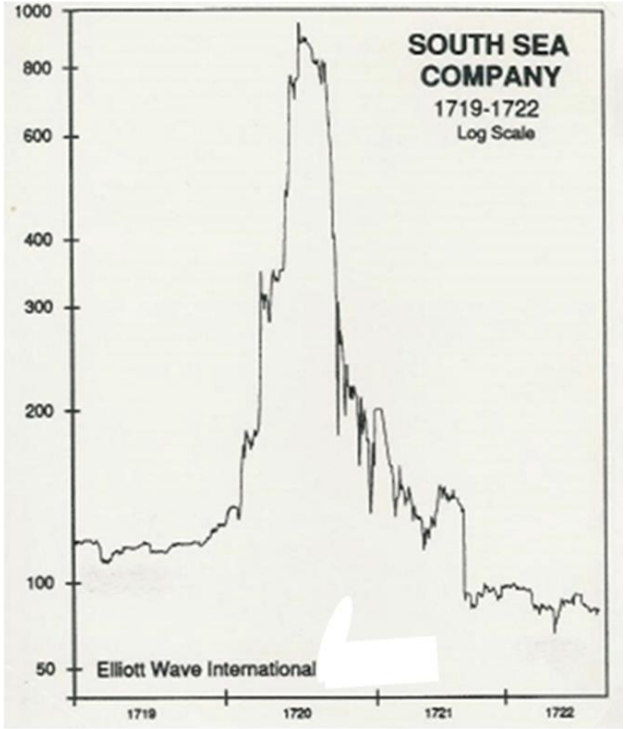
Challenge of Chance

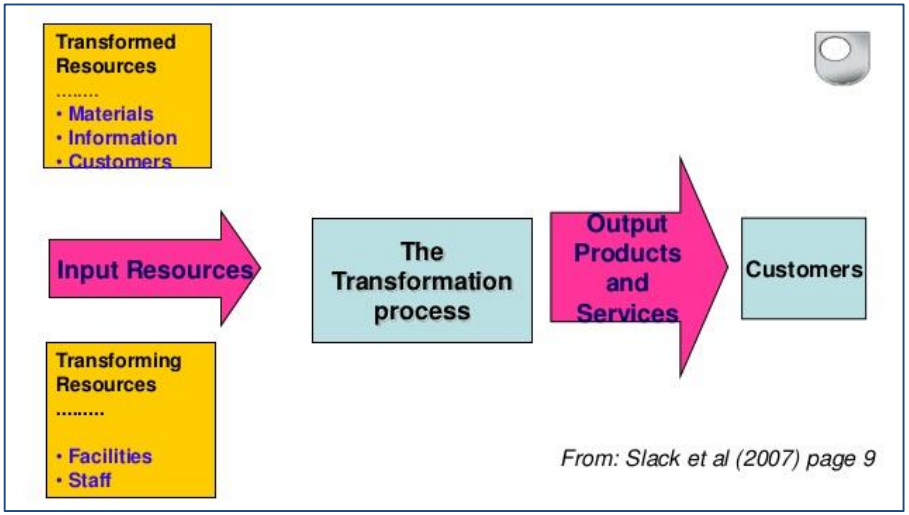
(Utz Weitzel)



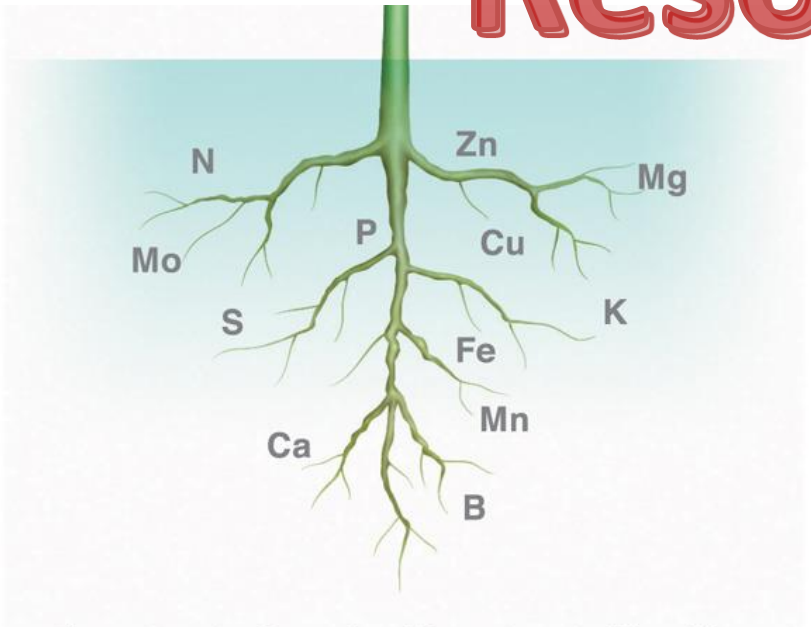
"I can calculate the movement of the stars, but not the madness of men."

