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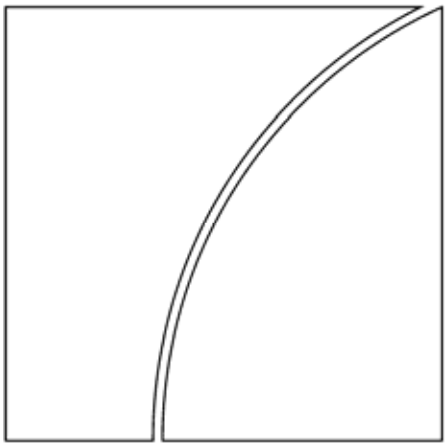

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Financial system: shock absorber or amplifier?

by Franklin Allen and Elena Carletti

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Foreword

On 18–19 June 2007, the BIS held its Sixth Annual Conference on “Financial systems and macroeconomic resilience”, in Brunnen, Switzerland. The event brought together senior representatives of central banks, academic institutions and the private sector to exchange views on this topic. BIS Paper 41 contains the opening address by William R White (Economic Adviser, BIS), the contributions to the policy panel on “Coping with financial distress in a more markets-oriented environment” and the prepared remarks of the participants at the overview panel of the conference. The participants in the policy panel discussion were Donald Kohn (Board of Governors of the Federal Reserve), Armínio Fraga (Gávea Investimentos) and John Gieve (Bank of England). Yi Gang (People’s Bank of China), Stanley Fischer (Bank of Israel) and Lucas Papademos (European Central Bank) participated in the overview panel, which was chaired by Malcolm Knight (BIS). The present Working Paper includes a paper presented at the conference and the discussant comments.

Conference programme

Sunday 17 June

17:30	Conference registration
19:00	Cocktail reception and informal dinner

Monday 18 June

09:00	Opening remarks:	William White (Bank for International Settlements)
	Chair:	YV Reddy (Reserve Bank of India)
09:15	**Session 1:**	**Financial intermediation through institutions or markets?**
	Paper title:	"Financial intermediaries and financial markets"
	Author:	Martin Hellwig (Max Planck Institute for Research on Collective Goods)
	Discussants:	Bengt Holmström (Massachusetts Institute of Technology) Martín Redrado (Central Bank of Argentina)
10:45	Coffee break	
11:15	**Session 2:**	**Towards market completeness**
	Paper title:	"Innovations in credit risk transfer: implications for financial stability"
	Author:	Darrell Duffie (Stanford University)
	Discussants:	Mohamed El-Erian (Harvard Management Company) Kenneth Froot (Harvard Business School)
12:45	Lunch	
	Chair:	Alan Bollard (Reserve Bank of New Zealand)
14:15	**Session 3:**	**Accounting and financial system behaviour**
	Paper title:	"Liquidity and financial cycles"
	Author:	Hyun Shin (Princeton University) and Tobias Adrian (Federal Reserve Bank of New York)
	Discussants:	Philipp Hildebrand (Swiss National Bank) Mary Barth (Stanford University)
15:45	Coffee break	

Monday 18 June (cont)

16:15	**Session 4:**	**Policy panel discussion on "Coping with financial distress in a more markets-oriented environment"**
	Panellists:	Donald Kohn (Board of Governors of the Federal Reserve System) Armínio Fraga (Gávea Investimentos) John Gieve (Bank of England)
18:00	Adjournment	
19:00	Reception followed by formal dinner	
	Keynote lecture by Robert Merton (Harvard University)	

Tuesday 19 June

	Chair:	Kazumasa Iwata (Bank of Japan)
09:00	**Session 5:**	**Risk transfer to households and macroeconomic resilience**
	Paper title:	"Risk management for households – the democratization of finance"
	Author:	Robert Shiller (Yale University)
	Discussants:	John Campbell (Harvard University) Jaime Caruana (International Monetary Fund)
10:30	Coffee break	
11:00	**Session 6:**	**Financial system: shock absorber or amplifier?**
	Paper title:	"Financial system: shock absorber or amplifier?"
	Author:	Franklin Allen (Wharton School of the University of Pennsylvania) and Elena Carletti (Center for Financial Studies)
	Discussants:	Raghuram Rajan (University of Chicago) Yung Chul Park (Seoul National University)
12:30	Lunch	
14:00	**Overview panel**	
	Chair:	Malcolm Knight (Bank for International Settlements)
	Panellists:	Yi Gang (People's Bank of China) Stanley Fischer (Bank of Israel) Lucas Papademos (European Central Bank)
15:30	Close of conference	

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Financial system: shock absorber or amplifier?[1]

Franklin Allen[2] and Elena Carletti[3]

1. Introduction

In recent decades there has been significant deregulation in many industries. However, a sector that remains heavily regulated is banking. Why is this the case? One reason is consumer protection, but this is a relatively minor one. The main reason for banking regulation is to prevent financial crises. However, banking regulation is unusual compared to other types of regulation in that there is no broad agreement on what the market failure is that justifies it.

With other types of regulation, there typically is agreement. For example, antitrust regulation is necessary to prevent the pernicious effects of monopoly, the market failure in this case being the lack of competition. With environmental regulation, there is a missing market: polluters do not have to pay a price to compensate the people they harm. If there were a market in which they did have to do so, there would be an efficient allocation of resources and no need for intervention. But there is no such a market, so it is necessary to regulate instead. In contrast, what is the market failure that justifies so much regulation of banking? The purpose of this paper is to address this question and examine the implications for the role of the financial system as a shock absorber or amplifier.

Many banking regulations in the United States were originally introduced as a reaction to the banking crises in the early 1930s and the perception that these were an important contributing factor to the severity of the Great Depression. The experience of the Depression was so awful that it was widely agreed that it must never be allowed to happen again, and extensive banking regulation was introduced as a result. The regulation was not guided by theory but was rather a series of piecemeal reforms. In many European countries, such as France and Sweden, the response was much stronger and involved government ownership of the banking sector. Through either regulation or public ownership, the banking sector was highly controlled.

