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The Length and Cost of Banking Crises

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Abstract

This paper reviews how recent studies of banking crises differ with regard to the dating, length, and costs of the crises. Significant discrepancies in these features suggest the absence of analytical consensus. The data allow an examination of the relation between perceived crisis length, as an index of delay in taking actions to resolve a crisis, and crisis costs. Cross-sectional evidence does not show that the length of a crisis is a significant contributor to its resolution cost. A measure of economic cost, the growth shortfall in the crisis period, shows more evidence of a link.

Contents   Page

I. INTRODUCTION

The spread of banking crises globally in recent decades has spurred interest in studying the phenomenon. One of the principal problems of investigating banking crises is identifying when such occurrences happened and how long they lasted. Accurately timing banking crises is obviously important to the financial surveillance responsibilities of the Fund in terms of determining the best policies for preventing their onset and limiting their damage. A banking crisis is not a simple event that takes place at a point in time, like a revaluation of a currency parity under the Bretton Woods system, for example. Rather, it is an episode, spread out diffusely over time, with no clear beginning or end.

An "objective" procedure cannot readily be used to date episodes of banking crises as has been done in the case of currency crises. Some studies of currency crises identify them by unusually large declines in a weighted index of exchange rates and international reserves (and possibly interest rates).[1] Bank loans by their nature do not allow high-frequency observations of their underlying market value that can be used to construct an empirically-based indicator for dating crisis episodes. Also, critical distress in a country's banking system can show up in many ways. It may not always manifest itself as a sharp decline in the value of bank assets or in the size of the deposit base. It may result instead in special official assistance, nationalization, forced mergers, or a variety of changes in circumstances that cannot be fully anticipated by a simple quantitative index.

Nor will every instance of distress or weakness in a country's banking system represent a crisis. Even a large individual bank may fail because of fraud or mismanagement. A group of banks may fail because of undiversified exposure to regional economic risks. If such problems are limited, and perceived as resulting from shocks that are specific to one institution or a narrow class of institutions, they need not pose a risk of systemic crisis.

As a consequence, classifying and dating a banking crisis involves some irreducible degree of subjective judgment. In this respect, the problem of dating a banking crisis is similar to that of designating a recession. Recessions are treated as recurrent, although not periodic, events that have a fundamental similarity in terms of a sustained, general decline in economic activity followed by a sustained, general recovery. This fundamental repeating pattern of macroeconomic dynamics makes recessions identifiable events that are subject to analysis.

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[1] See Eichengreen, Rose and Wyplosz (1996) for an example of such an index. Of course, even in the case of currency crises, it is conceptually difficult to capture all dimensions of a crisis in a simple index. Interest rates may be raised to forestall a run on an exchange rate, but they may go up for other reasons as well; it is difficult to screen out only those instances that represent a currency crisis. Furthermore, the reaction to an emerging currency crisis may be manifested in none of the components of the Eichengreen-Rose-Wyplosz index but in, for example, the imposition of capital controls or in directed private foreign borrowing or asset repatriation.

Although simple rules have been proposed to define recessions—for example, two or more quarters of real output decline—the consensus of economists views recessions as too complicated to be so simply characterized. The breadth of output declines, the conditions of the labor market, and many other factors are also important. So economists have come to rely on expert judgment to demarcate the timing of recessions. In the United States, for example, the National Bureau of Economic Research has acquired that role by virtue of its traditional expertise on business cycle indicators.

Banking crises are events similar to recessions. Crises share a pattern of widespread damage to banking systems; like recessions, their timing cannot be easily determined by simple statistical filters, such as the ratio of nonperforming loans, and is better established by careful expert judgment. As yet, however, no consensus has been achieved about who should be the arbiter of dating banking crises.

Appropriately dating banking crises and determining their length and cost is important for assessing how much delay in dealing with a crisis may add to its cost. Data from these recent studies allow a direct examination of the relation between bank crisis length and measures of crisis cost.

The paper is structured as follows. Section II reviews recent studies of banking crises and examines how they differ regarding the dating, length and costs of crises. Section III uses data from these studies to analyze the relationship between crisis length and resolution costs. Even after incorporating various determinants of initial crisis costs, a significant relation between length and cost cannot be established. Section IV considers the relationship between crisis length and a more general measure of economic costs, the shortfall in economic growth during the crisis period. Here the evidence is somewhat more supportive of a positive relation between length and cost, but the connection is again not very strong. Section V presents conclusions.

II. RECENT STUDIES

The approach of most researchers in this area has been not to impose wholly their own judgment, but to incorporate the judgments of observers with expertise about country banking systems. This paper reviews five recent studies of banking crises.[2] Appendix 1 summarizes the episodes listed in each study and provides information, when available, on the dating and severity of the episodes.

The criteria used in the studies for the selection and dating of banking crises are summarized below:

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[2] Caprio and Klingebiel (1996), Demirguc-Kunt and Detragiache (1998), Dziobek and Pazarbasioglu (1997), Kaminsky and Reinhart (1996), and Lindgren, Garcia and Saal (1996).

- **Caprio and Klingebiel (CK).** This study organizes data on episodes of bank insolvency since the late 1970s. "It relies upon the assessment of a variety of finance professionals. Only published sources or interviews with experts familiar with individual episodes were employed. The dates attached to the crises reviewed here are those generally accepted by finance experts familiar with the countries. Some judgment has gone into this list [of systemic episodes]...virtually every transitional economy [TE] at some stage in the transition process belongs on the (systemic) list; however, in the interest of limiting the number of countries with missing information these were excluded. Including all the TEs would bring the number of countries covered to about 90 and the episodes to well over 100."

- **Demirguc-Kunt and Detragiache (DKD).** "...we have identified and dated episodes of banking sector distress during the period 1980–94 using primarily five recent studies: Caprio and Klingebiel (1996), Drees and Pazarbasioglu (1995), Kaminsky and Reinhart (1996), Lindgren, Garcia and Saal (1996), and Sheng (1995). Taken together, these studies form a comprehensive survey of banking sector fragility around the world. We established—somewhat arbitrarily—that for an episode of distress to be classified as a full-fledged crisis in our panel at least one of the following four conditions had to hold:

  (i)   The ratio of nonperforming assets to total assets in the banking system exceeded 10 percent.

  (ii)   The cost of the rescue operation was at least 2 percent of GDP.

  (iii)   Banking sector problems resulted in a large scale nationalization of banks.

  (iv)   Extensive bank runs took place or emergency measures such as deposit freezes, prolonged bank holidays, or generalized deposit guarantees were enacted by the government in response to the crisis.

    In a few cases, however, we had insufficient information and made a decision based on our best judgment."

- **Dziobek and Pazarbasioglu (DP).** "The sample consists of a representative group of countries reflecting a broad coverage across regions and levels of development. Countries were included only in cases where the problems were judged to be systemic...defined as a situation where problems affected banks which, in aggregate, held at least 20 percent of the total deposits of the banking system. A questionnaire was sent to country authorities and, in some cases, to IMF or World Bank staff with special expertise on banking sector problems. Data were requested for three points in time; the year when bank restructuring action started four years before and four years after that date...This information and data covered five broad areas: banking structure; bank performance; banking sector institutional framework (regulatory, legal and

accounting environment); instruments of bank restructuring used; and, costs and budgetary implications."

- **Kaminsky and Reinhart (KR)**. "...we mark the beginning of a banking crisis by an event that indicates either: (i) Bank runs that lead to the closure, merging, or takeover by the public sector of one or more financial institutions...(ii) If there are no runs, the closure, merging, takeover, or large-scale government assistance of an important financial institution (or group of institutions), that marks the start of a string of similar outcomes for other financial restitutions [sic]...To date these events, we rely heavily on existing studies of banking crises and on the financial press around the time of the crisis."

- **Lindgren, Garcia, and Saal (LGS)**. "Sources...include IMF desk economists, Sheng (1996), Caprio and Klingebiel (1996), the studies in Sundararajan and Balino (1991), and various official and news publications. Two general classes are identified: 'crisis'...and 'significant' problems...There is some degree of judgment in these classifications, but in general we refer to cases where there were runs or other substantial portfolio shifts, collapses of financial firms, or massive government intervention, as crises. Extensive unsoundness short of a crisis is termed significant."

