

Topic 7

Interest Rates and the Economy



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Agenda

- Basic Finance
- Financial Markets
- National Savings



Basic Finance



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The role of financial markets

- When a firm borrows money, where do they get it from?
- We consider two types of individuals
 - Those with extra money (savers)
 - Those without enough money (borrowers)
- Aside: This is a simplification. Microsoft has \$62B in cash and \$12B in debt



Which of the following is investment?

- Buying shares in the stock market
- Building a new house with the intent to sell for a profit
- Building roads and bridges
- Building new factories and equipment
- Are these all the same type of investment?



Which of the following is investment?

- Buying shares in the stock market
- Building a new house with the intent to sell for a profit
- Building roads and bridges
- Building new factories and equipment

- No



We distinguish between two types of investment

- **Economic Investment:** Payments for new additions to the nation's capital stock, whether public (new roads and bridges) or private (new factories and equipment)
- **Financial Investment:** Buying or building an asset in expectation of earning financial gain (new factories and homes, but also old buildings, stocks, bonds, and other financial assets)



Classify each of the following

	Economic	Financial
Buying shares in the stock market		
Building a new house with the intent to sell for a profit		
Building roads and bridges		
Building new factories and equipment		



Classify each of the following

	Economic	Financial
Buying shares in the stock market		X
Building a new house with the intent to sell for a profit		X
Building roads and bridges	X	
Building new factories and equipment	X	X



We are mostly concerned with economic investment

- When we discuss the effect on “investment”, we mean on the building of factories, borrowing for production, etc.
- Therefore, we are really considering firms.



Financial Markets

How savers and borrowers get in contact with each other



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Financial markets

- Bond Market: Company sells a bond – a promise to pay amounts at specific dates. Essentially a loan
 - Ex. \$100 per year for next 5 years, and an additional \$1000 on the last payment date
- Stock Market: Individuals buy ownership of a company – they get a share of profits through dividends



Financial Intermediaries

- Banks – deposit money or get a loan
- Mutual funds – a collection of bonds and stocks, which you can purchase



How do we value an investment?

- Do you prefer \$100 today or \$100 in 10 years?
 - Why?
- How about \$100 today and \$200 next year?
 - What if the interest rate were 2%? 200%?
 - Would your answer change if these were Zimbabwean dollars in 2008?
- Interest rates and inflation can affect whether an investment is a good one or not



Example

- \$100 invested at 10% a year
 - Year 1: $100 + (0.1 * 100) = 110$
 - Year 2: $110 + (0.1 * 110) = (1 + 0.1)110 = (1.1)^2 * 100 = 121$
 - Year 3: $121 + (0.1 * 121) = (1.1)^3 * 100 = 133.10$
- In general, Year t: $(1 + 0.1)^t * 100$











Compound interest

- The process of paying interest on the original investment and also previously received interest



The power of compounding - Pennies on a chessboard

								128
256	512	1024	2048	4096	8192	16384	32768	
65536	131K	262K	524K	1M	2M	4M	8M	
16M	33M	67M	134M	268M	536M	1G	2G	
4G	8G	17G	34G	68G	137G	274G	549G	
1T	2T	4T	8T	17T	35T	70T	140T	
281T	562T	1P	2P	4P	9P	18P	36P	
72P	144P	288P	576P	1E	2E	4E	9E	

“\$million”

“\$billion”

US economy

World economy

“\$trillion”



Compound interest

Real Interest Rate	Years to grow \$1 to \$1 billion
3%	700
3.5%	600
4%	528
5%	424
6%	355
7%	306
8%	269
9%	240
10%	217



Present Value

- The amount of money that would be needed today (given interest rates) to produce a given future amount of money
- By comparing present values of different investments, I can select the best one



General formula for PV

- $PV = \frac{Y_t}{(1+i)^t}$
- Note: Y_t can be thought of as the future value.
- So, we also have
 - $FV = PV * (1 + i)^t$
- Ex. PV of receiving \$200 in 10 years, 10% interest
 - $PV =$



General formula for PV

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- So, we also have
 - $FV = PV * (1 + i)^t$
- Ex. PV of receiving \$200 in 10 years, 10% interest

- $PV = \frac{Y_t}{(1+i)^t} = \frac{200}{(1+0.1)^{10}} = \77.11



Class work

- $i=10\%$: Would you prefer \$100 today or \$200 10 years from now?
- $i=5\%$: What is PV of \$200 in 10 years?
 - Would you prefer \$100 today or \$200 in 10 years?