These reforms were very successful in terms of preventing banking crises. From 1945–71, there was only one banking crisis in the world. That was in Brazil in 1962, and occurred together with a currency crisis. Apart from that there was not a single banking crisis (Bordo et al (2001)). The reason that crises were prevented is that risk-taking and competition were controlled so much that the financial system ceased to perform its function of allocating resources efficiently. The financial repression that resulted from excessive regulation and public ownership eventually led to pressures for financial liberalisation. Starting in the 1970s, regulations were lifted, and in many countries with government ownership banks were privatised.

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[1] This paper was presented at the Sixth BIS Annual Conference 2007, "Financial system and macroeconomic resilience", 18–19 June 2007, Brunnen, Switzerland. We are grateful to our discussant, Raghuram Rajan, and other conference participants for helpful comments.

[2] University of Pennsylvania.

[3] Center for Financial Studies.

Financial liberalisation not only allowed the financial system to fulfil its role in allocating resources. It also led to the return of banking crises, of which there have been many in the last three decades. Many have been in emerging market countries, but many have also been in developed countries such as Norway, Sweden and Finland in the early 1990s. Bordo et al (2001) find that the frequency of crises in the period since 1971 is not that different from what it was before 1914.

There is an extensive literature on the costs of crises and their resolution (see eg Bordo et al (2001), Hoggarth et al (2002), Boyd et al (2005) and Honohan and Laeven (2005)). Much of the debate has been concerned with how exactly to measure costs. A large part of the early literature focused on fiscal costs. This is the amount that it costs the government to recapitalise banks and reimburse insured depositors and possibly other creditors. However, these are mostly transfers rather than true costs. The subsequent literature has focused more on the lost output relative to a benchmark such as trend growth rate.

There are two important aspects of the costs of crises when measured this way. The first is the high average cost and the second is the large variation in the amount of costs. Boyd et al (2005) estimate the average discounted present value of losses in a number of different ways. Depending on the method used, the mean loss is between 63% and 302% of real per capita GDP in the year before the crisis starts. The range of losses is very large. In Canada, France, Germany and the United States, which experienced mild non-systemic crises, there was no significant slowdown in growth and costs were insignificant. However, at the other extreme, the slowdown and discounted loss in output were extremely high. In Hong Kong SAR, the discounted PV of losses was 1,041% of real output the year before the crisis. The variation in costs underlines the importance of the issue of whether the financial system is a shock absorber or amplifier.

It is the large average costs and the very high tail costs of crises that make policymakers so averse to them. This is why in most cases they go to such great lengths to avoid crises. However, it is not clear that this is optimal. There are significant costs associated with regulations to avoid crises, and in many cases the expected costs of crises are not very high. But what are these costs of regulation? Are crises always bad or can they sometimes be advantageous? Once again, the key issue is what exactly the market failure is.

The Basel agreements illustrate the lack of consensus on the basic underlying market failure. An enormous amount of effort has been put into designing these rules; billions of dollars have been expended by banks in setting up systems to implement them. They provide an example of regulation that is empirically rather than theoretically motivated. Practitioners have become experts at the details of a highly complex system for which there is no widely agreed rationale based in economic theory. What is the optimal capital structure? What market failure necessitates the imposition of capital adequacy requirements? Why can't the market be left to determine the appropriate level of capital? There are no good answers to these questions in the theoretical literature.

The key point is that just because there is asymmetric information of some kind does not necessarily mean there is a market failure and that intervention is thus justified. It must be shown that the government can do better than the market. In the literature on capital adequacy, it is often argued that capital regulation is necessary to control the moral hazard problems generated by the existence of deposit insurance. Partial deposit insurance was introduced in the United States in the 1930s to prevent bank runs or, more generally, financial instability. Because banks issue insured debt-like obligations (eg bank deposits), they have an incentive to engage in risk-shifting behaviour. In other words, the bank has an incentive to make excessively risky investments, because it knows that in the event of failure the loss is borne by the deposit insurance fund, and in the event of success the bank's shareholders reap the rewards. The existence of bank capital reduces the incentive to take risks because, in the event of failure, the shareholders lose their capital. Thus, capital adequacy requirements are indirectly justified by the desire to prevent financial crises.

However, any analysis of optimal policy must weigh the costs and benefits of regulation. This can only be done in a model that explicitly models the possibility of crises. In the absence of explicit modelling of the costs of financial crises, it is difficult to make a case for the optimality of intervention. As a corollary, it is difficult to make a case for capital adequacy requirements as a means of offsetting the risk-taking generated by deposit insurance.

There are numerous theories of crises (see eg Holmstrom and Tirole (1998), Caballero and Krishnamurthy (2001) and Diamond and Rajan (2005)). This literature contains many interesting insights that focus on particular aspects or types of crises. In this paper we consider a framework developed in Allen and Gale (2004a, 2004b, 2007) and Allen and Carletti (2006, 2007) that allows a wide range of phenomena associated with crises to be analysed. These phenomena include excessive asset price volatility, bank runs, financial fragility, contagion and asset price bubbles. We argue that the key issue that determines whether the financial system is a shock absorber or amplifier is whether there is a market failure. Without a market failure, the financial system is a shock absorber. With a market failure, it is an amplifier and these phenomena can occur.

2. Panics versus fundamentals

Two approaches to crises can be developed. Both have a long history. One view, well expounded in Kindleberger (1978), is that they occur spontaneously as a panic. The modern version was developed by Bryant (1980) and Diamond and Dybvig (1983). The analysis is based on the existence of multiple equilibria (there is a panic in at least one equilibrium while in another there is not).

The second view asserts that crises arise from fundamental causes that are part of the business cycle (eg Mitchell (1941)). The basic idea is that when the economy goes into a recession or depression, the returns on bank assets will be low. Given their fixed liabilities in the form of deposits or bonds, banks may be unable to remain solvent. This may precipitate a run on banks. Gorton (1988) shows empirically that in the United States in the late 19th and early 20th centuries, a leading economic indicator based on the liabilities of failed businesses could accurately predict the occurrence of banking crises.