CK, DKD and LGS generally specify both starting and ending dates at annual frequency for crises, although in several cases crises that have emerged recently are treated as ongoing. DP specify only the year in which bank restructuring operations began, which is an objective, observable criterion but which does not really date the emergence of the crisis. KR specify only the start of the crisis but do so at a monthly frequency.[3]

The classification of episodes of banking crises in these studies relies fundamentally on the judgments of expert opinion and more derivatively on the work of earlier studies. In this regard, CK seem to be a root source, since they base their classification completely on surveys of expert opinion and they are used as a source by several other studies. None of the studies suggest that the timing set by these subjective judgments was adjusted by using more objective information sources, such as changes in risk premia for sovereign or domestic bank borrowers in international markets, overall country risk ratings, the volume of banking system deposits, etc. Reliance on subjective expert views to date crises is appropriate. Simple multiple objective indicators, whether based on bank balance sheet data or financial market prices, are likely to be misleading. The concept of a crisis is meaningful principally in terms of its effects on the expectations of participants in financial markets and the economy. Expert opinion can directly reflect these expectations. The risk of error arises from expert opinion not being representative of the broader range of expectations in markets and the economy.

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[3] KR's dates for the start of crises in Appendix 1 are listed at annual frequency to be comparable with the other studies in the table.

There are discrepancies among the various studies regarding the timing and costs of banking crises. Table 1 shows that LGS are the most comprehensive listing of banking crisis episodes, with 149 occurrences. CK list a total of 86 episodes but has deliberately excluded several potential instances, especially among the transition economies, in order to limit the number of occurrences for which useful data are missing. CK and LGS have a much smaller discrepancy in the number of crisis episodes that have a definite length. For many episodes, in both studies, crises are listed as taking place in indefinite periods, such as "the 1980s" or as being "ongoing" or having a definite starting date but remaining open-ended. LGS use stricter criteria in practice for the selection of systemic banking crises than does CK; LGS identify 40 systemic episodes to 72 for CK.

Table 1. Summary Comparison of Various Indicators

	CK	DKD	DP	KR	LGS
Total episodes	86	31	24	25	149
Episodes of definite length	67	31	--	--	79
Average length of episode (years)	2.6	3.9	--	--	3.5
Systemic episodes	72	31	24	25	40
Systemic episodes of definite length	55	31	--	--	29

The other studies have a smaller set of episodes than CK and LGS because they were constructed to analyze the determinants or consequences of banking crises—rather than to provide comprehensive lists—and were generally limited by the availability of other information needed for the analysis. In some cases the selection procedures have produced a biased sample. As Appendix 1 shows, both DKD and KR exclude observations from transition economies and KR also omit African episodes. The exclusion of only the TEs may not create a severe selection bias. Banking crises in those countries can reasonably be viewed as the result of historically unique stresses. They are not a large fraction of total observed crises: TEs account for 25 of the total 149 episodes in the comprehensive LGS list and only five of the 40 systemic episodes.[4] However, the omission of both Africa and the TEs from the KR sample may pose a more serious problem for generalizing any conclusions about banking crises from that study. Africa and the TEs together account for 75 of the 149 total LGS episodes and 19 of the 40 systemic cases. The DP set avoids this problem because it was constructed to be a geographically representative sample.

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[4] TEs account for 10 of the 72 systemic episodes on the CK list, or 13.8 percent; this share is basically equivalent to the 12.5 percent in the LGS list.

A comparison of the two comprehensive sets—CK and LGS—reveals significant differences in the timing of common episodes. Table 2 shows comparative data for two subsets of common observations. There are 35 common observations between the two studies for crisis episodes of definite length (CK show 67 instances; LGS, 79). Of these 35, only nine show identical crisis periods.

Table 2. Comparison of CK and LGS Observations on Banking Crises

	Common episodes of definite length	Common systemic episodes with definite starting dates
Number of observations	35	26
Complete period overlaps	9	-
Same starting date	20	17
One-year difference in starting date	5	4

Often, however, the feature of interest is the starting date rather than the entire period of the crisis. Of the 35 common episodes, 20 have the same starting date and five others differ by only one year. This way of looking at the episodes shows a closer correspondence between the two studies. Still, more than 40 percent of the common episodes differ by a year or more in their start. If economic observers had similar disagreements about the timing of recessions, the concept of recession would be seriously impaired as a tool of empirical research. If the comparison is limited to systemic episodes with a definite starting date, overlap improves somewhat. Of 26 such crises that the two studies have in common, 17 have the same starting year and an additional four differ by one year.

Unless different observers share a common perception of what the facts are about banking crises around the world, developing any understanding about the process will be fundamentally hampered. Dating these crises is not the only dimension where perceptions differ. Table 3 provides data on the length and resolution costs of 11 overlapping episodes for which CK and LGS have complete data for both features. Of the 11 instances, four have an exact overlap in their periods, eight share the same starting date and two others have a one-year difference in the starting date. This is a close agreement on starting dates, but the studies differ somewhat on the average length of crisis. Furthermore, there is a more pronounced difference regarding the size of resolution costs, although much of this is attributable to the discrepancy for Argentina.[5]

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[5] The CK number for crisis costs in the 1980-82 Argentina episode, 55.3 percent of GDP, invites skepticism for being such an extreme outlier and probably reflects a broader cost concept than fiscal costs in this case. Excluding this observation from the regressions did not materially affect the results or change the qualitative conclusions.

Table 3. Comparison of CK and LGS Observations, Common Episodes
of Definite Length and Observed Resolution Costs

	CK		LGS	
	Length	Cost	Length	Cost
	(in years)	(in percentage of GDP)	(in years)	(in percentage of GDP)
Argentina	3	55.3	3	4.0
Chile	3	41.2	7	29.0
Estonia	1	1.4	3	1.8
Finland	3	8.0	4	8.4
Ghana	8	6.0	7	3.0
Malaysia	4	4.7	4	4.7
Norway	3	4.0	7	3.3
Philippines	7	3.0	7	13.2
Spain	9	16.8	9	5.6
Sweden	1	6.4	4	4.0
United States	8	3.2	13	2.4
Average	4.5	13.6	6.2	7.2

III. THE RELATION BETWEEN CRISIS LENGTH AND RESOLUTION COST

The data sets on global banking crises allow for a cross-section exploration of what effect delay in resolving a crisis has on the cost of the crisis. Most analysts of banking crises argue for their prompt resolution because of the risks posed by moral hazard. Banks that have negative or low net worth, and operate under limited liability with explicit or implicit depositor protections, have incentives to gamble. Such banks are willing to undertake investments with a low probability of a high payoff but which do not cover their risk and, therefore, pose an expected loss. As every croupier knows, anyone who keeps making unfair bets eventually loses. The longer that "dead" banks gamble with public insurance, the larger will be the public sector bill.

This tendency has a real cost because resources are directed to uneconomic uses and the creditworthiness of the government winds up encumbered, reducing its ability to give financial support to socially useful purposes. This theoretical argument is very general and should apply to varied circumstances since it depends only on the financial conditions of banks operating in a nearly universal legal and regulatory environment. As Caprio and Klingebiel (1996a) put it: "The common link between different types of bank failure is that the initial

losses, whatever their cause, often multiply when prompt corrective action is not taken." Or Lindgren, Garcia, and Saal: "Delay in addressing unsound banks is rarely effective and usually detrimental....unsound banks tend to take on even more risk or may be looted by insiders, which ultimately increases resolution costs."

A natural assumption is that delay in taking effective corrective action is directly related to the length of a crisis. Crisis length, then, can be used as a proxy measure for delays, and differences in crisis length across countries can measure differences in the speed of acting to effectively resolve the problem. Episodic evidence from different cases suggests the costliness of delaying resolution. However, systematic evidence across countries of a positive relation between the length of a banking crisis and the amount of resolution costs is not abundant.

DP show a negative relation between the time delay in taking bank restructuring measures after the surfacing of systemic problems and an overall measure of success in dealing with those problems. Their results show a general relation between rapid action and more progress in addressing bank problems but do not give indications of the strength or significance of the relationship. The success measure does not directly contain resolution costs but uses a number of factors that are clearly determinants of those costs—such as nonperforming loans and profitability indicators—as well as indicators of overall banking system performance. And the measure of the length that they consider refers to the gap between the onset of systemic problems and restructuring actions. This gap is not equivalent to the full length of a banking crisis, which may begin before systemic problems are perceived (some crises are not classified as systemic) and will extend beyond the onset of restructuring actions until some degree of stabilization is achieved in the banking system.

The CK and LGS data sets, however, do allow a direct test of the correlation between the length of a banking crisis and its costs. It should be noted at the outset that these cost data are not comprehensive or fully reliable. The costs reported in these data sets are meant to be the fiscal costs associated with the resolution of the banking crisis. Their accuracy varies across countries, however. In some cases they are based on scanty information; in others, a broader measure than just fiscal costs may have been inadvertently incorporated. The resolution costs of relatively recent crises are subject to constant revision as new losses or stronger-than-anticipated recoveries materialize. They do not include, as Caprio and Klingebiel (1996b) write, "that part of the burden born by depositors and borrowers in the face of widened spreads for bad loans that were left on banks' balance sheets" or the costs of indirect assistance such as "giving a subsidy to a borrower, granting the borrower some monopoly privilege or other means to improve its profits and thereby repay loans, or by directly injecting funds to banks."Also omitted are the macroeconomic costs that arise through the disruption to the credit system from bank failures or in other ways, which may be substantial since bank crises are frequently associated with succeeding recessions. Finally, the implicit assumption that direct resolution costs are correlated with total costs may be wrong in some instances. A country, for example, could avoid a banking crisis by resorting to massive monetary expansion, thereby passing the burden onto the economy at large.

