

**The 2008 Financial Crisis:
How Social Scientists Need to Change Their Thinking**

Stuart A. Umpleby

Department of Management
The George Washington University
Washington, DC 20052 USA
Umpleby@gwu.edu

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ABSTRACT

The presentation considers four underlying models in science – linear causality, circular causality, self-organization, and reflexivity. Much of the academic literature on financial crises relies on linear causal models that obscure ‘bubble’ phenomena. Circular causal diagrams, on the other hand, readily account for how financial innovations, which were initially thought to decrease risk, actually increased risk. Traditional science rejects circular causality, however, because it violates the fallacy of circular reasoning. Reflexivity violates two additional fallacies: a fallacy of emotion (ad hominem statements), and a fallacy of language (descriptions operating on two levels). Rather than reject such models, economists and other social scientists could change their thinking in three ways. First, accept the uncertainties that arise when one constructs arguments that violate the informal fallacies. Second, expand the philosophy of science by including the observer within the domain of science. Third, adopt a model of economic systems in which the observer is also a participant and participants are also observers. These changes go well beyond behavioral economics. Reflexivity in social systems is quite compatible with recent developments in cybernetics and with an expanded view of the philosophy of science.

Keywords: Reflexivity, circular causality, self-organization, philosophy of science

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INTRODUCTION

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. I shall argue that a change in economic theory and a change in the philosophy of science are also required. First I shall describe how the financial crisis has been described in journalistic accounts. Second, I shall point to several articles in academic journals that describe financial crises. Third, I shall describe four models underlying current research. Finally, I shall describe how I believe social scientists need to change their thinking.

HOW THE FINANCIAL CRISIS HAPPENED

Credit cycles occur at rather 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 as if they were plus or minus ones. A

positive loop indicates increasing deviation from an initial state. A negative loop indicates control or return toward an initial state. A positive feedback loop can rise or fall. 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. 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 of loans 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 loans. As loop 2 shows, by selling mortgages to third parties investment banks were able to increase the amount of money they could loan out. Banks make money on the spread between the interest they pay to depositors and the interest they receive on loans. So, the more money they loan out, the more income in the form of interest they earn. Also, the increased lending provided increased commissions both for the institutions creating the mortgages (loop 3 in 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). 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. Loops 2, 3, 4, and 5 are all positive. These loops drove the super credit cycle. (Tett, 2009) A negative feedback control loop (loop 6 in Figure 5), which establishes national or international reserve requirements, is one way to control such cycles in the future. However, such a system has not yet been implemented.

There was 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 low interest. Over time people began to look for higher yielding investments. They found such investments in the 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. See Figure 6.

AN UNLIKELY EVENT

The stock market decline in 2008 was not anticipated by the major banks. Indeed Goldman's CFO David Viniar stated, "We were seeing things that were 25-standard deviation moves, several days in a row." (Bonner, 2007; Dowd, *et al.*, 2008) To understand what 25 standard deviations, or 25 sigma, means it is helpful to recall a normal curve. One standard deviation on either side of the mean encompasses 68% of the data. Two standard deviations encompass 95%. Three standard deviations encompass 99% of the data. Six sigma, a standard used in quality improvement means

less than 3.4 defects per million. Just how unlikely a 25-sigma event was, can be understood by comparing it to the probability of winning the lottery 21 or 22 times in a row. (Dowd, *et al.*, 2008)

Such a result is extremely unusual in the social sciences. Most doctoral students are very pleased with a result at the two sigma level, or 95 percent. To have a theory, expressed in a model, be rejected at the level of 25 sigma is unprecedented. Clearly the model, and probably the theory on which it was based, are in error.

Not only was the stock market crash of 2008 unanticipated by most professional economists, it led to large losses. The Bank of England says losses arising from banks' having to mark their investments down to market prices stand at \$3,000 billion, equivalent to about a year's worth of British economic production. The Asian Development Bank has estimated that financial assets worldwide may have fallen by more than \$50,000 billion – a figure about as large as annual global output.

HOW COULD PEOPLE HAVE BEEN SO MISTAKEN?

Several factors contributed to creating the superbubble. 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 “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 very high 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 belief in “market fundamentalism.” Monetary policy was excessively loose.

