The Energy & Finance Systems: Mismatched Dynamics

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Main Points

• The systems we have created to provide resources, including fossil fuels, are dominated by negative loops. They are homeostatic; they act to resist or offset outside changes; always seeking some stable point.

• The systems we have created to provide financing are dominated by positive loops. They are explosive; they act to magnify outside changes; always explosively growing away from any stable point.

• Therefore present financial systems will not permit us to manage energy systems sustainably.
Three Levels; Two Loops

Financial System

Demographic System

Capital System

Physical System

Invest

Income

Food, Goods, Energy

Pollution

Fuels, Materials
Financial Stocks

Interest & Profits

Financial Capital

Rate of Return

Political & Managerial Power

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Nonrenewable Resource Stocks

- Undiscovered Resources
- Discovered Resources
- Production
- Resources in use
- Discard
- Waste

Flow Diagram:
- Discovery
- Investment in Discovery
- Cost of Discovery
- Cost of Resource
- Environmental Costs
Typical Behavior of Negative and Positive Feedback Loops

Positive Loop

Exogenous push away from equilibrium

Negative Loop
Exponential Growth in US Debt

9/2012
$16 Trillion
History of Target2 Balances

Billion €

1/10
6/12

Legend:
- Germany
- Luxembourg
- Netherlands
- Finland
- France
- Belgium
- Austria
- Portugal
- Ireland
- Greece
- Italy
- Spain
Fraction of Foreign Currency Transactions for Trade

- Year: 1975 to 201
- Percent: 70% to 3%
Average Length of Time a Stock Investment is Held

- 1975: 7 years
- 2000: 7 minutes
- 2010: 0 years
The Growing Gap between Production and Discovery of Regular Conventional Oil (1930-2050)

World Discoveries Peaked in 1965

Production has Exceeded Discoveries since 1984

Past discoveries have been backdated with revisions to reflect “Reserve Growth”

(data from Campbell, personal communication, October, 2009)
Global Trends in Energy
Return on Investment

![Graph showing trends in Energy Return on Investment (EROI) from 1990 to 2030. The graph indicates a declining trend from approximately 50 in 1990 to 10 in 2030.](image-url)
The Financial System Hinders Sustainability in Five Ways

• It amplifies oscillations
• It reduces the time period of interest
• It forces promotes indefinite growth
• It increases the gap between rich and poor
• It devalues social capital

This list is adapted from *Money and Sustainability*, Bernard Lieter, et. al., Chapter V, pp 93-118.