Abstract

We construct a model in which a banking panic is triggered by the banker, not the depositors. When a banker receives a pessimistic information on the return of the bank's assets, he liquidates them prematurely in order to protect his capital. In the face of this liquidation, all depositors withdraw their funds prematurely. Such a panic occured in 1857. This kind of banking panic occurs at sufficiently capitalized banks.

Key words: credit crunch, banking panic, panic of 1857

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The panic of 1857 as a bank-initiated banking panic

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1 Introduction

In the current literature, banking panics are viewed as a liquidation of the bank's assets which is triggered by a bank run. Bank runs can be due to a destabilizing behavior by depositors modeled as a sunspot equilibrium. This is the theory developed in Diamond and Dybvig (1983). Dowd (2000) showed that this kind of panic cannot occur when the bank is sufficiently capitalized. Bank runs can also be information-based. When depositors receive a pessimistic information on the return of the bank's assets, they rush to withdraw their funds, forcing the bank to liquidate prematurely its assets. Basically, this is the theory developed in Jacklin and Bhattacharya (1988).

In this paper, we extend Marini (2003) by assuming that the banker receives an information on the return of the bank's assets. In our model, a banking panic is triggered by the banker, not the depositors. When a banker receives a pessimistic information on the return of the bank's assets, he liquidates them prematurely in order to protect his capital. In the face of this liquidation, all depositors withdraw their funds prematurely. According to Gibbons (1859) and Van Vleck (1943), such a panic occured in 1857. This kind of banking panic occurs at sufficiently capitalized banks.

The paper is organized as follows. In section 2 we describe the model. In section 3 we show that our model can explain some stylized facts emphasized by Gibbons (1859) and Van Vleck (1943). Section 4 concludes.

2 The Model

Following Dowd (2000) and Marini (2003), we distinguish between two types of financial intermediaries. The first type is a mutual bank which maximizes the expected utility of its depositors and earns no profits. A mutual bank issues only one kind of liability. Hence, its liability must be considered either as equity only, or as a demand deposit contract only. However, in the latter case there is no capital buffer to absorb any losses. We examine the case in which the liability issued by the mutual bank is a demand deposit contract. The second type of financial intermediary is a capitalized bank that issues demand deposit contracts and equity. A capitalized bank maximizes the expected utility of the banker that owns the equity.

2.1 The Mutual Bank

There are three time periods, T=0;1;2. Each agent is endowed at T=0 with one unit of the consumption good. An agent's intertemporal preferences for consumption are:

$$u = \begin{cases} u(c_1) \text{ with probability } t \\ u(c_2) \text{ with probability } 1 - t \end{cases} \tag{1}$$

where c_T is the consumption at T. We assume that $u(c_T) = \frac{c_T^{1-\alpha}}{1-\alpha}$ with $\alpha > 1$. An agent who wants to consume at $T = 1$ is called a type 1 agent, while an agent who wants to consume at $T = 2$ is a type 2 agent. A type 1 agent is impatient while a type 2 agent is patient. Agents do not know their types in the planning period $T = 0$ but discover them at $T = 1$. Knowledge of one's type is private information. The technology is given by:

$$\begin{array}{ccc} T = 0 & T = 1 & T = 2 \\ -1 & 1 & \tilde{R} \end{array} \tag{2}$$

For an investment of 1 at $T = 0$, the technology yields 1 at $T = 1$ if the investment is liquidated at $T = 1$, or $\tilde{R}$ at $T = 2$ if it is liquidated at $T = 2$.

The stochastic return $\tilde{R}$ has a two-point support:

$$\tilde{R} = \begin{cases} R(H) > 1 \text{ with probability } P(H) \\ R(L) < 1 \text{ with probability } P(L) \end{cases} \tag{3}$$

with $E[\tilde{R}] = P(H)R(H) + P(L)R(L) > 1$. So there is a technological risk.

At $T = 1$, depositors receive no information on the probability distribution of $\tilde{R}$. So they do not update the a-priori probabilities $P(H)$ and $P(L)$.

In autarky, the expected utility of depositors is:

$$tu(1) + (1-t)P(H)u(R(H)) + (1-t)P(L)u(R(L)) \tag{4}$$

Since agents are risk-averse, social welfare can be increased by a mutual bank. This bank maximises the expected utility of its depositors subject to its two budget constraints (one for each state of nature at $T = 2$) and an incentive-compatibility constraint which guarantees that at $T = 1$ a type 2 agent does not have an interest in lying, i.e. claiming to be a type 1 agent:

$$Max\ tu(c_1^1) + (1-t)P(H)u(c_{2H}^2) + (1-t)P(L)u(c_{2L}^2) \tag{5}$$

$$s.t \qquad tc_1^1 + \frac{(1-t)c_{2L}^2}{R(L)} = 1 \tag{6}$$

$$tc_1^1 + \frac{(1-t)c_{2H}^2}{R(H)} = 1 \tag{7}$$

$$P(L)u(c_{2L}^2) + P(H)u(c_{2H}^2) \geq u(c_1^1) \tag{8}$$

where c_1^1 is the consumption of a type 1 agent at $T = 1$, c_{2L}^2 is the consumption of a type 2 agent at $T = 2$ when $\tilde{R} = R(L)$, and c_{2H}^2 is the consumption of a type 2 agent at $T = 2$ when $\tilde{R} = R(H)$. The expected utility of depositors is given by (5). The budget constraints are given by (6)-(7). The budget constraint (6) is derived as follows. Let S be the proportion of the bank's assets liquidated at $T = 1$. At $T = 1$, the budget constraint is $tr_1 \leq S$. This constraint says that the liquidated assets must be sufficient to provide for the consumption of the early consumers. The bank may want to liquidate strictly more than tr_1 and roll it over to $T = 2$ in order to reduce the consumption variability of the late consumers. Hence, at $T = 2$ the budget constraint is $(1-t)c_2 = R(L)(1-S) + S - tr_1$. However, with our assumptions $E(\tilde{R}) > 1$ and $\alpha > 1$, the Kuhn-Tucker conditions show that the budget constraint at $T = 1$ is binding. Hence, eliminating S in the budget constraints at $T = 1$ and at $T = 2$ yields the intertemporal budget constraint (6). The budget constraint (7) is derived by the same logic. The incentive-compatibility constraint is given by (8), in which the left-hand side is the expected utility at $T = 1$ of a late consumer and the right-hand side is the utility of an early consumer. This constraint says that a late consumer will not withdraw at $T = 1$ if there is no panic.

When the incentive-compatibility constraint is not binding, the deposit contract is given by:

$$r_1 = c_1^1 = \frac{\delta}{t\delta + \dfrac{1-t}{R(L)}}, \tag{9}$$

$$r_{2L} = c_{2L}^2 = \frac{1}{t\delta + \dfrac{1-t}{R(L)}}, \tag{10}$$

$$r_{2H} = c_{2H}^2 = \frac{R(H)}{R(L)} r_{2L} , \tag{11}$$

where $\delta \equiv \left[R(H)\ P(H) \left(\frac{R(H)}{R(L)} \right)^{-\alpha} + R(L)\ P(L) \right]^{\frac{-1}{\alpha}}$.

When the incentive-compatibility constraint is binding, the deposit contract is given by:

$$r_1 = \frac{\xi}{t\xi + \dfrac{1-t}{R(H)}}, \tag{12}$$

$$r_{2H} = \frac{1}{t\xi + \dfrac{1-t}{R(H)}}, \tag{13}$$

$$r_{2L} = \frac{R(L)}{R(H)} R(H), \tag{14}$$

where $\xi \equiv \left[P(H) + P(L) \left(\frac{R(L)}{R(H)} \right)^{1-\alpha} \right]^{\frac{1}{1-\alpha}}$.

The expected profit of this mutual bank is nil because the mutual bank maximizes the expected utility of depositors. Following Jacklin and Bhattacharya (1988), we interpret the deposit contract defined by equations (9) to (14) as follows. The uncertain second period return reflects the fact that the bank may not be able to make its promised second-period payment in full because it has invested in a risky technology. The bank promises an amount r_{2H} that it will be able to pay only if $\tilde{R} = R(H)$. If $\tilde{R} = R(L)$, the bank is insolvent and depositors get a fraction $R(L)/R(H)$ of their promised payment (because $r_{2L} = (R(L)/R(H))r_{2H}$).

2.2 The Capitalized Bank

We introduce a type 3 agent not in need of liquidity at $T = 1$ and endowed with K units of the consumption good per capita. Following Dowd (2000), we call banker a type 3 agent. For simplicity, we assume that the banker is risk-neutral. A capitalized bank is a bank which issues demand deposits and equity. The banker can earn a positive profit by setting up a capitalized bank. This is because type 2 agents are risk averse. So there is a $\overline{r}_2$ satisfying $\overline{r}_2 < P(H)r_{2H} + P(L)r_{2L}$ and $u(\overline{r}_2) > P(H)u(r_{2H}) + P(L)u(r_{2L})$. This means that a type 3 agent can increase the expected utility of type 2 agents by promising them a certain return smaller than the expected return of the deposit contract issued by a mutual bank.

Now, let r_2^* defined by $u(r_2^*) = P(H)u(r_{2H}) + P(L)u(r_{2L})$. In other words, r_2^* is the certainty equivalent of the deposit contract issued by a mutual bank. The banker can earn an expected profit greater than its expected profit in autarky by setting $\overline{r}_2 = r_2^* + \varepsilon$ with $\varepsilon > 0$ sufficiently small. He insures depositors against the technological risk because he promises them a certain return at $T = 2$.

