INSTITUTE OF ACTUARIAL & QUANTITATIVE STUDIES

Class: TY BSc

Subject : Risk Management & Investment Management -1

Chapter: Unit 3 Chapter 2 Part 2

Chapter Name: Deciphering the Liquidity and Credit Crunch 2007-2008

Topics to be covered

1. Introduction

2. Banking Industry Trends leading up to the Liquidity Squeeze.
    1. Background
    2. Trends

3. Securitization: Credit Protection, Pooling and Tranching Risk
    1. Overview
    2. Uses and Consequences

5. Shortening Maturity Structure & Demand from Money Market Funds.

1. Lending Frenzy and Housing Boom.

1. Subprime Mortgages.

1. Relaxation of Lending Standards.

Topics to be covered

8. Funding Liquidity and Market Liquidity
    1. Funding Liquidity
    2. Market Liquidity
    3. Interaction

8. Mechanisms for Amplification
    2. Borrower's Balance Sheet Effects: Loss Spiral and Margin Spiral
    3. Lending Channel
    4. Runs on Financial Institutions

8 Funding Liquidity and Market Liquidity

Funding Liquidity

- **Funding liquidity** describes the ease with which expert investors and arbitrageurs can obtain funding from (possibly less informed) financiers.
- Funding liquidity is high—and markets are said to be "awash with liquidity"—when it is easy to raise money. Typically, when a leveraged trader, such as a dealer, hedge fund, or investment bank, purchases an asset, the trader uses the purchased asset as collateral and borrows (short term) against it. However, the trader cannot borrow the entire price. The difference between the security's price and its value as collateral— the margin or haircut—must be financed by the trader's own equity capital.
- Margin lending is short term since margins and haircuts can be adapted to market conditions on a daily basis. Outside equity or long-term debt financing is typically more expensive and difficult to obtain when the trader suffers from the debt overhang problem.
- As a consequence, traders tend not to carry much excess capital and thus increasing margins and haircuts force traders to de-leverage their positions (that is, to sell part of their assets).

8 Funding Liquidity and Market Liquidity

Funding Liquidity

- Funding liquidity risk can thus take three forms:
  i. margin/haircut funding risk, or the risk that margins and haircuts will change
  ii. rollover risk, or the risk that it will be more costly or impossible to roll over short-term borrowing
  iii. Redemption risk, or the risk that demand depositors of banks—or even equity holders of hedge funds, for example—withdraw funds.

- All three incarnations of funding liquidity risk are only detrimental when the assets can be sold only at fire-sale prices—that is, when market liquidity is low.

8 Funding Liquidity and Market Liquidity

Market Liquidity

- **Market liquidity** is equivalent to the relative ease of finding somebody who takes on the other side of the trade.
- The literature distinguishes between three sub-forms of market liquidity (Kyle, 1985):
  i. the bid–ask spread, which measures how much traders lose if they sell one unit of an asset and then buy it back right away
  ii. market depth, which shows how many units traders can sell or buy at the current bid or ask price without moving the price
  iii. market resiliency, which tells us how long it will take for prices that have temporarily fallen to bounce back.
- While a single trader might move the price a bit, large price swings occur when "crowded trades" are unwound—that is, when a number of traders attempt to exit from identical positions in unison.

8 Funding Liquidity and Market Liquidity

Interaction

- Financial institutions that rely substantially on short-term (commercial) paper or repo contracts have to roll over their debt. An inability to roll over this debt—if, for example, the market for commercial paper dries up—is equivalent to margins increasing to 100 percent, because the firm becomes unable to use the asset as a basis for raising funds. Similarly, withdrawals of demand deposits or capital redemptions from an investment fund have the same effect as an increase in margins.
- Market liquidity is low when it is difficult to raise money by selling the asset (instead of by borrowing against it). In other words, market liquidity is low when selling the asset depresses the sale price and hence it becomes very costly to shrink the balance sheet.
- At an abstract level, we can think about market liquidity and funding liquidity in the following way: market liquidity refers to the transfer of the asset with its entire cash flow, while funding liquidity is like issuing debt, equity, or any other financial contract against a cash flow generated by an asset or trading strategy.

- The mechanisms that explain why liquidity can suddenly evaporate operate through the interaction of market liquidity and funding liquidity. Through the following mechanisms, a relatively small shock can cause liquidity to dry up suddenly and carry the potential for a full-blown financial crisis.

