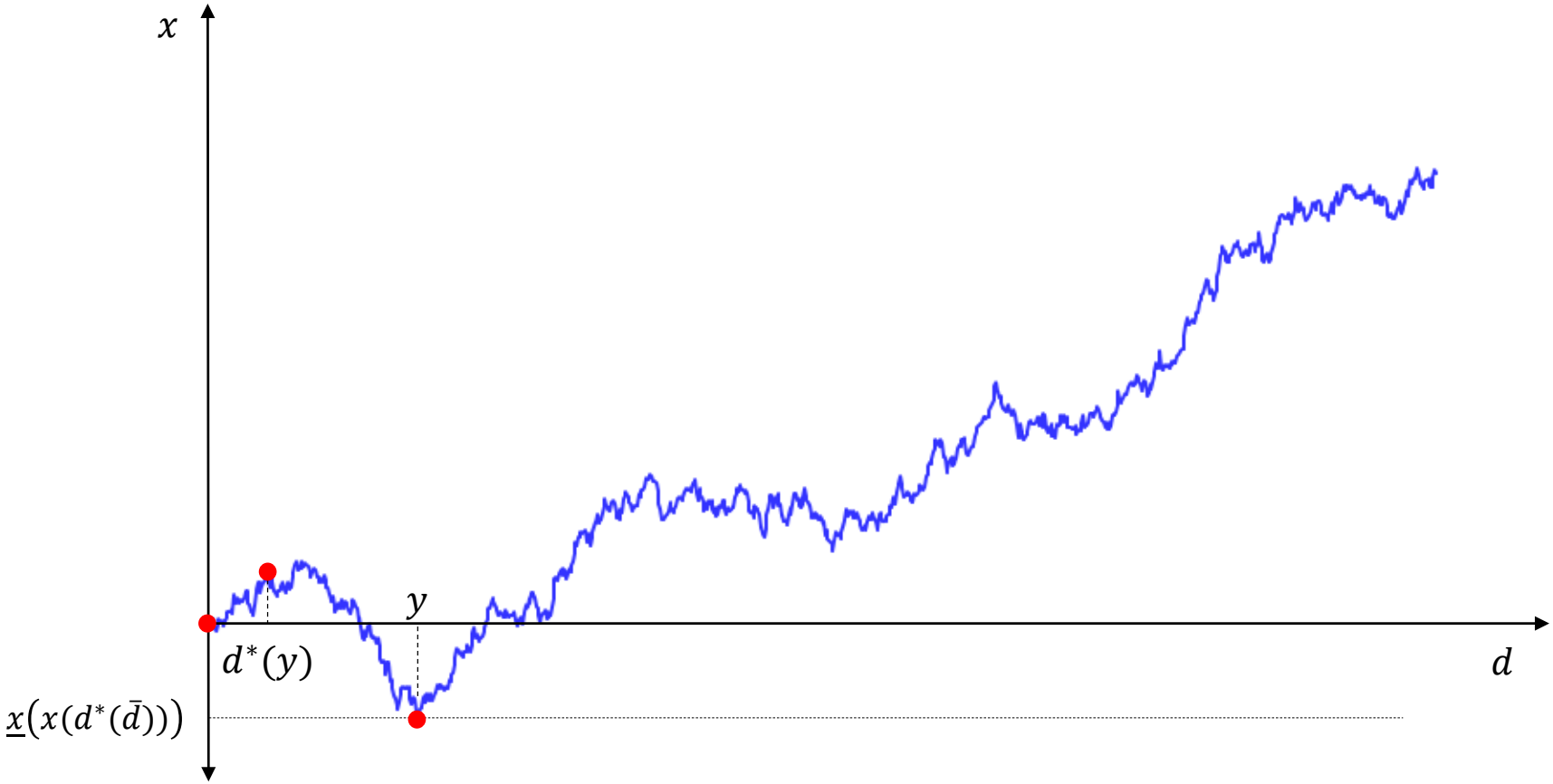
