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BANKING AND CURRENCY CRISES AND SYSTEMIC RISK:

A TAXONOMY AND REVIEW

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Many countries have experienced serious banking and/or currency (exchange rate or balance of payments) problems in recent years with high costs to their own countries and others. A study by the International Monetary Fund (IMF) reported that more than 130 of the IMF's 180-plus member countries had experienced serious banking problems between 1980 and 1995 and this was even before the recent East Asian banking crises (Lindgren, Garcia, and Saal 1996). A map of countries experiencing banking crises is shown in Figure 1. The authors' define serious problems to include banking crises that involve bank runs, collapses of financial firms, or massive government intervention, as well as less damaging but extensive unsoundness of institutions. Currency crises were more frequent than banking crises. They are typically defined as historically large depreciations in exchange rates and/or large declines in foreign reserves. Another IMF study of 53 industrial and developing countries identified 158 currency crises and 54 banking crises in approximately the same time period (IMF, 1998a). Many countries suffered more than

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one such crisis during this period. A third study by Kaminsky and Reinhart (1996 and 1999) of 20 countries from 1970 to 1995 identified 25 banking crises and 71 currency crises.

Not only have banking and currency crises been frequent in number, but they have often been extremely costly in terms of both declines in real output and, at least for banks, transfer payments from taxpayers to bank depositors and other creditors, whose funds were explicitly or implicitly insured or guaranteed at par value by the government. The IMF estimated that the cumulative actual and potential losses in output associated with the recent 158 currency crises in 53 countries averaged 4.3 percent of their trend GDP values and 7.1 percent in the 96 crises in which output losses were suffered (IMF, 1998a). This is shown in Table 1. The output loss was greater in emerging economies than in developed economies. The cumulative output loss in the 54 banking crises was significantly greater than in the currency crises, averaging 11.6 percent in all crises and 14.2 percent in the 44 crises that experienced an output loss. The loss was again greater for emerging than industrial economies. Moreover, banking crises last 3.1 years on average, twice as long as currency crises. The transfer payments in support of deposit guarantees in banking crises topped 10 percent of GDP in a number of countries and exceeded 40 percent in Argentina, Thailand, Korea, Indonesia, and Malaysia (Table 2). The magnitude of comparable transfer payments in currency crises from taxpayers to protected domestic or foreign creditors, including repayment of any loans from official international institutions, has not been estimated, but appears to have been sizeable in a number of recent crises. These estimates exclude the costs to other countries that may either have been adversely affected by the above problems or provided assistance to the countries experiencing the problems.

The large magnitude of these numbers and the fact that many of the crises occur concurrently across countries and give rise to widespread fear of contagion or systemic risk

clearly indicate why banking and currency crises attract the attention of bankers, policy-makers and the general public worldwide. But the causes, characteristics, dangers, and other features of these crises are not often clearly delineated and analyses of these problems frequently suffer from vagueness. For example, while liquidity and solvency problems at banks may be readily visualized and differentiated, the idea of an illiquid or insolvent country is more difficult to convey. However, sharp depreciations in exchange rates may trigger defaults by private borrowers, including banks, and even by sovereign governments on their foreign currency denominate debt and even on their domestic currency debt, if the costs of their foreign currency debt increases sufficiently. Surprisingly, until recently, the explanation and analysis of banking and currency crises were largely undertaken by different researchers, many of whom were largely unaware of or uninterested in each others' contributions. (Significant exceptions include Glick, 1999; Kaminsky and Reinhart, 1996 and 1999; and McKinnon and Pill, 1998).

Banking and currency breakdowns are also feared more than breakdowns in most other sectors of the economy because the public does not understand the operations of these sectors very well. Both sectors deal in finance and intangibles, which make them more difficult for the public to comprehend than sectors that deal in tangibles, such as steel, automobiles, and even communications. As a result, for many, these sectors are shrouded in mysticism and lend themselves readily to fictitious accounts of their operations, particularly of the implications of problems and breakdowns. To the extent that the adverse implications are exaggerated, the resulting tales of horror are widely reported in the press as facts and become the stuff that popular novels and movies are made of, which further fan the flames of fear.[1] Thus, failures in the financial sector lead to greater and stronger calls for government intervention and remedies. This

paper identifies and defines the characteristics of banking and currency crises, examines the nature and role of contagion and systemic risk, evaluates the effectiveness of public policies intended to mitigate the crises, and reviews the empirical evidence to attempt to distinguish between fact and fiction. The characteristics considered are summarized in Table 3. The paper also attempts to integrate the analysis of banking and currency crises into a unified framework.

I. Triggering Event

Crises have triggering events or shocks. A banking crisis is generally ignited either by the economic (or legal) insolvency of one or more large banks or similar financial institutions or by depositor runs on one or more large banks or similar financial institutions perceived to be insolvent and unable to repay their deposits or other debt claims on time and at par value. A currency crisis is generally started either by a sharp, substantial, and disorderly decline in the exchange rate in one country, frequently, although not always, from levels set by a fixed (pegged) exchange rate standard, a crawling peg standard, or a currency board, or by a speculative run on a country's currency that exerts downward pressure on the exchange rate (Eichengreen, Rose, and Wyplosz, 1996)[2]. Thus, banking and currency crises both involve an actual or potential depreciation in the value of claims. This reflects a failure by banks or countries on a fixed or semi-fixed exchange rate to keep their promise to redeem or exchange, respectively, claims at a given rate (price). For banks and other privately owned financial institutions, this results in insolvency and either reorganization or liquidation. For countries, although they survive, they are likely to experience losses from higher foreign debt burdens and from economic, political, and/or

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[1] For an example of the latest of a long series of "frightening" accounts of potential financial meltdowns, see the account of the 1907 banking crisis in the U.S. by Strouse, 1998.

[2] Some analysts differentiate between crisis and non-crisis depreciations. They argue that although all or almost all currency crises result in depreciations, all currency depreciations do not result in crises. Depreciations that are orderly and follow prolonged government attempts, albeit unsuccessful, to avoid such a change in value do not represent crises. (Eichengreen and Rose, 1998-9.)

social turmoil and subsequent restructuring. (A broad spectrum of views on the causes and triggering event of the East Asian crisis of 1997-99 appears in Hunter et al., 1999). Kaminsky and Reinhart (1996) develop a broad set of stylized facts (regularities) describing recent banking and currency crises.

II. Sector Vulnerability

Both the banking and international sectors of an economy are widely perceived to be particularly fragile or vulnerable relative to other sectors and therefore subject to "breakage" more easily (e.g., Eichengreen, 1999). For banking, the extreme fragility is perceived to stem primarily from three characteristics of the banks' balance sheet (Kaufman, 1996):

- Low cash to assets (fractional reserve banking)
- Low capital to assets (high leverage), and
- High demand to total deposits (high potential for runs).

If depositors, rightly or wrongly, perceive their banks to be insolvent and unable to repay them in full and on time, they will attempt to run and withdraw their funds. The higher the ratio of demand deposits, the faster will they be able to do so. As the banks are unlikely to hold sufficient cash to meet all these demands, they may need to sell some of their earning assets quickly. To the extent that these assets may be opaque, contain private information, and not be perfectly liquid, otherwise solvent banks may experience liquidity problems and suffer fire-sale losses that exceed their relatively small capital base and drive them into insolvency.

The extant literature on currency crises is less specific on the underlying reasons for the high fragility of the international sector, but the following three reasons appear to be comparable to those for banking:

- Low international (foreign) reserves to foreign currency (external) debt (low liquidity)

- Low foreign currency assets to foreign currency liabilities (low convertibility), and
- High short-term to total foreign currency debt (high potential for runs).

As for banks, if foreign currency creditors perceive, rightly or wrongly, that the domestic debtors, be they banks or otherwise, may be unable to repay them in full and on time, they will attempt to withdraw their funds.[3] The greater are short-term to total foreign claims, the quicker can these creditors run into other currencies at the existing exchange rate. The smaller the country's foreign assets and particularly foreign reserves, the less able it is to repurchase its own currency quickly without fire-sale losses and to prevent its exchange rate from depreciating. A shortfall of foreign currency assets at banks relative to their foreign currency liabilities further reduces the availability of foreign currencies at times of speculative attacks and may indeed encourage such attacks.

These fragility measures are, however, less precise than for banks. For example, in the absence of capital or exchange controls, foreign or domestic demand depositors and even some other short-term creditors can quickly exchange their domestic currency claims into foreign currency claims. Under fixed exchange rates (including currency boards), the government promises to exchange foreign currency for domestic currency at a fixed price. This is similar to banks promising to redeem deposits at par and encourages runs when investors no longer believe that the government can maintain this rate. Similar to bank runs, domestic currency claims are likely to be exchanged into foreign currency claims in largest amounts precisely at the time that the domestic currency is under the greatest pressure and the existing exchange rate is perceived to be in greatest danger of depreciation. Later exchanges may occur at a lower rate and the claim holders suffer losses. Such runs deplete the country's foreign reserves further and increase the likelihood of actual depreciation. Runs into foreign currencies also occur under flexible or

floating exchange rates, although the resulting changes in exchange rates are likely to be in smaller increments. As a result, some analysts prefer to include all short-term bank deposits or money supply in addition to foreign denominated debt in these three fragility ratios, which increases the measured fragility significantly.

But, as I have argued in previous papers on banking, fragility per se does not automatically translate into breakage (e.g., Kaufman, 1996). Rather, it signals "handle with care." Although more fragile, fine wine glasses and chinaware often have a lower breakage rate than ordinary, less fragile ordinary wine glasses or dishware, which are typically handled with less care. And, at least in the United States, it appears that the market was aware of the fragility of banks and handled them with considerable care in the period before government guarantees and insurance lessened the incentive to do so. For example, from 1870, shortly after the end of the Civil War, to 1914 and the introduction of the Federal Reserve System and its lender of last resort facility, the average annual bank failure rate was slightly lower than that for nonbanks, despite the fact that the severe restrictions on banking activities made it difficult for most banks to reduce their risk as much as they might have wished through either product or, particularly, geographic diversification. And even after including the large jump in number of bank failures in the 1920s, almost all of which were very small unit banks in primarily agricultural states, the average annual failure rate does not rise above the nonbank failure rate until the large number of failures during the Great Depression from 1929 to 1933 are included. Nevertheless, the annual variability in the bank failure rate was much higher than for nonbanks. Bank failures came in clusters. Because such a pattern is consistent with symptoms of contagious systemic risk, it increased the perception that failures were more damaging in banking than elsewhere.

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[3] Debt holders can, of course, run on other issuers. An interesting account of such a run on a pyramid scheme is described in

Before the introduction of government guarantees, the values of each of the three bank fragility or vulnerability measures were set by the banks in response to pressures exerted on them primarily by depositors, other creditors, shareholders, and even loan customers. Thus, the values of the ratios reflected the market's perceptions of both the quality of bank management and the potential magnitude of the impact of any external national or regional macroeconomic instability and other shocks on the banks. Contrary to conventional wisdom, cash ratios in this period were higher, not lower, for banks than for nonbank firms. Demand deposits and other short-term debt were considerably higher than for nonbanks. But, the demand deposit ratio may be interpreted in two ways. As noted earlier, the higher the ratio, the quicker may funds be withdrawn and the greater is the likelihood of fire-sales and losses that exceed the bank's capital. On the other hand, by being able to run quickly, depositors can discipline their banks more quickly through demand than time deposits. Because bank management knows that these depositors can run at any time without warning, it is likely to pursue less risky policies for fear of starting a run (Calomiris and Kahn, 1991). That is, the greater is the demand deposit ratio, the greater does the ex-ante threat of a run serve as a powerful source of market discipline that encourages prudential responses by banks that will prevent many if not nearly all ex-post actual runs. Moreover, what is disruptive to the banking system and the economy are not runs on individual banks perceived to be unsafe, these will ultimately result only in a shift of deposits to perceived safe banks, but runs on all banks simultaneously into currency because no bank in the system is perceived to be safe (Benston et. al., 1986).