Crisis costs, of course, depend on factors other than just the delay in addressing banking system problems. They depend foremost on the nature and magnitude of the shocks that initiated the crisis -- a general recession, a terms-of-trade decline, the collapse of a bubble in the property market, and so forth. They will depend as well on the types of actions that the authorities take to resolve the crisis. Some actions may be less costly than others; for example, a merger of a failed institution into a viable one on assisted terms may be less costly than closure and liquidation because it avoids the "fire sale" disposition of relatively illiquid assets. If the size of the initial crisis shocks and the types of resolution actions undertaken are independent of the length of delay in taking action, no bias will be introduced into an ordinary least squares (OLS) cross-section estimation of the relation between crisis length and cost. For the initial estimations, such independence is assumed. The need to re-examine the assumption of independence between crisis length and the size of the shocks that trigger a crisis will be discussed later. However, the assumption of independence between crisis length and the types of resolution actions undertaken is broadly justifiable.

Assume that when the authorities take action, they will choose the option that is lowest cost. Then, for assessing the relationship between delay and crisis cost, what matters is whether the menu of options available for actions to resolve a banking crisis varies systematically with the length of the delay in taking action. Specifically, the estimated relation between cost and delay will be biased downward if waiting longer to act allows more choices for dealing with the crisis to emerge. A wider number of policy options will be likely to increase the prospects of undertaking lower cost resolution actions. If a longer time means more options, and more options mean lower costs, a longer-lived crisis may be less costly, even given the moral hazard incentives that delay creates for increased crisis costs.

Does waiting to take resolution actions systematically increase of decrease the policy options that authorities have? This answer is not clear. Consider first a comparison of closure versus liquidation. The authorities always have the option to close and liquidate a failed bank, but this action may be a more costly resolution than merger with a viable institution. Developing a merger option, however, may take time. In this case, waiting to act may reduce resolution costs. On the other hand, suppose a merger option exists. Delay in acting, say, in the hope of developing better merger alternatives, risks losing the original option, for example, through unfavorable changes in the financial condition of the likely acquirer. The absence of a clear systematic relation between crisis length and the menu of options for resolution actions means that omitting the types of policy actions taken does not bias the estimation of the relation between crisis length and cost.

The CK data set includes a sample of 29 countries that have a banking crisis with both the definite length of the crisis period and the resolution costs (as a percentage of GDP) identified. These are listed in Table 4.

Table 4. Length and Cost of Banking Crises
(CK Sample)

Country	Period	Length (years)	Cost (percent of GDP)
Argentina	1980-82	3	55.3
Benin	1988-90	3	17.0
Brazil	1994-95	2	7.5
Chile	1981-83	3	41.2
Colombia	1982-87	6	5.0
Cote d'Ivoire	1988-91	4	25.0
Estonia	1992	1	1.4
Finland	1991-93	3	8.0
Ghana	1982-89	8	6.0
Guinea	1985	1	3.0
Hungary	1991-95	5	10.0
Indonesia	1994	1	1.8
Israel	1977-83	7	30.0
Malaysia	1985-88	4	4.7
Mauritania	1984-93	10	15.0
Mexico	1995	1	13.5
Norway	1987-89	3	4.0
Philippines	1981-87	7	3.0
Senegal	1988-91	4	17.0
Spain	1977-85	9	16.8
Sri Lanka	1989-93	5	5.0
Sweden	1991	1	6.4
Tanzania	1987	1	10.0
Thailand	1983-87	5	1.5
Turkey	1982-85	4	2.5
United States	1984-91	8	3.2
Uruguay	1981-84	4	31.2
Venezuela	1994-95	2	18.0
Zambia	1995	1	1.4

Figure 1: Cost of Banking Crises vs Length, CK Sample
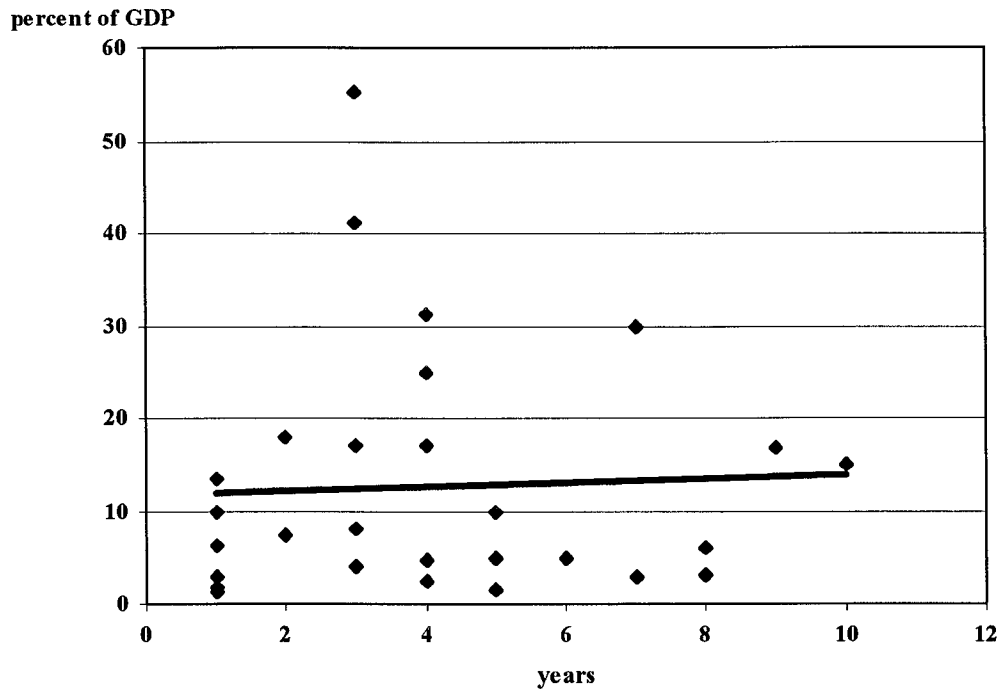
Eq. (1)   Cost = 11.6 + 0.24 Length $R^2 = 0.002$
              (2.54)*   (0.26)   T-stats in parentheses

* significant at 1 percent confidence level

Figure 1 shows the scatter diagram for these data with a trend line and Equation (1) reports the results of a simple OLS regression of cost on length.

There is no significant relationship between the length of a banking crisis and its resolution costs in the CK data. Although the coefficient on length is positive, it is far from significant and the extremely low R^2 indicates an absence of explanatory power. [6]

[6] Countries in the sample show a wide range in economic size, which may indicate different capabilities of dealing with crises effectively. Including a measure of economic size—the share of global GDP in 1995 dollars—did not appreciably change the results. Crisis length remained insignificant.

Similar results occur using LGS data for episodes of definite length where information on resolution costs is given. Table 5 provides these data and Equation (2) shows again another insignificant positive relation with no explanatory power.

Table 5. Length and Cost of Banking Crises
(LGS Sample)

Country	Years	Length	Cost
Argentina	1980-82	3	4.0
Chile	1981-87	7	29.0
Estonia	1992-95	4	1.8
Finland	1991-94	4	8.4
France	1991-95	5	0.6
Ghana	1983-89	7	3.0
Kazakstan	1991-95	5	4.5
Malaysia	1985-88	4	4.7
Norway	1987-93	7	3.3
Philippines	1981-87	7	13.2
Spain	1977-85	9	5.6
Sweden	1990-93	4	4.0
Turkey	1994	1	1.0
United States	1980-92	13	2.4

