Se você é tão inteligente, por que você não é rico?

Talent vs Luck: the role of randomness in success and failure

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Abstract

The largely dominant meritocratic paradigm of highly competitive Western cultures is rooted on the belief that success is due mainly, if not exclusively, to personal qualities such as talent, intelligence, skills, smartness, efforts, willfulness, hard work or risk taking. Sometimes, we are willing to admit that a certain degree of luck could also play a role in achieving significant material success. But, as a matter of fact, it is rather common to underestimate the importance of external forces in individual successful stories. It is very well known that intelligence (or, more in general, *talent* and personal qualities) exhibits a Gaussian distribution among the population, whereas the distribution of wealth - often considered a proxy of success - follows typically a power law (Pareto law), with a large majority of poor people and a very small number of billionaires. Such a discrepancy between a Normal distribution of inputs, with a typical scale (the average talent or intelligence), and the scale invariant distribution of outputs, suggests that some hidden ingredient is at work behind the scenes. In this paper, with the help of a very simple agent-based toy model, we suggest that such an ingredient is just randomness. In particular, we show that, if it is true that some degree of talent is necessary to be successful in life, almost never the most talented people reach the highest peaks of success, being overtaken by mediocre but sensibly luckier individuals. As to our knowledge, this counterintuitive result - although implicitly suggested between the lines in a vast literature - is quantified here for the first time. It sheds new light on the effectiveness of assessing merit on the basis of the reached level of success and underlines the risks of distributing excessive honors or resources to people who, at the end of the day, could have been simply luckier than others. With the help of this model, several policy hypotheses are also addressed and compared to show the most efficient strategies for public funding of research in order to improve meritocracy, diversity and innovation.

Keywords: Success, Talent, Luck, Randomness, Serendipity, Funding strategies.

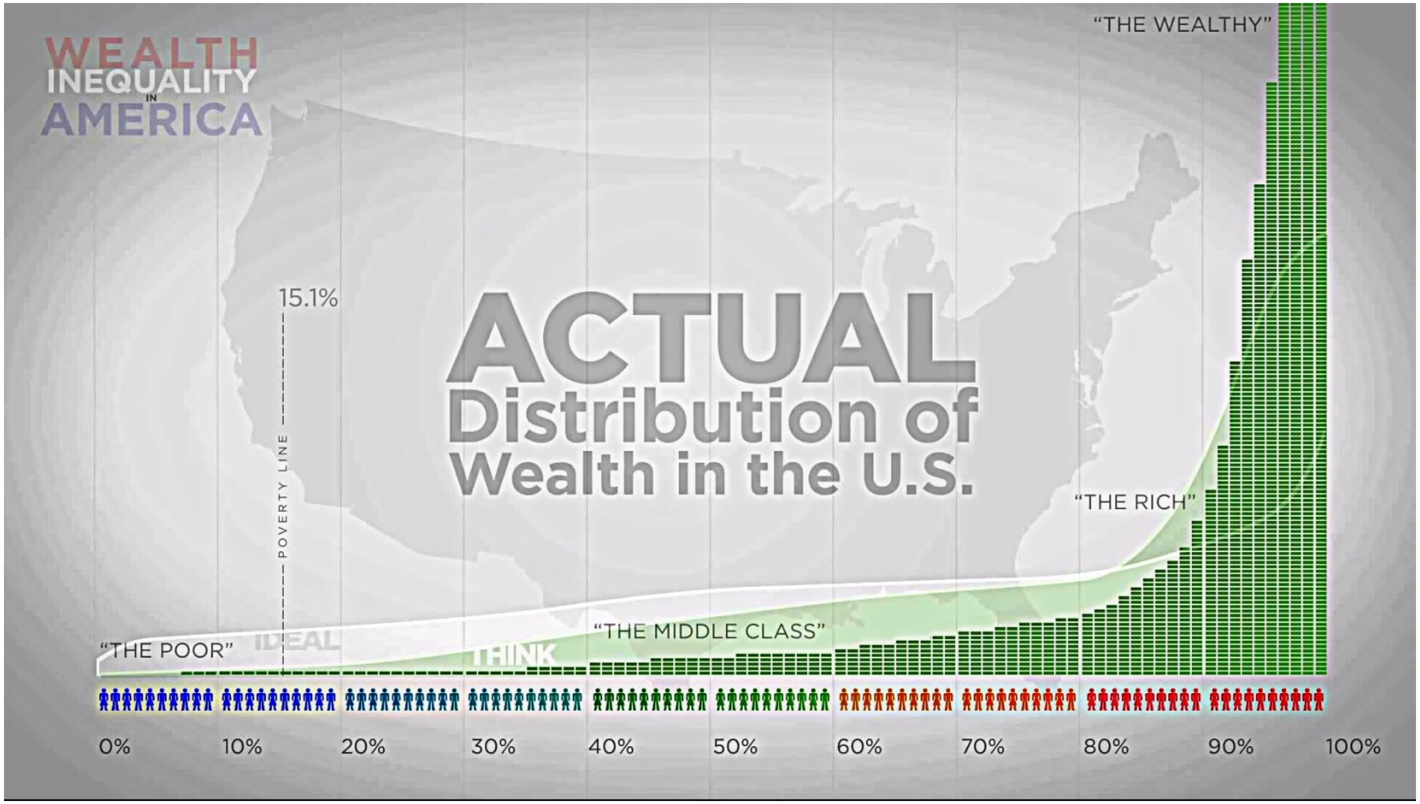
Some links about our paper:

- Talent vs Luck: the role of randomness in success and failure (Improbable research, 2018)
- MIT Technology Review: The Best of the Physics arXiv (week ending February 24, 2018)
- Talento o fortuna? Il ruolo del caso nel successo o nel fallimento (Il Merito.org, 1 Marzo 2018)
- If you're so smart, why aren't you rich? Turns out it's just chance (MIT Technology Review, March 1, 2018)
- The Role of Luck in Life Success is Far Greater Than We Realized (Scientific American, March 1, 2018)
- Successful people owe much more to LUCK than we thought: Being smart and talented ISN'T enough, say scientists (MailOnline - Science and Tech, March 2, 2018)
- Life definitely isn't fair, new research shows (Cosmos, The science of everything, March 2, 2018)
- Se siete così intelligenti, perché non siete ricchi? E' solo per caso (Milano Finanza, 2 Marzo 2018)
- Life positively isn't honest, new analysis exhibits (Cosmopolitan, 2 Marzo 2018)
- World's most successful people are simply the luckiest (News2Read, March 2, 2018)
- World's most successful people are simply the luckiest (Video News Technology, March 2, 2018)
- How much does luck play in being successful? (NZherald Business, March 3, 2018)
- If you're so smart then why aren't you rich? Here is the answer (Sky Valley Chronicle, March 3, 2018)
- So You're Smart, But You're Not Rich? This Eye-Opening New Scientific Study Tells You Why (INC., March 4, 2018)
- Better lucky than smart (Le Temps, March 4, 2018)
- Méritocratie ? La chance est déterminante pour devenir riche (Express Business, March 4, 2018)
- Talent vs. Luck! And the winner is... (Mind the Post, March 4, 2018)
- Successful people owe much more to luck than we thought (Sunday Times, March 4, 2018)
- Sorte é mais importante do que talento na busca pelo sucesso (Galileu.br, March 5, 2018)
- Meritocratic failure (Progressive Pulse, March 5, 2018)
- Il segreto del successo (Scienza, Tecnologia, Quisuilie e Pinzellacchere, 5 Marzo 2018)
- Success Comes Down to Skill - And a Lot of Luck (Discover Magazine, March 5, 2018)
- Warum Glück für Erfolg entscheidender ist als Talent (Welt.de, March 7, 2018)
- Sa ndikon fati në të qenët i suksesshëm (Monitor.al, March 7, 2018)
- Vì sao ban thòng minh mà vàn khòng giàu? (TiaSàng Vietnam, March 7, 2018)
- Füüsikud: aeg on tunnistada õnne ja juhuslikkuse olulisust (Novaator Estonia, March 7, 2018)

Distribuição de riqueza

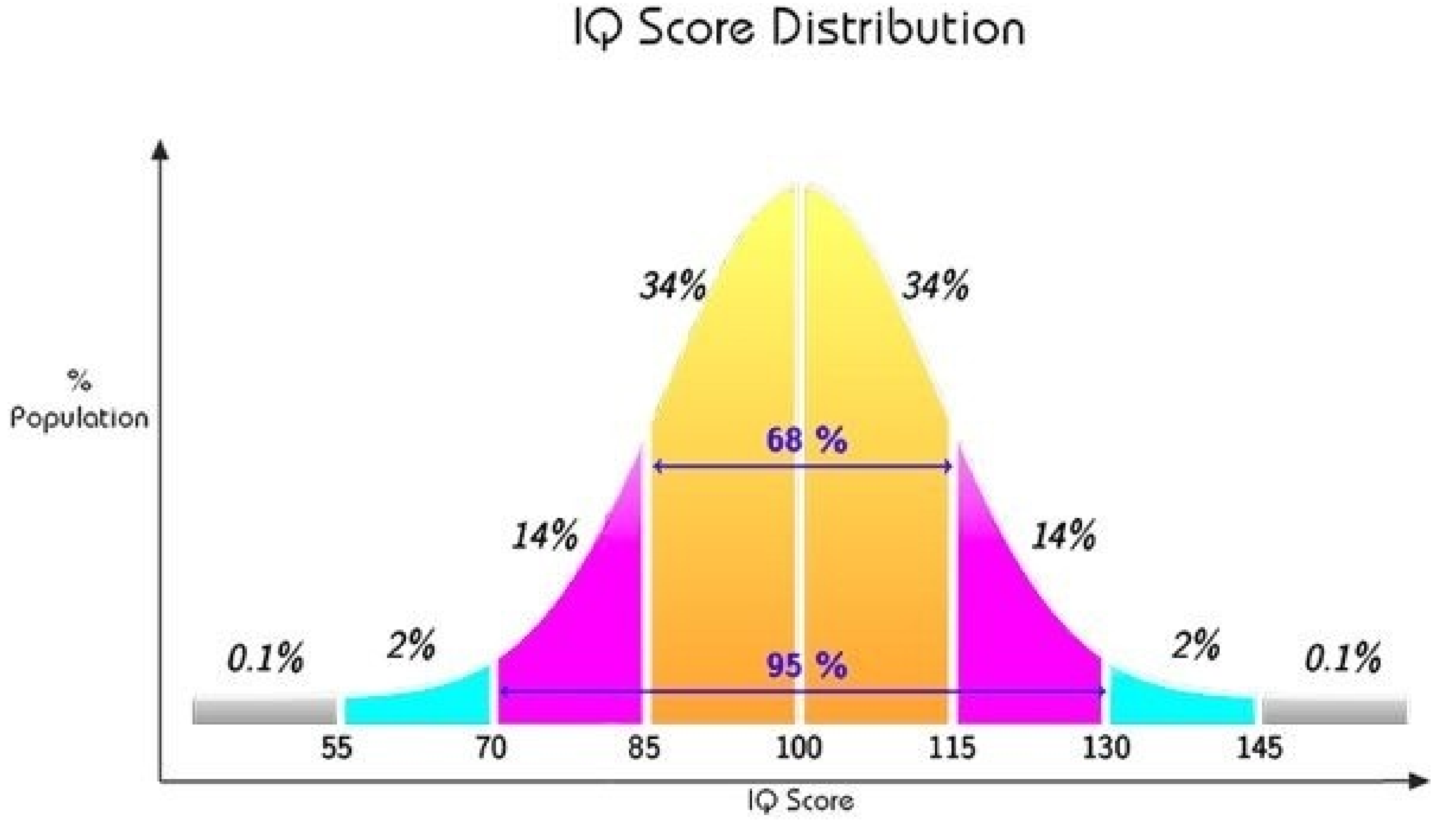
- **Princípio de Pareto**

  O princípio de Pareto (também conhecido como regra do 80/20, afirma que, para muitos eventos, aproximadamente 80% dos efeitos vêm de 20% das causas.



