
Bank Liquidity and Regulation

Yehning Chen
Professor, Department of Finance
National Taiwan University (NTU)

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Outline

- **The theory part :**
 - **Bank liquidity creation**
 - **Liquidity issues during financial crises**
- **The empirical part :**
 - **Bank behavior during the 2008 crisis**
 - **Measures of bank liquidity creation and risk**
- **Discussions**

Outline

■ The theoretical part

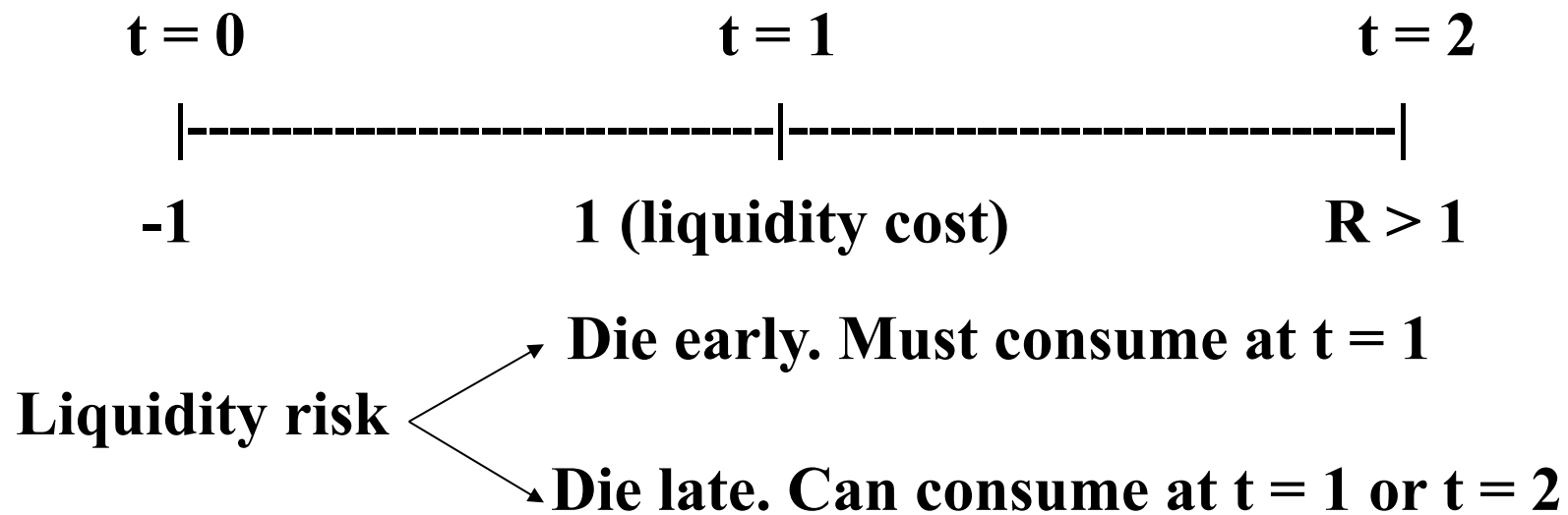
- **Liquidity creation: Diamond and Dybvig (1983), Diamond and Rajan (2001), Kashyap et al. (2002) and others**
- **Liquidity crises: Brunnermeier and Pedersen (2009), Acharya et al. (2011), Diamond and Rajan (2011)**

■ The empirical part

- **Bank behavior: Cornett et al. (2011), Acharya et al. (2015)**
 - **Measures: Berger and Bouwman (2009), Bai et al. (2015)**
- ## ■ Discussions : King (2013) 、 Hong et al. (2013)