(Sir Isaac Newton, after he lost a fortune in the South Sea Bubble in 1720)

Ecology = Economy



Resources

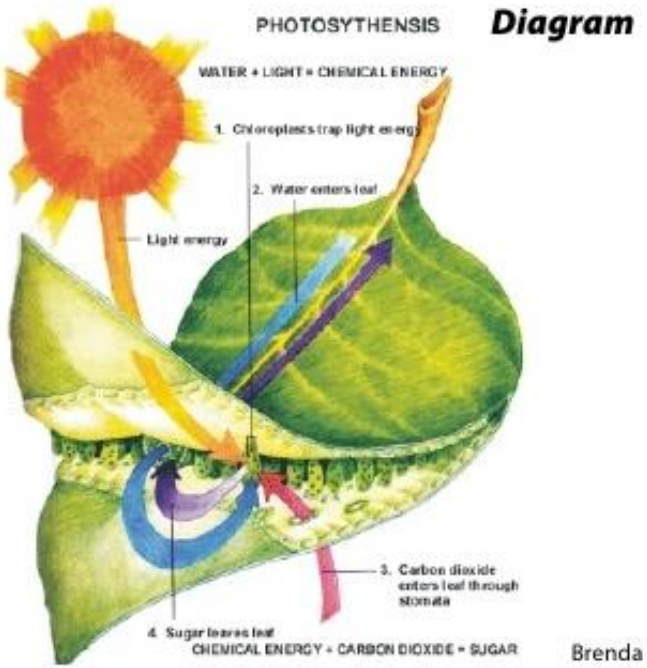


Macro Elements
N - Nitrogen
P - Phosphorous
K - Potassium

Secondary Elements
Ca - Calcium
Mg - Magnesium
S - Sulphur

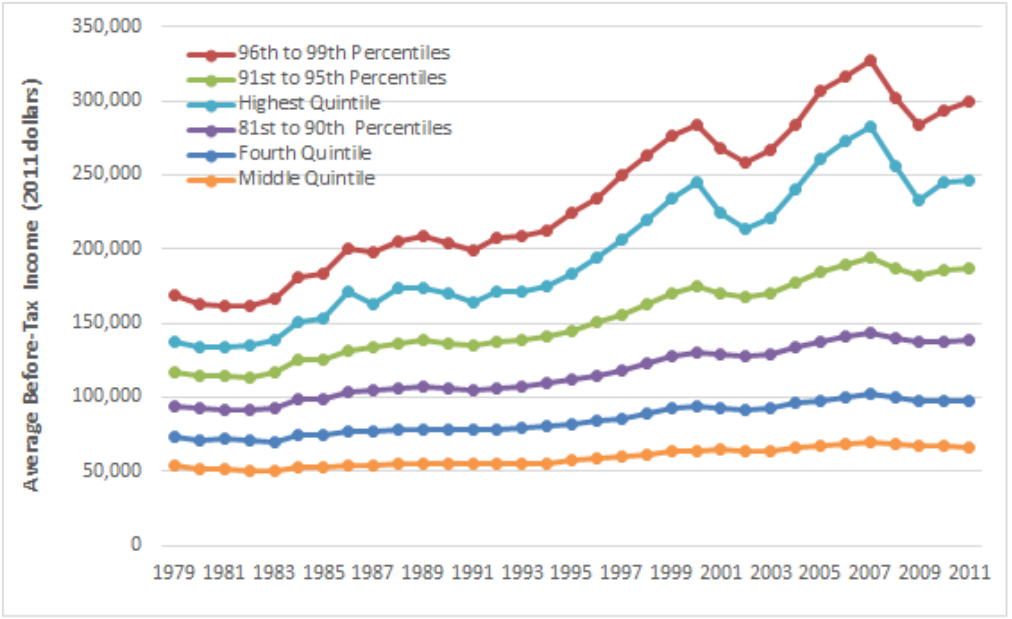
Micro Elements
Fe - Iron
B - Boron
Zn - Zinc
Cu - Copper
Mn - Manganese

