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# IDENTIFYING STABILITY OR INSTABILITY IN ECONOMIC SYSTEMS: CIRCULAR AND LINEAR ANALYSES OF FINANCIAL CRISES

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**Abstract.** The financial crisis of 2008 has led to much discussion of what needs to be done to prevent a recurrence. Most attention has focused on federal regulations and new institutions. This paper argues that circular causal models in addition to linear causal models are also required. Linear causal models can be tested using statistics. Circular causal models can be more holistic and reveal stability or instability in a complex system. This article describes how the financial crisis has been described in journalistic accounts versus how academic articles describe financial crises. It ends with a suggestion for a way to monitor financial systems.

**Keywords:** linear causality, circular causality, stability, instability, financial crises.

## HOW THE FINANCIAL CRISIS HAPPENED

Credit cycles occur frequently. They are a normal part of business activity. See Figure 1. As economic activity increases, employment, consumer spending and demand for houses increase. Rising home values mean more collateral, which can be used to borrow and to increase spending. This cycle continues until debt service (loan repayment) becomes too large. People then cut back on their spending. Unemployment increases. If home values drop, lending declines.

In Figure 1 a positive sign on an arrow means a direct relationship: if variable A increases, variable B also increases; or if variable A decreases, variable B also decreases. A negative sign on an arrow means an inverse relationship: if variable A increases, variable B decreases; or if variable A decreases, variable B increases. The sign on a loop is found by multiplying the signs on the arrows that compose it as if they were plus or minus ones. A positive loop indicates increasing deviation from an initial state, hence growth or decay. A negative loop indicates control or return to an initial state. In Figure 1 the two positive loops generate growth until the negative loop reverses the trend. The result is a boom and bust cycle. Many negative loops indicate a system that is very stable, for example an ecosystem.

Many positive feedback loops indicate a system that is “out of control.”

In 2008 the world experienced the end of a super credit cycle (Tett, 2009). See Figure 2. This happened because the usual brakes on lending were removed. Loop 1 is a negative feedback loop, meaning it operates to produce stability. As lending increases, banks encounter reserve requirements (amount loaned compared with amount of reserves) and reduce their lending. However, the repeal in 1999 of some provisions of the Glass-Steagall Act of 1933 allowed investment banks to make home loans as well as banks and savings and loan companies. As loop 2 shows, by selling mortgages to third parties investment banks were able to increase the amount of money they could loan out. Since banks make money on the spread between the interest they pay to depositors and the interest they receive on loans, the more money they loaned out, the more income in the form of interest they earned. Also, the increased lending provided increased commissions for both the institutions creating the mortgages (Figure 3) and the institutions reselling the mortgages (loop 5 in Figure 4). Spreading the risk to third parties was thought to make the financial system more resilient (loop 4 in Figure 4). The reselling of mortgages was increased further by securitizing loans or packaging them into tranches and Collateralized Debt Obligations (CDOs).

