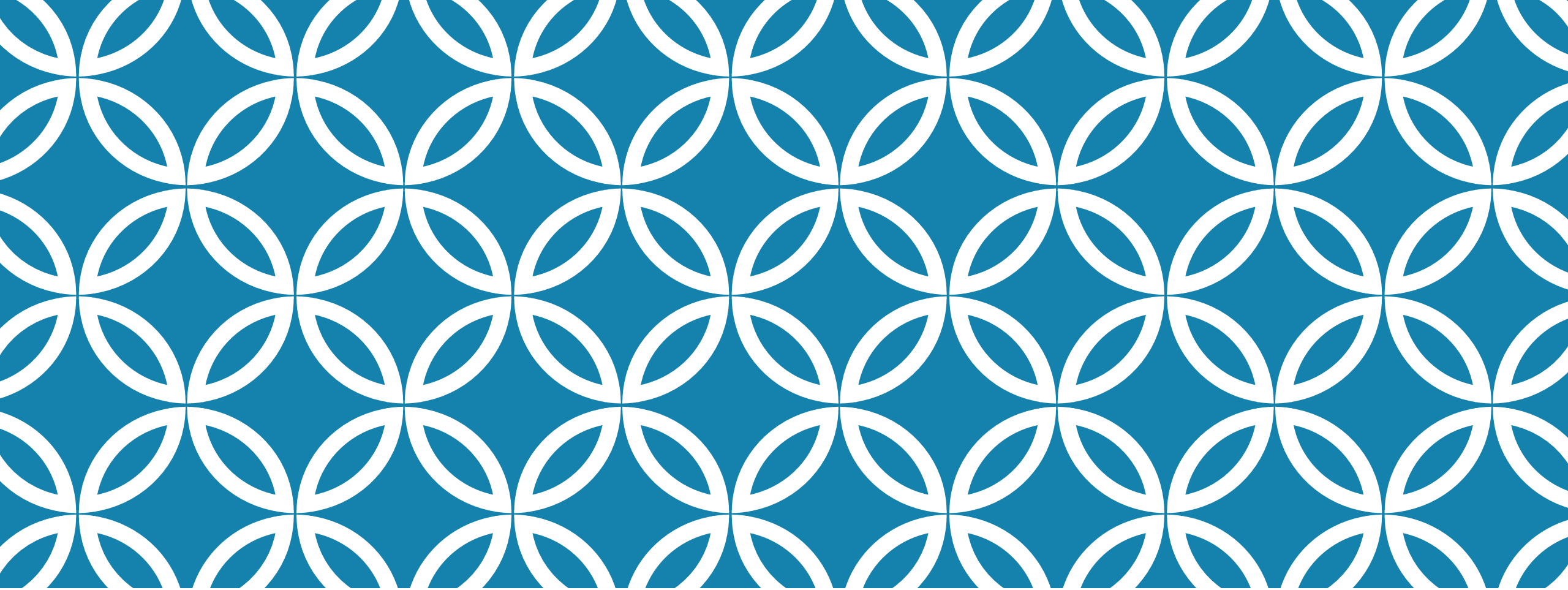
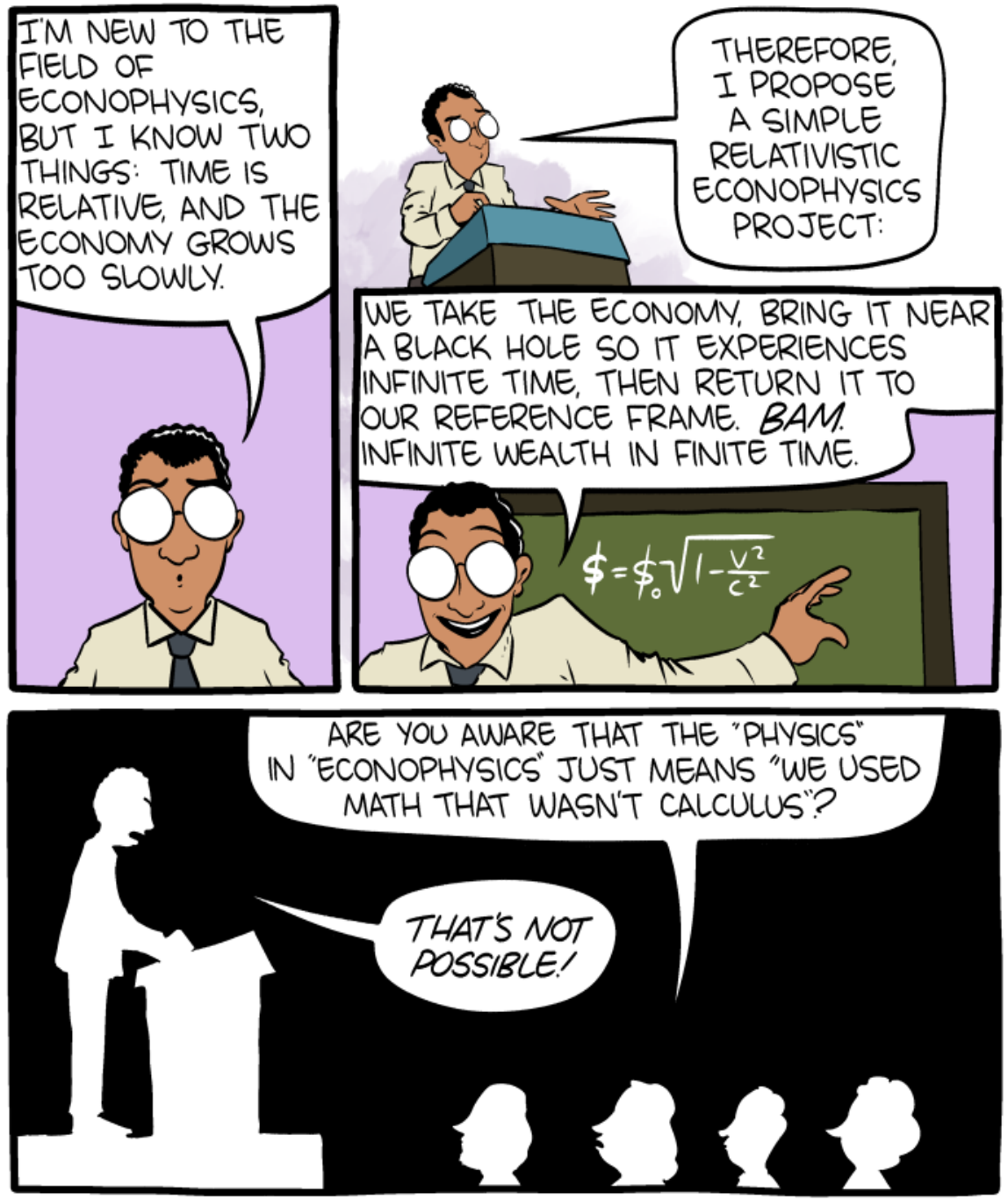