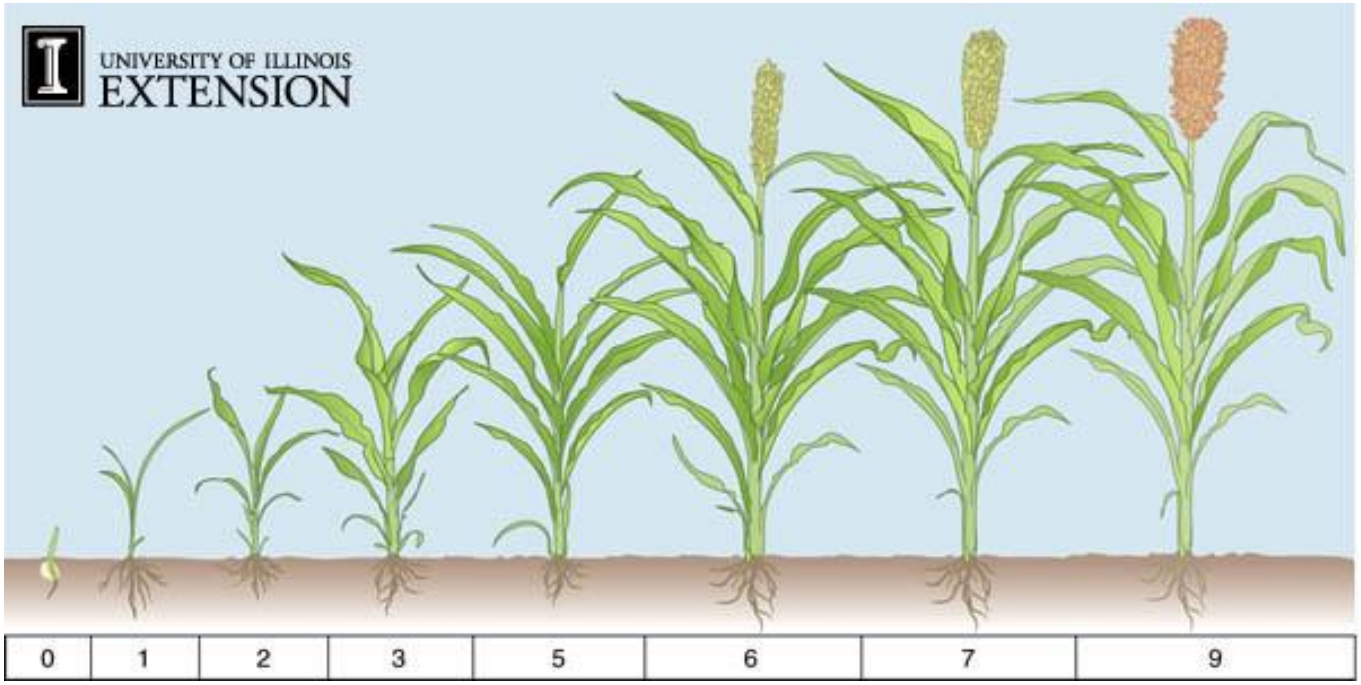
Currency



Brenda Felix

Growth


Average Before-Tax Income (2011 dollars)
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
96th to 99th Percentiles
91st to 95th Percentiles
Highest Quintile
81st to 90th Percentiles
Fourth Quintile
Middle Quintile
1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011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Vol 451|21 February 2008 nature

NEWS & VIEWS

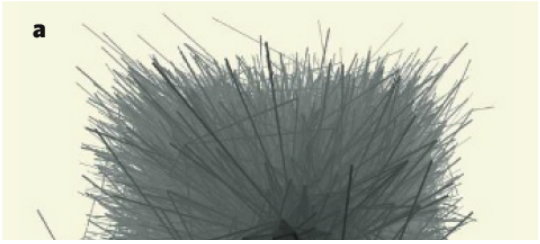
COMPLEX SYSTEMS

Ecology for bankers

Robert M. May, Simon A. Levin and George Sugihara

There is common ground in analysing financial systems and ecosystems, especially in the need to identify conditions that dispose a system to be knocked from seeming stability into another, less happy state.

'Tipping points', 'thresholds and breakpoints', 'regime shifts' — all are terms that describe the flip of a complex dynamical system from one state to another. For banking and other financial institutions, the Wall Street Crash of 1929 and the Great Depression epitomize such an event. These days, the increasingly



spent on studying systemic risk as compared with that spent on conventional risk management in individual firms? Second, how expensive is a systemic-risk event to a national or global economy (examples being the stock market crash of 1987, or the turmoil of 1998 associated with the Russian loan default, and

Ecology ≠ Economy

Is Bitcoin overpriced?

$8,325.62 ▼-8.95%			
Today's Open	$9,144.15	Change	▼ $-818.52
Today's High	$9,313.03	Market Cap	$0.141T
Today's Low	$8,219.73	Supply	16,919,188

Is Tesla Motors overpriced?

