

Public Affairs 974-1
Monetary and Financial Policy in
the Wake of the Financial Crisis
(10/25/12)

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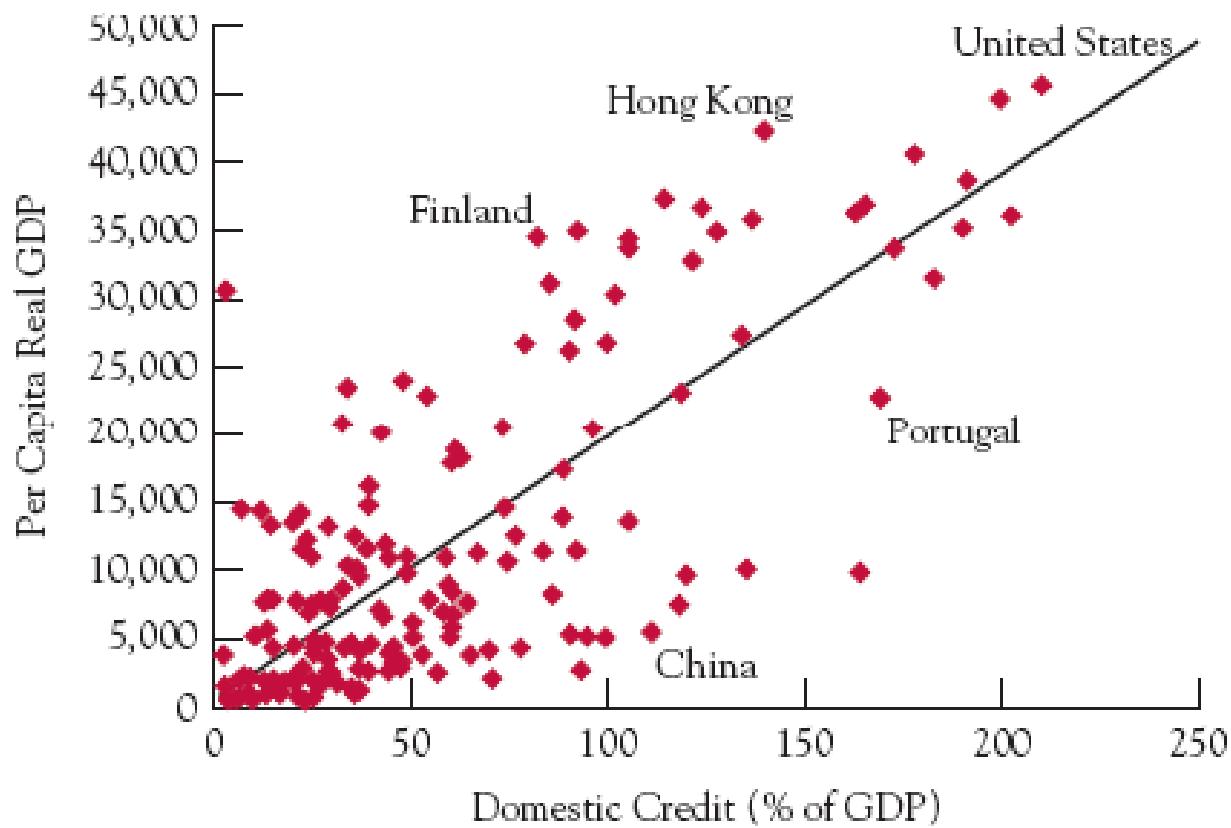
Introduction

- Financial institutions serve as intermediaries between savers and borrowers, so their assets and liabilities are primarily financial instruments.
- These institutions pool funds from people and firms who save and lend them to people and firms who need to borrow.
- Intermediaries investigate the financial condition of the individuals and firms.
- In principle, intermediaries increase investment and economic growth at the same time that they reduce investment risk and economic volatility.

Introduction

Figure 11.1

Financial and Economic Development



Problems

- The flow of information among parties in a market system is particularly rife with problems.
- These problems can derail real growth unless they are addressed properly.
- In this lecture we will review some of these information problems and learn how financial intermediaries attempt to solve them.

The Role of Financial Intermediaries

Table 11.1

The Relative Importance of Direct and Indirect Finance

(Averages for 1990–2007)

Country	Direct Finance		Indirect Finance	
	Stock Market Capitalization as Percent of GDP (A)	Outstanding Domestic Debt Securities as Percent of GDP (B)	Credit Extended by Banks & Other Financial Institutions as Percent of GDP (C)	Ratio of Indirect to Direct Finance C/(A+B) (D)
Industrialized Countries				
France	59.0	45.0	88.2	0.8
Germany	40.7	47.4	107.2	1.2
Greece	38.9	2.3	45.4	1.1
Italy	34.0	35.8	68.0	1.0
Japan	78.7	43.9	154.0	1.3
United Kingdom	131.1	15.6	125.4	0.9
United States	113.2	94.9	154.3	0.7
Emerging Markets Countries				
Argentina	31.6	4.7	16.7	0.5
Brazil	34.0	9.8	34.1	0.8
India	38.3	0.9	27.5	0.7

The Role of Financial Intermediaries

- These data highlight the importance of intermediaries.
 - Banks are still critical providers of financing around the world.
 - Intermediaries determine which firms can access the stock and bond markets.
 - Banks decide the size of a **loan and interest rate** to be charged.
 - Securities firms set the **volume and price** of new stocks and bond issues when they purchase them for sale to investors.