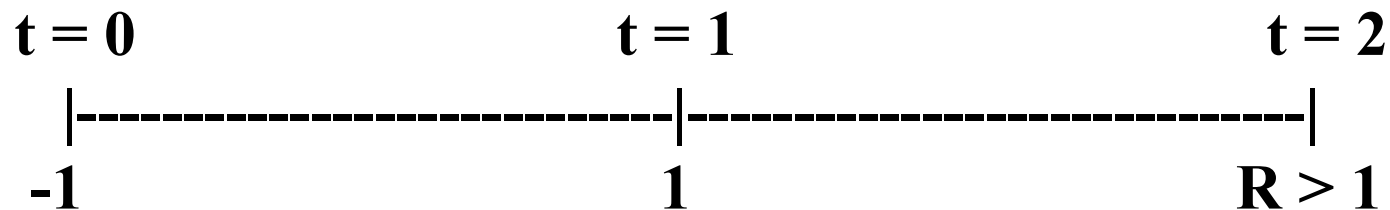
Diamond and Dybvig (1983)

- Banks improve social welfare by providing liquidity services. But there may exist a bank run problem
 - Risk averse depositors who face liquidity risk
 - Investment opportunity



Diamond and Dybvig (1983)

■ How does the bank provide liquidity? Deposit contract.

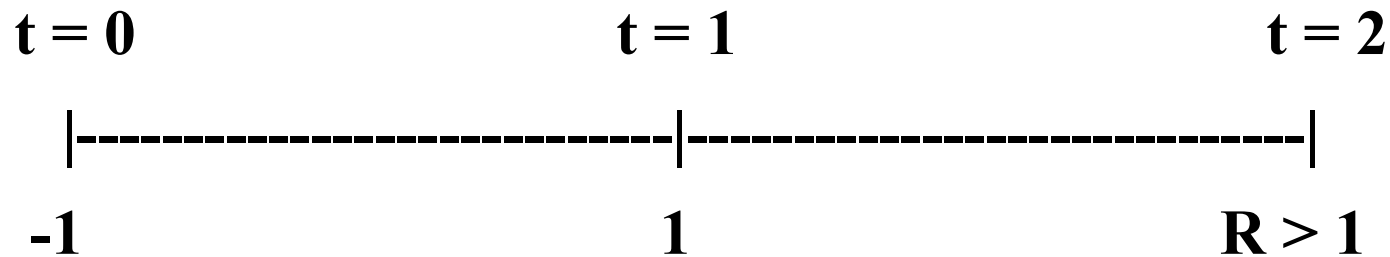


- Without bank : early dier $\rightarrow 1$ late dier $\rightarrow R$
- Deposit contract: (r_1, r_2) , with $1 < r_1 < r_2 < R$
- With bank : early dier $\rightarrow r_1 > 1$ late dier $\rightarrow r_2 < R$

\rightarrow The banking arrangement increases welfare if
depositors are sufficiently risk averse

Diamond and Dybvig (1983)

- How does the bank provide liquidity? Deposit contract.



- Good equilibrium : early dier $\rightarrow r_1 > 1$, late dier $\rightarrow r_2 < R$
- But since $r_1 > 1$, a late dier should withdraw early if he believes that all the others will withdraw at $t = 1$
 \rightarrow A bank run equilibrium!
- Liquidity creation brings the threat of a bank run

Diamond and Rajan (2001)

- **It is optimal for banks to be fragile !**
 - **The bank is better than others at managing the borrowers' projects : $CF_{\text{Bank}} > CF_{\text{Others}}$**
 - **The bank faces liquidity risk**
 - **If the bank raises funds from only one investor, it can threaten to walk away from renegotiation, and reduce the payment to CF_{Others}**
 - **This problem will lower the amount of money that the investor is willing to lend to the bank**

Diamond and Rajan (2001)

- **If the bank issues deposits and there are many depositors, then (i) the bank is fragile, that is, a bank run occurs if anything wrong, and (ii) the bank cannot renegotiate with depositors**
→ **Pay if it can! → Easier to finance.**
- **Implication: Narrow bank is not a good idea.**
- **Arrangements that make banks less fragile (excessive capital, deposit insurance,...) may not be good for social welfare.**

Kashyap et al. (2002)