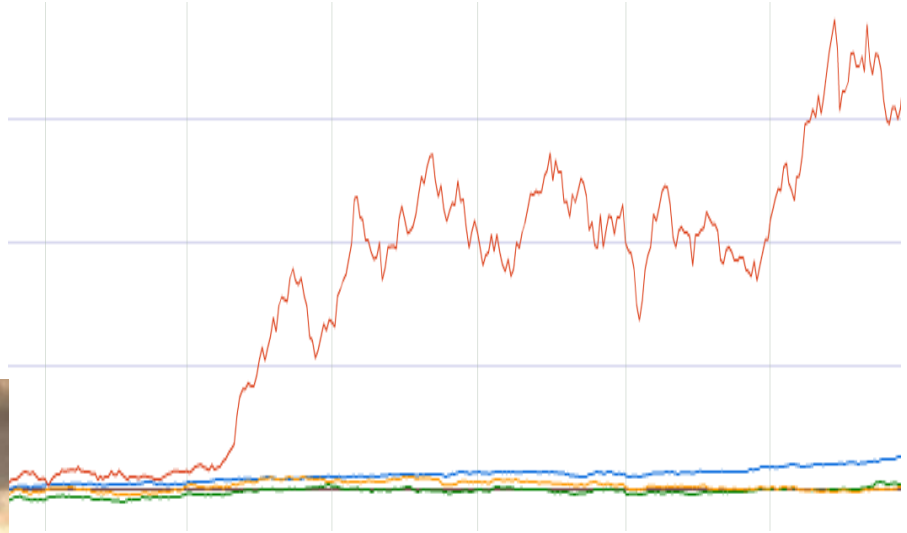

Model X

Tesla is currently trading at a market capitalization over $56 billion, more than that of General Motors ($53 billion), and Ford (US$ 44 billion). GM and Ford have a broader product range, international presence and 20 times the annual revenues of Elon Musk's start up (2016: Tesla 7 billion; GM 145 billion; Ford $116 billion). (Source: Google Finance, Feb 2018)

Is Tesla Motors overpriced?

A. overpriced

B. NOT overpriced

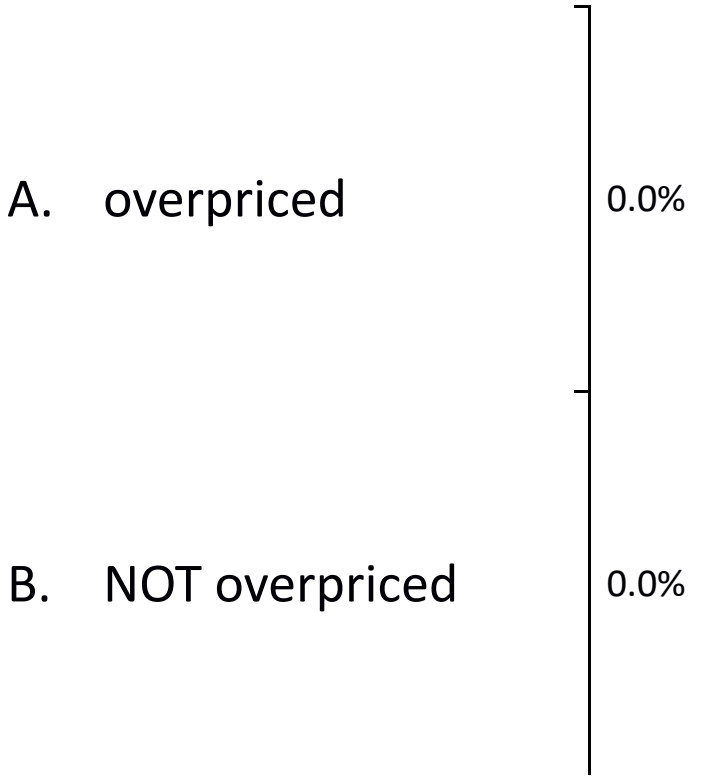


The question will open when you start your session and slideshow.

Votes: 0

Closed

Is Tesla Motors overpriced?



We will set these example results to zero once you've started your session and your slide show.

In the meantime, feel free to change the looks of your results (e.g. the colors).

