

EE432 Monetary Theory and Policy



Mid-semester Exam Recap
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Chapter 3



Financial Instruments, Financial Markets, and Financial Institutions

Uses of Financial Instruments

- Three functions:
 - Financial instruments act as a **means of payment** (*like money*).
 - Employees take **stock options** as payment for working.
 - Financial instruments act as **stores of value** (*like money*).
 - Financial instruments can be *used to* transfer *purchasing power into the future*.
 - Financial instruments **allow for the transfer of risk** (unlike money).
 - **Futures and insurance contracts** allows *one person to transfer risk to another*.

Characteristics of Financial Instruments

- These contracts are **very complex** thus make it *costly*.
- Standardization of financial instruments *overcomes potential costs* of complexity.
- Financial instruments *also communicate* information about the issuer.

Characteristics of Financial Instruments

- It is a **mechanism** *to reduce the cost of monitoring the behavior* of counterparties.
 - A **counterparty** is the person or institution *on the other side of the contract*.
- *Financial instruments* are **designed to handle** the *problem of asymmetric information*.
 - Borrowers have some information they **don't disclose** to lenders.

The Role of Financial Markets

1. Market liquidity:

- Ensure owners can *buy and sell* financial instruments cheaply.
- Keeps *transactions costs low*.

2. Information:

- *Pool and communicate information* about issuers of financial instruments.

3. Risk sharing:

- *Provide individuals* a place to *buy and sell risk*.

Chapter 5



Understanding Risk

Risk Defining and Measuring

Defining Risk

- Risk is “*the possibility of loss.*”
- For outcomes of financial and economic decisions

Risk *is a measure of uncertainty about the future payoff to an investment, assessed over some time horizon and relative to a benchmark.*

Defining Risk

1. Risk is a *measure* that *can be quantified*.
 - The *riskier* the investment, the *less desirable* and the *lower the price*.
2. Risk arises from *uncertainty about the future*.
 - We do not know *which of many possible outcomes will follow in the future*.
3. Risk has to do with the *future payoff of an investment*.
 - We must imagine all the **possible payoffs** and the **likelihood** of each.

Defining Risk

4. Definition of risk refers to an *investment* or group of investments.
 - Investment described very broadly.
5. Risk must be assessed over some *time horizon*.
 - In general, risk over *shorter periods* is *lower*.
6. Risk must be measured *relative to some benchmark* - not in isolation.
 - A good **benchmark** is the *performance of a group of experienced investment advisors* or money managers.

Measures of Risk

The variance is the *average of the squared deviations of the possible outcomes* from their *expected value*, weighted by their *probabilities*.

1. Compute **expected value**.
2. **Subtract expected value** from each of the **possible payoffs** and **square the result**.
3. **Multiply** each result *times* the **probability**.
4. **Add up** the results.

Variance and Standard Deviation

- **Standard deviation** is the (positive) *square root of the variance*

$$\text{standard deviation} = \sqrt{\text{Variance}}$$

- The **standard deviation** is more useful because it deals in ***normal units***, not squared units (like dollars-squared).
- We can **calculate standard deviation** into a **percentage of the initial investment**.
- We can ***compare other investments*** to this one.
- *Given a choice between two investments with equal expected payoffs*, most will **choose the one with the lower standard deviation**.
 - *The greater the standard deviation, the higher the risk.*

Value at Risk

- Sometimes we are *less concerned with spread* than with the **worst possible outcome**
 - Example: We don't want a bank to fail
- **Value at Risk (VaR)**: The **worst possible loss** over a *specific horizon* at a *given probability*.
- For example, we can use this to *assess* whether a *fixed* or *variable-rate mortgage* is better.