The causal loop diagrams in Figures 1-6 are based on articles by journalists. 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

Academic articles by economists use primarily linear thinking. A computer search of articles on financial crises produced many articles, all using linear thinking. Below are brief abstracts and then diagrams of the relationships that the articles report on.

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)

Banking crisis	>>>	decline in output
	>>>	decline in stock market
	>>>	decline in currency

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)

Small changes in costs of securities or risks of loans	>>>	sudden changes in interest rates, asset prices, market structure
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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. What political factors influence these decisions? (Rosas, 2006)

Political factors	>>>	policy to bail out banks or to force closure
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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)

Institutions >>> solve financial crises
>>> enforce market processes

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)

International organizations
bring about collective action which
contains financial contagion

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 short term, immediate responses to a crisis, intermediate steps during the period of downturn, and long-term continuing responses. (Mudd, Grosse, and Mathis, 2002)

Actions by firms >>> short term steps
to deal with >>> intermediate steps
financial crises >>> long term responses

7. Early Warning for Financial Crises

The goal is to develop an early warning system that can detect financial crises. The system monitors several indicators that exhibit unusual behavior in the periods preceding a crisis. (Edison, 2003)

Monitor several >>> early warning of
indicators financial crisis

8. Monetary Policy's Effects During Financial Crises

This paper looks at the effect of monetary policy changes on asset prices in the foreign exchange and equity markets of Brazil and Korea. Does monetary policy tightening have an adverse effect on asset markets? (Goodhart, Mahadeva, and Spicer, 2003)

Monetary policies during >>> asset prices
financial crises

FOUR MODELS USED BY SCIENTISTS

Comparing the diagrams above to the causal loop diagrams depicting journalistic accounts of the financial crisis suggests that the way social scientists are trying to construct knowledge of social systems is impairing their ability to perceive the larger picture. So, we can ask, why do economists use linear models? One answer to the question is to claim that there are four models currently used by academics -- linear causality, circular causality, self-organization, and reflexivity.

1. Linear Causality

Linear causality is the way most dissertations are written. Many statistical techniques are available, such as regression analysis. Hypotheses can be falsified. Propositions can be evaluated with a level of statistical significance. The objective is to create descriptions which correspond to observations.

2. Circular Causality

Circular causal thinking is 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. Usually a psychological variable is involved, e.g., “perception of,” or “desire for.”

3. Self-organization

Self-organization is the theory underlying a method of computer simulation. The method includes cellular automata and genetic algorithms. The game of life was an early computer illustration. Self-organization is a very general concept. It encompasses competition among species or corporations, and also conjectures and refutations in philosophy. The two key processes within a self-organizing system are the creation of new elements and the selection of appropriate elements. Self-organization explains emergence.

4. Reflexivity

Reflexivity requires operations on two levels – observation and participation. It involves self-reference, hence leads to paradox, hence inconsistency. Reflexivity violates three informal fallacies – circular arguments, the ad hominem fallacy, and the fallacy of accent.

WHICH MODELS ARE ACCEPTABLE?

The informal fallacies are used to classify errors in reasoning. The informal fallacies can be divided into three groups. (Engel, 1980)

1. Fallacies of presumption are concerned with errors in thought, e.g., circular reasoning.
2. Fallacies of relevance raise emotional considerations. An example is the ad hominem fallacy, when attention is paid to the observer in addition to the observation.

3. Fallacies of ambiguity involve problems with language. An example is the fallacy of accent in which two levels of analysis are used, such as observation and participation.

Which of the four models described above are accepted within the scientific community?

1. Linear causality is the dominant conception of science. It is the way to do science which is recommended to doctoral students.

2. Circular causality has become accepted in some fields, such as electrical engineering or control engineering, simply because it is necessary. More broadly, circular causality is suspect, because it involves circular reasoning.

3. Self-organization is what Stephen Wolfram (2002) calls a “new kind of science.” It violates no informal fallacies and has led to new computer tools and new approaches to science. Self-organization is the theoretical idea underlying the field of complex systems.

4. Reflexivity is the newest of the four models. It is very similar to the idea of second order cybernetics. (Von Foerster, 2003) Reflexivity violates three informal fallacies. So, it is highly suspect. It is not unusual for people trained in the physical sciences to stand up and walk out of a room when someone begins to explain the idea of reflexivity. Reflexivity is VERY different from the classical conception of science. However, a case can be made that reflexivity is essential for understanding social systems.