Lastly, the capital ratios for banks were considerably lower than for nonbanks. In the absence of government guarantees, this indicates that the market considered banks to be less, not

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Darby, 1998.

more, risky than nonbanks. Market participants were willing to lend funds to banks with lower capital ratios than nonbanks because banks failed less often than nonbanks and, when they did fail, depositors experienced, on average, smaller losses than did creditors at failed nonbanks (Kaufman, 1994). The lower loss rate may be attributed primarily to faster resolution of insolvent banks by bank regulators, who possess resolution authority, than of nonbanks by the bankruptcy courts, in large part because market forces prompted runs by depositors on perceived troubled banks. If the resulting liquidity problems and fire-sale losses caused the banks to be unable to convert their deposits into either currency or deposits at other banks at par, the bank was forced to suspend its operations and the regulators forced to determine whether the problem represented a liquidity or solvency problem. If liquidity, the bank was permitted to reopen in time when it could redeem its deposits at par again. If solvency, the regulators were effectively forced to resolve the institution at that time and not keep it in operation. The run was not frequently the cause of the insolvency, but the symptom. Runs were the primary cause of only relatively few bank failures in this period (O'Conner, 1938). For the most part, except in periods of severe crisis when the financial condition of nearly all banks were suspect, runs, particularly by larger depositors, involved fund transfers from perceived financially sick to perceived financially healthy banks. Thus, they did not significantly reduce the aggregate amount of bank credit or deposits, although the runs likely affected both the geographic and product mix of the credit and deposits.

Other than fraud, which has been an important cause of bank failures throughout history, banks became insolvent when exogenous adverse shocks were greater than expected and the resulting losses from credit, interest rate, liquidity, and other risk exposures exceeded a bank's capital protection. Thus, bank fragility or vulnerability cannot be evaluated in isolation, but must be gauged relative to the magnitude and frequency of expected exogenous shocks. Such

expectations are likely to differ both among countries and within a country across banks and for the same bank through time. The larger the expected shocks, the more likely are banks to fail for any given values of the fragility ratios. Conversely, for any given shock, banks are less likely to fail, the higher are their cash and capital to total assets. What matters is not the banks' absolute fragility, but their relative fragility.

The introduction of government guarantees on some or all depositors, other creditors, and even shareholders reduces the influence of the market on the values of the three fragility ratios, in particular, on the capital-to-asset ratio. Because some or all stakeholders are totally or partially protected against loss from failure, they are more likely to engage in moral hazard behavior. Depositors and other creditors are less likely to be concerned with the banks' capital positions and continue to provide funds to banks with lower capital ratios than otherwise. The banks, in turn, are likely to increase their risk exposures further by reducing their cash positions and increasing the credit, interest rate, liquidity, and other risk exposures in their asset and liability portfolios. Contrary to their intended purpose of enhancing bank safety, the guarantees increase the values of the fragility measures and the banks' relative fragility. A given shock is, therefore, more likely to cause at least economic if not legal bank insolvencies than in the absence of such guarantees.

In addition, the values of the fragility ratios can affect the desired risk exposure of bank management for a given exogenous shock. As already noted, a higher demand to total deposit ratio may make banks more cautious. Likewise, lower cash and capital ratios may also make banks more cautious, particularly in the presence of large bankruptcy costs. Thus, the values of the three fragility measures in isolation are unlikely to be good predictors of bank failures and crises. They are subject to significant Type 1 and Type 2 errors. Rather, to serve such a role, these ratios must be used together with other information.

Evidence from recent currency crises indicates that, at least, the Latin American and East Asian crises were driven primarily by capital account rather than current account problems, as had been the case in many of the previous crises in the post-World War II period. The countries involved tended to have low reserves relative to their foreign currency debt, large increases in foreign liabilities to domestic money supply and foreign currency assets, and high short-term foreign debt to total foreign debt (Table 4, Table 5, and Figure 2). But the evidence also suggests serious Type 1 and 2 errors. A number of countries with similar values for some or all of the three fragility ratios did not experience major currency problems and all countries that experienced such currency problems did not have the same fragility characteristics.[4] For example, the three emerging economies with the highest ratios of short to total external debt in mid-1997 were Singapore, Taiwan, and Hong Kong. But these countries were least affected by the East Asian crisis (Eichengreen et al, 1998). As with banks, it may be that the ever present threat of a run on their currencies, as reflected in the high ratios of short-term to total debt, encouraged policy makers to pursue more conservative policies.

Thus, as with banks, the fragility measures for the international sector are not by themselves infallible indicators of breakdowns and predictors of currency crises. They must be viewed in combination with the magnitude and frequency of potential adverse shocks, such as banking crises, macroeconomic instability, and, at least temporarily, problems in countries with perceived similar risk exposures. More recent research suggests that the initial adverse shocks may not only originate from poor domestic macroeconomic policies that make maintenance of the existing exchange rate difficult (first generation explanations), but also from pressures on fixed or

[4] The same problem holds for most if not all so-called "early-warning" indicators of currency crises. Although most countries that experienced currency crises also experienced rapid growth in bank credit and money supply relative to their GDP and had

semi-fixed exchange rates from macro policies that may be appropriate for achieving domestic goals, e.g., employment and price stability, but are inconsistent with maintaining the existing exchange rate so that it is not a lasting equilibrium and vulnerable to speculative attack (second generation explanations). Thus, in the latter scenarios, government attempts to maintain the exchange rate at this "bad" equilibrium effectively make depreciations to more consistent and lasting "good" equilibriums self-fulfilling prophecies. (A good summary of first and second generation models appears in Flood and Marion, 1998. A similar argument is made for bank runs in Federal Reserve Bank of Minneapolis, 1999.)

Also, as with banks, attempts by governments or international organizations to protect some or all foreign currency creditors against loss is likely to result in reduced monitoring and discipline by these parties and riskier values for these measures for a given exogenous shock. The behavior of both bank depositors and foreign creditors is often said to be motivated greatly by "confidence." But such confidence must ultimately be based on some concrete facts or, at least, perceptions about the future value of bank deposits or foreign currency denominated debt. If there are fears that either domestic deposits or other domestic denominated debt could be depreciated relative to other financial assets, the accompanying "lack of confidence" implies that the numerical values of the three fragility measures for each type of asset are viewed as insufficient to protect against such events.

III. Potential Dangers

The health of the banking and international sectors are viewed to be important not only because they are perceived to be particularly vulnerable or fragile, but because they are both economically important per se and closely intertwined with other sectors in the economy and

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high levels of outstanding bank credit and money supply, all countries that had such characteristics did not experience currency

therefore perceived to be likely to infect other sectors with their problems (Davis, 1995). A relatively small individual problem may be turned into a much larger and broader crisis. Bank liabilities comprise the major form of money in developed economies and nearly everyone in such economies touches and is touched by money and credit in their everyday life. The insolvency or near insolvency of one or more important banks is believed to reduce credit, particularly loans, to the market or markets served, ignite depositor runs either to other "safe" banks or to riskless Treasury securities and currency, reduce deposits and the money supply, disrupt the operation of the payments system, increase uncertainty, disturb financial markets, and cause, at a minimum, fire-sale losses that will drop security prices below their otherwise equilibrium levels. Such effects endanger the solvency of other, economically solvent banks and could ignite further runs (CEA, 1999). These adverse effects are magnified if the insolvent banks are physically closed or frozen for a significant length of time, so that some or all depositors do not have immediate access to some or all of their funds. Dermine (1996, p. 680) has noted that

> The issue is not so much the fear of a domino effect whereby the failure of a large bank would create the failure of many smaller ones; strict analysis of counterparty exposures has reduced substantially the risk of a domino effect. The fear is rather that the need to close a bank for several months to value its illiquid assets would freeze a large part of deposits and savings, causing a significant negative effect on national consumption.

This does not happen in the U.S. today. Insured depositors at failed banks have access to the full value of their funds the next business day and uninsured depositors to the estimated recovery value of their claim the next business day through an advance by the FDIC serving as receiver (Benston and Kaufman, 1998). However, this is not true in many other countries, where uninsured depositors may have to wait long periods of time until the appointed private receiver actually recovers the funds through the liquidation of the bank's assets and even insured

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crises and some countries that experienced currency crises did not experience rapid credit and money supply growth.

depositors at failed institutions may have to wait some time to regain access to the full value of their deposits. In either case, the adverse effects of problems at a single bank or small group of banks could be transmitted quickly throughout the banking sector, beyond to the entire financial sector, and possibly even beyond to the macroeconomy, causing sharp and abrupt declines or aggravating already extant declines in aggregate output (Federal Reserve Bank of Minneapolis, 1999). At the same time, asset prices, particularly in real estate and stock markets, which often were bid up sharply by earlier excessive bank credit expansion, are likely to decline sharply.

It is the suddenness of the transmission of shocks as well as the breadth of the potential impact that appears to differentiate the financial sector from most other sectors as a cause of crises. As former president of the Federal Reserve Bank of New York, Gerald Corrigan (1991, p.3), has noted: "more than anything else, it is the systemic risk phenomenon with banking and financial institutions that makes them different from gas stations and furniture stores." Indeed, there appears to be little fear of contagion and systemic risk in most other, nonfinancial sectors of more or less equal importance, such as automobiles, computers, transportation, and even agriculture (food).

Banking problems may also ignite currency problems, particularly in smaller, open economies on fixed or semi-fixed exchange rate standards. If the banking and any accompanying macroeconomic and asset price bubble problems are sufficiently severe, doubts may eventually arise about the government's ability and/or willingness to maintain full deposit guarantees. At that time, perceived unprotected depositors at insolvent or near-insolvent banks as well as other domestic and foreign investors are likely to shift their capital into foreign currency, including into foreign currency denominated deposits at perceived safe domestic banks, particularly foreign owned banks, or at safe banks in other countries. Such capital outflows (runs) exert downward

pressure on the country's exchange rate. If the country attempts to protect its exchange rate by selling its foreign reserves, aggregate bank reserves are reduced by a like amount and, unless offset by increases through other central bank operations, intensify the banking and macroeconomic problems by forcing further bank asset sales and monetary contraction and encouraging further capital outflows. This makes it more difficult for the country to avoid a depreciation.

Currency crises characterized by sharp depreciations in exchange rates are likely to increase both the burden of debt denominated in foreign currency to domestic borrowers and the probability of default on such debt. The former will reduce the profitability of domestic debtor firms and even threaten their solvency. The latter is likely to reduce capital inflows, particularly in the short-run. Both effects will exert downward pressure on aggregate income. Likewise, a sharp depreciation in the currency of one country relative to others will increase the price of its imports and thereby also, at least in the short run, its rate of inflation. The volume of imports is likely to decline. In time, the lower exchange rate will stimulate increased exports. These effects are likely to reduce the exports both of the country's trading partners and of its export competitors to third countries and may set off one or more rounds of competitive depreciations (beggar-thy-neighbor responses), possibly accompanied by increased trade and capital barriers. If so, aggregate incomes in all affected countries will be reduced.

Just as banking problems can ignite currency problems, currency problems can ignite banking problems. If a country experiencing a speculative run on its currency attempts to protect its exchange rate from depreciation by selling foreign currency, the resulting reduction in its international reserves will reduce bank reserves and, unless offset (sterilized) by the central bank, ignite a multiple contraction in money and credit that could threaten the solvency of banks.