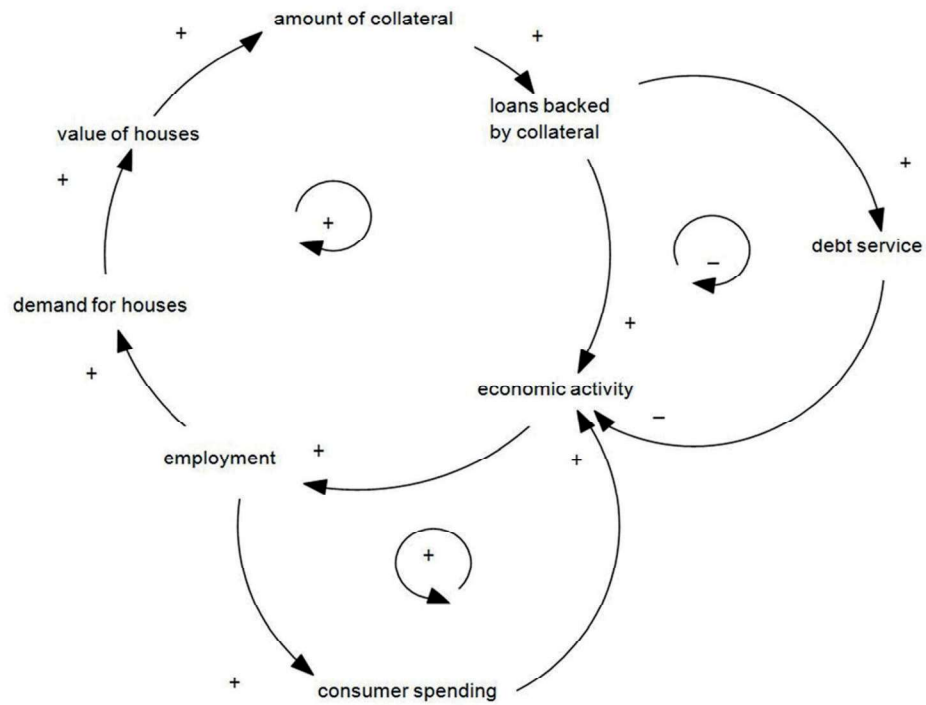


Fig. 1 The Usual Credit Cycle

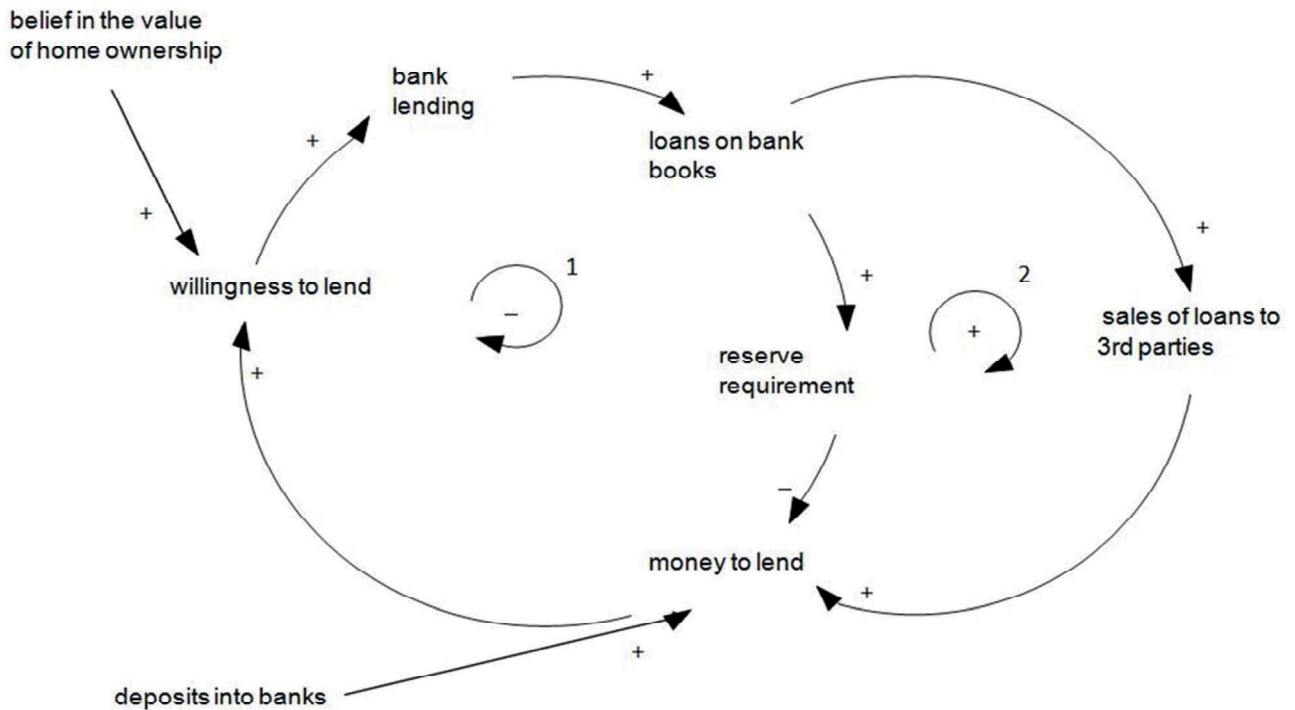


Fig. 2 Reserve Requirement and Selling Loans to Third Parties

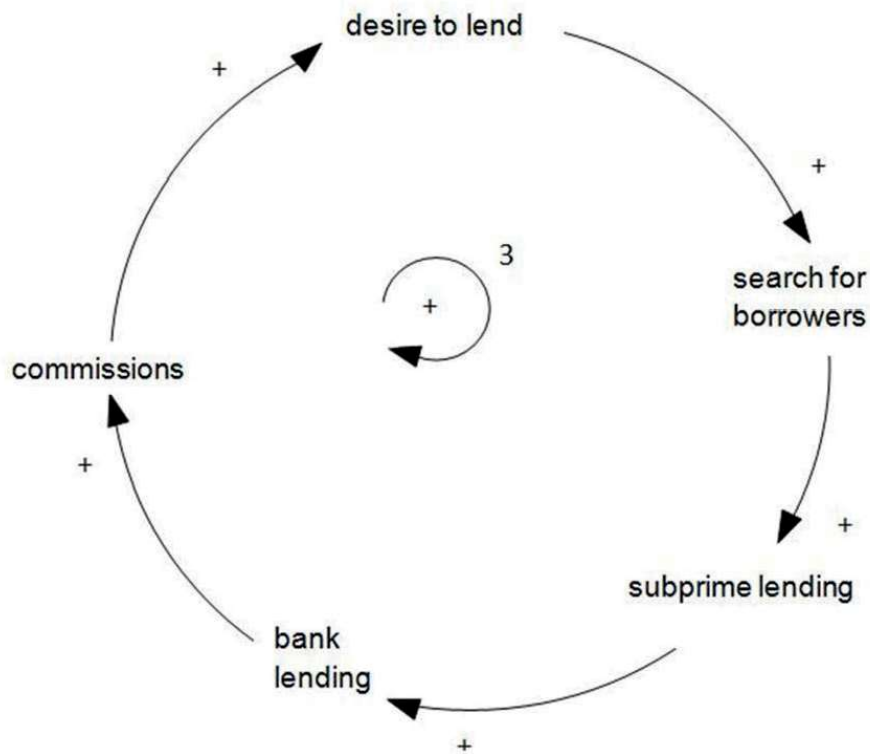


Fig. 3 Desire for Commissions Drives Subprime Lending

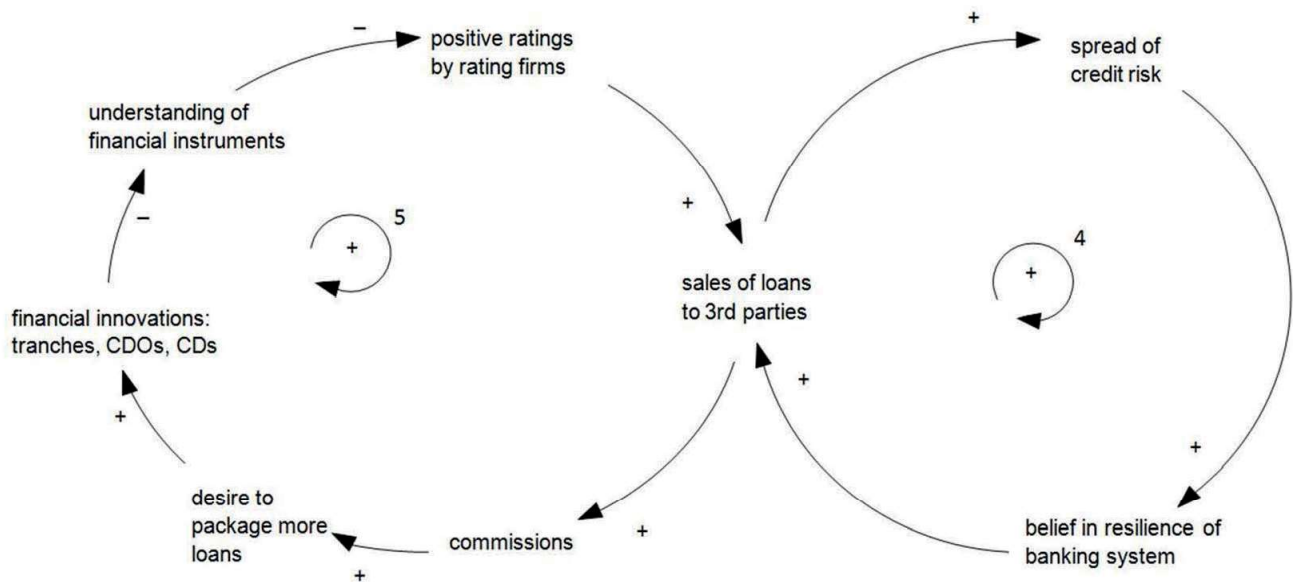


Fig. 4 Financial Innovations and Reduced Understanding of Financial Instruments

These new financial instruments were not thoroughly understood either by the executives in the institutions creating them or by the rating agencies that should have been evaluating their safety. The large number of positive loops drove the super credit cycle. (Tett, 2009) Hence, the repeal of a key provision of the Glass-Steagall Act -- the separation of commercial banks and investment banks -- changed a stable system with many negative loops into an unstable system with mostly positive loops. A negative feedback control loop (loop 3 in Figure 5), to establish national or international reserve requirements, is one way to control such cycles.