9 Mechanisms for amplification

Borrower's Balance Sheet Effects: Loss Spiral and Margin Spiral

- A **loss spiral** arises for leveraged investors because a decline in the value of assets erodes the investors' net worth much faster than their gross worth (because of their leverage) and the amount that they can borrow falls.
- For example, consider an investor who buys $100 million worth of assets on 10 percent margin. This investor finances only $10 million with its own capital and borrows $90 million. The leverage ratio is 10. Now suppose that the value of the acquired asset declines temporarily to $95 million. The investor, who started out with $10 million in capital, now has lost $5 million and has only $5 million of its own capital remaining. Holding the leverage ratio constant at 10, this investor is forced to reduce the overall position to $50 million—which means selling assets worth $45 million exactly when the price is low. These sales depress the price further, inducing more selling and so on.
- This loss spiral arises as an equilibrium because some other potential buyers with expertise may face similar constraints at the same time and also because other potential buyers find it more profitable to wait out the loss spiral before reentering the market.
- In more extreme cases, other traders might even engage in "predatory trading," deliberately forcing others to liquidate their positions at fire-sale prices.

9 Mechanisms for amplification

Borrower's Balance Sheet Effects: Loss Spiral and Margin Spiral

- The margin/haircut spiral reinforces the loss spiral. As margins or haircuts rise, the investor has to sell even more because the investor needs to reduce its leverage ratio (which was held constant in the loss spiral).
- Margins and haircuts spike in times of large price drops, leading to a general tightening of lending. The documented fact that margins and haircuts as well as lending standards increase after large price drops seems counterintuitive because a price reduction that results from a lack of liquidity is likely to be temporary, and investors with the necessary expertise face a great buying opportunity. Hence, one might think that lenders would be willing to lend more freely by lowering margins after prices have dropped.

9 Mechanisms for amplification

Borrower's Balance Sheet Effects: Loss Spiral and Margin Spiral

- There are at least three reasons why exactly the opposite is true.
  i. Unexpected price shocks may be a harbinger of higher future volatility. And when volatility increases, margins and haircuts increase. An extreme example was the situation in August 2007, when the asset-backed commercial paper market dried up completely. Prior to the crisis, asset-backed commercial paper was almost risk-free because of overcollateralization. However, in August 2007, the overcollateralization cushion evaporated, making the assets much more risky. Consequently, investors were unwilling to let structured investment vehicles roll-over their debt.
  ii. The second reason why margins increase when prices drop suddenly is that asymmetric-information frictions emerge. Financiers become especially careful about accepting assets as collateral if they fear receiving a particularly bad selection of assets. They might, for example, be worried that structured investment vehicles sold the good, "sellable" assets and left as collateral only the bad, less valuable, "lemons."
  iii. If lenders naively estimate future volatility using past data, then a large price drop leads to higher volatility estimates and higher margins—even though a price drop potentially reflects a great buying opportunity.

9 Mechanisms for amplification

Borrower's Balance Sheet Effects: Loss Spiral and Margin Spiral

- The loss spiral is more pronounced for stocks with low market liquidity, because selling them at a time of financial distress will bring about a greater price drop than selling a more liquid asset would. For many structured finance products, market liquidity is so low that no reliable price exists because no trade takes place.
- As a consequence, owners have considerable discretion in what value to place on the asset. Selling some of these assets in a financial crisis would establish a low price and force the holder to mark down remaining holdings. Hence, investors are reluctant to do this—and instead prefer to sell assets with higher market liquidity first.

9 Mechanisms for amplification

Lending Channel

- So far, we have assumed that lenders have deep pockets. When lenders also have limited capital, they restrict their lending as their own financial situation worsens.
- We can distinguish two main mechanisms: moral hazard in monitoring and precautionary hoarding. Most lending is intermediated by banks that have expertise in monitoring a borrower's investment decisions. For intermediators to exert sufficient effort in monitoring, they must have a sufficiently high stake of their own.
- **Moral hazard** arises when the net worth of the intermediaries' stake falls because intermediaries may then reduce their monitoring effort, forcing the market to fall back to direct lending without monitoring.
- **Precautionary hoarding** arises if lenders are afraid that they might suffer from interim shocks and that they will need funds for their own projects and trading strategies.

9 Mechanisms for amplification

Lending Channel

- Precautionary hoarding therefore increases when 1) the likelihood of interim shocks increases, and 2) outside funds are expected to be difficult to obtain.
- The troubles in the interbank lending market in 2007–08 are a textbook example of precautionary hoarding by individual banks. As it became apparent that conduits, structured investment vehicles, and other off-balance-sheet vehicles would likely draw on credit lines extended by their sponsored bank, each bank's uncertainty about its own funding needs skyrocketed. At the same time, it became more uncertain whether banks could tap into the interbank market after a potential interim shock since it was not known to what extent other banks faced similar problems. These effects led to sharp spikes in the interbank market interest rate, LIBOR, relative to the Treasury bill rate.