Concurrently, to avoid or, to at least delay, a depreciation from a speculative run, countries frequently increase their rates of interest to discourage additional capital outflows and attract capital inflows. But the higher rates may dampen domestic economic activity, increase loan defaults, and threaten bank solvency. Speculative runs on a currency also are likely to include runs from domestic currency deposits to foreign currency deposits possibly even at the same banks. This is a run on domestic currency, not on banks, but in time may invite a run on banks.

If a country does not prevent a depreciation and if accompanying declines in aggregate income are sufficiently large, loan defaults are likely to increase and could drive some banks into or near to insolvency. Loan defaults are likely to be more frequent and larger if banks and/or bank customers had borrowed in foreign currencies on an unhedged basis and were forced by the depreciation to make larger domestic currency payments than expected. Thus, even banks that fully hedge their foreign currency borrowing by foreign currency loans to domestic borrowers are likely to suffer defaults when the domestic currency depreciates significantly. The borrowers' exchange rate risk becomes the bank's credit risk

Thus, currency and banking crises are mutually reinforcing, particularly under fixed or semi-fixed exchange rates. However, Kaminsky and Reinhart (1996) report that, while banking crises statistically predicted balance of payments crises in the countries they studied, balance of payments crises did not predict banking crises. That is, banking crises are an important cause of currency crises, but not vice-versa.

IV. Systemic Risk

What makes banking and currency crises different and particularly frightening to many persons are the accompanying cries of systemic risk. As noted earlier, the frequency and magnitude of banking and currency crises are often attributed to systemic risk. Systemic risk

refers to the risk or probability of breakdowns (losses) in an entire system as opposed to breakdowns in individual parts or components and is evidenced by comovements (correlation) among the parts. Thus, systemic risk in banking is evidenced by a high correlation and clustering of bank failures in a country, a number of countries, or globally; and in currencies, by a clustering of deprecations in exchange rates in a number of countries. Systemic risk may also occur in other parts of the financial sector, e.g., in securities markets as evidenced by declines in the prices of a large number of securities in one or more markets in a country or across countries. Systemic risk may be either or both domestic and/or transnational.

Although systemic risk is frequently proclaimed during banking and currency crises, its meaning is vague and ambiguous. It means different things to different persons. One popular definition refers to a "big" shock that produces adverse effects for most or all of the domestic economy. That is, systemic "refers to an event having effects on the entire banking, financial, or economic system, rather than just one or a few institutions" (Bartholomew and Whalen, 1995, p. 4). Likewise, Frederic Mishkin (1995, p. 32) defines systemic risk as "the likelihood of a sudden, usually unexpected, event that disrupts information in financial markets, making them unable to effectively channel funds to those parties with the most productive investment opportunities." How the transmission occurs is unclear.

Other definitions focus on potential spillover to others. For example, I have previously defined systemic risk as the "probability that cumulative losses will accrue from an event that sets in motion a series of successive losses along a chain of institutions or markets comprising a system… That is, systemic risk is the risk of a chain reaction of falling interconnected dominoes." (Kaufman, 1995 p. 47). This definition is consistent with that of the Bank for International Settlements (BIS) that systemic risk is "the risk that the failure of a participant to meet its

contractual obligations may in turn cause other participants to default with a chain reaction leading to broader financial difficulties" (BIS, 1994, p. 177). As will be discussed in the next section, this definition emphasizes causation and requires strong direct interconnections or linkages among the institutions, markets, sectors, or countries involved, so that when the first domino falls it falls on others causing them to fall and, in turn, knock down others in a chain reaction. For banks, this may occur if, for whatever reason, Bank A defaults on a loan, deposit, or other payment to Bank B that produces a loss greater than B's capital and forces it to default on a payment to Bank C with losses that are larger than C's capital, and so on down the chain (Crockett, 1997). For countries, this may occur through direct trade linkages so that if Country A experiences problems or a depreciation in its exchange rate that reduce its imports from Country B, it causes B's aggregate income to decline, reducing its imports from Country C, and so on down the chain. What makes direct transmitted or causation systemic risk in financial sectors particularly frightening to many is both the lightning speed with which it is perceived to occur and the perception that it can infect innocent as well as guilty parties, so that there is little or no protection against its damaging effects.

A third definition of systemic risk also focuses on spillover, but does not involve causation and requires less direct and weaker interconnections. Rather, it emphasizes similarities in third party risk exposures among the units involved. When one unit experiences an adverse shock that generates losses, uncertainty is created about the values of other units subject to the same shock. To minimize additional losses, market participants will examine other units (e.g. banks or countries) in which they have economic interests to see whether they are at risk. The more similar the risk exposure profile with that of the initial unit economically (in terms of macroeconomic behavior, markets, or institutions), politically, or otherwise, the greater is the probability of loss

and the more likely are the participants to withdraw funds as soon as possible and possibly induce liquidity and even more fundamental problems. This is referred to as a “common shock” effect and represents correlation without direct causation, or indirect transmission.

Because information on either the causes or magnitude of the initial shock or on the risk exposures of the other units potentially at risk is not available immediately, accurate, or free and analysis of the information is not immediate or free, participants require time and resources to sort out the identities of the other units at risk and the magnitudes of any potential losses. As credit markets deteriorate, the quality of private and public information also deteriorates and uncertainty increases further. Moreover, because many of the participants are risk averse who would rather be safe than sorry, they will transfer funds, at least temporarily during the period of confusion and sorting out, as quickly as possible to well recognized safe or at least safer units without waiting for the final analysis. That is, there is likely to be an immediate flight or run to quality away from units that appear potentially at risk, regardless of whether further analysis would identify them ex-post as having similar exposures that actually put them at risk (guilty) or not (innocent). At this stage, common shock contagion appears random, potentially affecting more or less the entire universe and reflecting a general loss of confidence in all units. Moreover, because these runs are concurrent and widespread, such behavior by investors is often referred to as "herding" behavior. These runs are likely to exert strong downward pressure on the prices (upward pressures on interest rates) of the securities of affected institutions and countries. At the same time, many of the affected countries are likely to force their interest rates up even further to reduce additional capital outflows and encourage inflows. Thus, liquidity problems are likely to temporarily spill over to units not directly affected by the initial external shock. That is, the initial domino does not fall directly on other dominos, but its fall causes players to examine and

temporarily move their nearby dominos to see whether they are subject to the same destabilizing forces as caused the initial domino to fall.

At some later date, after the sorting out process is complete, some or all of these flows affecting innocent banks or countries may be reversed. During the sorting out period, the fire-sale driven changes in both financial quantities (flows) and prices (interest rates) are likely to overshoot their ultimate equilibrium levels and intensify the liquidity problems (Kaminsky and Schmukler, 1999). However, the more frequent are banking or currency crises, the shorter are the sorting out and liquidity problem periods likely to be as market participants are likely to become both better prepared and better informed and the briefer will any overshooting last. The sorting out of countries appears to have occurred faster after the Brazil crisis of January 1999 than the Russian crisis of August 1998, which, in turn, was faster than after the East Asia crisis of June 1997 and the Mexican crisis of yearend 1994.

A distinction is often made between rational or information-based systemic risk and irrational, noninformation-based, random, or "pure" contagious systemic risk (Kaufman, 1994 and Kaminsky and Reinhart, 1998). Rational or informed contagion assumes that investors (depositors) can differentiate among parties on the basis of their fundamentals. Random contagion, based on actions by uninformed agents, is viewed as more frightening and dangerous as it does not differentiate among parties, impacting innocent as well as guilty parties, and is therefore likely to be both broader and more difficult to contain.[5] It is likely that innocent parties may be impacted immediately under common shock contagious systemic risk, but in time will be sorted out by investors and depositors from guilty parties. Thus, the empirical borderline between

[5] For banks, runs on the entire banking system into currency because no bank is perceived safe leads to a decline in aggregate bank reserves and, unless offset by the central bank, a multiple contraction in aggregate money and credit.

rational and irrational contagion is fuzzy and in part depends on the time horizon applied. Likewise, the definition of “innocent” and “guilty” are not always clear and precise. “Innocent” parties may be defined as units that are widely perceived to be economically well-behaved. That is, banks that are perceived to be solvent and not overly leveraged and countries that are perceived to have high foreign reserves relative to their foreign liabilities and to be following sound monetary and fiscal macroeconomic policies. “Guilty” parties then are insolvent, near-insolvent, or excessively leveraged banks and low reserve or poorly managed countries.

The importance of both speed and the distinction between innocent and guilty parties for evaluating contagious systemic risk for both banking and exchange rates may be seen in the following recent statements. Mann (1999, p. 1) believes that "distress at a single financial institution could spill over to sound financial institutions, thus impairing the conduct of the whole system." The Economist (October 31, 1998, p. 82) noted that:

> "Economies that looked healthy one moment were seriously ill the next -- not, apparently, because of any new development within their borders, but because of a shock from abroad, in the form of a withdrawal of international investment.... The fear that otherwise-healthy economies could fall victim in this way is one of the scariest aspects of the world's current troubles -- and one of the most portentous. It challenges the idea that a country should open its borders to goods and capital: perhaps, after all, the benefits do not outweigh the risk of infection.... The idea of contagion had better be right, then: A lot is riding on it."

Likewise, the U.S. Council of Economic Advisers has argued that enhancing the IMF's funding in 1998 was necessary to permit it to deal with "those cases where problems stem more from contagion than from poor policies.... (that is) countries with sound economic policies may be subject to attack because of contagion" (CEA, 1999, p. 285). It is largely the perceived randomness of the contagion that appears to make it more frightening in banking and exchange rates than elsewhere and justifies special protective public policy actions.

For currency crises, there may also be a wealth-type channel for systemic risk. International portfolio investors may prefer to reduce their risk exposures by diversifying geographically in foreign currency securities across a number of countries. If one of their countries experiences difficulties that reduces the value of its securities, the value of the entire portfolio declines and the investors will need to sell securities of other countries in order to rebalance their portfolios to the original mix. Such sales will exert downward pressure on the exchange rates of these countries. This channel has been used by some analysis to explain the systemic risk that transmitted downward pressure on exchange rates to Latin America, particularly Brazil and Argentina, from Russia following its devaluation and debt default in the summer of 1998.

V. Transmission of Shocks

Both the chain reaction and common shock definitions of systemic risk involve speedy contagion and require some interconnection among the parties at risk. In modern economies, few participants are self-sufficient and most engage in specialization of labor. As a result, sectors tend to be interrelated and the more specialized the production processes, the greater and stronger are the interdependence and resulting interrelationships. Thus, what happens in any one sector is likely to have some impact on, at least, some other sectors. The more important the sector experiencing a shock and the more closely is it interrelated with the other sectors, the more will any shock be transmitted in both strength and breadth. The more developed an economy, the more it is susceptible to contagious systemic risk. Moreover, to the extent countries are interrelated, shocks may be transmitted internationally.

Financial institutions and markets tend to be more important in more developed economies (Demirguc-Kunt and Levine, 1999). Banks are interconnected directly through interbank

deposits, loans, and payment system clearings and indirectly through serving the same or similar deposit or loan markets. Countries are economically interconnected directly through trade and capital flows with each other (including linkages with banks in other countries) and indirectly through transactions with the same or similar third countries. Moreover, to the extent banks operate across national borders, they link the countries in which they operate. Thus, an adverse shock that generates sufficiently large losses at one bank to drive it into insolvency or a sufficiently large depreciation in exchange rates in one country may transmit the shock to other banks or countries along the transmission chain. Moreover, as noted, adverse shocks in the financial sector appear to be transmitted more rapidly than similar shocks in other sectors. Both theory and evidence suggest that the probability, strength, and breadth of any contagious systemic risk is greater for both banking and foreign exchange, the larger and more significant is the party (bank, country, etc.) experiencing the initial shock. The transmission and danger of systemic risk is likely to differ depending both on the strength of the initial shock and on the characteristics of the party initially affected.