ECONOMICS, CRITICALITY AND COMPLEXITY

Paul Ormerod

C[3] International Biannual Symposium, University of Sydney, December 2017

www.paulormerod.com



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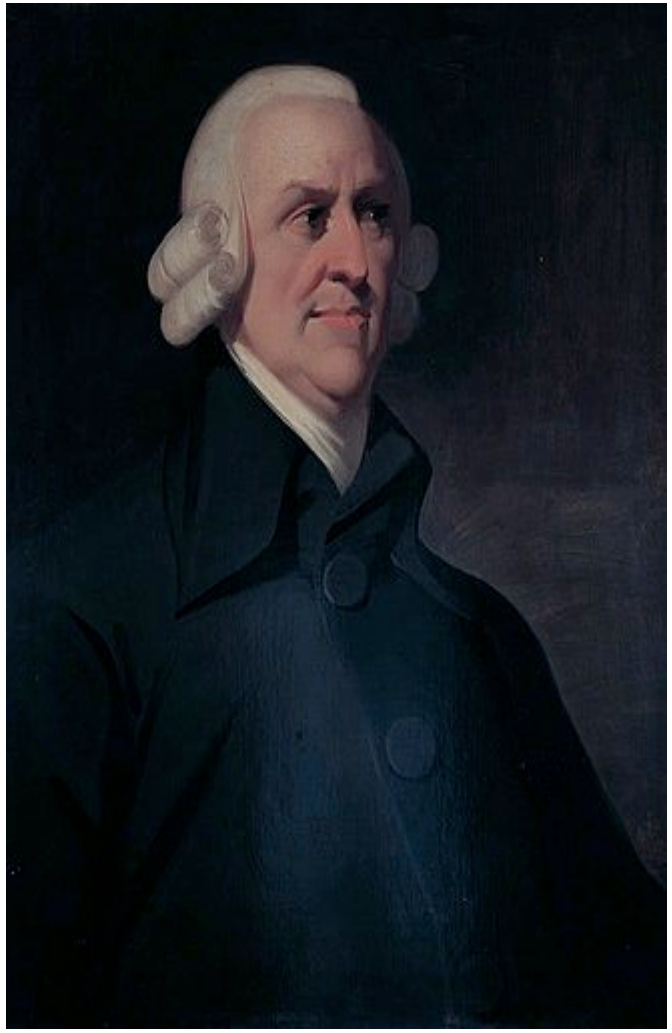
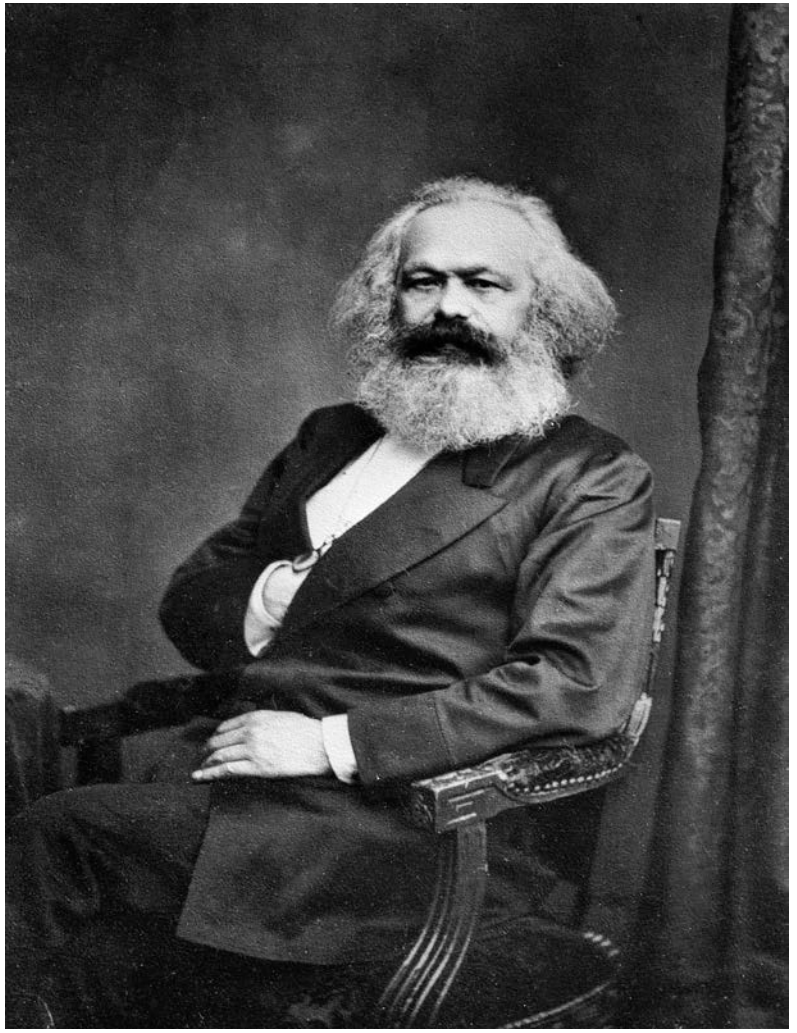
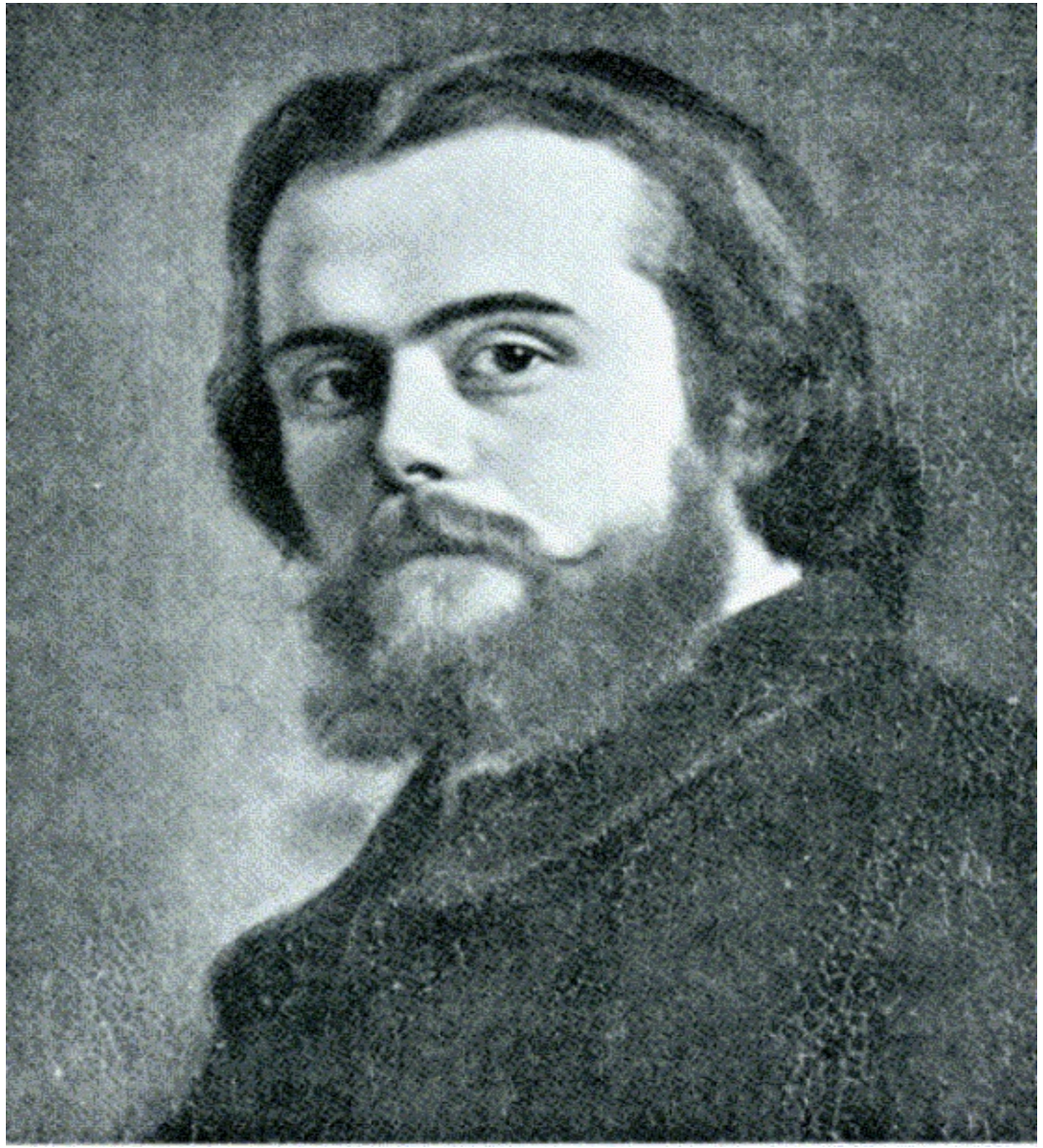
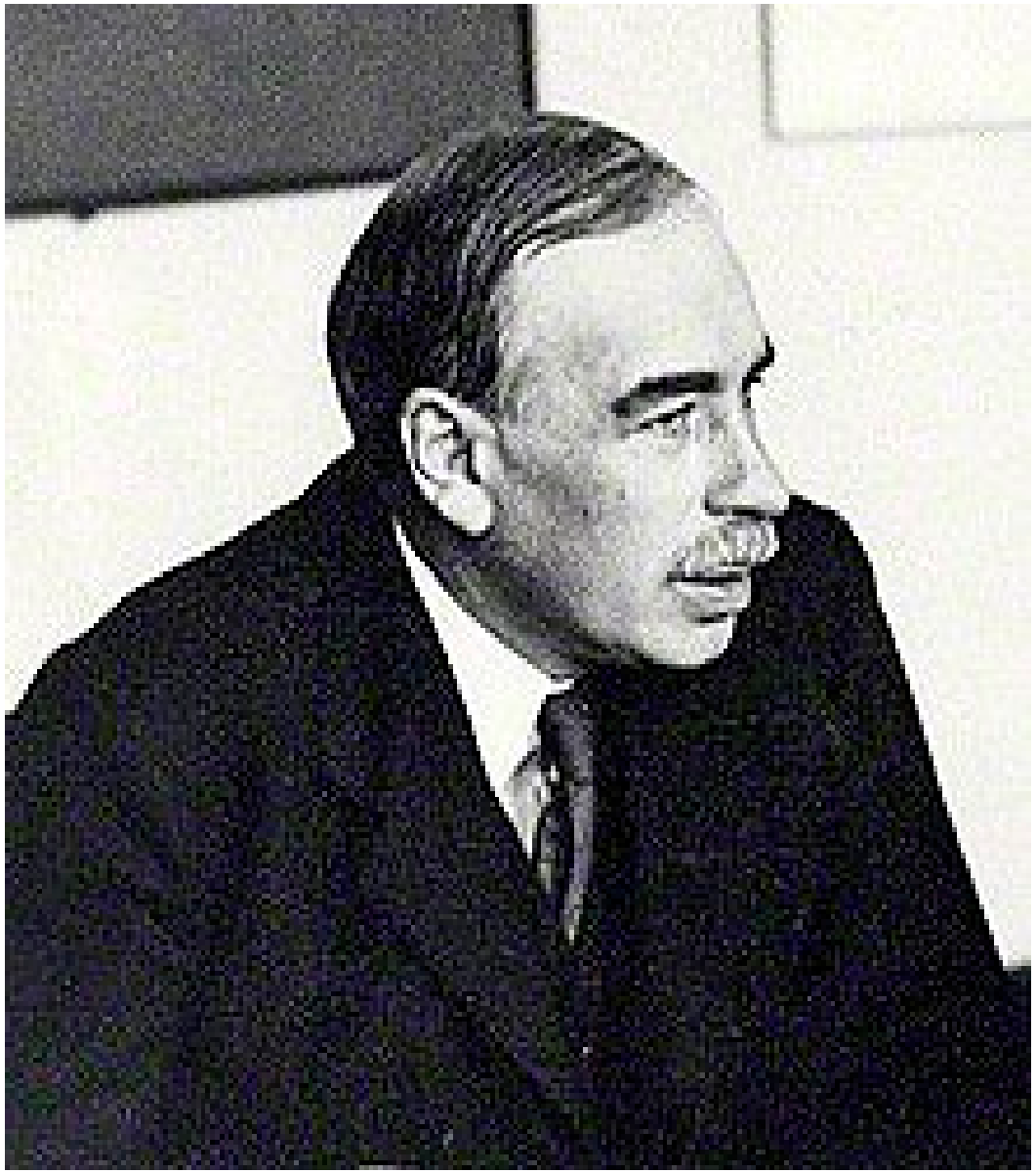