Providing Liquidity

- *Liquidity* is a measure of the ease and cost with which an asset can be turned into a means of payment.
- Financial intermediaries offer us the ability to transform assets into money at relatively low cost - ATM's, for example.
- Banks can structure their assets accordingly, keeping enough funds in short-term, liquid financial instruments to satisfy the few people who will need them and lending out the rest.

Diversifying Risk

- Financial institutions enable us to diversify our investments and reduce risk.
- Banks take deposits from thousands of individuals and make thousands of loans with them.
 - Each depositor has a very small stake in each one of the loans.
- All financial intermediaries provide a low-cost way for individuals to diversify their investments.

Collecting and Processing Information

- The fact that the borrower knows whether he or she is trustworthy, while the lender faces substantial costs to obtain that information, results in an *information asymmetry*.
 - Borrowers have information that lenders don't.
- By collecting and processing standardized information, financial intermediaries reduce the problems that information asymmetries create.

Information Asymmetries and Information Costs

- Information plays a central role in the structure of financial markets and financial institutions.
- Markets require sophisticated information to work well.
 - If the cost of information is too high, markets cease to function.
- Issuers of financial instruments know more about their business prospects and willingness to work than potential lenders/investors.

Information Asymmetries and Information Costs

- **Asymmetric information** is a serious hindrance to the operation of financial markets.
- It poses two important obstacles to the smooth flow of funds from savers to investors:
 1. **Adverse selection** arises before the transaction occurs.
 - Lenders need to know how to distinguish good credit risks from bad.
 2. **Moral hazard** occurs after the transaction.

11-11 Will borrowers use the money as they claim?

Adverse Selection

- The market for lemons:
 - Used car buyers can't tell good from bad cars.
 - Buyers will at most pay the expected value of good and bad cars.
 - Sellers know if they have a good car; won't accept less than the true value.
 - Good car sellers will withdraw cars from the market.
 - Then the market has only the bad cars
- If you can't tell good from bad companies
 - Stocks of good companies are undervalued, and
 - Owners will not want to sell them.
- If you can't tell good from bad bonds
 - Owners of good companies will have to sell bonds for too low a price, so
 - Owners won't want to do it.
 - Then the market has only the bad cars.

Solving the Adverse Selection Problem

- From a social perspective, the problems of adverse selection are not good.
 - Some companies will pass up good investments.
 - Economy will not grow as rapidly as it could.
- We must find ways for investors and lenders to distinguish well-run firms from poorly run firms.

Disclosure of Information

- Solution to asymmetric information problem: provide more information.
- In most industrialized countries, *public companies* are required to disclose voluminous amounts of information.
- E.g., SEC requirements
- Counter-example: Enron
- Private information provision: Moody's, Value Line, Dun and Bradstreet
- “Free Rider” problem

Collateral and Net Worth

- Another solution: ensure lenders are compensated even if borrowers default.
 - If a loan is insured in some way, then the borrower isn't a bad credit risk.
- **Collateral** is something of value pledged by a borrower to the lender in the event of the borrower's default. Reduces adverse selection
 - E.g.: Cars, houses
- **Unsecured loans** are loans made without collateral.

11-15 Generally have very high interest rates.

Collateral and Net Worth

- The **net worth** is the owner's stake in a firm: value of the firm assets minus liabilities.
 - Net worth serves the same purpose as collateral
 - If a firm defaults on a loan, the lender can make a claim against the firm's net worth.
- From the perspective of the mortgage lender, the homeowner's equity serves exactly the same function as net worth in a business loan.
- Hence why small business owners have difficulty accessing credit



APPLYING THE CONCEPT

DEFLATION, NET WORTH,
AND INFORMATION COSTS

- Deflation is harmful because it aggravates information problems in ways that inflation does not - it reduces a company's net worth.
- When prices fall,
 - The dollar value of the firm's liabilities remains the same, but
 - The value of the firm's assets fall with the price level.
- Deflation drives down a firm's net worth, making it less trustworthy as a borrower.

Moral Hazard: Problem and Solutions

- Origin: *moral hazard* -- an insurance policy changes the behavior of the insured.
- Moral hazard arises when we cannot observe people's actions and therefore cannot determine whether a poor outcome was intentional or just a result of bad luck.
- Also arises because the borrower knows more than the lender about the way borrowed funds will be used and the effort that will go into a project.

Moral Hazard in Equity Finance

- The separation of your ownership from their control creates what is called a *principal-agent problem*.
- During the 1990's, a concerted attempt was made to align managers' interests with those of stockholders.

