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THE FINANCIAL FIREFIGHTER'S MANUAL

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Johns Hopkins Institute for Applied Economics,
Global Health, and the Study of Business Enterprise
&
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The Financial Firefighter's Manual

By Kurt Schuler

About the Series

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Abstract

Apparently no up to date compilation exists of the various measures governments and the private sector have undertaken to address economic crises, especially financial crises. This paper tries to provide an overview that is comprehensive but brief. It is not an exhaustive analysis of crises, but rather an aid to thinking about how to respond to them, especially at their most acute.

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Introduction

Apparently no up to date compilation exists of the various measures governments and the private sector have undertaken to address economic crises, especially financial crises. This paper tries to provide an overview that is comprehensive but brief. It is not an exhaustive analysis of crises, but rather an aid to thinking about how to respond to them, especially at their most acute.

An economic crisis is a severe, sudden upset in any part of an economy. A financial crisis is a severe disturbance to financial markets, associated typically with falling asset prices and insolvency or at least illiquidity among debtors and intermediaries, which ramifies through the financial system, disrupting the market's capacity to allocate capital within the economy. (There are no standard definitions for what constitutes an economic or financial crisis, but the ones I have given include elements many other writers include.)

Financial crises come from suddenly readjusting asset values that now seem mistaken, plus lacking adequate reserves to maintain the previously expected path of activity. In financial crises, many more people and firms than usual find themselves short of liquid assets. They cannot sell

the assets they have except at much lower prices than before. To reduce their risk of bankruptcy, they curtail their activity. On a large enough scale, doing so reduces, or at least reduces the growth rate of, overall economic activity. Financial markets experience a shock adapting to the new circumstances. If severe enough, the shock may cascade to affect output or consumption of goods and services, because neither financial markets nor markets for goods and services are frictionless.

Crises unfold in two basic patterns: the hill (boom-bust) and the cliff (stable/shock). In the hill, prices rise steeply in the buildup to the crisis, reach what in retrospect we consider a peak or trigger point, then drop steeply in the crisis phase as the expectations that drove the buildup reverse. Real estate, stock market, and commodity booms and busts often follow this pattern. In the cliff, formerly stable prices suddenly drop. The classic example is the devaluation of a pegged exchange rate; another example is real estate values after a natural disaster. For both the hill and the cliff, typical features of the bust phase besides falling prices include high volatility, low liquidity, credit crunches, and business failures. A third pattern, the steady deterioration, may be punctuated by crises, but in itself lacks the suddenness that characterizes a crisis.

(Why don't financial crises happen when prices are rising? The answer is that they do, but they are rarer. Sharply rising oil prices have triggered recessions in oil-importing countries. Rising prices for financial assets may trigger recessions if they lead to bankruptcies among important speculators who have been shorting those assets, although no examples come to mind.)

It is useful to think about crises as arising from one or more of several sources. Different sources often call for different responses to address problems.

- Inadequate risk management, for example the failure of many investors in U.S. mortgage-backed securities before 2007 to understand the extent of default risk.
- Wrong incentives, such as behavior predicated on the privatization of gains but the socialization of losses.
- Macroeconomic trends, such as a large, unexpected drop in the price of a major export.
- Corruption hidden then uncovered, as in Albania's pyramid schemes that collapsed in 1997.
- Surprise political events, such as those that snowballed from the assassination of Archduke Franz Ferdinand to a general European war five weeks later in 1914.
- Unexpectedly severe natural disasters: a recent example is Hurricane Maria in Puerto Rico in 2017, the strongest storm to hit the island in nearly 90 years.

Financial crises are at least 2,000 years old. The ancient Roman historian Tacitus records in his *Annals* a crisis that occurred in 33 A.D. An old law, no longer enforced, required that financiers who wished to lend at interest had to invest part of their funds in Italian land. Renewed enforcement of the law led to a credit crunch as financiers called in loans to invest in Italian land. The emperor Tiberius ended the credit crunch by making available a large sum in three-year, interest-free loans to borrowers with good collateral. The Roman crisis had a regulatory angle, spillovers from one market into others, and resolution by a lender of last resort. The 2007-09 financial crisis also had those features, so there is no reason to think that we are immune from similar crises in the future. My reading of financial history is that bubbles are to some extent

unavoidable. Short of eliminating financial markets, as centrally planned economies have done, bubbles will always be with us because financial markets transmit and coordinate expectations.

A wide variety of policies, even those that look like opposites, can be successful in ending crises depending on the circumstances. For instance, floating the exchange rate has ended some currency crises, but so has fixing the exchange rate. Not all measures work equally well, though. I offer my judgment of the theoretical rationales for various measures and their performance in practice, where I have a good sense of their history. Some approaches have not been used for a long time, and a few are purely theoretical so far.

Some general points about responding to crises

Ted Truman, a former Treasury and Federal Reserve official, has summarized his experience in observing and taming crises in these words:

First, serious crises are tamed, in the end, by a multipronged set of responses. Early searches for simple, one-dimensional solutions fail. Success comes only after a comprehensive, multipronged approach is adopted. Second, serious crises require the application of overwhelming force. Half-measures are insufficient to arrest their evolution. Third, the principal obstacle to applying the first and second lessons is the political and institutional context in which the crisis itself unfolds. The evolution of any crisis is highly path dependent. (Truman 2009)

Here, in no particular order, are some further useful general points that other writers on crises have made.

Crises are often a process of discovery and dissemination of knowledge about weaknesses. Uncertainty about who is affected and to what extent creates a contamination of reputations that makes the crisis worse. Reporting standards that reveal who is weak and who is strong can end the contamination, reducing the crisis. Note however that sometimes judicious opacity, for instance through temporary regulatory forbearance, calms a crisis.

There are near-crises avoided by prompt action that would be worth studying in a longer treatment than this one. One example is the brief U.S. stock market crash of October 1987.

Trading flows are often small compared to the stocks of assets in question. Although most of the assets remain untraded even in a crisis with heavy volume, policymakers should remember that their actions affect the valuation of stocks many times larger than the flows they see.

Policy makers should know what legal authorities to address crises they have and how capable of addressing crises the government bureaucracy is. One way to test knowledge and capabilities is to do crisis simulations via tabletop exercises.

The two worst financial crises of the last hundred years were deflationary: the Great Depression and the Great Recession. Avoiding sharp falls in nominal spending should be a key consideration for monetary policy.

The response to a crisis should have economic coherence and, if possible, broad political support. In the present, a rescue package needs to operate in a disciplined budgetary framework that avoids transferring large amounts of wealth up the income scale. For the future, incentives need to be such as to discourage future imprudent behavior. One example is tying compensation of top managers of financial institutions to a longer horizon than this quarter, giving them more skin in the game of the long-term success of their institutions.

New financial institutions or instruments are often at the heart of crises because they create unfamiliar complexities. Similarly, in emerging markets and some advanced economies, crises have often occurred during the liberalization of transactions on the capital and financial account. Large flows of capital, not previously allowed, have created risks that market participants and policy makers have not had experience in handling. Changes in desired stocks of financial assets can generate much larger flows of capital than those associated with financing trade.

Regulatory arbitrage is a constant temptation in a modern financial system. Financial operators seek loopholes that reduce their taxes or regulatory burden. Sometimes regulatory arbitrage combines with inaccurate accounting or opaque reporting, which are also frequently at the heart of crises. For example, in the mini crises that occurred in the year before Lehman Brothers failed, a recurrent theme was the prevalence of structured investment vehicles (SIVs), entities that were in principle legally separate from the financial firms that had established them, but for which the parent firms in practice accepted responsibility.

The economist Arnold Kling distinguishes between making financial systems easy to fix versus hard to break. An easy to fix system has frequent small problems. A hard to break system has infrequent but big problems that are hard to fix. Policy makers should think about how their actions and proposals for reform comport with this distinction.

A financial system with a diverse investor base served by diverse institutions, where those institutions have evolved because of investor preferences and not regulatory quirks, is more resistant to crises than a less diversified system.

Types of crises and potential remedies

Crises fall into a handful of broad types, enumerated in the sections below. It is possible for multiple types of crises to happen simultaneously and therefore to require the kind of multipronged response that Ted Truman mentioned above. For example, a currency crisis can trigger a banking crisis if local banks have large unhedged foreign liabilities, and a banking crisis can trigger a real-estate crash if banks greatly reduce their real-estate lending in an attempt to become more liquid. The main consequences of a crisis that most measures seek to reduce or eliminate are a fall in consumption and a jump in unemployment.

In thinking about how to resolve crises it is useful to keep in mind the types of measures that can be taken, which correspond to the kinds of organizations that typically take them.

- *Monetary measures* such as providing lender of last resort assistance or stabilizing the exchange rate are typically provided by the central bank nowadays. Ministries of finance are also involved in some cases.
- *Funding* can come from private or government sources, domestic or foreign.
- *Business practices* originate in and are adopted by industry. Examples are standard-setting bodies that implement practices on their own and not because some regulation requires it.
- *Fiscal measures* such as tax relief and higher government spending originate in the legislature and are administered through the ministry of finance.
- *Regulatory measures* such as changes in bank capital requirements sometimes originate in the legislature, and in other cases both originate in and are administered by the central bank, ministry of finance, or specialized regulatory agencies.
- *Legal measures* such as changes to the bankruptcy code originate in the legislature and are administered by the courts.

Different measures work at different speeds. The list above orders them by their typical speediness. In particular, monetary policy, where decisions can be made day by day, is usually faster than fiscal policy, which is usually on an annual budgeting cycle. In crises, though, fiscal policy and even laws can change fast, as we saw in 2008 at the height of the financial crisis and are seeing now during the coronavirus pandemic.

Measures to resolve crises involve one or more of four basic responses to the losses of value that crises inflict. Call them the four D's: default (acknowledging losses through write-offs); deferment (rescheduling debts in hope of recuperating their present value, perhaps even with a fresh infusion of funds to boot); debt-to-equity conversions; or (re)distribution (using funds from a third party, to offset losses through grants, loans, or equity). The third party is often government, in which case taxpayers share some of the losses with original creditors. These basic responses may be the result of voluntary agreements, or a branch of government may impose them.

For an overview of what follows, see Appendix D, on the last page.

1. Debt crisis

a. Sovereign debt (fiscal) crisis

What it is: Delay or stoppage of payments to debt holders. Defaults on local-currency debt to local debt holders are rarer than defaults on foreign-currency debt because governments can inflate away the real value of local-currency debt and because foreigners, who are more likely to hold foreign-currency debt, are not part of the electorate. Sovereign debt crises are almost always crises of political willpower to devote so much revenue to debt service rather than actual inability to service debt. Sovereigns may default on debt to private creditors (e.g., bondholders), bilateral creditors, international financial institutions (e.g., IMF), or a combination of creditors.