Figure 2: Cost of Banking Crises vs. Length, LGS Sample

percent of GDP
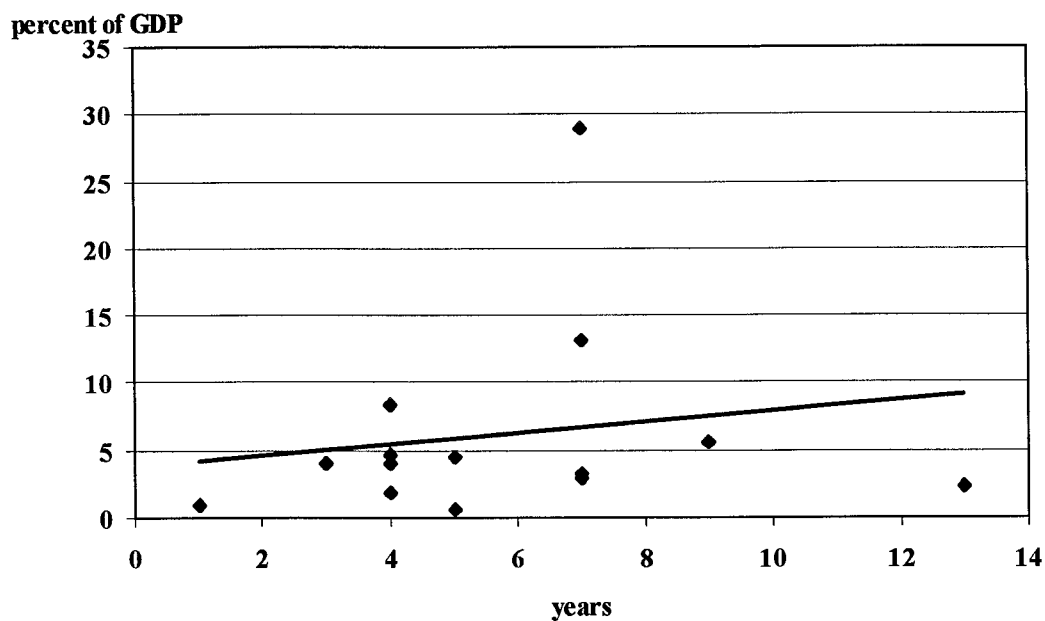
$$Eq.(2) \qquad Cost = 3.75 + 0.41 \ Length \qquad R^2 = .03$$
$$\qquad\qquad (0.83) \quad (0.58) \qquad\qquad\qquad \text{T-stats in parentheses}$$

There is not a clear-cut relation between crisis length and cost in the cross-sectional data despite a potential bias in that direction. The observed length of a crisis period may not measure the conceptually appropriate delay between the onset of a problem and actions to resolve it effectively. Episode lengths reported in the CK and LGS samples reflect experts' judgments about the beginning of the crisis. There is, however, a necessary perception lag between first impressions of a crisis and the time at which banks actually built up large losses. Observers may have an ex-post tendency to shorten this perception lag by recalling their perceptions of a crisis to be earlier in the process than they actually were. This tendency would be especially strong for major crises: their standing as experts is enhanced more, the sooner they are perceived to have called the onset of a major crisis.[7] Unless dating is done against a contemporaneous record of expert perceptions (and this does not seem to be the case throughout the CK and LGS samples), the temptation to enhance reputation ex post will work to bias upward the perceived length of costly bank crises.

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[7] On the other hand, the regulators who were responsible for banking system oversight have an incentive in retrospect to place the first signs of crisis later, and hence closer to their actions. The perceptions of the bank regulators, however, are not the sources of dating crises in the samples.

Why is there not a significant link?

Various reasons may account for the somewhat surprising lack of a significant positive correlation between crisis length and resolution costs.

The reduced borrowing capacity of low net worth banks

One factor that can produce a weak linkage between crisis length and cost is the negative effect of asset losses on the ability of troubled banks to raise funds. This effect can arise even in a regime of implicit deposit insurance. Implicit deposit insurance is expected to protect the capital value of bank deposits but provides no assurance about their liquidity. So losses that threaten to put a bank into a negative net worth position raise the probability that depositors will exercise their (implicit) call on the deposit insurance fund. This risk, in turn, reduces the liquidity of any new deposits with the institution and works to tighten counterparty limits and restrict new funds -- a kind of residual market discipline.

Additionally, if enough banks fall to a negative net worth position during a crisis, the amount of unencumbered reserves that support the deposit insurance function may be severely reduced. These reserves would have to be reconstituted through a government appropriation and there will be some uncertainty whether that replenishment would be done in full, depending on the government's own fiscal position. As a consequence, the marginal attractiveness of new deposits for all banks in a system undergoing crisis will be reduced.[8]

Under these conditions, low net worth banks will find their access to new deposits restricted. Although they have an incentive to gamble by acquiring unjustifiably risky assets, their ability to take on such assets quickly is limited. Since the growth in the total footings of low net worth banks is checked by their restricted capacity to attract new funding, they can only take on new risky assets by substituting for old, less risky ones.[9] This slow process limits the rate at which new risk is undertaken. As a result, banks in crisis do not rapidly generate new losses and add to crisis resolution costs.

Subtle intervention

The manner in which supervisory intervention is conducted may also affect the perceived relation between banking crisis length and resolution cost. Removing the distorted incentives for gambling facing the management of banks that have suffered major net worth erosions is achieved usually by overt actions such as directed recapitalization, forced

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[8] Banks cannot easily overcome rationing behavior in the deposit markets by offering higher rates, since such bidding for funds generates familiar adverse selection problems that further aggravate credit rationing; see Stiglitz and Weiss (1981).

[9] Low net worth banks will also be restricted by their impaired creditworthiness from using derivatives transactions to increase their asset risk profile.

shrinkage, replacement of management, merger, etc. These overt actions are typically the events that signal to observers the denouement of a crisis episode. It is possible, however, for the authorities to influence behavior through subtle interventions that may not be readily apparent to outside observers. Discreet warnings to a troubled bank to adopt a more conservative business posture may result in that bank going into standstill mode even without a change in management. In that case, no new unjustifiable risks will be undertaken. Even if the condition of damaged assets worsens further, such losses may be covered by earnings on viable assets. That bank, then, will appear to an outside observer to be in an unresolved crisis. It will have low net worth, low earnings, and no overt actions will have been taken to address the matter. But at the margin, behavior will have moved away from dangerous risk-taking. These conditions will be viewed as an ongoing, long-lived crisis that does not generate further increases in resolution costs, contrary to presumptions.

Faster reaction to larger crises

A final important factor interfering with a strong positive link between crisis length and cost is an incentive for authorities to act more quickly when the initial perception of the size of the crisis is higher. This tendency undercuts the assumption of independence between initial shocks and crisis length mentioned earlier. The process of a banking crisis can be conceptually divided into different stages (Figure 3). The first stage is the period between the onset of crisis problems and the first awareness of them outside the problem banks; call this the perception lag. The second stage, the action lag, is the gap between those initial perceptions and the perceived resolution of the crisis through policy measures. The action lag can be further divided into "inside" and "outside" action lags. The inside action lag is the gap between the perceived beginning of the crisis and the initial policy steps to resolve it. The outside lag is the period from those initial actions until the actions are perceived to be effective in ending the crisis. This last lag may be prolonged if the initial policy actions were insufficient to resolve the crisis and must be followed by another set of measures. Such a sequence of initial failure and repeated follow-up may account for occasional differences among observers about whether a country has experienced one long crisis or two (or more) separate episodes.[10] Conversely, if the initial policy actions are generally viewed as very strong, the outside action lag may be squeezed down to zero length. The observed crisis length will run from the end of the perception lag to the end of the outside action lag.

The perception lag may vary in length depending on the nature of the shocks that trigger problems and the way that banks respond. Initial disturbances—such as exchange rate depreciation, terms of trade declines, falls in property values, and so forth—can obviously vary in their intensity. Troubled assets may be disguised by "evergreening" of loans through a complicated network of related borrowers, by off-balance sheet manipulations, or by outright fraud. As a consequence, initial perceptions of the size of a banking sector problem and its implied resolution costs can vary a great deal from case to case.

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[10]See, for example, the case of Tanzania in Appendix 1. CK classify two separate instances in 1987 and 1995, while DKD and LGS record one long protracted episode.

Figure 3. Temporal Sequence of Crisis Resolution
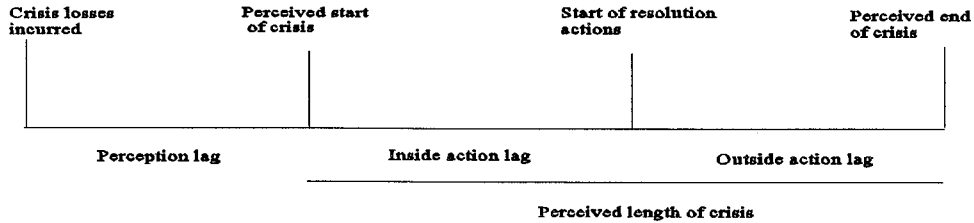
If the first impressions of the size of a problem are large, the authorities may be very prompt in their response. The prudent assumption for bank regulators is to assume that conditions are deteriorating at a rate commensurate with the initial size of the problem. This assumption is consistent with the incentives facing the banking system. The larger the initial losses arising from the original shocks, the greater is the likely amount of assets in banks with low net worth. The larger, in turn, is the likely amount of loss-provoking gambling that will be undertaken and the faster will the crisis worsen. The authorities, then, have a greater incentive to act quickly to resolve an initially large crisis because the incentives facing the banking sector will make the situation deteriorate rapidly. On the other hand, incentives to address a smaller initial problem are weaker, since the prospective rate of deterioration is less.