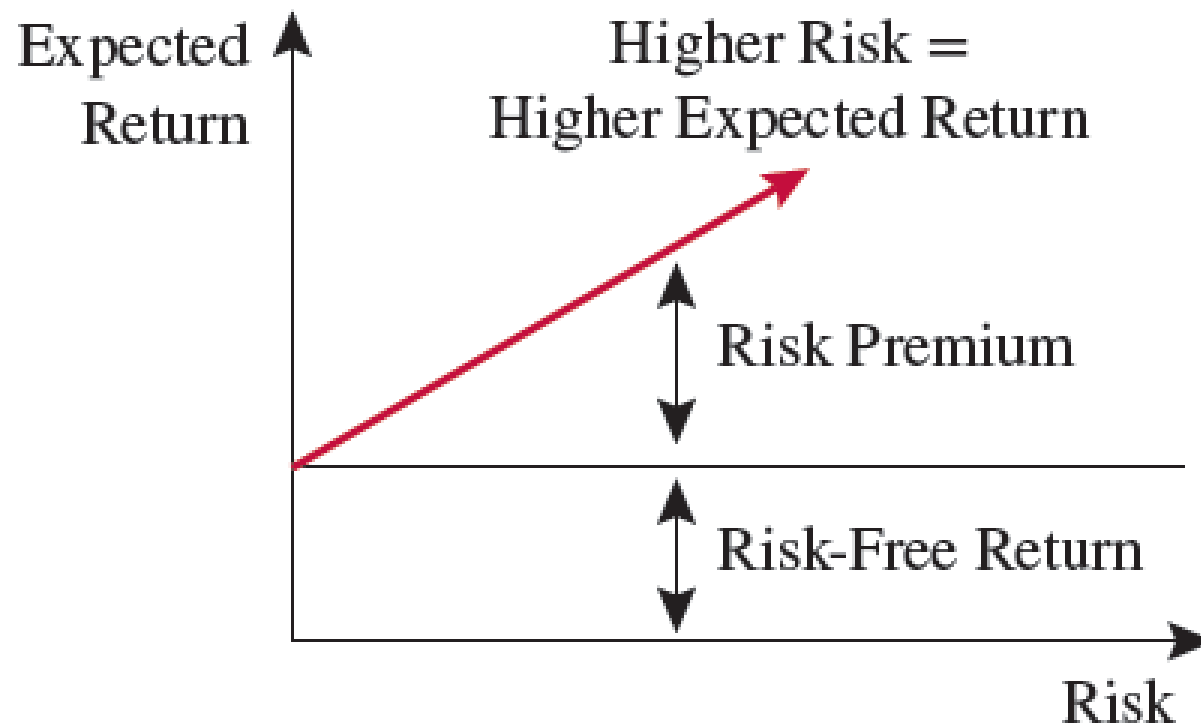
Value at Risk

- For a *mortgage*, the **worst case scenario** means you ***cannot afford your mortgage*** and will ***lose you home***.
 - *Expected value and standard deviation do not really **tell** you the **risk** you face, in this case.*
- **VaR** answers the question: ***how much will I lose*** if the *worst possible scenario* occurs?
 - *Sometimes this is the most important question.*

Risk Aversion, the Risk Premium, and the Risk-Return Tradeoff

- Most people do not like **risk** and will **pay to avoid** it because most of us are **risk averse**.
 - *Insurance* is a good example of this.
- A **risk averse** investor will always *prefer an investment with a certain return* to one with the same expected return but *any amount of uncertainty*.
- Therefore, the *riskier an investment*, the **higher the risk premium**.
 - The **compensation** investors *required to hold the risky asset*.

Risk Aversion, the Risk Premium, and the Risk-Return Tradeoff



Sources of Risk: Idiosyncratic and Systematic Risk

All **risks** can be classified into two groups:

1. Those *affecting a **small number of people*** but no one else:

Idiosyncratic or *unique* **risks**

2. Those *affecting **everyone***:

Systematic or *economy-wide* **risks**

Sources of Risk: Idiosyncratic and Systematic Risk

Idiosyncratic risks can be classified into two types:

1. A **risk** is **bad for one sector** of the economy but good for another.
 - A rise in oil prices is **bad for car industry** but **good for the energy industry**.
2. **Unique risks** **specific to one** person or company and no one else.

Reducing Risk through Diversification

- Some people take on so much risk that a **single big loss** can wipe them out.
 - Traders call this “**blowing up.**”
- Risk can be *reduced through* **diversification**, the principle of **holding more than one risk** at a time.
 - This **reduces the idiosyncratic risk** an investor bears.
- One can ***hedge*** risks or ***spread*** them among many investments.

Hedging Risk

- **Hedging** is the strategy of reducing idiosyncratic risk by *making two investments with **opposing risks***.
 - If one industry is volatile, the payoffs are stable.
- Let's compare three strategies for investing \$100:
 - Invest \$100 in GE.
 - Invest \$100 in Texaco.
 - Invest half in each company – *splitting investment between two stocks with different payoff patterns to eliminate risk*

Spreading Risk

- You can't always hedge as *investments don't always move in a predictable fashion.*
- The alternative is to **spread risk** around.
 - Find investments ***whose payoffs are unrelated.***
- We need to ***look at the possibilities, probabilities and associated payoffs of different investments.***

Spreading Risk

- The **more independent sources of risk** you hold in your portfolio, the **lower your overall risk**.
 - *Never put all eggs in one basket*
- As we add more and more independent sources of risk, the ***standard deviation becomes negligible***.
- **Diversification** through the ***spreading of risk*** is the ***basis for the insurance business***.

Chapter 7



The Risk and Term Structure of Interest Rates

Ratings and the Risk Structure of Interest Rates

- **Default** is one of the *most important risks* a *bondholder faces*.
- **Independent companies (rating agencies)** have arisen to *evaluate the creditworthiness of potential borrowers*.

Bond Ratings

- The best known **bond rating services** are
 - Moody's
 - Standard & Poor's
- They ***monitor the status of individual bond issuers*** and assess the ***likelihood a lender will be repaid*** by the bond issuer.
- A **high rating** suggests that a bond issuer will have **little problem** meeting a ***bond's payment obligations.***

Bond Ratings

- Firms or governments with an *exceptionally strong financial position* carry the ***highest ratings*** and are able to issue the highest-rated bonds, **Triple A**.
- The **top four categories** are considered **investment-grade bonds**.
 - These bonds have a ***very low risk of default***.
 - ***Reserved for*** most government issuers and corporations that are ***among the most financially sound***.

Bond Ratings

- The distinction between **investment-grade** and **speculative, noninvestment-grade** is important.
 - A number of regulated institutional investors are **not** ***allowed to invest*** in bonds rated *below investment grade*, which is **Baa** on *Moody's scale* or **BBB** on *Standard and Poor's scale*.