It is important to remember that the informal fallacies are just “rules of thumb.” If violating the informal fallacies is necessary in order to describe social systems, then a decision is required. Should traditions concerning the *form of arguments* limit the *scope of science*? Or, should the subject matter of science be guided by curiosity and the desire

to construct explanations of phenomena? Cyberneticians have chosen to study certain phenomena, even if they need to use unconventional ideas and methods.

CONCLUSION

The financial crisis provides ample evidence that a change is needed in our thinking about social systems. But most economists say that no change in theory is needed. Where are they stuck? What is blocking them? This author's view is that three changes are needed in economics.

1. Economists, and other social scientists, need to accept the uncertainty that accompanies violating the informal fallacies.
2. Social scientists need to expand the philosophy of science by including the observer in the domain of science.
3. Economists need a model of economic systems which allows participants to be observers and observers to be participants. This is a large step beyond behavioral economics.

Equilibrium theory in economics, based by analogy on thermodynamics in physics, was based on the assumption that people in social systems are rational, profit maximizing, and equally informed. Recent work in behavioral economics has modified these assumptions. However, despite recent improvements in theories, most economists were still surprised by the crash of 2008. In the reflexive model of social systems, people are both observers and participants. Reflexivity theory is more realistic than equilibrium theory, even though it presents some logical difficulties which must be coped with. Based on the reactions to reflexivity so far, it appears that an expanded philosophy of

science will need to be accepted before reflexivity theory itself can be accepted within the social sciences. This expanded view of science, where the observer is included within the domain of observations, is what is meant by Science Two.

George Soros, investor and philanthropist, has been developing reflexivity theory for over twenty years. (Soros, 1987; Soros, 2009) He has said for many years that unregulated financial markets are unstable. People are now beginning to pay attention to his ideas.

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FIGURE 1
The Usual Credit Cycle