KEY FEATURES OF THE WORK OF HAYEK AND KEYNES

Emergence

Low level of predictability at a point in time

Limited cognition of individual agents

Multiple possible histories

Ormerod P. (2009) Keynes, Hayek and Complexity. In:Faggini M., Lux T. (eds) *Coping with the Complexity of Economics. New Economic Windows*. Springer, Milano

KEYNES AND PSYCHOLOGY

Booms and slumps primarily driven by psychology

“waves of irrational psychology”

Business sentiment being generated as the “outcome of mass psychology of a large number of ignorant individuals”

“the essence of the situation is to be found in the collapse of animal spirits.... It is this, indeed, which renders the slump so intractable... the collapse in animal spirits may be so complete that no practicable reduction in the rate of interest will be enough”

WHERE ARE WE NOW?

"One thing that economists do know is that the study of economics is divided into two fields, "microeconomics" and "macroeconomics". Micro is the study of individual behaviour, and macro is the study of how economies behave as a whole. That is, microeconomics concerns things that economists are specifically wrong about, while macroeconomics concerns things economists are wrong about generally."

PJ O'Rourke *Eat the Rich*

TWO AREAS OF MAJOR ADVANCE IN SCIENTIFIC KNOWLEDGE IN 21ST CENTURY

Network theory: how behaviour/ideas either spread or are contained on networks

Computer science: mapping actual networks; identifying key nodes; identifying themes being discussed

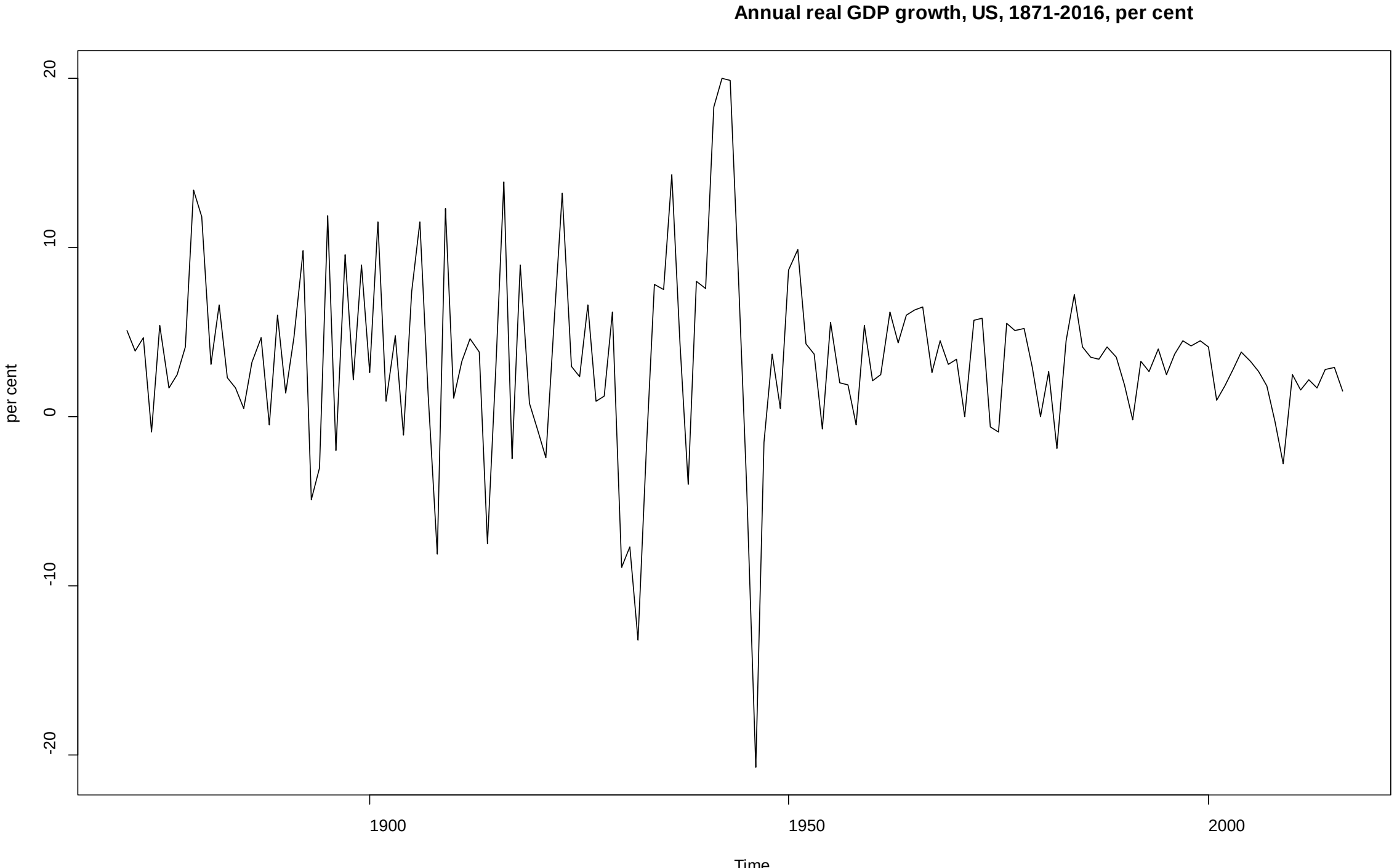
Perhaps we can now make operational Keynes's "animal spirits" and measure and control (?) the "waves of irrational psychology"