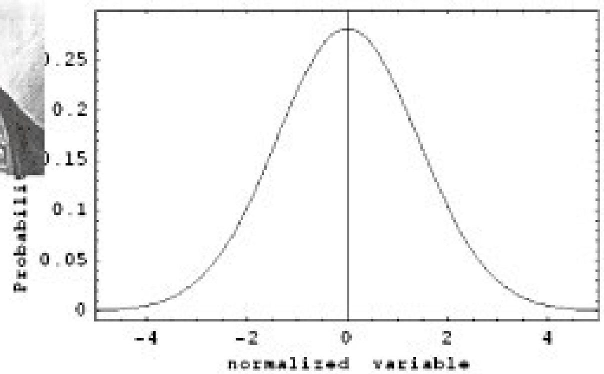
Meritocracia?

- Distribuição de Inteligência/Talento

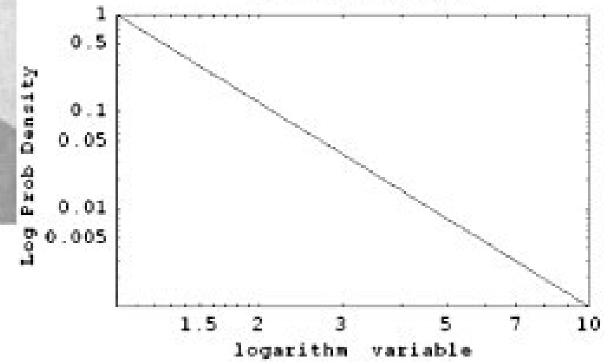


Gaussiana vs Lei de Potência

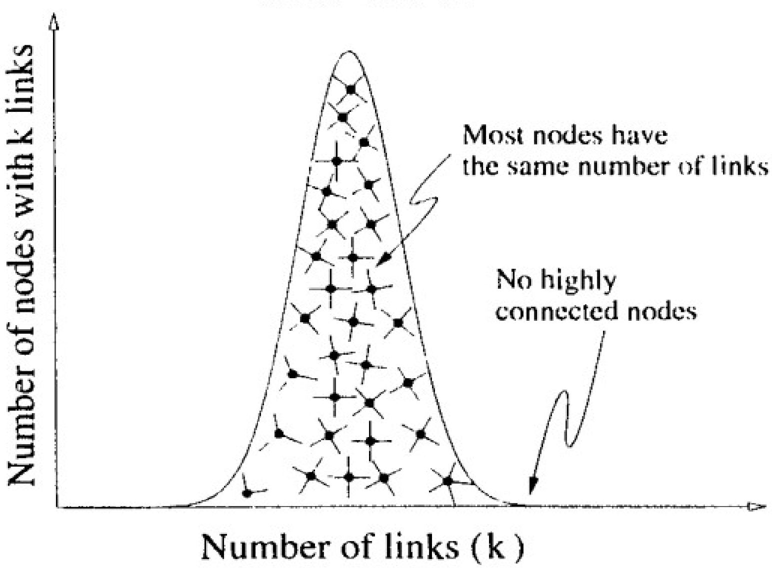
Gauss; bell curve (circa 1800)



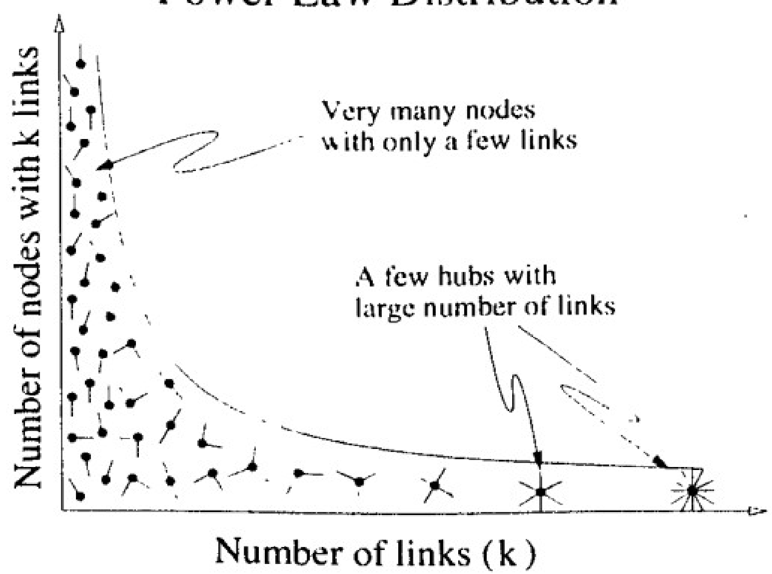
Pareto; inverse power law (circa 1900)



Bell Curve



Power Law Distribution



O modelo dos autores

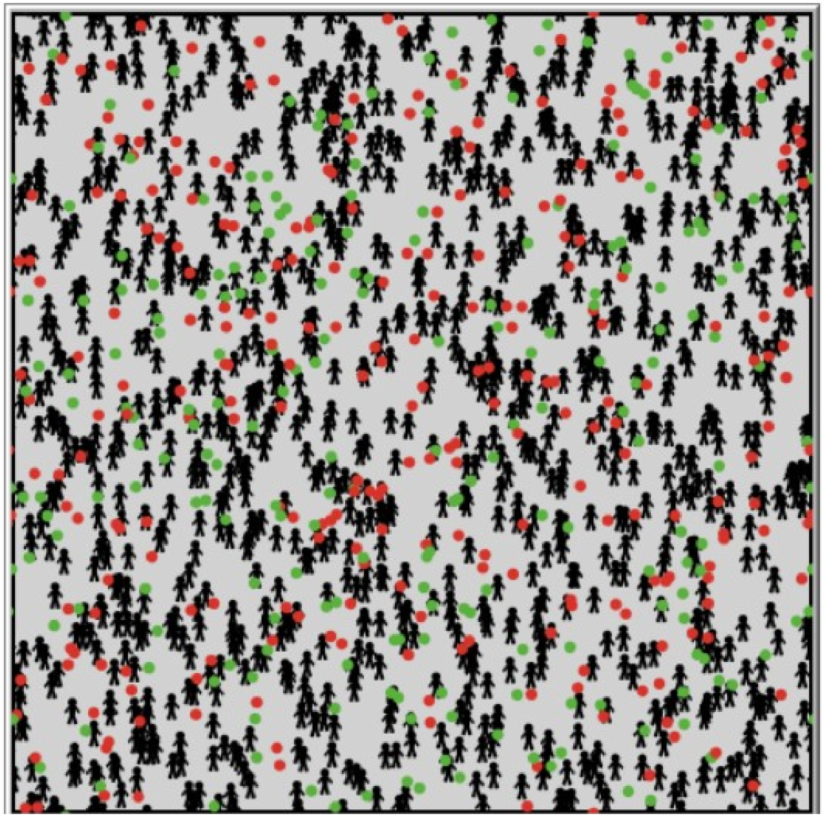


Figure 1: An example of initial setup for our simulations. $N = 1000$ individuals (agents), with different degrees of talent (intelligence, skills, etc.), are randomly located in their fixed positions within a square world. During each simulation, which covers several dozens of years, they are exposed to a certain number N_E of lucky (green circles) and unlucky (red circles) events, which move across the world following random trajectories (random walks). In this example $N_E = 500$. All simulations presented in this paper were realized within the NetLogo agent-based model environment [45].

Regras

For a single simulation run, a working life period P of 40 years (from the age of twenty to the age of sixty) is considered, with a time step δ_t equal to six months. At the beginning of the simulation, all agents are endowed with the same amount $C_i = C(0)\ \forall i = 1, ..., N$ of capital,

1. No event-point intercepts the position of agent A_k: this means that no relevant facts have happened during the last six months; agent A_k does not perform any action.

2. A lucky event intercepts the position of agent A_k: this means that a lucky event has occurred during the last six month; as a consequence, agent A_k doubles her capital/success with a probability proportional to her talent T_k. It will be $C_k(t) = 2C_k(t-1)$ only if $rand[0, 1] < T_k$, i.e. if the agent is smart enough to profit from his/her luck.

3. An unlucky event intercepts the position of agent A_k: this means that an unlucky event has occurred during the last six month; as a consequence, agent A_k halves her capital/success, i.e. $C_k(t) = C_k(t-1)/2$.

Resultados (single run)