- **Explain why banks issue deposits and offer loan commitments to borrowers**
 - **Similarity between deposits and loan commitments: both impose liquidity risk on banks**
 - **If these two kinds of liquidity risk are not perfectly correlated → Synergy from diversification!**
 - **Predictions : When a bank's demand deposits ↑
→ Liquid Assets ↑ , Loan commitments ↑**

Kashyap et al. (2002)

■ Liquidity assets and transaction deposits (92-96)

	Sample			
	All Banks	Large Banks	Medium-sized Banks	Small Banks
Number of observations	9,262	100	500	8,662
Panel A: Dependent Variable = LIQRAT: (cash + securities)/assets				
Coefficient on DEPRAT	0.227	0.313	0.105	0.235
(t-statistic)	(16.62)	(2.94)	(1.82)	(16.67)
Explanatory power of DEPRAT	0.172	0.309	0.084	0.177
Panel B: Dependent Variable = SECRAT: securities/assets				
Coefficient on DEPRAT	0.153	0.255	0.056	0.158
(t-statistic)	(10.83)	(2.64)	(0.95)	(10.84)
Explanatory power of DEPRAT	0.114	0.280	0.045	0.118

dependent variable. The other independent variables whose coefficients are not reported include the log of real bank assets, the ratio of commercial and industrial loans to total loans, the ratio of real estate loans to total loans, the ratio of loans to individuals to total loans, and Federal Reserve district dummies. The sample begins with all federally insured banks between

Source: Kashyap et al. (2002)

Kashyap et al. (2002)

■ Loan commitments and transaction deposits (92-96)

	Sample			
	All Banks	Large Banks	Medium-sized Banks	Small Banks
Number of observations	9,262	100	500	8,662
Coefficient on DEPRAT	0.116	0.232	0.160	0.113
(<i>t</i> -statistic)	(20.21)	(3.35)	(5.80)	(19.35)
Explanatory power of DEPRAT	0.181	0.207	0.242	0.188

standard deviation of the dependent variable. The other independent variables whose coefficients are not reported include the log of real bank assets, the ratio of commercial and industrial loans to total loans, the ratio of real estate loans to total loans, the ratio of loans to individuals to total loans, and Federal Reserve district dummies. The sample begins with all

Source: Kashyap et al. (2002)

Kashyap et al. (2002)

- **Gatev and Strahan (2006): Banks enjoy implicit government guarantee → Deposits increase when market liquidity is tight (CP rate – T.Bill rate high) → An advantage for offering loan commitments**
- **Gatev et al. (2009) : transaction deposits reduce the positive impact of loan commitments on bank volatility**
- **Gatev and Strahan (2009) : Banks are dominant in syndicated loans that involve line of credit**

Brunnermeier and Pedersen 09

- **Model : A four-period model ($t = 0, 1, 2, 3$)**
- **There are many risky assets, whose values are realized at $t = 3$**

$$v_{t+1}^j = v_t^j + \Delta v_{t+1}^j = v_t^j + \sigma_{t+1}^j \varepsilon_{t+1}^j, \quad \sigma_{t+1}^j = \underline{\sigma}^j + \theta^j |\Delta v_t^j|,$$

- **Three types of players :**
- **Risk-averse investors who face liquidity risk**
- **Speculators (FI) : risk-neutral, can buy and sell assets, face a capital constraint**

$$\sum_j (x_t^{j+} m_t^{j+} + x_t^{j-} m_t^{j-}) \leq W_t, \quad \begin{array}{l} +: \text{long, } -: \text{short} \\ \mathbf{x}: \text{position, } \mathbf{m}: \text{margin} \end{array}$$