Units on the transmission chain may attempt to protect themselves from losses from the shock. For banks, this requires them to have sufficient capital to absorb any losses from their association with the infected bank or banks or from runs by their depositors. For the shock to be successfully transmitted and bring down other banks, losses must exceed capital at each bank along the chain. Banks with sufficient capital to absorb the transmitted losses will remain solvent, although they may be weakened. The amount of capital required to remain solvent depends both on the exposure of a particular bank to other units and on expectations about the magnitude of any shocks. These may be expected to vary both among banks and for any one bank, through time. Nevertheless, ceteris paribus, the more banks or other institutions are leveraged, the smaller

the adverse shock that is required to drive a bank or other institution into insolvency and the greater is the likelihood that losses will be passed through along the transmission chain. In addition, the faster the transmission occurs, the more difficult it is for units to develop their protection after the shock has occurred and the more important it is for them to have sufficient protection in place ahead of time. This differentiates the financial sector from most other sectors, where the transmission of adverse shocks is slower and units can successfully act to protect themselves after the initial shock has occurred.

For countries, protection requires countries with fixed or semi-fixed exchange rates and risk exposure to each other or to the same or similar third countries to have sufficient foreign reserves to offset all or much of the downward pressure on their exchange rates. The more that is offset, the smaller is the shock transmitted to other countries and the smaller are the likely depreciations in their exchange rates. As with banks, the greater are the foreign reserves that countries hold relative to their actual or potential foreign debts, the less likely are shocks to be passed on and the less important is the fear of contagious systemic risk.

As noted earlier, random contagious systemic risk is considered particularly dangerous and undesirable because it spills over to and damages perceived innocent as well as guilty parties. Although it is relatively easy to distinguish the innocent from the guilty ex-post after a crisis, it is difficult in practice to distinguish between the two ex-ante before a crisis. Ex-ante information is frequently not sufficiently available, timely, or reliable to make the distinction with any great confidence. Banks, often with the active assistance and encouragement of their governments, fail to disclose relevant information and when they do tend to underreserve for loan losses and use other questionable and even fraudulent accounting procedures to inflate their reported capital ratios. Countries also fail to disclose relevant information about their domestic and, particularly,

their international economic positions, including loans (Korea) and forward sales of official foreign reserves (Thailand) and private foreign currency liabilities (Lissakers, 1999). Many perceived innocent parties are, in reality, guilty parties in sheep's clothing. As a result, the collapse of "innocent" banks and countries catch many participants by surprise and unprepared. Ex-post, many may have been guilty all along. Their capital or reserves were not nearly as great as reported and their nonperforming loans and loan losses or foreign liabilities much greater.

VI. Recent Changes in Environment

It may be argued that contagious systemic risk has become more likely and more important in recent years as a result of both 1) economic development that increases the importance and interdependence of banking and the interdependence of countries and 2) advances in computer and telecommunications technology that permit funds to be transferred more easily, quickly, and cheaply across large distances and national boundaries and connects both banks and countries more closely. At the same time, financial liberalization and deregulation of both bank activities and international capital controls have permitted vastly increased national and transnational capital flows to occur and participants to increase their risk exposures. Gross international capital flows through both banks and security markets have increased almost twenty-fold since the 1970s (Eichengreen et al, 1998). Nevertheless, net international capital flows, as measured by the negative of the current account, relative to GDP are still below the levels reached under the gold standard and the 1920s. For example, Bordo, Eichengreen and Kim (1998) report that this ratio peaked at 6 percent for 12 major countries in the late 1910s, declined to 1 percent in the 1960s, and recovered only to 2 percent by 1990. (See also Folkerts-Landau, 1997 and Goodhart and Delargy, 1998.)

Through time, many more economic units have been brought into contact with banks and other financial institutions and markets. Thus, disturbances in the banking and financial sectors are likely to impact a larger proportion of the population than in earlier periods. One could ask how many individuals were affected directly or even indirectly by the Tulip Bulb Bubble in Holland in the 1630s or the South Sea Bubble in England in 1720? It is unlikely to have been very many, either in absolute numbers or as a percent of the population, particularly relative to the numbers affected by more recent financial crises.

The advances in technology have made bank and currency runs both easier and faster. Depositors no longer need to line up physically at banks to withdraw their funds. They can transfer their funds to other banks by telephone and computer and obtain, at least temporarily, currency at ATMs. "Silent" electronic runs now dominate "noisy" paper runs. Not only can funds be withdrawn faster and more cheaply, but runs can start faster upon receipt of any adverse news about the financial health of institutions and countries.

Trading activity for financial assets, including both futures and options as well as cash securities and trading by the banks for their own accounts, have both increased sharply and have vastly increased the volume of interbank clearings. The national value of derivative contracts have increased nearly fivefold from $8 trillion in 1991 to $40 trillion in 1997. Spot and forward currency transactions increased from $600 billion per day in 1989 to $1,500 billion per day in 1998 (CEA, 1999). To the extent that interbank claims are not settled immediately on a gross basis with good funds (payment vs. payment or delivery), risk exposures have increased both domestically and internationally. In addition, the volatility of capital flows from the ability of participants to change the directions and reverse their investments almost immediately has increased. Thus, for example, external bank and securities lending to the "sick" East Asian

countries dropped abruptly from $23 billion in the second quarter of 1997 to an outflow of about the same magnitude in the fourth quarter (Figure 3). The reversal in private capital flow was even greater, as part of the decline in 1997 and 1998 was offset by increased official flows from international institutions and individual countries. Net private inflows into these countries totaled $103 billion in 1996 and dropped to near zero in 1997 and to an outflow of $28 billion in 1998 (CEA, 1999).

It is sometimes argued that financial liberalization and deregulation effectively were responsible for the increases in both the frequency and seriousness of banking and currency crises in recent years. On the surface, there appears to be some truth to this. Capital flows to developing countries increased sharply following the liberalization of capital controls by these countries (Folkerts-Laudau, 1997). In addition, a number of studies have reported that most recent banking and currency crises occurred after financial deregulation or liberalization. For example, Kaminsky and Reinhart (1996) report that some 70 percent of banking crises were preceded by deregulation and that financial liberalization was statistically significant in explaining banking crises, although not currency crises. By permitting increased competition and reducing protection for existing institutions, financial deregulation may be expected to increase the number of bank failures. Liberalization of capital controls sharply increased capital inflows in many countries that could reverse just as sharply and ignite pressures for depreciations. But, more importantly, liberalization and deregulation were poorly implemented and sequenced in most countries that were experiencing crises rather than that they were inappropriate and unnecessary. Particularly for banking, the deregulation was generally introduced to correct serious extant problems in the industry that had resulted in widespread and massive insolvencies and severe misallocations of resources from excessive government regulation and credit controls. Because of

government guarantees and credit controls that accompany most forms of government regulation, banks were not only likely to become insolvent frequently, but, once insolvent, were likely to be permitted to continue to operate and generate additional costs rather than being resolved. As a result, the magnitude, although possibly not the frequency, of banking insolvencies are likely to be greater than before the introduction of these guarantees. The deposits financing the negative net worths of the insolvent banks are effectively off-balance sheet government debt and liabilities of the taxpayer. At some point, the combined cost of the increased burden on taxpayers and the lost efficiency and output from the misallocation of resources increases sufficiently to cause government regulation to lose support and be increasingly replaced by market regulation. Likewise for liberalization of capital flows. The cost of misallocations of resources from capital controls that directed foreign credit and the loss of potential increases in income from greater capital flows generate pressures for change.

But market discipline does not work in a vacuum. To be effective and superior to government regulation, market regulation requires a number of institutional preconditions. For banking, market regulation requires a system of laws and property rights, particularly regarding bankruptcy and repossession, incentives that reward success and punish failure, well-trained and knowledgeable bankers and bank supervisors, and relatively stable macroeconomic conditions. These conditions are particularly important because, with only rare if any exception, governments appear unable to avoid providing at least some explicit or implicit guarantees and downside protection for bank depositors, other creditors and occasionally even shareholders. Some parties, at minimum shareholders, must be permitted to share in any government losses to encourage the correct risk incentives and to avoid privatizing only bank profits and socializing the losses. For transnational capital flows, basically the same preconditions are required.

But in many if not most instances in recent years, deregulation and liberalization were introduced before the preconditions were in place (McKinnon, 1993). In the resulting absence of either government or market discipline, the outcome is often increased risk taking with resulting large losses and disruptions that are widely considered, incorrectly, the result of the deregulation and liberalization per se. Indeed, the transition from government regulation to market regulation is often a dangerous and tricky road that is full of potholes and steep drop-offs that, if not navigated carefully, can damage the process if not derail it altogether. If the appropriate prerequisites are not in place at every step of the deregulation process, the result may be worse than the starting point. That is, if the appropriate prerequisites are not in place, deregulation wrongly done may be more damaging to the economy than the government regulation that it was intended to replace. Banking failures could increase further and capital inflows could increase to unsustainable levels that magnify the likelihood of abrupt and disruptive reversals (McKinnon and Pill, 1996).

VII. Historic Evidence of Contagious Systemic Risk

Clustering of bank failures, stock market crashes, and exchange rate depreciations are observed frequently. But do they reflect systemic risk? The empirical evidence for systemic risk depends on the definition used. Almost by definition, systemic risk is observed most frequently when it is defined as a broad big shock. But, as noted earlier, this definition is silent on contagion. Contagious common shock systemic risk, particularly in the short-term, appears to be more frequent than causation contagious systemic risk. But, except for the big bad shock definition, when it does occur, systemic risk appears to be both rational and confined primarily to "guilty" parties and not to randomly affect "innocent" parties fatally.

With respect to banks, as discussed above, at least in the United States, which has been studied most thoroughly, there is little if any evidence of contagious systemic risk that causes economically solvent banks to become economically or legally insolvent, either before or after the introduction of federal government guarantees and insurance (Kaufman, 1994). Problems at one or a group of banks do spillover to other banks, but almost exclusively only to those banks with the same or similar portfolio risk exposures and subject to the same shock. There is little if any empirical evidence that the insolvency of an individual bank directly causes the insolvency of other, economically solvent banks or that bank depositors run on economically solvent banks very often and that it drives these banks into insolvency when they do. A recent study has simulated the likelihood of direct causation contagion in the U.S. through interbank Fed funds transactions for the period February-March 1998 (Furfine, 1999). It reports that, if a high loss rate of 40 percent is assumed, the failure of the largest debtor bank in the market would cause the failure of 2 to 6 other primarily smaller banks. The failure of smaller debtor banks would have lesser effects. If the two largest debtor banks failed at the same time, fewer than 10 other banks would fail. If the assumed loss rate were reduced to 5 percent, approximately that experienced in the Continental Illinois Bank failure in 1984, no other banks would fail. Moreover, these results overstate the damage to other banks as they assume failure when only tier 1 rather than total capital, including tier 2, is depleted.