So crises that show a high perceived cost at the end of the perception lag will have a short action lag and, probably (if the initial actions are vigorous) a short crisis length. Episodes that show a relatively low cost at the end of the perception lag will not spur such quick action. If banking sector conditions in those cases worsen relatively slowly, they will result in a lengthy crisis but with relatively low cost. As a consequence, cross-sectional data can show an insignificant or even negative relation between crisis length and resolution cost, even if such a true positive relationship exists, provided resolution costs do not increase very rapidly with delays.

This bias is illustrated in Figure 4. The lengths OA an OC measure different levels of initial crisis costs based on banking system losses at the perceived start of a banking crisis. Crises with higher initial costs tend to deteriorate faster than low initial cost crises because more banks are likely to be in a lower net worth position, creating stronger incentives within the banking system for gambling behavior.[11] The marginal cost of delay in high initial cost crises will be relatively high. In Figure 4 the slope of CD is greater than the slope of AB.

Figure 4. Downward Bias in the Observed Relationship Between Crisis Cost and Length
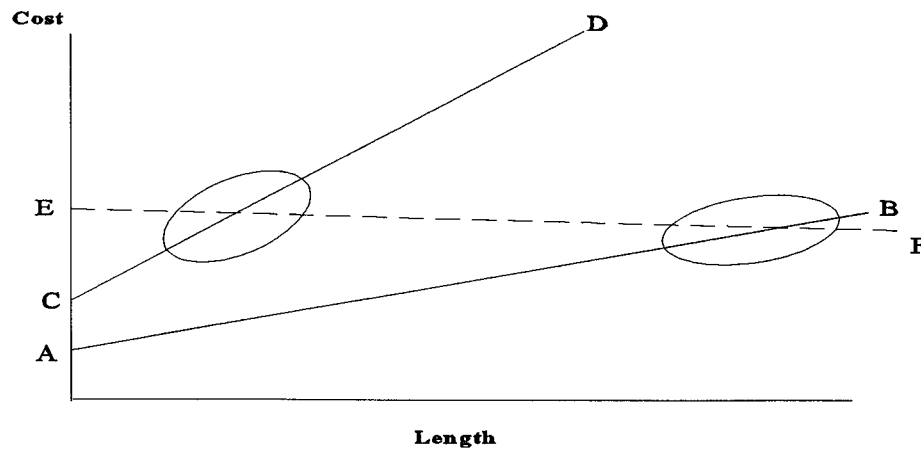
Bank regulatory authorities, therefore, will have a stronger incentive to cut short crises with higher initial costs. Observations of high initial cost crises will be clustered in, say, the oval on line CD, while low initial cost crises are observed to be bunched in the oval on line AB. The estimated relationship from all the observations, however, is shown by the dashed line EF, which produces a downwardly biased estimate of the correct underlying marginal cost of delay in dealing with banking crises.

Given the moral hazard problem, authorities should try to minimize the action lag and take resolution measures that are commensurate with the size of the problem at the end of the

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[11] This statement is true probabilistically, since the consequences of initial shocks on bank behavior depend on the distribution of the shocks within the banking system. It is possible, but unlikely, that the distribution of a larger level of initial costs is highly correlated with the distribution of capital in the banking system, leaving fewer banks in a low net worth position than in the case of a crisis with lower, but less favorably distributed, initial costs.

perception lag. The marginal cost attributable to the delay in taking appropriate action should be the difference between the costs at the end of the perception lag and the total costs of resolution. This cost is the combination of the cost of delaying any action after getting the first impression of a crisis and the costs of taking insufficiently strong actions that do not succeed in stabilizing the situation, even if these actions are taken in a timely manner.

Typically, however, information is not available that allows the resolution costs of a banking crisis to be accounted accurately between those that were realized before the end of the perception lag and those taken on later. Even going back to the contemporaneous record at the end of the perception lag, as it may appear in newspaper accounts or statements of public officials, may misstate the true cost at that time, since contemporaneous estimates are unlikely to be based on full information.

Incorporating determinants of initial costs

Given this information problem, an alternative approach is to include determinants of the size of the banking problem at the end of the perception lag in the estimation of the relation between cost and length of the banking crisis. These determinants would account for cross-country variation in the initial size of the banking crisis and allow a more accurate estimate of the marginal effect of delay on resolution cost.

Recent studies point to a broad variety of potential determinants of banking crises.[12] This paper selects only a limited set of likely macroeconomic factors—credit growth, economic activity, and real interest rates—in order to preserve degrees of freedom in the small sample and to limit the number of countries excluded because of missing data.[13] The literature generally contends that banking crises are preceded by credit booms, economic weakness, and a rise in real interest rates that may be a consequence of financial liberalization.[14] These three factors are commonly highlighted as macroeconomic determinants of banking distress but they are hardly exhaustive. The purpose of this paper, however, is not to test comprehensively for

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[12] See Demirguc-Kunt and Detragiache (1998), Gonzalez-Hermosillo (1998), Hardy and Pazarbasioglu (1998), and Kaminsky and Reinhart (1996). Determinants of banking crises fall into two broad classes: indicators of bank exposure to risk and macroeconomic conditions. The former include bad loan ratios, capitalization measures, market risk exposures and so forth. The latter encompass features such as credit growth, the level of economic activity, real interest rates and exchange rates, terms of trade, the consequences of financial liberalization, etc. In general, these studies support an interpretation that banking crises can arise from a complex set of causes.

[13] The estimation sample is the CK sample from Table 5 less Estonia, Guinea, Israel and Turkey, which were omitted for reasons of data availability (see Appendix 2).

[14] In some cases, higher real interest rates may reflect as well credit crunch conditions that are also occasionally cited as a precipitating factor of a banking crisis. A credit boom and a credit crunch do not, of course, occur simultaneously, but they may appear sequentially in a given period preceding a banking crisis.

determinants of banking crises. Rather, the purpose is to introduce some generally accepted variables that may account for cross-country variation in the perceived costs of the crisis at the end of the perception lag in order to estimate better the effect of delay on resolution costs. The credit boom measure is the average of the difference between the ratio of domestic credit to GDP and a 10-year linear trend value of that ratio for the two years preceding the onset of the banking crisis. The activity variable is the average ratio of the output gap (measured against a 10-year linear trend for real GDP) for the two years preceding the banking crisis.

The real interest rate measures the average difference between real interest rates and the 10-year linear trend of real interest rates for the two years preceding the banking crisis. Real interest rates were calculated using bank lending rates, if available, or other bank rates or money market rates, if not. Inflation rates were calculated from implicit GDP deflators. Resolution costs of banking crises are assumed to increase directly with the credit boom and interest rate measures and inversely with the output measure.

The result of incorporating these macroeconomic determinants into the cross-country estimation of resolution costs is presented in equation (3).

Eq.(3)   Cost = 7.60 + 0.84 Length + 0.92 Credit + 2.87 Output + 0.02 Real interest rate
                (1.38) (0.81)   (1.94)*   (2.46)*   (1.41)

*significant at 5 percent confidence level $R^2 = .32$ Degrees of freedom = 20
                                                              T-stats in parentheses

The inclusion of the macroeconomic determinants in the estimation improves the general fit of the equation; the R^2 statistic increases to .32. The coefficients on credit acceleration and the output gap are significant, but the output gap has the wrong sign. The coefficient on the length term increases (to 0.84 from 0.24 in equation (1)) but remains insignificant. The wrong sign on the output gap and the omission of other potential determinants point to remaining problems of misspecification and mismeasurement. These problems may account for the continuing insignificance of the length term. Still, for the CK sample, which offers the largest available data set on both the cost and length of banking crises globally, the evidence does not point to delay in resolution actions having a clear-cut strong effect on resolution costs.

IV. CRISIS LENGTH AND GROWTH

As noted earlier, resolution costs measure the fiscal costs of a banking crisis but are subject to various errors and do not incorporate various indirect costs to the government or general costs to the economy. An alternative approach, then, to examining whether longer crises are more costly is to look at their effects on "bottom-line" indicators of economic performance.

Economic growth is a natural final performance indicator. Banking crises can depress economic growth in various ways. Concern about the condition of the banking system can restrict sources of funds and raise their cost. In reaction banks not facing an incentive to gamble may limit the amount of credit available and raise borrowing costs to the general economy, slowing growth. In addition, uncertainty about the costs to the government of bank losses and any ensuing tax liabilities may depress aggregate demand.