Bond Ratings

- **Speculative grade bonds** are bonds issued by companies and countries that may have *difficulty* meeting their *bond payments* but are *not at risk of immediate default*.
- **Highly speculative bonds** consist of *debts* that are in *serious risk of default*.
- All bonds with grades *below investment grade* are often referred to as **junk bonds** or *high-yield bonds*.

Bond Ratings

- Types of **junk bonds**:
 - **Fallen angels** are bonds that were *once investment-grade*, but their *issuers fell on hard times*.
 - Bonds issued by *issuers* about which *there is little known*.
- Material changes in a *firm's or government's financial conditions* precipitate changes in its debt ratings.
 - **Ratings downgrade** - *lower* an issuer's bond *rating*.
 - **Ratings upgrade** - *upgrade* an issuer's bond *rating*.

The Impact of Ratings on Yields

- **U.S. Treasury issues** are viewed as having *little default risk*, so they are used as **benchmark bonds**.
- **Yields** on other bonds are *measured* in terms of the **spread over Treasuries**.
- **Bond yield** is the sum of two parts:
= **U.S. Treasury yield + Default risk premium**

The Impact of Ratings on Yields

- If bond ratings properly reflect risk, then the **lower the rating, *the higher the default-risk premium.***
- *When Treasury yields move, all other yields move with them.*

Term Structure of Interest Rates

- Why do **bonds** with the *same default rate* but *different maturity dates* have ***different yields?***
 - **Long-term bonds** are like a *composite of a series of short-term bonds*.
 - Their **yield** depends on *what people expect to happen in the future*.

Term Structure of Interest Rates

- The *relationship among bonds with the same risk characteristics but different maturities* is called the **term structure of interest rates**.
- Comparing 3-month and 10-year Treasury yields we can see:
 1. *Interest rates of different maturities* tend to ***move together***.
 2. *Yields on short-term bonds* are more volatile than yields on long-term bonds.
 3. *Long-term yields* tend to be higher than short-term yields.

The Expectations Hypothesis

- The expectations hypothesis of the term structure focuses on the *risk-free interest rate*.
- The risk-free interest rate can be computed, assuming there is not *uncertainty about the future*.

The Expectations Hypothesis

- If *there is no uncertainty*, then an investor will be indifferent between **holding a two-year bond** or a **series of two one-year bonds**.
 - Certainty means that the bonds of different maturities are perfect substitutes for each other.
- The **expectations hypothesis** implied that the *current two-year interest rate should equal the average of current one-year rate and the one-year interest rate one year in the future.*

The Expectations Hypothesis

- When *interest rates are expected to rise*, **long-term interest rate** *will be higher than short-term interest rates*.
 - The **yield curve** which plots the yield to maturity on the vertical axis and the time to maturity on the horizontal axis, will slope up.
- This also means:
 - If **interest rates are expected to fall**, the *yield curve will slope down*.
 - If **expected to stay the same**, the *yield curve will be flat*.

The Expectations Hypothesis

Figure 7.5

The Expectations Hypothesis and Expectations of Future Short-term Interest Rates



The Expectations Hypothesis

- If *bonds of different maturities* are **perfect substitutes for each other**, then we can construct *investment strategies* that must have the *same yields*.
 1. Invest in a **two-year bond** and *hold it to maturity*
 2. Invest in two **one-year bonds**, *one today and one when the first matures*.

The Expectations Hypothesis

- The **expectations hypothesis** tells us investors will be indifferent between the two options.

- This means they must have the same return:

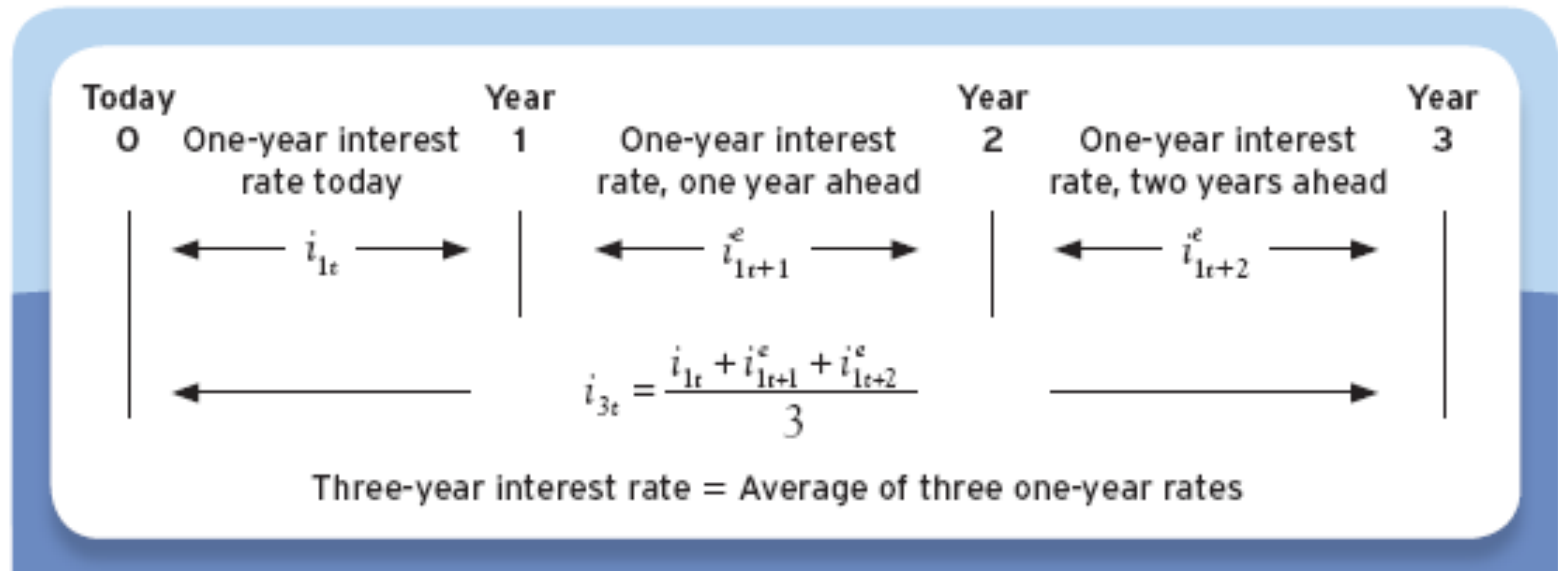
$$(1 + i_{2t})(1 + i_{2t}) = (1 + i_{1t})(1 + i^e_{1t+1})$$