When the Continental Illinois Bank, the seventh largest bank in the U.S. at the time, failed in mid-1984, it was the largest correspondent bank in the country. Nearly 2,300 other banks held deposits at or loaned funds to the Continental. Because the FDIC protected all creditors, no bank suffered any losses. But what would have happened if all creditors had not been protected? Not very much! Some 1,325 banks had exposure of less than $100,000 and were thus fully insured by

the FDIC. The remainder had some risk exposure. A study by the staff of the House Banking Committee found that had Continental's loss been as large as 60 cents on the dollar (a recovery rate on assets of only 40 percent), more than ten times either the estimated or actual loss at the time of its resolution, only 27 banks would have suffered losses in excess of their reported capital and become insolvent (U.S. Congress, 1984). These losses would have totaled only $137 million. Another 56 banks would have suffered losses equal to between 50 and 99 percent of their total capital in an amount totaling $237 million. If the Continental's loss had been only 10 cents on the dollar, twice the actual loss, no bank would have suffered a loss greater than its capital and only two banks would have suffered losses in excess of 50 percent of their capital. Banks acted to protect themselves by apparently limiting their exposures and monitoring them. It is thus also unlikely that any of the banks with insured deposits at the Continental would have failed had these deposits been uninsured.

Lastly, dangerous spillover losses to U.S. and some other foreign banks are often cited when the Herstatt Bank in Germany was closed by the authorities in 1974. These banks had entered into foreign exchange transactions with Herstatt. Indeed, "Herstatt risk" has become a generic term to describe cross-border settlement risk for banks. But losses to these banks occurred not so much because of losses at Herstatt, but because the exchange in payments was not simultaneous because of differences in time zones. The counterparty banks paid the mark side of the transactions to Herstatt during its working day, but the German authorities then closed the bank at the close of business in Germany before the Herstatt could make the corresponding dollar payments to the counterparty banks during their business day, primarily in New York many hours later (Eisenbeis, 1995). If the German authorities had waited to the end of the business day in New York before closing the Herstatt Bank, the counterparty losses would have been greatly

reduced if not avoided altogether. Instead, they would have accrued to Herstatt depositors and the German bank deposit insurance fund. Thus, much of spillover from the Herstatt Bank to other banks from these transactions represents government failure, not market failure. Even so, no other bank failed as a result of this debacle.

Except for fraud, bank failures are almost always triggered by adverse conditions in the regional or national macroeconomies or the bursting of asset price bubbles, particularly in real estate (Benston and Kaufman, 1994 and Kaufman, 1998). That is, banks fail from exposure to the same common shock, not from direct spillover from other banks without themselves being exposed to the shock. Post mortems of failed banks in the U.S. indicate that in almost every instance since the introduction of deposit insurance the bank was already economically insolvent for many months and, on occasion in the 1980s, even for years before it was resolved by the regulators.

Sudden unexpected bad news about a particular bank or group of banks appears to ignite a round of reexamination of other banks by market participants to determine their risk exposures. Although deposit flows and stock values of a larger group of banks may be immediately affected adversely, the sorting out process appears to occur relatively quickly. To the extent deposit flows and particularly stock values of innocent banks (i.e., those with high capital or different risk exposures) are adversely affected, they rebound within a day or two so that no significant announcement effects on stock values are observed (Kaufman 1994). Even at the height of the banking crisis and bank runs in Chicago in June 1932 during the Great Depression of 1929-1933, the evidence suggests that liquidity problems and depositor runs rarely, if at all, drove economically solvent banks into insolvency (Calomiris, 1999b; Calomiris and Mason, 1997; and Wicker, 1996). Moreover, almost all the banks that failed during the depression were small unit

banks. While the annual bank failure rate was 6, 11, 8, and 28 percent in 1930, 1931, 1932, and 1933, respectively, the percentage of deposits in these banks was only 2, 1, 2, and 12 percent of deposits in all banks. Benston et al (1986, p. 62) concluded that "these failures occurred primarily because of adverse local business conditions rather than because of spillover from other failed banks outside their market areas." However, as in most previous severe U.S. banking crises, there were runs out of bank deposits and into currency, particularly by smaller depositors, so that the aggregate currency to deposit ratio increased and aggregate bank credit and deposits declined. Nevertheless, few, if any, innocent banks appear to be buried in the graveyard of failed U.S. banks. To the extent contagion exists in banking, at least in the U.S., it appears to be rational and information based ignited by a common shock.

Nor is there empirical evidence that bank failures ignited downturns in the macroeconomy. Rather, at least for the United States, the direction of causation appears to be primarily from downturns in the macroeconomy and the stock market (asset price bubbles) to increases in bank failures (Benston, et al, 1986; Benston and Kaufman, 1995; Mishkin, 1991; and Calomiris and Gorton, 1991). Bank failures, however, are likely to exacerbate the magnitude of the downturns that caused them. Perhaps one of the reasons for the small negative effects of bank failures on other banks and the macroeconomy, at least in recent years in the United States, relative to those feared is the before noted policy of effectively giving depositors at failed banks immediate access to the full amount of their insured funds and the estimated recovery value of their uninsured funds.

In many countries, particularly developing and transition economies, evidence of contagious systemic risk in banking is frequently confused with crises stemming from the freezing, confiscation, or devaluation of bank deposits or the defaulting on bank held government securities by governments. That is, the bank problems frequently arise not from the actions of the banks

themselves in their banking activities, but from the use of the banks by the governments to pursue their nonbanking policies. And when the crises are bank made, they almost always reflect flagrant abuses that were permitted if not abetted by the government and the inability of the government to resolve insolvent banks in a timely and efficient manner. (Whitehouse, 1999, describes such a crisis currently in Russia.) These crises are more accurately defined as government crises rather than bank crises.

There are fewer studies of systemic risk and currency crises and the evidence is less conclusive. The studies suggest that currency crises are ignited more by the performance of other countries through either direct trade or indirect exposure to them through the same or similar third country trading partners than by domestic macroeconomic forces (Eichengreen, Rose, and Wyplosz, 1996 and Glick and Rose, 1998). But these studies do not differentiate between rational and irrational contagion or for indirect exposures between common shock and causation contagion. Moreover, they were generally completed before the recent currency crises in East Asia that appear, at first glance, to be attributable more to domestic forces, such as rapid credit expansion, asset price bubbles, particularly in stocks and real estate, large unhedged short-term foreign currency borrowing by banks, and long-time economically insolvent banks than the previous currency crises studies (Hunter et al., 1999). Indeed, few countries that experienced currency crises appear to have been soundly managed and possessed high reserves relative to their foreign currency liabilities, the risk exposures of their trading partners, or their own macro instability. Other studies, e.g. Frankel and Schmukler (1996), examine correlations among stock price behavior in different countries or among funds specializing in different country stocks. They report high correlations among some but not all country stock prices following major currency

shocks, e.g., the December 1994 Mexican devaluation. Such contagion appears stronger from large countries to small countries than vice-versa and the magnitude of the declines appear related to simple measures of a country's domestic macroeconomic fundamentals. Thus, international common shock contagion, like domestic common shock contagion, appears to be informational and rational. Kaminsky and Reinhart (1998) conclude that historically currency "contagion is more regional than global." From their review of currency crises worldwide from 1821 through 1998, Bordo and Schwartz (1998) find "no evidence of pure contagion" (p. 26). There is no evidence of innocent countries being forced to default on their foreign currency-denominated debt.

VIII. Corrective Policies (Solutions) and Associated Problems

Because systemic risk in banking and finance is widely perceived to be destructive to the aggregate economy, governments have almost throughout history introduced a wide array of public policies intended to reduce the frequency and magnitude of its impact. Indeed, Corrigan (1991, p.3) has argued that it is systemic risk "more than any other factor -- that constitutes the fundamental rationale for the safety net arrangements that have evolved in this (U.S.) and other countries". Because the seriousness of systemic risk is often judged by whether it is information based and impacts only guilty parties or is irrational and nets innocent parties as well, different policy strategies may be appropriate to each type of systemic risk.

If contagious systemic risk is assumed to be information based and affect only guilty parties, then solutions should focus both on strengthening each party's abilities to absorb adverse external shocks, i.e., reduce their vulnerability, and on reducing the magnitude and frequency of any such shocks through appropriate macroeconomic policies. As noted earlier, in the absence of government intervention, the market place will determine the optimal vulnerability of each party.

If deposit or currency values depreciate, losses would be suffered by shareholders, depositors and other creditors in the case of bank failures and possibly by a broader range of participants in the case of exchange rate depreciations. But it is precisely the fear of such losses that encourages participants to protect themselves by reducing their vulnerability. The long-term economic benefits of governments compensating guilty parties ex-post for actual losses or ex-ante guaranteeing (insuring) them against potential losses from bank insolvencies or currency depreciations appears, at best, highly questionable. However, this does not rule out government actions to prevent or offset temporary overshooting of price and quantity adjustments, which frequently occur during the information gathering and processing segments of the sorting out period, through lender of last resort type activities. But the new, post-shock price equilibrium and the extent of overshooting are both difficult to define, and governments at times may unwisely attempt to restore the old pre-shock equilibrium price structure with unfortunate consequences.

If, however, the systemic risk affects both guilty and innocent parties, then a stronger although not airtight case can be made for providing, at least, temporary liquidity assistance to harmed but perceived economically solvent parties to tide them over until the market has recognized their innocence and both prices and flows have adjusted accordingly. But, as argued earlier, there is little if any evidence of severe and lasting damage to innocent parties in either common shock or causation contagious systemic risk, even in the period before government intervention. Moreover, it often appears difficult for governments to differentiate between guilty and innocent parties and, at least, recent history suggests that governments have frequently tended to define innocent rather broadly and often provided assistance to insolvent parties. This tends to delay the adjustment process and increase aggregate costs to the economy. For banks, particularly in the period before the Federal Reserve Bank, monitoring of their interbank

exposures appears to have been practiced seriously. If a bank experienced a significant run, the other banks in the market area, generally operating in concert through the local clearing house, would examine the bank's financial condition to determine whether it was suffering from a liquidity or a solvency problem. If it was only a liquidity problem and the bank was economically solvent, the other banks would effectively recycle the lost deposits back to the bank through loans and interbank deposits. If it was a solvency problem, the other banks would generally not recycle the deposits and permit the bank to fail.

After the Federal Reserve was established, bank monitoring began to change from a private to a public responsibility. The Fed's initial lender of last resort activity through the discount window was supplemented in 1933 by the insurance of at least some bank deposits by the FDIC. But as its ultimate guarantor, the safety net gave the government a direct financial stake in the security of the protected institutions and necessitated regulation to control its potential losses. As Federal Reserve Chairman Greenspan (1999, p. 10) has noted, "the safety net requires that the government replace with law, regulation, and supervision much of the disciplinary role that the market plays for other businesses". Because both the Fed and the FDIC have policy objectives other than protecting the FDIC's funds, they frequently lent to or guaranteed uninsured liabilities of banks experiencing solvency as well as liquidity problems. Nor did they price their protection commensurate with their own risk exposures. This introduced more serious agency and moral hazard problems than is usually permitted by private insurers or guarantors. By delaying both the imposition of sanctions on troubled institutions and the resolution of economically insolvent institutions, bank regulators have often been poor agents both for their healthy, premium paying banks and for taxpayers, who are the ultimate backstop for the insurance funds. The introduction of the safety net effectively transferred the timing of the

resolution of insolvent banks from the market place, which had little if any discretion, to the regulators, who had considerable discretion.