Brunnermeier and Pedersen 09

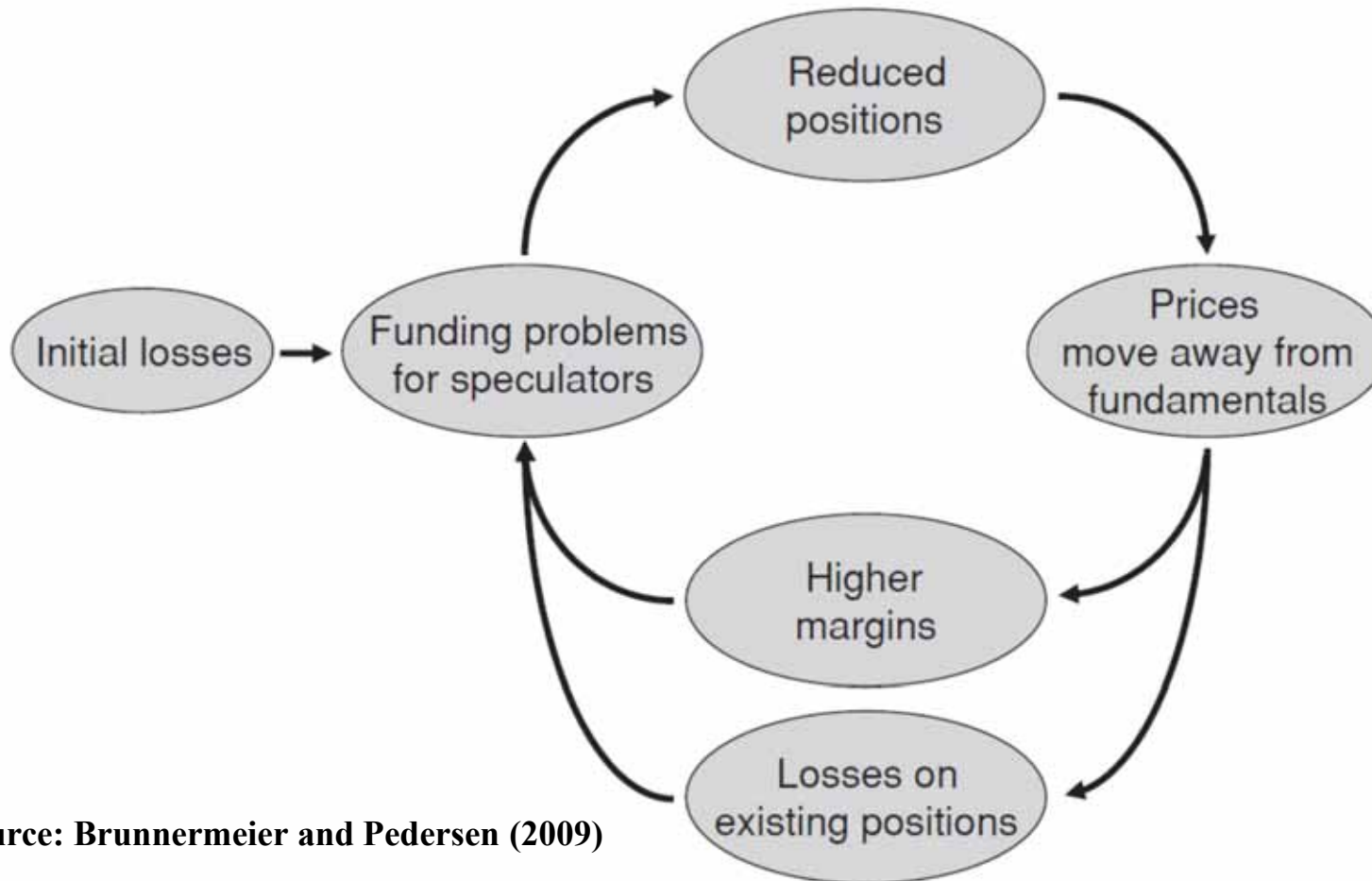
- **Model : A four-period model ($t = 0, 1, 2, 3$)**
 - **Three types of players :**
 - **Financers : Set margins according to VaR**
 - **Require higher margins for more volatile assets**
- **Because speculators face the capital constraint, there is a limit of arbitrage, so asset prices may be different from the assets' fundamental values**
 - **Market illiquidity : Asset price – Asset value**