Executive stock options; induced tendency to misrepresent profits

Moral Hazard in Debt Finance

- When the managers are the owners, moral hazard in equity finance disappears.
- Because debt contracts allow owners to keep all the profits in excess of the loan payments, they encourage risk taking.
- Lenders need to find ways to make sure borrowers don't take too many risks.
- People with risky projects are attracted to debt finance because they get the full benefit of the upside, while the downside is limited to their collateral.

Solving the Moral Hazard Problem in Debt Finance

- Legal contracts can solve the moral hazard problem inherent in debt finance.
 - Bonds and loans carry restrictive covenants that limit the amount of risk a borrower can assume.
 - The firm may have to maintain a certain level of net worth, a minimum credit rating, or a minimum bank balance.
 - For example: home mortgages' home insurance, fire insurance, etc.

How Companies Finance Growth and Investment

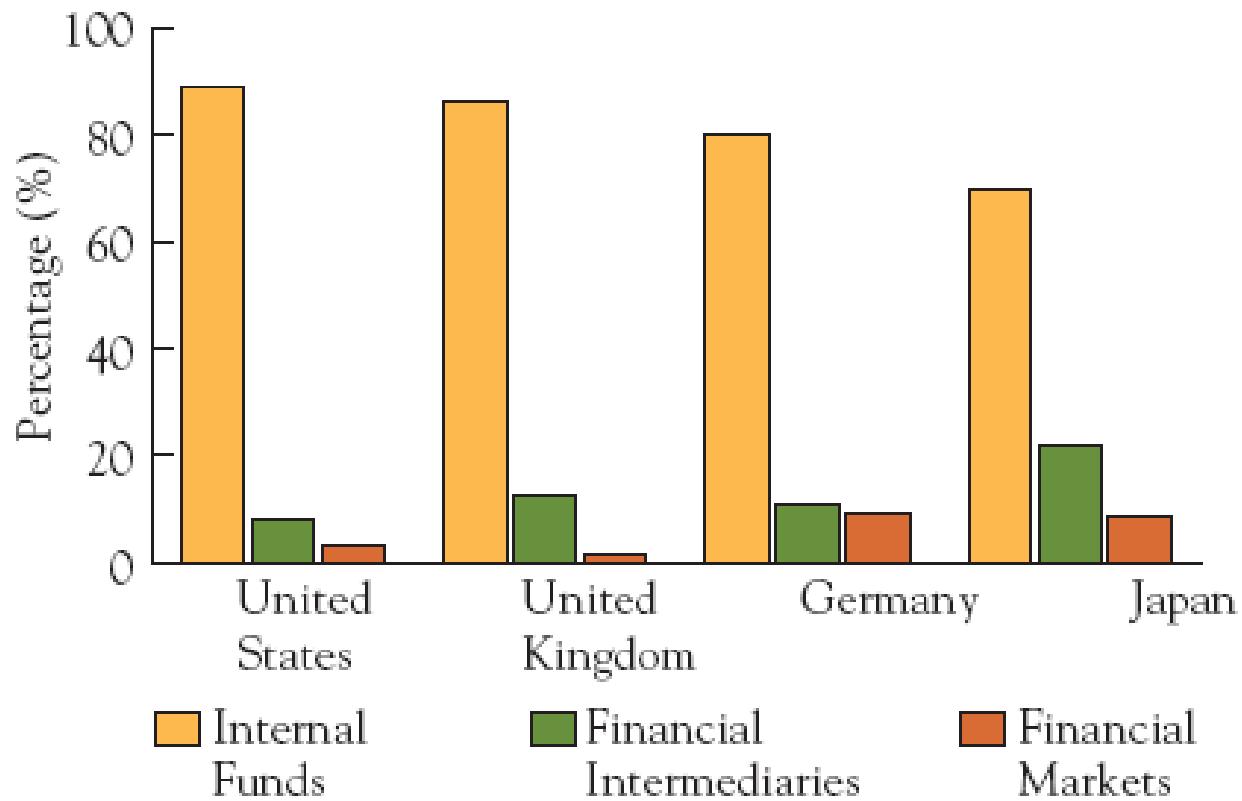
- We noted two things at the beginning of this chapter:
 1. Wealthy countries have high levels of financial development, and
 2. Intermediaries play key roles both in direct and indirect finance.
- In addition to direct and indirect finance, a firm can also use its own profits.

How Companies Finance Growth and Investment

- Instead of distributing profits to shareholders, a firm can reinvest the earnings into the firm.
 - A vast majority of investment financing comes from internal sources.
- The fact that managers have superior information about the way in which their firms are and should be run makes internal finance the rational choice.