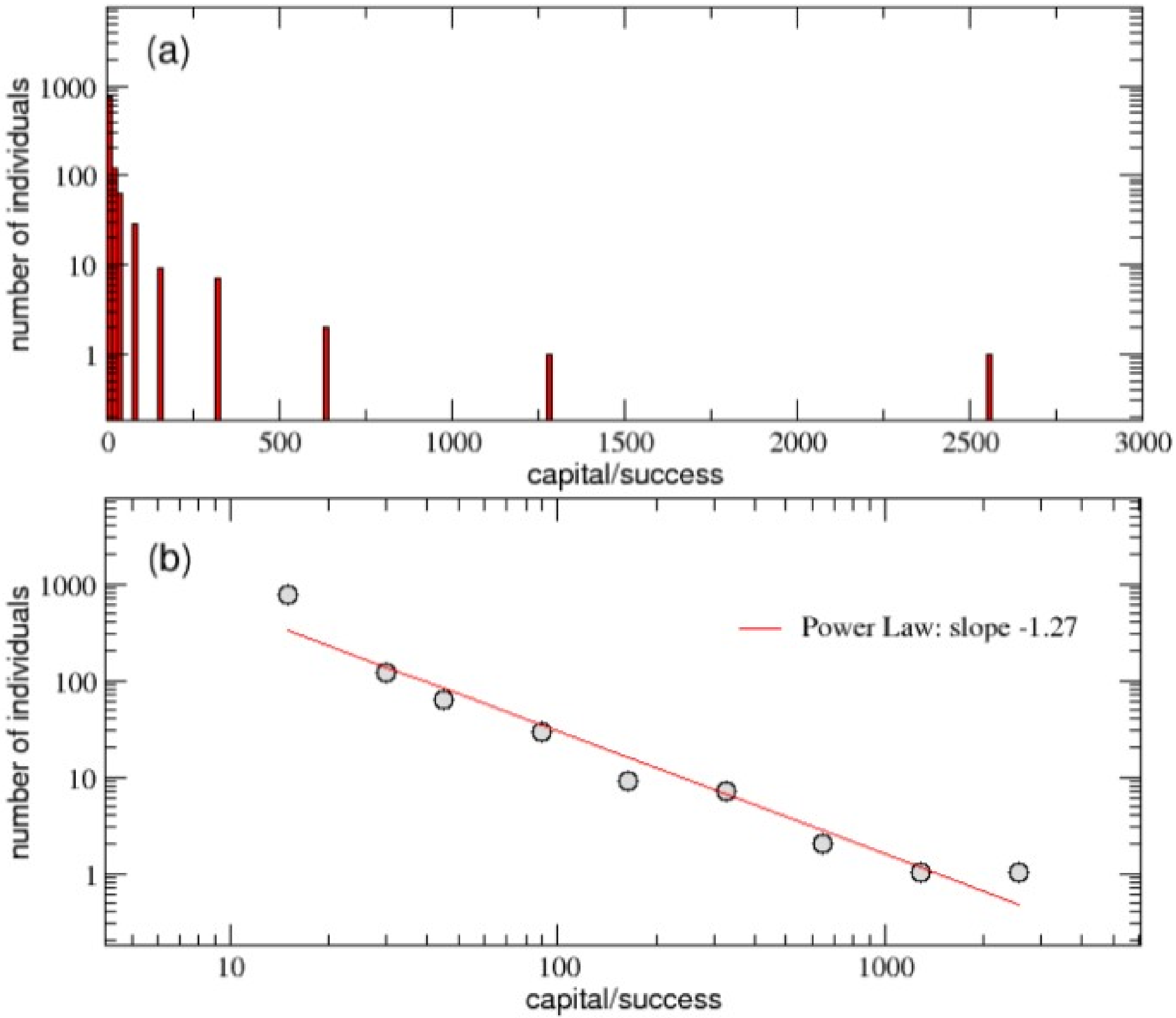
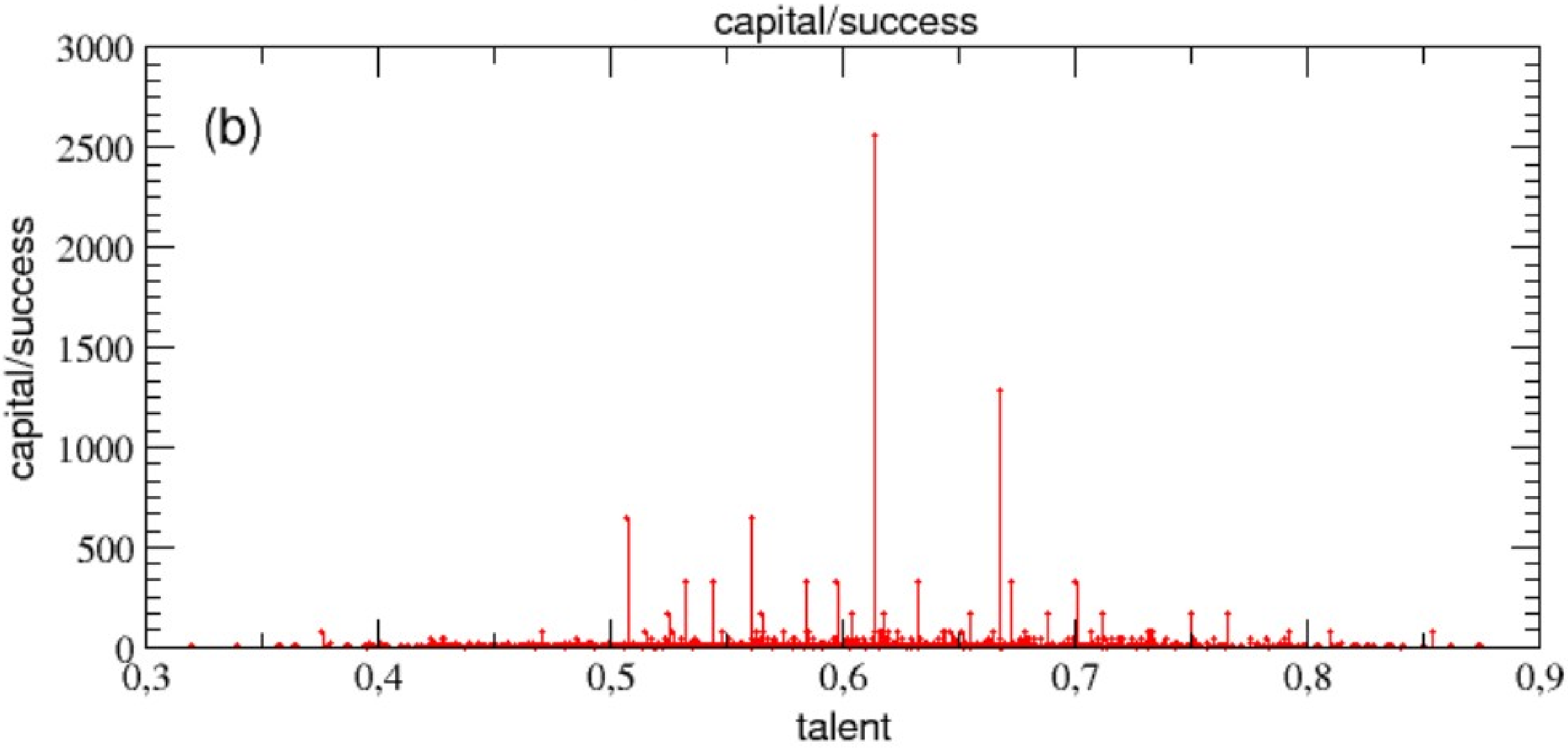


Figure 3: Final distribution of capital/success among the population, both in log-lin (a) and in log-log (b) scale. Despite the normal distribution of talent, the distribution of success - as visible in panel (b) - can be well fitted with a power-law curve with slope -1.27. We also verified that the capital/success distribution follows the Pareto's "80-20" rule, since 20% of the population owns 80% of the total capital, while the remaining 80% owns the 20% of the capital.

Sucesso vs Talento



Resultados (100 runs)

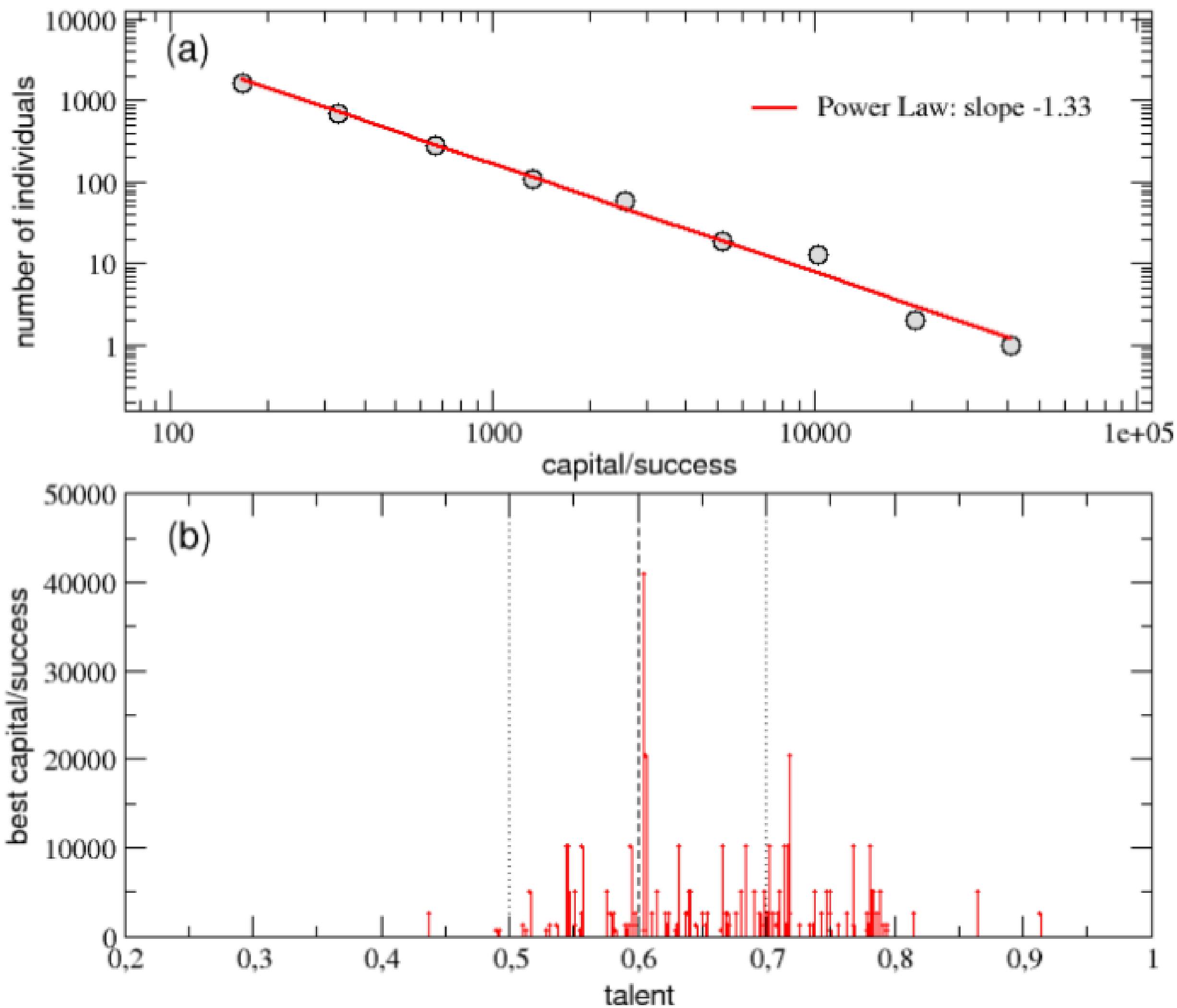


Figure 7: Panel (a): Distribution of the final capital/success calculated over 100 runs for a population with different random initial conditions. The distribution can be well fitted with a power-law curve with a slope -1.33. Panel (b): The final capital of the most successful individuals in each of the 100 runs is reported as function of their talent. People with a medium-high talent result to be, on average, more successful than people with low or medium-low talent, but very often the most successful individual is a moderately gifted agent and only rarely the most talented one. The m_T value, together with the values $m_T \pm \sigma_T$, are also reported as vertical dashed and dot lines respectively.

