

Bank Runs When Liquidity and Solvency Risks Interact

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Full Paper

Motivation

- **Bank runs are the phenomena that depositors panic and try to withdraw money from banks. Several were followed by or associated with financial crises.**
- **The modern banking system is more complicated than in the past.**
 - Banking system brings comfort to modern lifestyles.
 - The transition from a cash to a cashless society after the introduction of the Promptpay system and COVID-19, and the coming of digital currencies.
 - Despite its social benefits, the system relies on trust and is fragile.
 - All deposit contracts are in the nominal terms; hence, prices and inflation matter to the real value of deposits.
 - Most money is generated by loans. Apart from some prudential policies, there is no limit on banks' ability to lend; hence, the stability of a currency relies on social trust that the roles of money still function.
 - The role of reserves to settle the transactions in the interbank markets, not what households deposit their wealth with banks.
 - Central banks that act as regulators and the lender of the last resort.
 - **When bank runs happen, banks need liquidity, and the central banks can assist with the liquidity demands.**
- **Solvency risk is another risk that banks are facing with the higher magnitude (VUCA world).**
 - Global warming that brings about diseases such as COVID-19 and natural disasters.
 - Wars, conflicts, inequality, and political unrest.
 - Excessive lendings, frauds, and imprudent lending policies.
- **Central banks have the role in preventing bank runs and financial crises.**
 - Larger solvency shock \Rightarrow the risk of deposit loss.
 - Larger liquidity shock \Rightarrow liquidity managing cost.
 - Central banks' abilities to prevent bank runs may be limited only to the liquidity risk.
 - **The magnitude of solvency risk may even change the ability to alleviate the liquidity risk.**

Research Purpose and Methodology

- **Research Purpose:** Explore the chance and mechanism of bank runs when liquidity and solvency shocks interact in the modern banking system.
- **Methodology:**
 - Introducing solvency risk to Rivero and Rodriguez (2024).
 - Exploring how the shocks pass to the depositors through the deposit rates using the analytical methods.
 - Introducing the Monte-Carlo simulations to explore the chance of bank runs.