Because large units suffering adverse shocks are perceived to be a greater threat to ignite more damaging systemic risk, governments have been particularly concerned with protecting such units and their stakeholders from serious harm. Such policies are popularly referred to as "too-big-to-fail", even though in some countries, such as the U.S., the firms are generally permitted to fail. In the U.S., the government may at times extend the safety net below depositors and other creditors at very large banks beyond the de jure non-FDIC insured $100,000 per account coverage and protect them against loss. There is also a perception that the U.S. government might intervene in the threatened insolvency of some large non-depository non-FDIC insured financial institutions, such as insurance companies, pension funds, finance companies, and hedge funds, e.g., as it recently did in Long-Term Capital Management. This is particularly likely if banks are among the major creditors and if the unwinding of large and complex derivatives positions may be feared to produce uncertainty and large fire-sale losses. The safety-net is not likely to be stretched under smaller institutions of the same type. In such interventions, the government's concern is likely to be as much on limiting adverse spillover to financial markets as to other institutions. Thus, full protection of stakeholders may be of less concern.

In part because of the safety-net, large banks have failed in the U.S. for the first time in its history, although their depositors may not have suffered losses. In contrast to the pre safety net period in the U.S., when almost all bank failures were small unit banks (in large part because laws and regulations often prohibited branching), the failures since the 1950s include proportionately more larger banks, including some of the very largest. That is, the safety-net has transformed bank failure in the U.S. from primarily a small bank phenomenon to an all size bank phenomenon.

The net has become an "equal opportunity" motivator of bank failures! Bank crises are often costlier now than before the safety-net, even though far fewer banks fail and the costs are borne primarily by surviving banks and on occasion eventually the taxpayer, rather than solely the depositors.

In addition, regulators and governments frequently encourage and even force banks to engage in risky portfolio activities to further their economic, social, or political goals in the form of credit allocation. In the U.S., for example, until the thrift and banking debacle of the 1980s, the government encouraged and at times even forced thrift institutions to channel short-term deposits into long-term fixed-rate residential mortgages. Such policies were possible only because of the simultaneous government guarantees. Absent these guarantees, depositors would have fled from institutions with such large risk exposures and the institutions would have either failed or changed their operating strategy. The policies increased the vulnerability of the institutions and prolonged the length and greatly increased the cost of the recent banking crises in the U.S., Mexico, Japan and many more countries.

Because governments typically underprice the guarantees and insurance that they provide, the insurance and guarantees have encouraged depositors and banks to engage in greater moral hazard behavior than would be permitted by private insurers, whose primary objective is minimizing losses to their shareholders. The increased risk taking by banks in the form of greater credit, interest rate, and foreign exchange rate risk as well as lower capital ratios both increased the likelihood of banking crises and the costs to solvent banks and taxpayers. In addition, the agency problems tend to be greater for government provided insurance than for privately provided insurance. Evidence developed by Calomiris (1999a) suggests that the magnitude of both banking and currency crises has been greater on average in the post-safety net era than before. As a result,

the costs of government policies to restrict systemic risk frequently have exceeded the benefits, although all the costs may not become widely visible until long after any benefits -- reduced runs and supported asset values -- are enjoyed. Such guarantees appear to be a classic example of the time inconsistency problem in economics. The benefits of the guarantees are observed today and the costs only tomorrow Given that the public as well as policy makers generally apply high discount rates to evaluating the present value of future outcomes of policy actions, Kindleberger (1978) appears to be correct when he argues that "today wins over tomorrow."

Nor have countries that have blamed their banking or currency crises on deregulation been very successful in reducing the vulnerability of banking and international finance by reinstating government regulation. If the regulations were effective, they tended to misallocate resources as before. But, because of advances in computer and telecommunications technology, the regulations frequently were ineffective. Once the genie was out of the bottle, it was difficult putting it back in. As has been argued earlier, the initial problem was not so much deregulation per se, but the poor and inappropriate implementation and sequencing before the necessary accompanying legal and regulatory structures had been put in place. (Surveys of recent financial liberalization experiences appear in Williamson and Mahar, 1998 and Eichengreen et al, 1998.)

More recently, public policy strategies to limit systemic risk in banking have focused more on restricting the safety net and attempting to have regulatory discipline resemble market discipline more closely and on limiting if not eliminating losses from bank insolvency through more timely resolution of economically floundering banks before their economic or market value capital turns out negative. Contagious systemic risk can only transmit insolvencies if the losses at each and every party on the transmission chain exceed their capital. If banks are resolved before their market value capital turns negative, systemic risk transmitting losses is eliminated. These

corrective structures have been termed names such as "prompt corrective actions" and "least cost resolution". In the U.S., they were enacted in varying and yet unknown degrees of effectiveness in the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991 (Benston and Kaufman 1988, 1994, and 1997 and Kaufman, 1997).

Policies similar to those applied to banks have been used to deal with currency crises. But, because domestic governments cannot print the currencies of other countries, purchases of domestic currency with foreign currency to maintain exchange rates and the provision of guarantees of foreign currencies effectively require the assistance of one or more other countries or of multinational international organizations. Through time, as with banks, such support was first provided by private parties, generally bankers, and then by foreign governments (Bordo and Schwartz, 1998). Most recently, it has been provided by official international institutions, such as the IMF, World Bank, and regional development banks. For example, in Mexico in 1994, the IMF guaranteed dollar denominated Mexican government securities and in Korea in 1997, dollar denominated deposits at Korean banks. These policies have been subjected to the same criticisms as have been leveled at the similar bank policies. They increase moral hazard behavior by countries and private investors that in turn increases the vulnerability of the international sector to future shocks and international institutions are unable to differentiate among guilty and innocent parties and too often support guilty parties. Moreover, the evidence is unclear whether the financial assistance provided by official international institutions in the long run benefited primarily the recipient country or the foreign currency investors by providing them additional time to exit with no or smaller losses than otherwise. If the loans to countries are not paid back by the same parties that benefited directly from them, as with bank insolvencies, the repayment represents a transfer payment from domestic taxpayers to the beneficiaries, often foreign investors.

Corrective policies, appropriate or inappropriate, are more difficult for currency crises than banking crises for at least two reasons. One, countries are sovereign and it is difficult for other countries or international organizations to impose enforceable conditions on them without their cooperation and agreement. This is evidenced by the frequent disregard of the IMF's conditionality requirements by assisted countries or the "dumbing down" of the conditionality features as the assisted countries protest their perceived harshness. Two, as noted, international organizations are not central banks that can print unlimited quantities of the currency of any country. They can only borrow other countries' currencies in limited quantities. Thus, the assistance packages often include the worst of all worlds. They are too small to prevent a devaluation or mitigate most of its effects, but too large to avoid moral hazard responses and increase the likelihood and costs of future crises in that or other countries.

Many of the more recent capital inflows into developing countries were undertaken on the perception of government or international institution guarantees and would likely have been significantly lower had such perceptions not existed. But, even smaller capital flows from one or more larger countries can swamp the economies of smaller countries and cause substantial pressures on their exchange rates in rapidly changing directions that could damage even well managed countries. Short-term international capital flows to emerging economies are considerably more volatile than long-term flows. This is evident from Figure 3, which shows bank loans, which are primarily short-term, and securities issuances, which are primarily longer-term, and from Figure 4 for investments other than long-term direct and portfolio. Indeed, direct international investment has been relatively stable in recent years. As a result, some propose restricting only "bad" short-term capital inflows and not "good" long-term (portfolio and direct) capital inflows. However, as argued earlier, this may increase risk taking by private and government debtors by

reducing the threat of foreign investors disciplining them on a timely basis by withdrawing their funds.

Government policies to combat systemic risk are undertaken primarily because private policies are perceived to be inadequate. Failures are considered too frequent and too costly. But the evidence suggests that for neither banking nor currency crises do government or regulatory policies necessarily produce more efficient and less costly solutions in the long run. Indeed, while government (regulatory) failure may be less frequent, primarily because of the government's ability to disguise (cover-up) failures better and covertly finance them longer, when government failure does occur or the failure is officially recognized, it tends to be both more severe and longer lasting than private market failures. That is, alleged market failures are likely to be more frequent but less severe than government failures. Moreover, the frequency of small failures often prevents larger failures later by increasing the alertness of the involved parties. Thus, government policies to offset or prevent failures may unintentionally encourage larger private or government failures in the future and be counterproductive on net.

In summary, a number of difficulties plague the use of government policies to prevent or mitigate systemic risk in either banking or balance of payments without introducing counterproductive and harmful longer-term effects. These include problems in:

- Differentiating innocent (economically sound) parties or sectors that require only temporary liquidity assistance from guilty (economically unsound) parties or sectors that require longer-term support that if provided could often fail to lead to recovery, delay adjustment, result in substantial misallocations of resources, and increase losses in the longer run. Governments and bank regulators may have more timely and superior information about troubled banks in emerging economies, but not necessarily in industrial countries. Thus, at least in industrial

countries, it may be more efficient to provide liquidity assistance indirectly through open market operations and let the market allocate the funds to perceived solvent parties than to attempt to do so directly to the government perceived solvent banks through the central bank's discount window or otherwise (Kaufman, 1991 and Capie, 1998). This would also ease the pricing problem noted below.

- Determining the correct amount of any assistance
- Avoiding political considerations and interference
- Delaying necessary actions that could harm powerful political groups or government allies
- Discouraging excessive moral hazard behavior
- Discouraging adopting simple and intuitively appealing but ineffective policies, such as restoration of banking or currency controls, that, although they were inefficient and ultimately motivated the deregulation, concealed the problem for some time
- Introducing fundamental structural legal reforms that are necessary for market discipline to be effective

IX. Long-Term Solutions

The most feasible long-run solutions to systemic risk in both banking and exchange rates lie with increased reliance on market forces and market discipline. But this does not imply either that there will not be failures -- indeed these are likely to be relatively frequent but small crises -- or that there is no role for government policies. Government policies may be required to improve the effectiveness of market discipline, particularly if other government policies have weakened the incentives for such discipline, including encouraging the collection and timely disclosure of accurate information and use of accounting principles that the market would otherwise require. Indeed, often the governments themselves have not only hampered disclosure by private parties

such as banks but have withheld the disclosure of their own data or distorted it. For banks, policies to offset government sponsored reductions in market discipline would include requiring values of capital ratios that the market would require in the absence of guarantees. As noted earlier, the evidence strongly suggests that banks and other financial institutions that are perceived to be insured operate with lower capital ratios than their noninsured competitors. This makes them more vulnerable to shocks than the market believes is appropriate. The higher the leverage, the smaller need be the shocks that produce insolvency.[6] Moreover, the capital shortfall may be even greater if, as is often argued, the market prices (requires capital for) only the potential failure of the individual bank and does not take into account the costs of potential negative systemic risk or contagion externalities.

Government guarantees may actually increase the magnitude of the shocks that banks may experience, as banks may shift into riskier assets, such as commercial real estate loans. These assets are riskier because credit, market, and liquidity shocks are more frequent and larger for these assets than for many other bank assets and the banks often fail to diversify these risks away. Excessive concentrations of such risky assets on the books of the banks help explain the reason for the large number of recent banking crises worldwide from the U.S. to Latin America to Japan to other countries in East Asia. Likewise, the guarantees have likely encouraged banks in many countries to increase their short-term borrowings in foreign currencies on an unhedged basis.

[6] Federal Reserve Chairman Alan Greenspan recently warned that increases in volatility (shocks) may require higher capital ratios for all firms in the U.S.

> Moreover, contagion is clearly enhanced by leverage, and while leverage is not demonstrably greater today than in earlier post World War II decades, the degree of leverage that was viable then apparently no longer appears appropriate in today's more volatile financial environment. If financial asset prices are more variable, firms need to protect themselves against unexpected adverse market conditions by having more robust financial structures. (Greenspan, 1998.)