Panics

The panics view suggests that crises are random events, unrelated to changes in the real economy. The classical form of this view suggests that panics are the result of “mob psychology” or “mass hysteria” (eg Kindleberger (1978)). The modern version, developed by Bryant (1980) and Diamond and Dybvig (1983), is that bank runs are self-fulfilling prophecies. Given the assumption of first come, first served and costly liquidation of some assets, there are multiple equilibria. If everyone believes no panic will occur, only those with genuine liquidity needs will withdraw their funds, and these demands can be met without costly liquidation of assets. However, if everyone believes a crisis will occur, then it becomes a self-fulfilling prophecy as people rush to avoid being last in line. Which of these two equilibria occurs depends on extraneous variables or “sunspots”. Although sunspots have no effect on the real data of the economy, they affect depositors’ beliefs in a way that turns out to be self-fulfilling.

The key issue in theories of panics is which equilibrium is selected and, in particular, what the equilibrium selection mechanism is. Sunspots are convenient pedagogically, but this explanation does not have much content. It does not explain why the sunspot should be used as a coordination device. There is no real account of what triggers a crisis. This is particularly a problem if there is a desire to use the theory for policy analysis.

Carlsson and van Damme (1993) show how the introduction of a small amount of asymmetric information could eliminate the multiplicity of equilibria in coordination games. They call these games with asymmetric information about fundamentals “global games”. Their work shows that the existence of multiple equilibria depends on the players having common knowledge about the fundamentals of the game. Introducing noise ensures that the fundamentals are no longer common knowledge and thus prevents the coordination that is essential to multiplicity. Morris and Shin (1998) apply this approach to models of currency crises. Rochet and Vives (2004) and Goldstein and Pauzner (2005) have applied the same technique to banking crises.

Using a global games approach to ensure the uniqueness of equilibrium is theoretically appealing. It specifies precisely the parameter values for which a crisis occurs and allows a comparative static analysis of the factors that influence this set. This is the essential analytical tool for policy analysis. However, what is really needed in addition to logical consistency is empirical evidence that such an approach is valid. Currently there is a limited empirical literature. This is in the context of currency crises and is broadly consistent with the global games approach (Prati and Sbracia (2002), Tillman (2004), Bannier (2005) and Chen et al (2007)). In an important recent contribution, Chen et al (2007) develop a global games model of mutual fund withdrawals. Using a detailed dataset, they find evidence consistent with their model. This represents significant evidence supporting the global games approach.

As regards the question of what the market failure is, the coordination problem that leads to panics is one possible answer. The problem is that any serious policy analysis requires a theory of equilibrium selection. However, this is not something on which much progress has been made. Global games provide one possible approach, but there is currently little evidence on how empirically relevant this approach is.

Fundamentals

An alternative to the sunspot view is that banking crises are a natural outgrowth of the business cycle. An economic downturn will reduce the value of bank assets, increasing the possibility that banks are unable to meet their commitments. If depositors receive information about an impending downturn in the cycle, they will anticipate financial difficulties in the banking sector and try to withdraw their funds. This attempt will precipitate the crisis. According to this interpretation, crises are not random events but a response to unfolding economic circumstances.

A number of authors have developed models of banking crises caused by aggregate risk. For example, Chari and Jagannathan (1988) focus on a signal extraction problem where part of the population observes a signal about future returns. Others must then try to deduce from observed withdrawals whether an unfavourable signal was received by this group or whether liquidity needs happen to be high. Chari and Jagannathan are able to show crises occur not only when the outlook is poor but also when liquidity needs turn out to be high.

Building on the empirical work of Gorton (1988) which determined that 19th century banking crises were predicted by leading economic indicators, Allen and Gale (1998) develop a model that is consistent with the business cycle view of the origins of banking crises. They assume that depositors can observe a leading economic indicator that provides public information about future bank asset returns. If there are high returns, depositors are quite willing to keep their funds in the bank. However, if the returns are sufficiently low, they will withdraw their money in anticipation of low returns, resulting in a crisis.

Empirical evidence

What is the empirical evidence concerning whether runs are panic-based or fundamental-based? Friedman and Schwartz (1963) have written a comprehensive monetary history of the United States from 1867 to 1960. Among other things, they argue that banking panics can have severe effects on the real economy. In the panics of the early 1930s, banking distress developed quickly and had a large effect on output. The authors argue that the crises were panic-based and offer as evidence the absence of downturns in the relevant macroeconomic time series prior to the crises. Gorton (1988) shows that banking crises in the National Banking Era were predicted by a leading indicator based on liabilities of failed businesses. This evidence suggests banking crises are fundamental- or business cycle-related rather than panic-based. Calomiris and Gorton (1991) provide a wider range of evidence that crises are fundamental-rather than panic-based. Wicker (1980, 1996) shows that, despite the absence of collapses in US national macroeconomic time series, in the first two of the four crises identified by Friedman and Schwartz in the early 1930s there were large regional shocks, and attributes the crises to these shocks. Calomiris and Mason (2003) undertake a detailed econometric study of the four crises using a broad range of data and conclude that the first three crises were fundamental-based while the fourth was panic-based.

Overall, the evidence thus suggests that both types of banking crisis can occur in practice. However, the evidence for the United States in the 19th century and for the early 1930s suggests that fundamental-based crises are the most important type.

3. The market failure in fundamental-based models

Allen and Gale (2004a, 2007) develop a general equilibrium framework for understanding the normative aspects of crises. The model is a benchmark for investigating the welfare properties of financial systems. The interaction of banks and markets is considered. The markets are institutional in the sense that they are for banks and intermediaries to share risks and liquidity. Individuals cannot directly access these markets, but invest their funds in banks that have access to them. Given the lack of a widely accepted theory of equilibrium selection, the authors focus on fundamental shocks as the driver of financial crises – only *essential* crises are considered. In other words, panics that are unnecessary, in the sense that an equilibrium without a panic also exists, are not taken into account. Only when there are no good equilibria are equilibria with crises considered.

Both financial intermediaries and markets play an important role in the model. The former provide liquidity insurance to consumers against idiosyncratic liquidity shocks, while markets allow financial intermediaries and their depositors to share aggregate liquidity and return shocks.