Fiscal crises are often at the root of other types of crises because governments use various techniques to force the financial system to finance government debt that it otherwise would not,

such as allowing financial institutions to rate the risk of government debt as zero when it is not, compelling to hold a minimum amount of assets in government debt, or disfavoring those that refuse to hold as much debt as the government would like.

Here are a few important ideas to keep in mind when thinking about sovereign debt crises:

(1) What is the schedule of debt payments, and are there any particularly large payments due at one time? Are any of those payments dependent on cyclical tax revenue (e.g., from harvests)?

(2) Is the debt mostly in domestic currency or foreign currency? If it is mostly in foreign currency, exchange rate depreciation will worsen the burden of the debt and more broadly domestic policy makers have fewer ways to address problems short of debt restructuring.

(3) In the short run, meeting payments on foreign-currency debt may be a liquidity problem, but in the long run, debt sustainability is usually at bottom a political problem rather than a solvency problem. With sufficiently drastic measures to cut other spending, the debt in most cases would be repayable. The problem is that the government, usually reflecting the will of the populace, does not wish to devote such large resources to debt repayment.

(4) The problem at the root of many fiscal crises is lack of what economic jargon calls a hard budget constraint. A hard budget constraint means that an organization cannot spend more than its earnings (for a government, its tax revenue) plus market-rate borrowing. Government subsidies or bailouts soften budget constraints for corporations; state-owned enterprises are especially likely to cause drains on the government budget. In some countries, the national government bails out subnational governments, softening their budget constraints. Inflation softens the budget constraint for the national government if some expenses, especially debt, are not indexed to inflation.

(5) Fiscal crises often become crises in other sectors, or sometimes crises in other sectors become fiscal crises when the government tries to rescue those sectors. A way to try to stop contagion is to “quarantine” the government budget. That means, for example, not using regulatory measures to force banks to buy government securities and avoiding heavy reliance on the central bank to finance the government debt.

(6) Problems at the subnational level are rarely a big problem unless the central government takes large subnational debts onto its own balance sheet, either before the fact through cross-default provisions or after the fact through bailouts.

Warning signs: Persistent large fiscal deficits; rising ratio of government debt to GDP or debt service to GDP or to government revenue; downgrades by credit rating agencies, especially to long-term foreign currency debt rating; rising credit default swap spread; falling bid-to-cover ratio at debt auctions; arrears in payments to suppliers or wages of civil servants; “lumpy” refinancing profile with large repayments concentrated at possibly inopportune times. More formally, one can conduct a debt sustainability analysis to evaluate the intertemporal consistency of government finance and determine whether debt is on a sustainable or an exploding path with the continuation of current policy. Because of the close relationship between banks and

governments, a banking crisis is often a warning of a sovereign debt crisis to come after the government bails out banks.

Crisis signs: Blowout of credit default swap spreads; bid-to-cover ratio falls below 1 (failed auctions); financing costs spike upward from higher yields or increases in new or maturing debt.

Possible consequences: Loss of access to credit markets; government cannot borrow to smooth fluctuations in revenue; inability to pay for government services that the population depends on or at least likes. Political unpopularity leading to possible change of government. When the sovereign defaults on local-currency debt to local holders, the effects are particularly devastating because they turn what was previously a liquid financial asset for the domestic financial system into an illiquid one.

Examples: A recent default on foreign debt is Venezuela. In the euro area periphery (Cyprus, Greece, Ireland, Italy, Portugal, and Spain) from 2010-2012; debts were in a “domestic” currency, the euro, that however was not under the direct influence of the governments affected. An example where a government also defaulted on its internal debt was Russia in August 1998, where the banking system then became insolvent.

Potential preventive measures: Issue GDP-linked securities, which have an equity-type element to them. (For certain countries, it may be necessary to have third-party certification of GDP figures to avoid government fiddling with them as Argentina is accused of having done.) Establish contingent credit lines to draw on in emergencies. Write collective action clauses into securities to prevent a small number of holdouts from preventing debt restructuring. Avoid the central government taking on the debts of other entities, such as subnational governments, state owned enterprises, or failing financial institutions. Establish debt limits in constitutional or statute law (in practice, limits are often evaded). Transparency in enumeration and speed in dissemination of data on revenue, spending, and debt. Transparency is important for the proper observance of legal limits on deficits or debt. Recall that Greece was able to gain acceptance into the euro area in 2001 despite exceeding the Maastricht treaty guidelines on government deficits and debt because it cooked the books. In 2004 the Greek government admitted the fraud, and in 2009 the twin effects of recession and the global financial crisis caused Greek yields to rise, leading to bailouts in 2010, 2012, and 2015. The procedure of the U.S. Senate and House of Representatives, who publish detailed reports of their spending two and four times a year, respectively, is a model to imitate.

Potential cures:

- Reduce spending
 - Eliminate subsidies.
 - Replace broad subsidies with less costly targeted subsidies.
 - Kill or delay new projects.
 - Defer maintenance (risky in some cases because it may raise future costs substantially).
- Increase taxes
 - Increase rates on existing taxes (risks putting a country on the wrong side of the Laffer curve).
 - Introduce new taxes, temporary or permanent, for instance a wealth tax.

- Broaden the tax base, which may enable rate cutting (Laffer curve effect).
- Improve tax enforcement, which likewise may enable rate cutting.
- Borrow from voluntary lenders, rolling over existing loans or obtaining new ones
 - Local “patriotic bond” as with Argentina in 1995.
 - Banking system, for instance through altering regulatory requirements.
 - Foreign private capital markets, which can for instance be encouraged through tax or regulatory changes.
 - International financial institutions.
- New forced lending (financial repression), at below-market interest rates
 - Require the central bank to lend directly to the government.
 - Require financial institutions to hold more government debt (applicable not just to banks, but also insurance companies, pension funds, etc.).
 - Require individuals to hold more government debt, for instance by forcibly converting some savings in bank accounts to government bonds, as many European countries did after World War II and as Argentina did with the “Bonex plan” in 1989.
 - Restructuring/reprofiling (no loss of present value for creditors) or restructuring (loss of present value for creditors).
- Overt default
 - Default only to foreign creditors.
 - Default also to domestic creditors (not done as often as default to foreign creditors. because it can freeze the domestic financial system; no cases come to mind of the third option, a default only to domestic creditors).
- Covert reduction of debt burden through unexpected inflation.
 - This only works with debt denominated in local currency, since the government has no control of the monetary policy of foreign monetary authorities..
- Sell government assets, possibly combined with debt-to-equity conversion for government debt
 - Companies.
 - Land, buildings, airwaves.
 - Selling monopoly rights in areas of the economy that could be competitive is, however, a bad idea because it tends to reduce overall economic growth; an example would be a monopoly grant to import oil.
- Off-budget activities creating budgetary problems, such as state-owned enterprises
 - If there is a mass of inter-enterprise debt, use net settlement to reduce them.
 - Get an accurate picture of arrears to and from state-owned enterprises; enforce collection of debts owed to the enterprises and take steps to pay or default on the debts the enterprises owe to other parties.
- Economic growth to reduce the denominator of the debt/GDP ratio is beneficial in the long run, but does not work fast enough to contain a crisis.

b. Banking system crisis

What it is: Illiquidity or insolvency of the banking system resulting from large-scale withdrawal of deposits or other kinds of short-term funding, ending in stoppage of payments or failure of important banks unless rescued by the government. Can arise on the asset side from a rapid

deterioration of asset quality, such as default by a major borrower, or on the liability side from large-scale withdrawal of bank deposits (bank run).

A key question is how tightly linked banks are with other banks and with the rest of the economy. For instance, if one bank dominates a particular important market, such as triparty repo or financing agriculture, its failure may set off a chain of failures by other financial or nonfinancial firms. Failures can occur either directly through “connection” (default on its liabilities to them) or indirectly through contagion (causing bank runs because people are afraid that other banks share undesirable characteristics with a bank that failed). Ideally, a financial system should have a sufficient variety of institutions, with varied investment strategies and sufficiently loose links, that some important institutions can fail without causing others to do so.

If the main danger from a bank panic is a collapse of the money supply, the proper response for the central bank to inject more money into the economy generally. The survival of particular financial institutions is of secondary significance. On the other hand, if the danger comes from key financial institutions failing and choking off credit, the proper response is to rescue them.

Warning signs: Low capital-to-asset ratios; low profitability (or interest margins); unusually high rate of growth in loans or assets generally; signs of deteriorating asset quality such as rising rates of past-due or defaulted debts; falling return on assets or return on equity; inadequate diversification of portfolios; historically loose lending standards; extensive “connected lending”; declining retail or wholesale deposits, large off balance sheet net liabilities not well recognized; drop in price of bank stocks relative to the wider market.

Crisis signs: Banks report large losses; collapse in price of bank stocks; large increase in their credit default swap spreads; interbank lending dries up; extensive recourse to the central bank as lender of last resort; bank runs, either retail or “silent runs” at the wholesale level.

Possible consequences: Because the centrality of banks to the payments system, a freezing of payments and of economic activity more widely.

Examples: Iceland and Ireland in 2008-09 are cases where the banking systems were so big that their problems almost swallowed the economy. Because Icelandic banks had expanded into the European Union and were offering attractive rates to depositors, bank liabilities were about seven times GDP. The Icelandic government could not easily compensate all depositors after the banks fell into trouble, so it compensated resident depositors only and left depositors not resident in Iceland in the hands of the legal system in their country. A currency crash ensued and the economy shrank 14% from peak to trough. Ireland fully bailed out its banks, requiring a substantial increase in government debt to finance the rescue. Because Ireland used the euro, no currency depreciation occurred, but the economy shrank more than 12% from peak to trough.

Potential preventive measures: There have been many attempts to make banks safer. Many of them involve increasing the ratio of equity to debt, either on a continuing basis or contingently (as with contingent capital securities today or uncalled capital and double liability of bank shares in the 19th century). Other measures include liquidity ratios, living wills, stress tests, and tilting compensation of top managers away from short-term performance measures. If some banks are

“too big to fail,” then taxation or regulation might reduce them to a more tractable size. An underlying problem, though, is that regulation is like a chess game. Regulators make a move, but then banks get to make a countermove. Regulation is easiest where financial firms and markets are simple. The more complex they become, the more channels exist for regulatory arbitrage.

Further possible preventive measures include: deposit insurance (with an upper limit to coverage) to reduce likelihood of runs by retail depositors; increase required capital; countercyclical capital, leverage, or collateral requirements; limit certain kinds of unhedged exposure, such as to currency fluctuations; restrict competition, e.g., by not licensing new banks; “narrow banking” that limits assets to government securities or others that are supposedly safe; take the opposite tack by welcoming greater competition, especially from reputable foreign banks that are potential sources of foreign funding in a crisis; limit the size of existing banks so that none become too big to fail; impose surcharges on the largest banks; impose funding requirements to limit dependence on short-term funding. A measure formerly somewhat widespread but now fallen into disuse is an option clause, a contractual agreement under which a bank had the option to delay withdrawal of deposits for a specified period in return for paying a penalty rate of interest to depositors during the delay. There were also notice of withdrawal clauses, under which banks technically could impose a specified delay on withdrawal of deposits if they would continue to pay the same interest as before on the deposits.