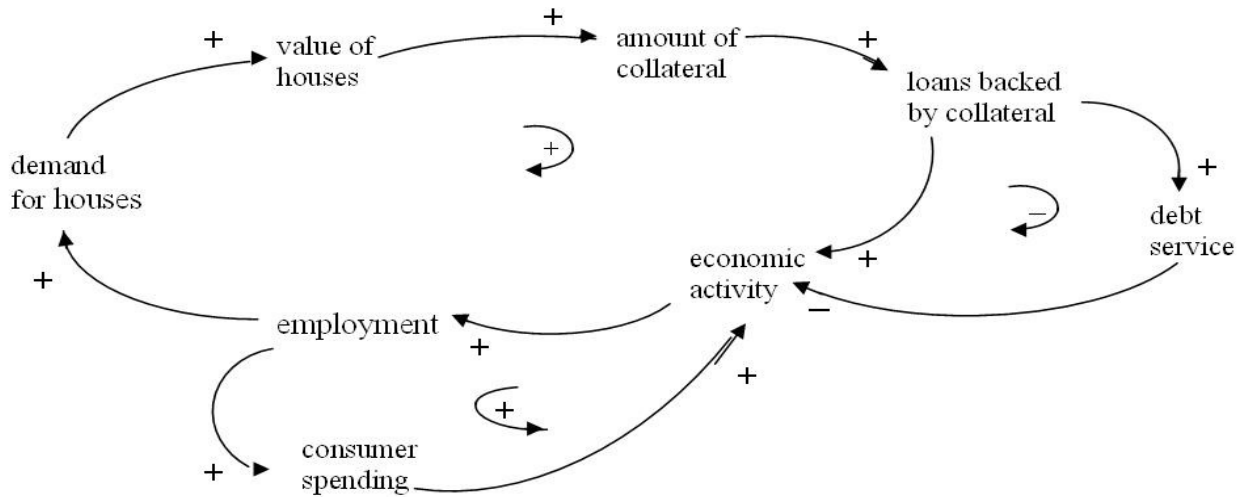


FIGURE 2
Reserve Requirement and Selling Loans to Third Parties

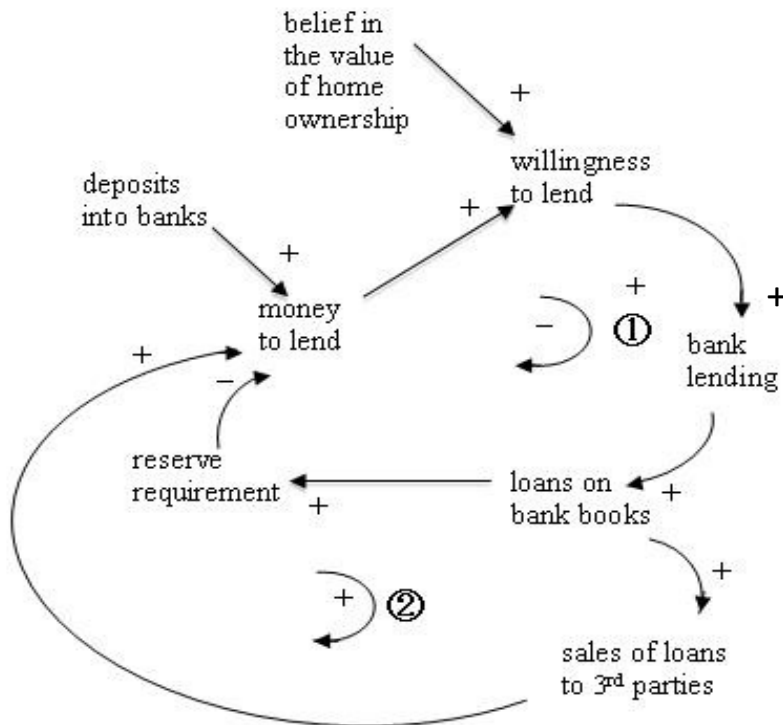


FIGURE 3
Desire for Commissions Drives Subprime Lending

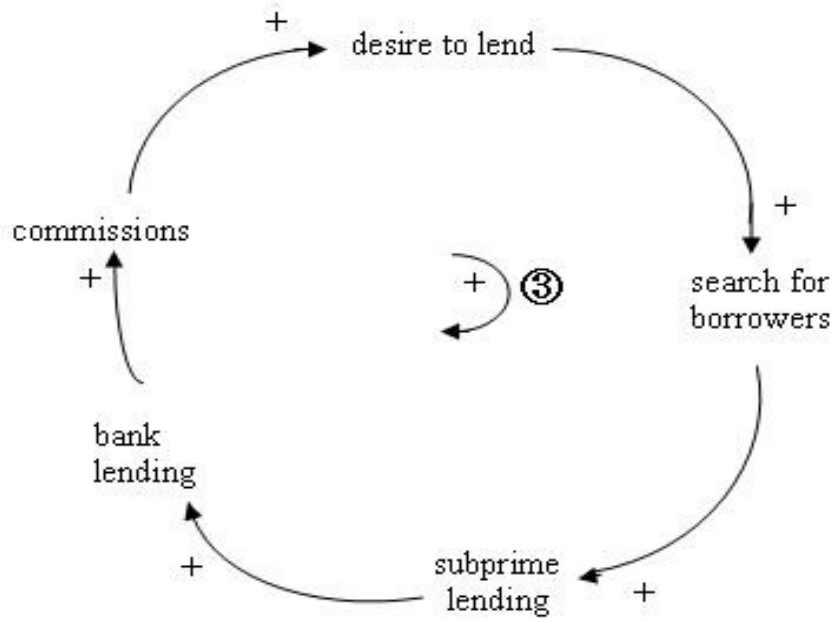


FIGURE 4
Financial Innovations and Reduced Understanding of Financial Instruments

