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## GIRO 2016, Dublin

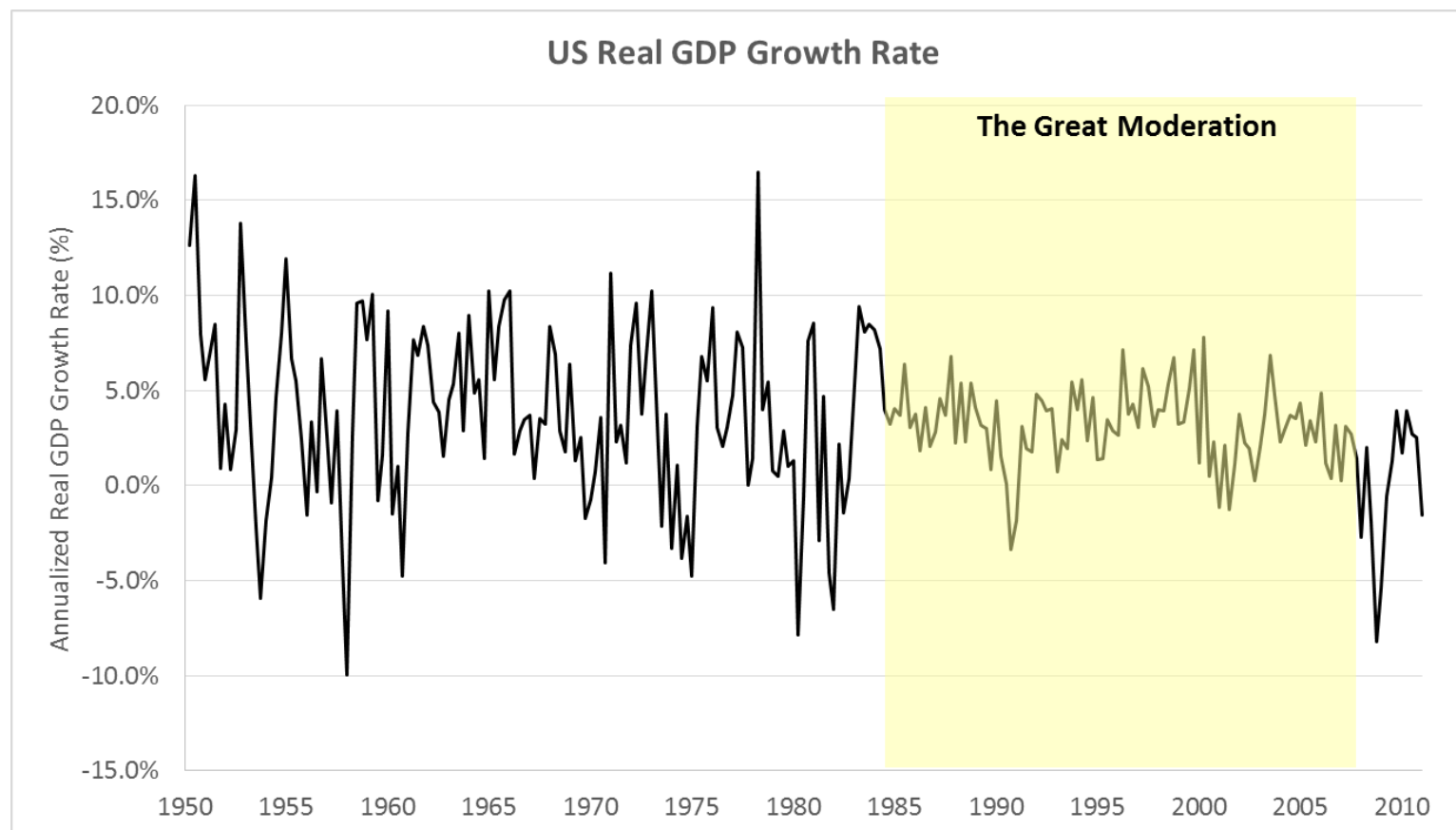
# New developments in economics and the impact on GI, Risk Management and ALM

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# Introduction: The Great Moderation and the 2008 Financial Crisis



Source: US Real GDP data series obtained from the Federal Reserve Economic Data (FRED) database provided by Economic Research at the St. Louis Fed. <https://research.stlouisfed.org/fred2/series/GDPC96?cid=106>



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# Introduction: The Great Moderation and the 2008 Financial Crisis

## 6<sup>th</sup> November 2008\*

“The Queen spoke for the nation yesterday when she asked how the credit crunch could have taken so many economics experts by surprise.

“She described the financial crisis as 'awful' and inquired that, since the meltdown was so massive, 'Why did nobody notice it?'”



<http://www.dailymail.co.uk/news/article-1083290/Its-awful--Why-did-coming--The-Queen-gives-verdict-global-credit-crunch.html#ixzz2YoV8VGec>



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# Contents:

**Part 1: Problems with traditional (neoclassical) economics**

**Part 2: New economics: “Let a hundred flowers bloom, let a hundred schools of thought contend”**

**Part 3: The actuarial profession and the road ahead**



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# Why is economics important?

Economics is a key influence on:

- Investment theory (via financial economics)
- Actuarial practice (via investment theory)
- Politics

“I don't care who writes a nation's laws - or crafts its advanced treaties - if I can write its economics textbooks.”

Paul Samuelson



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# The financial crisis was also a crisis for economics

## Adair Turner, on the need to “reconstruct” economics\*

- “... one oversimplified strand [of economics] dominated in the pre-crisis years”
- “... do we really need, as Skidelsky argues, to “reconstruct economics”? My conclusion is that we do.”

## Joseph Stiglitz, Nobel prize winning economist

“... models said that financial markets were always efficient. Remarkably, standard macroeconomic models did not even incorporate adequate analyses of banks.”



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# The currently dominant school: Neoclassical Economics

- Economics has become synonymous with one particular school of economic thought: neoclassical economics.
- Neo-classical economics assumes that individuals make choices:
  1. With rational preferences,
  2. Attempting to maximise their utility, and
  3. Acting with perfect information



# Neoclassical Economics

- Also assumes the economy is an equilibrium system.

Optimisation + Equilibrium = Neoclassical Economics\*



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# Problems with neoclassical economics

Three examples:

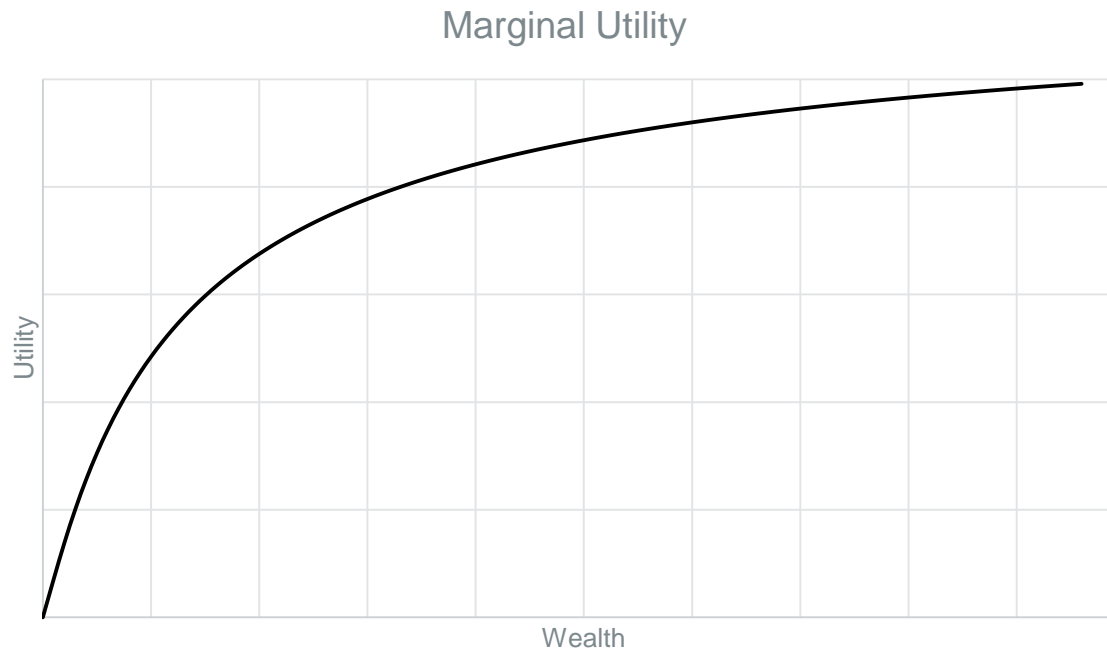
1. Expected utility and the theory of insurance
2. Banks and money creation
3. Supply and demand curves



# Problem 1: Expected Utility and the theory of insurance

Textbook explanation of insurance:

Risk aversion is caused by decreasing marginal utility

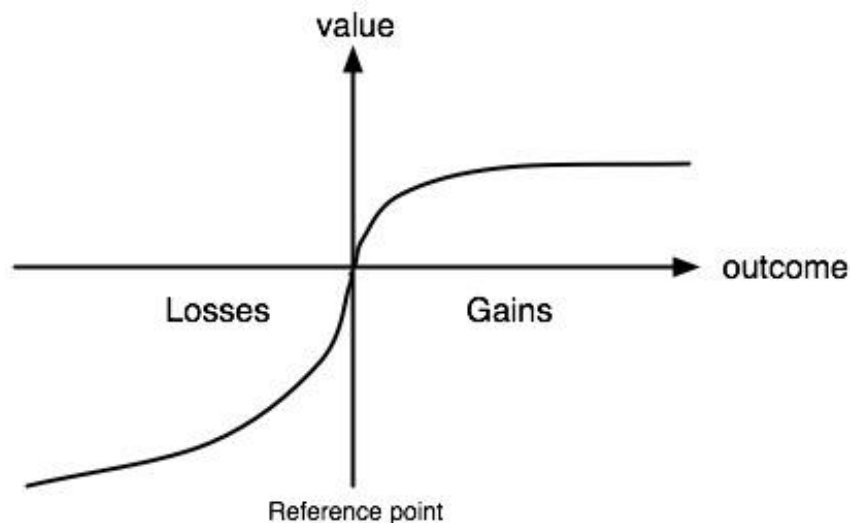


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# Expected utility cannot fully explain risk aversion

Expected utility cannot fully explain risk aversion, because requires implausibly large drop off of utility with increased wealth.

Prospect theory – people's perceived value depends on starting point of wealth



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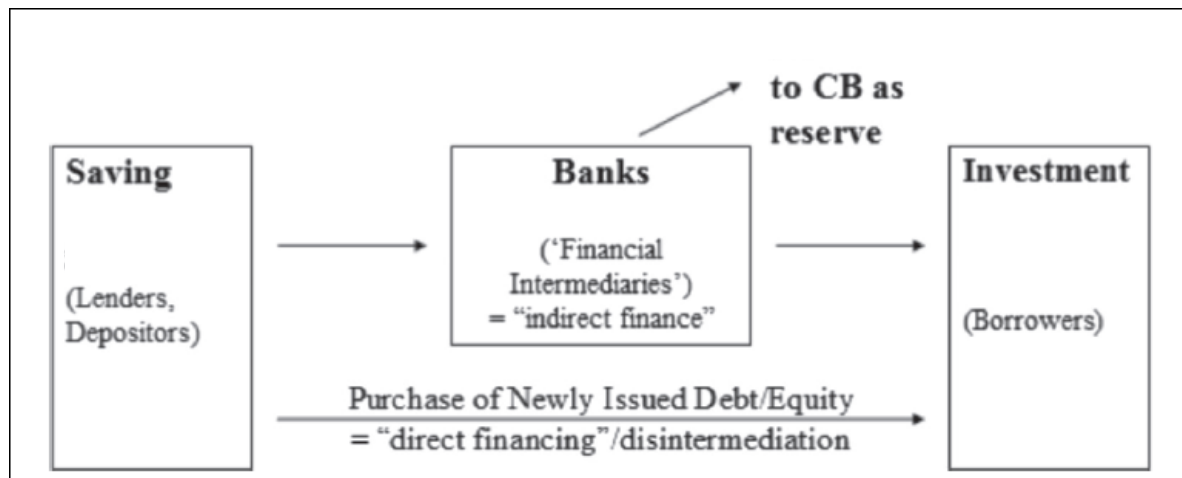


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## Problem 2: Banks and Money Creation

The textbook explanation of banking is fractional reserve system:

- Banks act as intermediaries
- Banks take in deposits first. Then loan these deposits out
- A bank does not create money on its own, but the system does
- Central bank can control money supply with reserve ratio



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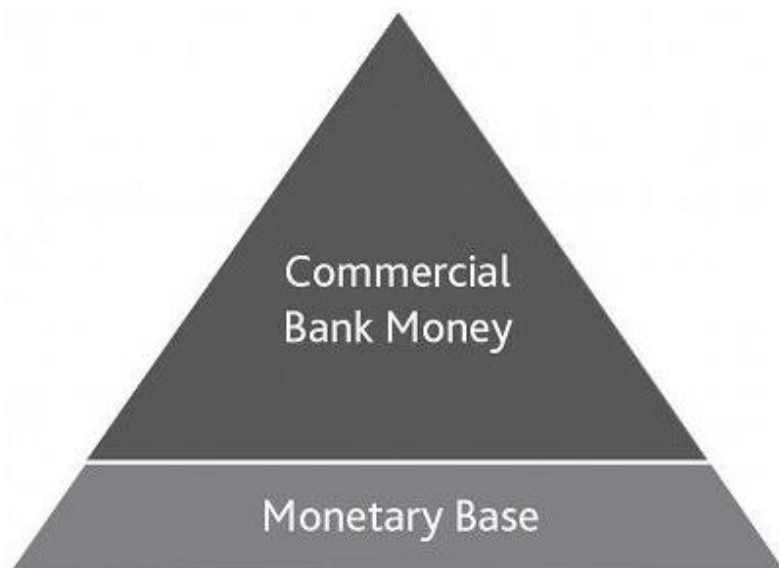
# Alternative explanation of banking: Endogenous money theory

- Banks are not intermediaries
- Banks do not have to wait for deposits to make loans
- When one bank makes a loan it creates money out of nothing
- Central banks cannot and do not control money supply by regulating the reserve ratio

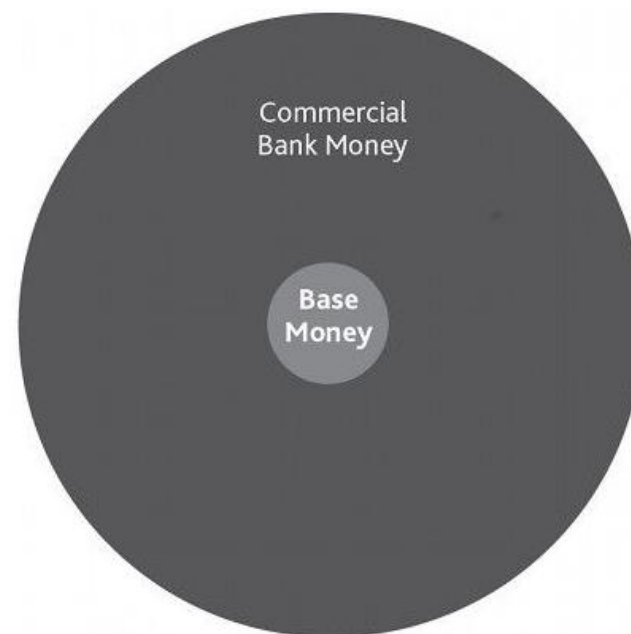


# Fractional reserve v Endogenous money explanations

## Fractional Reserve Banking



## Endogenous Money Theory



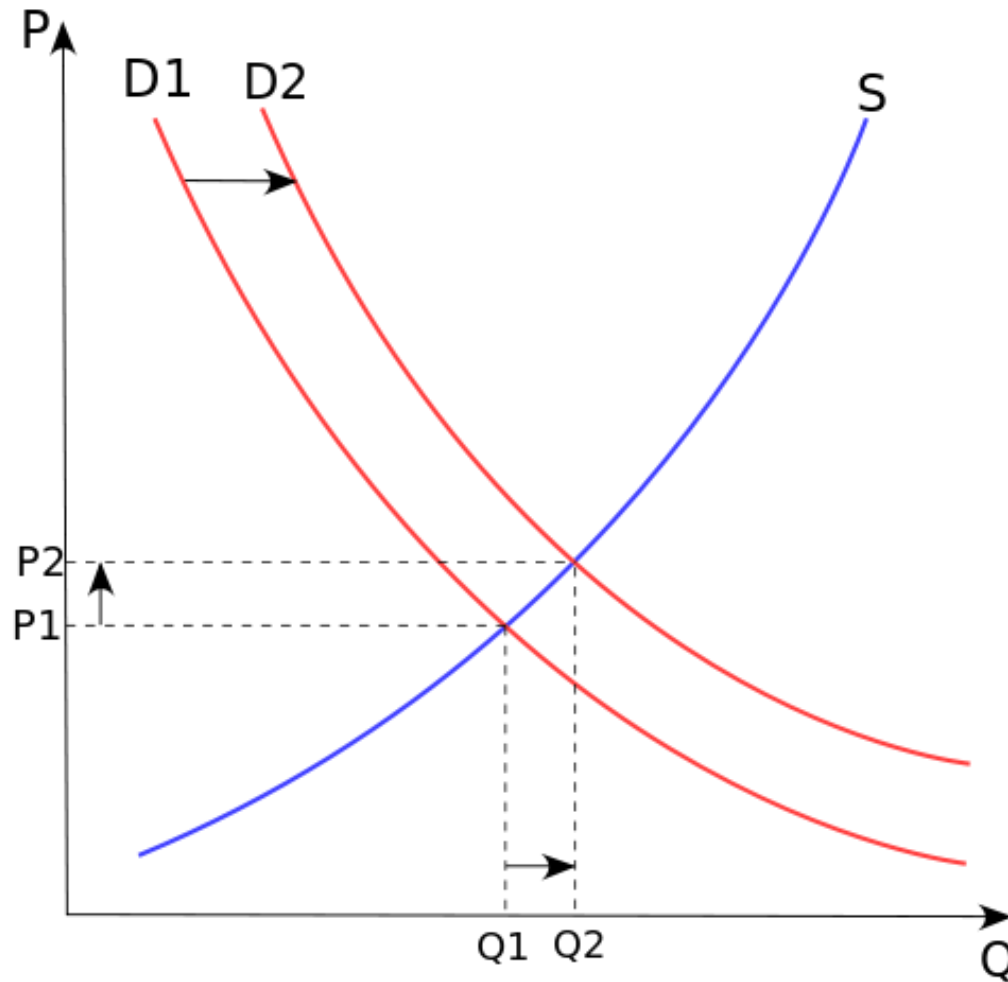
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# Which is correct?