- We can now write the *two-year interest rate* as the *average of the current and future expected one-year interest rates*:

$$i_{2t} = \frac{i_{1t} + i^e_{1t+1}}{2}$$

The Expectations Hypothesis

The Expectations Hypothesis of the Term Structure:



The Expectations Hypothesis

- We can *generalize* this: a bond with n years to maturity is the average of n expected future one-year interest rates:

$$i_{nt} = \frac{i_{1t} + i_{1t+1}^e + i_{1t+2}^e + \dots + i_{1t+n-1}^e}{n}$$

The Expectations Hypothesis

Does this **hypothesis** explain the three observations we started with?

1. **Interest rates of different maturities will *move together*.**
 - We can see this holds from the previous equation.
2. **Yields on short-term bonds will be more *volatile* than yields on long-term bonds.**
 - **Long-term rates** are *averages of short-term rates*, so changing one short-term rate has little effect on the long term rate.

The Liquidity Premium Theory

- **Risk** is the key to understanding the *upward slope of the yield curve*.
- *Bondholders face both **inflation** and **interest-rate risk**.*
 - The *longer the term of the bond*, the *greater both types of risk*.
- Computing **real return** from nominal return requires a **forecast of expected future inflation**.
 - *A bond's inflation risk increases with its time to maturity.*

The Liquidity Premium Theory

- **Interest-rate risk** arises from the **mismatch** between the *investor's investment horizon* and a *bond's time to maturity*.
 - If a bondholder plans to *sell a bond prior to maturity*, changes in the interest rate generate *capital gains or losses*.
 - The **longer the term of the bond**, *the greater the price changes for a given change in interest rates* and the **larger the potential for capital losses**.
- Investors require *compensation for the increase in risk* they take for buying longer term bonds.

The Liquidity Premium Theory

- We can think about **bond yields** as having two parts:
 - One that is **risk free**: explained by the *expectations hypothesis*.
 - One that is a **risk premium**: explained by *inflation and interest-rate risk*.
- Together this forms the **liquidity premium theory of the term structure** of interest rates.

$$i_{nt} = rp_n + \frac{i_{1t} + i_{1t+1}^e + i_{1t+2}^e + \dots + i_{1t+n-1}^e}{n}$$

Chapter 11



The Economics of Financial Intermediation

The Role of Financial Intermediaries

Financial institutions **perform** *five functions*:

1. **Pooling the resources** of small savers,
2. **Providing safekeeping** and accounting services, as well as access to **payments system**,
3. **Supplying liquidity** by *converting* savers' balances directly *into a means of payment* whenever needed,
4. Providing ways to **diversify risk**, and
5. *Collecting and processing information* in ways that **reduce information costs**.

Pooling Savings

- The most straightforward economic function of a financial intermediary is to **pool the resources of many small savers**.
 - By *accepting many small deposits*, banks empower themselves *to make large loans*.
- In order to do this, the intermediary:
 - Must **attract substantial numbers of savers**, and
 - Must **convince** potential depositors of the **institution's soundness**.

Safekeeping, Payments System Access, and Accounting

- Banks:
 - Are a **place for safekeeping**.
 - Provide access to the **payments system** -- the **network** that ***transfers funds*** from the *account of one person or business* to the *account of another*.
 - *Specialize in handing payments transactions*, allowing them to **offer these services relatively cheaply**.
- Financial intermediaries **reduce the costs of financial transactions**.

Safekeeping, Payments System Access, and Accounting

- Financial intermediaries **facilitate** the *exchange of goods and services*.
- This principal of comparative advantage leads to specialization so that each of us ends up doing just one job and being paid in some form of money.
- Financial intermediaries help our economy to function **more efficiently**.