In understanding the market failures that can justify regulation, a key role is played by complete versus incomplete markets and contracts. If financial markets are complete, it is possible for intermediaries to hedge all aggregate risks in the financial markets. Complete markets involve state-contingent Arrow securities or their equivalent in terms of derivative securities or dynamic trading opportunities. In contrast, incomplete markets mean that the amount of consumption in each possible aggregate state cannot be independently varied. If the contracts between intermediaries and consumers are complete, they can also be conditioned on aggregate risks. An incomplete contract would be something like debt where the payoff on the contract does not depend on the aggregate state. Given these definitions, Allen and Gale (2004a) show the following results.

Result 1: When markets are complete and contracts are complete, the allocation of resources is *incentive*-efficient.

The result provides an important benchmark of circumstances where Adam Smith's "invisible hand" works despite the presence of asymmetric information. As usual, it involves comparing the allocation of a decentralised market system with an allocation implemented by a central planner. The allocation is incentive-efficient because the idiosyncratic liquidity shocks to depositors cannot be directly observed by the intermediaries in the case of the market, or the planner in the case of direct allocation. The depositors must have the correct incentives to reveal the information if this is necessary in the efficient allocation. Hence, the notion of incentive efficiency rather than full efficiency is used.

In this ideal world of complete markets and complete contracts, there is no market failure. Moreover, financial crises do not occur because banks and other intermediaries can balance assets and liabilities state by state. In this case, there is no need for regulation or government intervention of any kind. It is the analog to the first fundamental theorem of welfare economics in the context of financial intermediation.

So far we have assumed complete contracts between banks and other intermediaries and their customers. Many contracts observed in practice between intermediaries and consumers such as debt and deposit contracts are incomplete. However, even if this is the case, it is possible to show a result concerning efficiency.

Result 2: When contracts are incomplete and markets are complete, the allocation is *constrained* efficient.

Again, the invisible hand of the market works in the sense that a planner constrained to use incomplete contracts with consumers could not do any better than the market provided financial markets are complete. What is more, it can be shown that in the equilibrium with incomplete contracts there can be financial crises. For example, if a bank uses a deposit contract, there can be a banking crisis. This demonstrates that crises are not always bad. In some cases they can increase effective state contingencies and improve the possibilities for risk-sharing and hence the allocation of resources. Of course, nor are crises always good; however, in some cases they can be, in particular when financial markets are complete and contracts between intermediaries and consumers are incomplete.

Once again, there is no market failure and no justification for regulation or any other kind of intervention. This is another important benchmark. It shows that some crises can be good. Moreover, the possibility of crisis does not always justify intervention. Having said that, however, there is of course another case to be considered: when financial markets are incomplete. We turn to this situation next. As we shall see, there is indeed a market failure here. Now crises can be bad and regulations and other forms of intervention have the possibility of improving the allocation of resources.

The difference between complete and incomplete markets essentially determines whether the financial system is a shock absorber or an amplifier. With complete markets, it is a shock absorber. The completeness allows risks to be borne efficiently by everyone. With incomplete markets, however, shocks – even very small ones – can be amplified and significant inefficiencies can result.

4. Incomplete markets

The two results in the previous section show that if there are complete markets then there is no market failure. This is true whether contracts between banks and other intermediaries are complete or incomplete. Of course, welfare is usually higher with complete contracts than incomplete contracts, but there is no market failure. With incomplete markets, however, it turns out there is indeed a market failure. This can take a number of different forms, as we shall see: financial fragility, contagion or asset price bubbles.

The essential problem with incomplete markets is that liquidity provision is inefficient. The nature of risk management, to ensure that the bank or intermediary has the correct amount of liquidity, changes significantly in comparison to the case of complete markets. When markets are complete, it is possible to use Arrow securities or equivalently a full set of derivatives or dynamic trading strategies to ensure liquidity is received when it is needed. The price system ensures adequate liquidity is provided in every state and is priced properly state by state. To understand how this works, it is helpful to conceptualise complete markets in terms of Arrow securities that are traded at the initial date and pay off in a particular state. In this case, banks and other intermediaries buy liquidity in states where it is scarce by selling liquidity in states where it is plentiful for them. The complete markets allow risk-sharing and insurance. The financial system acts as a shock absorber. If risk is increased, it is spread around efficiently by the complete markets.

In contrast, when markets are incomplete, liquidity provision is achieved by selling assets in the market when the liquidity is required. Asset prices are determined by the available liquidity, that is, by the "cash in the market". It is necessary for people to hold liquidity and stand ready to buy assets when they are sold. These suppliers of liquidity are no longer compensated for the cost of providing liquidity state by state. Instead, the cost must be made up on average across all states, and this is where the problem lies.

The providers of liquidity have the alternative of investing in a productive long asset. There is an opportunity cost associated with holding liquidity since this has a lower return than the productive long asset. In order for people to be willing to supply liquidity, they must be able to make a profit in some states. If no one held liquidity, then when banks and intermediaries sold assets to acquire liquidity their price would collapse to zero. This would provide an incentive for people to hold liquidity since they can acquire assets cheaply. In equilibrium, prices will be bid up to the level at which the profit in the states where banks and intermediaries sell is sufficient to compensate the providers of liquidity for not using liquidity – and simply bearing the opportunity cost of holding it –in other states. In other words, prices are low in the states where banks and intermediaries need liquidity. But this is exactly the wrong time from an efficiency point of view for there to be a transfer from banks and intermediaries that need liquidity to the providers of liquidity. There is, in effect, negative insurance and suboptimal risk-sharing. Allen and Carletti (2006, 2007) explain in detail how this pricing mechanism works.

With incomplete markets, the financial system thus acts as an amplifier. Large shocks can lead to more price volatility, which can cause significant problems in terms of bankruptcy and so forth.

To summarise, when markets are incomplete asset prices must be volatile to provide incentives for liquidity provision. This asset price volatility can lead to costly and inefficient crises. There is a market failure that potentially provides the justification for regulation and other kinds of intervention to improve the allocation of resources.

5. The symptoms of market failure

The problems in liquidity provision that arise from incomplete markets can result in a number of phenomena that are associated with financial crises. These are financial fragility, contagion and asset price bubbles. Financial fragility is when a small shock can have a large effect and lead to a crisis. With contagion, a shock in one region can spread to others and have a damaging effect. With asset price bubbles, the inefficient provision of liquidity by the market can be exacerbated by the inefficient provision of liquidity by the central bank, which can result in deviations of asset prices from fundamentals. We consider each of these symptoms of market failure in turn.