If longer crises have greater economic costs, they should act as a greater burden on economic growth. A simple test of this thesis is to see whether any shortfall between economic growth in the crisis period and some trend measure of growth is positively correlated with crisis length.

Such a measure was constructed, where data were available, by subtracting average growth during the crisis period from average growth during the 10 years preceding the crisis.[15] The observations are presented in Table 6 and Figure 5. They indicate that short-lived crises of one-year duration are not associated with a growth shortfall. Episodes of 2 to 7 years are correlated with substantial growth shortfalls, although not in a monotonic fashion. Beyond 7 years in length the association breaks down and the number of observations is scarce.

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[15] The sample used was the CK sample of crises of definite length. Countries lacking sufficient real GDP data were excluded. For countries with multiple banking crises, later crises were excluded unless separated by at least 10 years. These exclusions reduced the total number of observations from 67 to 50. The full sample is in Appendix 3.

Table 6. Growth Shortfall by Crisis Length (CK Sample)

1 Crisis length (years)	2 Number of Observations	3 Average GDP Growth During Crisis Period (percent)	4 Average GDP Growth for 10 Years Prior to Crisis (percent)	5 Growth Shortfall Col. (4) - Col. (3) (percent)
1	17	3.18	2.86	-0.32
2	9	2.01	4.34	2.33
3	7	-0.93	2.60	3.53
4	6	-0.50	2.62	3.12
5	4	3.11	4.58	1.47
6	1	2.25	5.16	2.91
7	2	2.84	7.06	4.22
8	2	2.64	1.19	-1.45
9	1	2.79	5.42	2.63
10	1	2.47	2.54	0.07

See Appendix 3 for full sample data.

Simple regressions of the growth shortfall on crisis length show only a marginally stronger relationship than was the case using resolution costs. Figure 6 shows the fitted trend line indicated in Equation (4). Again there is a positive relation between crisis length and cost—this time measured by the growth shortfall—but it is statistically weak.

Figure 5: Average Growth Shortfall vs. Length of Banking Crisis

Percent
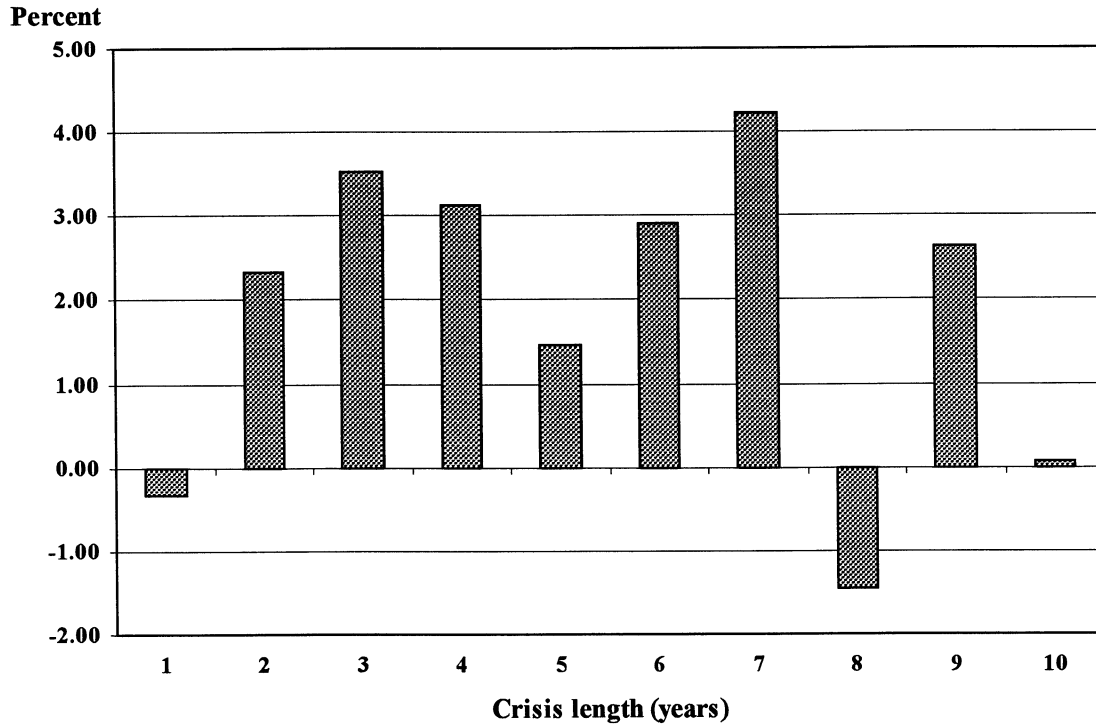
Long-lived crises are very uncommon -- only one or two are observed at each length
above 5 years. Consequently, confidence in the information value of these scanty observations
will be relatively low. Excluding the unusual events of very long-lived crises (more than
5 years) on such concerns about measurement error in the sample observations does improve
the results, as shown in Equation (5); crisis duration then has a significant, as well as a more
sizeable, effect on bank costs. These results suggest that part of the difficulty in obtaining a
significant relationship between crisis length and resolution cost is due to the variety of
measurement problems that plague resolution costs.

Figure 6: Growth Shortfall vs Length of Banking Crisis
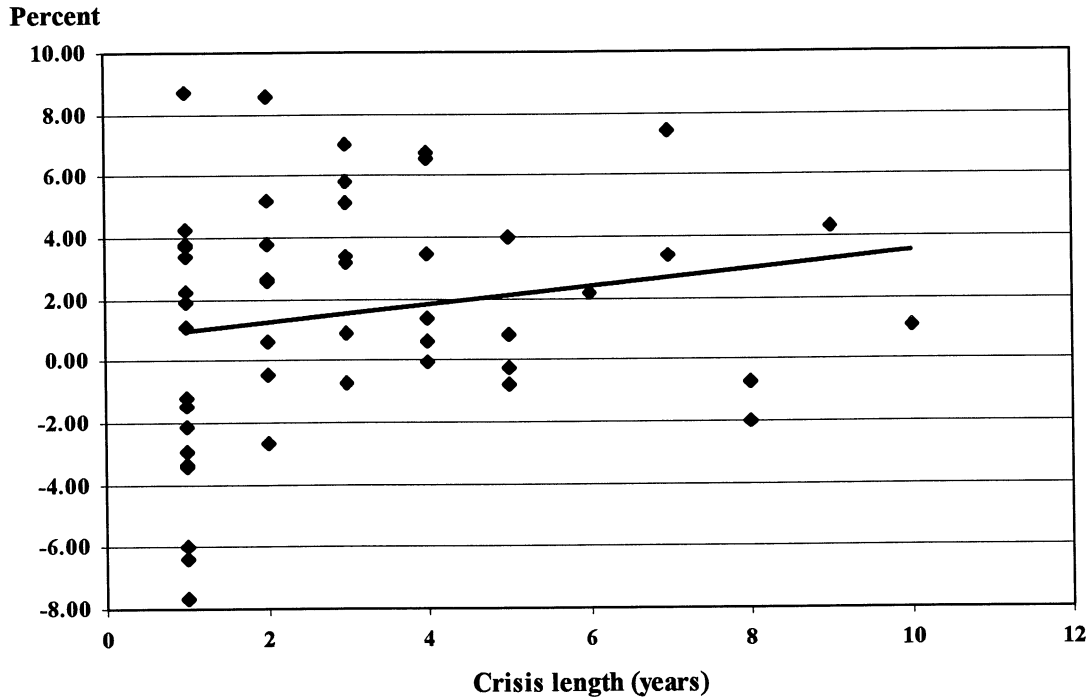
Eq. (4)　Growth shortfall = 0.68　+　0.28 Length　　　$R^2 = .03$　Degrees of freedom = 49
　　　　　　　　　　　(0.79)　(1.26)　　　　　　　　T-stats in parentheses

Eq. (5)　Growth shortfall = -0.26 + 0.73 Length　　　$R^2 = .07$　Degrees of freedom = 42
　　　　　　　　　　　(0.23)　(1.76)*　　　　　　　T-stats in parentheses

*significant at 5 percent confidence level

　　　Using a growth shortfall as a measure of overall cost raises the possibility of a causal linkage in the opposite direction: a growth shortfall may produce a banking sector crisis as the consequence of a generally weaker economy. Indeed, that association is likely to be stronger, the longer the duration of the shortfall, since prolonged economic weakness is needed to destroy banking system capital and create a crisis. If causation runs from economic weakness to bank crises, though, the incidence of crises by duration is more likely to be positive, since periods of prolonged growth shortfall are more likely to produce banking crises. In that case, more crises would be observed at longer crisis lengths than at shorter lengths. The incidence of crises by duration in the sample, however, is negative, which is consistent with causality running from crisis length to growth shortfall.