Safekeeping, Payments System Access, and Accounting

- Financial intermediaries also help us **manage our finances**.
- They provide us with **bookkeeping and accounting services**, *noting all our transactions for us*
- These force financial intermediaries to **write legal contracts** - but *one can be written and used over and over again* - reducing the cost of each.
- Much of what financial intermediaries do takes advantage of ***economies of scale***

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
- 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 then lending out the rest.**

Providing Liquidity

- By **collecting funds** from a large number of *small investors*, the bank can ***reduce the cost of their combined investment***, offering each individual investor both *liquidity* and ***high rates of return***.
- Intermediaries *offer* both individuals and businesses **lines of credit**, which provides customers with **access to liquidity**.
- A financial intermediary must **specialize** in **liquidity management**.
- It **must design its balance sheet** so that it can ***sustain sudden withdrawals***.

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

Asymmetric information 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.*
 - Will borrowers **use the money as they claim?**

Adverse Selection

- **Used cars and the market for lemons; a lemon is a vehicle (often new) that turns out to have several manufacturing defects:**
 - Used car buyers ***can't tell good cars from bad.***
 - **Buyers** will at most **pay the expected value of good and bad cars.**
 - **Sellers** know if they have a good car, so they **won't accept less than the true value.**
 - **If buyers** are only **willing to pay average value**, *good car sellers will withdraw cars from the market.*
 - Then the market has *only the bad cars.*

Adverse Selection in Financial Markets

- 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
 - **Good bonds** *won't be sold want to do it*.

Disclosure of Information

- An obvious way to solve the *hidden attributes* problem is to provide more information.
- In most advanced economies, *public companies* are **required to disclose** voluminous amounts of **information**.
 - For example, in the *Securities and Exchange Commission (SEC)* requires firms to **produce public financial statements** that are prepared according to standard accounting practices.

Disclosure of Information

- In a limited sense, **there is *private information* collected and sold to investors.**
 - *Research services like Moody's , collect information directly from firms and produce evaluations.*
 - *To be credible, companies cannot pay for this research, so **investors have to pay.***

Collateral and Net Worth

- **Collateral** is something of value *pledged or guaranteed by a borrower* to the lender *in the event of the borrower's default*.
 - It is said to *back* or *secure* a loan.
- **Unsecured loans**, like *credit cards*, are loans made without collateral.
 - Because of this they generally have ***very high interest rates***.

Collateral and Net Worth

- The **net worth** is the owner's stake in a firm;
 - *the value* of the **firm's assets** *minus* the value of its 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*.
- Most small business owners must *put up their homes and other property as collateral* for their business loans.

Moral Hazard: Problem and Solutions

- **Moral hazard** arises when
 - we *cannot observe people's actions* and therefore *cannot judge whether a poor outcome was intentional* or just a result of bad luck.
 - 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

- If you buy stock in a company, *how* do you know *your money will be used* in the way that is *best for you*, the stockholder?
- It is more likely that the ***managers will use the funds in a way that is most advantageous to themselves***, not you.
- The ***separation of your ownership from their control*** creates what is called a **principal-agent problem**.

Solving the Moral Hazard Problem in Equity Financing

- The attempts to align managers' interests with those of stockholders were **giving stock options** *as incentives to managers* that provided lucrative payoffs *if a firm's stock price rose above a certain level.*
- When the *managers are the owners*, moral hazard in equity finance *disappears.*

Moral Hazard in Debt Finance

- 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.
 - The firm may **have to maintain a certain level of net worth, a minimum credit rating, or a minimum bank balance or home insurance and fire insurance** for mortgages.

Monitoring to Reduce Moral Hazard

- Intermediaries **monitor firms** that *issue bonds and stocks* to reduce moral hazard.
 - *Many hold significant number of shares* in individual firms.
 - They *may place a representative* on the company's *board of directors*.

Monitoring to Reduce Moral Hazard

- For **new companies**, a financial intermediary called a ***venture capital firm*** does the monitoring.
 - They **specialize in investing in *risky new ventures*** in return for a ***stake in the ownership*** and a ***share of the profits***.
 - *Stake is the share of financial involvement that you risk on (for example, investment or competition)*
 - They *keep a close watch on the managers' actions.*
- The threat of a takeover helps to **persuade managers to act in the *interest of the stock and bondholders*.**

Chapter 12



Depository Institutions: Banks and Bank Management

The Balance Sheet of Commercial Banks

- The *difference* between a bank's **assets** and **liabilities** is the bank's capital, or **net worth**.
 - Net worth is the *value of the bank to its owners*.
- A **bank's profits** come from *both service fees* and from the *difference between what it pays for its liabilities and the return it receives on its assets*.

Assets: Uses of Funds

- The **asset** side of the balance sheet shows *what banks do with the funds they raise*.
- **Assets** are divided into four broad categories:
 - *Cash*
 - *Securities*
 - *Loans*
 - *All other assets*

Cash Items

Cash asset are of three types:

1. Reserves - the most important.

- *Regulations require a certain percent of cash held in reserves.*
- Include the *cash in the bank's vault*, **vault cash**, and *bank's deposits at the Federal Reserve System.*
- **Cash** is the *most liquid* of the bank's assets.

2. Cash items in process of collection.

- *The uncollected funds from checks.*

3. Balances of the accounts that banks hold at other banks.

- Small banks have accounts at large banks - *correspondent bank* deposits.

Securities

- **Securities** are the *second largest component of bank assets*.
- Banks cannot hold stocks, so these are **only bonds**.
- About half of all securities are **mortgage-backed**.
- A sizeable portion ***are very liquid*** - can be *sold quickly if the bank needs cash*.