Note that increasing capital requirements during or soon after a crisis risks deflation by making credit tighter. Also, over the long term, deposit insurance and lender of last resort operations pose a risk of making moral hazard a permanent feature of the financial system.

Potential cures:

- Lender of last resort operations
 - Standard approach counseled by Walter Bagehot: lend at a penalty rate on good collateral; the penalty rate idea, devised with the gold standard in mind, is not as necessary under a floating exchange rate.
 - Lend on unusual collateral or under unusual conditions.
 - Limit lending to domestic operations of banks only, not to foreign affiliates if problems are on an Icelandic scale in relation to GDP.
 - Purchase banks’ assets at above-market prices as an implicit subsidy.
 - Note that the room that lenders of resort to lend without creating inflationary expectations varies widely across countries depending on the size of the economy, the depth of local financial markets, and the credibility of the central bank.
- Government guarantee of deposits and perhaps of other assets (may occur through the central bank or through another agency, such as the Treasury or FDIC in the United States)
 - Government guarantee of deposits and perhaps of other assets.
 - Management takeover.
 - Capital injection loan (recapitalization), such as via Reconstruction Finance Corporation in the Great Depression or the package offered by Treasury to U.S. banks during in 2008
 - Partial or total government ownership through preferred stock / warrants / common stock / options; degree of risk sharing with private sector varies.
- Regulatory forbearance; note that many of these steps in effect reduce the information available to the public, reducing its ability to discriminate among banks.

- Suspend mark to market accounting in favor of cost accounting or some other basis.
- Reduce required capital.
- Reduce required reserves, if any.
- Be more lenient with other buffers such as leverage ratio.
- Change risk weights.
- Tax incentives for writing off bad loans.
- Arranged mergers of weaker banks with stronger ones.
 - Merger with a local bank reduces the total number of local banks; merger with a foreign bank typically does not but may be politically disfavored.
 - Expedited approval from bank regulators.
 - Government financial backstop, such as absorbing losses in excess of a certain amount.
 - Full government indemnification against losses by the absorbing institution.
- Increase income for banks, such as by paying higher interest on reserves at the central bank.
- Suspension of payments (moratorium, deposit freeze).
 - Continuation of payments within banking system but no conversions into the monetary base, as in Argentina's *corralito* of 2001 or various U.S. panics of the 1800s; in the United States the suspensions were often coordinated through clearinghouses.
 - Bank holiday, as in the United States in March 1933, during which banks are closed.
 - Either of the two possibilities above but with some compensation to depositors, such as a higher interest rate paid by banks during suspension.
 - Forced conversion of some part of demand deposits into time deposits, bank or government securities, or equity.
- Bankruptcy or forced conversion of debt to equity. The big question: how deep will losses go? Will they reach all the way to depositors, traditionally the most protected creditors?
 - Speed bankruptcy ("Chapter 14" proposals for U.S. bankruptcy code); untested.
 - "Good bank / bad bank" separation; bad bank may be a private or government body
 - Asset management company approach where bad assets are sold on the market to the highest bidder, possibly with a government backstop.
 - Debt to equity conversion (bail-ins) on a discretionary basis by regulators.
- Let the panic burn out without any extraordinary measures, perhaps involving a lot of bankruptcy.
- On an international level there is an option not open at the national level, to increase the IMF's issue of Special Drawing Rights (SDRs), as was done in 2009.

c. Shadow banking system crisis

What it is: Sudden tightening of credit by institutions or in markets that an important segment of borrowers has come to rely on for short-term liquidity. Examples range from money market mutual funds that provide retail investors with accounts that many use like demand deposits to repo markets that large financial institutions use for overnight borrowing.

Shadow banking, also termed market finance (as opposed to bank finance), has a retail and a wholesale side. The retail side consists of institutions that offer people accounts that are supposedly highly liquid, like bank deposits, but that often lack a government insurance guarantee. The wholesale side consists of corporations issuing short-term securities, using repo markets in particular to lend or borrow for periods as short as a day, and using derivatives or

other financial instruments to redistribute risk. Shadow banking involves higher yields to lenders and lower costs to borrowers through eliminating banks as middlemen. It also means that participants have to do their own credit evaluation rather than relying on banks to do it for them and that, lacking the resources of a bank to support them, borrowers are more vulnerable to changes in market sentiment drying up their sources of funding.

Warning signs: Increasing haircuts in repo markets; difficulty in rolling over repos or other short-term credit; mutual fund shares “breaking the buck”; decline in stocks of shadow banking institutions relative to the broader market; liquidation of significant investment funds by asset managers because of substantial losses or liquidity problems.

Crisis signs: Collapse in stocks of shadow banking institutions; large increase in their credit default swap spreads; sudden large jumps in repo market haircuts, or markets dry up; bank-type run on financial firms that offer liquid short-term liabilities, such as finance companies or money market mutual funds at the retail level and sometimes investment banks or other institutions at the wholesale level.

Possible consequences: Similar to consequences of a crisis in the banking system.

Examples: The Great Recession exposed weakness in U.S. investment banks. The failure of Lehman Brothers was the trigger that turned financial system troubles into a full-blown financial crisis. Other large U.S. investment banks converted their legal status to be able to gain direct access to Federal Reserve lending. American International Group (AIG) was a large writer (issuer) of credit default swaps that caused it massive losses as recession took hold in the United States. And of course Fannie Mae and Freddie Mac were taken over by the federal government.

Potential preventive measures: Level the field between banks and nonbank financial institutions by making sure nonbanks do not have significant regulatory or tax advantages over banks. (Before the Great Recession, Fannie Mae and Freddie Mac had the official advantage of a direct line of credit from the Treasury and the unofficial advantage of a perception, proven correct, that the federal government would rescue them rather than let them fail.) In many countries, one way that governments try to offset the lower regulatory burden on nonbanks is to allow only banks to have direct access to central bank lending. Another method is to make sure the public is aware that nonbanks do not have deposit insurance and are not assured of being bailed out, for example by requiring money market mutual funds to mark their shares to market rather than holding the price invariable at \$1.

An alternative approach is to treat the shadow banking system more like the regular banking system and allow at least part of it to have a similar type of access to central bank financing in a crisis.

Potential cures:

- Many steps here as similar to those for a banking system crisis, so they are not repeated.
- The most often used measure is to make the central bank a market maker of last resort to shadow banks, not just a lender of last resort to banks. Lender of last resort operations

may be harder than with banks if the central bank faces legal restrictions on the type of lending it can do.

- Limits or fees on redemptions, similar to notice of withdrawal clause for banks. Such measures trade greater prospective stability for lower potential liquidity.

d. Corporate or household debt crisis

What it is: Increase in debt of nonfinancial corporations or households beyond borrowers' ability to repay at historical ratios of debt service to income.

Warning signs: Sustained historically rapid growth of real (inflation-adjusted) credit; high ratios of debt to total assets, debt to income, debt service to income; rising ratios of late payment or default; rising yield spreads for lower-quality credits over higher-quality ones (for instance, BBB or CCC versus AAA); deterioration in credit quality as indicated by loan officer surveys.

Crisis signs: Spike in interest rates; drying up of credit to medium- or high-risk borrowers.

Possible consequences: Falling consumption or investment; pressure to government to take over responsibility for bad debts, converting the crisis into a government debt crisis.

Examples: During the Great Recession and its aftermath, a number of countries established programs to help home owners who encountered trouble making their mortgage payments. The United States had the Home Affordable Modification Program (HAMP), a voluntary program that was part of the Troubled Assets Recovery Program (TARP). In November 2010, Hungary passed a law requiring banks to convert foreign currency loans into local currency and provided banks with foreign currency to settle their related foreign currency debts. Before the law, many Hungarians had taken out mortgages in Swiss francs, exposing them to currency risk. Argentina in 2002 forcibly converted U.S. dollar debt into pesos at a rate more favorable to debtors than the market rate, which contributed to losses to banks.

In large economies, corporate bankruptcies other than those of financial institutions are rarely big enough to cause spillovers that spread deep into the economy. In smaller economies, the failure of a large corporation can more easily spill over into the financial system, real estate values, and consumption. Large waves of household bankruptcies can occur in small and large economies, and is often related to downturns in house values.

Potential preventive measures: Impose minimum down payment requirements for mortgages. Restrict households' ability to take on debt in excess of certain levels in relation to income or net worth. Place debt and equity on an equal tax footing, or even give equity more favorable tax treatment. Restrict household and perhaps corporate ability to take on unhedged foreign currency debt, which households have often not managed well when exchange rates have turned unfavorable to them. Covered bonds for mortgage finance, as in some European countries, or compulsory withholding of mortgage payments from paychecks, as in Panama, rather than making payments a matter of the borrower's choice.

Potential cures: Note that the private sector has a variety of solutions it employs with ordinary corporate or household debt. In normal times, government leaves resolution to those methods. The measures below are in addition to the private sector solutions.

- Regulatory forbearance, especially for corporate debt, for instance, allowing some assets or liabilities to be stated at cost instead of market value.
- Tax breaks for troubled debtors or asset classes.
- Compulsory changes in loan terms.
 - Lengthening of loan periods (reduction or moratorium on repayments in the near future).
 - Reduction of interest charges.
 - Write-offs of debt.
 - Conversion from foreign currency into local currency, at market rates or preferential rates
- Assumption of credit risk by government, for instance refinancing higher-yielding private debt with lower-yielding government debt so that the government becomes the creditor, or converting private external debt into sovereign external debt plus private domestic debt, so that the government now bears the exchange rate risk that private debtors formerly bore.
- Debt-to-equity conversion.

2. Monetary crisis

a. Exchange rate (currency) crisis

What it is: Market pressure for a substantial depreciation of the exchange rate from its official or de facto managed current level. A kind of exchange rate crisis can also happen under a floating rate if the rate depreciates far and fast. This type of crisis appears here separated from crises of inflation and deflation (discussed below) because it also applies to cases where there are not strong pressures on the price level but the currency suffers a speculative attack anyway.

There have been exchange rate problems related to pressures for an exchange rate to appreciate rather than depreciate, as mentioned below, but such cases are a small minority.

A key concept in exchange rate policy is the “impossible trinity,” which states that of the three goals of stability of nominal exchange rates, national monetary autonomy, and absence of exchange controls, it is possible to achieve fully only two at once. Pegged exchange rates often end in exchange rate crises because the central bank tries to maintain national monetary autonomy by not reducing the monetary base when foreign reserves fall (sterilized intervention). Eventually reserves fall so low that the choices are to devalue, float, or impose exchange controls.