- Experiment to test – see Werner, R.A., **A lost century in economics: Three theories of banking and the conclusive evidence**, International Review of Financial Analysis (2015),  
<http://dx.doi.org/10.1016/j.irfa.2015.08.014>
- Entered a German bank on a Sunday. Booked one single loan. Checked the bank's accounting system before and after the loan.
- Result supported endogenous money theory
- Bank of England in 2014 published article supporting endogenous money theory.



# Problem 3: Supply and Demand Curves



## Textbook explanation of supply and demand:

- Downward sloping demand curve
- Upward sloping supply curve
- Unique market price where curves intersect



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# Supply Curves

- Real world data does not support the upward sloping supply curve
- Engineers design factories to work at near optimal efficiency at a wide range of outputs
- Likely that real supply curve is flat or even slightly downward sloping

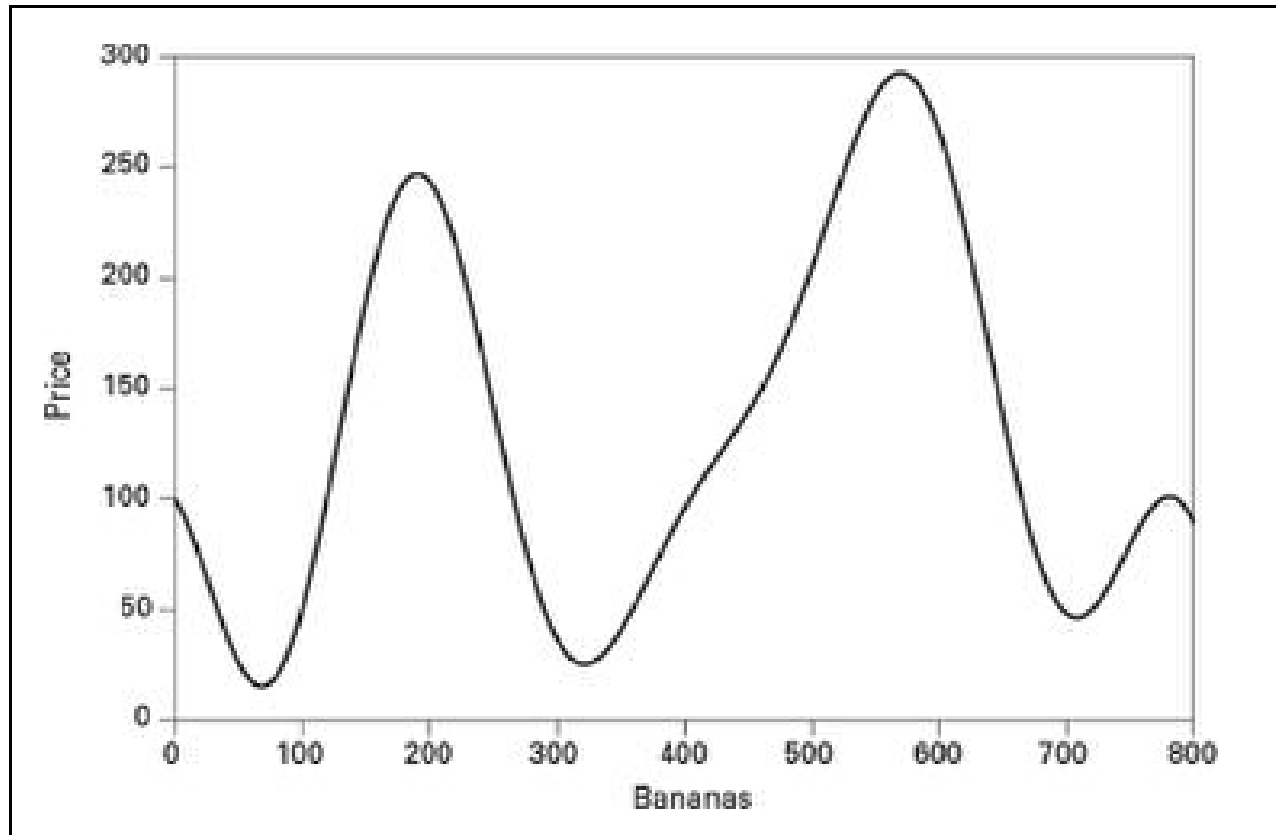


# Demand Curves: Sonnenschein-Mantel-Debreu (SMD) theorem

- Demand curves slope downwards for an individual.
- Neoclassical economics says market demand curve follows from aggregating individuals' demand curves.
- But, this is an aggregation fallacy. What applies to one consumer does not apply when there is more than one.
- This was first proved in 1953 by a mathematical neoclassical economist, and later rediscovered by several others.
- The market demand curve can have any shape, apart from doubling back on itself.



# Example of a valid market demand curve

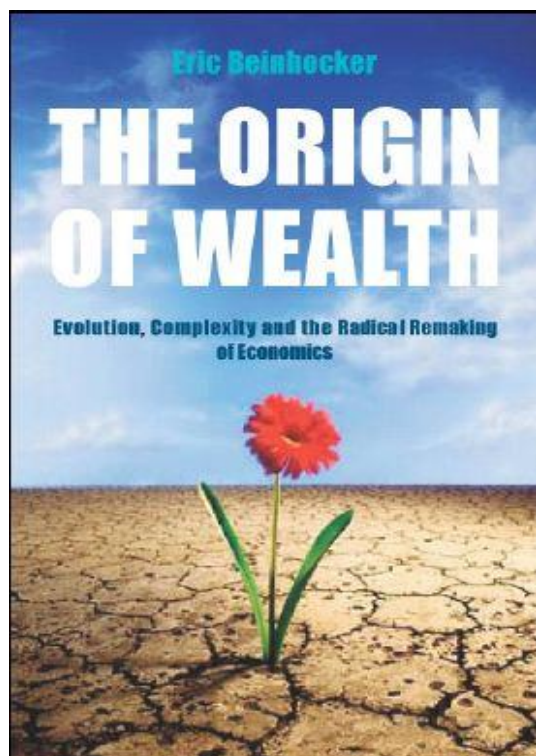


# Conclusions

- In each case, the explanations provided by neoclassical economics are plausible, but do not stand up to empirical study
- However, in each case they are still taught in economics textbooks
- What is going on?



# The history of neoclassical economics



- Neo-classical economics developed from classical economics of Adam Smith, David Ricardo etc
- 19<sup>th</sup> century economists borrowed from the physics of the time to mathematise economics.
- They wanted to make economics more scientific – but the effect was the opposite.
- Neo-classical economics does not allow for 2nd law of thermodynamics.

## Albert Einstein on thermodynamics

“It is the only physical theory of universal content which I am convinced will never be overthrown, within the framework of applicability of its basic concepts.”



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# The Scientific Method



**“All swans ever seen are white, therefore all swans are white.”** was a proverb for the ancient Greeks and for Europeans during the middle ages, until black swans were discovered in Australia.

- The scientific method relies on proof by induction
- All scientific knowledge is provisional
- Unlike mathematical/logical proof by deduction



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# “The methodology of positive economics”, Milton Friedman 1953

- Facts = positive, Values = normative
- Very influential essay on methodology in economics
- Friedman said, the origins of assumptions don't matter, all that matters is a theory's predictive power.

*“Truly important and significant hypotheses will be found to have "assumptions" that are wildly inaccurate descriptive representations of reality, and, in general, the more significant the theory, the more unrealistic the assumptions (in this sense).”*

- But there are two kinds of assumptions: negligibility assumptions and domain assumptions.