Investment Financing: The Pecking Order

Figure 11.3 Sources of Business Finance



Introduction

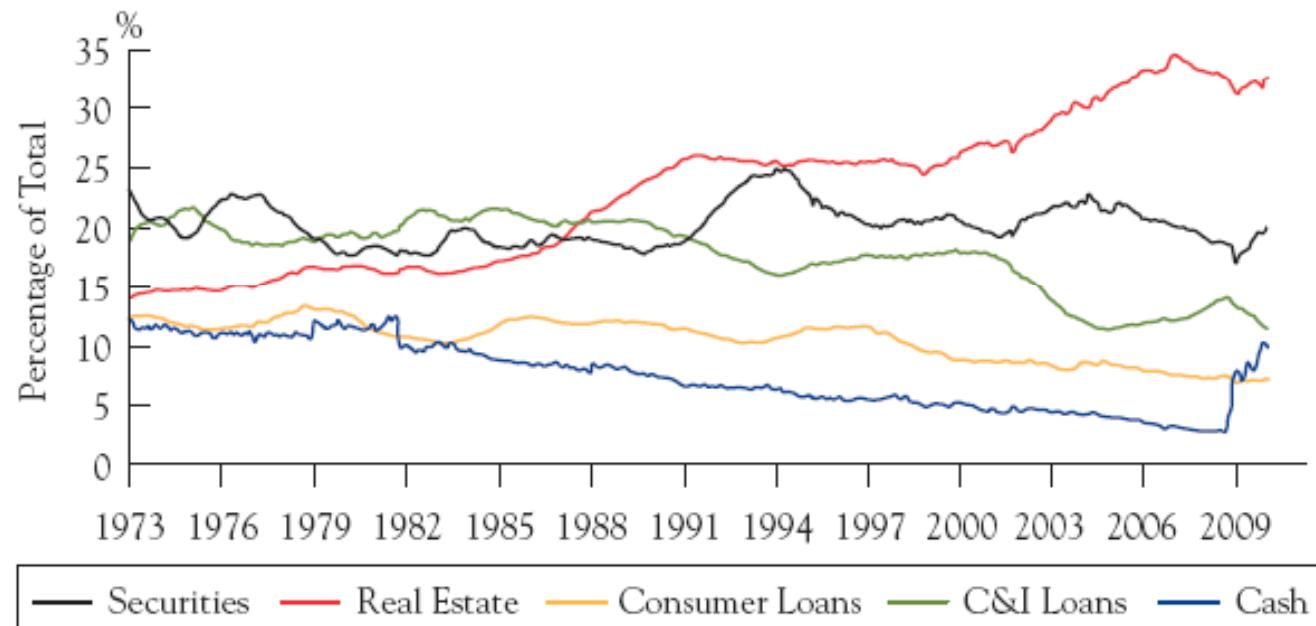
- Most people use the word *bank* to describe a **depository institution**.
- There are depository and **non-depository institutions** that differ by their primary source of funds - the liability side of their balance sheet.
- Depository institutions include
 - Commercial banks, savings and loans, and credit unions.

Table 12.1 Balance Sheet of U.S. Commercial Banks, January 2010

Assets in billions of dollars (numbers with % sign are percentages of total assets)			
Cash items	1246.7	10.6%	
Securities*	2336.8	19.9%	
U.S. government and agency	1421.2	12.1%	
Other securities	915.5	7.8%	
Loans	6693.8	57.1%	
Commercial and industrial	1320.1	11.3%	
Real estate (including mortgage)	3794.3	32.4%	
Consumer	817.7	7.0%	
Interbank	212.4	1.8%	
Other	761.6	6.5%	
Other assets	1439.5	12.3%	
Total Commercial Bank Assets	11716.8		
Liabilities in billions of dollars (numbers with % sign are percentages of total liabilities)			
Deposits	7716.1	74.0%	
Large time deposits	1886.2	18.1%	
Borrowings	1901.6	18.2%	
From banks in the U.S.	256.3	2.5%	
From others	1645.4	15.8%	
Other liabilities	807.8	7.7%	
Total Commercial Bank Liabilities	10425.5		
Bank Assets – Bank Liabilities = Bank Capital	1291.3		