Another important point is that raising (or lowering) the interest rate does not necessarily change the monetary base. In the case where the monetary base should probably be lower to preserve a pegged exchange rate, even a very high interest rate may not compensate adequately for the perceived risk of devaluation. In the case where the monetary base should be higher to hit the inflation target, a low interest rate may not be low enough to compensate adequately for expectations of deflation. The central bank interest rate is really a means to influence the quantity of the monetary base; it is not a goal in itself. If the link between the central bank interest rate and the monetary base is weak, it is more effective to influence the monetary base directly by

unsterilized foreign exchange intervention, open-market operations or quantitative tightening or quantitative easing.

Warning signs: Peacetime exchange controls, especially a tightening of controls; premium of more than a few percentage points in the parallel or offshore market; widening bid-ask spreads; forward rate much depreciated from current rate; declining net foreign reserves at the central bank; net foreign reserves equal to less than three months of imports if the exchange rate is officially or de facto pegged; stance of monetary policy not compatible with official or de facto exchange rate regime.

Crisis signs: Very wide bid-ask spreads; sharp depreciation of floating exchange rate; near exhaustion of reserves backing pegged exchange rate; drying up of supply of foreign currency.

Possible consequences: Bankruptcy for borrowers with large unhedged foreign liabilities; losses and in extreme cases insolvency of the central bank, at least on paper.

Examples: There are hundreds or even thousands of historical examples. Lebanon currently (2019) has a pegged exchange rate to the U.S. dollar but not enough dollars are available at the official rate to satisfy demand and the central bank has rationed dollars, so a parallel market rate about 15% depreciated from the official rate exists.

A dramatic example of an exchange rate crisis with a floating rate is Indonesia in 1997-98. The government abandoned a de facto crawling peg to the U.S. dollar during the East Asian financial crisis, but because of lack of confidence in government policy the rupiah depreciated from 2,433 on July 10, 1997 to 15,450 on January 23, 1998 before making a partial recovery. The currency crisis caused a banking crisis and a severe recession, with real GDP falling 17.8% from peak to trough. The resulting economic turmoil led to a change of government.

Case of pressure for an exchange rate to appreciate are much rarer. A recent case was Switzerland during its period of pegging the Swiss franc to the euro, September 6, 2011-January 15, 2015. Switzerland pegged the franc to the euro because appreciation against the euro was causing problems for Swiss exporters. Pressure for further appreciation continued during the period of pegging, and the franc immediately appreciated 20% against the euro after the peg ended. The pegged exchange rate was sustainable from a technical point of view, but Swiss authorities decided they did not want to import the modestly higher inflation rate of the euro area. The Swiss National Bank lost money in Swiss franc terms from the depreciation of its euro assets.

Potential preventive measures: Hold large foreign exchange reserves if the exchange rate is managed. At the root of most currency crises with pegged exchange rates, though, is the unwillingness of the central bank to let the monetary base shrink when foreign reserves fall. Orthodox currency boards and dollarization do not have this problem because they automatically link the monetary base and foreign reserves.

Currency crises can also happen under flexible exchange rates. If people have large unhedged foreign liabilities, because they have not anticipated a large depreciation in the currency, a

depreciation can then create contagion widely in the economy. So, regulations to prevent large unhedged foreign liabilities are another possible preventive measure.

Potential cures: Broadly, the ways of addressing a currency crisis are to reduce the real supply of the currency, increase real demand, or some combination of the two. In each case there is a choice between using more market-oriented approaches or using compulsion.

- Jawboning (“open mouth operations”).
- Coordinated foreign exchange intervention (may not work unless followed by other steps).
 - Operations in derivative markets.
- Exchange controls to prevent demand from expressing itself fully (not advisable if other measures are ready to hand, because the problem springs from the supply side, not the demand side).
 - Impose quantitative exchange controls on the amount of local currency that can be exchanged into foreign currency.
 - Establish multiple exchange rates.
 - There are also many more subtle devices, listed in the IMF’s *Annual Report on Exchange Arrangements and Exchange Restrictions*, applying to current account or capital account transactions. They include repatriation requirements, surrender requirements, advance deposits for imports, portfolio restrictions, various kinds of exit taxes, etc.
- “Financial repression” to increase demand for the local currency (not advisable if other measures are ready to hand, because it creates incentives for financial engineering to evade regulations).
 - Increase banks’ reserve requirements.
 - Other regulatory measures such as increasing the minimum required share of cash or other local assets in the portfolios of mutual funds and insurance companies.
- Bolster foreign reserves.
 - Borrow through pre-established or ad hoc swap lines.
 - Borrow from international financial institutions.
 - Market borrowing (such as Argentine 1995 “patriotic bond”).
- Restrict the money supply through market-oriented means.
 - Increase the central bank policy rate (but with the goal in mind of a later easing as credibility and conditions improve).
 - Establish a money supply target, such as a target for change in net domestic assets.
- Restrict the money supply through “financial repression.”
 - Enact a discriminatory monetary reform (e.g., limits on exchange or differential exchange rates of old currency for new) (many former Soviet republics).
 - Forced saving: convert demand deposits into time deposits that cannot be withdrawn for a stated period, or into government bonds that may or may be tradable depending on circumstances.
 - Forced conversion: convert foreign-currency deposits into local-currency deposits, perhaps at an unfavorable rate that confiscates part of their purchasing power (Argentina 2002).
 - Credit controls.
- Fire the central bank governor and other staff if the problem is the people, not the system.
- Reform the central bank.
 - Make it more independent of the government.

- End preferential access to credit for politically favored borrowers, which may be farmers, banks, state owned enterprises, or the treasury.
- Establish performance targets for the governor.
- Reform the currency
 - Redenominate it to make it “stronger,” e.g., 100 old pesos = 1 new pesos (a matter of psychology rather than monetary policy in the narrow sense).
 - Establish a parallel currency (such as the German Rentenmark of the 1920s or U.S. gold notes vs. greenbacks after the Civil War).
- Exchange rate measures
 - Devalue the exchange rate to a new pegged level.
 - Float the exchange rate.
- Replace the central bank
 - Establish a currency board. Recent examples are Estonia in 1992 and Lithuania in 1994, both of which later smoothly transitioned to membership in the euro area, and Bulgaria and Bosnia in 1997.
 - Officially dollarize. Recent examples are Montenegro in 1999 and Ecuador in 2000 during crises, and Timor-Leste in 2000 and El Salvador in 2001 during calm periods. Unofficial dollarization is not really a solution; rather, it is an indication that for various reasons, many people prefer to hold foreign currency.

Note: if the problems is an exchange rate whose market value is appreciated rather than depreciated compared to its official rate, a number of the steps are the opposite of those above — for instance, reduce banks’ reserve requirements to cut demand.

b. Inflation crisis

What it is: General increase in prices resulting from monetary policy rather than from events such as bad harvest or natural disaster. Research is divided about what level inflation has to reach before it affects economic growth. It seems to be about the mid double digits, when people switch from thinking of inflation in annual terms and start thinking of it in monthly terms. Its effects on financial markets occur at much lower levels: ten-year or even five-year local-currency loans at fixed rates are unavailable once inflation reaches double digits; instead, loans are de facto indexed to inflation or the exchange rate.

A key idea to keep in mind is that the demand for money can rise or fall depending how well it seems likely to keep its value and how attractive other assets are. The higher inflation rises, the less attractive holding money becomes because the faster it loses its value. The real supply of money can shrink as low as a few percentage points of its former value in a high inflation as people cease to hold it for more than short periods and turn to U.S. dollars or other assets as stores of value. That is what has happened in Venezuela. If confidence in the currency is restored after a high inflation, the process works in reverse and the monetary base and other money supply measures can increase many-fold without creating inflation as people rebuild their local-currency money balances.

Warning signs: Growth of nominal money and credit magnitudes at double-digit year-over-year rates; absence of new long-term contracts not indexed for inflation or the exchange rate;

consumer price index rising at more than mid single digits absent compelling external factors such as a large discovery of oil for a small country; widespread price controls that suppress open inflation.

Crisis signs: Large increase in nominal interest rates; widespread indexation of contracts to the inflation rate or the exchange rate; consumer price inflation in double digits, and especially in mid double digits or higher, the rate at which people start to think in terms of inflation rates per month rather than per year.

Possible consequences: Disintermediation of the local financial system; flight to foreign currency or physical assets; disappearance of long-term credit at fixed rates; consumption of capital; severe shortages of goods if combined with price controls.

Examples: Plentiful in history. Currently Venezuela is experiencing a hyperinflation and Argentina is experiencing a mid double digit inflation.

In the aftermath of an inflation combined with exchange controls or price controls, where there is a large “overhang” of cash and bank deposits that people would spend if they could, raising nominal prices, one approach to preventing the price level from rising so much is to reduce the nominal money supply. The usual ways of addressing an overhang have been through a differential conversion scheme (for instance, converting the first 1,000 old pesos of cash or bank deposits into new pesos at 1:1, but subsequent amounts only at, say 5 old pesos = 1 new peso) or “blocked balances,” in which cash or demand deposits above a certain threshold are converted into time deposits or government bonds that cannot be spent until later. The implicit bargain in many such reforms is that people have less money, but what they have is more useful because controls are lifted at the same time. This was the approach that many European countries took after World War II, most notably in the 1948 monetary reform that began the postwar German economic miracle (*Wirtschaftswunder*).

Potential preventive measures: Outsource monetary policy by adopting a currency board or dollarizing; adopt an official inflation target or a related measure such as a nominal GDP target; keep control of government deficits and debt, which are usually the underlying cause of high inflation because they prompt the government to cover them through increased borrowing from the central bank.

Potential cures:

- See also the section above on an exchange rate crisis, because many of the measures are the same.
- Reduce the nominal money supply through a discriminatory exchange rate reform or by converting demand deposits into time deposits or bonds; see the discussion just above
- Price controls (not advisable because they address the demand side, whereas the problem is on the supply side).
- Incomes policies (ditto).
- Forbid inflation indexation to prevent inertial inflation after a monetary reform.
- Convert interest rates from old to new basis (*desagio*), especially if dollarizing.
- Establish a formal inflation target.

- Target nominal GDP (possibly via a forecast market).
- Move assets from inside to outside the national financial system (less effective the greater the ease of arbitrage across borders).

c. Deflation crisis

What it is: Falling prices resulting from monetary policy rather than technological improvements. Rapid disinflation may also be a problem even if it never becomes deflation in cases where there are many contracts that set wages, prices, and interest rates for more than a year into the future with the expectation of higher inflation.

Severe deflation typically causes more harm than severe inflation because unexpected deflation raises the real burden of debt for creditors, causing bankruptcies and unemployment of workers in bankrupt firms, whereas unexpected inflation may cause decapitalization, but rarely bankruptcy.

