Intelligent Escalation and the Principle of Relativity

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ENS de Lyon

November 2014
1 Escalation
   - In 2014
   - In 1720
   - In 1971 and now

2 The Dollar auction

3 Escalation and cognitive psychology

4 Conclusion
Incomes

Évolution des revenus moyens par quantiles 1996-2006 en France
Base 100 en 1996 (Source : Piletty, Landais)

- P99,99-100 (Revenu moyen 2006 = 2 070 000 € ; croissance moy./an 1996-2006 = + 6,1 %)
- P99,9-99,99 (Revenu moyen 2006 = 505 000 € ; croissance = + 4,1 %)
- P99,5-99,9 (Revenu moyen 2006 = 218 000 € ; croissance = + 2,7 %)
- P99-99,5 (Revenu moyen 2006 = 139 000 € ; croissance = + 2,1 %)
- P95-99 (Revenu moyen 2006 = 81 400 € ; croissance = + 1,3 %)
- P90-95 (Revenu moyen 2006 = 54 000 € ; croissance = + 0,8 %)
- P0-90 (Revenu moyen 2006 = 18 600 € ; croissance = + 1,3 %)
Energy

Source: Gail Tverberg, *World Energy Consumption Since 1820 in Charts*
I can calculate the movement of the stars, but not the madness of men. claimed to be Newton’s view on the outcome of the South Sea Bubble (1720).
The Dollar Auction

In 1971, in a paper called

The Dollar Auction game:
A paradox in noncooperative behavior and escalation

Martin Shubik described an infinite game.

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The Dollar Auction *(the story revisited)*

For charity, an object is sold on an auction made a special way. There is a piggy bank (or a hat).

To bid, each person puts one euro in the piggy bank which is never returned to him.
The Dollar Auction

Assume

- that there are two bidders (Alice and Bob)
- that the value of the object is $v \in \mathbb{E}$ and
- that the bid is always $b \in \mathbb{E}$

The payoff is negative after $\frac{v}{b}$ turns.
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After \( n \) turns

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v = 100, b = 5

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- The Dollar Auction Game is by definition an infinite game, 

   *We could add an upper limit to the amount that anyone is allowed to bid. However the analysis is confined to the (possibly infinite) game without a specific termination point, as no particularly interesting general phenomena appear if an upper bound is introduced.*  

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  We could add an upper limit to the amount that anyone is allowed to bid. However the analysis is confined to the (possibly infinite) game without a specific termination point, as no particularly interesting general phenomena appear if an upper bound is introduced. Shubik (1971), p. 109.

- It should be studied using tools designed for infiniteness. namely coinduction.
Is escalation in the Dollar Auction irrational?

- Escalation is irrational
  
  *Once two bids have been obtained from the crowd, the paradox of escalation is real [...] A total of payments between three and five dollars is not uncommon*  
  
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- Escalation is not irrational (no paradox)
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  *Obviously such an outcome is *inconsistent* with a subgame perfect equilibrium of an extensive game that models the auction: every participant has the option of not bidding.*  
  

- Escalation is not irrational *(no paradox)*

**Theorem** *(using coinduction):*

*Escalation among intelligent agents is possible in the dollar auction.*
Why this discrepancy?

- For Osborne et al. the resources are finite.

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  Osborne \textit{An Introduction to Game Theory},

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\textbf{No escalation among intelligent agents} \textit{if they believe in a world of finite resources}
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**No escalation among intelligent agents**

*if they believe in a world of finite resources*

**Possible escalation among intelligent agents,**

*if they believe in a world of infinite resources.*
The Dollar auction

The Dollar Auction pictured

0,100 → 95,0 → −5,95 → 90,−5 → −10,90 → 85,−10 → ... → −5n,100−5n → 100−5(n+1),−5n

The dollar auction
A

The Dollar auction

The Dollar Auction pictured

The dollar auction

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The Dollar auction

Alice abandons

We can prove that the strategy
Alice abandons and Bob continues

is a SubGame Perfect equilibrium.
Alice abandons

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Alice takes Bob’s threat as credible and considers it is better to give up.
Bob abandons

The strategy Alice continues and Bob abandons

is a **SubGame Perfect Equilibrium**.
The Dollar auction

Bob abandons

The strategy Alice continues and Bob abandons

is a SubGame Perfect Equilibrium.

Bob takes Alice’s threat as credible.
The strategy *always give up*

is a *not a SubGame Perfect Equilibrium* and therefore *not a Nash equilibrium.*
An intelligent agent takes a decision based on an equilibrium.
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At each turn if the agent continues she (he) is intelligent.
An intelligent agent takes a decision based on an equilibrium.

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A recent book addresses the new trends on rational thought.

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*What Intelligence Tests Miss: The Psychology of Rational Thought.*  
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  - *Intelligence*

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Reasoning on infinite sequential games is necessary.
**Conclusion**

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- **Escalation is possible if**
Reasoning on infinite sequential games is necessary.

Escalation is possible if

- the agents are intelligent and
• Reasoning on infinite sequential games is necessary.

• Escalation is possible if
  • the agents are intelligent and
  • believe in a world of infinite resources,
- **Reasoning** on infinite sequential games is necessary.
- **Escalation** is possible if
  - the agents are intelligent and
  - believe in a world of infinite resources,
  - that is if the game is infinite.
Conclusion

- Reasoning on infinite sequential games is necessary.
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- Coalgebras and coinduction are the right tools for rethinking economics.
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- Coalgebras and coinduction are the right tools for rethinking economics.

- The point of view of the agent is different form the point of view of the observer: principle of relativity (the answer to Newton).
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• Coalgebras and coinduction are the right tools for rethinking economics.

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• The fact that intelligent agents can lead to situations that are not stable questions the efficiency of the markets.
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- **Reasoning on infinite sequential games is necessary.**
- **Escalation is possible if**
  - the agents are intelligent and
  - believe in a world of infinite resources,
  - that is if the game is infinite.
- Coalgebras and coinduction are the right tools for **rethinking economics**.
- The point of view of the agent is different from the point of view of the observer: **principle of relativity**.
- The fact that intelligent agents can lead to situations that are not stable questions the **efficiency of the markets**.
To Jeanne Daum