Balance Sheet of Commercial Banks: Changes in Assets Over Time

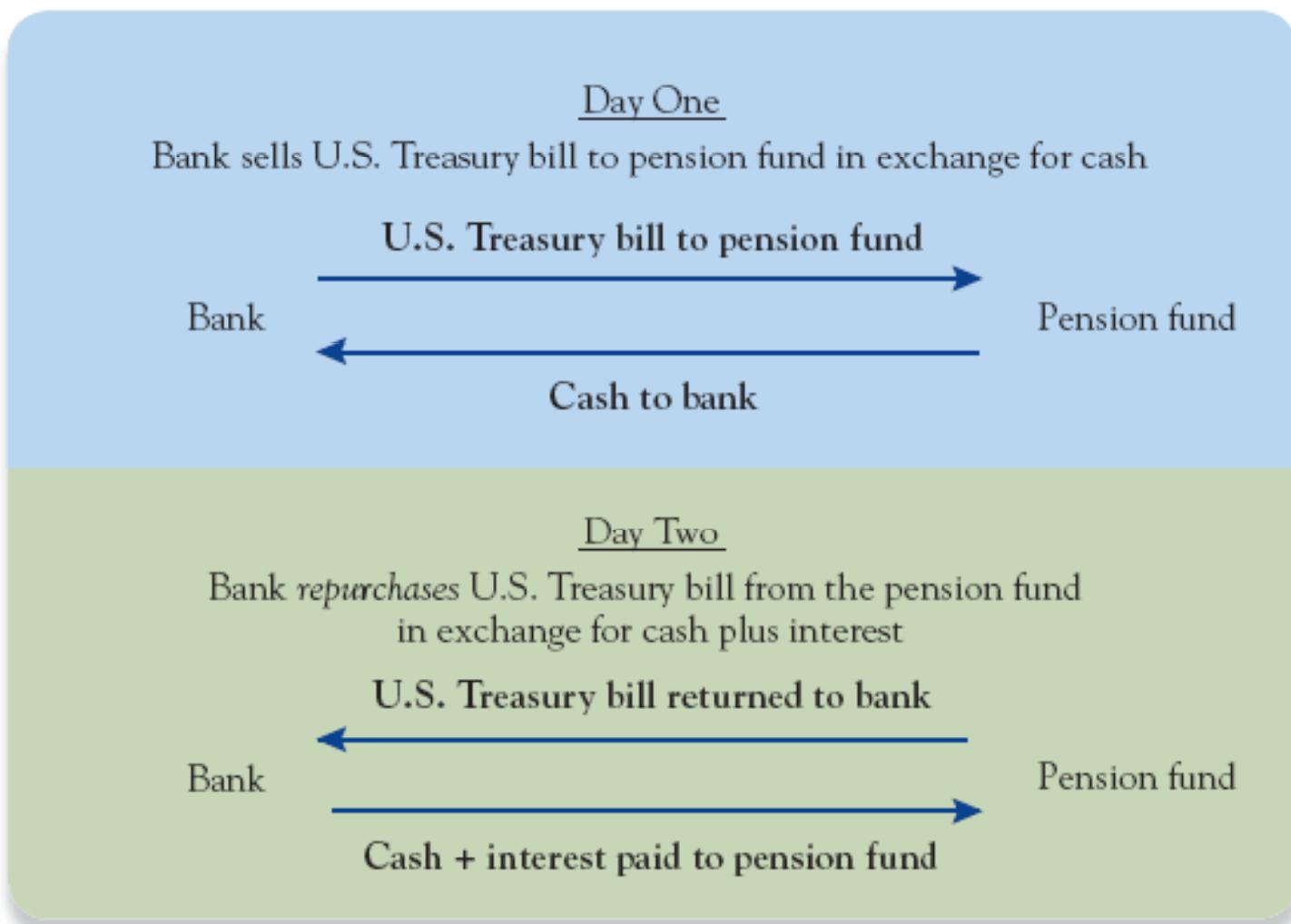
Figure 12.1 U.S. Commercial Bank Assets, 1973-2009



Borrowings

- Banks finally can borrow using an instrument called a **repurchase agreement**, or **repo**.
 - A short-term collateralized loan in which a security is exchanged for cash.
 - The parties agree to reverse the transaction on a specific future date.

Figure 12.3 Mechanics of an Overnight Repurchase Agreement



Bank Risk

Table 12.3

Risks Banks Face and How They Manage Them

Type of Risk	Source of Risk	Recommended Responses
<i>Liquidity Risk</i>	Sudden withdrawals by depositors or takedowns of credit lines	<ol style="list-style-type: none">1. Hold sufficient cash reserves to meet customer demand.2. Manage assets—sell securities or loans (contracts the size of the balance sheet)3. Manage liabilities—attract more deposits (maintains the size of the balance sheet)
<i>Credit Risk</i>	Default by borrowers on their loans	<ol style="list-style-type: none">1. Diversify to spread risk.2. Use statistical models to screen for creditworthy borrowers.3. Monitor to reduce moral hazard.
<i>Interest-Rate Risk</i>	Mismatch in maturity of assets and liabilities coupled with a change in interest rates	<ol style="list-style-type: none">1. Closely match the maturity of both sides of the balance sheet.2. Use derivatives such as interest-rate swaps.
<i>Trading (Market) Risk</i>	Trading losses in the bank's own account	Closely monitor traders using risk management tools, including value at risk.

Liquidity Risk

- Liquidity risk is the risk of a sudden demand for liquid funds.
- Banks face liquidity risk on both sides of their balance sheets.
 - Deposit withdrawal is a liability-side risk.
 - Lines of credit are an asset-side risk.
- Even if a bank has a positive net worth, illiquidity can still drive it out of business.
- In the financial crisis of 2007-2009, banks could neither sell their illiquid assets nor obtain funding at a reasonable cost to hold those assets.