Closed

Option #1:

Tesla is overpriced

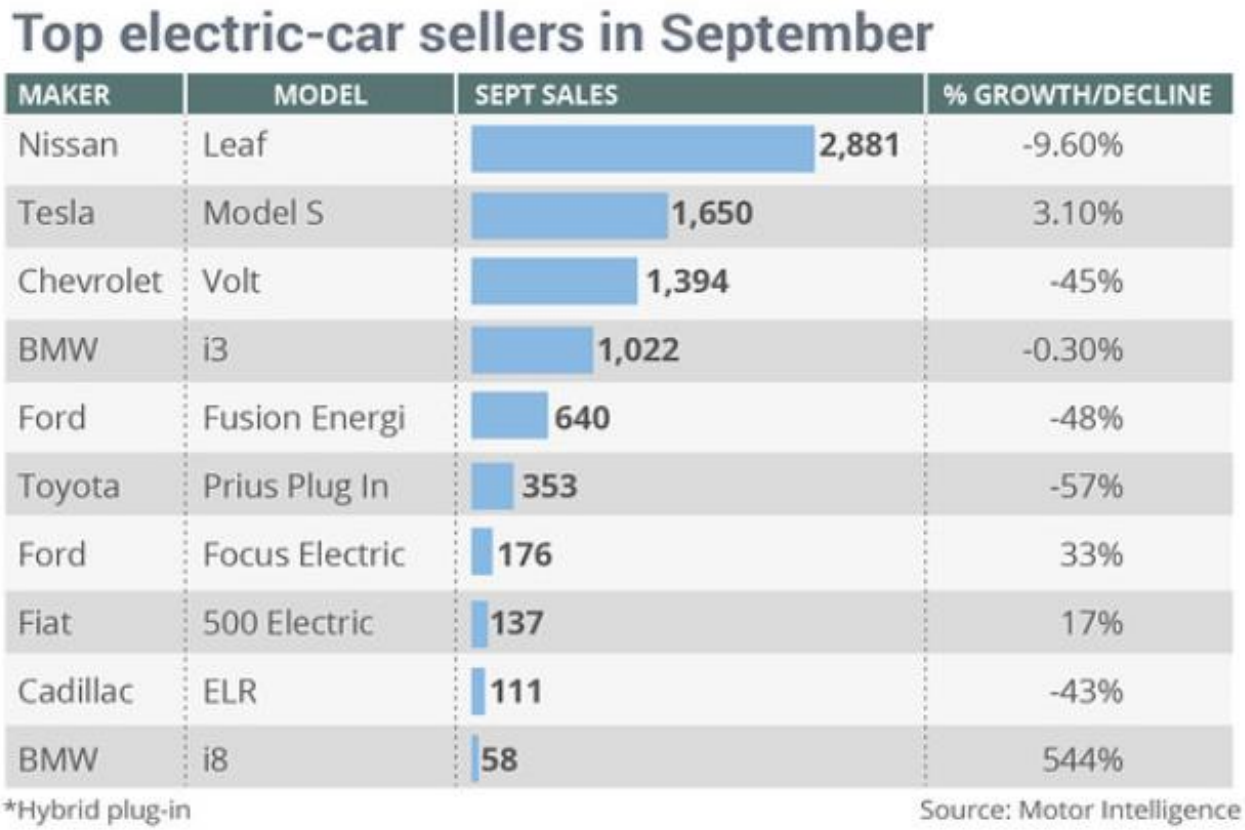
Tesla Motors makes losses and is heavily in debt

Annual Income Statement (values in 000's)					Get Quarterly Data
Period Ending:	Trend	12/31/2017	12/31/2016	12/31/2015	12/31/2014
Total Revenue		$11,758,751	$7,000,132	$4,046,025	$3,198,356
Cost of Revenue		$9,536,264	$5,400,875	$3,122,522	$2,316,685
Gross Profit		**$2,222,487**	**$1,599,257**	**$923,503**	**$881,671**
Operating Expenses					
Research and Development		$1,378,073	$834,408	$717,900	$464,700
Sales, General and Admin.		$2,476,500	$1,432,189	$922,232	$603,660
Non-Recurring Items		$0	$0	$0	$0
Other Operating Items		$0	$0	$0	$0
Operating Income		**($1,632,086)**	**($667,340)**	**($716,629)**	**($186,689)**

Source: Nasdaq.com

Balance sheet information (Bloomberg, Sept 2015): *'Tesla Motors, Inc. may have more financial risk than other companies in the Automobiles industry as it is one of the most highly leveraged (Debt:Total Capital = 74%). An examination of near-term assets and liabilities shows that there are not enough liquid assets to satisfy current obligations.*

Is Tesla Motors overpriced?