Loans

- Loans are the **primary assets of modern commercial banks**, accounting for well over one-half of assets.
- Loans can be divided into **five categories**:
 1. **Business loans** called *commercial and industrial (C&I) loans*;
 2. **Real estate loans**, including both *home and commercial mortgages* and *home equity loans*;
 3. **Consumer loans**, like *auto and credit card loans*;
 4. **Interbank loans**; and
 5. **Other types**, including *loans for the purchase of other securities*.

Liabilities: Sources of Funds

- Banks get ***funds*** from ***savers*** and from ***borrowing*** in the financial markets.
- There are two types of deposit accounts:
 - **Transaction accounts** (checkable deposits)
 - **Nontransaction accounts** (savings deposits and time deposits)

Borrowings

- **Borrowing** is the second most important source of bank funds.
- ***Banks can borrow*** by:
 - Borrowing *from the central bank*, which is rare
 - Borrowing *from other banks*

Borrowings

- Banks with **excess reserves** will *lend their surplus funds to banks that need them* through an **interbank market** called the **federal funds market**.
 - The *lending bank* must trust *the borrowing bank* as these *loans are unsecured*.
- Commercial banks **also borrow from foreign banks**.

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, typically the next day.*

Bank Capital and Profitability

- **Net worth** is referred to as **bank capital**, or *equity capital*.
- Capital is the **cushion** banks have *against a sudden drop* in the **value of their assets** or an **unexpected withdrawal of liabilities**.
 - It *provides some insurance against insolvency*.

Bank Capital and Profitability

- An important component of bank capital is **loan loss reserves**:
 - Loan loss reserves are an *amount the bank sets aside* to cover potential losses from *defaulted loans*.
- At some point the *bank gives up hope a loan will be repaid* and it is **written off**, or erased from the bank's balance sheet.
- At this point, the *loan loss reserve* is reduced by the *amount of the loan that has defaulted*.

Bank Capital and Profitability

There are several measures of **bank profitability**.

1. Return on assets (ROA)

- ROA is the *bank's net profit left after taxes* divided by *the bank's total assets*.

$$ROA = \frac{\text{Net profit after taxes}}{\text{Total bank assets}}$$

- It is a measure of how efficiently a particular banks uses its assets.

Bank Capital and Profitability

2. The bank's *return to its owners* is measured by the **return on equity (ROE)**.
- This is the *bank's net profit after taxes* divided by *the bank's capital*.

$$ROE = \frac{\text{Net profit after taxes}}{\text{Capital}}$$

Bank Capital and Profitability

- **ROA and ROE** are *related to leverage*.
- One measure of **leverage** is the *ratio of banks **assets** to bank **capital***.
- Multiplying **ROA** *by asset to capital ratio* gives **ROE**.

$$ROE = \frac{\text{Net profit after taxes}}{\text{Bank Capital}}$$

$$\begin{aligned} ROA \times \frac{\text{Bank Assets}}{\text{Bank Capital}} &= \frac{\text{Net profit after taxes}}{\text{Total bank assets}} \times \frac{\text{Bank Assets}}{\text{Bank Capital}} \\ &= \frac{\text{Net profit after taxes}}{\text{Bank capital}} = ROE \end{aligned}$$

Bank Capital and Profitability

3. The final measure of bank profitability is ***net interest income***.
- This is related to the fact that ***banks pay interest on their liabilities*** and ***receive interest on their assets***.
 - *Net interest income* is the **difference** between
 - Securities and loans generate ***interest income***
 - Deposits and bank borrowing generate ***interest expenses***

Bank Capital and Profitability

- **Net interest income** can also be expressed as
 - the *difference* between the *interest income* generated by banks or other financial institutions and the amount of *interest paid out* to their lenders, relative to the amount of their interest-earning assets: **net interest margin**.
 - This is the bank's **interest rate spread** - the weighted average *difference* between the *interest rate received on assets* and the *interest rate paid for liabilities*.

Bank Risk: Where It Comes from and What to Do about It

- The **bank's goal** is to ***make a profit in each of its lines of business.***
- They want to **pay less for the deposits** they receive ***than*** for the **loans they make** and the **securities they buy.**

Bank Risk: Where It Comes from and What to Do about It

- Thus, the bank is ***exposed*** to *a host of risks*:
 - Liquidity risk
 - Credit risk
 - Interest-rate risk
 - Trading 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.*

Liquidity Risk

- *In the past, the common way to manage liquidity risk was to **hold excess reserves**.*
 - This is a **passive way** to manage liquidity risk.
 - Holding excess reserves is **expensive**, because it means *forgoing higher rates of interest* than can be *earned with loans or securities*.
- There are two other ways to manage liquidity risk.
 - The bank can **adjust** its **assets** or its **liabilities**.

Liquidity Risk

On the **asset side** a bank has several options.

1. The easiest option is to ***sell a portion of its securities portfolio.***
 - Most **treasuries** can be ***sold quickly*** at relatively low cost.
 - Banks that are particularly concerned about liquidity risk ***can structure their securities holdings to facilitate such sales.***

Liquidity Risk

2. A second possibility is for the bank to **sell some of its loans** to another banks.
 - Banks generally make sure that a *portion of the loans they hold* are **marketable** for this purpose.
3. Another way is to **refuse to renew a customer loan** that has come due.
 - However this is bad for business.
 - The bank can **lose a good customer**.
 - Reducing assets **lowers profitability**.