There was also an international dimension to the financial crisis. Americans had been buying oil from the Middle East and manufactured goods from China. With the money they earned from exports these producing countries bought U.S. treasury bills as an investment. The demand for treasury bills was so high the U.S. government could sell them while paying very little interest. Eventually, people began to look for higher yielding investments. They found Collateralized Debt Obligations (CDOs), which were packages of home mortgages. The purchase of CDOs gave money back to the banks who could then loan it out for home purchases and consumer spending.

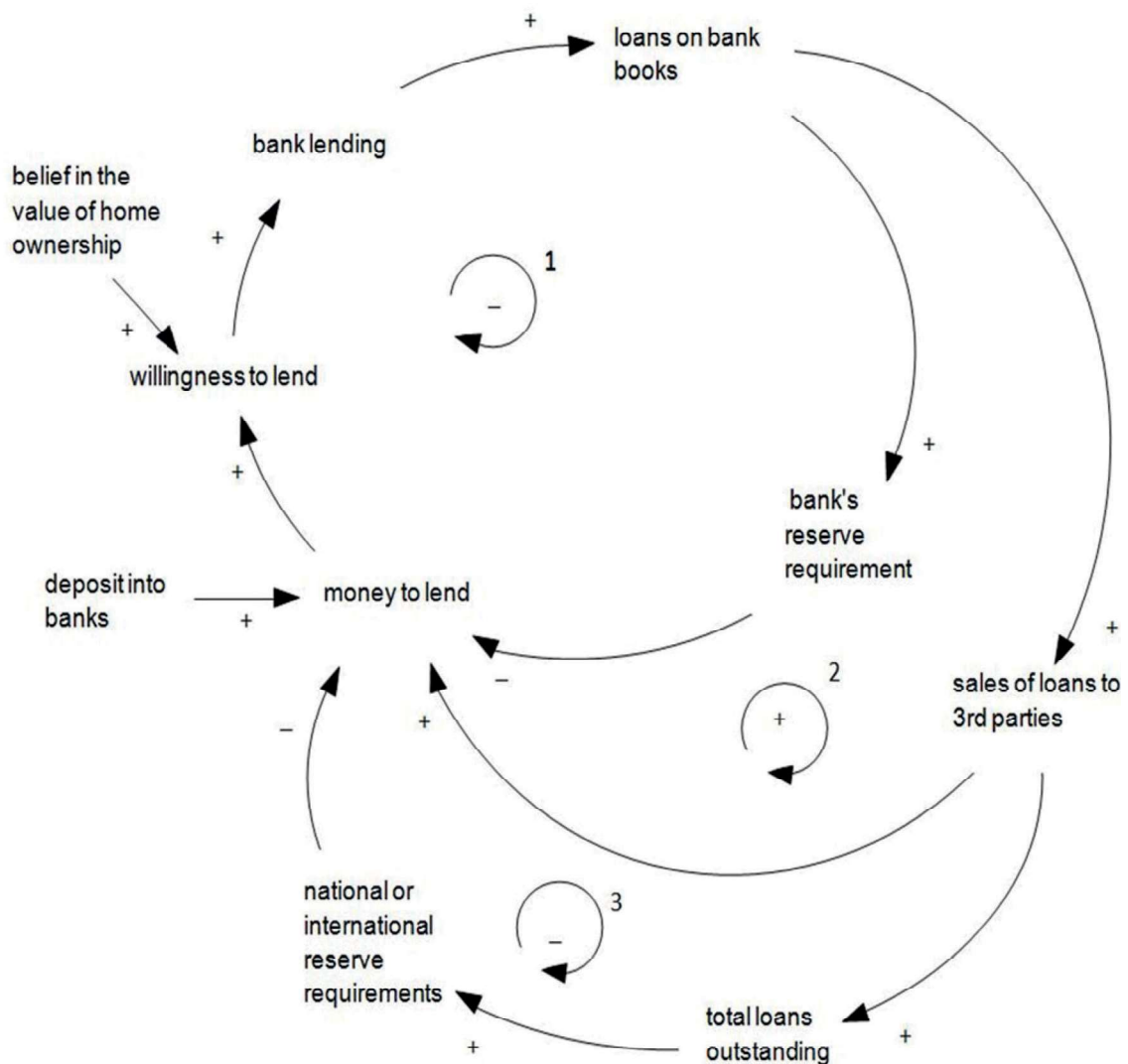