Perspectivas dos autores

- Serendipidity

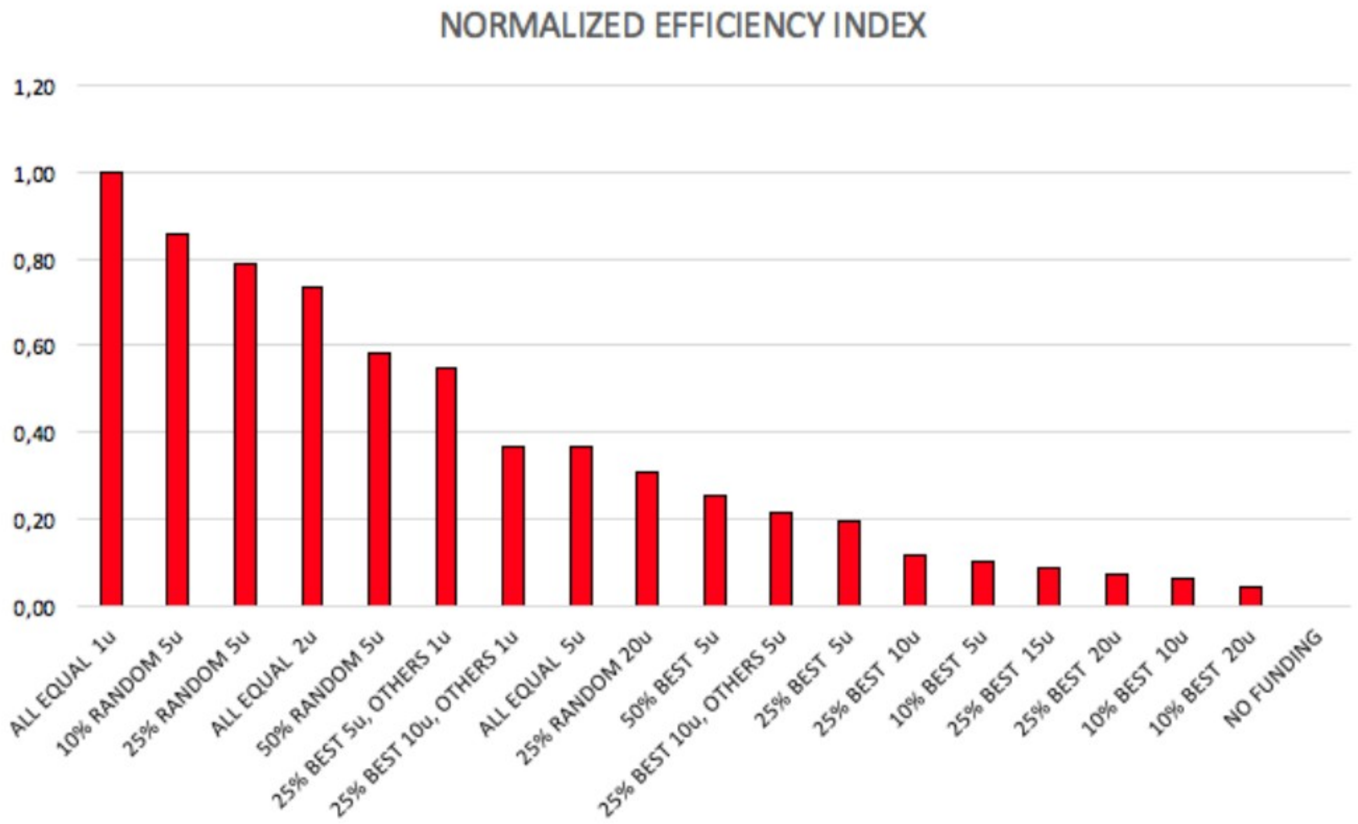


Figure 11: Normalized Efficiency index for several funding strategies. The values of the normalized efficiency index E_{norm} are reported as function of the different funding strategies. The figure shows that for increasing the success of a larger number of talented people with $C_{end} > C(0)$, it is much more efficient to give a small amount of funds to many individuals instead og giving fund in other more selective ways.

Meu modelo

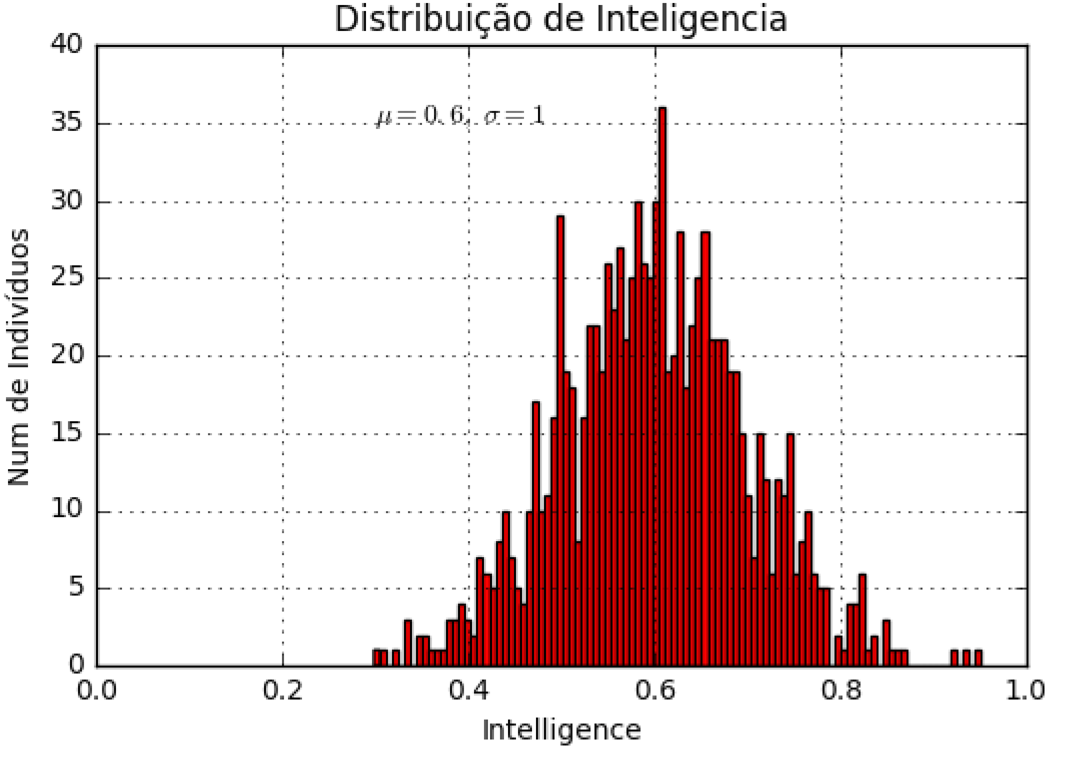
- O modelo original é baseado em agentes, os eventos seguem uma **caminhada aleatoria** num **espaço bidimensional**, foi programado em **Netlogo**. A minha versão dispensa a necessidade de um espaço e considera que os **eventos** sejam **sorteados** a cada iteração de acordo com uma determinada probabilidade e foi programado em Python e C++.

Regras:

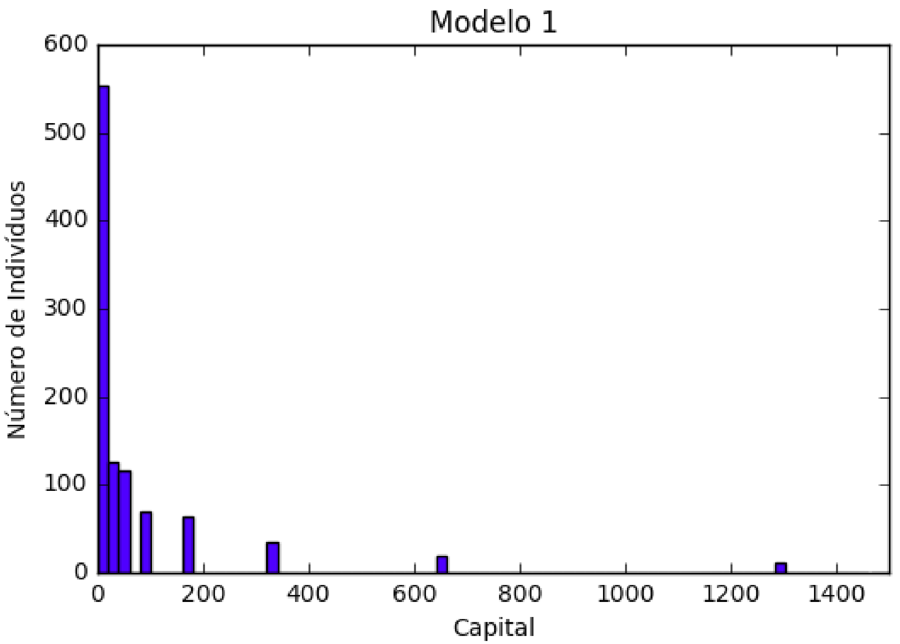
- Consideramos uma população de N indivíduos não interagentes.
- Cada indivíduo tem associado um valor de 0 a 1 que corresponde à sua inteligência (que pode ser associada ao Q.I., à média nos anos de escola, ou a um talento subjetivo).
- Todo mundo começa com a mesma quantia em dinheiro (capital).
- A cada seis meses cada um dos indivíduos está sujeito a um de três eventos ao acaso: Evento Neutro, Evento Bom, Evento Ruim.
    - Se o evento for neutro, nada acontece com o capital do indivíduo.
    - Se o evento for ruim, o capital financeiro do indivíduo cai pela metade, independente da sua inteligência (o azar é para todos).
    - Se o evento for bom, o capital do indivíduo dobra com uma probabilidade que é proporcional à sua inteligência (supondo dessa maneira que os mais inteligentes possuem mais chances de descobrir e aproveitar oportunidades de crescimento financeiro).
- A simulação acontece por 40 anos (80 iterações de 6 meses).

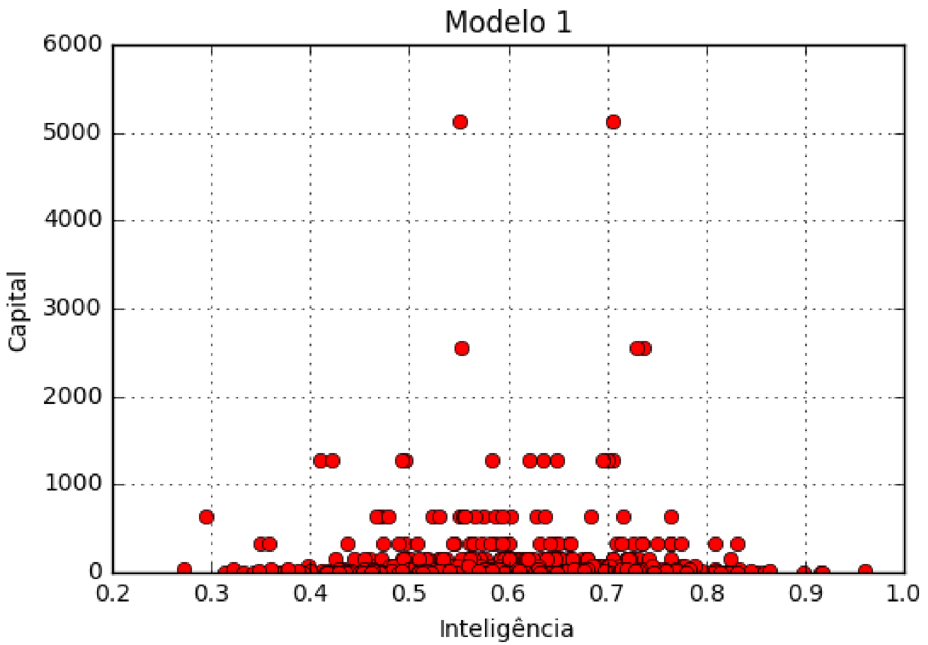
Parâmetros

- Número de indivíduos: 1000
- Número de iterações: 80
- Capital inicial: 10
- Probabilidade de evento bom: 0.05
- Probabilidade de evento ruim: 0.05
- Probabilidade de evento neutro: 0.9
- Talento: gaussiano ,média 0.6, sigma 0.1