MAJOR CHALLENGES: COMING FULL CIRCLE

Business cycle

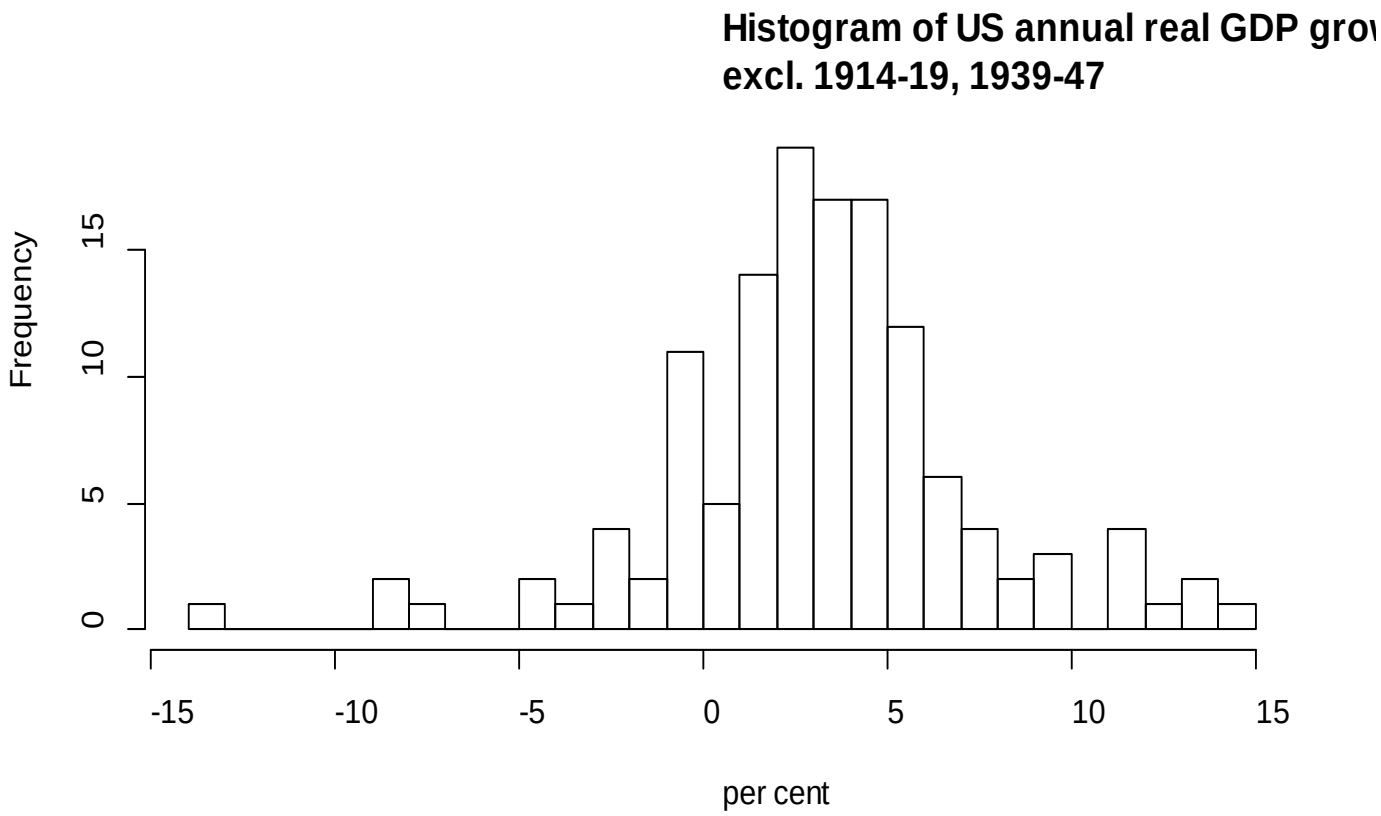
Growth

Inflation


Annual real GDP growth, US, 1871-2016, per cent
per cent
20
10
0
-10
-20
1900
1950
2000
Time

CUMULATIVE SIZE OF RECESSIONS, PER CENT FALL IN REAL GDP (EXCL 1914-19 AND 1939-47)

Min	0.01
1st quartile	0.79
Median	2.34
3rd quartile	5.18
Max	29.59


Histogram of US annual real GDP gro
excl. 1914-19, 1939-47
Frequency
0
5
10
15
-15
-10
-5
0
5
10
15
per cent

DURATION OF RECESSION, YEARS, I.E. NUMBER OF CONSECUTIVE YEARS IN WHICH REAL GDP GROWTH IS LESS THAN ZERO (EXCLUDING 1914-1919 AND 1939-47)