Brunnermeier and Pedersen 09

■ Important results

- **Destabilizing margins: Market liquidity↓ → Asset prices↓ → Price volatility↑ → Margins↑**
- **Because speculators face the capital constraint, they have to reduce positions when suffering losses**
- **Margin spirals : Funding tight → Market illiquidity ↑ → Margins ↑ → Funding tighter → ...**
- **Loss spirals : A lot of long positions → need to sell assets when liquidity is tight and banks suffer losses → Asset prices↓ → Losses↑ ...**

Brunnermeier and Pedersen 09



Source: Brunnermeier and Pedersen (2009)

Brunnermeier and Pedersen 09

- **Speculators maximize profits**
 - **The marginal profits on all asset are the same**
- **Important implications**
 - **There are market liquidity and funding liquidity, and they interact**
 - **Market liquidity: securities, loan sales, securitization**
 - **Funding liquidity: bank runs, short-term financing sources become more costly**
 - **Multiple equilibriums → Can explain sudden disappearance of liquidity**
 - **Price volatility↑ → Liquidity ↓**
 - **There may be contagion**

Acharya et al. (2011)

- Explain why banks hoard liquidity during crises
 - Bank liquidity is counter-cyclical : hold fewer liquid assets in good times, and more in bad times
 - The government's policies (bailouts, liquidity injections,...) will affect the amounts of liquid assets that banks will hold

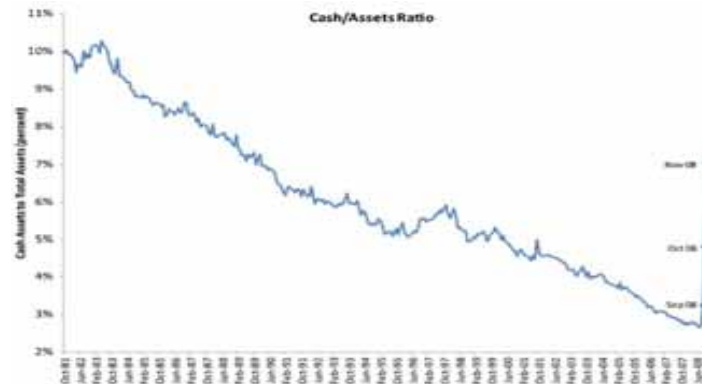


Figure 1
Monthly cash holdings of U.S. commercial banks (Source: Federal Reserve H8)



Figure 2
Weekly cash holdings of U.S. commercial banks (Source: Federal Reserve H8)

Source: Acharya et al. (2011)

Acharya et al. (2011)

Source: Acharya et al. (2011)