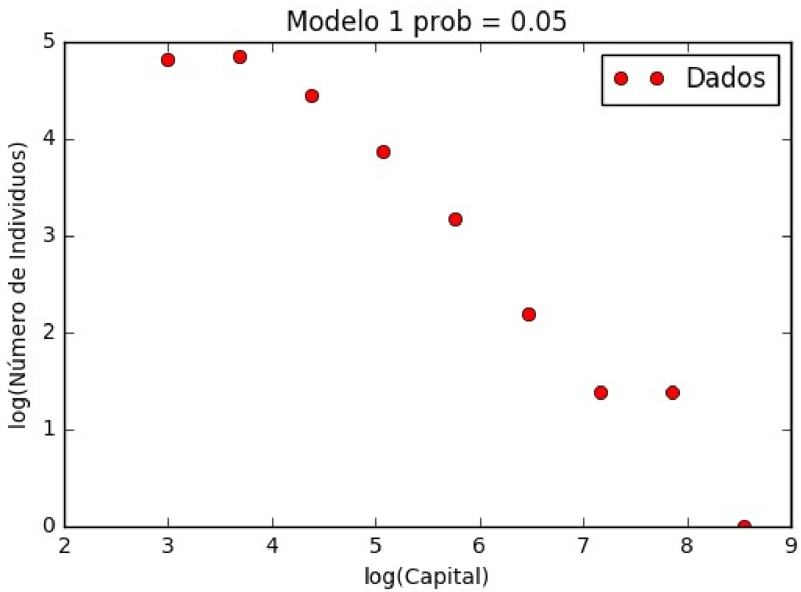


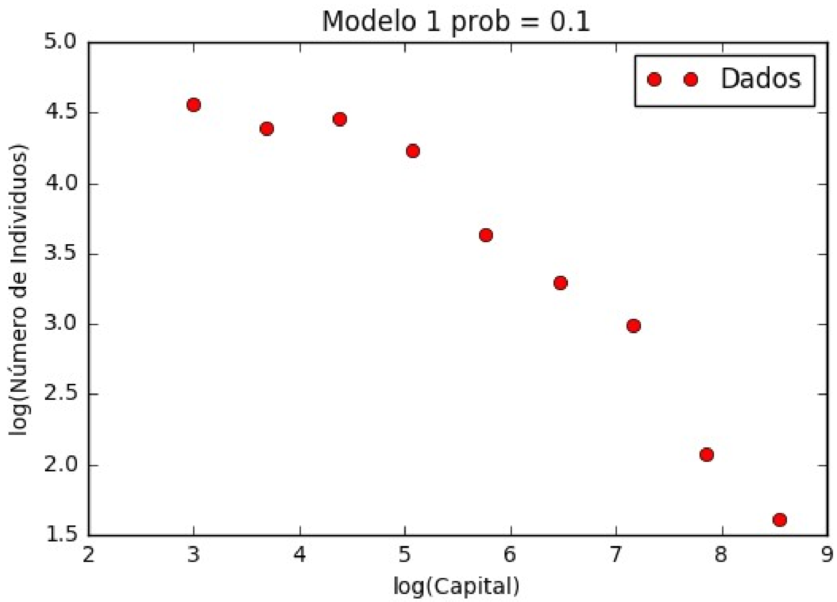
Resultados (single run)



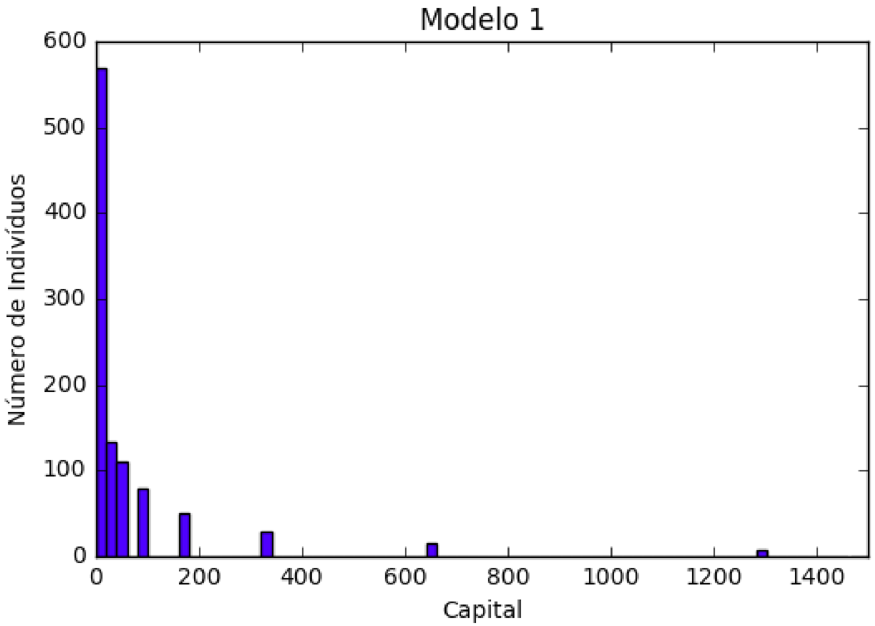


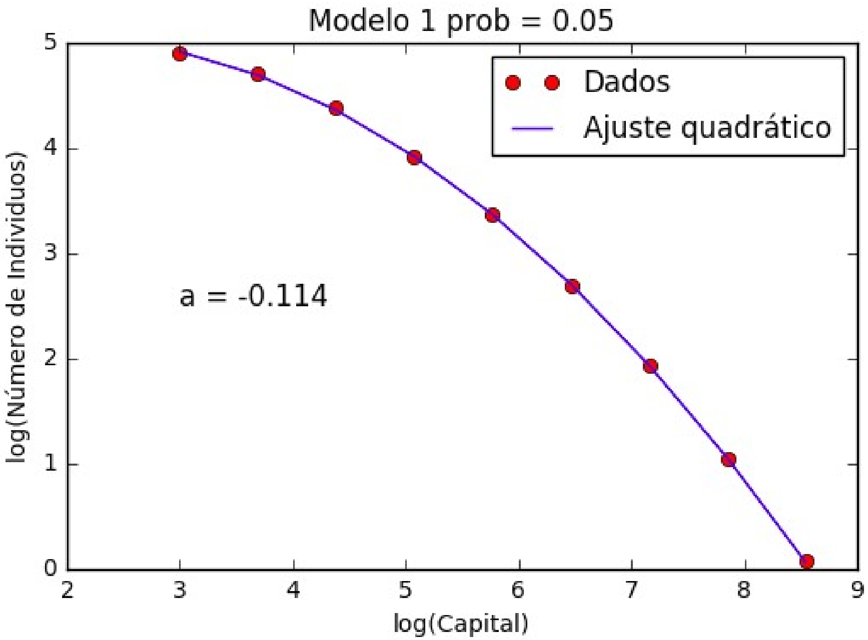
Lei de potência?



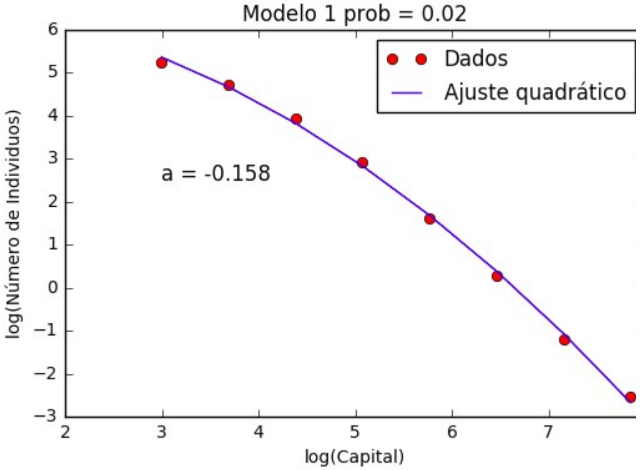


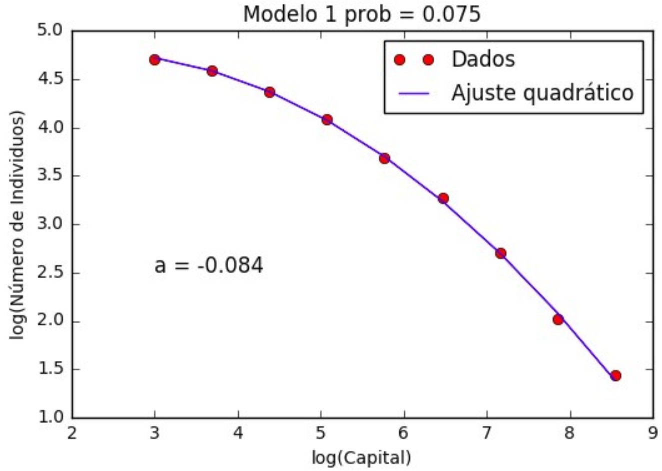
Resultados (multiple runs)

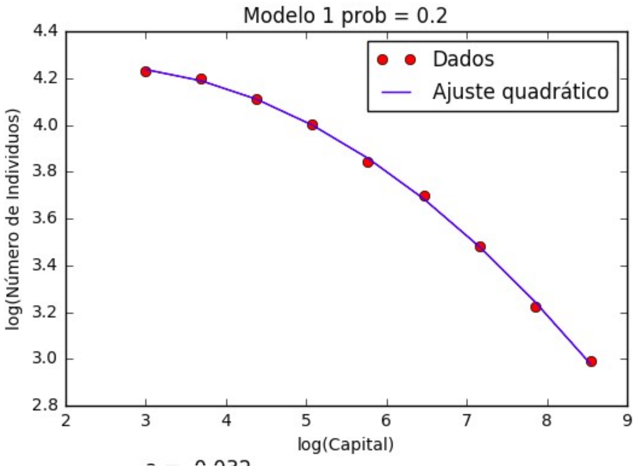


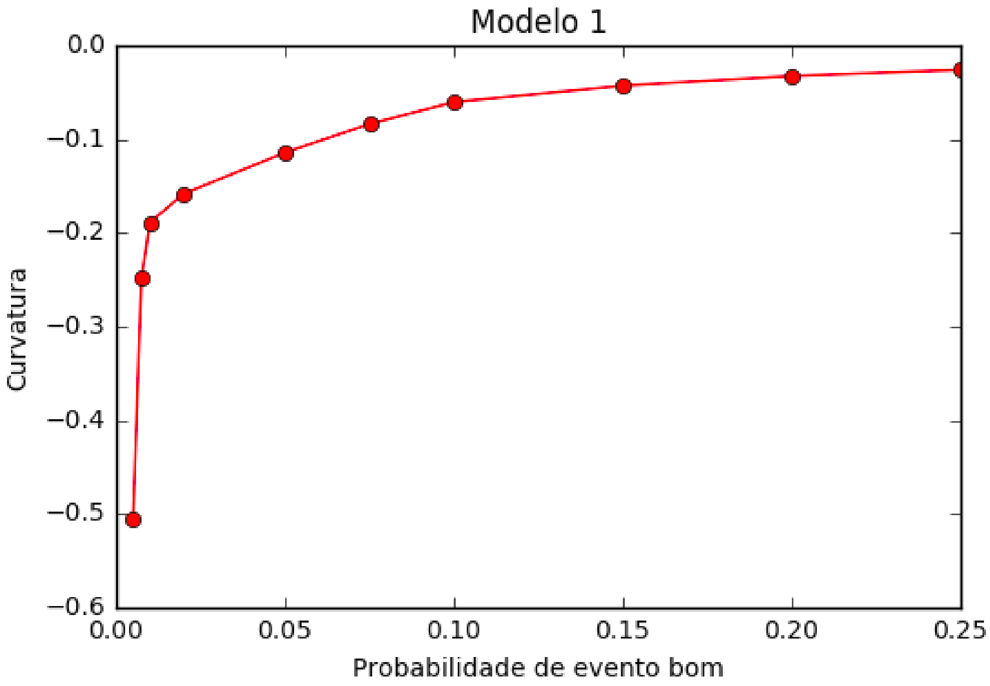


Variando a probabilidade









Novo Modelo

- Críticas ao modelo original
- Hipótese da lei de potência por correlação **espacial**