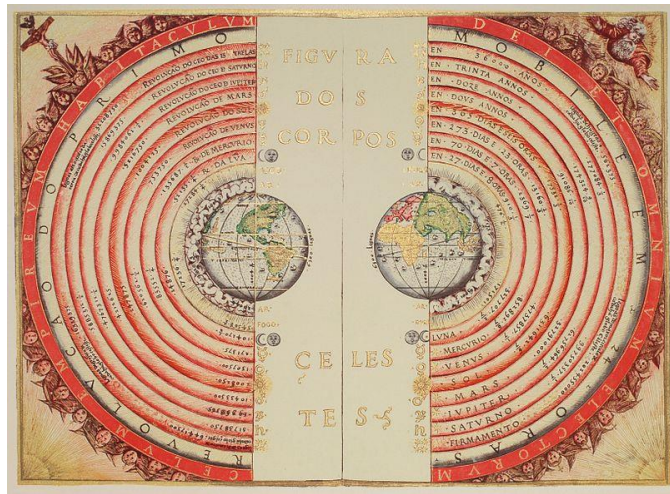


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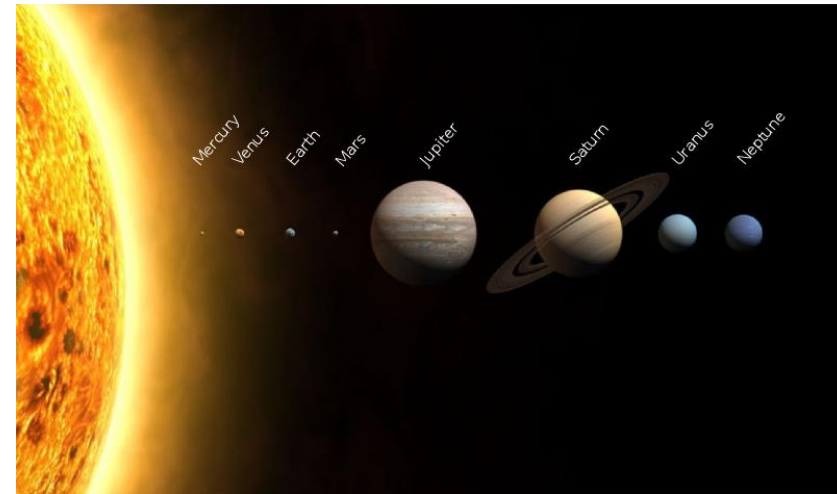
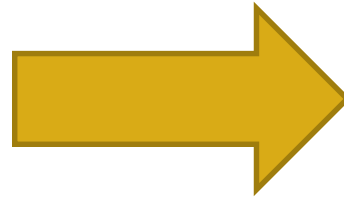


# A paradigm shift is underway

“... a new paradigm, I believe, is within our grasp”\*,  
Joseph Stiglitz, 19 August 2010



Ptolemaic system



Galilean system

\*Joseph Stiglitz writing in the Financial Times, 19 August 2010

<http://www.ft.com/cms/s/0/d5108f90-abc2-11df-9f02-00144feabdc0.html#axzz48mrgTgQ8>



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## Part 2: Alternative Economics: “Let a hundred flowers bloom”



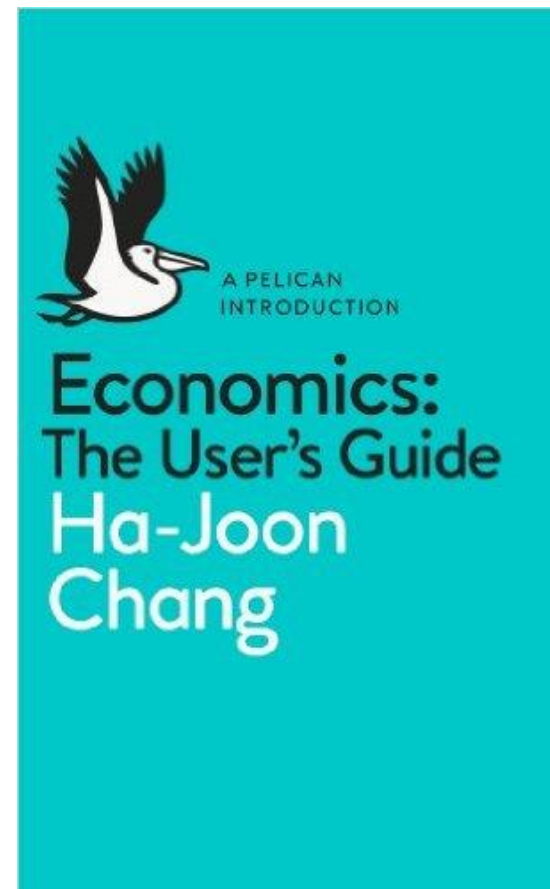
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# More pluralism needed in economics

- All models are wrong, some models are useful
- Different models are needed for different purposes

Cambridge University economist Ha-Joon Chang's book "**Economics: The user's guide**" has introduction to other schools of economic thought

Also suggests that the old name "political economy" was better



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# Some other schools of economic thought

- Behaviouralist
- Classical
- Developmentalist
- Institutionalist
- Post-Keynesian
- Ecological
- Evolutionary
- Feminist
- Marxist



# Three examples of questions that we might use alternative economics to answer

1. Can we get better outcomes in financial services, with low cost to the economy?

Use: Behavioural economics

2. Can we estimate the risk of financial crisis and associated changes in economic variables such as GDP?

Use: Post-Keynesian economics

3. What is a long term sustainable investment return?

Use: Ecological economics



# Q1: How to get better outcomes in financial services with low cost

## Behavioural economics experiment – Free Beer!



- Those that chose first liked their beer the best.
- Effect disappears if choice made in private.
- Same experiment in Asia gives same result for opposite reason.
- Conclusion – people change their choice for social reasons, and do not maximise their utility.



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# Conclusion: There is such a thing as a free lunch!

- In neoclassical economics, it is assumed that people make decisions that maximise utility.
- Therefore, question why people don't save enough for retirement is meaningless.
- In reality, simple nudges like auto-enrolment can improve outcomes, with small or no cost to the economy as a whole.



## Q2. Can we estimate risk of financial crisis?

- Very few economists saw the financial crisis coming – a few did.
- The Australian economist Steve Keen warned from 2005 onwards that a crisis was likely.
- Why did he see it coming?



# Post-Keynesian economics

- Post-Keynesians start from John Maynard Keynes' work on macroeconomics
- Hyman Minsky developed his financial instability hypothesis
- Steve Keen has developed computer models of the economy which incorporate bank debt.
- These models foresaw not only the financial crisis but also the Great Moderation before it.

Next slides in blue are from a presentation by Steve Keen, slightly edited for length, see link below for original:

<http://www.debtdeflation.com/blogs/2016/04/18/transcending-the-lucas-critique-simple-dynamic-modelling-with-minsky/>



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# How to answer economic questions with models?

- Classical tradition that structure of capitalism is the main explicant of its behaviour: Model in classes
- Hyman Minsky (1969)