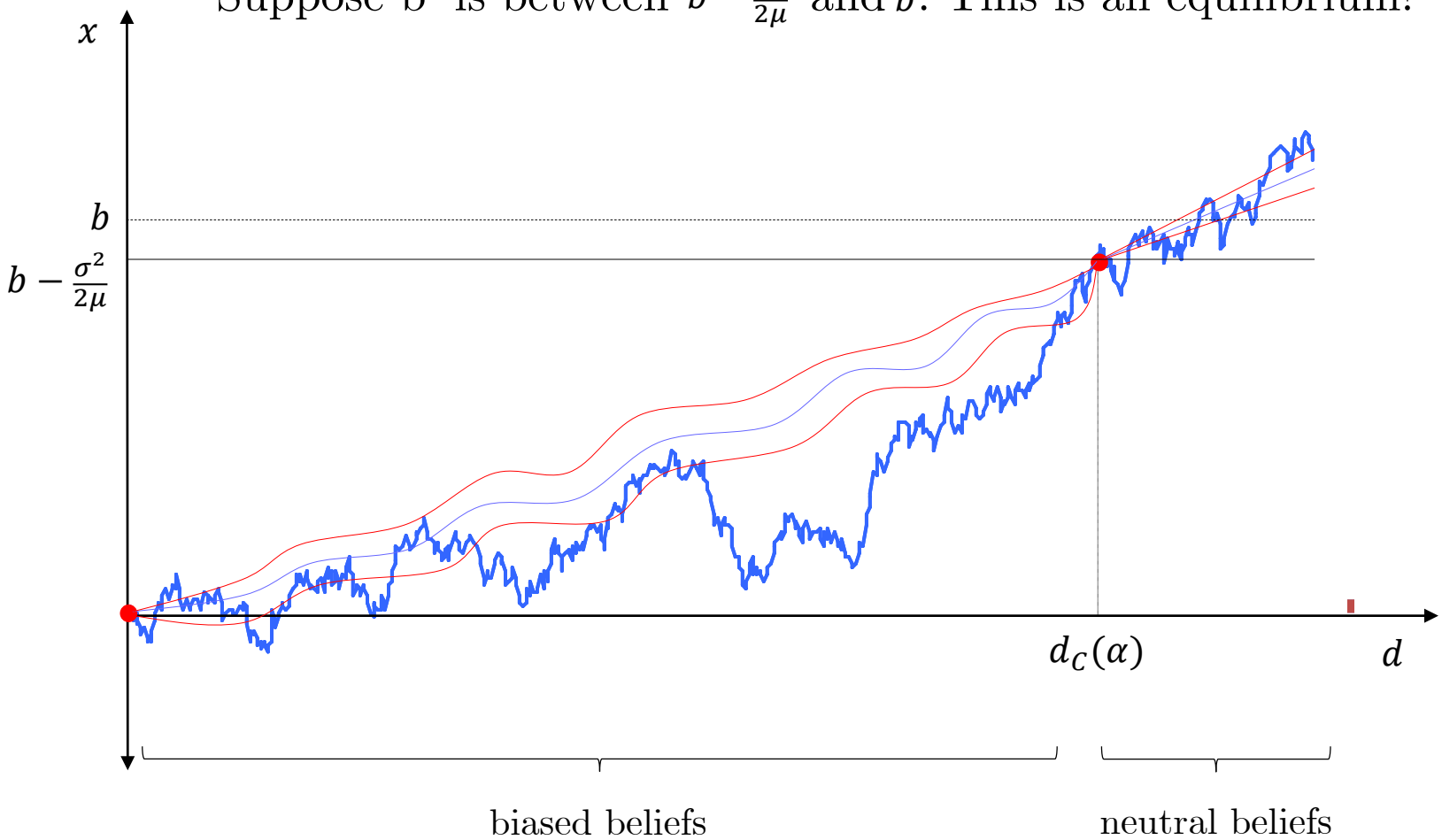