Financial fragility

There are many historical cases where small shocks have had a significant impact on the financial system. For example, Kindleberger (1978, pp 107–8) argues that the immediate cause of a financial crisis:

> "...may be trivial, a bankruptcy, a suicide, a flight, a revelation, a refusal of credit to some borrower, some change of view which leads a significant actor to unload. Prices fall. Expectations are reversed. The movement picks up speed. To the extent that speculators are leveraged with borrowed money, the decline in prices leads to further calls on them for margin or cash, and to further liquidation. As prices fall further, bank loans turn sour, and one or more mercantile houses, banks, discount houses, or brokerages fail. The credit system itself appears shaky and the race for liquidity is on".

Recent examples provide a stark illustration of how small events can cause large problems. In August 1998, the Russian government announced a moratorium on about 281 billion roubles ($13.5 billion) of government debt. Despite the small scale of the default, it triggered a global crisis and caused extreme volatility in many financial markets. The hedge fund Long Term Capital Management (LTCM) came under extreme pressure. Despite LTCM's small size in relation to the global financial system, the Federal Reserve Bank of New York was sufficiently worried about the potential for a crisis if LTCM were to go bankrupt that it helped arrange for a group of private banks to purchase the hedge fund and liquidate its positions in an orderly way. The Fed's concern was that if LTCM went bankrupt, it would be forced to liquidate all its assets quickly. LTCM held many large positions in fairly illiquid markets. In such circumstances, prices might fall a long way if large amounts were sold quickly. This could put strain on other institutions, which would be forced to sell in turn, and this would further exacerbate the problem, as Kindleberger describes in the passage above.

Allen and Gale (2004b) show how the interaction of financial intermediaries and markets can lead to financial fragility. Small events, such as minor liquidity shocks, can have a large impact on the financial system because of the interaction of banks and markets. The role of liquidity is crucial. In order for financial intermediaries to have an incentive to provide liquidity to a market, asset prices must be volatile. Intermediaries that are initially similar may pursue radically different strategies, with respect to both the types of assets in which they invest and their risk of default. The interaction of banks and markets provides an explanation for systemic or economy-wide crises, as distinct from models, such as those of Bryant (1980) and Diamond and Dybvig (1983), that explain individual bank runs.

As described in the previous section, the central idea is that when markets are incomplete financial institutions are forced to sell assets in order to obtain liquidity. Because the supply of and demand for liquidity are likely to be inelastic in the short run, a small degree of aggregate uncertainty can cause large fluctuations in asset prices. Holding liquidity involves an opportunity cost which the suppliers of liquidity can only recoup by buying assets at fire sale prices in some states of the world, so the private provision of liquidity by arbitrageurs will always be inadequate to ensure complete asset price stability. As a result, small shocks can cause significant asset price volatility. If the volatility is severe enough, banks may find it impossible to meet their fixed commitments and a full-blown crisis will occur.

Contagion

Financial contagion refers to the process by which a crisis that begins in one region, country or industry spreads to an economically linked region or country or another industry. There are a number of reasons contagion can occur. For example, one basis for contagion is information (see eg Kodres and Pritsker (2002), Calvo and Mendoza (2000a, 2000b) and Calvo (2002)). Here we focus on a second type of contagion which is due to incompleteness, described in Allen and Gale (2000a). Again, the problem is related to liquidity provision, but

in a somewhat different way than that discussed in the context of financial fragility. The possibility of this kind of contagion arises from the overlapping claims that different regions or sectors of the banking system have on one another. When one region suffers a bank crisis, the others suffer a loss because their claims on the troubled region fall in value. If this spillover effect is strong enough, it can cause a crisis in adjacent regions. In extreme cases, the crisis passes from region to region, eventually having an impact on a much larger area than the one in which the initial crisis occurred.

Suppose the economy consists of a number of regions. The number of early and late consumers in each region fluctuates randomly, but the aggregate demand for liquidity is constant. This allows for interregional insurance as regions with liquidity surpluses provide liquidity for those with shortages. One way to organise the provision of insurance is through the exchange of interbank deposits. Suppose that region A has a large number of early consumers when region B has a low number, and vice versa. Since A and B are otherwise identical, their deposits are perfect substitutes. The banks exchange deposits at the first date, before they observe the liquidity shocks. If region A has a higher than average number of early consumers at date 1, then banks in A can meet their obligations by liquidating some of their deposits in the banks of region B. Region B is happy to oblige, because it has an excess supply of liquidity, in the form of the short asset. At the final date, the process is reversed, as banks in B liquidate the deposits they hold in A to meet the above average demand from late consumers in region B.

Interregional cross-holdings of deposits work well as long as there is enough liquidity in the banking system as a whole. If there is an excess demand for liquidity, however, the financial linkages caused by these cross-holdings can turn out to be a disaster. While cross-holdings of deposits are useful for reallocating liquidity within the banking system, they cannot increase the total amount of liquidity. If the economy-wide demand from consumers is greater than the stock of the short asset, the only way to provide more consumption is to liquidate the long asset. In this case, liquidation refers to technological or physical liquidation rather than selling the asset in a market. There is a limit to how much can be liquidated without provoking a run on the bank, however, so if the initial shock requires more than this buffer, there will be a run and the bank will be forced into bankruptcy. Banks holding deposits in the defaulting bank will suffer a capital loss, which may make it impossible for them to meet their commitments to provide liquidity in their region. Thus, what began as a financial crisis in one region will spread by contagion to other regions because of the cross-holdings of deposits.

Whether the financial crisis does spread depends crucially on the pattern of interconnectedness generated by the cross-holdings of deposits. The interbank network is said to be complete if each region is connected to all the other regions and incomplete if each region is connected with a small number of others. In a complete network, the amount of interbank deposits that any bank holds is spread evenly over a large number of banks. As a result, the initial impact of a financial crisis in one region may be attenuated. In an incomplete network, on the other hand, the initial impact of the financial crisis is concentrated in the small number of neighbouring regions, with the result that they easily succumb to the crisis too. As each region is affected by the crisis, it prompts premature liquidation of long assets, with a consequent loss of value, so that previously unaffected regions find that they are also affected.