9 Mechanisms for amplification

Runs on Financial Institutions

- In the days before deposit insurance, everybody had an incentive to be the first to withdraw funds from a possibly troubled bank, because those who withdraw their money early get their full amount while those who move late might not.
- Late movers receive less for two reasons:
  i. if the run occurred for fundamental reasons—say, the bank invested in bad projects—there may not be enough asset value left to pay those who withdraw late.
  ii. if the run occurred for funding liquidity reasons, early withdrawals force a bank to liquidate long-maturity assets at fire-sale prices because market liquidity for those assets is low. The sale of long maturity assets below their fair value leads to an erosion of the bank's wealth and thus leaves less for those who withdraw their money late.
- Under both scenarios, every investor has an incentive to preempt others and run to the bank.
- A firstmover advantage triggers a dynamic preemption motive, which can lead to socially inefficient outcomes.

9 Mechanisms for amplification

Runs on Financial Institutions

- Deposit insurance has made bank runs almost obsolete, but runs can occur on other financial institutions. Not rolling over commercial paper is, in effect, a run on the issuer of asset-backed commercial paper.
- Furthermore, Bear Stearns essentially experienced a bank run in March 2008 when hedge funds, which typically park a sizable amount of liquid wealth with their prime brokers, pulled out those funds.
- In September 2008, AIG faced a "margin run". Several counterparties requested additional collateral from AIG for its credit default swap positions. These requests would have brought the firm down if the Fed had not injected additional funds.

10 Network Effect

Introduction

- All our settings so far have assumed a distinct lending sector that lends to a distinct borrowing sector. In reality, however, most financial institutions are lenders and borrowers at the same time. Modern financial architecture consists of an interwoven network of financial obligations.
- In reality, an increase in counterparty credit risk can create additional funding needs and potential systemic risk.

10 Network Effect

Counterparty Credit Risk

- Network risk is best illustrated by an example related to the Bear Stearns crisis in March 2008. Imagine a hedge fund that has an interest rate swap agreement with Goldman Sachs—that is, both parties had agreed to swap the difference between a floating interest rate and a fixed interest rate.
- Now suppose that the hedge fund offsets its obligation through another swap with Bear Stearns. In the absence of counterparty credit risk, the two swap agreements can be viewed as reduced to a single one between Goldman and Bear Stearns.
- However, it would be unwise for Goldman to renew the contract if it fears that Bear might default on its commitment. Goldman was asked to increase its direct exposure to Bear after the trading hours on March 11, 2008. Goldman's responsible manager did renew the contract in the morning of March 12 and what looked like a delay in response was mistakenly interpreted as a hesitation on Goldman's behalf and thus as a sign that Goldman was afraid Bear Stearns might be in trouble.
- This misinterpretation was leaked to the media and might have contributed to the run on Bear Stearns.