Referential Advice – Conclusion

- Take-away: The power of referential advice.
  - The expert must shape beliefs about the action she wishes to be undertaken *and* the actions she wants the receiver to not take.
  - Without revealing too much information!
  - Only then can the true power of the expert be realized and the expert "overtower" the decision maker.
  - Communication is of a different form: More than a recommendation.

Cheap Talk

- Announce the <u>first</u> decision to produce sender's ideal outcome, b^s.
  - Suppose b^s is between $b - \frac{\sigma^2}{2\mu}$ and b. This is an equilibrium!



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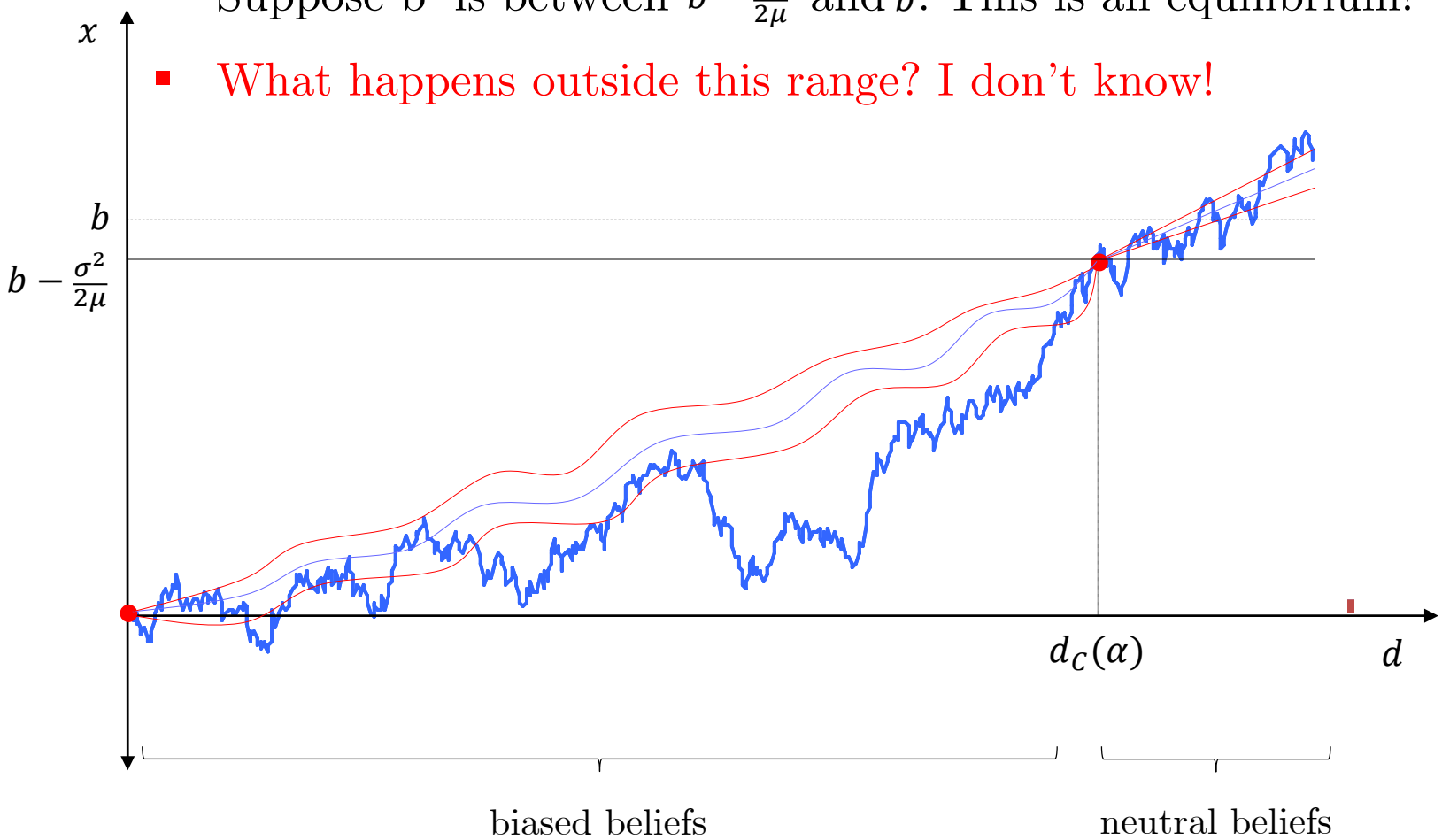
  - What happens outside this range? I don't know!



Communication in a Complicated World

- Expertise is more than a single piece of information.
- Advice is imperfectly invertible.
  - A recommendation should not render a layperson an expert

- Open questions & other ideas:
  - Cheap-talk for larger preference differences?
  - Multiple periods: reveal progressively over time?
    - w/ Lambert and Matouschek ... trying.
  - Regulating innovative industries – Multiple senders (w/ Hongyi Li ... come on, Hongyi!).
  - ... ?