1 year 159

2 year 52

3 year 12

4 year 3

5 year 2

6 year 1

A SIMPLE 'ANIMAL SPIRITS' MODEL OF THE CYCLE

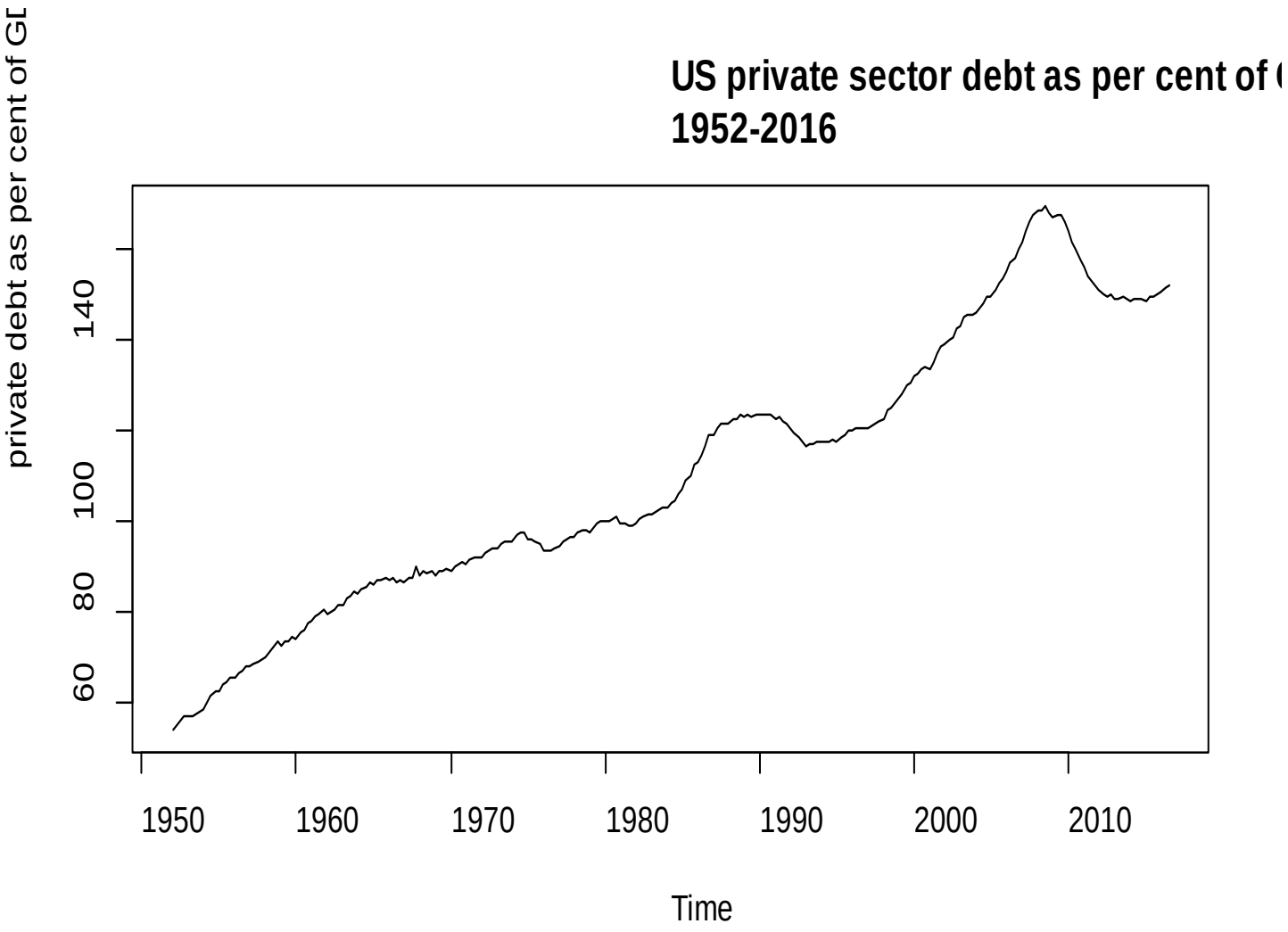
Ormerod, *Physica A*, 2002, 2004

Illustrative of what could be done by combining 'emotion' analysis and networks

The model is very simple and leaves out many things – even a monetary sector!

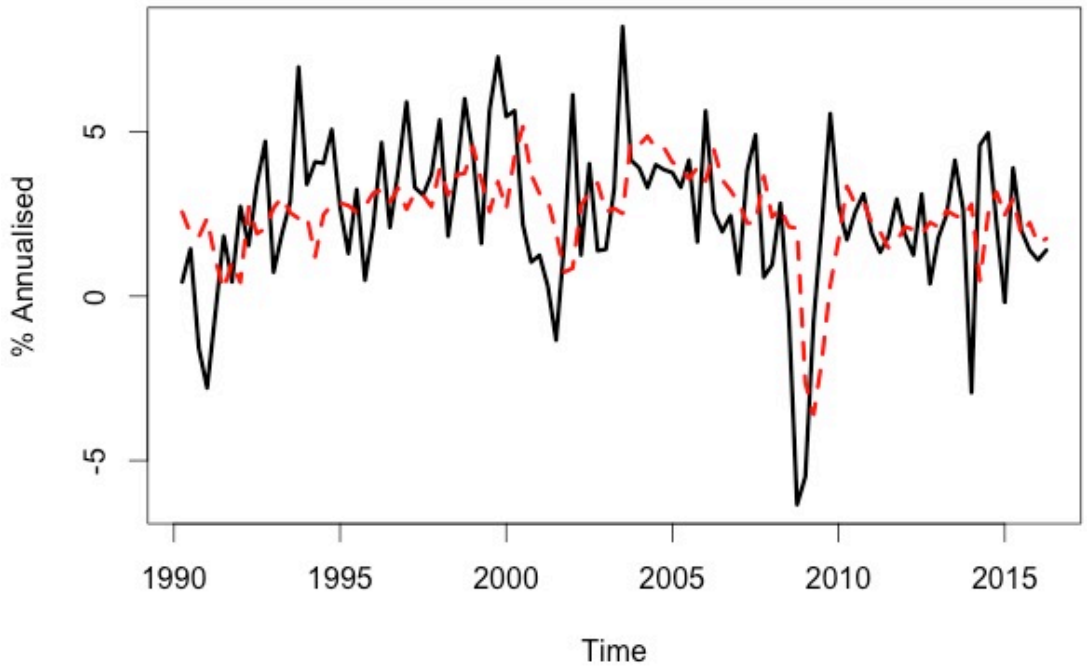
But it replicates key stylised facts about the cycle e.g.

- Structure of autocorrelation function of GDP growth
- Power spectrum of growth
- Non-Gaussian distribution of both size and duration of recessions
- Positive cross-correlations in output growth across sectors


US private sector debt as per cent of G
1952-2016
private debt as per cent of GI
60
80
100
140
1950
1960
1970
1980
1990
2000
2010
Time

ACTUAL ANNUALISED QUARTER ON QUARTER THIRD ESTIMATE US GDP GROWTH, PER CENT, AND RANDOM FOREST PREDICTIONS MADE SIX QUARTERS PREVIOUSLY, 1990Q2 – 2016Q2

NYMAN, R. AND ORMEROD, P., 2017. PREDICTING ECONOMIC RECESSIONS USING MACHINE LEARNING ALGORITHMS. *ARXIV PREPRINT ARXIV:1701.01428*.



GROWTH

Standard economics identifies innovation – the successful adoption of inventions – as the main source of growth

But it does not explain it!

Interesting work has been done on “fitness” of countries, relating this to the complexity of the products they produce

The analysis is based on the bipartite network of world trade flows

Hidalgo, C. A. & Hausmann, R. *The building blocks of economic complexity.* *Proceedings of the National Academy of Sciences* **106**, 10570–10575 (2009)

Tacchella, A., Cristelli, M., Caldarelli, G., Gabrielli, A. and Pietronero, L., 2012. A new metrics for countries' fitness and products' complexity. *Scientific reports*, *2*, p.723.