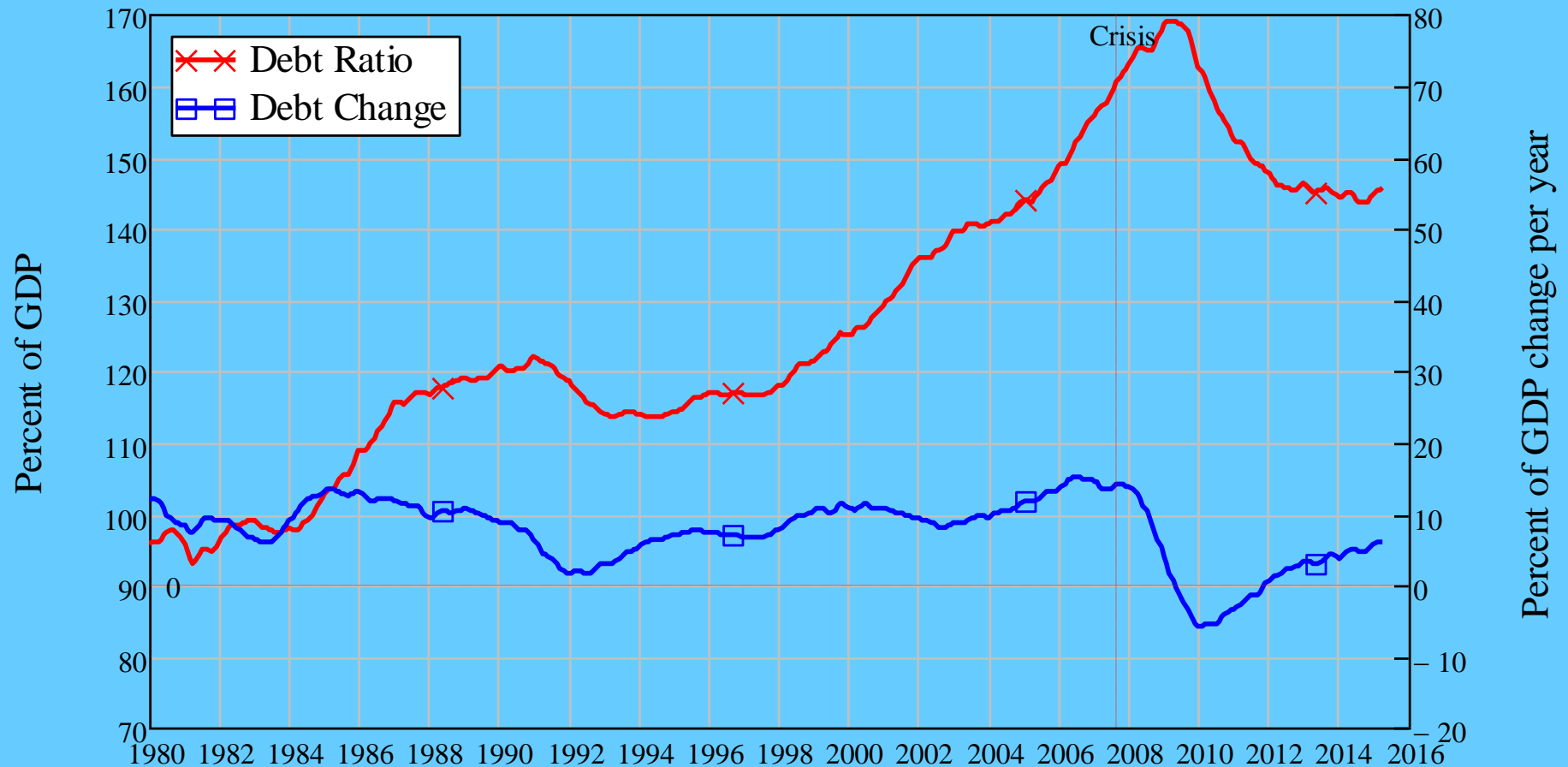
## Stability leads to instability

- Post Keynesian practice:
  - ***Derive dynamics of capitalism from its social & physical structure***
- ***Use this to pose the ultimate question about capitalism:***
  - ***“Is capitalism stable or unstable?”***

# Rising debt then crisis

- Rising private debt in the United States, followed by deleveraging

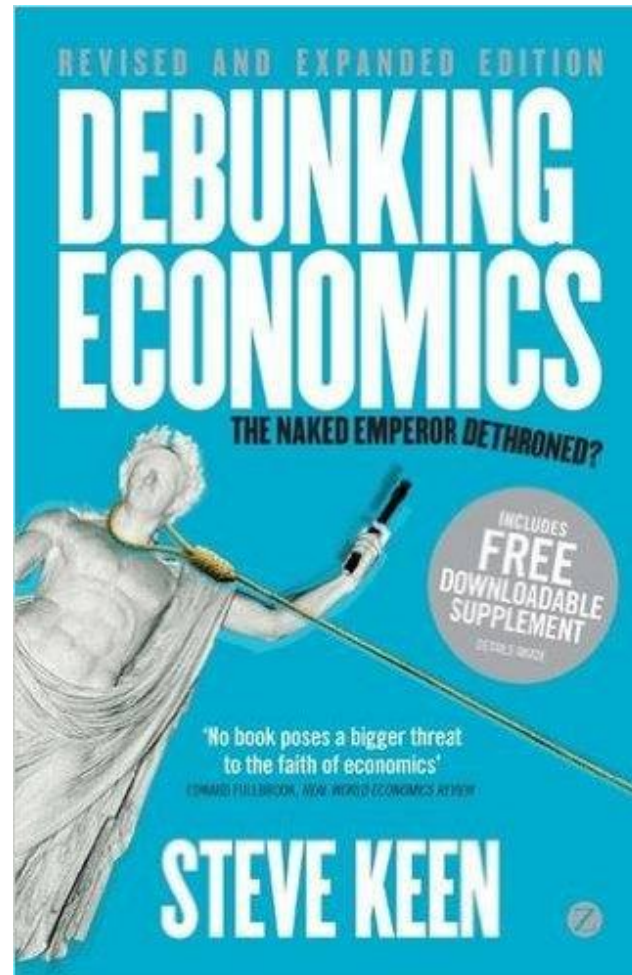
1980-Now: Rising Debt, then Deleveraging



[www.debtdeflation.com/blogs](http://www.debtdeflation.com/blogs)

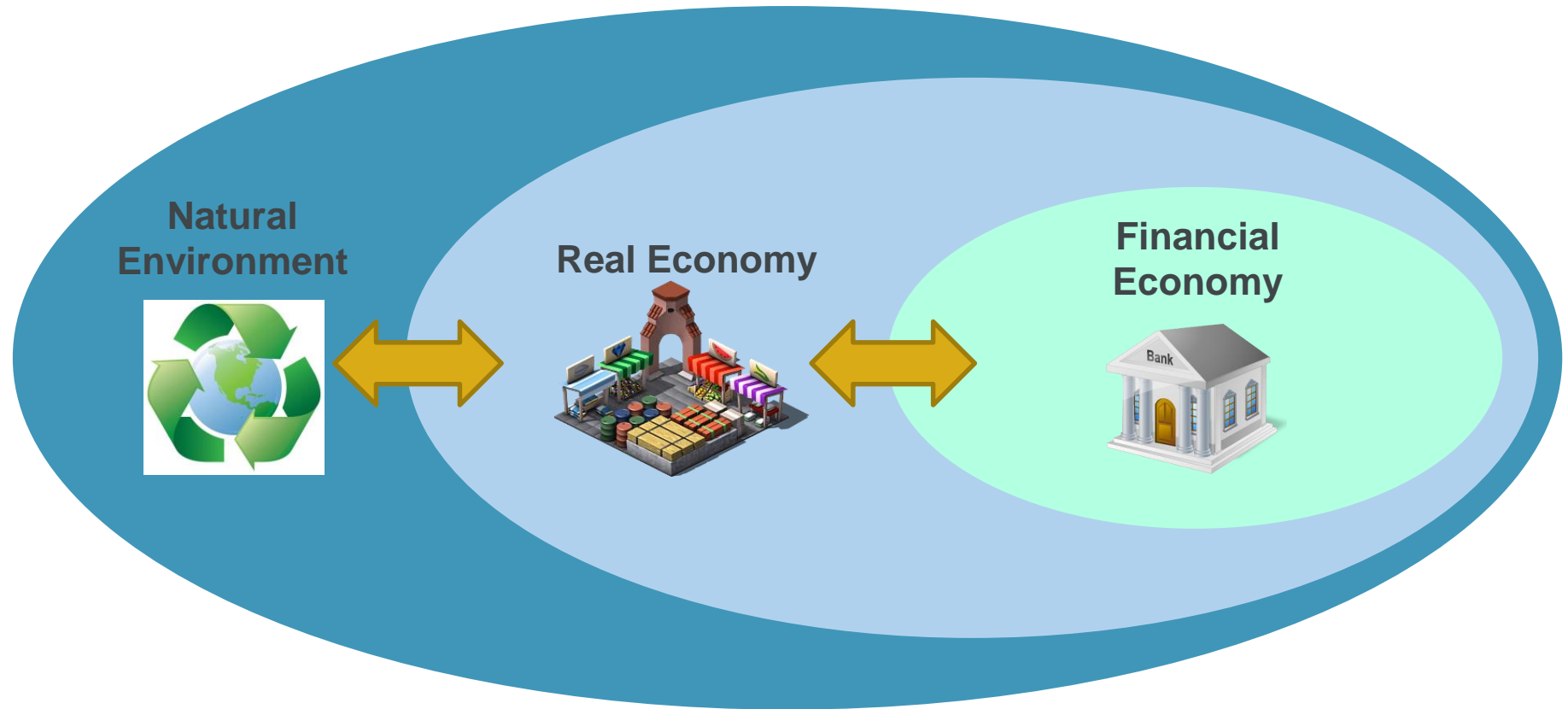
Ref: <http://www.debtdeflation.com/blogs/2016/04/18/transcending-the-lucas-critique-simple-dynamic-modelling-with-minsky/>