Dealing with Liquidity Risk

Figure 12.6

Balance Sheet of a Bank Following a \$5 Million Withdrawal and Asset Adjustment

Withdrawal Is Met by Selling Securities

Assets		Liabilities	
Reserves	\$10 million	Deposits	\$95 million
Loans	\$100 million	Borrowed funds	\$30 million
Securities	\$35 million	Bank capital	\$20 million

Withdrawal Is Met by Reducing Loans

Assets		Liabilities	
Reserves	\$10 million	Deposits	\$95 million
Loans	\$95 million	Borrowed funds	\$30 million
Securities	\$40 million	Bank capital	\$20 million

Dealing with Liquidity Risk

Figure 12.7

Balance Sheet of a Bank Following a \$5 Million Withdrawal and Liability Adjustment

Withdrawal Is Met by Borrowing

Assets		Liabilities	
Reserves	\$10 million	Deposits	\$95 million
Loans	\$100 million	Borrowed funds	\$35 million
Securities	\$40 million	Bank capital	\$20 million

Withdrawal Is Met by Attracting Deposits

Assets		Liabilities	
Reserves	\$10 million	Deposits	\$100 million
Loans	\$100 million	Borrowed funds	\$30 million
Securities	\$40 million	Bank capital	\$20 million

Credit Risk

- Credit risk analysis produces information that is very similar to the bond rating systems.
 - Banks do this for small firms wishing to borrow, and credit rating agencies perform the service for individual borrowers.
 - The result is an assessment of the likelihood that a particular borrower will default.
- In the financial crisis of 2007-2009, banks underestimated the risks associated with mortgage and other household credit.

Credit Risk/Capital Adequacy Management:

Screen assets or keep high capital

Commercial Bank (Before)			
Assets		Liabilities	
Reserves	\$10M	Deposits	\$90M
Loans (Mortgages, CRE)	\$90M	Bank Capital (or “equity”)	\$10M
T-Bills			
Other bonds (GSEs)			

Commercial Bank (After)			
Assets		Liabilities	
Reserves	\$10M	Deposits	\$90M
Loans (Mortgages, CRE)	\$81M	Bank Capital (or “equity”)	\$01M
T-Bills			
Other bonds (GSEs)			

Assume a \$9 million loss to loans

Credit Risk/Capital Adequacy Management: Consider in contrast a low capital bank

Commercial Bank (Before)			
Assets		Liabilities	
Reserves	\$10M	Deposits	\$95M
Loans (Mortgages, CRE)	\$90M	Bank Capital (or “equity”)	\$5M
T-Bills			
Other bonds (GSEs)			

Commercial Bank (After)			
Assets		Liabilities	
Reserves	\$10M	Deposits	\$91M
Loans (Mortgages, CRE)	\$81M	Bank Capital (or “equity”)	\$0M
T-Bills			
Other bonds (GSEs)			

Assume \$9 million loss, no government intervention so that depositors take some losses

Bank Capital and Profitability

There are several measures of bank profitability.

1. Return on assets (ROA): ROA is the bank's profit left after taxes divided by the bank's total assets.
2. **return on equity (ROE)**. The bank's return to its owners. This is the bank's net profit after taxes divided by the bank's capital.
3. Net interest income. Difference between interest rates on assets, liabilities.
4. Net interest margin. Net interest income divided by assets.

NB: ¹²⁻³⁷“Leverage” is bank assets to capital

Capital Adequacy Management:

Returns to Equity Holders

Return on Assets: net profit after taxes per dollar of assets

$$ROA = \frac{\text{net profit after taxes}}{\text{assets}}$$

Return on Equity: net profit after taxes per dollar of equity capital

$$ROE = \frac{\text{net profit after taxes}}{\text{equity capital}}$$

Relationship between ROA and ROE is expressed by the

Equity Multiplier: the amount of assets per dollar of equity capital

$$EM = \frac{\text{Assets}}{\text{Equity Capital}}$$

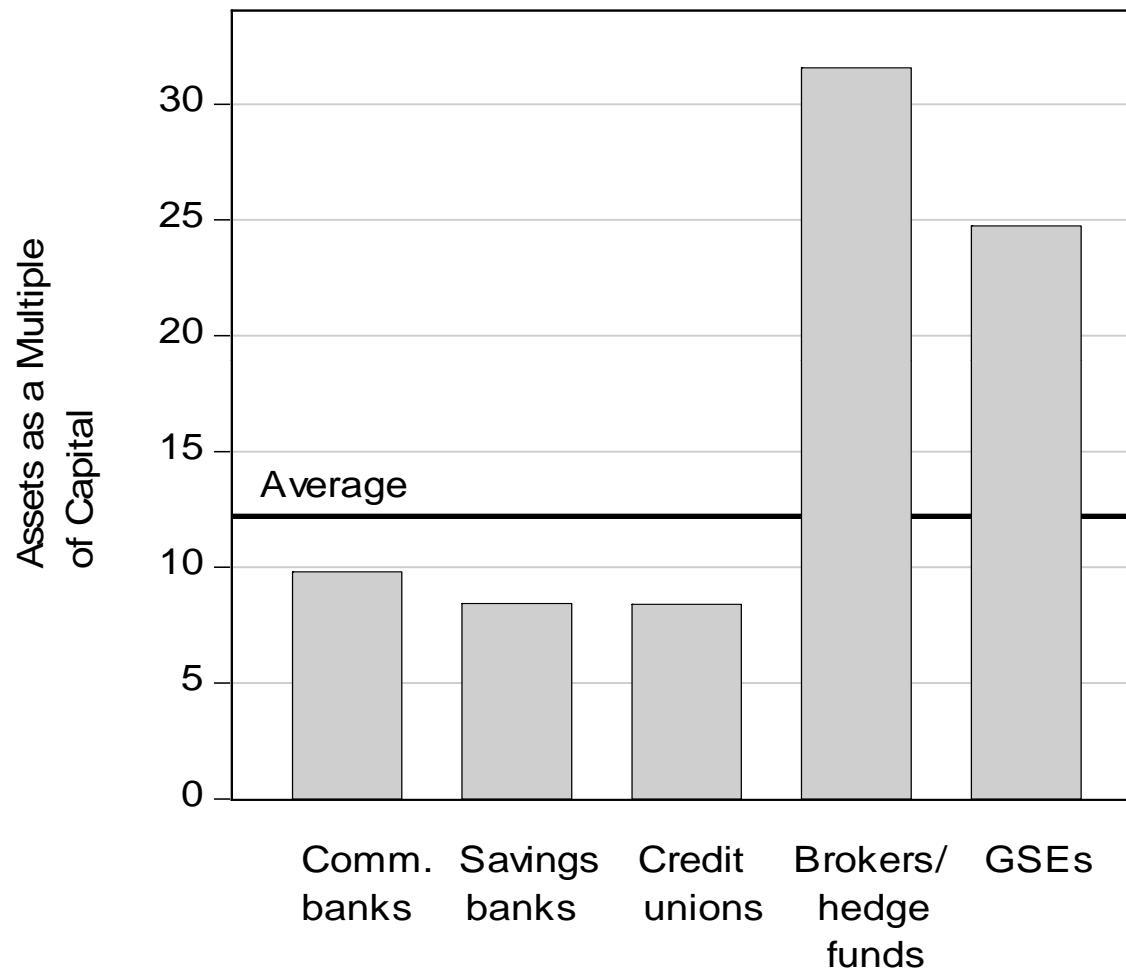
$$\frac{\text{net profit after taxes}}{\text{equity capital}} = \frac{\text{net profit after taxes}}{\text{assets}} \times \frac{\text{assets}}{\text{equity capital}}$$

$$ROE = ROA \times EM$$

$$ROE \text{ for high capital firm} = ((0.05 - 0.02) * 90) / 10 = 27\%$$

$$ROE \text{ for low capital firm} = (0.05 * 90 - 0.02 * 95) / 5 = (2.6) / 5 = 52\%$$

Leverage in 2007



Leverage, measured as assets to capital, in the financial sector, in July-September 2007.
GSE's are Fannie Mae and Freddie Mac. Source: Greenlaw, Hatzis, Kashyap, and Shin (2008).

- *Mark-to-market* accounting rules require banks to adjust the recorded value of the assets on their balance sheets when the market value changes.
 - When the price falls, the value is “written down” and *writedowns* reduce a bank’s capital.
- Banks don’t like to hold a large capital cushion because capital is costly.
- The more leverage the greater the possible reward for each unit of capital and the greater the risk.

Interest-Rate Risk

- A bank's liabilities tend to be short-term, while assets tend to be long term.
 - The mismatch between the two sides of the balance sheet create **interest-rate risk**.
- When interest rates rise, banks face the risk that the value of their assets will fall more than the value of their liabilities, reducing the bank's capital.
 - Rising interest rates reduce revenues relative to expenses, directly lowering a bank's profits.

Interest-Rate Risk

- The term *interest-rate sensitive* means that a change in interest rates will change the revenue produced by an asset.
- When a bank's liabilities are more interest-rate sensitive than its assets, an increase in interest rates will cut into the bank's profits.
- Managers must compute an estimate of the change in the bank's profit for each one-percentage-point change in the interest rate.
- This procedure is called *gap analysis*.
 - This can be refined to take account of differences in the maturity of assets and liabilities, but it gets complicated

Interest-Rate Risk

- Bank managers can use a number of tools to manage interest-rate risk.
 1. They can match the interest-rate sensitivity of assets with that of liabilities.
 - Although this decreases interest-rate risk, it increases credit risk.
 2. Alternatives include the use of derivatives, specifically interest-rate swaps.

Table 12.2**An Example of Interest-Rate Risk**

The impact of an interest-rate increase on bank profits (per \$100 of assets)

	Assets	Liabilities
Interest-rate sensitive	\$20	\$50
Not interest-rate sensitive	\$80	\$50
Initial interest rate	5%	3%
New interest rate on interest-rate-sensitive assets and liabilities	6%	4%
	Revenue from Assets	Cost of Liabilities
At initial interest rate	$(0.05 \times \$20) + (0.05 \times \$80) = \$5.00$	$(0.03 \times \$50) + (0.03 \times \$50) = \$3.00$
After interest-rate change	$(0.06 \times \$20) + (0.05 \times \$80) = \$5.20$	$(0.04 \times \$50) + (0.03 \times \$50) = \$3.50$
Profits at initial interest rate:	$(\$5.00) - (\$3.00) = \$2.00$ per \$100 in assets	
Profits after interest-rate change:	$(\$5.20) - (\$3.50) = \$1.70$ per \$100 in assets	