Modelo 2 – Diferenças

- Consideração do espaço
- Eventos por caminhadas aleatórias
- Consideração do número de passos de random walk em cada iteração
- Rede unidimensional

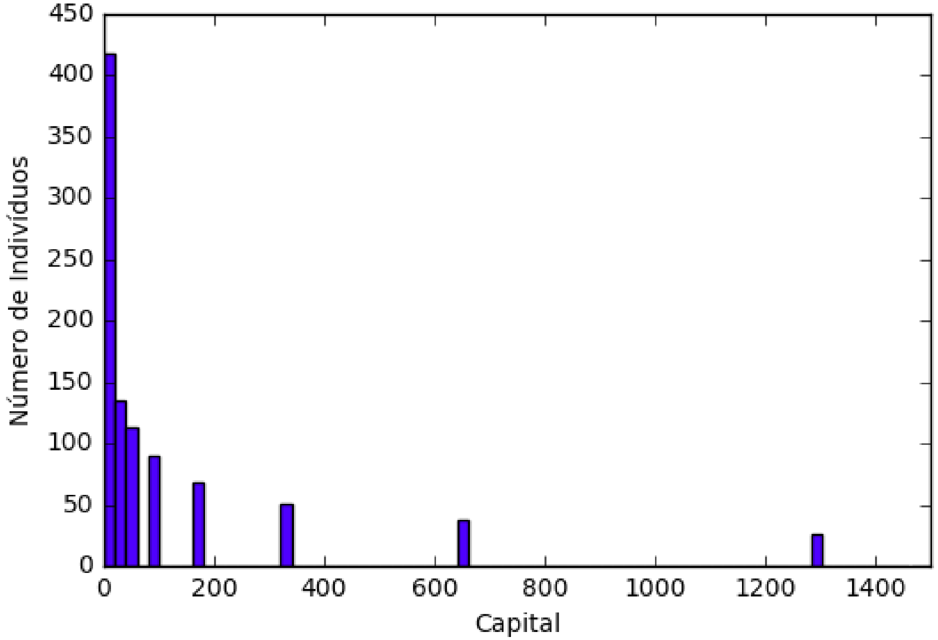
Modelo 2 - Regras

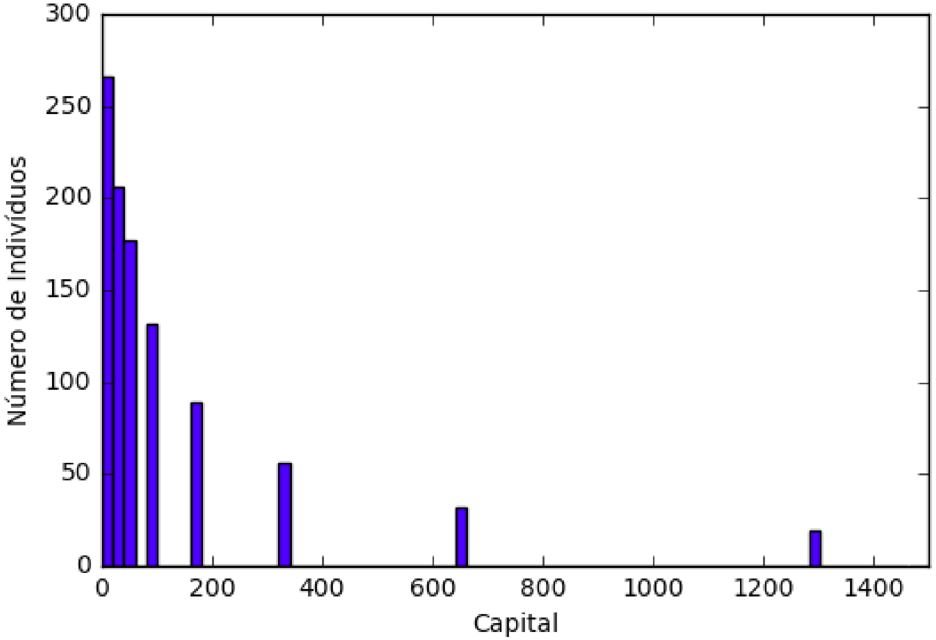
- Consideramos uma população de N indivíduos não interagentes alocados uniformemente em uma rede unidimensional de N sítios com condições periódicas de fonteira (um anel com N sítios e com um indivíduo em cada sítio);
- Cada indivíduo tem associado um valor de 0 a 1, sorteado em distribuição gaussiana, que corresponde à sua inteligencia;
- Os eventos bons e maus desse modelo são agentes distribuidos pela rede que se movimentam em "random walk" (a cada passo têm igual probabilidade de saltar para o sítio da sua direita ou da sua esquerda).
- A cada iteração os eventos podem dar um número fixo de passos em random walk.
- No final de cada iteração, o capital de cada indivídduo é calculado com as seguintes regras:
    - Se o sítio que ocupa também comportar um ou mais eventos bons, o capital do indivíduo dobra com probabilidade proporcional à sua inteligência.
    - Se o sítio que ocupa comportar um ou mais eventos maus, o capital do indivíduo cai pela metade.
- A simulação acontece por 40 anos (80 iterações de 6 meses cada).

Modelo 2 - Parâmetros

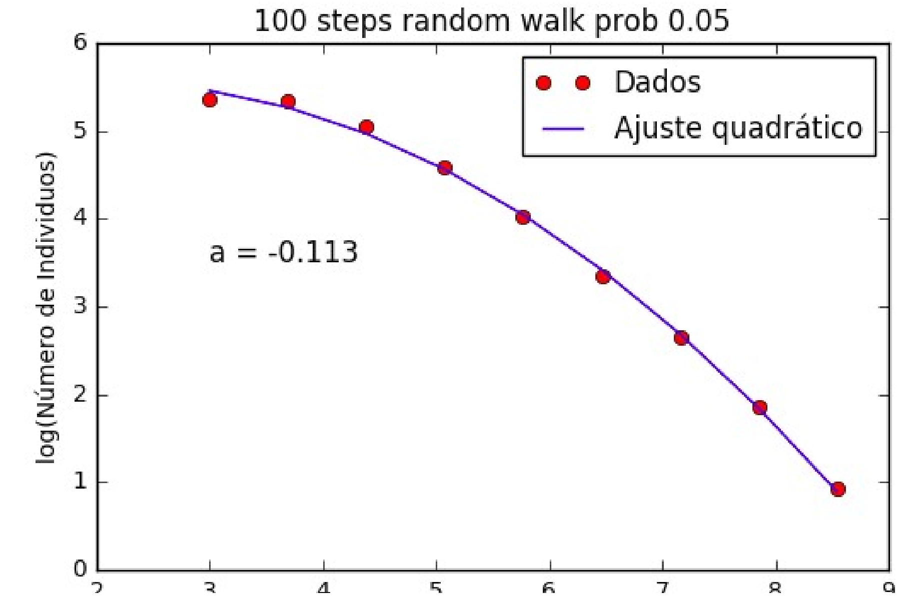
- Número de sítios na rede: 1000;
- Número de indivíduos: 1000;
- Número médio de eventos bons na rede:
  - segue probabilidade (0 a 1), default: 0.05;
- Número médios de eventos maus na rede:
  - segue probabilidade (0 a 1), default: 0.05;
- Número de iterações: 80;
- Capital inicial de cada indivíduo: 10;
- Talento: Gaussiano, média 0.6, desvio padrão 0.1;
- Número de passos em random walk para cada evento em cada iteração:
  - varia de 1 a 100;
- Média sob 200 simulações

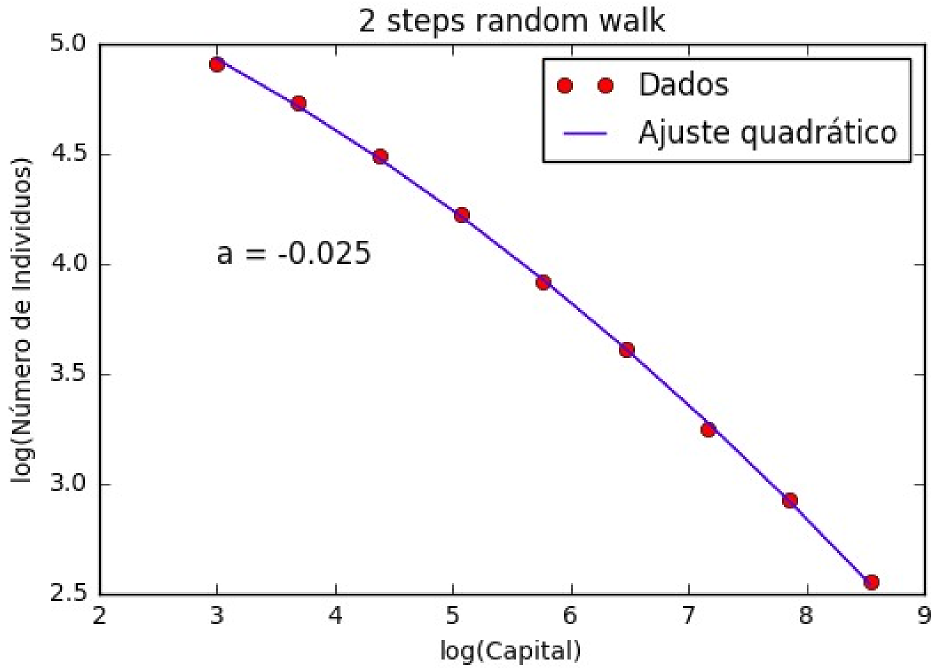
Resultados (multiple runs)