# Further reading

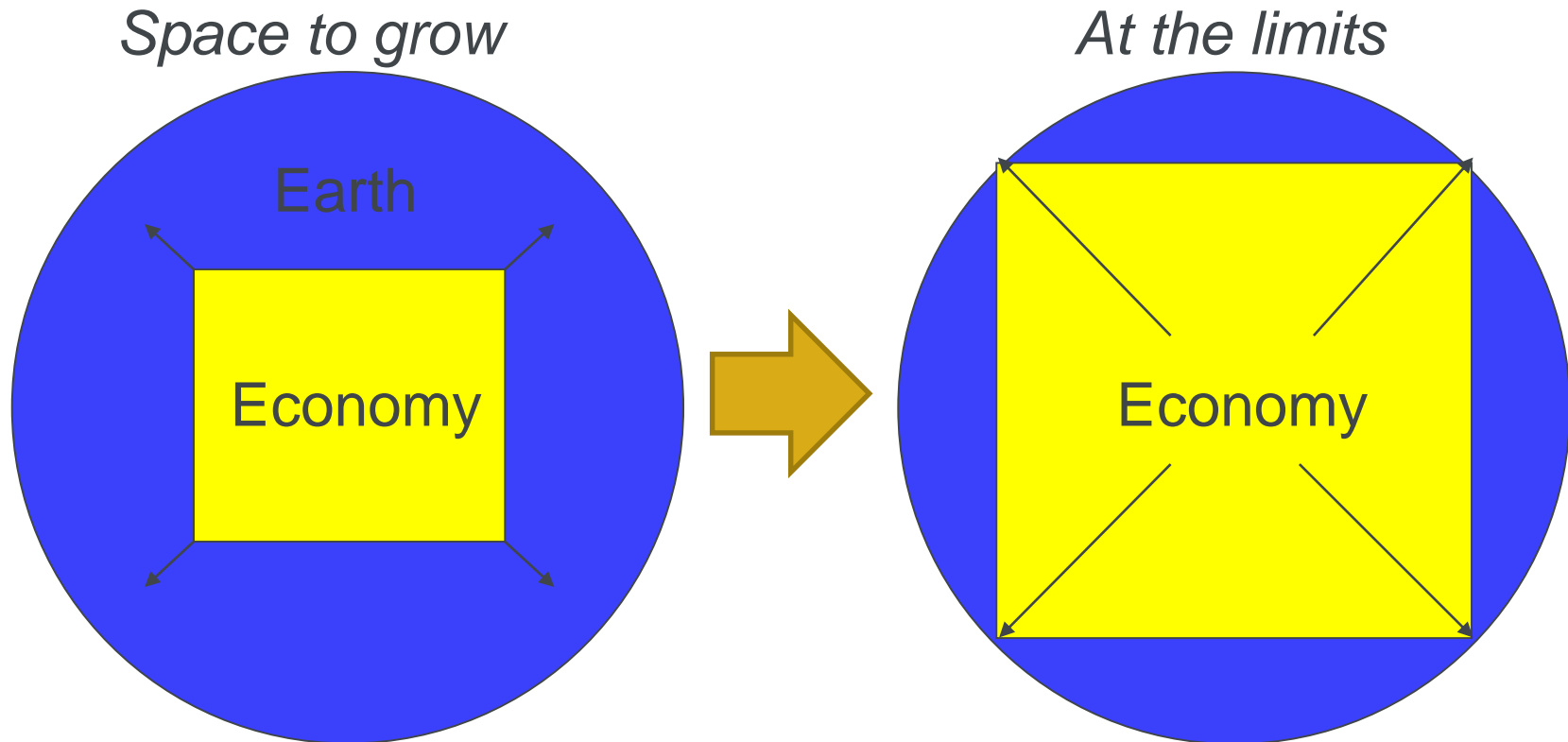


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### Q3. What is a reasonable long term (multi-decade) sustainable investment return?



# Are we close to the limits of the Earth?

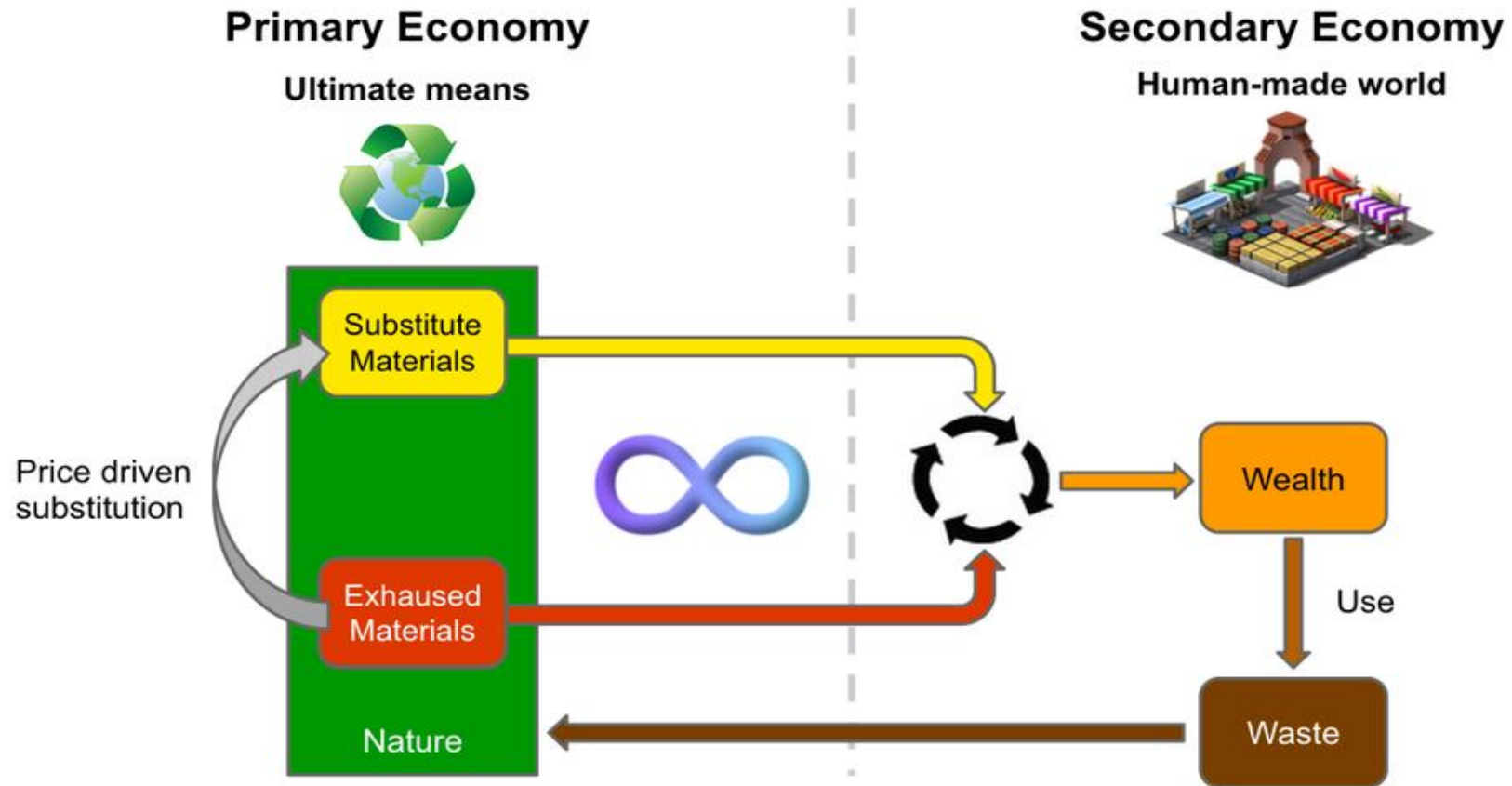


(adapted from Clapp and Dauvergne 2005: p.101)