Fig. 5 An International Reserve Requirement

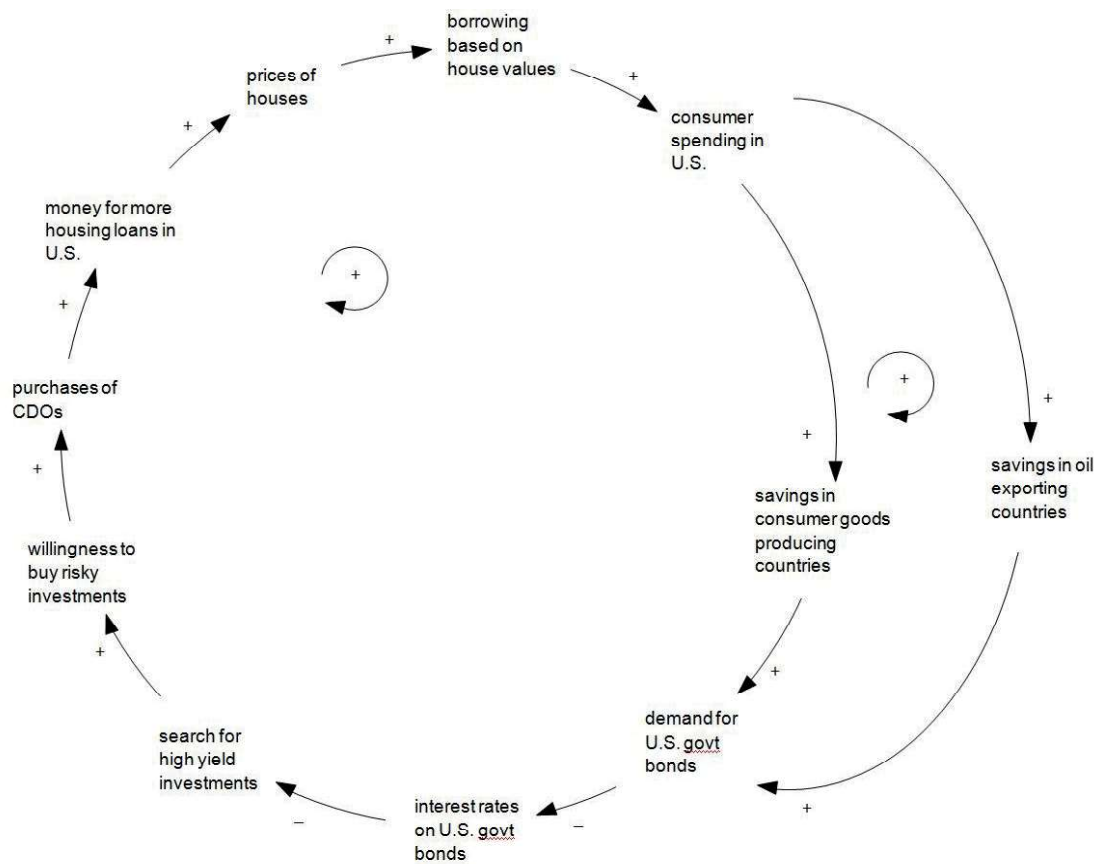


Fig. 6 The International Aspects of the Super Credit Cycle

## HOW COULD PEOPLE HAVE BEEN SO MISTAKEN?

Several factors contributed to creating the super-bubble. The banking reforms of the 1930s had been steadily weakened over time, including repeal of key provisions in the Glass-Steagall Act in 1999. Wall Street firms spent \$300 million on lobbying in the 1990s in order to change the laws. (Frontline, 2003) The Federal Reserve had several times acted to bail out businesses judged to be “too big to fail.” Competition rewarded in the short term companies that took big risks.