■ Banks' liquidity hoarding decisions

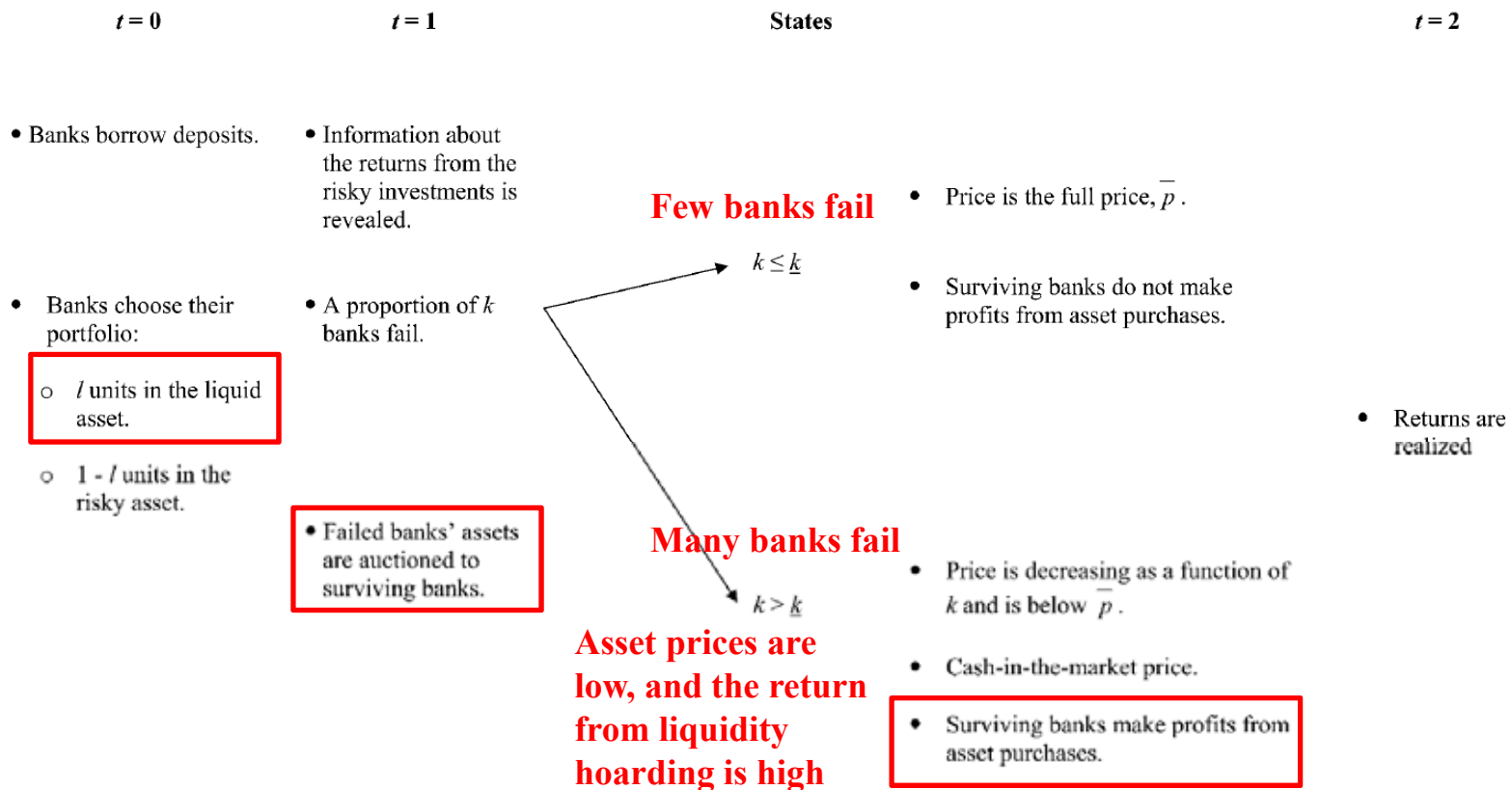
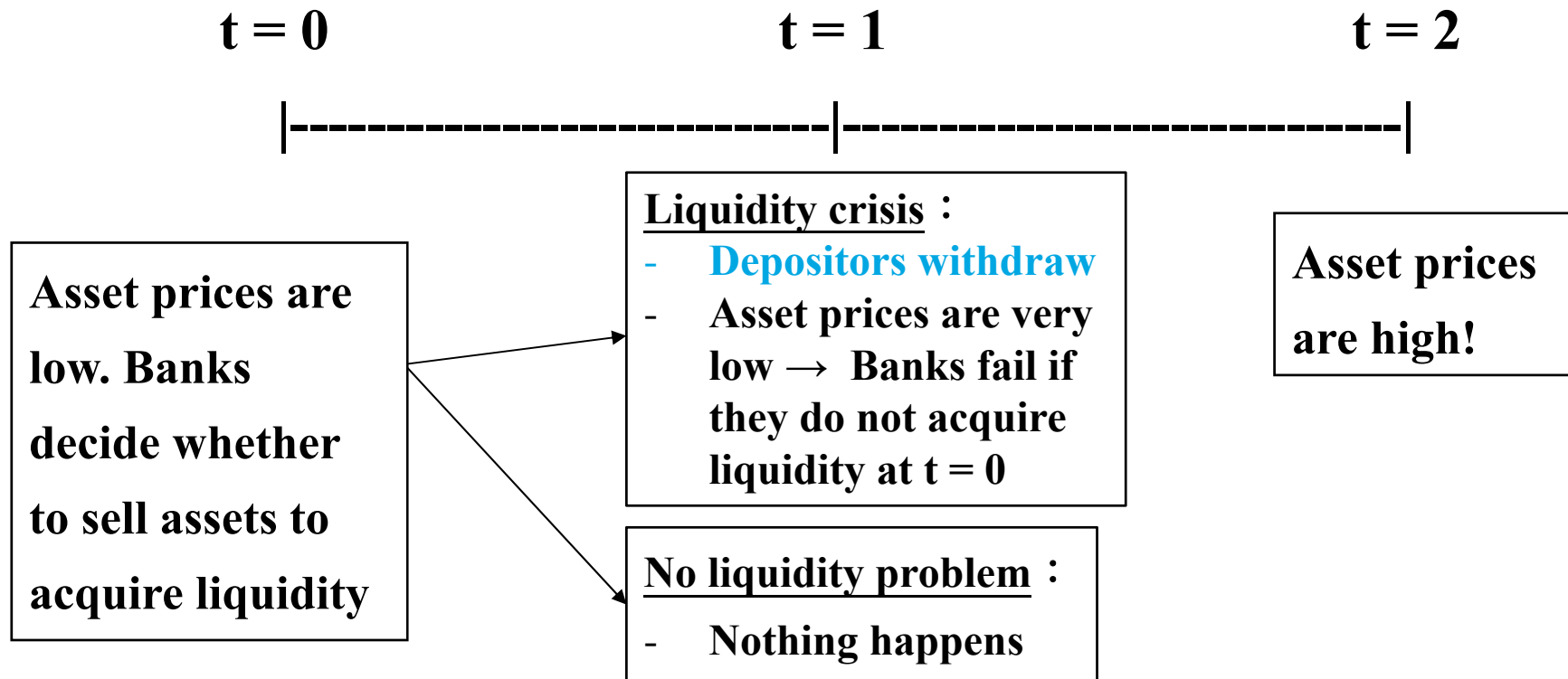