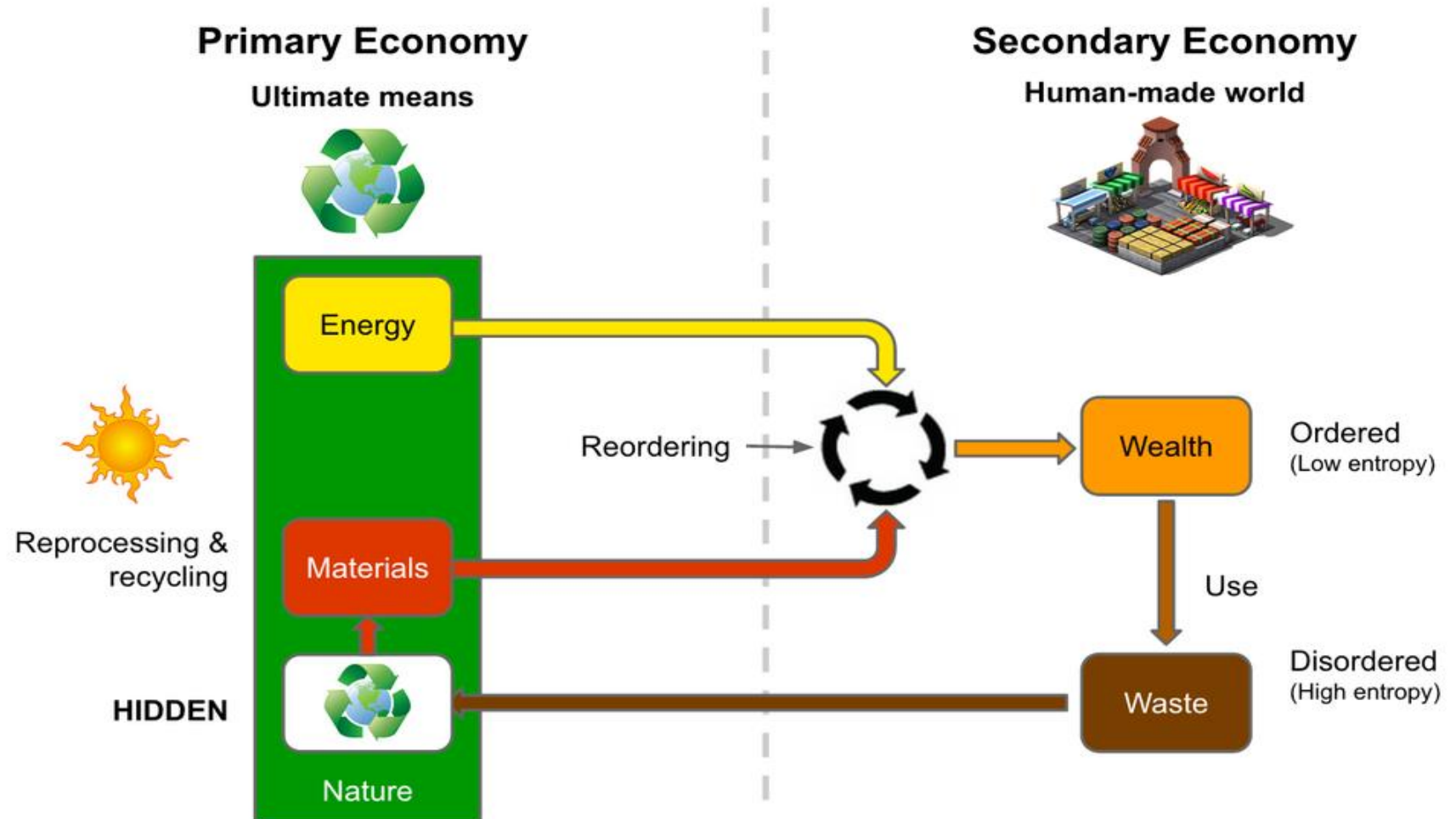


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# Standard Economics View



# Ecological Economics View



# Centre for the Understanding of Sustainable Prosperity (CUSP)



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# All Party Parliamentary Group on Limits to Growth



ABOUT



Image (CC-BY-NC-ND 2.0) Linda Gellner / kultur.work

The aim of the All-Party Parliamentary Group (APPG) on Limits to Growth is to provide a new platform for cross-party dialogue on economic growth...

The full membership of the APPG includes the following parliamentarians:

Stuart Andrew MP (Conservative)  
Baron Deben (Conservative)  
Barry Gardiner MP (Labour)  
Baron Howarth (Labour)  
Baroness Jones of Moulsecoomb (Green)  
George Kerevan MP (SNP)  
Caroline Lucas MP (Green)  
Baron Oxburgh (Crossbench)  
David Puttnam MP (Labour)  
Baron Skidelsky (Crossbench)  
Baron Turner of Ecchinswell (Crossbench)  
Alan Whitehead MP (Labour)  
Daniel Zeichner MP (Labour)



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# Summary

- Many of the problems with neoclassical economics arise from trying to build macroeconomics directly from microeconomics
- Was understandable that the early neoclassical economists in late 19<sup>th</sup>/early 20<sup>th</sup> century would do this
- But, it is now known that building the high level (macro) system view directly from low level (micro) is not possible
- This is because the economy, like all complex systems, has emergent behaviour



# Emergent Behaviour

X	Y
Chemistry	Physics
Biology	Chemistry
...	...
Psychology	Physiology
Social sciences	Psychology

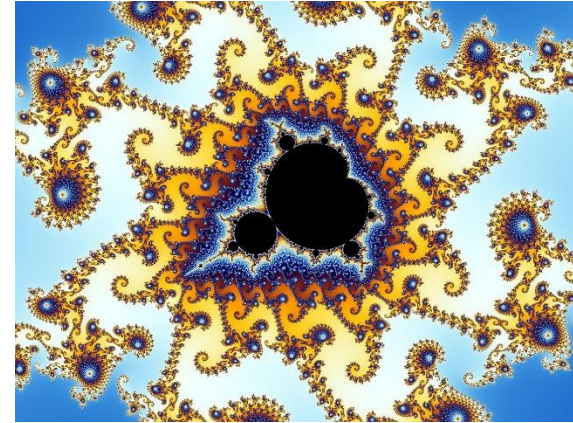
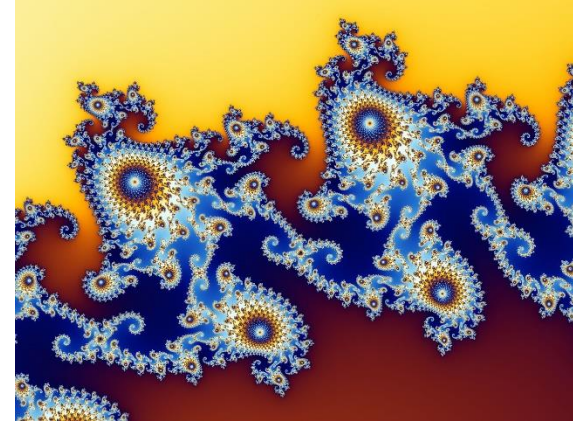
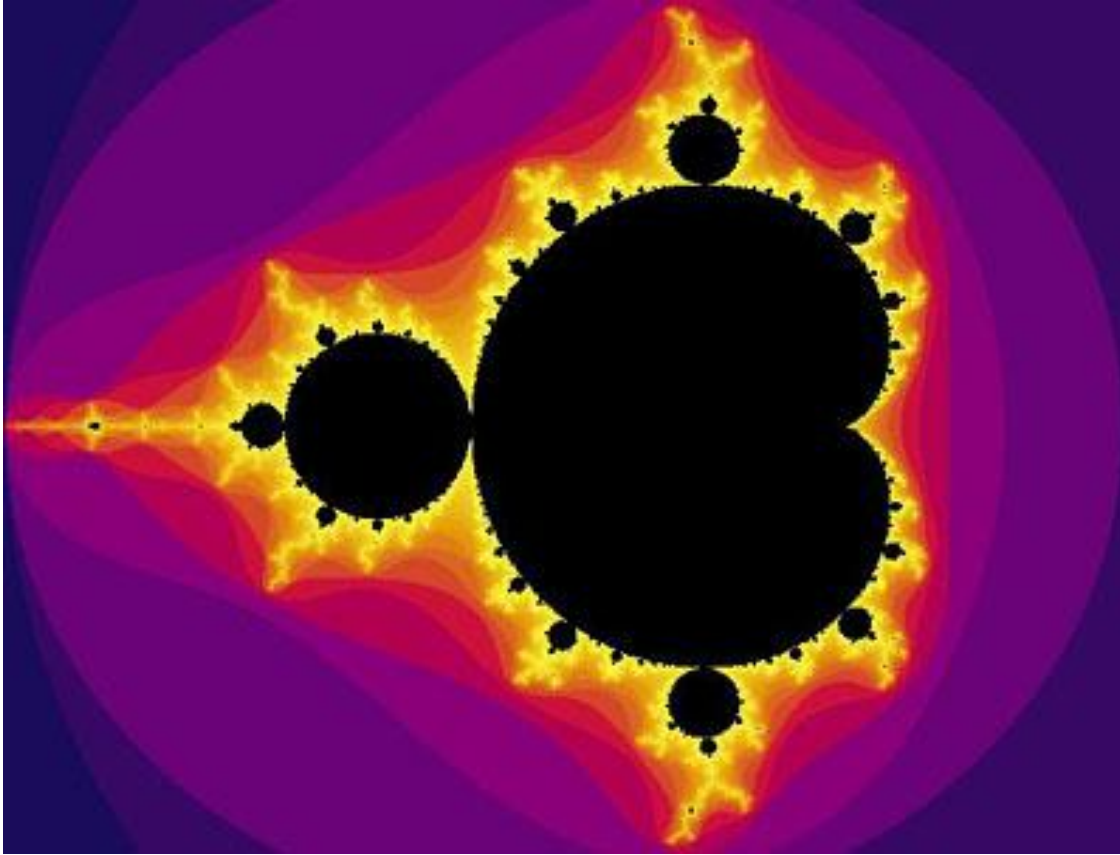
- The elementary entities of science X obey the laws of science Y
- But this hierarchy does not imply that science X is “just applied Y.”
- At each stage entirely new laws, concepts, and generalizations are necessary.