V. CONCLUSIONS

Recent studies of banking crises show important differences regarding the timing, duration and cost of the crises. An analytical consensus on the features is still elusive. Dating banking crises is a similar problem to demarcating recessions; it involves a necessary degree of expert judgment. As is the case with recessions, an analytical consensus can be achieved by relying on the judgment of a group of credible experts as arbiters.

Data from the recent studies also allow analysis of the relation between crisis length and measures of crisis cost. Arguments based on the incentives created from the moral hazard of delay in resolving a banking crisis suggest that a positive relation should exist between crisis length and cost. Tests using a cross-section of available data do not show a significant positive relation. Regulators have a clear incentive to more quickly resolve crises where delay threatens to be more costly. Crises where bank losses from initial shocks are high create the risk of further relatively high losses from delay. But even after trying to account for this effect by including determinants of initial crisis costs, a significant relation between crisis length and cost remained elusive. Results are somewhat better if costs are measured by forgone GDP growth rather than by budgetary resolution costs, possibly because resolution costs are a relatively narrow cost concept prone to a variety of measurement errors.

Episodes of Banking Crises

	Caprio and Klingebiel			Demirguc-Kunt and Detragiache			Dziobek and Pazarbasioglu			Kaminsky and Reinhart		Lindgren, Garcia, Saal				
Country	Period	Length (years)	Cost*	Country	Period	Length	Country	Year	Cost*	Country	Year	Country	Period	Length	Type	Cost*
Africa																
Angola				Angola			Angola			Angola		Angola	1991-		1	
Benin	1988-90	3	17.0	Benin			Benin			Benin		Benin	1988			2	
Botswana				Botswana			Botswana			Botswana		Botswana	1994-5			1	
Burkina Faso	late 1980s			Burkina Faso			Burkina Faso			Burkina Faso		Burkina Faso	1988-94			1	
Burundi				Burundi			Burundi			Burundi		Burundi	1994-		1	
Cameroon	1987-			Cameroon			Cameroon			Cameroon		Cameroon	1987-93			2	
Cape Verde				Cape Verde			Cape Verde			Cape Verde		Cape Verde	1993-		1	
Congo	1980s			Congo			Congo			Congo		Congo				
Congo	1994			Congo			Congo			Congo		Congo	1994-			2	
Central African Rep.	1980s			Central African Rep.			Central African Rep.			Central African Rep.		Central African Rep.	1976-92			2	
Central African Rep.	1995			Central African Rep.			Central African Rep.			Central African Rep.		Central African Rep.	1995-			1	
Chad	1980s			Chad			Chad			Chad		Chad	1979-83				
Chad	1994			Chad			Chad			Chad		Chad	1992				
Cote d'Ivoire	1988-91	4	25.0	Cote d'Ivoire			Cote d'Ivoire	1991	13.0	Cote d'Ivoire		Cote d'Ivoire	1988-90				
Djibouti				Djibouti			Djibouti			Djibouti		Djibouti	1991-93				
Equatorial Guinea				Equatorial Guinea			Equatorial Guinea			Equatorial Guinea		Equatorial Guinea	1983-85			2	
Equatorial Guinea				Equatorial Guinea			Equatorial Guinea			Equatorial Guinea		Equatorial Guinea	1995				
Ethiopia	1995			Eritrea			Eritrea			Eritrea		Eritrea	1994				
				Ethiopia			Ethiopia			Ethiopia		Ethiopia	1994-95				
Gabon				Gabon			Gabon			Gabon		Gabon	1995-		1	
The Gambia	1992-95		6.0	The Gambia	1993		The Gambia	1985	6.0	The Gambia		The Gambia	1985-92			2	
Ghana	1983		6.0	Ghana			Ghana			Ghana		Ghana	1983-89				
Guinea	1985		3.0	Guinea			Guinea			Guinea		Guinea	1980-85			2	
Guinea	1993	1		Guinea			Guinea			Guinea		Guinea				3.0
Guinea-Bissau	1995-95			Guinea-Bissau			Guinea-Bissau			Guinea-Bissau		Guinea-Bissau	Ongoing		1	
Guinea-Bissau				Guinea-Bissau			Guinea-Bissau			Guinea-Bissau		Guinea-Bissau	1988-		1	
Kenya	1985-89	3		Kenya			Kenya			Kenya		Kenya				
Kenya	1992			Kenya			Kenya			Kenya		Kenya	1993			1	
Kenya	1993-95			Kenya			Kenya			Kenya		Kenya	1985				
Lesotho				Lesotho			Lesotho			Lesotho		Lesotho	1988-		1	
Liberia				Liberia			Liberia			Liberia		Liberia	1991-95				
Madagascar	1988			Madagascar			Madagascar			Madagascar		Madagascar	1988			1	
Madagascar				Madagascar	1987-88	2	Madagascar			Madagascar		Madagascar	1991-95				
Mali				Mali			Mali			Mali		Mali	1987-89			1	
Mali	1987-89	10	25.0	Mali			Mali			Mali		Mali	1995				
Mauritania	1984-93			Mauritania	1991-93		Mauritania	1993	15.0	Mauritania		Mauritania	1991-93			3	
Mozambique	1987-			Mozambique			Mozambique			Mozambique		Mozambique	1988-			6	
Mozambique				Mozambique			Mozambique			Mozambique		Mozambique	1994-5			2	
Nigeria				Nigeria	1991-94	4	Nigeria			Nigeria		Nigeria	1983-			2	
Nigeria	1990s			Nigeria			Nigeria			Nigeria		Nigeria	1991-95				
Rwanda				Rwanda			Rwanda			Rwanda		Rwanda	1991-		1	
Sao Tome - Principe	1980-91	4	17.0	Sao Tome - Principe	1983-88	6	Sao Tome - Principe			Sao Tome - Principe		Sao Tome - Principe	1980-			2	
Senegal	1988-91			Senegal			Senegal			Senegal		Senegal	1983-88			6	
Sierra Leone	1988			Sierra Leone			Sierra Leone			Sierra Leone		Sierra Leone	1990				
Somalia				Somalia			Somalia			Somalia		Somalia	1990				
South Africa	1977			South Africa	1985		South Africa			South Africa		South Africa	1985				
South Africa				South Africa			South Africa			South Africa		South Africa	1989-				
Swaziland			10.0	Swaziland			Swaziland	1995	10.0	Swaziland		Swaziland	1995			?	6.5
Tanzania	1987			Tanzania	1988-95		Tanzania	1992		Tanzania		Tanzania	1988-			1	
Tanzania	1988			Tanzania			Tanzania			Tanzania		Tanzania				2	
Togo	1993-95			Togo			Togo			Togo		Togo	1993-95			3	
Uganda	1994			Uganda	1990-95	5	Uganda			Uganda		Uganda	1990-		1	
Zaire	1991-92			Zaire			Zaire	1995		Zaire		Zaire	1991-		1	
Zambia	1995		1.4	Zambia			Zambia			Zambia		Zambia	1994-		1	3.0
Zimbabwe				Zimbabwe			Zimbabwe			Zimbabwe		Zimbabwe	1995-		1	

Asia and Far East

Bangladesh
Bhutan
Brunei
Cambodia
China
Fiji
Hong Kong
Hong Kong
India
Indonesia
Korea
Laos
Malaysia
Mongolia
Myanmar
Nepal
Pakistan
Papua NG
Philippines
Singapore
Sri Lanka
Taiwan
Taiwan
Thailand
Thailand
Vietnam

Latin America and Caribbean

Argentina
Argentina
Argentina
Bolivia
Bolivia
Brazil
Brazil
Chile
Chile
Colombia
Costa Rica
Dom. Rep.
Ecuador
El Salvador
Guyana
Haiti
Jamaica
Mexico
Mexico
Nicaragua
Panama
Paraguay
Peru
St. Vincent
Trinidad
Uruguay
Uruguay
Venezuela
Venezuela

North Africa and Mideast

Algeria
Egypt
Egypt
Jordan
Israel
Kuwait

Lebanon
Morocco — early 1980s
Tunisia
Turkey — 1982-85
Turkey
Turkey

Transition Economies

Country		
Albania		
Armenia		
Azerbaijan		
Belarus		
Bosnia		
Bulgaria	1990s	14.0
Croatia		
Czech Rep.		
Estonia	1992	
Estonia	1994	
Georgia		
Hungary	1991-95	10.0
Kazakstan		
Kyrgyz Rep.		
Latvia	1995	
Lithuania	1995-96	
Macedonia		
Moldova		
Poland	1990s	$1.7bil
Romania	1990-93	
Russia	1995	
Slovak Rep.		
Slovenia	1990s	$1.3bil
Tajikistan		
Ukraine		
Uzbekistan		

Advanced OECD

Country		
Australia	1989-90	
Canada		
Denmark		
Finland	1991-93	8.0
France	1994-95	$10bil
Germany	late 1970s	
Greece		
Iceland		
Iceland		
Ireland		
Italy	1990-94	
Japan	1990s	+ $100 bil
New Zealand	1987-90	
Norway	1987-89	
Portugal		
Spain	1977-85	16.8
Sweden	1991	6.4
United Kingdom	1974-76	
United States	1984-91	3.2

Highlighted areas represent episodes of bank crises that have definite periods associated with them.

