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# Banking panics and policy responses ☆

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ABSTRACT

When policy makers have limited commitment power, self-fulfilling bank runs can arise as an equilibrium phenomenon. We study how such banking panics unfold in a version of the Diamond and Dybvig (1983) model. A run in this setting is necessarily partial, with only some depositors participating. In addition, a run naturally occurs in waves, with each wave of withdrawals prompting a further response from policy makers. In this way, the interplay between the actions of depositors and the responses of policy makers shapes the course of a crisis.



## 1. Introduction

Recent events have renewed interest in studying how policy makers respond to banking panics and related disruptions in the financial system. Several episodes during the current crisis have been compared to "old fashioned" banking panics; examples include the collapse of the market for asset-backed commercial paper in 2007, the near-failure of the investment bank Bear Stearns in March 2008, and the surge of withdrawals from money market mutual funds in September 2008, to name only a few. Each of these events led to a reaction by policy makers in central banks and in government. Moreover, traditional bank runs—where retail depositors rush to withdraw from their local banks—remain a major issue in some economies, as demonstrated by events in Argentina (in 2001), Russia (in 2004) and elsewhere. Policy makers respond to these events as well, often by freezing deposits and/or rescheduling the liabilities of the banking sector.

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Investors anticipate that policy makers will respond to a crisis, of course, and the anticipated response influences their behavior. We study the interplay between investors' decisions and the responses of policy makers in a version of the Diamond and Dybvig (1983) model of bank runs with limited commitment. The assumption of limited commitment seems particularly appropriate for studying bank runs and other crisis; it amounts to assuming that policy makers cannot credibly promise to refrain from intervening when an (ex post) improvement in resource allocation is possible. Our model illustrates the essential trade-offs facing policy makers during a banking panic and highlights important features of the equilibrium banking policy. It also shows how a lack of policy commitment can play a critical role in both allowing self-fulfilling banking panics to arise and in determining the pattern that such panics follow.

The previous literature has assumed, often implicitly, that policy makers can commit to follow a specific course of action in the event of a crisis. To see why the issue of commitment is important, consider the standard version of the Diamond–Dybvig model with no aggregate uncertainty. Individual agents are unsure about when they will need to consume and, therefore, pool their resources in a bank for insurance purposes. In an environment with commitment, a benevolent banking authority sets a payment schedule—a complete specification of how much each depositor who withdraws early will receive—before depositors make their withdrawal decisions. By threatening to freeze all remaining deposits if too many depositors withdraw early, this authority can guarantee the solvency of the banking system. When solvency is guaranteed, it is a dominant strategy for each depositor to wait to withdraw unless she truly needs to consume early. Hence, commitment to an appropriate course of action can rule out the possibility of a banking panic and ensure the efficient outcome.[1]

We study this same model, but in an environment where the banking authority cannot pre-commit to a course of action. Instead, it will respond optimally to whatever situation arises. When faced with a run in this environment, the banking authority will not choose to freeze all remaining deposits, because doing so would deny consumption to some agents who have a true need to consume early.[2] The optimal response is to allow additional withdrawals, but at a discount to their face value. The appropriate discount depends on how the banking authority expects the remaining depositors to behave. The behavior of these remaining depositors, in turn, is influenced by the level of the discount imposed by the banking authority. The banking authority and all depositors fully anticipate and optimally react to each others' behavior in our model. The equilibrium pattern of withdrawals and discounts is thus determined by the interplay between depositors' withdrawal decisions and the responses of the banking authority.

When depositors are sufficiently risk averse, there exists an equilibrium of the model in which a bank run occurs with positive probability. Despite the simplicity of the environment, the structure of the equilibrium can be surprisingly rich. The initial run is necessarily partial, with only some depositors participating. Once the number of early withdrawals passes a certain threshold, the banking authority realizes that a run is underway and imposes a discount on all further early withdrawals. The run may halt at this point or it may continue, leading the banking authority to announce another, more severe discount on withdrawals. A bank run thus occurs in "waves," with each wave of withdrawals prompting a further reaction by the banking authority. The number of waves that occur in equilibrium is stochastic and can be arbitrarily large.

This dynamic "wave" structure is fundamentally different from the type of bank run studied in the previous literature, where depositors run either *en masse* or not at all. After the first wave of early withdrawals, the banking authority in our model is able to infer that a partial run has taken place, but it does not know whether the run will continue. The structure of the equilibrium is such that, at each decision point, the banking authority is optimistic that the run has ended. This optimism leads it to offer a relatively high degree of risk sharing to the remaining depositors, which, in turn, leaves the banking system susceptible to a continued run. In this way, our model suggests that the combination of a lack of commitment together with optimism on the part of policy makers during a crisis may lie at the root of the problem of self-fulfilling runs. This is a new and potentially important insight into the underlying causes of financial fragility.

Our analysis contributes to a small but growing literature on discretionary policy and multiple equilibria. Most of the work on issues related to time inconsistency has studied situations where the inability of a policy maker to commit leads to an inefficient outcome in the unique equilibrium. In our setting, the efficient outcome is always *an* equilibrium. A policy maker with commitment power can rule out other (i.e., bank run) equilibria, but a lack of commitment power allows such equilibria to arise. Hence, the analysis here is more in line with the flood control example in Kydland and Prescott (1977). In that example, a commitment to not invest in flood control would convince private agents to not build on a flood plain. However, if the policy maker cannot commit, there is an equilibrium in which agents build on the flood plain and, as a result, the policy maker ends up investing in flood control.[3] This second type of inefficiency resulting from a lack of commitment power has been studied in the context of fiscal policy by Glomm and Ravikumar (1995) and in the context of monetary policy by Albanesi et al. (2003) and King and Wolman (2004). Our analysis shows how these same forces

[1] In a related model, de Nicolò (1996) shows how run equilibria can be ruled out under commitment without freezing deposits by using a priority-of-claims provision on final date resources. Deposit freezes (sometimes called *suspensions of convertibility*) have been studied in similar settings by Gorton (1985), Chari and Jagannathan (1988), and Engineer (1989).

[2] In earlier work (Ennis and Keister, 2009a), we showed that a full deposit freeze is not *ex post* efficient in the event of a run on the banking system and discussed institutional features that often shape a government's response to a run.

[3] In both cases, there is an equilibrium with no building on the flood plain and no investment in flood control. See King (2006) for a more formal analysis of this problem.