Liquidity Risk

Bankers prefer to ***use*** **liability management** to address liquidity risk.

1. Banks can **borrow to meet any shortfall** either *from the central bank* or *from another bank*.
2. The bank can **attract additional deposits**.

Credit Risk

- **Credit risk** is the *risk that a bank's loans will not be repaid.*
- Banks use a variety of tools *to manage credit risk:*
 1. **Diversification**, where banks *make a variety of different loans to spread the risk.*
 2. **Credit risk analysis**, where the bank *examines the borrower's credit history* to determine the *appropriate interest rate to charge.*

Credit Risk

- **Diversification** can be *difficult* for banks, especially *if they focus on a certain type of lending*.
 - If a bank lends in only **one geographic area** or **one industry**, it is *exposed to economic downturns* that are *local or industry-specific*.
- **Credit risk analysis** uses a *combination of statistical models and information* that is ***specific to the loan applicant***
 - The result is an **assessment of the likelihood** that a **particular borrower will default**.

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.*
- For a bank to make a profit, the ***interest rate on its liabilities*** must be **lower** than the ***interest rate on its assets***.
 - The difference in the two rates is the bank's **net interest margin**.
- *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.*

Interest-Rate Risk

- To manage interest-rate risk is to *determine how sensitive the bank's balance sheet is to a change in interest rates.*
- **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.**

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.**
2. Alternatives include the **use of derivatives, specifically interest-rate swaps.**

Trading Risk

- Risk that the *value of instrument may go down rather than up* is called **trading risk**, or *market risk*.
- Today **banks hire traders** to *actively buy and sell securities, loans, and derivatives* using a portion of the bank's capital.
- **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*.

Other Risks

- ***Foreign exchange risk*** comes from *holding assets denominated in one currency and liabilities denominated in another.*
- Banks manage this in two ways:
 - They work to **attract deposits** that are *denominated in the same currency as their loans*, matching assets to liabilities.
 - They ***use foreign exchange futures and swaps*** to hedge the risk.

Other Risks

- ***Sovereign risk*** arises from the fact that ***some foreign borrowers may not repay their loans*** because their **government prohibits them from doing so.**
 - If a foreign country is experiencing a *financial crisis*, the **government may decide to restrict dollar-denominated payments.**
- Banks have three options:
 - **Diversification,**
 - **Refuse loans to certain countries, or**
 - **Use derivatives to hedge the risk.**

Other Risks

- **Operational risk** is when *computer systems fail or buildings burn down.*
 - This was an issue for some banks when the *World Trade Center was destroyed.*
- The banks must **make sure their computer systems and buildings are sufficiently robust** to withstand potential disasters.

Chapter 14



Regulating the Financial System

The Sources and Consequences of Runs, Panics, and Crises

- ***Banks' fragility arises*** from the fact that they *provide liquidity to depositors*, **allowing depositors to withdraw** their balances on demand.
- Banks also **promise to satisfy depositors' withdrawal requests** on a *first-come, first-served basis*.

The Sources and Consequences of Runs, Panics, and Crises

- Reports that a **bank** has become **insolvent** can *spread fear that it will run out of cash* and close its doors.
- Such a **bank run** can *cause a bank to fail*.

The Sources and Consequences of Runs, Panics, and Crises

- This phenomenon of **spreading panic** *on the part of depositors in banks* is called **contagion**.
- ***Information asymmetries*** are the reason that *a run on a single bank can turn into a bank panic*
- Depositors **cannot** tell the difference between a good bank and a bad bank.

The Government Safety Net

There are three reasons for the **government to get involved in the financial system:**

1. To **protect investors.**
2. To **protect bank customers** *from monopolistic exploitation.*
3. To **safeguard the stability** of the *financial system.*

The Government Safety Net

1. The government is **obligated to protect small investors**.
 - Many are ***unable to judge the soundness of their financial institution***.
 - Only the ***force of law*** can ensure a bank's honesty.

The Government Safety Net

2. The growing tendency for *small firms to merge into large ones* reduces competition.
 - **Monopolies** are *inefficient*, so the government intervenes to *prevent the firms in an industry from becoming too large*.

The Government Safety Net

3. The mix of **liquidity risk and information asymmetries** means that the financial system is *inherently unstable*.
 - *A single firm's failure can bring down the entire system.*

The Government Safety Net

- Government officials **protect investors** and **ensure stability** of the financial system.
 - ***lender of last resort**, making loans to banks that face sudden deposit outflows.*
 - ***deposit insurance**, guaranteeing that depositors receive the full value of their accounts if the institution fails.*
- However, the safety net causes bank managers to take on too much risk.

Problems Created by the Government Safety Net

- Government officials are worried about the **largest institutions** because they can ***pose a threat to the entire financial system*** if they fail.
- Some intermediaries are treated as **too big to fail** or ***too interconnected to fail***.
 - ***too complex to shut down***
 - ***too big to resolve***
 - special legal definition to such a firm: **systemically important financial institution (SIFI)**.

Problems Created by the Government Safety Net

- Whenever the government *provides a safety net without charging an appropriate fee in advance of the protection*, they create an **incentive** for financial institutions **to take risks** that can **threaten the system as a whole**.
- It compounds the problem of moral hazard.