Top electric-car sellers in September

MAKER	MODEL	SEPT SALES	% GROWTH/DECLINE
Nissan	Leaf	2,881	-9.60%
Tesla	Model S	1,650	3.10%
Chevrolet	Volt	1,394	-45%
BMW	i3	1,022	-0.30%
Ford	Fusion Energi	640	-48%
Toyota	Prius Plug In	353	-57%
Ford	Focus Electric	176	33%
Fiat	500 Electric	137	17%
Cadillac	ELR	111	-43%
BMW	i8	58	544%

*Hybrid plug-in

Source: Motor Intelligence

"Pure electric cars remain a niche market, making up less than 1% of total U.S. car sales. And within that, Tesla is a niche product. Its Model S costs about $75,000, while prices for the Leaf start around $30,000 and the Volt around $35,000."
[marketwatch.com, Oct 3, 2014 2:59 p.m. ET]

Strong positive reactions to meaningless signals

In October 2014, Musk mentioned the “D and something else” in one of his tweets.

That could be D for driverless system (or the beginnings of an “autopilot” anti-collision system); (…) a dual motor to deliver all-wheel drive, (…); and the first peek at a Model 3 prototype, to name a few guesses.

Musk’s cryptic tweets — and the rampant speculation they have fueled since — have pushed Tesla shares about 9% higher.

[marketwatch.com, Oct 6, 2014 3:48 p.m. ET]

Is Tesla Motors overpriced?

Elon Musk himself:

Possible theoretical explanation

Greater fool theory:

The price of an object is determined not by its fundamental value, but can be justified under the belif of a ‘speculator’ that another party (‘greater fool’ a.k.a. ‘noise trader’) is willing to pay an even higher price.

Note that the ‘greater fool’ can also be another speculator, who believes in other ‘greater fools’.

With small mistakes in their believes, speculators can thus ‘feed on each other’ and drive bubbles without the existence of noise traders.

Option #2:

Tesla is not overpriced

Tesla Motors invests heavily in new technology and all components needed for electric driving

Annual Income Statement (values in 000's)					Get Quarterly Data
Period Ending:	Trend	12/31/2017	12/31/2016	12/31/2015	12/31/2014
Total Revenue		$11,758,751	$7,000,132	$4,046,025	$3,198,356
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Operating Income		**($1,632,086)**	**($667,340)**	**($716,629)**	**($186,689)**

- Tesla invests in the largest battery plant on the planet (Tesla's 'Gigafactory'). It will produce more lithium ion batteries annually than were produced worldwide in 2013.
- Tesla invests heavily in building a 'supercharger network' that supports long range e-travelling and offers free charging for all Teslas.

Possible theoretical explanation

Mirages or Sunspot Equilibria:

'Random' market fluctuations *can correlate beliefs and drive* fundamental values, resulting in *self-fulfilling fluctuations* driven by arbitrary market beliefs.

1. A 'random' increase in market confidence increases Tesla's stock price (coordination)

2. The rising stock price convinces Tesla to invest more in the company (feedback cycle)

3. The increased prospects of better technology and better competitive position justifies the higher share price (self-fulfilling)

4. The 'bubble' manifests itself and will – ex post – not even be considered a 'bubble' anymore (new reality)

The ‘true value’ of Tesla depends

on our beliefs about

the beliefs of the others …

Choose an integer from 0 and 100.
You win if your number is closest to
2/3 of the mean of all submitted numbers.

A. 100 to 90
B. 89 to 80
C. 79 to 60
D. 59 to 50
E. 49 to 40
F. 39 to 30
G. 29 to 20
H. 19 to 10
I. 9 to 0

The question will open when you start your session and slideshow.

Votes: 0

Closed

Choose an integer from 0 and 100. You win if your number is closest to 2/3 of the mean of all submitted numbers.