It is important to note the role of a free rider problem in explaining the process of contagion. Cross-holdings of deposits are useful for redistributing liquidity, but they do not create it. So when there is excess demand for liquidity in the economy as a whole, each bank attempts to meet external demands for liquidity by drawing down its deposits in another bank. In other words, each bank tries to “pass the buck” to another. The result is that all the interbank deposits disappear and no one gets any additional liquidity.

The only solution to a global shortage of liquidity (when withdrawals exceed short assets) is to physically liquidate long assets. Each bank has a limited buffer that it can access by physically liquidating the long asset. If this buffer is exceeded, the bank must fail. This is the key to understanding the difference between contagion in complete and incomplete networks. When the network is complete, banks in the troubled region have direct claims on banks in every other region. Every region takes a small hit (physically liquidates a small amount of the long asset), and there is no need for a global crisis. When the network is incomplete, banks in the troubled region have a direct claim only on the banks in adjacent regions. The banks in other regions are not required to liquidate the long asset until they find themselves on the front line of the contagion. At that point, it is too late for them to save themselves.

There are a number of other ways contagion can occur. For example, Allen and Carletti (2006) analyse how financial innovation can create contagion across sectors and lower welfare relative to the autarky solution. They focus on the structure of liquidity shocks hitting the banking sector as the main mechanism generating contagion. In contrast, Allen and Carletti (2007) focus on the impact of different accounting methods and show that mark to market accounting can lead to contagion in situations where historic cost-based accounting values do not.

Bubbles

The idea that the amount of liquidity available is an important factor in the determination of asset prices has a long history. In addition to the liquidity provided by the market, the liquidity in the form of money and credit provided by the central bank also plays an important role. This aspect of liquidity provision is the focus here. In his description of historic bubbles, Kindleberger (1978; p 54) emphasises the role of this factor: “Speculative manias gather speed through expansion of money and credit or perhaps, in some cases, get started because of an initial expansion of money and credit”.

In many recent cases where asset prices have risen and then collapsed dramatically, an expansion in credit following financial liberalisation appears to have been an important factor. Perhaps the best known example of this type of phenomenon is the dramatic rise in real estate and stock prices that occurred in Japan in the late 1980s and their subsequent collapse in 1990. The next few years were marked by defaults and retrenchment in the financial system. The real economy was adversely affected by the aftermath of the bubble, and growth rates during the 1990s were typically slightly positive or negative, in contrast to most of the postwar period when they were much higher.

This and other examples suggest a relationship between the occurrence of significant rises in asset prices or positive bubbles and the provision of liquidity. They also illustrate that the collapse in the bubble can lead to severe problems because the fall in asset prices results in strains on the banking sector. Banks holding real estate and stocks with falling prices (or with loans to the owners of these assets) often come under severe pressure from withdrawals because their liabilities are fixed. This forces them to call in loans and liquidate their assets, which in turn appears to exacerbate the problem of falling asset prices. In other words, there may be negative asset price bubbles as well as positive ones. These negative bubbles, in which asset prices fall too far, can be very damaging to banks and other financial intermediaries. This can make the problems in the real economy more severe than they need have been.

Despite the apparent empirical importance of the relationship between liquidity and asset price bubbles, there is no widely agreed theory of what underlies these relationships. Allen and Gale (2000b) provide a theory based on the existence of an agency problem. Many investors in real estate and stock markets obtain their investment funds from external sources. If the ultimate providers of funds are unable to observe the characteristics of the investment, there is a classic risk-shifting problem. Risk-shifting increases the return to

investment in risky assets and causes investors to bid up prices above their fundamental values. A crucial determinant of asset prices is thus the amount of credit provided. Financial liberalisation, by expanding the volume of credit and creating uncertainty about the future path of credit expansion, can interact with the agency problem and lead to a bubble in asset prices.

When the bubble bursts, either because returns are low or because the central bank tightens credit, banks are put under severe strain. Many of their liabilities are fixed while their assets fall in value. Depositors and other claimants may decide to withdraw their funds in anticipation of problems to come. This will force banks to liquidate some of their assets, which may result in a further fall in asset bubbles because of a lack of liquidity in the market. It can be shown that when there is a market for risky assets, their price is determined by "cash-in-the-market pricing" in some states and can fall below their fundamental value. This leads to an inefficient allocation of resources. The central bank can eliminate this inefficiency by an appropriate injection of liquidity into the market.

6. Discussion

We have identified two market failures. The first concerns a coordination problem associated with panics. The problem in analysing this from a policy perspective is that there is no widely accepted method for selecting equilibria. Global games are one promising approach, but as yet there is limited empirical evidence to support this methodology. The second market failure concerns the incompleteness of financial markets. The essential problem here is that the incentives to provide liquidity lead to an inefficient allocation of resources. We have discussed three manifestations of market failure associated with liquidity provision. These are financial fragility, contagion and asset price bubbles.

The framework we have developed allows some insight into the question of when the financial system acts a shock absorber and when it acts as an amplifier. When markets are complete and there is no market failure, the financial system acts as a shock absorber. Risks are spread efficiently across economic agents. In this sense, risks are absorbed. When there is a market failure, the financial system can act as an amplifier. In the case of panics, there is an extreme amplification effect. Sunspots are shocks that by themselves have no effect; however, if they are used as coordination devices they can have an extreme effect on the equilibrium allocation, and in that sense the financial system acts as an amplifier.

The second market failure of incomplete markets in fundamental-based models also acts as an amplifier. Financial fragility is another extreme example. Here, small shocks can again lead to large changes in asset prices. This volatility, in turn, can lead to significant disruption and crises. With contagion, there is again amplification. A shock in one region can spill over to others and have a much larger effect than the original one. Finally, asset price bubbles can also lead to large economic problems and in that sense are amplifiers.