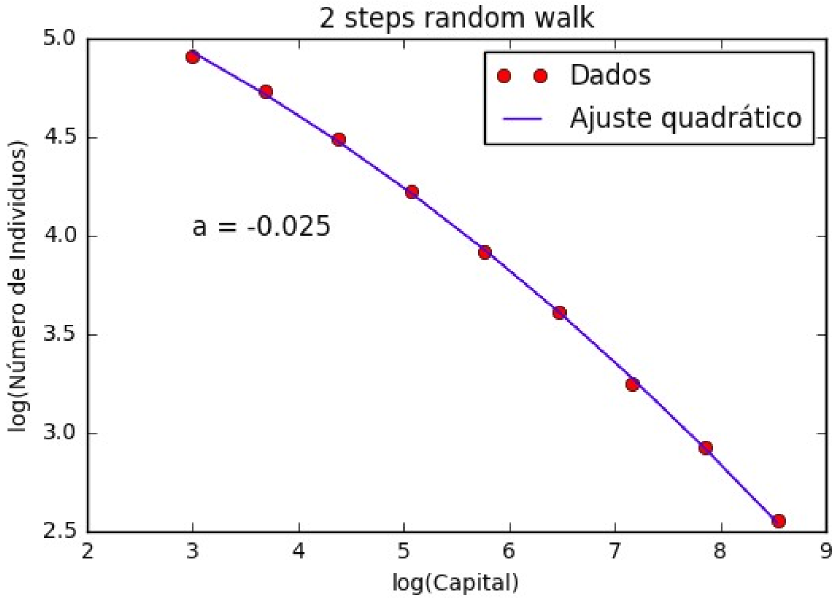


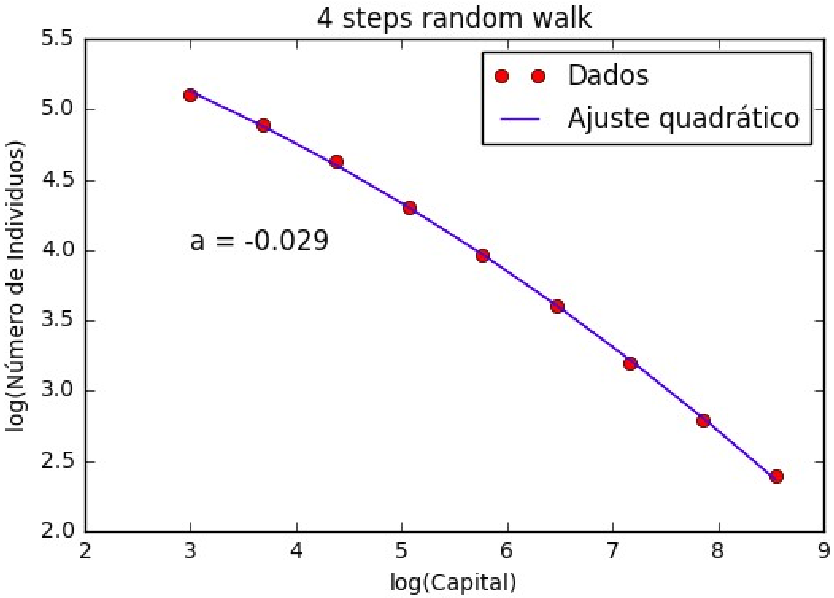
Lei de potência?

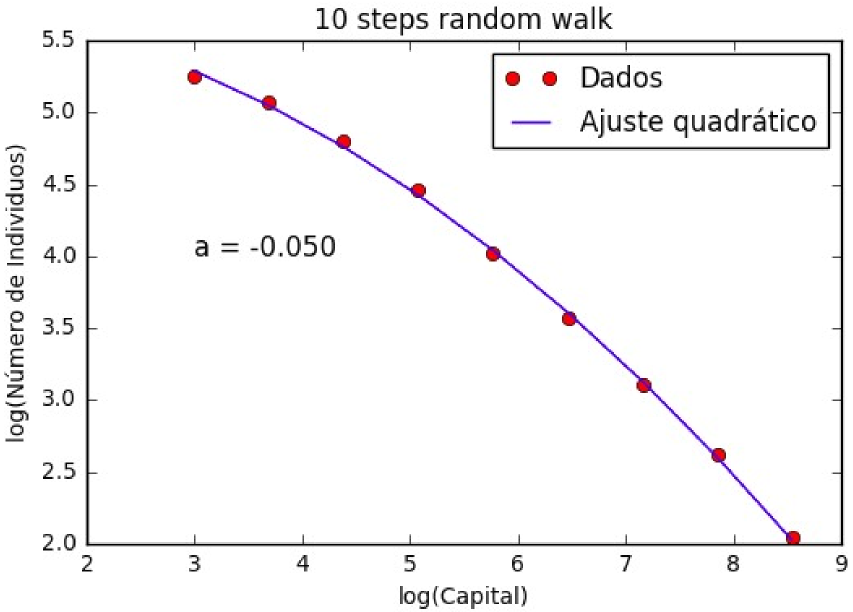


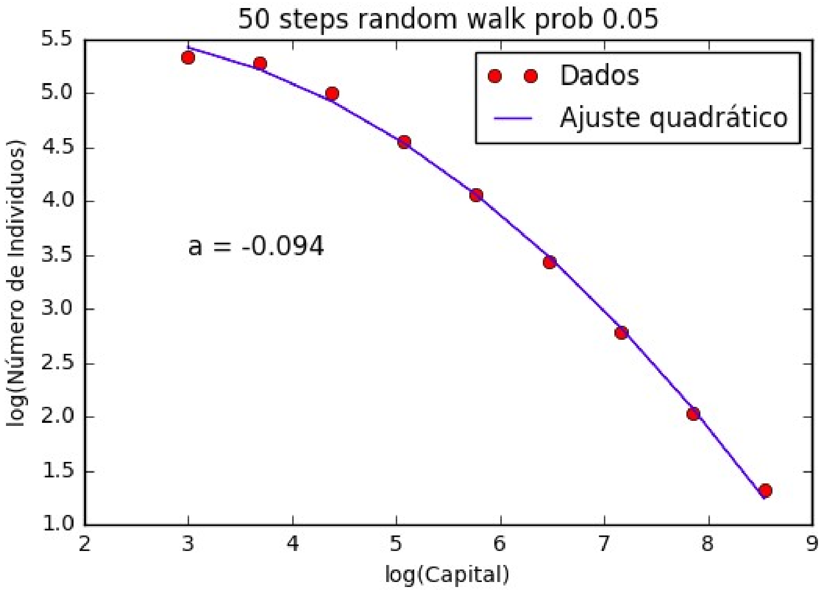


A curvatura varia com os “steps”