Warning signs: Growth of nominal money and credit magnitudes low or negative; unusually low nominal interest rates (note that real interest rates may be high); tight credit, as revealed for instance in loan officer surveys; falling volume of loans but with nominal interest rates “stuck” and not falling; downward pressure on wages and prices that is general rather than sector specific; rising unemployment rate.

As in inflations, in deflations the nominal interest rate alone may tell little about the stance of monetary policy. In an inflation, monetary policy can be loose with a central bank policy rate of 50% if inflation is 80%. Similarly, in a deflation, monetary policy can be tight with a policy rate of 1% if inflation is below the central bank’s target rate.

Crisis signs: Widespread bankruptcies; falling nominal wages across the board rather than only in specific sectors.

Possible consequences: Increased real burden of fixed-rate debt, leading to reduced consumption, higher bankruptcy rates, and recession or depression.

Examples: The most widespread occurrence of deflation was during the Great Depression. During the euro area debt crisis of 2012-2014, deflation occurred in Cyprus, Greece, Ireland, Italy, Portugal, and Spain. Note that deflation is not always harmful. If food prices are a large part of the consumer price index, for instance, and they rise during a bad harvest and then fall during a plentiful one, the deflation has occurred from improvements on the goods side of the economy rather than from contractionary monetary policy.

Potential preventive measures: Adhere strictly to an above-zero inflation target or similar target such as an appropriately high nominal GDP target; if the target is undershot significantly, the central bank should overshoot it in the next period rather than letting bygones be bygones (in other words, target a path over time for the price level or nominal GDP rather than a series of one-shot targets). The purpose of such a policy is to prevent expectations forming that the outcome will be persistently below the target.

Potential cures: Above it, policy makers should remember that a central bank never “runs out of ammunition” to address deflation; that claim, which makes no logical sense, has been shown incorrect as an empirical matter by the actions of central banks during the coronavirus crisis.

- Forward guidance; talk without action will usually be insufficient, though.
- Interest rates.
 - Lower the policy interest rate, into negative territory if necessary. (At some point, perhaps -0.50%, negative rates drive people into holding cash instead.)
 - Cease paying interest on bank reserves, or even impose penalties on them.
- Change the target to
 - Higher inflation target.
 - Price level path.
 - Exchange rate path (either a one-time devaluation or a depreciating crawling peg).
 - Nominal GDP path.
 - Monetary base growth rate or path.
 - Conventional broader monetary aggregate growth rate or path.
 - Divisia monetary aggregate growth rate or path.
- Directly increase the monetary base
 - Quantitative easing. The important consideration here is how the recipients of new money use it. If it goes into financial markets, inflation may not change. If the goal is to meet an inflation target, quantitative easing must occur for as long as it takes for arbitrage between financial markets and markets for goods and services to result in spending that shows up in the rate of inflation.
 - Expand the types of assets eligible for purchase if necessary.
 - Foreign exchange intervention.
 - Treasury operations with the banking system (borrowing from banks and using the loan proceeds to buy any asset from private nonbanks, as proposed by the English economist Tim Congdon in his book *Money in a Free Society*, chapter 4). Similar to central bank open market operations.
 - Move assets from outside to inside the domestic financial system.
- More exotic measures
 - Stamped money, whose nominal value is reduced if not spent within a specified period. Some small communities used it in the 1930s.
 - Circumvent the central bank by using the treasury or other institutions; an example from U.S. history is the issuance of silver certificates; a proposal during the Great Recession was a loophole, now closed, regarding a trillion dollar platinum coin.
 - Tim Congdon’s proposal regarding bank deposits.
 - A monetary or fiscal “helicopter drop” aimed at increasing the velocity of money. Unlike operations in financial markets, helicopter drops give money to recipients without the central bank receiving any asset in return, hence they reduce its ability to reverse course later by shrinking the monetary base if necessary to combat inflation.

3. Asset crisis

What it is: Sudden, unexpected decline, often combined with a drying up of liquidity, in a significant asset category such as real estate or equities where people treat the asset as easily to

sell and expect to use the proceeds for consumption in the near future. If people treat the asset as locked up and do not expect to sell it and use the proceeds for consumption in the near future, a crash may have no lasting effects, as was the case with the U.S. stock market crash of 1987.

Asset crises sometimes create debt crises. For instance, big declines in housing prices may reduce the equity of mortgage holders below zero.

Warning signs: Asset boom with indicators such as price-to-earnings ratio or purchase price to rental price ratio reaching historically high levels; historically high levels of leverage used to finance asset purchases; loosening of collateral requirements by lenders.

Crisis signs: Sharp decline in asset prices, such as real estate or stock market crash. An asset crash can quickly spill over into a debt crisis if asset purchases were highly leveraged, and in emerging markets may also lead in that case to a capital account crisis (sudden stop).

Possible consequences: Large-scale bankruptcy; decline in consumption.

Examples: Perhaps the most spectacular asset bubble in recent decades was Japan's real estate and stock market boom of the 1980s, which collapsed in the 1990s. At the peak, the value of the land comprising the grounds of the Imperial Palace in Tokyo was notionally equal to the value of all the land in the state of California. The bust, also connected to a slow-motion banking crisis, resulted in about four years of stagnation and a lasting shift of the Japanese economy from moderate to low growth. The United States experienced a nationwide asset bubble in housing beginning about 2004 and ending in 2006 in what became a real estate bust from 2007-2012. Complex securities linked to U.S. real estate, which had been widely sold in the United States and Western Europe, suffered much larger losses than the models to create them had indicated would occur. Millions of homeowners in the United States experienced problems repaying loans and holders of the securities based on U.S. properties suffered large losses.

From time to time there are also mini-crises such as the U.S. flash crash of May 26, 2010. They are related to market structure rather than to economic fundamentals and typically leave no lasting effects.

Potential preventive measures: The bluntest tool is raising the central bank's policy interest rate, which may be tricky if, say, the central bank is below its inflation target and the goals of meeting that target and trying to prevent an asset bubble conflict. Macroprudential measures that decrease leverage, such as higher margin requirements for stock speculation or higher minimum down payments for real estate purchases, are more narrowly targeted. Two big problems with such measures are whether those who impose them can get the timing right and dampen rather than amplify fluctuations, and whether reducing leverage in one asset class simply leads investors to move to other asset classes or to more complex financial instruments that are less regulated. Centralized markets, such as stock exchanges and commodity exchanges, often have "circuit breakers" that impose temporary halts in trading if prices fall beyond certain limits; the purpose is to give traders time to assess whether they are behaving soberly or just panicking.

Potential cures:

- Central bank lending. This risks converting the central bank into a lender of first resort to the economy rather than a lender of last resort to the banking system.
- Support the stock market with fiscal surpluses if you have them, as Hong Kong did in 2008.
- For flash crashes, change market structure.
- Bans on short selling have sometimes been enacted but are counterproductive because they tend to reduce market liquidity.
- If barriers exist to participation by foreigners or other groups that could improve market liquidity, remove them.
- Another approach to increasing market liquidity is to shorten trading hours—in the extreme, limiting them to, say, an hour per day. Everybody who wants to trade will be active then.
- Regulatory forbearance, for example allowing assets to be valued at cost rather than market value on balance sheets.
- Halt trading briefly (intraday) or for multiple days. For example, at the start of World War I, the New York Stock Exchange closed for nearly four months. When closures are long, an unofficial market typically springs up, as happened in this case.
- For real estate crises, remedies that have been used include moratoria (prohibitions on foreclosure); government assumption of some debt or backstopping of credit risk; and forced restructuring of debt to longer maturities or lower interest payments.

4. “Financial plumbing” crisis

What it is: Inability to settle transactions because of problems with an intermediary such as a clearinghouse, broker, computer program, computer system, communications network, or the perceived risks of dealing with them.

Warning signs: Fragility in the face of cyber attacks; lack of back-up systems; long settlement times, which increase the risk of a problem occurring between transaction and settlement.

Crisis signs: Reduction or halt of trading because of slowness in settlements. Problems may also spring from hitherto unexpected sources, such as firms that store financial data or mobile phone apps in wide use among consumers.

Possible consequences: Freezing of the payments system.

Examples: A classic example is the Irish bank employee strikes of 1966, 1970, and 1976, in which people could no longer order their banks to transfer funds to other people. People wrote checks for later payment on their frozen bank accounts, and pubs played an important role as financial intermediaries because of the owners’ extensive knowledge about people in their neighborhoods. Usually the problems that concern policy makers under this category involve wholesale payments, such as a computer failure at the Bank of New York in 1985 that impeded thousands of transactions in government securities and sent the bank to the Federal Reserve for a \$32 billion loan. A different type of example related to financial plumbing is related to the subprime mortgage security crisis of 2007-2010, in which markets dried up in part because of lack of clarity about which tranches had claim to which assets, and just what the characteristics of the underlying assets were. The securities were not sufficiently transparent to be readily analyzed for making trading decisions.

Financial sanctions are attempts to impose costs on sanctioned countries, institutions, or people by denying them access to international payments systems.

Stresses such as those recently in the U.S. overnight repurchase (repo) markets do not qualify under this category because they result from lack of willing lenders at market prices rather than from problems with the payments system or the institutions that operate it.

Potential preventive measures: Computerization, standardization, and transparency of products, trading platforms, and settlement; back-up channels for settlement; short period between transaction and settlement (in the extreme, real time gross settlement); redundant systems (including, for consumers, cash and possibly multiple payment apps); well capitalized central clearing bodies; clear rules about what happens in case of failures to settle trades; raise margin requirements for trading; brief “circuit breaker” timeouts to let settlements catch up with trades. Note that real time gross settlement has costs as well as benefits compared to, say, end of day settlement: real time settlement avoids credit risk but can increase the risk of payment fails if payments are highly lumpy and require substantially greater reserves than end of day settlement. Centralized settlement works if the central party is well run, but for small markets it is more costly than decentralized settlement.

Potential cures: There seem to be no policies that are both quick and costless to implement — unlike the case for, say, exchange stabilizations, where often simply announcing a change in policy and providing credible evidence that it will be followed can immediately end a currency depreciation with no new resources.

- Bailout. This is the standard response. A financial institution, a group of institutions, the central bank, or the treasury provide funding to tide over the payment system while analysts and clerks untangle the mess and then see that payment can be made if the debtor is solvent.
- The alternative is a combination of net settlement of claims that can be settled easily and legal proceedings for those that cannot, rather like the “good bank / bad bank” split in bank resolution. Because of legal questions about priority of payment, legal proceedings for part of the payments can hold up the rest; that is why the standard solution is a bailout.

5. Balance of payments crisis

a. Current account crisis

What it is: Shortage of foreign exchange to finance the regular course of trade. Sometimes the result of exchange rate policy; other times the result of a collapse in demand for the output of a key industry, especially a commodity export, hence the reason for listing it as a separate kind of crisis from an exchange rate crisis.