Brief Literature Review

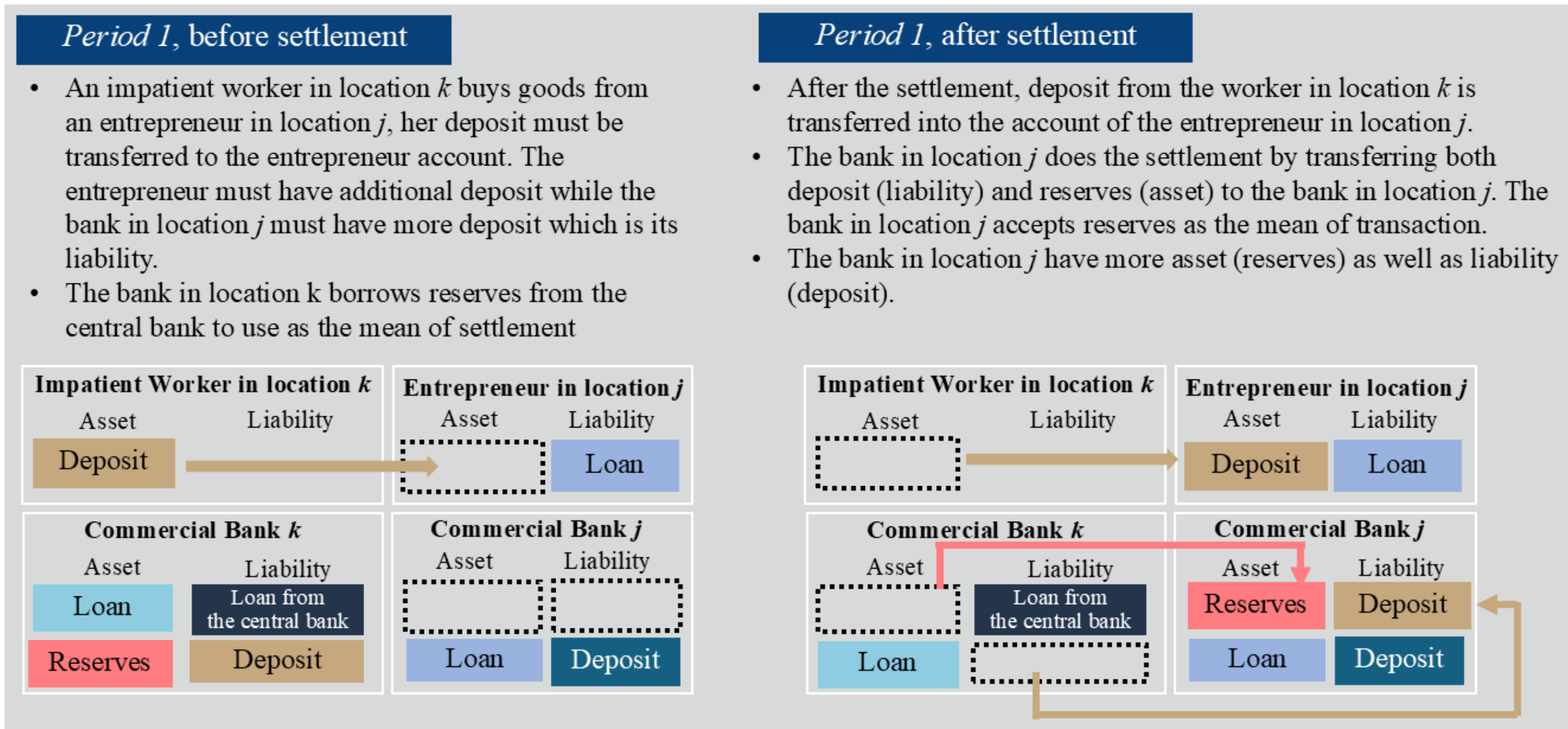
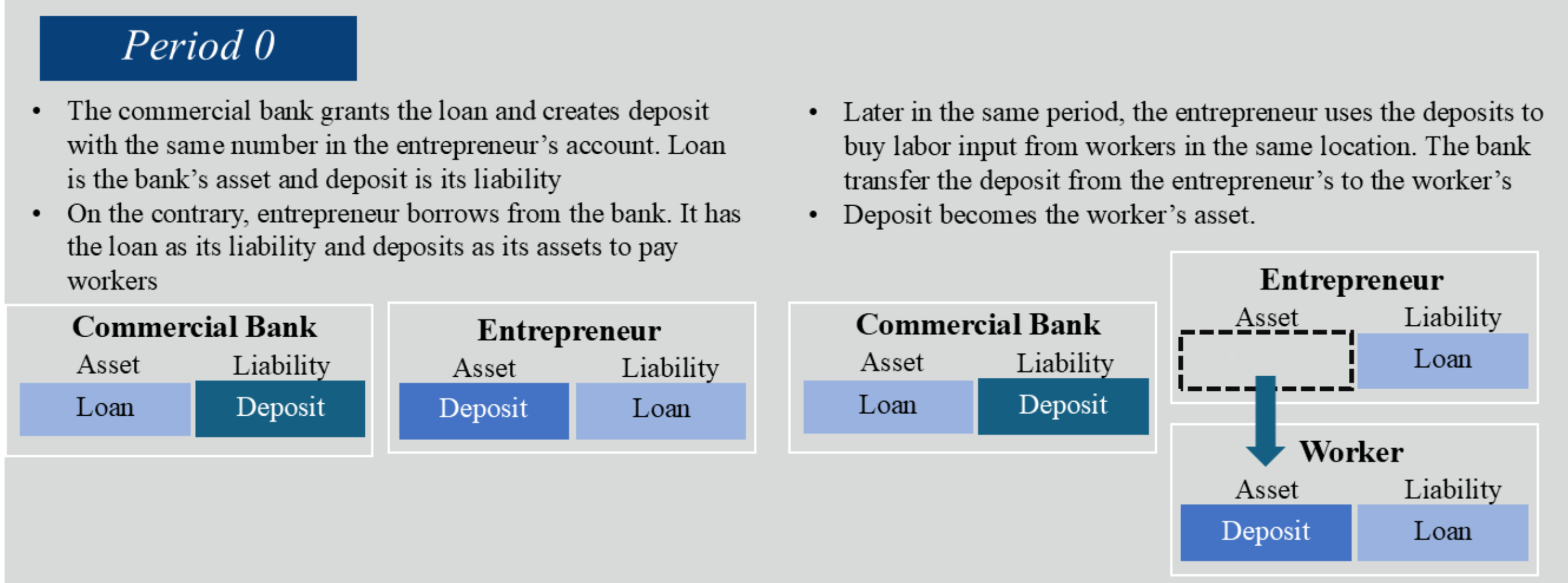
- The banking system as a tool to diversify risk and bring about social benefits. However, banks are prone to self-fulfilling runs. (Bryant 1980; Diamond and Dybvig 1983)
- Deposit insurance is one of the tools that can prevent bank runs; however, deposit insurance can cause moral hazard problems. (Miller and Luangaram 1998)
- The introduction of the interbank market, systemic risks, and "too-big-to-fail" banks. The interbank system can help absorb liquidity shocks, but can also lead to a gridlock equilibrium. (Freixas, Parigi, and Rochet 2000).
 - Some economists had introduced the lexicon and mentioned the bad outcomes of the financial system before the global financial crisis.
 - In the author's opinion, bank runs and crises are not new concepts. They have been with humanity ever since the emergence of private banknotes; hence, studying bank runs is important for preventing further crises.
- Solvency risk is another risk that banks are facing (Gorton 1988; Iyer, Puri, and Ryan 2016)
- With the nominal banking system and liquidity risk, central banks can prevent bank runs by acting as the lender of the last resort (Allen, Carletti, and Gale 2014; Rivero and Rodriguez 2024).
 - Theoretically, bank runs should have never happened as long as central banks still function.
 - **The contribution of this paper is to introduce solvency risk and let the two risks interact, on the basis that central banks can provide liquidity when in need.**