Figure 3
Time line of the benchmark model

Diamond and Rajan (2011)

- Sellers' reluctance to sell can cause market freeze
- Banks' problems: whether to sell assets at $t = 0$



Diamond and Rajan (2011)

- **Banks have two choices :**

- **(1) Sell assets at $t = 0$ to acquire liquidity (safe)**

- **Benefit : does not fail if the liquidity crisis occurs**

- **Cost: lower profits if no liquidity crisis**

Jensen and

- **(2) Do not sell assets at $t = 0$ (risky)**

Meckling (1976)

- **Benefit : higher profits if no liquidity crisis**

- **Cost : fail if the liquidity crisis occurs**

→ **Banks will take the risky strategy and does not sell assets → Can explain why banks are too late in responding to potential liquidity crises**

A Brief Summary

- **Creating liquidity is a core business for banks**
→ **Eliminating liquidity risk may not be good**
- **CB and IB may have different liquidity problems**
- **Market liquidity becomes more important**
- **Banks' decisions regarding liquidity may be suboptimal for social welfare during crises**
- **The role of the government is important (bailouts, liquidity support, lender of last resort...)**

Cornett et al. (2011)

- **Examine U.S. banks' behavior during the 2008 crisis**
 - **Dependent variables: Δ Liquid assets, Δ Loans, Δ Credit (loans + commitments)**
 - **Independent variables: Illiquid assets, Core deposits, Capital ratio (tier-1), Commitments, Assets**
 - **Macro liquidity: TED spread (3m LIBOR – Treasury)**
 - **Data period: 2006Q1 to 2009Q2**
 - **Main conclusion: Banks with better financial conditions are less like to reduce credit**