We assume that at the beginning of the period $T = 1$, i.e. before depositors decide to withdraw or not to withdraw, the banker receives a private information. With this new information, he updates $P(H)$ and $P(L)$ using the Bayes rule. Following Jacklin-Bhattacharya (1988) and Alonso (1996), we assume that the deposit contract is not contingent on the information received at $T = 1$. For simplicity, we assume that the banker can receive an optimistic information s_o or a pessimistic information s_p. We denote $P(R(H)/s_p)$ and $P(R(L)/s_p)$ the a-posteriori probabilities conditional on s_p. Obviously, $p(R(H)/s_p) < P(H)$, and $P(R(H)/s_o) > P(H)$. If the banker receives the pessimistic information s_p, he must decide whether he liquidates the bank's assets or not. If he does not liquidate, his expected profit is

$$E(\tilde{\pi}/s_p) = (1 + K - tr_1)E(\tilde{R}/s_p) - (1 - t)\overline{r}_2 \tag{15}$$

If he liquidates, there is a credit crunch. We assume that depositors are informed that there is a credit crunch. This is perhaps because they can observe the rise of business failures. When there is a credit crunch, depositors withdraw their funds at $T = 1$ because the bank will have no asset at $T = 2$ to pay off $\overline{r}_2$. So the profit of the banker is $K + 1 - r_1$. The banker liquidates if $K + 1 - r_1 > E(\tilde{\pi}/s_p)$, i.e. if :

$$K > \frac{r_1 - 1 + (1 - tr_1)E(\tilde{R}/s_p) - (1 - t)\overline{r}_2}{1 - E(\tilde{R}/s_p)} \equiv \overline{K} \tag{16}$$

If the banker has invested in the bank more than $\overline{K}$, he will liquidate the bank when he receives a pessimistic information. This is because by liquidating he protects his capital against an expected loss. He has an interest to liquidate if his capital is great enough. Therefore, depositors withdraw their funds. This is because when there is a credit crunch at $T = 1$, the bank is insolvent at $T = 2$. This bank run is triggered by the banker. It is not triggered by a destabilizing behavior from depositors. A banking panic occurs when the bank is sufficiently capitalized. This is because it is triggered by the banker who wants to protect his capital.

3 The Panic of 1857

It is beyond the scope of this paper to make an exhaustive study of the panic of 1857. More advanced studies are Gibbons (1859), Van Vleck (1943), Temin (1975), Huston (1983,1987), and Calomiris and Schweikart (1991). We simply want to emphasize that according to Gibbons (1859) and Van Vleck (1943), the kind of panic that we have modeled in the previous section seems to have occured in 1857.

In the table, we can see the New York Clearing House figures for the period from august 22 to september 26 in round numbers (in US dollars).

These numbers show that while the banks were forcing a contraction of their loans to the extent of more than $12 000 000 in five weeks, the confidence of the public was still persisting at a remarkably high level. The most violent liquidation was between september 5th and september 19th, when the loans were reduced $ 3 444 000 in the face of an increase of deposits of $ 591 000. As pointed out by Gibbons (1859, page 354) :

" There can be no escape from these figures. They show beyond cavil, that the banks, not the depositors, took the lead in forcing liquidation".

Moreover, Gibbons argues that the fall in deposits to the extent of $ 7 322 000 was by no means wholly traceable to frightened New York merchants. Fully three fourth of this amount was drawn out by the country banks.

It was not until october that depositors rushed to withdraw their deposits. September 29 witnessed business houses failures at an appaling rate in Chicago. In the early days of october, business failures were announced on every side of the country. On october 10, three great railroad companies, the Erie, the Michigan Central, and the Illinois Central, failed to meet their engagements. By the evening of october 14, suspension of deposits convertibility was general throughout the nation.

We conclude this section by quoting Gibbons (1859, page 361):

"The history of the panic is clearly divisible into these two periods : the former, when the banks took the initiative in forcing down their loans; and the latter, in which the depositors seized it and brought on the closing act of suspension".

4 Conclusion

We have extended Marini (2003) by assuming that the banker receives an information on the return of the bank's assets. When this information is sufficiently pessimistic and the bank is sufficiently capitalized, the banker liquidates the bank's assets in order to protect his capital. Consequently, all depositors withdraw their funds prematurely. According to Gibbons (1859) and Van Vleck (1943), this kind of banking panic occured in 1857.

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The table gives the New York Clearing House figures for the period from august 22 to september 26 in round numbers (in US dollars).

Week ending	loans	specie	circulation	deposits
August 22	120 140 000	10 097 000	8 694 000	64 241 000
August 29	116 589 000	9 241 000	8 671 000	60 861 000
September 5	112 221 000	10 228 000	8 673 000	57 261 000
September 12	109 986 000	12 182 000	8 322 000	57 334 000
September 19	108 777 000	13 556 000	8 074 000	57 852 000
September 26	107 791 000	13 327 000	7 838 000	56 919 000

Source: Van Vleck (1943), page 70