Ref. Physics Nobel laureate Philip Anderson 1972



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# Only relatively recently computers have allowed investigation of complexity



- Mandelbrot set was discovered relatively recently in 1980
- Example of very complex patterns emerging from simple non-linear equations



# Key Points

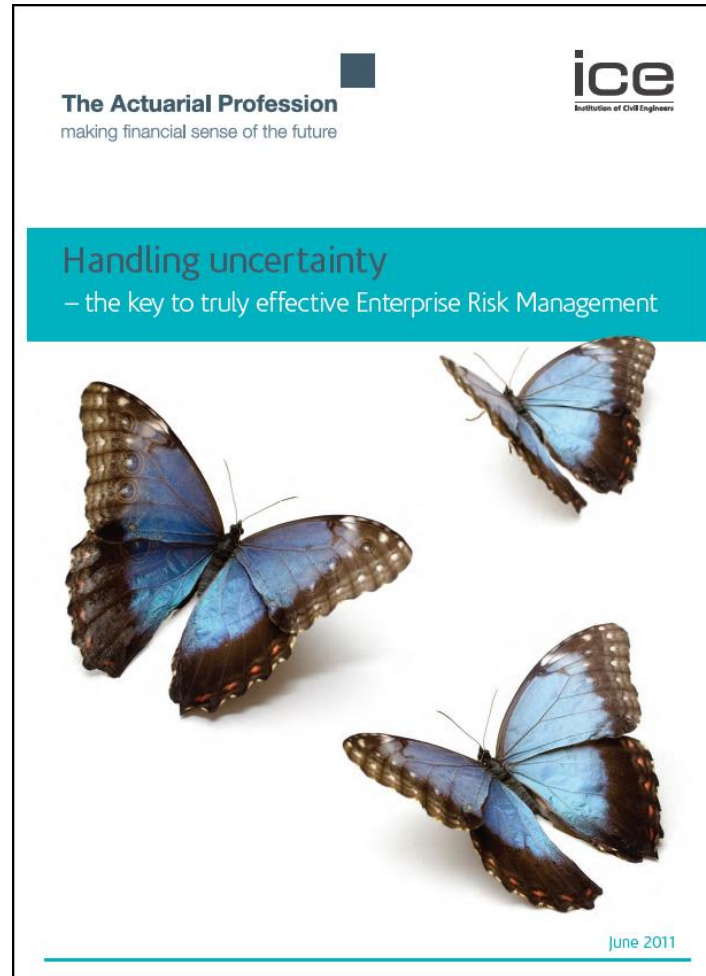
- The economy is a complex system with emergent behaviours – cannot derive macro level directly from micro
- Economics is developing rapidly – a paradigm shift
- The common thread of the newly developing economics is thinking in terms of systems i.e. holistic thinking
- There are huge opportunities to use systems thinking/new economics, to understand capitalism and the financial system



# Part 3: The Actuarial Profession and the road ahead



# Systems thinking in risk management

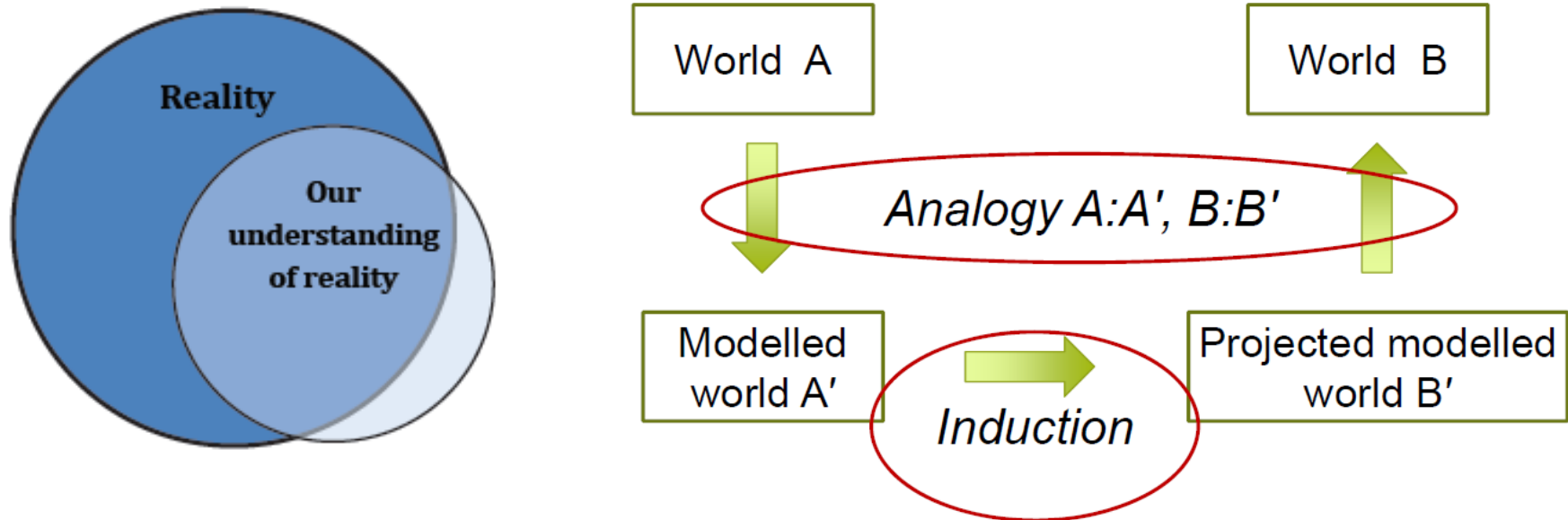


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# Actuaries consider the Philosophy of Modelling

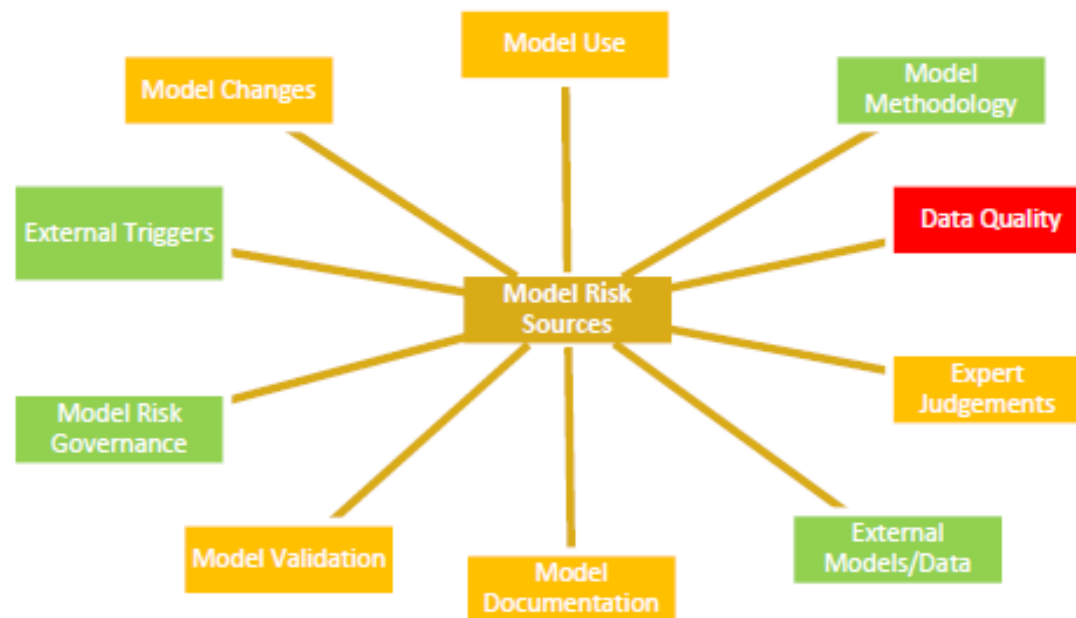
Probability range of model output is the range from the model, not the range of outcomes for the modelled system.



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# The Actuarial Profession's Model Risk Working Party



Model Risk Working Party paper was presented at a sessional meeting on 23 March 2015

- Actuaries know that where possible more than one model should be used, to mitigate model risk
- Think more “top-down” for model building



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# Research

- IFoA's Research and Thought Leadership Committee (RTLTC) is leading a much increased academic research effort
- Council has authorised a substantial budget for research in economic modelling
- Economic and Social Research Council (ESRC) recently launched a call for a Network+ to study the macroeconomy, with a £3.7m budget
- IFoA will link with the ESRC in their Network+



# Next Steps

- Systems Thinking workshop for senior actuaries from all practice areas, 30<sup>th</sup> September
- Survey of the actuarial profession's use of economic theory
- Watch out for volunteer vacancies



# Questions

# Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.



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