A. 100 to 90
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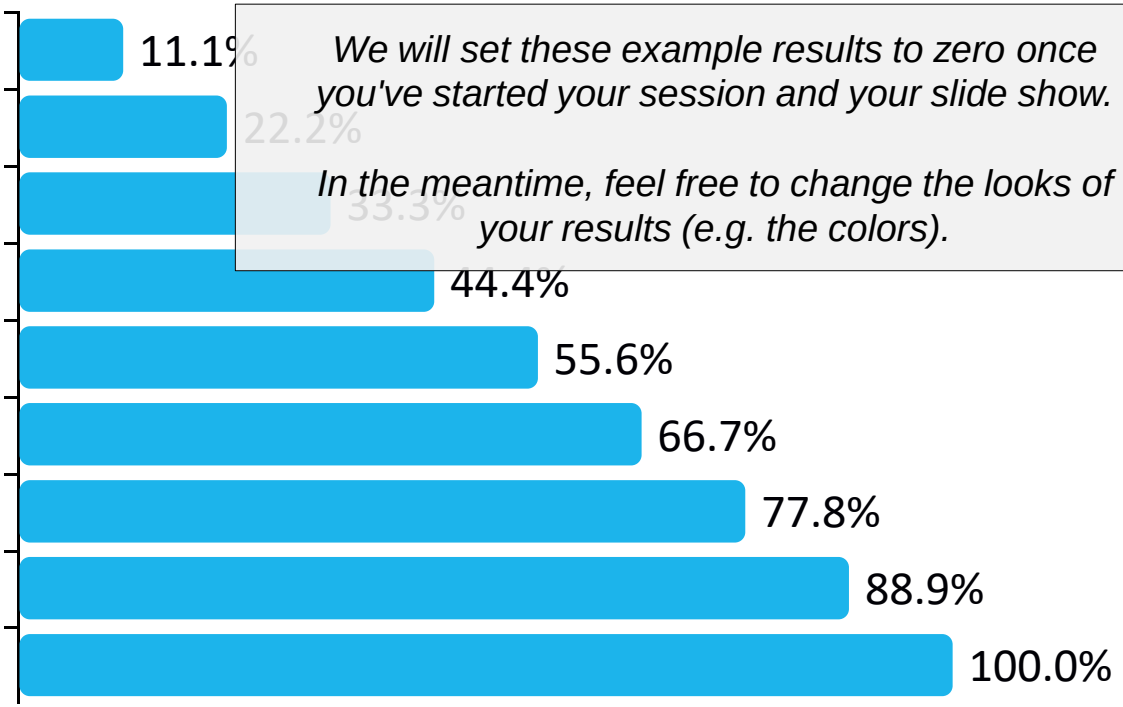

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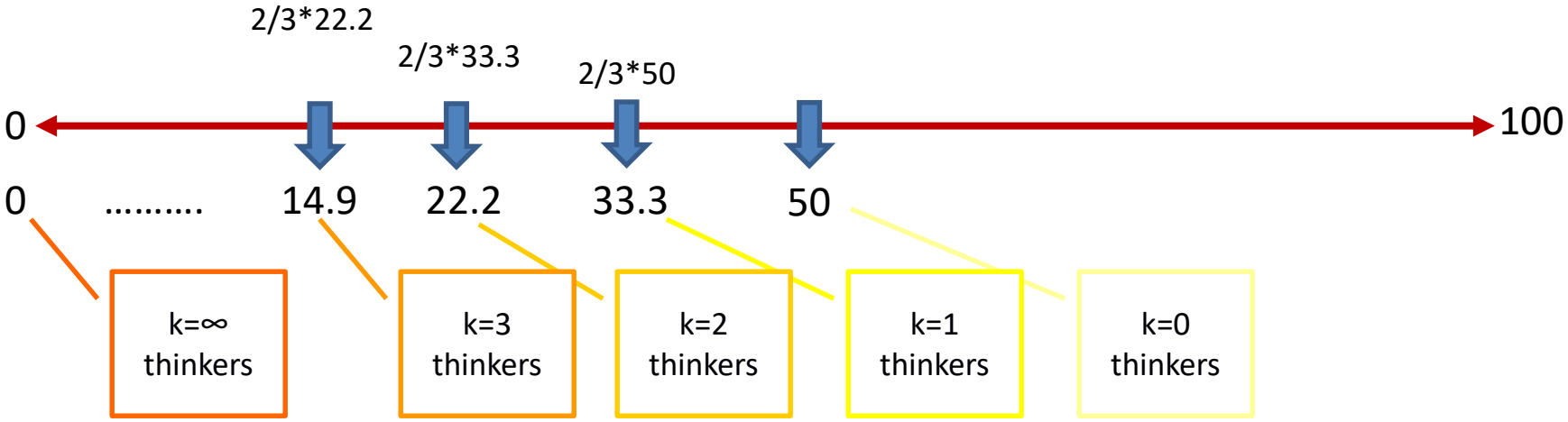
Closed

‘Beauty Contest’ or ‘Guessing Game’



The winner is who correctly believes what the others believe that the others believe …

The price of Tesla is what ‘the marginal trader’ believes what the others believe that the others believe …

We need a theory of expectations in order to understand social dynamics.