* Percentage of GDP, unless otherwise indicated.

Sources: Caprio and Klingebiel (1996b), Demirguc-Kunt and Detragiache (1998), Dziobek and Pazarbasioglu (1995), Kaminsky and Reinhart (1996), Lindgren, Garcia and Saal (1996).

Data for Cross-Country Estimation of Equation

Country	Period	Credit acceleration*	Output gap**	Real interest rate change ***	Length (years)	Cost (percent of GDP)
Argentina	1980-82	7.71	-1.13	261.29	3	55.3
Benin	88-90	-1.23	-1.74	-8.78	3	17
Brazil	94-95	-5.26	-1.90	882.69	2	7.5
Chile	81-83	-2.00	9.10	-11.64	3	41.2
Colombia	82-87	0.39	0.43	1.28	6	5
Cote d'Ivoire	88-91	-2.75	4.26	3.22	4	25
Finland	91-93	1.21	2.53	5.23	3	8
Ghana	82-89	-16.60	0.21	-33.45	8	6
Hungary	91-95	-3.42	-0.32	5.04	5	10
Indonesia	94	-2.52	1.95	-5.07	1	1.8
Malaysia	85-88	1.85	0.52	-0.46	4	4.7
Mauritania	84-93	-1.75	-0.19	0.86	10	15
Mexico	95	5.92	1.02	2.87	1	13.5
Norway	87-89	3.02	1.69	7.98	3	4
Philippines	81-87	1.06	0.72	4.72	7	3
Senegal	88-91	-4.46	0.85	-0.62	4	17
Spain	77-85	-0.10	-1.61	-0.17	9	16.8
Sri Lanka	89-93	1.93	-1.31	-3.03	5	5
Sweden	91	2.92	0.08	0.56	1	6.4
Tanzania	87	-4.25	0.94	-1.63	1	10
Thailand	83-87	-2.16	-0.07	8.89	5	1.5
United States	84-91	0.79	-2.42	-2.45	8	3.2
Uruguay	81-84	1.26	2.74	-10.99	4	31.2
Venezuela	94-95	0.53	2.23	8.90	2	18
Zambia	95	-13.92	0.20	124.83	1	1.4

* Average percentage difference between the ratio of domestic credit to GDP and a 10-year linear trend in the two years before the crisis.

** Average percentage difference between real GDP and 10-year linear trend for the two years before the crisis.

*** Average difference between real interest rate and 10-year linear trend for the two years before the crisis.

Data for Estimation of Equations (4) and (5)

1 Country	2 Period	3 Length (years)	4 Average GDP Growth During Crisis Period (percent)	5 Average GDP Growth for 10 Years Prior to Crisis (percent)	6 Growth Shortfall (percent)
Brazil	1990	1	0.87	3.11	2.24
C. A. R.	1994	1	7.76	0.07	-7.69
Chad	1994	1	9.81	3.40	-6.41
Chile	1976	1	3.52	1.40	-2.12
Congo	1991	1	1.45	5.24	3.79
Indonesia	1994	1	7.54	6.06	-1.48
Madagascar	1988	1	3.40	0.48	-2.92
Mexico	1995	1	-6.17	2.56	8.73
Nepal	1988	1	7.03	3.61	-3.42
Paraguay	1995	1	4.71	3.51	-1.20
Russia	1995	1	-4.14	-3.04	1.10
Singapore	1982	1	6.86	8.78	1.92
South Africa	1977	1	-0.09	4.19	4.28
Sweden	1991	1	-1.66	2.07	3.73
Tanzania	1987	1	4.93	1.55	-3.38
Uganda	1994	1	10.58	4.59	-5.99
Zambia	1995	1	-2.27	1.13	3.40
Australia	1989-90	2	2.70	3.33	0.63
Bolivia	1986-87	2	0.06	0.66	0.60
Egypt*	1990-91	2	3.39	7.21	3.82
France	1994-95	2	2.45	1.98	-0.47
Hong Kong	1982-83	2	4.45	9.69	5.24
India	1994-95	2	7.81	5.16	-2.65
Mexico	1981-82	2	3.99	6.62	2.63
Venezuela	1994-5	2	0.66	3.22	2.56
Zaire	1991-2	2	-7.37	1.20	8.57
Argentina	1980-82	3	-2.45	2.66	5.11
Benin	1988-90	3	1.31	4.70	3.39
Chile	1981-83	3	-3.10	2.74	5.84
Finland	1991-93	3	-3.93	3.13	7.06
Norway	1987-89	3	0.95	0.20	-0.75
Togo	1993-95	3	0.56	1.45	0.89
United Kingdom	1974-76	3	0.12	3.34	3.22
Cote d'Ivoire	1988-91	4	0.82	0.78	-0.04
Malaysia	1985-88	4	3.56	7.04	3.48
New Zealand	1987-90	4	0.24	1.63	1.39
Romania	1990-93	4	-5.86	0.88	6.74
Senegal	1988-91	4	1.87	2.47	0.60
Uruguay	1981-84	4	-3.61	2.94	6.55
Hungary	1991-95	5	-2.22	1.78	4.00
Kenya	1985-89	5	5.65	4.89	-0.76
Sri Lanka	1989-93	5	4.85	4.63	-0.22
Thailand	1983-87	5	6.21	7.01	0.80
Colombia	1982-87	6	2.96	5.16	2.20
Israel	1977-83	7	4.62	7.98	3.36
Philipppines	1981-87	7	-1.26	6.15	7.41
Ghana	1982-89	8	1.29	0.56	-0.73
United States	1984-91	8	3.85	1.83	-2.02
Spain	1977-85	9	1.09	5.42	4.33
Mauritania	1984-93	10	1.46	2.54	1.08

* Growth rate in column 5 calculated for 7 years prior to crisis.
Sources: IMF, *International Financial Statistics* ; World Bank, *World Development Indicators.*

REFERENCES

Caprio, Jr., Gerald, and Daniela Klingebiel, 1996a, "Bank Insolvency: Bad Luck, Bad Policy or Bad Banking," Annual World Bank Conference on Development Economics, (April).

——, 1996b, "Bank Insolvencies: Cross Country Experience," Working Paper 1620, World Bank, (July).

Demirguc-Kunt, Asli, and Enrica Detragiache, 1998, "The Determinants of Banking Crises in Developing and Developed Countries," *Staff Papers*, Vol.45, No. 1, (Washington: International Monetary Fund), (March).

Drees, Burkhard, and Ceyla Pazarbasioglu, 1995, "The Nordic Banking Crises: Pitfalls in Financial Liberalization?," IMF Working Paper 95/61, (Washington: International Monetary Fund), (June).

Dziobek, Claudia, and Ceyla Pazarbasioglu, 1997, "Lessons from Systemic Bank Restructuring: A Survey of 24 Countries", IMF Working Paper 97/161, (Washington: International Monetary Fund), (December).

Eichengreen, Barry, Andrew K. Rose and Charles Wyplosz, 1996, "Contagious Currency Crises", NBER Working Paper 5681, National Bureau for Economic Research, (July).

Gonzalez-Hermosillo, Brenda, 1998, "Determinants of Ex-Ante Banking System Distress: A Macro-Micro Empirical Exploration", draft Research Paper, (Washington: International Monetary Fund), (August).

Hardy, Daniel C., and Ceyla Pazarbasioglu, 1998, "Leading Indicators of Banking Crises: Was Asia Different?," IMF Working Paper 98/91, (Washington: International Monetary Fund, (June).

Kaminsky, Graciela L., and Carmen M. Reinhart, 1996, "The Twin Crises: The Causes of Banking and Balance-of-Payments Problems," International Finance Discussion Paper No. 544, Board of Governors of the Federal Reserve System, (March).

Lindgren, Carl-Johan, Gillian Garcia, and Matthew I. Saal, 1996, *Bank Soundness and Macroeconomic Policy*, (Washington: International Monetary Fund).

Sheng, Andrew, 1996, *Bank Restructuring*, (Washington: The World Bank).

Sundararajan, V., and Tomas J. T. Baliño (eds.), 1991, *Banking Crises: Cases and Issues*, (Washington: International Monetary Fund).

Stiglitz, Joseph and Andrew Weiss, 1981, "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, 71(3), 393-410.