Regulation and Supervision of the Financial System

- Government officials employ *three strategies to ensure that the **risks created by the safety net** are contained.*
 - **Regulation** establishes a set of specific rules for intermediaries to follow.
 - **Supervision** provides general oversight of financial institutions.
 - **Examination** of an institution's books by specialists provides detailed information on the firms' operation.

Regulation and Supervision of the Financial System

Regulatory requirements designed to **minimize the cost of failures** to the public:

1. *New banks must obtain a charter (license).*
2. Once open, **regulations**
 - **Restricts competition**
 - Specifies what **assets the bank cannot hold**
 - Requires the bank to **hold a minimum level of capital**
 - Makes **public information** about the bank's balance sheet

Restrictions on Competition

- *Bank mergers require government approval.*
- One long-standing goal of financial regulators has been *to **prevent banks from growing too big and too powerful**.*
- Before *granting a merger*, officials must be *convinced* on two points.
 1. The new bank must **not** **constitute a monopoly**.
 2. The *small bank's customers* must be **well served** *by the merger*.

Restrictions on Competition

- *Competition reduces the prices* customers must pay.
- **Lower interest margins and reduced fee income** cause bankers to *look for other ways to turn a profit*.
 - Some may be tempted to assume *more risk* than advisable, to **increase leverage**, or to rely **excessively on short term funding**.
- Thus, government officials can explicitly **restrict competition**.

Asset Holding Restrictions and Minimum Capital Requirements

- One way to prevent bankers from exploiting their safety net is **to restrict banks' balance sheets**.
- **Minimum capital requirements** complement those limitations on bank assets.
- Capital requirements take two basic forms:
 1. Most banks are required to keep their ***ratio of capital to assets above some minimum level***, regardless of the structure of their balance sheets.
 2. Banks are required to ***hold capital*** in proportion to the ***riskiness of their operations***.

Supervision and Examination

- The government enforces *banking rules and regulations* through an elaborate **oversight** process called **supervision**.
 - This relies on a combination of **monitoring** and **inspection**.
 - It is done both **remotely** and through **on-site examination**.

Supervision and Examination

- The most important part of bank examination is the **evaluation of past-due loans**.
- The examiner's job is to make sure that ***when borrowers stop making payments, loans are written off and the bank's balance sheet properly reflects the losses***.

Micro-Prudential Versus Macro-Prudential Regulation

- The government official's job is not to stabilize the profits of an *individual bank* or insurance company.
- The regulator's goal should be to **prevent large-scale catastrophes**.

Micro-Prudential Versus Macro-Prudential Regulation

- Regulators are *broadening their focus beyond **micro-prudential oversight** to encompass **macro-prudential regulation**.*
- Micro-prudential regulation aims at **limiting the risks *within* intermediaries** in order to *reduce the possibility of an individual institution's failure.*

Micro-Prudential Versus Macro-Prudential Regulation

- *Micro-prudential oversight is insufficient to prevent **systemic risks**.*
- **Macro-prudential regulation** treats **systemic risk** taking by an intermediary as a kind of **pollution** that **spills over** to other financial institutions and markets.

Micro-Prudential Versus Macro-Prudential Regulation

- **Common Exposure**
 - When *many institutions* have an *exposure to the same specific risk factor*, it can make the **system vulnerable to a shock to that factor**.
 - Intermediaries may be **directly exposed** to a *fragile institution through financial contracts*.

Micro-Prudential Versus Macro-Prudential Regulation

- **Common Exposure**
 - They may be **exposed *indirectly*** and unknowingly *through their counterparties*, who are themselves *directly exposed to a fragile institution*.
 - *All institutions may be vulnerable* to the same underlying risks.

Micro-Prudential Versus Macro-Prudential Regulation

- **Pro-Cyclicality**

- *Financial activity* is prone to *vicious cycles*.
- The interaction between **financial** and **economic** activity can be *mutually reinforcing* leading to *unsustainable booms and busts*.

Micro-Prudential Versus Macro-Prudential Regulation

- **Macro-Prudential Policy**
 - This aims to **make intermediaries bear, or *internalize*, the costs that their behavior imposes on others.**
 - *To be effective in limiting systemic threats, a **systemic capital surcharge** probably would be disproportionately ***larger for firms that contribute the most to systemic risk****
 - Intermediaries would have an *incentive to limit the systemic risks* they create.

Micro-Prudential Versus Macro-Prudential Regulation

- Macro-Prudential regulators *could also make capital requirements vary* with the business cycle.
- In good times, **capital requirements would rise above the long-run average** to create a *capital buffer against adverse shocks* and to *discourage euphoria*.

Micro-Prudential Versus Macro-Prudential Regulation

- Regulators could *require banks* to buy **catastrophe insurance**.
- Could also have banks issue so-called **contingent convertible bonds** that *convert to equity in the event of a capital shortfall*.

Micro-Prudential Versus Macro-Prudential Regulation

Ultimately, addressing *systemic risk* will require a *broad framework* of **macro-prudential supervision** that includes

1. Rules and mechanisms that *promote better risk management* on the part of intermediaries, and
2. Reforms that *reduce the vulnerability of the financial system* to the liquidation of any single financial firm.

End of lecture