Why did banks not see, or act on, the danger? Banks compete for investors. Banks with high earnings attract more investors. Prudent banks have lower returns during a period of expansion and hence attract fewer investors. And banks were using leverage to increase returns. Some key decision-makers misjudged the motives of economic actors. For example, Alan Greenspan,

former head of the Federal Reserve, said, “I made a mistake in presuming that the self-interests of organizations, specifically banks and others, were such that they were best capable of protecting their own shareholders and their equity in the firms.” Also, the effect of globalization on risk was not correctly perceived. As Nassim Taleb, author of *The Black Swan*, has written, “Globalization creates interlocking fragility. The growth of giant banks gives the appearance of stability, but it raises the risk of systemic collapse. When one fails, they all fail.”

There were many amplifying factors. Higher returns on leveraged positions encouraged more leverage. Commissions from writing subprime mortgages and from selling them to third parties led to a desire for more commissions. Fraudulent borrowing was permitted, even encouraged. Managers failed to enforce prudent procedures. The new financial instruments were complex and opaque. There was lax regulation due to a

strong belief in “market fundamentalism.” Monetary policy was excessively loose. In 2009 the front pages of newspapers were filled with talk of boom and bust cycles. But when asked if a new theory were needed, economists replied, “No, just less ‘ideology’.”

## HOW ECONOMISTS THINK ABOUT FINANCIAL CRISES

A review of academic articles on financial crises in 2010 found that they used primarily linear thinking. Some articles treated a financial crisis as an independent variable, some as a dependent variable. (Umpleby and Ristovska, 2010) Below are brief descriptions of several articles.

1. The Consequences of Banking Crises. Banking crises lead to a decline in output (for a long period of time), to a decline in the stock market, and to a decline in the currency (about 30%). (Boyd, Kwak, and Smith, 2005)

2. Financial Structure and Financial Fragility. Securities markets have lower costs, but banks have better information. Small changes in the cost advantage of the securities market or the risk structure of loans can lead to sudden changes in interest rates, asset prices, and market structure. (Van Order, 2006)

3. Bank Bailouts or Bank Closures. In response to banking crises governments have chosen policies that vary between rescuing insolvent banks (bailout) and enforcing bank closures. Political factors influence these decisions. (Rosas, 2006)

4. The Role of Institutions in Achieving Financial Liberalization. In emerging economies banking crises illuminate the role played by institutions in financial liberalization. Institutions help to solve financial instability and enforce the market process. (Allegret, Courbis, and Dulbecco, 2003)

5. Containing Contagious Financial Crises. A financial crisis can spread contagiously. A crisis can be contained through intervention. International organizations play an important role in achieving collective action to contain the spread. (Hausken and Plumper, 2002)

6. How Firms Cope with Financial Crises in Emerging Markets. Firms have taken steps to protect themselves against financial crises and to deal with crises once underway. The strategies are divided into immediate responses to a crisis, intermediate steps during the period of downturn, and long-term continuing responses. (Mudd, Grosse, and Mathis, 2002)

7. Monetary Policy’s Effects During Financial Crises. Goodhart, Mahadeva and Spicer (2003) look at the effect of monetary policy changes on asset prices in the foreign exchange and equity markets of Brazil and Korea. They address the question, does monetary policy tightening have an adverse effect on asset markets?

8. Early Warning for Financial Crises. Edison’s goal (2003) is to develop an early warning system that can detect financial crises. The system monitors several indicators that exhibit unusual behavior in the period preceding a crisis.

The articles by economists discuss a variety of important issues related to financial crises. Academic studies tend to look for quantifiable relationships that can be tested with statistics. The diagrams include motivational and institutional factors. They also depict sequences of events that occurred during the crisis. The causal loop diagrams provide a more holistic description of what happens in a financial crisis. The great advantage of circular causal accounts is that they reveal whether a system is stable or unstable. If the system is unstable, interventions can be designed to make it stable by converting positive feedback loops to negative feedback loops.

Circular causal processes are essential to any regulatory process – controlling the temperature in a room, operating an automatic assembly line, driving a car, or managing a large organization. Circular causality can be modeled with causal influence diagrams and system dynamics computer models. Often a psychological variable is involved, e.g., “perception of,” or “desire for.” Circular causal diagrams suggest the reasoning by actors within an economic system, not just the results at the end of a large event (Soros, 1987, 2009).

To know whether a system is stable or unstable, count the number of positive and negative feedback loops. If there are only negative loops, the system is stable. If there are only positive loops, the system is unstable. If there is a combination of positive and negative loops, the system is capable of periods of growth and periods of stability. Fluctuations are to be expected.

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