Having identified when there is a market failure, the question that naturally follows is whether there are policies that can correct the undesirable effects of such failures. With the first market failure of panics, one of the main points that Diamond and Dybvig (1983) make is that deposit insurance is a way of eliminating the multiplicity of equilibria. In practice, deposit insurance is not complete since typically only small depositors are covered. As a result, actual deposit insurance schemes do not prevent the possibility of panics. The analysis of deposit insurance as a way of eliminating crises deserves more attention. It potentially provides an underpinning for why deposit insurance is needed, which in turn justifies the need for capital regulation. In standard analyses of capital regulation, the need for this is usually justified by the existence of deposit insurance, but this is simply assumed. A full analysis requires the need for deposit insurance to be properly modelled.

In the context of the market failure due to incomplete markets in fundamental-based models, Allen and Gale (2004a, 2007) and Gale and Özgür (2005) consider two types of regulation: regulation of bank liquidity and regulation of bank capital. Allen and Gale (2004a) investigate bank liquidity regulation and show that requiring banks to hold more liquidity than they would choose to is welfare-improving if relative risk aversion is above 1. Gale and Özgür (2005) investigate simple examples with consumers who have constant relative risk aversion, when financial markets are incomplete. It is shown that the effect of bank capital regulation depends critically on the degree of relative risk aversion. When relative risk aversion is sufficiently low (below 2), increasing levels of bank capital above what banks would voluntarily hold can benefit all involved. The informational requirements for these kinds of intervention are high. Thus, it may be difficult to improve welfare through these kinds of regulation as a practical matter.

Financial fragility, contagion and asset price bubbles are also manifestations of market failures. The policies required for dealing with these are rather different. These issues have not been extensively analysed; however, it seems likely that provision of liquidity by the central bank is required to overcome them. The relationship between monetary policy and the control of crises is not well understood. For the case of financial fragility, the problem is the price volatility that arises from private incentives for liquidity provision. By injecting monetary liquidity into the market, the central bank may be able to change the price volatility and hence financial fragility. With contagion, the problem is again a lack of liquidity. By injecting liquidity into the interbank market, the central bank may be able to prevent the spread of crises. Also, asset price bubbles represent an important area where the central bank may be able to use monetary policy to solve the market failure.

The development of microeconomic banking models with monetary channels is at an early stage. Allen and Gale (1998, 2007) and Diamond and Rajan (2006), among others, have made steps in this direction. However, the role of monetary policy in solving these market failures and turning the financial system into a shock absorber rather than an amplifier represents an important topic for future research.

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Comments on “Financial system: shock absorber or amplifier?”

Yung Chul Park

The paper by Allen and Carletti is an excellent survey of the literature on the microeconomic foundation of financial intermediation and crisis which includes many of their own contributions. The authors identify some of the failures of financial markets which are at the root of financial crises in both advanced and emerging economies. These failures justify the heavy regulation of banking throughout history in many economies. In their view, financial liberalisation over the last three decades has therefore been responsible for many of the financial crises. This is in marked contrast to the policy prescription the IMF has advocated in resolving financial crises in emerging economies since the early 1990s.

In managing the Asian financial crisis of 1997.98, for example, the IMF saw repressive financial policies such as controlling the market interest rate and capital account transactions had made many East Asian economies vulnerable to external shocks to their financial systems. As part of the policy conditionality, therefore, the IMF demanded overall deregulation and opening of financial markets, with the belief that financial liberalisation with prudential supervision of banks in place helps improve the robustness and safety of the financial system.

Although a rigorous analysis of and an excellent contribution towards understanding causes and consequences of financial crises, the paper is not an easy one to comment on as it is a survey of a highly technical and abstract theoretical literature on *financial* crises. Indeed, it would be presumptuous and certainly beyond the scope of this note to discuss the relevance and technical aspects of the theories underlying the authors’ analysis. Instead, this note attempts to articulate some of the salient features of banking crises seen from the perspectives of emerging market economies, which may deserve closer scrutiny than the authors' analysis. Specifically, this note stresses the critical importance of the coordination problem among banks in their asset management rather than the behaviour of bank depositors as a trigger in either a panic or a business cycle view of financial crises. It will also be shown that in a closed economy setting, which the authors assume, financial crises can be managed through the intervention of the central bank and fiscal authority, but not necessarily in an open economy.

The authors analyse fundamental-based financial crises as a response to unfolding economic circumstances in a framework in which banks are exposed to the maturity mismatch in their assets and liabilities and a market for contingent liquidity does not exist. In terms of this framework, the authors show that an economic downturn could precipitate deposit withdrawals insofar as it is perceived to be an indicator of financial difficulties *banks are faced with*. The economic slowdown could then, depending on the size of this liquidity shock, set off a banking crisis. The business cycle view of the origins of banking crises raises a number of issues the authors do not address.

Heterogeneous banks and heterogeneous depositors

One issue is whether the same conclusion will follow if banks and depositors are heterogeneous. There will be weak banks vulnerable to the deposit withdrawals caused by the decrease in asset returns, but there are likely to be stronger banks capable of weathering the downswing phase of the cycle. Unless a severe case of information asymmetry is

assumed, it is difficult to imagine a situation in which depositors line up at the doors of all banks at the same time to take their money out for fear of bank insolvency. An element of panic may have to be introduced to generate a bank run.

Allen and Gale (2004) also argue that banks cannot easily protect themselves from liquidity shocks through trading options and futures; that is, the markets for hedging liquidity shocks are likely to be incomplete. However, if banks and depositors know that they will have to pay a high cost of liquidating assets in managing a liquidity shock, they may have incentives to take out insurance against liquidity shortages. In reality, the frequency of banking crises is low and a run on a bank can be contagious and thus pose systemic risks to the entire banking sector. *These considerations* would make an insurance solution untenable. However, assuming that heterogeneous banks are subject to different probabilities of liquidity shocks, in theory at least, an insurance firm could come into existence to provide contingent liquidity for a fee to be received in every state.

Coordination failure in bank lending

In their analysis, the authors *do not take into consideration* the coordination failure among banks in managing their loan portfolios, which often creates a boom-bust cycle, as shown by Borio (2003) and White (2004). The procyclicality in the lending behaviour of banks appears to be a more serious cause of banking crises than depositors' withdrawal of funds in response to deterioration of macroeconomic indicators *in both developed and emerging market economies*.