THE PHILLIPS CURVE

Blanchard, O., 2016. The United States Economy: Where to from Here? The Phillips Curve: Back to the'60s?. *The American Economic Review*, *106*(5), pp.31-34.

“The US Phillips curve is alive and well”

“The standard error of the residual in the relation is large, especially in comparison to the low level of inflation”

From the early 1990s into the 2000s, *both* inflation and unemployment fell

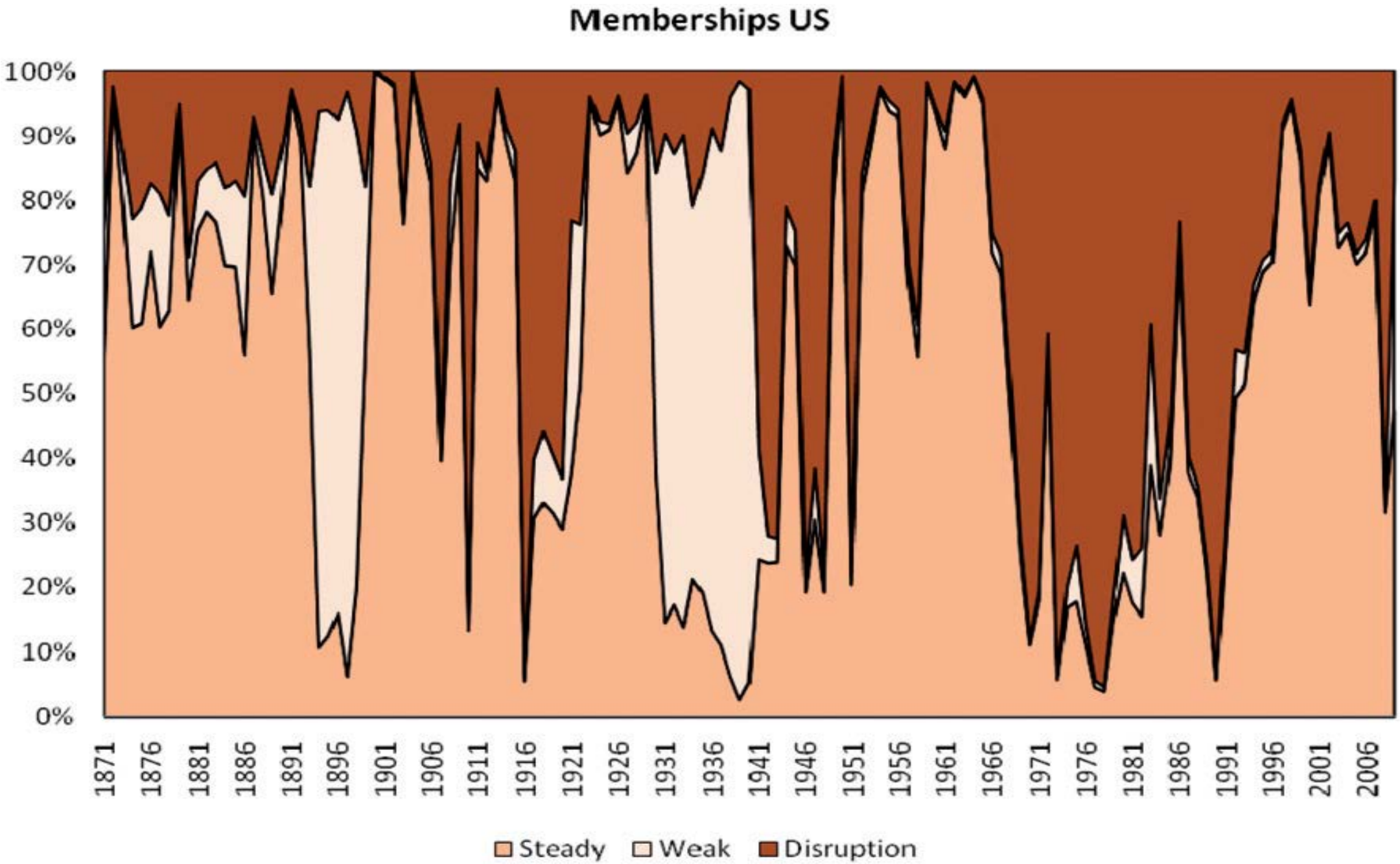
Inflation and Unemployment, UK, 1871
Inflation, per cent
20
10
0
-10
0
5
10
15
Unemployment rate, per cent

INFLATION REGIMES

Ormerod, P., Rosewell, B. and Phelps, P., 2013. Inflation/unemployment regimes and the instability of the Phillips curve. *Applied Economics*, *45*(12), pp.1519-1531

Fuzzy clustering identifies 3 regimes in the leading capitalist economies 1871-2009

Cluster	Inflation	Unemployment	Observations
Steady	0.9	5.1	85
Weak	1.7	14.2	17
Disruption	6.7	5.8	37


Memberships US
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1871
1876
1881
1886
1891
1896
1901
1906
1911
1916
1921
1926
1931
1936
1941
1946
1951
1956
1961
1966
1971
1976
1981
1986
1991
1996
2001
2006
Steady
Weak
Disruption