Gap Analysis

Gap between interest-rate-sensitive assets and interest-rate-sensitive liabilities:

$(\text{Interest-rate-sensitive assets of } \$20) - (\text{Interest-rate-sensitive liabilities of } \$50) = (\text{Gap of } -\$30)$

Trading Risk

- Today banks hire traders to actively buy and sell securities, loans, and derivatives using a portion of the bank's capital.
- Risk that the instrument may go down in value rather than up is called **trading risk**, or *market risk*.
- Traders normally share in the profits from good investments, but the bank pays for the losses.
 - This creates moral hazard - traders take more risk than the banks would like.

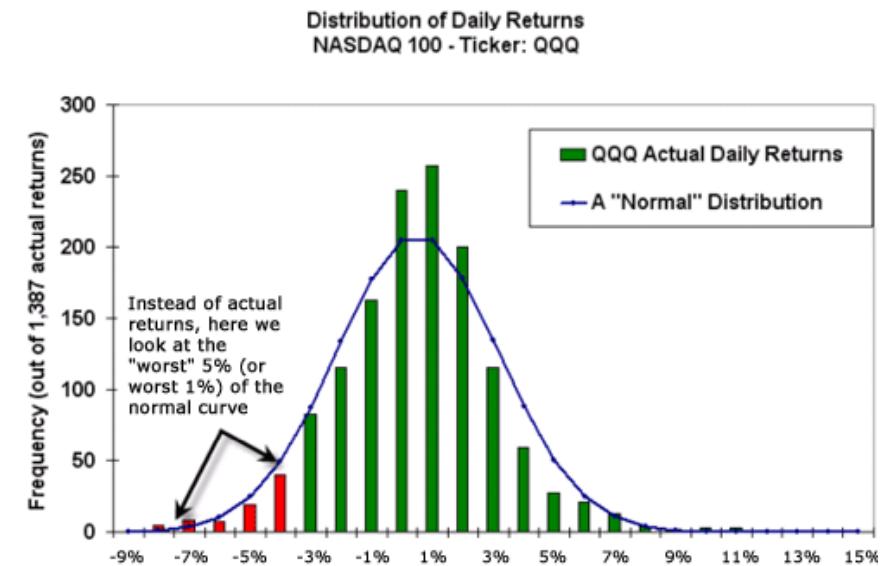
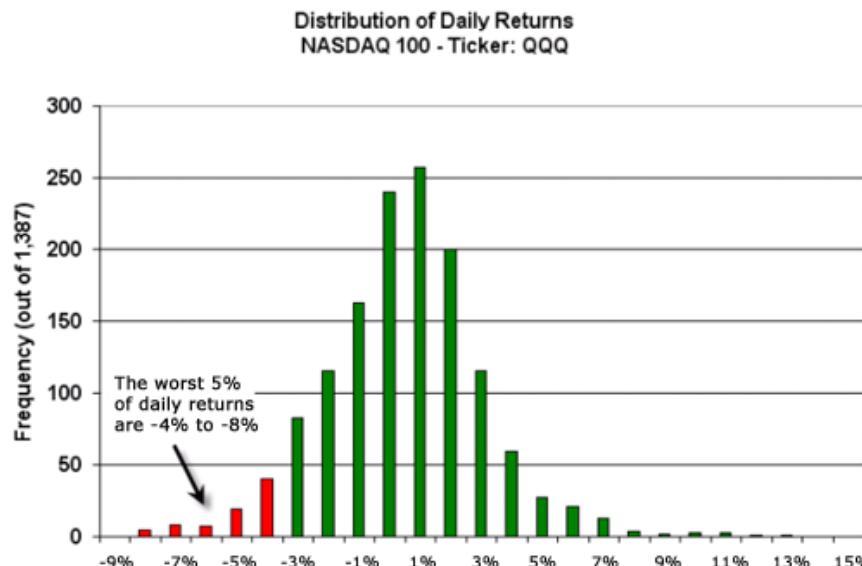
Trading Risk

- The solution to the moral hazard problem is to compute the risk the traders generate.
 - Use standard deviation and value at risk.
- The bank's risk manager limits the amount of risk any individual trader is allowed to assume and monitors closely.
- The higher the inherent risk in the bank's portfolio, the more capital the bank will need to hold.

Value at Risk (VaR)

A methodology that answers: What is the most I can - with a 95% or 99% level of confidence - expect to lose in dollars over the next month (or quarter or year)?

E.g. daily stock returns, historical, variance-covariance,(monte carlo)



Caveats

- Variance-Covariance approach requires assumption of Normal or mixture of Normal distributions (first two moments summarize all information)
- Potentially many parameters need to be estimated
- Need to assume stability of parameters
- What if different distributions apply (jump-diffusion)
- Or much more non-Normal (Taleb and “black swan”)