The evidence from recent currency crises clearly highlights the key role of government protected economically insolvent banks in fostering the underlying economic conditions that precipitated the speculative runs and eventual depreciation of the currencies by financing unsustainable increases in real estate and stock market prices (Adams, 1998; BIS, 1997 and 1998; IMF, 1998a and b). These banks were able to do this as they were not exposed to full market discipline until the government guarantees lost their credibility. By that time, it was too late. In addition, state owned and controlled banks are rarely subject to market discipline and, as effectively arms of government policy in allocating credit to targeted sectors, are notorious for badly misallocating credit (Kaufman, 1999). The banking problems in transitional economies are attributable largely to loans to insolvent state-owned or controlled and recently poorly privatized enterprises and, in Russia, to finance securities and foreign exchange speculation.

To enhance the role of market discipline for larger banks in an environment of partial government guarantees, they should be required to issue a minimum percentage of term debt of a relatively short maximum maturity that is subordinated to the government's claim. These claimants have only limited upside potential relative to their downside risk and, because they cannot run, may reasonably be expected to monitor their banks carefully. This would supplement monitoring and discipline by both shareholders and regulators (Benston and Kaufman, 1998).

In addition, most governments can greatly upgrade the quality, prestige, and independence of their bank supervisors. Supervisors must be able to understand the nature and consequences of bank activities and have the respect and authority of the bankers in order for their reports and recommendations to have credibility and be evaluated seriously. This also requires that they be adequately compensated relative to the bankers that they supervise.

Moreover, in some countries, the guarantees are perceived to extend beyond banks and other financial institutions to other major firms. Thus, corporate leverage ratios in general are at levels vastly inconsistent with the degree of macro instability in the economy, e.g., in Korea and Thailand, where the debt to equity ratios are four to five times the levels in the U.S. and much of Western Europe (Figure 5 and Table 6), and are possible only because of the perceived guarantees It does not take much of an adverse shock, at times only a slowdown in growth rates or small increases in interest rates, to drive these firms into insolvency. And if the government protects share holders as well as debt holders, little if any market discipline will exist. These countries require the introduction or intensification of an equity culture, in which losses as well as profits are privatized.

As with banks, the perception of foreign currency guarantees by domestic governments or official international organizations is likely to discourage both investors from conducting as thorough credit evaluations and monitoring of foreign banks and other foreign debtors as otherwise and governments from maintaining as high foreign reserve positions to protect a fixed or semi-fixed exchange rate as otherwise. Whether a country should adopt a fixed (pegged), semi-fixed, currency board, or floating exchange rate structure or even abandon its own currency and adopt that of another country is beyond the scope of this paper. Suffice it to note the currency crises are less likely almost by definition under floating or flexible exchange rate regimes, but may still occur if the shocks cause significantly larger deprecations in exchange rates than is expected.

As discussed in the previous section, governments need to put in place the legal, cultural, social, and political structure that permits markets and market discipline to operate efficiently. A poorly designed or partially implemented structure is likely to be counterproductive and, if proven ineffective, likely to discourage further experimentation with market solutions.

Governments can greatly reduce the damage from and thus also the fear of bank failures and systemic risk without reducing the benefits of the exit of unprofitable banks very simply by not freezing bank deposits at failed banks. Depositors should be provided with immediate (or next day) access to the full amount of their explicitly insured funds and the estimated recovery value of their explicitly uninsured funds. This should not delay or interfere with the simultaneous transfer of ownership to the parties willing to recapitalize the insolvent banks or with the orderly liquididation of the bank, if necessary. This will minimize any disruptions of bank failures to the marketplace.

Lastly and perhaps most importantly, governments can reduce the likelihood of systemic risk and crises in both banking and exchange rates by pursuing stabilizing macroeconomic policies that reduce the frequency and magnitude of adverse shocks. This is easiest for larger diversified industrial countries and most difficult for smaller, open, undiversified, developing countries. The less able a government is to stabilize its economy, the more it must require its banks to be protected by capital and its exchange rate to be protected by foreign reserves or be prepared to permit the rate to float.

X. Summary and Conclusions

Costly banking and currency crises have plagued most countries in recent years, reducing their GDPs and causing sizable transfer payments among domestic sectors. Considerable time and effort have been devoted to identifying the causes of these twin crises and developing solutions to reduce both the probability of their occurrence in the future and their severity if and when they do occur. To date, these tasks have been hampered because the two types of crises were typically analyzed by different types of economists. Banking crises were primarily analyzed by microeconomists and currency crises by macroeconomists. Often the two sets of researchers did

not consult with each other or share the results of their analyses. Yet, the two types of crises have a number of common characteristics and are frequently interconnected, so that one may ignite the other. This paper attempts to develop a common framework for analyzing both types of crises, applies the framework to recent banking and currency problems, clarifies a number of terms frequently associated with these crises, such as systemic risk and contagious transmission of shocks, evaluates the historic evidence, and develops some potentially workable long-term solutions.

The banking and international sectors of economies are widely perceived to be fragile. But fragility per se does not automatically imply breakdowns. Before government guarantees, market forces, at least for banking in the U.S., permitted the perceived fragility to exist because, contrary to widespread belief, breakdowns were relatively infrequent and low cost, at least to bank depositors, in comparison with breakdowns in perceived less fragile sectors. Thus, fragility must be judged relative to the frequency and magnitude of adverse shocks that may be expected to impact the sector. The low bank cash and capital ratios and high demand deposit ratio generally viewed as signs of fragility were, however, deemed sufficient by the market to withstand the expected shocks. Nevertheless, despite the low relative fragility, bank breakdowns and failures did occur and, although on average not more frequent that nonbank failures, tended to occur in clusters. This pattern, as well as that banks create much of what serves as money and that their services are used by a large percentage of the population, generated widespread fears of systemic risk and broader and more costly damage.

In response, government guarantees were often introduced that protected at least some bank claimholders. But the guarantees were generally poorly designed. As a result, they frequently increased rather than decreased the relative fragility of these sectors, so that subsequent

breakdowns were frequently more serious and costly. But at least part of the cost was shifted from bank depositors to the insurance agency, so that the cost was less visible. In addition, because broad and efficient domestic and international financial institutions and markets are widely perceived to be conducive to more rapid economic growth and development, many countries in recent years introduced programs of financial deregulation and liberalization to increase the influence of market forces and encourage greater efficiency. Unfortunately, these changes were often introduced before the underpinnings that permit market forces to operate efficiently and successfully were fully in place. In the absence of both effective market and effective regulatory discipline, breakdowns increased in frequency and magnitude.

Attempts to reduce the frequency and severity of breakdowns through government provided safety-net and guarantee programs frequently encountered time inconsistency problems. Through time, the cure was often worse than the disease. The paper argues that lasting solutions need both to avoid these difficulties and to be incentive compatible. With respect to banks, adverse moral hazard and principal-agent problems associated with government guarantees may be reduced by limiting the guarantees so as to introduce partial market discipline and by designing a structure of regulatory discipline that both mimics market discipline and offsets the declines in market discipline that the regulation itself may introduce. This is likely to include increasing bank capital ratios to values that are closer to those maintained by their competitors that are not subject to the same government guarantees. Moreover, government ownership or intervention that, in the presence of the guarantees, encourage the misallocation of resources and the financing of speculative price bubbles in real estate and the stock market that in turn increase the frequency and magnitude of bank insolvencies need to be reduced dramatically, if not eliminated altogether.

Ironically, given limited government-provided guarantees, increased emphasis on market

discipline requires that governments significantly upgrade the quality, prestige, and independence of their bank supervisors both to monitor the condition of the banking system and to implement appropriate sanctions on troubled institutions on a timely and effective basis before the banks reach insolvency. A system of mandatory regulatory prompt corrective action and least cost resolution based on the provisions included in FDICIA in the U.S. could serve as an anchor. To improve market discipline, it is also necessary in some countries to establish or strengthen an equity culture in which losses as well as profits are privatized, rather than only profits and losses socialized. This requires putting in place the legal, cultural, social, and political structures that permit markets and market discipline to operate effectively.

Similarly for currency or exchange rates problems. Fragility may be measured by financial ratios similar to those for commercial banks and must also be evaluated relative to the frequency and magnitude of expected adverse shocks. These shocks may reasonably be expected to differ from country to country, so that the values of the financial ratios necessary to avoid breakdowns would also vary from country to country. Guarantees by either the domestic government or official international organizations that eliminate entirely or even significantly reduce potential losses to creditors if the domestic currency is depreciated have as often eventually contributed to depreciations and their associated problems as have prevented them. Just as greater capital is required to protect banks in a world of explicit or implicit guarantees, greater international reserves are required to protect exchange rates, particularly fixed exchange rates. To reduce the likelihood of exchange rate breakdowns, increased emphasis must both be transferred to market forces to discipline wrongdoers and be placed on stabilizing macroeconomic policies to reduce the need for guarantees that delay and disguise the adverse implications of poor policies.

It is particularly important to maintain stability in both the banking and exchange rate

sectors as instability in one can ignite instability in the other. Banking crises can trigger runs from near-insolvent or insolvent but depositor protected banks to deposits at safe domestic or foreign banks. To the extent these runs are into deposits denominated in foreign currencies, they exert downward pressures on exchange rates. Currency crises can trigger banking crises when governments try to protect their currencies from depreciation by selling foreign currencies. This reduces their foreign reserves and may result in a multiple contraction in bank credit and deposits. If the government permits a depreciation, the financial health of banks is threatened by increasing the cost of foreign currency debt of unhedged banks and bank loan customers. The latter's exchange rate risk becomes the banks' credit risk. The evidence suggests that banking crises are more likely to trigger currency crises than vice-versa.

Systemic risk for both banking and exchange rates appears to be more serious in perception than in reality. The historical evidence suggests that direct causation contagion rarely if ever occurs. Common shock contagion occurs more frequently, but primarily on a rational, information based basis. Banks and countries with similar risk exposures to those of the bank or country experiencing the initial adverse shock will also be adversely affected. But to the extent that neither information nor processing of information is either free or immediate, innocent banks or countries may be impacted temporarily during the sorting out period. However, the effect is rarely sufficiently strong to drive innocent banks into insolvency or depreciate innocent countries' currencies permanently. Rather than providing guarantees and safety-nets, the public interest is better served if public policy were directed at reducing the time required for market participants to sort out the innocent from the guilty parties and the costs of doing so. Indeed, governments can start by removing barriers that they themselves have frequently imposed on the timely disclosure of data that the market would otherwise demand, including the governments' own

tendencies to delay dissemination of their own data and even to distort it.

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Table 1

COSTS OF CRISES IN LOST OUTPUT RELATIVE TO TREND
1975-1978

	Number of Crisis	Average Recovery Time[1] (in years)	Cumulative Loss of Output per Crisis[2] (in % points)	Crisis with Output Losses[3] (in %)	Cumulative Loss of output per crisis with Output Loss[4] (in % Points)
Currency crises	158	1.6	4.3	61	7.1
Industrial	42	1.9	3.1	55	5.6
Emerging market	116	1.5	4.8	64	7.6
Currency crashes[5]	55	2.0	7.1	71	10.1
Industrial	13	2.1	5.0	62	8.0
Emerging market	42	1.9	7.9	74	10.7
Banking crises	54	3.1	11.6	82	14.2
Industrial	12	4.1	10.2	67	15.0
Emerging market	42	2.8	12.1	86	14.0
Currency & Banking crises[6]	32	3.2	14.4	78	18.5
Industrial	6	5.8	17.6	100	17.6
Emerging market	26	2.6	13.6	73	18.8

[1] Average amount of time until GDP growth returned to trend. Because GDP growth data are available for all countries only on an annual basis, by construction the minimum recovery time was one year.