Acharya and Mora (2015)

- **The role of the government in the liquidity crisis**
 - **Data: U.S. banks, 1994 to 2009, quarterly**
 - **Hypothesis: Before the U.S. government promised to help, banks with high liquidity risk pay higher interests, and have lower deposit and credit growth**
 - **Main independent variables: Crisis1 (07Q3-08Q2, Crisis2 (08Q3-09Q2) , unused loan commitments**
 - **Control variables: wholesale funding, NPL, capital ratio, large bank dummy, real estate loans**

Liquidity Coverage Ratio

- **Liquidity Coverage Ratio (LCR) (2013.1)** **HQLA: high quality liquid assets**

$$\frac{\text{Stock of HQLA}}{\text{Total net cash outflows over the next 30 calendar days}} \geq 100\%$$

- high trading volume, low volatility**
- **HQLA : level 1, 2A, 2B (haircut, max. proportion)**
- **Cash outflows : $E[\text{Outflows}] - \text{Min}\{E[\text{Inflows}], E[\text{Outflows}] * 0.75\}$**
- **Different cash outflows and inflows have different weights**
- **Report monthly**

Liquidity Coverage Ratio

Stock of HQLA	
A. Level 1 assets:	
<ul style="list-style-type: none"> • Coins and bank notes • Qualifying marketable securities from sovereigns, central banks, PSEs, and multilateral development banks • Qualifying central bank reserves • Domestic sovereign or central bank debt for non-0% risk-weighted sovereigns 	100%
B. Level 2 assets (maximum of 40% of HQLA):	
Level 2A assets	
<ul style="list-style-type: none"> • Sovereign, central bank, multilateral development banks, and PSE assets qualifying for 20% risk weighting • Qualifying corporate debt securities rated AA- or higher • Qualifying covered bonds rated AA- or higher 	85%
Level 2B assets (maximum of 15% of HQLA)	
<ul style="list-style-type: none"> • Qualifying RMBS • Qualifying corporate debt securities rated between A+ and BBB- • Qualifying common equity shares 	75%
	50%
	50%

Liquidity Coverage Ratio

Cash Outflows	
A. Retail deposits:	
Demand deposits and term deposits (less than 30 days maturity)	
<ul style="list-style-type: none"> Stable deposits (deposit insurance scheme meets additional criteria) Stable deposits Less stable retail deposits 	<p>3%</p> <p>5%</p> <p>10%</p>
Term deposits with residual maturity greater than 30 days	0%
B. Unsecured wholesale funding:	
Demand and term deposits (less than 30 days maturity) provided by small business customers:	
<ul style="list-style-type: none"> Stable deposits Less stable deposits 	<p>5%</p> <p>10%</p>
Operational deposits generated by clearing, custody and cash management activities	25%
<ul style="list-style-type: none"> Portion covered by deposit insurance 	5%
Cooperative banks in an institutional network (qualifying deposits with the centralised institution)	25%
Non-financial corporates, sovereigns, central banks, multilateral development banks, and PSEs	40%
<ul style="list-style-type: none"> If the entire amount fully covered by deposit insurance scheme 	20%
Other legal entity customers	100%
C. Secured funding: (略)	

Net Stable Funding Ratio

- **Net Stable Funding Ratio (NSFR):** Requiring banks to hold stable funding sources that can sustain for a year!

$$\frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} > 100\%$$

- **Available stable funding:** capital, deposits (weights are higher if more stable)
- **Required stable funding:** Assets (weights are lower if have lower credit risk or are more liquid)

Discussions

- **The meaning of bank liquidity measures: value creation or risk?**
 - **If liquidity creation → Policy implications**
 - **Berger et al. (2014)**
 - **How will LCR and NSFR affect liquidity creation?**
- **Costs and benefits of bank liquidity regulation**
- **How will liquidity creation generate value for banks?**
- **Liquidity measures and bank failures**