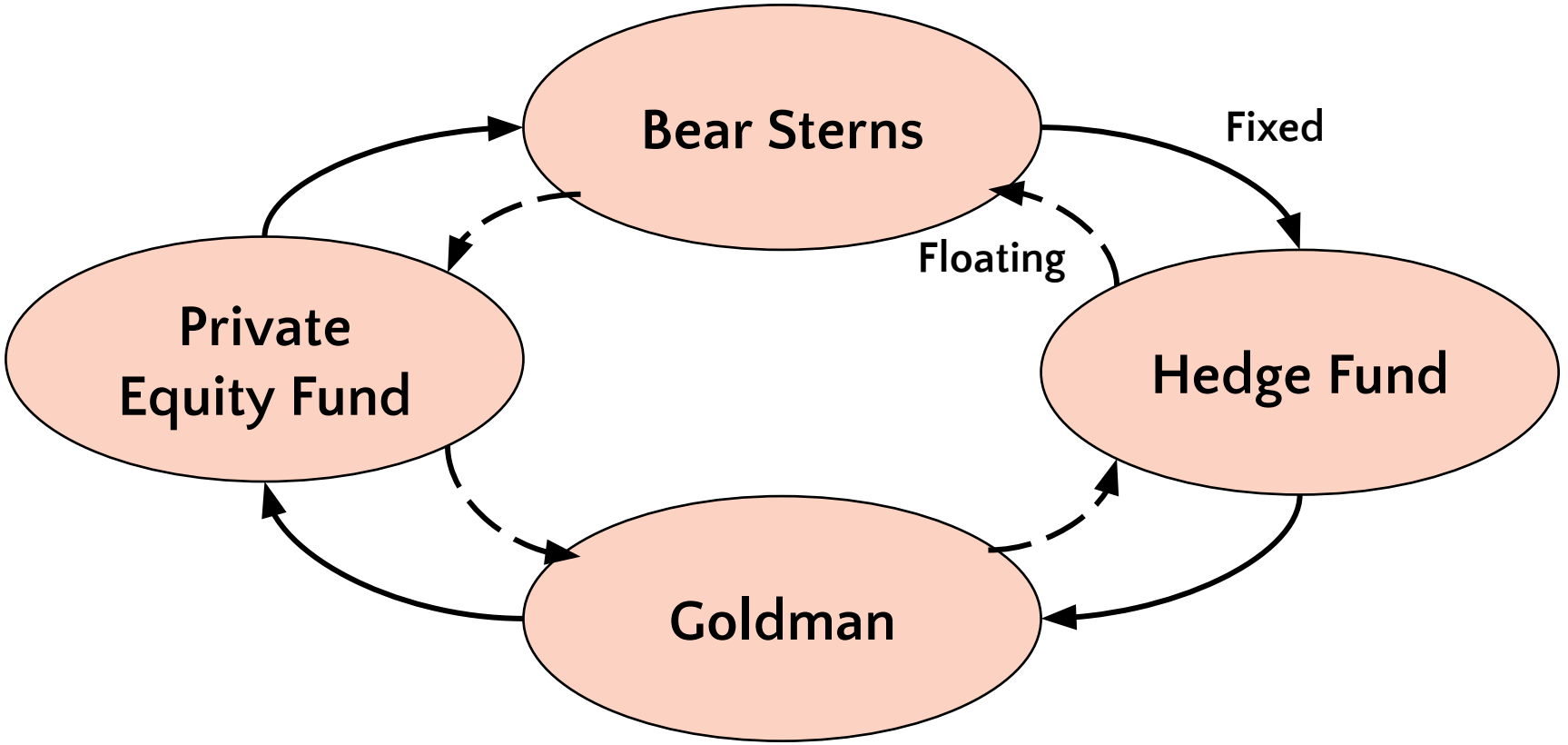
10 Network Effect

Counterparty Credit Risk

- Let us extend this example to see how an increase in perceived counterparty credit risk can be self-fulfilling and create additional funding needs. Suppose that Bear Stearns had an offsetting swap agreement with a private equity fund, which in turn offset its exposure with Goldman Sachs.
- In this hypothetical example, illustrated in the next slide, all parties are fully hedged and, hence, a multilateral netting arrangement could eliminate all exposures.
- However, because all parties are aware only of their own contractual agreements, they may not know the full situation and therefore become concerned about counterparty credit risk. If the investment banks refuse to let the hedge fund and private equity fund net—that is, cancel out—their offsetting positions, both funds have to either put up additional liquidity, or insure each other against counterparty credit risk by buying credit default swaps.
- This happened in the week after Lehman's bankruptcy, September 15–19, 2008. All major investment banks were worried that their counterparties might default, and they all bought credit default swap protection against each other.
- The already high prices on credit default swaps of the major investment banks almost doubled. The price of credit default swaps for AIG was hit the worst; it more than doubled within two trading days.

10 Network Effect

Counterparty Credit Risk



10 Network Effect

Counterparty Credit Risk

- Network and counterparty credit risk problems are more easily overcome if a clearinghouse or another central authority or regulator knows who owes what to whom.
- Then, multilateral netting agreements, such as the service provided by SwapClear, can stabilize the system.
- However, the introduction of structured products that are typically traded over the counter has made the web of obligations in the financial system more opaque, consequently increasing systemic risk.

11 Conclusio

Counterparty Credit Risk

- An increase in mortgage delinquencies due to a nationwide decline in housing prices was the trigger for a full-blown liquidity crisis that emerged in 2007 and might well drag on over the next few years.
- While each crisis has its own specificities, the mortgage one has been surprisingly close to a “classical banking crisis.” What is new about this crisis is the extent of securitization, which led to an opaque web of interconnected obligations. We outlined several amplification mechanisms that help explain the causes of the financial turmoil.
- These mechanisms also form a natural point from which to start thinking about a new financial architecture. For example, fire-sale externalities and network effects suggest that financial institutions have an individual incentive to take on too much leverage, to have excessive mismatch in asset–liability maturities, and to be too interconnected.