[2] Calculated by summing the differences between trend growth and output growth after the crisis began until the time when annual output growth returned to its trend and by averaging over all crises.

[3]Percent of crises in which output was lower than trend after the crisis began.

[4]Calculated by summing the differences between trend growth and output growth after the crisis began until the time when annual output growth returned to its trend and by averaging over all crises that had output losses.

[5]Currency ′crashes′ are identified by crises where the currency component of the exchange market pressure index accounts for 75 percent or more of the index when the index signals a crisis.

[6]Identified when a banking crisis occurred within a year of a currency crisis.

Source: International Monetary Fund, World Economic Outlook: May 1998, p. 79

Table 2

ESTIMATED TRANSFER COST OF SELECTED BANKING CRISES[7]

Country	Period	Estimated Cost / GDP (Percent)
United States	1980s	2.5
Japan	1990s	20.0p
Norway	1987-89	4.0
Spain	1977-85	16.8
Sweden	1991	6.4
Bulgaria	1990s	14/0
Hungary	1991-95	10.0
Israel	1977-83	30.0
Mexico	1990s	12-15
Argentina	1980-82	55.3
Argentina	1989-90	13.0
Brazil	1994-1995	5-10
Chile	1981-83	41.2
Uruguay	1981-84	24.2
Venezuela	1994-95	18.0
Turkey	1982-85	2.5
Finland	1991-94	8.4
Korea	199x	60.0p
Indonesia	199x	80.0p
Thailand	199x	45.0p
Malaysia	199x	45.0p

Includes all depository institutions, costs are to governments and depositors
p Preliminary

Sources: Caprio Jr. and Klingebiel , Lindgren, Garcia and Saal; Rojas-Suarez and Weisbrod; Wall Street Journal, October 22, 1998 and July 27, 1999

Table 3

SYSTEMIC RISK: A COMPARISON OF PERCEIVED EFFECTS FROM BANKING AND CURRE

BANKING	CURRENCY (FOREIGN EXCH
1. Triggering (Crisis) Event	
· Large bank(s) insolvency · Run on bank(s)	· Sharp depreciation in exchange rate of global economically important country, generally on exchange rate standard or with currency boar · Run (speculative attack) on currency
2. Sector Vulnerability	
· Low cash to assets (fractional reserve banking) · Low capital to assets (high leverage) · High demand to total deposits (high potential for run)	· Low international reserves to foreign currency · Low foreign currency assets to foreign currency banks), (low convertibility) · High short-term to total foreign currency debt*
3. Potential Dangers	
· Clustering of bank runs and/or failures (contagion); spillover to "innocent" banks via liquidity problems · Reduces credit availability · Reduces money supply • Reduces efficiency of payments system overshooting · Increases uncertainty, ignites panic and overshooting in price and quantity adjustments · Spillover beyond banks to financial system and macro-economy · Ignite currency problem · Reduces GDP	· Increases import prices and · Default on foreign currency debt · Increases uncertainty · Ignite banking problem · Reduces GDP · Decreases political stability · Transnational clustering of currency depreciat · Spillover to "innocent" countries via liquidity · Disrupts international capital flows

* In countries without capital controls, short-term domestic debt can easily and quickly be converted into short-term foreign currency debt
rates or with currency boards, at existing exchange rate when currency is under pressure.

BANKING	CURRENCY (FOREIGN EXCH
4. Type (Definition) of Systemic Risk	

· Big shock
· Chain reaction causation contagion (direct linkage among banks through interbank deposits, loans and clearings)
· Common shock contagion (similar risk exposures)
  · Informational (rational) -- no innocent victims
  · Noninformational (random) -- innocent victims
	· Big shock
	· Chain reaction causation contagion (direct linkage am through same third country markets)
	  · Common shock contagion (similar risk exposu third country exposure, political system)
	  · Informational (rational) -- no innocent victim
	  · Noninformational (random) -- innocent victims

5. Transmission (Channels)	
· Banks interconnected • Banks have same or similar markets · Banks highly leveraged (low capital)	· Countries interconnected · Countries with same or similar third markets · Countries with small international reserves · Portfolio rebalance
6. Requirements for Contagious Systemic Risk	
· Transmission mechanism (interdependence) · Losses greater than capital at all institutions along chain · Opaqueness - participants have difficulty in distinguishing "innocent" (liquidity problem) from “guilty” (solvency problem) banks	· Transmission mechanism (interdependence) · Foreign reserve losses sufficiently large relative · Opaqueness - participants have difficulty in dis from "guilty" countries
7. Victims	
· Innocent -- economically solvent banks experiencing liquidity problems from spillover from problems at other banks · Guilty – economically insolvent banks	· Innocent -- economically sound macroeconomie ward pressure on exchange rates from spillover countries (economically “solvent” countries exp problems from spillover) · Guilty – economically unsound macroeconomie

BANKING	CURRENCY (FOREIGN EX
8. Recent Changes in Environment	
· Increased interconnection with other banks through off-balance activities · Technological advances that permit funds to be transferred faster and more cheaply	· Wider use of flexible exchange rates · Technological advances that permit funds to b countries quickly and cheaply · Large increase in international capital flows re
9. Historical Evidence of Contagious Systemic Risk	
· Chain reaction causation -- little, if any · Common shock -- yes · Informational -- yes, in short- and long-run · Noninformational (random) -- yes, in short-run no, in long-run · Not much lasting damage to innocent banks. No liquidity problems causing solvency problems	· Chain reaction causation -- ? · Common shock · Informational -- yes, in short- and long-ru · Noninformational -- yes, in short run no, in long-run · Not much lasting damage to innocent countrie rate depreciation for sound economies
10. Corrective Policies	
· Private -- interbank loans to economically solvent banks experiencing liquidity problems • Public -- government loans to economically solvent banks experiencing liquidity problems, increase liquidity to aggregate economy to offset reduction in bank reserves, or guarantee some or all bank deposits · Rollback deregulation	· Private – Loans from private parties in other c experiencing downward pressures on exchang economically sound · Public – loans from other countries or official internati to countries experiencing downward pressures economically sound · Rollback liberalization, restore capital controls
11. Problems with Government (Public)Policies	
· Difficult to identify economically solvent from insolvent banks and loan only to solvent banks experiencing liquidity problems · Amount of assistance difficult to determine	· Difficult to determine liquidity problems from i loan only to economically sound economies · Correct amount of assistance difficult to deter · Correct pricing difficult to determine

BANKING	CURRENCY (FOREIGN EXCH

· Correct pricing of assistance difficult
· Tendency to exaggerate magnitude of problem by government
· Not free of political considerations
• Encourages future moral hazard behavior and increase vulnerability
  · By banks - lower capital and greater portfolio risk
  · By depositors - less monitoring and discipline
· Rollback deregulation likely to be ineffective and when effective, misallocate resources. Deregulation response to earlier problems, probably sequenced poorly.
	· Not free of political considerations
	· Tendency to exaggerate magnitude of problem
	· Encourages future moral hazard behavior and
	· By country – reduce reserves and increase shor in unhedged foreign currencies
	· By private investors - reduce monitoring and
	· Restore capital controls likely to be ineffective misallocate resources. Likely poor sequencing

12. Long-Term Solutions

· Increased reliance on private market discipline · Increased disclosure by reducing regulatory confidentiality and inappropriate accounting practices · Increase required capital ratios to competitive noninsured institution levels and consistent with macroeconomic instability • Encourage use of subordinated debt · Improved bank supervision, particularly improved supervisory prompt corrective action and closure policies · Restrict government guarantees to only “small” depositors · In developed countries, restrict central bank financial assistance to open market operations · Improve macroeconomic stability and avoid asset price bubbles · Appropriate sequencing of deregulation	· Increase disclosure of bank and official financia · Require country holdings of international rese macroeconomic instability and exchange rate · Provide official support only if private investor depreciation (no bailout of private investors di · Improved domestic macroeconomic stabilizatio · Strong and solvent banking system · Appropriate sequencing of capital liberalization · Official liquidity assistance only if recipient cou meaningful reform and as long as reforms imple · Improved legal property rights and bankruptcy

Table 4

FOREIGN EXPOSURE OF BANKS AND FINANCE COMPANIES

	Ratio of Foreign Liabilities to M2			Ratio of Foreign Liabilities to Assets		
	1990	1994	1996	1990	1992-96	1996
Indonesia	1.2	7.0	3.2	108	193	143
Rep. of Korea	4.4	8.3	14.1	140	149	174
Thailand	6.1	25.1	32.8	265	519	775
Argentina	33.7	10.1	9.5	313	197	158
Brazil	20.6	10.0	17.3	207	177	282
Mexico	55.3	66.8	44.7	901	750	498

Source: World Bank, Global Economic Prospects, 1998-99: Beyond Financial Crises, p. 66.

Table 5

MATURITY STRUCTURE OF EXTERNAL DEBT: SELECTED COUNTRIES, JUNE 1997 (MILLIONS U.S. DOLLARS)

Country	Total	Up to One Year	One to Two Years	Over Two Years	Unallocated	Percent Short (<=1)
Venezuela	12,148	3,629	421	6,717	1,381	29.9
Hungary	10,851	4,018	964	3,653	2,216	37.0
Colombia	16,999	6,698	1,423	8,503	375	39.4
Chile	17,573	7,61 S	673	8,698	587	43.3
Mexico	62,072	28,226	2,659	24,647	6,540	45.5
Poland	9,249	4,274	436	3,223	1,316	46.2
Slovak Republic	3,656	1,710	304	1,514	128	46.8
Turkey	25,060	13,067	2,516	8,087	1,390	52.1
Czech Republic	11,378	6,078	967	3,508	825	53.4
Argentina	44,445	23,891	1,662	15,207	3,685	53.8
Russia	69,091	38,308	3,811	24,959	2,013	55.4
Malaysia	28,820	16,268	615	8,248	3,689	56.4
South Africa	22,889	13,247	1,249	6,132	2,261	57.9
Phillippines	14,115	8,293	326	4,001	1,495	58.8
Indonesia	58,726	34,661	3,541	17,008	3,516	59.0
Brazil	71,118	44,223	2,193	19,555	5,147	62.2
Thailand	69,382	45,567	4,592	16,491	2,732	65.7
Peru	8,013	5,368	278	1,946	421	67.0
Korea	103,432	70,182	4,139	16,366	12,745	67.9
Uruguay	4,370	3,020	104	1,196	50	69.1
Hong Kong S.A.R.	222,289	183,115	4,417	24,974	9,783	82.4
Taiwan Province of China	25,163	21,966	236	2,598	363	87.3
Singapore	211,192	196,600	1,719	9,818	3,055	93.1

Source: Barry Eichengreen, Michael Mussa, et. Al., Capital Account Liberalization (Occasional Paper 172), IMF, 1998, p. 57)

TABLE 6

LEVERAGE RATIOS FOR NONFINANCIAL FIRMS AT OECD COUNTRIES, 1993[1]

Country	Percent
Austria	141
Belgium	147
Canada	109
Denmark	119
Finland	176[2]
France	36[2]
Germany	58
Italy	336
Japan	388
Korea	313
Netherlands	127[2]
Norway	279[2]
Spain	164
Sweden	203[2]
United Kingdom	46
United States	112[3]

[1] debt / equity.
[2] 1992.
[3] From other sources, ranges up to 250 percent.

Sources: OECD Countries -- Organization for Economic Cooperation and Development, OECD Economies at a Glance, Paris, 1996; Korea -- Bank of Korea webpage - Statistics of the Korean Economy: Business Management (http://www.bok.or.kr/kb/index-e.html) June, 1998.