The Model of Nominal Economy

- **Building blocks:** Diamond and Dybvig (1983) and Rivero and Rodriguez (2024).
- A circular economy existing for 3 periods with continuous locations that can represent the real locations, sectors, or countries, etc.
- One central bank that governs the whole economy.
- **Participants in each location:** 1) Entrepreneurs, 2) Workers, 3) Commercial banks.
- **Means of transactions:**
 - Deposits (inside-money) to purchase goods and pay debts.
 - Reserves (outside-money) for interbank transactions.
- **Timing and uncertainties:**
 - **Period 0:** Entrepreneurs borrow money to buy labor input. They can produce some goods in period 1, but they will get more real output if they can save their production to period 2
 - **Period 1:** Some workers realized that they need to consume early; hence, they use their deposits to buy goods. This imposes **liquidity shock** on banks in their locations.
 - **Period 2:** Some locations will face **solvency shock**; namely, the entrepreneurs in these locations have some production failure.
 - **The analogy:** The longer the investment is, the higher the yield and the risk are. Producing in period 1 is safer but provides less yield.
- **Main assumptions**
 - The entrepreneurs borrow from their local banks.
 - The workers can use their deposits to buy goods from anywhere. Money is transferred from banks to banks, and the interbank market starts to play a role.
 - Perfect competition among banks in each location. The gains and losses in the profits are transferred to depositors through the deposit interest rates.

• Bank runs happen because of the depositors' speculation in period 1:

- The workers who do not have to consume still have deposits in their hands; hence, they are the people who can cause bank runs.
- They observe how high the liquidity shock was that happened to their banks.
- They know that there is a risk that their banks may not be able to collect all debts due to the low production, leading the lower deposit rates paid to them.
- **They evaluate whether to store the real asset (consumption goods), which causes bank runs, or to keep holding the nominal deposits.**



Results

- **Bank runs can happen when there exists solvency shock despite the central bank's ability to alleviate the liquidity shock.**
- **The spread of deposit rates between the high and the low production.**
 - The losses from the low production and the gains from the high production pass to the depositors through the deposit rates paid by banks.
 - In the locations that face higher liquidity shocks, the spreads are higher. In other words, these locations get higher deposit rates when there is high production and vice versa.
- **Bank runs seem to happen more with the locations with more depositors, implying the sunspots.**
 - Though the lower spread implies more stability in the payoff, as the depositors are risk-averse, the deposit rates from the high production are not high enough to compensate the utility losses.
 - Another analogy is that there are more depositors to cause bank runs. Taking the banks' profits as a cake, there are more people to divide the cake.
 - We have this controversial result because the central bank has alleviated all the liquidity shock. Though it is trivial, it is worth mentioning that the locations with lower depositors are at risk of bank runs too if the central bank does not function well.
- **Key takeaways for the Bank of Thailand and central banks in the emerging market**
 - Countries in the emerging market are more prone to solvency risks. Some countries in the tropical zone will face more impact of global warming. With the low rule of law, the higher corruption rates, and low social trust, this leads to the higher risk of bank runs.
 - It is important for the central banks to maintain their credibility. The situation where the social mistrust central banks is studied in the author's second thesis chapter Chamornchan (2025).

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