When the economy enters an upswing phase of the business cycle, financial institutions *tend to make more loans* than before in the belief that the default risk of their loans has decreased. The increase in lending for the purchase of housing and commercial real estate fuels a boom and often creates a bubble in the real estate market. The credit expansion feeds, and is often fed by, the asset market boom. Banks may realise that their lending operations may indeed create a boom, sowing the seeds of a bubble which will eventually burst. It would therefore be in their interest to restrain their lending collectively, but there is no market mechanism that could bring about such a collective action among financial institutions.

Herein lies the coordination failure. Eventually the expansion phase or the boom comes to an end and the economy enters the *downswing phase* of the business cycle. At this point, banks become conscious of the potential increase in the default risk of their loans and begin to recall the existing loans while refusing new credit extensions as the prices of assets, which are in part held as collateral, begin to fall. For an individual institution, cutting credit exposure is a rational decision, but if all institutions do the same, they end up deepening the contraction. As a consequence, many banks may be unable to meet their commitments; non-performing loans begin to pile up at the banks. Realising the growing financial difficulties, depositors will withdraw their money from the banks, triggering a banking crisis

Over the business cycle, the central bank is expected to tighten monetary policy to slow down expansion and to reverse the policy stance during the *downturn*. However, depending on how vigorously it tightens, monetary policy may not be effective in curbing credit expansion, in particular when speculation sets in in the asset markets. Furthermore, the central bank may be disadvantaged in accurately gauging the response of financial institutions to changes in the stance of monetary policy in the absence of supervisory oversight. The procyclicality in bank lending suggests that it is the coordination failure that provokes deposit withdrawals and subsequently touches off a financial crisis, not the other way around, an aspect of crises which the authors do not emphasise.

Deadly combination of a banking crisis with a currency crisis

In a closed economy, the central bank *can rescue banks experiencing a run on their deposits by supplying liquidity, thereby averting the contagion of the run and a crisis*. But in an open economy, in which banks participate in international financial markets as both borrowers and lenders, such an intervention has its limits. *This is because in* an economy with an open financial system, a banking crisis invariably leads to a currency crisis, in particular when banks are exposed to both maturity and currency mismatches. If foreign lenders and investors observe a build-up of a banking crisis, it is likely that *foreign banks* will refuse to roll over their short-term foreign currency loans, and foreign investors will withdraw their investments. The domestic *banks in trouble* will then need both domestic and foreign currency liquidity. Since most central banks of emerging market economies hold a level of foreign exchange reserves that is less than their total foreign debt, the central banks can only support a limited amount of foreign currency denominated liquidity.

Emerging market economies may obtain lines of contingent credit from international banks to be drawn down when *foreign currency* liquidity is needed. But when they come under a speculative attack and are perceived to be vulnerable, the international banks may lower their overall exposure by recalling other types of credit while supplying the contingent credit. When they suffer from banking and foreign exchange crises they may therefore have no recourse but to seek rescue financing from the IMF. If they do so, they will have to make a number of macroeconomic adjustments, including a large increase in the market interest rate and currency depreciation to attract foreign currency liquidity. Only then will foreign investors return to buy depressed assets, and foreign lenders to reap profits from the high interest rates they can charge. Unlike in the case of a financial crisis in a closed economy, a banking crisis causes a transfer of resources to the lender countries.

Is there any analogy between financial crises in open and closed economies? According to the authors, a crisis in a closed economy is part of the process of adjustment to a liquidity shock. Suppliers of liquidity incur an opportunity cost of holding short assets with a low rate of return in different states where banks do not need liquidity. These liquidity providers will then have to be compensated for their loss by allowing them to purchase long assets below their equilibrium prices during crises. Do currency crises also serve as a mechanism for compensating those foreign lenders providing short-term loans? Unlike domestic suppliers of liquidity, foreign lenders charge the interest rate prevailing in the international financial market plus a hefty *risk* premium on their short-term loans to emerging market economies. *Therefore the currency* crises cannot be a compensating mechanism for the suppliers of foreign currency liquidity. There must be other explanations.

There is, however, a similarity between the closed and open *economy* regimes as far as the trigger of crises is concerned: once again, it is the coordination failure among international banks. When an emerging economy is growing rapidly while maintaining a current account balance, foreign lenders and investors see profitable investment opportunities and rush into this economy, inducing massive capital inflows beyond its absorptive capacity and thereby setting off an asset market boom and invariably creating a bubble. When the bubble bursts, all foreign lenders move out at the same time, exacerbating the crisis. Panic, *herding* and coordination failure among international lenders both small and large *were as responsible as structural weaknesses and inappropriate macroeconomic policies for the Asian financial crisis of 1997.98*.

Policies

Are there any policy measures that can correct the painful consequences of the *financial* market failure in a global setting? To be sure, emerging market economies are better advised to keep their macroeconomic policies in order to maintain internal and external balance. But that may not be enough to spare them the contagion of crises. It has also become prudent policy to avoid the currency mismatch in emerging market economies. While this *prudence* may be desirable as a precaution against crises, if it is enforced to the letter, the restriction on the currency mismatch will reduce *the scope of foreign financing of domestic investment and hence* international financial intermediation a great deal. One might ask then why emerging market economies should borrow from international financial markets at all except for transaction purposes, if they have to completely avoid the currency mismatch *by holding as much reserve as, or more than, their foreign debt* as many East Asian economies currently do.

The incompleteness of financial markets in a global setting may explain why so many emerging market economies hold *such a large amount* of foreign exchange reserves in excess of their total foreign indebtedness as self-insurance. The irony is that these countries have to be net lenders if they want to minimise *the risk of currency crises*.

The authors consider the regulation of liquidity and capital as possible policies *for the mitigation of* market failure due to missing markets, but their effectiveness and viability are not proven. If the absence of the markets for hedging liquidity shocks is such a serious cause of financial crises, then it is possible to introduce narrow banking, in which a special type of banks which invest their deposits only in default risk-free treasury securities with liquid markets could be created. However, in a global financial setting these measures would prove to be non-operational. To the extent that panic, herding and the coordination failure among international banks and other international intermediaries lie behind most of the currency crises in emerging market economies, domestic policies of these economies *will not be enough* to *relieve* the market failure; they need to be complemented by regulation of international suppliers of liquidity as well.

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