Warning signs: Delays in obtaining foreign exchange to finance trade; explicit rationing of foreign exchange for current trade transactions; effective exchange rate substantially appreciated from long-run average.

Crisis signs: Similar to those for an exchange rate crisis.

Possible consequences: Shortages of key imports; economic slowdown from inability to obtain key imports used in local production.

Examples: During the Bretton Woods era, 1946-1971, there were many crises of this type because even most major economies had capital controls. If the perception was that the underlying problem was one of solvency rather than short-term liquidity, the country would devalue. Otherwise, the combination of exchange controls restricting the supply for foreign currency, a loan from the IMF to tide a country over the crisis, avoiding overly expansionary monetary policy, and economic growth increasing the demand for local currency over time was often sufficient for a country to work its way out of a current account crisis with the help of a loan from the IMF. It was rare for countries to devalue all the way to a level that would then allow them to remove all exchange controls; subsequently it has been more common.

Potential preventive measures: Have an exchange rate policy that does not require exchange controls to bolster the rate (floating, currency board, or dollarization). If the exchange rate is managed, hold large foreign reserves, as many emerging markets started doing after the East Asian financial crisis of 1997-98.

Potential cures:

- Many steps similar to those for a currency crisis.
- Borrow from the IMF. This is the type of crisis that the IMF was established to alleviate, especially through Stand-By Arrangements under normal access conditions.
- Impose or increase exchange controls; for instance, increase surrender requirements in effect taking some foreign currency from private hands and giving it to the government. Addresses the consequence rather than the cause of the crisis.
- Import restrictions are not usually advisable because they reduce overall economic efficiency, including the ability to generate export revenue, and encourage black markets.

b. Capital account crisis

What it is: “Sudden stop” in capital inflows or a sudden rise in capital outflows that endangers local financing arrangements. Often linked with a sovereign debt crisis.

Warning signs: Sudden changes in balance of payments financing; drop in central bank reserves; rising interest rates on foreign-currency debt.

Crisis signs: Spike in interest rates, especially for borrowing in foreign currency; inability of the private sector and government to obtain financing from the foreign private sector at any maturity.

Possible consequences: Fall in consumption; recession or depression. Often a capital account crisis spills over into a sovereign debt, banking, currency, or asset (especially stock market or real estate) crisis.

Examples: The East Asian financial crisis of 1997-98 hit several countries that seemed to have solid fundamentals: low inflation, adequate foreign reserves, government budget surpluses, and current account surpluses or low deficits. Current account balances in Hong Kong, Indonesia, Korea, Malaysia, Singapore, and Thailand improved by as much as 20 percentage points of GDP over a few years, reflecting in part large drops in capital inflows. Korea in late 2008 experienced a similar though less traumatic episode, which hit markets both for external and internal finance.

By definition, a capital account crisis can only happen where the capital and financial account is officially or unofficially open to a large extent. Most crises under the Bretton Woods international monetary system (1945-1973) were current account crises. As most advanced economies opened up their capital accounts by the 1990s and many emerging markets followed, current account crises have become rarer and capital account crises more common.

Potential preventive measures: Impose a Chilean-style tax on short-term inflows of foreign capital. More generally, avoid liberalizing inflows and outflows of capital if monetary policy and the financial system are not ready for it. One indication of readiness is a substantial presence of foreign banks, which facilitate financial integration with foreign markets and thereby tend to “cool” flows of hot money. Eliminate tax or regulatory preferences for foreign portfolio investment.

Recall that that if the statistics are collected and calculated accurately, the capital account is the mirror image of the current account. So, a large current account deficit is a large capital account surplus. Any steps to affect one will affect the other.

Potential cures: It is possible to make the financial system ready quickly for large inflows and outflows of capital. Countries that have replaced central banks with currency boards or dollarization and that have allowed foreign banks to establish branches have found that capital flows may have strong effects on the local economy but that they do not capsize the financial system. Estonia and Lithuania, which at the time had currency board-like systems, successfully weathered large capital outflows after the 1998 financial crisis in Russia, which was one of their largest trading partners. Both saw their current account deficits shrink by about 7 percentage points as the counterpart to reduced inflows of investment. Their economies went from real GDP growth above 8 percent to mild recession but then rebounded to rapid growth. The financial systems of both countries, which had a large presence of foreign banks, were shaken but remained solid.

In the East Asian crisis, Malaysia controversially imposed controls on outflows of capital. Economists’ studies assessing whether they were effective differ in their conclusions, but they were certainly successful in terms of public perception, because the crisis tapered for Malaysia after the controls. Korea in 2008 cut its central bank policy rate; established or increased central bank swap lines with the United States, Japan, and China; and guaranteed banks’ external debt through June 2009.

- Many steps are similar to those for a currency crisis.

- Alter the central bank policy rate? Much will depend on whether the currency has credibility. If it does not, lowering the policy rate may create a spiral of currency depreciation that drives unhedged borrowers in foreign currency to bankruptcy.
- Secure external funding through bank syndicates, central bank swaps lines, international financial institutions, or other sources.
- Controls on outflows of capital.
 - Restrict amount of outflows.
 - Impose a temporary exit tax or, what can amount to the same thing, a different exchange rate for capital outflows than for other transactions.
- Temporary guarantees of key markets to keep liquidity flowing, as with the Korean government's temporary guarantee of banks' external debt in late 2008.

6. Nonfinancial crisis

a. General

What it is: A crisis that does not originate in internal or external finance, though it may propagate into the financial system and then become a financial crisis.

Warning signs: One can look to financial markets as rough gauges of risk, but because the crises vary considerably, so do the warning signs.

Crisis signs: Often, as with natural disasters or wars, the signs are immediate and obvious. A nonfinancial crisis will frequently result in a sharp fall in the local stock market, if one exists and if the government allows it to remain open.

Possible consequences: Spillovers to financial system to cause a financial crisis; recession or depression.

Examples: Natural disasters such as hurricanes and earthquakes; pandemics; famines; wars; collapses in demand for a major industry; extremely bad tax or trade policy. The 2010 earthquake in Haiti, which led to a 5.5 percent drop in GDP that year, is a typical case. The Nicaraguan civil war disrupted the economy and led to hyperinflation from 1986-1991. The Ethiopian famine resulted in a drop of GDP in excess of 11 percent in 1985. For small countries the whole country may be affected. For large countries, such events typically have little effect on GDP because their effect is localized.

Since the first draft of this paper, the Wuhan coronavirus (COVID-19) pandemic has occurred. Its effects and government responses to it caused the world economy to shrink and then mostly rebound, both at unprecedented speed, in 2020. The episode will be studied for years to come, both for its epidemiology and its policy lessons, so my remarks about it are tentative.

Potential preventive measures: Buffers of various kinds—especially financial buffers. Examples include: a rainy day fund; a credit rating sufficient to borrow in international financial markets at reasonable rates of interest if domestic markets cannot provide sufficient funds; insurance through regional risk pooling mechanisms such as the Caribbean Catastrophic Risk Insurance

Facility (CCRIF), catastrophe bonds; inclusion of hurricane (and other disaster) clauses in debt instruments; contingent credit lines such as the Inter-American Development Bank's Contingent Credit Line for Natural Disasters.

Potential cures:

- Quick revelation of the extent of the problem. For example, in the case of the current coronavirus pandemic, extensive testing to determine how many people are infected. In an earthquake, using satellite imagery and reports on the ground to determine where people are missing and where buildings are in danger of collapsing.
- Increased borrowing from financial markets.
- Temporary foreign loans or grants; for poor countries, often through international financial organizations, such as the IMF's Rapid Financing Instrument or World Bank programs.
- Reduce tax rates to encourage economic activity if sufficient financial space exists.
- Reduce regulation, again, to encourage economic activity.
- Provide targeted relief to affected industries, such as tax credits, subsidized loans, grants (more typically to people than to firms), or exemption from regulatory rules. For example, let people and firms borrow against future tax payments or draw upon lines of credit from the government equal to, for instance, three months of flows into their bank accounts. If one goal of relief is to support aggregate consumption, generalized relief, such as payments to employed as well as unemployed people, is an inefficient way to do it, because people who are not experiencing a drop in income will not necessarily spend the extra funds.
- For high- and middle-income countries, substantial payments to affected people through unemployment benefits and welfare grants is usually affordable, but for low-income countries it often is not.
- For countries with limited fiscal room to maneuver, options will be similar to those in the case of a sovereign debt crisis.
- Avoid getting in the way of private-sector solutions, such as alternative tests for coronavirus or volunteer rescuers after an earthquake.

b. Wuhan coronavirus pandemic (COVID-19)

The episode is far from over, but it is possible to draw some preliminary lessons from the experience—or more bluntly, mistakes—so far. Policy makers have had to take many leaps in the dark, and to try some policies whose efficacy may never be clear. There are, however, plenty of other policies whose results seem reasonably clear already. One or another government made almost every mistake it was possible to make.

In the early phase of the pandemic, the Chinese government delayed prompt dissemination of information about its origin and spread in Wuhan. The World Health Organization (WHO) failed to respond with appropriate skepticism of China's sanguine assessment. Other governments, with the notable exception of Taiwan—which China has kept out of the WHO—were too complacent about the virus remaining contained to China, a mistake they will not soon repeat.

Once the virus did appear outside of China, only a minority of countries immediately began vigorous contact tracing. Others waited until the virus had spread so far that tracing was ineffective. There was a lack of urgency among political leaders and the public because the

number of cases was initially small. People failed to understand that if a disease spreads exponentially, doubling say every three days, in a month one case will become 1,000 cases, in two months it will become 1 million cases, and in three months it will become 1 billion cases.

The United States was among the countries that had a well developed pandemic response plan on paper and that had even had recently performed simulation exercises, but failed to follow the plan because of lack of interest at the top political level and ineffective bureaucracies. Few countries had stockpiles of key medical supplies adequate to meet a sudden spike in demand.

Political leaders in most countries did a terrible job of weighing tradeoffs and informing the public about them. The depression that the world economy suffered in the first half of 2020, while short, was the worst since the Great Depression. Partly it resulted from voluntary actions, such as people not eating out or traveling from fear of catching the virus, but mainly it arose from government actions that forcibly shut large segments of national economies. No previous pandemic, even those that caused many more deaths, provoked such drastic government restrictions. It is understandable why politicians are reluctant to talk frankly about tradeoffs between lives and economic activity. The consequences of not doing so, though, are severe.

People are willing to tolerate total lockdowns for short periods and to endure long periods of taking preventive measures such as wearing masks and washing hands frequently. People tire of long-lasting restrictions, though, and governments need to communicate convincingly why people should continue to be vigilant.

Many countries initially failed to account for the differences in death rates across population groups, so they exposed vulnerable people, especially old people, to elevated risks of death. Governments now seem to have learned that lesson and are distinguishing between groups with low risks of dying and those with high risks, who need isolation and other special care until the risks diminish.