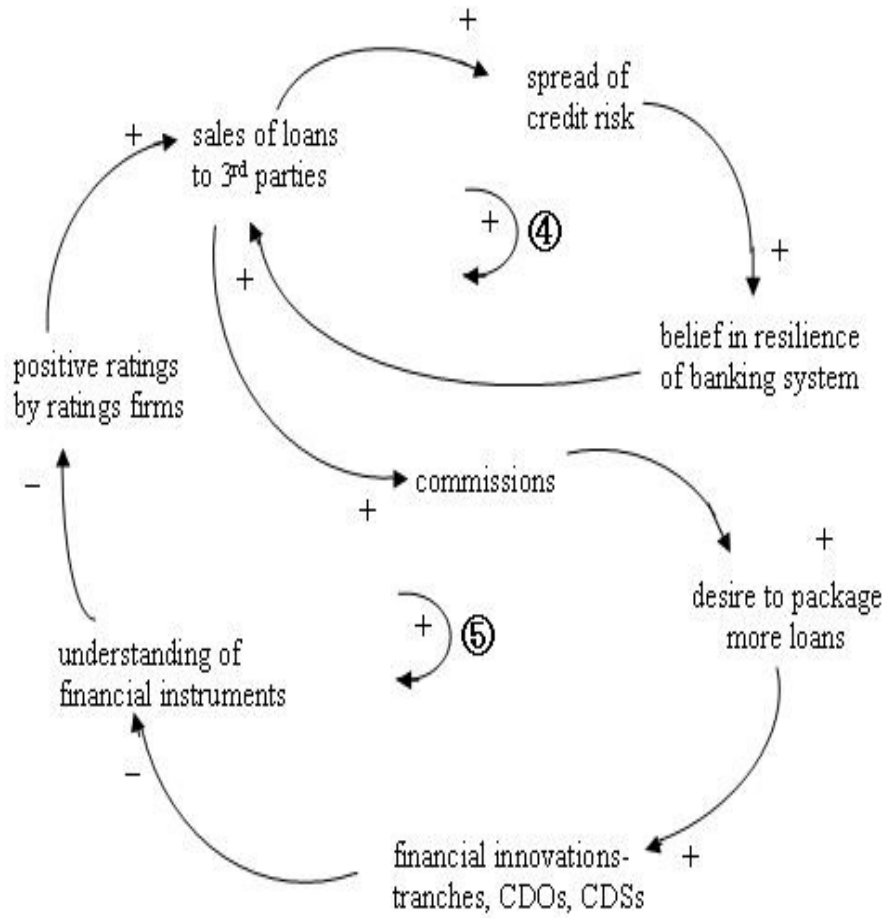


FIGURE 5
An International Reserve Requirement

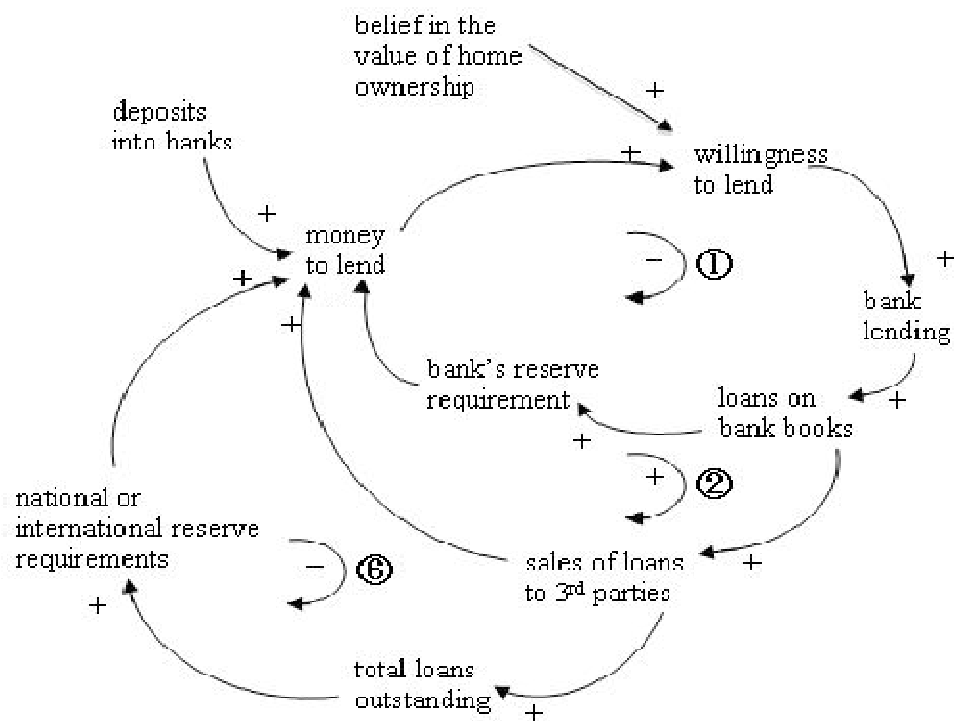


FIGURE 6
The International Aspects of the Super Credit Cycle