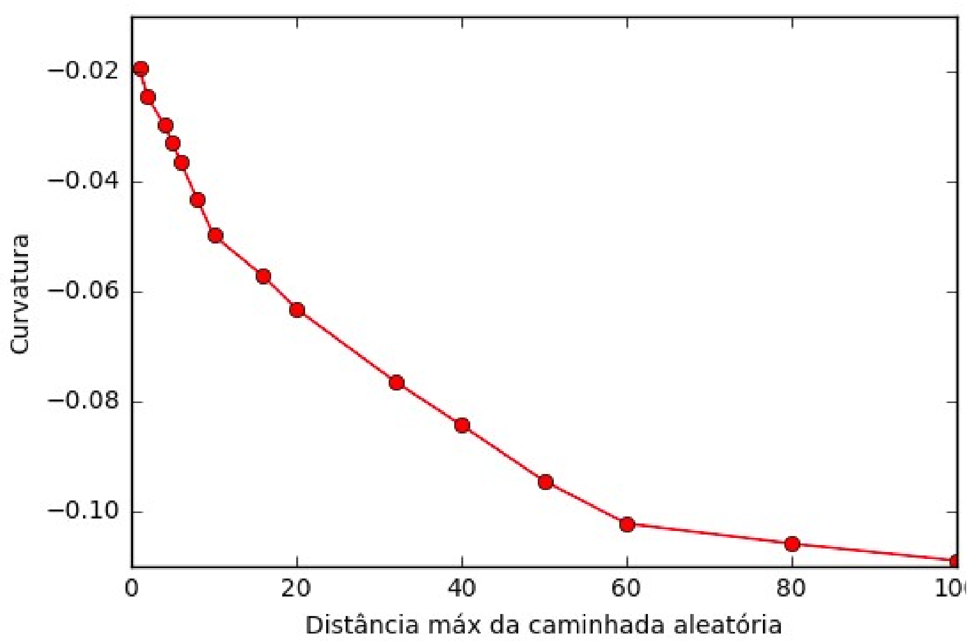


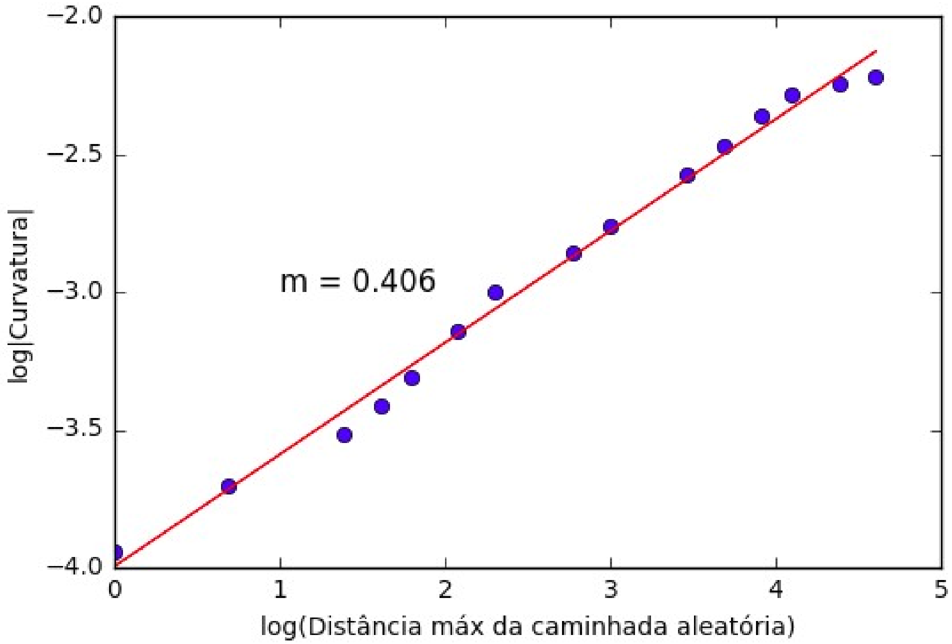




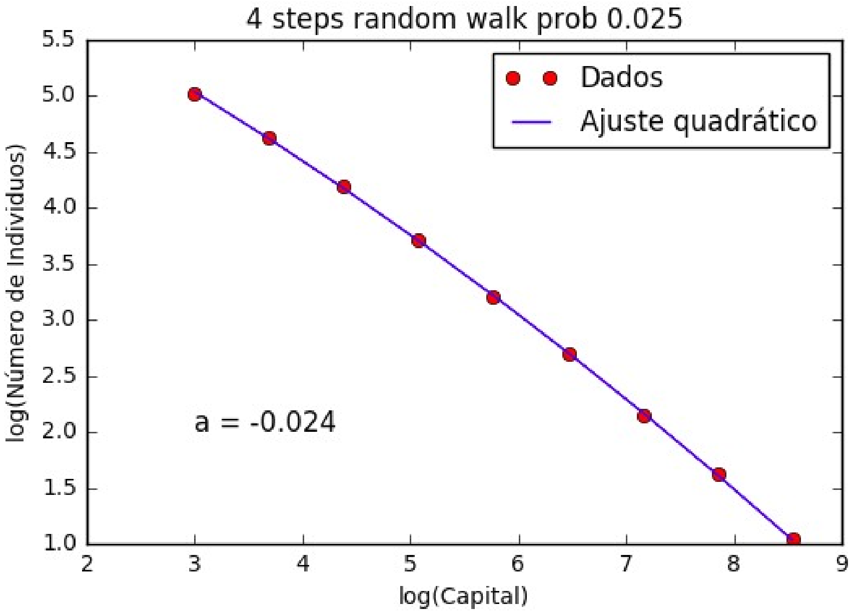


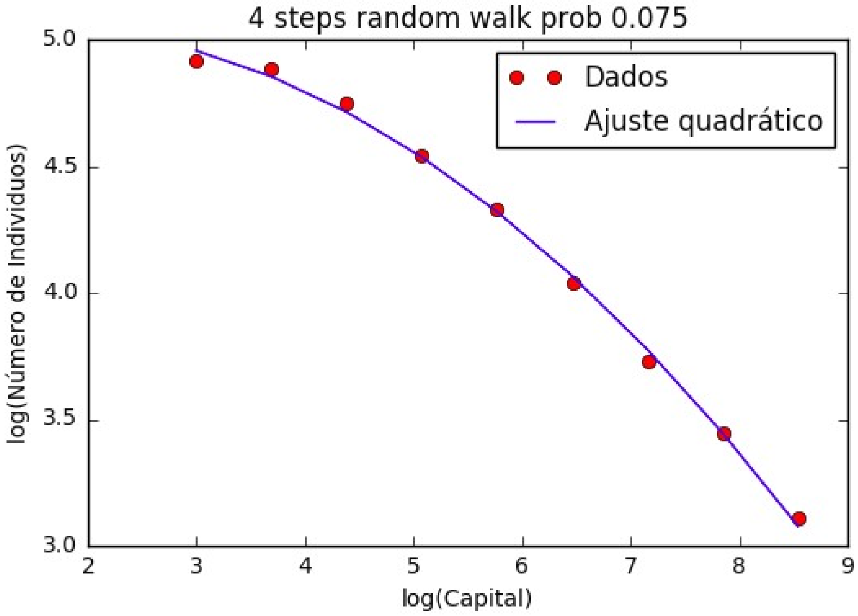
Correlação da **curvatura** com a **distância máx.** do random walk

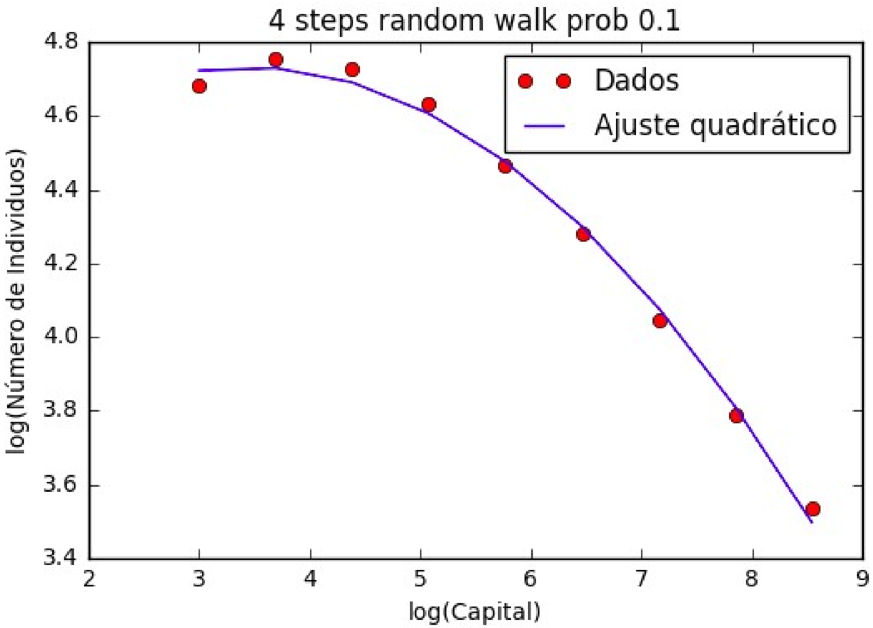


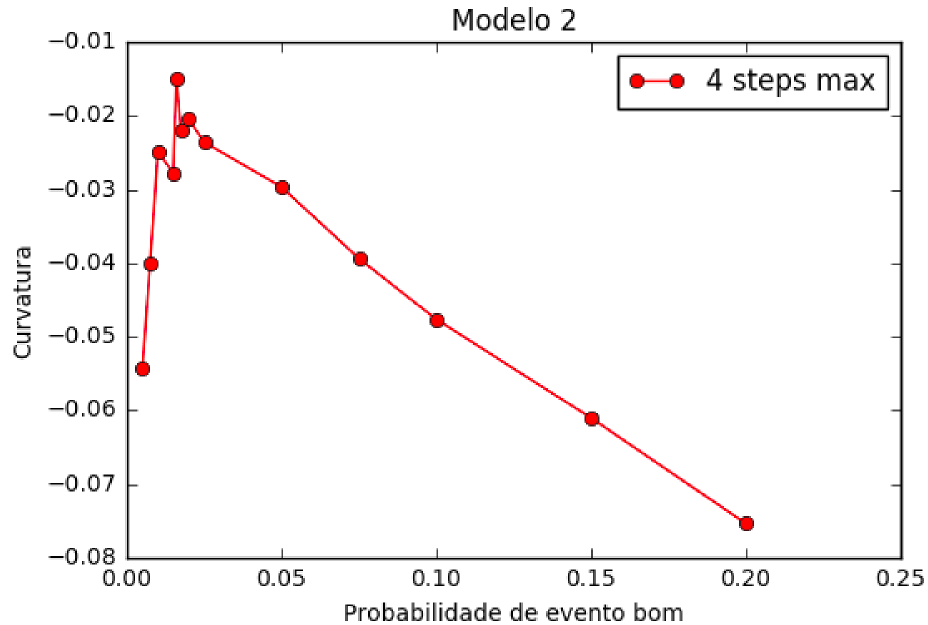


Variando a probabilidade

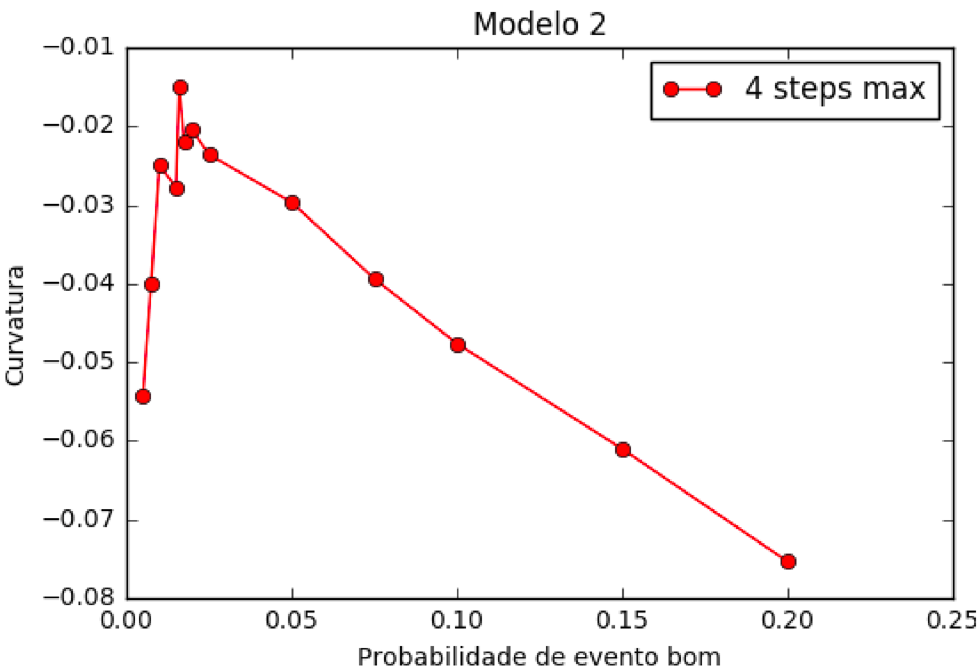


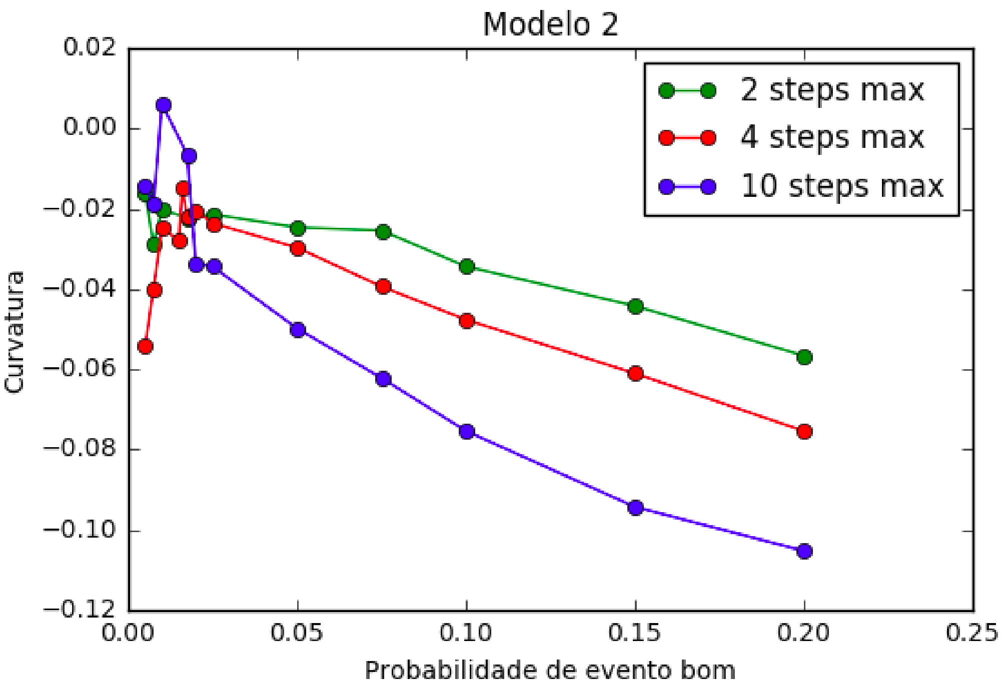






Curvatura vs Probabilidade





Sugestões?