Governments have spent trillions on symptoms but only billions on cure. Governments that can afford expanded unemployment relief, loans and grants to businesses, etc. have spent lavishly on them. They have been far more tight-fisted with spending on vaccines, testing, protective equipment, and other items that, by addressing the pandemic, would reduce the need for spending on economic relief. A \$50 billion prize for the person or company who develops an effective vaccine, for instance, is cheap compared to months of shutdowns across the world. The slowness of most countries to ramp up testing faster is puzzling given its promise for enabling people to return to more normal living patterns. (Just before this paper was issued, a leading drug maker announced that it had developed an effective vaccine.)

Some governments have imposed export restrictions or price controls on medicines or equipment to combat the virus. Such measures are counterproductive because they reduce long-term incentives for producers. A better policy is to work with rather than against markets.

Bureaucracies in some countries have also hindered provision of medical supplies, even for something as basic as hand sanitizer, by persisting with regulations they should have dropped for this emergency and maybe even permanently. More broadly, the pandemic has also exposed that

many countries have regulations that reduce the flexibility of their economies and thereby prevent businesses and workers from shifting out of shrinking areas of activity into growing ones. Examples include restrictions on telemedicine, differences in labeling requirements for wholesale and retail food sales, and needless occupational licensing laws.

In my view, economists have generally underestimated the effectiveness of monetary policy and overestimated the effectiveness of fiscal policy to address current problems, as they also did during the Great Recession. Monetary policy has been looser than it was during the Great Recession, as witness fewer countries descending into deflation. The U.S. economy has seen a rapid rebound in employment despite declining fiscal stimulus.

For the future, presumably governments will devote more resources to being prepared for pandemics: more research capability, more masks, greater capacity to produce tests and vaccines quickly, etc. Perhaps it would be useful to have a body, in the United States or internationally, that does something like what the Shadow Open Market Committee does for the Federal Reserve—providing a forum for a body of outside experts to criticize government policies and propose other options.

The coronavirus is a mild pandemic. In the case of a more severe future pandemic, governments will have to consider more carefully questions such as these to save lives without making the economy collapse:

- Does a lockdown actually save lives or does it just delay deaths at a high cost?
- If a vaccine cannot be developed quickly, are there ways to achieve herd immunity, at least for a large segment of the population, at a low cost in deaths?
- How much local variation should there be in the response to a pandemic to account for differences in conditions at the subnational level?
- Is the virus mutating such that the response to it needs to change?

Appendix C summarizes the measures countries have used to respond to the pandemic.

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Bibliography

Writings on financial crises are numerous, and the list below is merely suggestive.

- Abbas, S. Ali, Pienkowski, Alex, and Rogoff, Kenneth, editors. 2019. *Sovereign Debt: A Guide for Economists and Practitioners*. New York: Oxford University Press.
- Aliber, Robert Z., and Charles Kindleberger. 2015. *Manias, Panics and Crashes: A History of Financial Crises*, 7th edition. New York: Palgrave Macmillan. (Kindleberger wrote the 1st-4th editions, 1978-2000. Aliber has coauthored editions since Kindleberger's death.)
- Allen, Franklin, and Douglas Gale, editors. 2008. *Financial Crises*. Cheltenham, England: Edward Elgar.
- Bagehot, Walter. 1873. *Lombard Street: A Description of the Money Market*. London: Henry E. King and Son. <<https://oll.libertyfund.org/titles/bagehot-lombard-street-a-description-of-the-money-market>>
- Bénassy-Quéré, Agnès, Benoît Couré, Pierre Jacquet, and Jean Pisani-Ferry. 2009. "The Crisis: Policy Lessons and Challenges." Brueghel Working Paper 2009/06. <https://bruegel.org/wp-content/uploads/imported/publications/wp_crisislessons_091209.pdf>
- Bernanke, Ben S., Timothy F. Geithner, Henry M. Paulson, Jr., and Nellie J. Liang, editors. 2020. *First Responders: Inside the U.S. Strategy for Fighting the 2007-2009 Global Financial Crisis*. New Haven: Yale University Press.
- Claessens, Stijn, M. Ayhan Kose, Luc Laeven, and Fabián Valencia, editors. 2014. *Financial Crises: Causes, Consequences, and Policy Responses*. Washington, D.C.: International Monetary Fund. <https://www.elibrary.imf.org/doc/IMF071/20264-9781475543407/20264-9781475543407/Other_formats/Source_PDF/20264-9781484324295.pdf> (The best single book.)
- Dalio, Ray. 2018. *Big Debt Crises*. Austin, Texas: Greenleaf Book Group.
- Davis, E. Philip. 2003. "Towards a Typology for Systemic Financial Instability." Working paper, Brunel University, November 12. <<https://bura.brunel.ac.uk/bitstream/2438/916/1/03-20.pdf>>
- Dooley, Michael P., and Jeffrey A. Frankel, editors. 2003. *Managing Currency Crises in Emerging Markets*. Chicago: University of Chicago Press. <<https://www.nber.org/books/dool03-1>>
- Dullien, Sebastian, Detlef J. Kotte, Alejandro Márquez, and Jan Priewe. 2010. *The Financial and Economic Crisis of 2008-2009 and Developing Countries*. Geneva: United Nations Conference on Trade and Development. <https://unctad.org/en/Docs/gdsmdp20101_en.pdf>
- Edwards, Sebastian, and Jeffrey A. Frankel, editors. 2002. *Preventing Currency Crises in Emerging Markets*. Chicago: University of Chicago Press. <<https://www.nber.org/books/edwa02-2>> (See in particular Rudi Dornbusch, "A Primer on Emerging-Market Crises," chapter 16.)
- Eichengreen, Barry. 2002. *Financial Crises and What to Do about Them*. New York: Oxford University Press.
- Einzig, Paul. 1971. *Foreign Exchange Crises: An Essay in Economic Pathology*, 2nd edition. London: Macmillan / New York: St. Martin's Press.
- Einzig, Paul. 1972. *A Textbook on Monetary Policy*. London: Macmillan / New York: St. Martin's Press.
- Farmer, Roger. 2017. *Prosperity for All: How to Prevent Financial Crises*. New York: Oxford University Press.
- Fisher, Irving. 1933. "The Debt-Deflation Theory of Great Depressions" *Econometrica*, v. 1, no. 4, pp. 337-357.
- Goodman, Lawrence. 2016. "Crisis Detection and Prevention: Implications for Investors and Officials." Remarks to Boston Economic Club, March 23. <http://centerforfinancialstability.org/speeches/Boston_032316.pdf>
- Grossman, Richard S., and Hugh Rockoff. 2015. "Fighting the Last War: Economists on the Lender of Last Resort." National Bureau of Economics Working Paper 20832, January. <<https://www.nber.org/papers/w20832.pdf>>
- International Monetary Fund (IMF). 2020. *Fiscal Monitor*, October. Washington, D.C.: International Monetary Fund.

- Investment Company Institute. 2009. “U.S. Government Responses to the Financial Crisis September 1, 2008–Present.” <https://www.ici.org/policy/regulation/products/mmf/08_market_interventions>
- Jonung, Lars, Jaakko Kiander, and Pentti Vartia, editors. 2009. *The Great Financial Crisis in Finland and Sweden: The Nordic Experience of Financial Liberalization*. Cheltenham, England: Edward Elgar.
- Kaminsky, Graciela, Saul Lizondo, and Carmen M. Reinhart 1998. “Leading Indicators of Currency Crises,” *IMF Staff Papers*, v. 45, no. 1, March, pp. 1-48. <<http://www.imf.org/external/Pubs/FT/staffp/1998/03-98/pdf/kaminsky.pdf>>
- Kaufman, George G. 2000. “Banking and Currency Crises and Systemic Risk: A Taxonomy and Review.” *Financial Markets, Institutions and Instruments*, v. 9, no. 2: 69-131. An earlier version is available at <https://www.dnb.nl/binaries/sr048_tcm46-146826.pdf>
- Kolb, Robert W., editor. 2010. *Lessons from the Financial Crisis: Causes, Consequences, and Our Economic Future*. Hoboken, New Jersey: John Wiley and Sons.
- McKinnon, Ronald. 1993. *The Order of Economic Liberalization: Financial Control in the Transition to a Market Economy*, 2nd edition. Baltimore: Johns Hopkins University Press.
- Lieberman, Ira W. 2018. *In Good Times Prepare for Crisis: From the Great Depression to the Great Recession: Sovereign Debt Crises and Their Resolution*. Washington, D.C.: Brookings Institution.
- Quarles, Randal K. 2019. “The Financial Stability Board at 10 Years—Looking Back and Looking Ahead.” Speech to European Banking Federation’s European Banking Summit, Brussels, October 9. <<https://www.federalreserve.gov/newsevents/speech/files/quarles20191003a.pdf>>
- Racickas, Evaldas, and Asta Vasiliauskaite. 2012. “Classification of Financial Crises and Their Occurrence Frequency in Financial Markets.” *Socialiniai tyrimai / Social Research*, no. 4 (29): 32-44.
- Reinhart, Carmen M., and Kenneth S. Rogoff. 2009. *This Time Is Different: Eight Centuries of Financial Folly*. Princeton, N.J.: Princeton University Press.
- Schwartz, Anna J. 1987. “Real and Pseudo-Financial Crises.” In *Money in Historical Perspective*, pp. 271-288. Chicago: University of Chicago Press. <<https://www.nber.org/chapters/c7506.pdf>>
- Scott, Hal S. 2016. *Connectedness and Contagion: Protecting the Financial System from Panics*. Cambridge, Massachusetts: MIT Press.
- Sheng, Andrew. 2009. *From Asian to Global Financial Crisis: An Asian Regulator's View of Unfettered Finance in the 1990s and 2000s*. Cambridge: Cambridge University Press.
- Thornton, Henry. 1939 [1802]. *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain*, edited by F.A. Hayek. London: George Allen and Unwin. <<https://oll.libertyfund.org/titles/2041>>
- Trueherz, Rolf Mario. 2000. *The Crisis Manual for Emerging Market Countries*. Palo Alto, California: Fabrizio Publications.
- Truman, Edwin M. 2009. “Policy Responses to the Global Financial Crisis.” Remarks presented at the Ninth Annual International Seminar, on “Policy Challenges for the Financial Sector Emerging from the Crisis: Building a Stronger International Financial System,” Board of Governors of the Federal Reserve System, World Bank, and International Monetary Fund, June 9. <<https://www.piie.com/commentary/speeches-papers/policy-responses-global-financial-crisis>>

These sources have timelines of the 2007-09 crisis:

Center for Financial Stability, <<http://www.centerforfinancialstability.org/timeline.php?>>

Federal Reserve Bank of New York, <https://www.newyorkfed.org/research/global_economy/policyresponses.html>

Federal Reserve Bank of St. Louis, <<https://fraser.stlouisfed.org/timeline/financial-crisis>>

On the 2020 Wuhan coronavirus, see especially this list of country responses:

International Monetary Fund, Fiscal Affairs Department, *Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic*, <<https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19>>

Appendix A: Considerations on the Lender of Last Resort

Grossman and Rockoff (2015) think economists may be behind the times in their thinking about the lender of last resort. They offer these considerations to guide its operations.