Swiss Finance Institute
Research Paper Series N°08 – 14

Evolutionary Finance

Igor V. EVSTIGNEEV
Economic Studies, University of Manchester

Thorsten HENS
Swiss Banking Institute, University of Zurich

Klaus REINER SCHENK-HOPPE
Leeds University Business School and School of Mathematics, University of Leeds

Complex Evolutionary Systems in Behavioral Finance

Cars Hommes and Florian Wagener
CeNDEF, School of Economics, University of Amsterdam

19 FEBRUARY 2016 • VOL 351 ISSUE 6275

Science AAAS

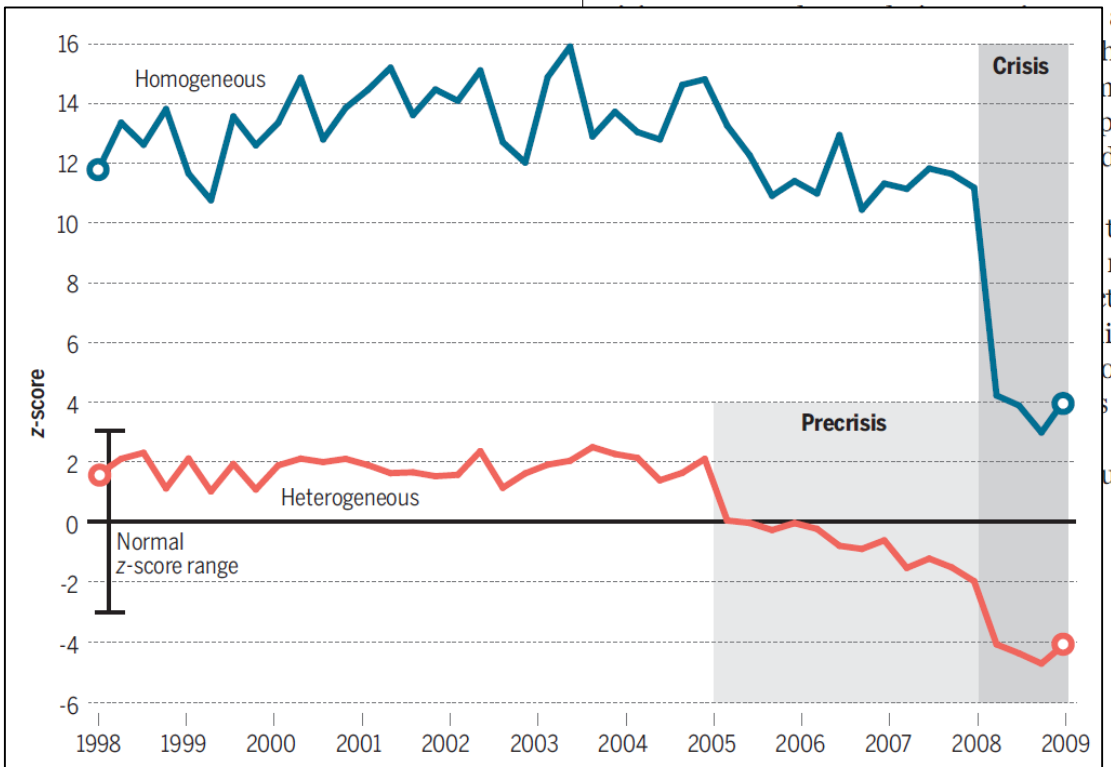
COMPLEX SYSTEMS

Complexity theory and financial regulation

Economic policy needs interdisciplinary network analysis and behavioral modeling

By **Stefano Battiston,[1]* J. Doyne Farmer,[2,3] Andreas Flache,[4] Diego Garlaschelli,[5] Andrew G. Haldane,[6] Hans Heesterbeek,[7] Cars Hommes,[8,9]† Carlo Jaeger,[10,11,12] Robert May,[13] Marten Scheffer[14]**

Recent research has revealed generic empirical quantitative indicators of resilience that may be used across complex systems to detect tipping points. Markers include rising correlation between nodes in a network and



Early-warning signals of the 2008 crisis in the Dutch interbank network. The figure portrays a temporal analysis of two loops, pairs of banks that are at the same time debtor and creditor to each other. Although the raw number of

a whole. Despite on-going efforts, these effects are unlikely to be routinely considered anytime soon.

Information asymmetry within a network—e.g. where a bank does not know about troubled assets of other banks—can be problematic. The banking network typically displays a core-periphery structure,

"...policies and financial regulation [that] weaken positive feedback... stabiliz[e] experimental macroeconomic systems..."

How do we get to a theory of expectations?

- How do we form beliefs / learn?
  - Bayesian brain (sensorimotor control)
  - Associative learning (reward system)

- How do we deal with errors?
  - Pattern recognition (-> technology)
  - False positives (-> superstition)
  - Error management with asymmetry. Cool ☺

- How stable are our beliefs?
  - Confirmation bias and polarization (flat earth)
  - Free will and/or determinism in decisions

- How do our beliefs interact?
  - Game theory
  - Complex models