Who can be the lender of last resort? Historically, not only the central bank; treasuries, clearinghouse associations, syndicates of banks, and even rich individuals have done it.

What is the goal of the lender of last resort? Walter Bagehot argued that it was to alleviate financial panics. Milton Friedman and Anna Schwartz implicitly offered an alternative: inject enough high-powered money to avoid declines in wider money supply measures, such as M2.

Who should be eligible for loans? The market but not individual firms; banks; nonbank financial firms such as mutual funds and insurance companies; nonfinancial firms? Charles Kindleberger argued for an expansive approach extending even to nonfinancial firms; Anna Schwartz countered that the lender of last resort should address only threats to the payments system.

What collateral should the lender of last resort accept? Experience indicates that at times it will need to accept less than top-quality collateral to fulfill its role adequately.

On what terms should it lend? Walter Bagehot advocated a penalty rate of interest to discourage applications from those who do not need loans. Other economists think it is more important to stop a panic before it gets rolling, so a penalty rate is not so important. Everybody seems to agree that it is important to lend liberally to those to whom it does lend.

How important are individual institutions? Are some so big or so interconnected that their failure would amplify a crisis, hence they should be rescued even if they are insolvent rather than just illiquid? Also, if individual banks have important knowledge about borrowers that is disrupted when they fail, hurting output, that is an argument for lending directly to them.

How significant is moral hazard? If it is significant, then it makes sense to let some institutions fail, much as forest managers allow periodic small fires to avoid disastrous huge fires.

How should the lender of last resort coordinate with other institutions? It can be part of a syndicate, work with the Treasury, or offer backstopping guarantees instead of lending outright.

If there is a conflict between internal financial stability and an external target such as the exchange rate, how to manage the conflict? Walter Bagehot's advice to lend liberally at a penalty rate is one proposed solution. In practice, central banks today usually sacrifice the external target if it interferes much with a bailout.

Are crises inherent to banking or are they the result of correctable distortions? One view is that banks are inherently fragile because they borrow short and lend long. Another is that crises result from bad regulations, bad management, or bad luck. My own view is an intermediate one, that there are ways to reduce banking risk, hence calling banks inherently fragile is too extreme.

Appendix B: Major U.S. government measures regarding financial crisis, 2007-2010

Date	Agency	Program
2 nd half 2007-2008	FHLB	Substantial increase in lending
December 12, 2007	Federal Reserve	Term Auction Facility
December 17, 2007	Federal Reserve	First swap arrangements with foreign central banks
March 7, 2008	Federal Reserve	28-day single-tranche repurchase agreements
March 11, 2008	Federal Reserve	Term Securities Lending Facility
March 16, 2008	Federal Reserve	Primary Dealer Credit Facility
July 30, 2008	Congress	Housing and Economic Recovery Act of 2008
September 7, 2008	Treasury	Took over Fannie Mae and Freddie Mac
September 16, 2008	Federal Reserve	Section 13(3) lending to AIG
September 17, 2008	SEC	Temporary ban on naked short sales
September 18, 2008	SEC	Temporary ban on short selling of financial stocks; also, easing of restrictions on repurchasing shares
September 19, 2008	Treasury (ESF)	Temporary Guarantee Program of Money Market Funds
September 22, 2008	Federal Reserve	Asset-Backed Commercial Paper Money Market Fund Liquidity Facility
October 3, 2008	Congress	Emergency Economic Stabilization Act (enabled TARP, parts of which are detailed separately below)
October 3, 2008	FDIC	Raised deposit insurance limit to \$250,000
October 9, 2008	Federal Reserve	Interest on excess reserves*
October 10, 2008	SEC	Temporarily permitted valuation at cost, not market
October 14, 2008	Treasury	Capital purchase program
October 14, 2008	FDIC	Transaction Account Guarantee Program
October 14, 2008	FDIC	Temporary Liquidity Guarantee Program
October 3, 2008	Fed, regulators	Technical change in regulatory capital calculations
October 27, 2008	Federal Reserve	Commercial Paper Funding Facility
November 10, 2008	Treasury, Fed	Restructuring of federal assistance to AIG
November 14-15, 2008	Treasury, State	G20 Washington DC summit focused on financial crisis
November 20, 2008	Treasury	Support for liquidating Reserve Fund component
November 20, 2008	SEC	Temporary exemption for money market liquidations
November 23, 2008	Treas, Fed, FDIC	Support package for Citigroup
November 25, 2008	Federal Reserve	Term Asset-Backed Securities Loan Facility (TALF)
December 19, 2008	Treasury	Loans to General Motors and Chrysler
January 16, 2009	Treas, Fed, FDIC	Support package for Bank of America
February 10, 2009	Treasury, etc.	Financial Stability Plan (a reshaping of TARP)
February 17, 2009	Congress	American Recovery and Reinvestment Act of 2009
March 9, 2009	Treasury, Fed	Further restructuring of federal assistance to AIG
March 23, 2009	Treasury	Public-Private Investment Program
April 1, 2009	FHFA	Home Affordable Refinancing Program
April 2, 2009	Treasury	G20 finance ministers announce coordinated plan
May 7, 2009	Treasury	Stress test results for large banks released
July 21, 2010	Congress	Dodd-Frank Act

* Not a response to the crisis; announced before the crisis began, and blamed by some observers for worsening the crisis by increasing the demand to hold rather than lend reserves.

AIG = American International Group; ESF = Exchange Stabilization Fund; FDIC = Federal Deposit Insurance Corporation; FHFA = Federal Housing Finance Agency; FHLB = Federal Home Loan Banks; SEC = Securities and Exchange Commission; TARP = Troubled Asset Relief Program, Treas = Treasury.

Sources: Scott (2016: 76-78), Investment Company Institute (2009), news reports.

Appendix C: Worldwide government measures during the coronavirus pandemic, 2020

This table, by the International Monetary Fund (2020: 16) is a mixture of descriptions of what countries have done and suggestions about what they might do.

Fiscal Measures	1. Widespread Lockdowns	2. Gradual Reopening	3. Post-COVID-19 Recovery
Household Income Support			
Cash or in-kind transfers	Yes, they likely have the largest multipliers, particularly for basic necessities and public services	Transition and better target to those in need	Reconsider within the reforms to enhance social protection systems
Unemployment benefits	Expand coverage and extend duration	Refine the benefits to preserve work incentives as unemployment returns to normal levels	Key components when enhancing social protection systems
Employment Measures			
Short-term work-/job-retention schemes	Yes, they can help preserve jobs and worker-firm relationship	Reduce use of these programs to encourage moving to new jobs if needed	Reduce access for prolonged cases
Temporary hiring subsidies	Not yet	Plan or initiate if supply disruptions have largely eased	Transition to active labor market policies (for example, retraining)
Active labor market policies	Not yet	Initiate with programs that improve labor skills (education, digitalization)	Yes, tailored to structural transformation in the post-COVID-19 economy
Public Investment			
Public investment	Planning for next phase	Could boost maintenance and public works; plan for next phase, emphasizing job creation and green recovery	Scale up quality investment with sustainable financing
Tax Measures			
Temporary deferral of taxes and social security payments	Yes, to protect cash flows for households and firms	Targeted deferrals, depending on taxpayers, pandemic developments, and strength of recovery	No, but could engage taxpayers as part of debt restructuring
General income tax cuts	No, because they largely benefit those not in need	No, because those benefiting are less likely to spend the additional income and because the cuts likely favor firms with profits	Consider as part of the stimulus package depending on fiscal space; could bring stronger effect if targeted to cash-constrained households
Accelerated depreciation or loss-carry backward	Not yet	Yes, to firms that resume activity	Yes
Progressive taxes	Consider, especially if financing is limited	Consider, especially if financing is limited	Yes, choice of instruments should conform to good tax law design; greater progressivity of taxes and ensuring highly profitable firms pay appropriate taxes helps finance other measures and may ease social tensions
Other Liquidity Support			
Loans, guarantees	Yes, could be partially conditional on preserving jobs, with restrictions on dividends/ executive pay	Refine with declining generosity	Tighten for a timely exit and manage fiscal risks
Solvency support (equity injections)	Yes, with dividend restrictions and imposing losses to shareholders	Interventions on systemic and strategic firms; restrictions on dividends/executive pay	Aim for a timely exit
Debt restructuring	No, possible debt moratorium	Prepare streamlined restructuring framework and mediation mechanism for a speedy workout	Yes, to facilitate reallocation and timely exit of nonviable firms

Appendix D: Summary table

Crisis type	Some market warning signs	Some market crisis signs	Some remedies
Debt			
—Sovereign debt	Rising CDS spreads, yields; falling bid-to-cover ratio; ratings downgrade; arrears	CDS spread and yield blowout; failed auctions	Spending cuts; tax increases; new borrowing; debt restructuring; default; inflation; sell assets
—Banking	Low profits; relative fall in bank stock prices; falling liquidity in interbank markets	Big losses; bank stock prices collapse; interbank lending dries up; bank runs	Lender of last resort loans; deposit guarantee; regulatory forbearance; bank holiday
—Shadow banking	Similar to banking crisis	Similar to banking crisis	Similar to banking crisis
—Corporate/ household	Rising late payment or default ratios; rising yield spreads	Widespread defaults; high yield spreads	Regulatory forbearance; forced changes in loan terms; government assumption of credit risk
Monetary			
—Exchange rate	Widening parallel market premium; falling foreign reserves	Very wide bid-ask spreads; foreign reserves exhausted; sharp depreciation	Restrict money supply growth, especially monetary base; devalue; exchange controls; dollarization
—Inflation	High money supply growth; widespread indexation; de facto dollarization	Inflation in double digits and especially above about 40% annually	Similar to exchange rate crisis
—Deflation	Low or negative money supply growth; falling loan volume	Widespread bankruptcies; falling nominal prices across the board	Increase monetary base
Asset	High price-to-earnings or purchase-to-rental ratios	Price crash	Central bank lending; bans on short selling; regulatory forbearance
Financial plumbing	Fragility of infrastructure; long settlement periods	Reduction or halt in trading	Bailout; good bank / bad bank type split of settlement claims
Balance of payments			
—Current account	Delays in obtaining foreign exchange; foreign exchange rationing	Similar to exchange rate crisis	Similar to exchange rate crisis
—Capital account	Falling foreign reserves; rising interest rates	Inability to obtain foreign financing short- or long-term	Controls on capital outflows; external borrowing
Nonfinancial	Varied, but falling stock market is often one sign	Varied, but a stock market plunge is often one sign	Increased domestic or foreign borrowing