Class work

- $i=10\%$: Would you prefer \$100 today or \$200 10 years from now?
 - Recall: $PV = \$77$
- $i=5\%$: What is PV of \$200 in 10 years?
 - Answer: \$122.78
 - Would you prefer \$100 today or \$200 in 10 years?



Risky Assets

- Which lottery would you choose (price: \$100)
 1. 50% chance win zero, 50% chance win \$200
 2. Guarantee win \$120
- How much do you expect to win in each case?



Calculating return on risky assets

- *Return* =

$$Inv * \sum_{events} Pr(event) * (1 + i)$$

- Ex. Invest \$100, 50% chance lose all money, 50% chance return 10%
 - Return =
- Would you invest in this?



Calculating return on risky assets

- *Return* =

$$Inv * \sum_{events} Pr(event) * (1 + i)$$

- Ex. Invest \$100, 50% chance lose all money, 50% chance return 10%
 - Return = \$100*[(0.5*0) + (0.5*1.1)]= \$55
- Would you invest in this?



Class work

- Bond that defaults (lose all money) with 50% probability, returns 5% with 50% probability. What is expected return?
- Bond that defaults with 50% probability, returns 200% with 50% probability. What is expected return?



Class work

- Bond that defaults (lose all money) with 50% probability, returns 5% with 50% probability. What is expected return?
 - $\text{Return} = \$100 * [(0.5 * 0) + (0.5 * 1.05)] = \52.50
- Would you invest in this?



Class work

- Bond that defaults with 50% probability, returns 200% with 50% probability.

What is expected return?

- Return = $\$100 * [(0.5 * 0) + (0.5 * 3)] = \150

- Would you invest in this?

Risky assets need higher interest rates for people to invest



Is anything risk-free?

- The least risk we can have is that of the country. Why?
 - A country can always print money to cover its debt (not necessarily a good thing).
 - If a country defaults, then the currency is theoretically “worthless” (we will discuss fiat currency later)



Risk-free rate of return

- Short-term U.S. government bonds are considered risk-free
- Interest rate on these bonds is referred to as the “risk-free” rate
- The federal reserve (i.e. the fed) determines risk-free rate through open market operations (o.m.o).



Risk free rate

- Would you buy a government bond for \$100 that paid \$100 back in six months?
 - People prefer to consume in the present. So interest rates must be positive to compensate, even if they are risk-free.



Diversification

Does this seem like a good idea?

Definition: The strategy of owning many different investments as a means to reduce overall risk to the portfolio



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Two types of risk

1. Diversifiable (firm specific): Risk that can be reduced by diversification
 - Ex. Drop in oil prices. Exxon Mobile shares lose value, Airline shares gain value
2. Non-Diversifiable/systemic/market risk – all terms for the same thing. Cannot diversify away
 - Ex. Value of all shares drop during a recession



Summary

- Riskier assets have higher returns because there is lower demand
- Best strategy is to diversify away all firm-specific risk by holding a variety of investments
- Impossible to diversify away all risk



National Savings



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What is savings?

- I earn \$100, buy \$50 of candy, pay \$30 taxes. What is my savings?
- A government takes in \$100 of taxes, and spends \$200 on roads. What is its savings?
- If I am my own country, what is the total savings of this country?



National Savings

- The total income that remains in the economy after paying for consumption and government purchases
 - $S=Y-C-G$
- But recall: $Y=C+I+G+NX$
- Consider a closed economy ($NX=0$)
- $Y=C+I+G$ which implies $I=Y-C-G$
 - Therefore, $S=I$



Aside

- We will need to be careful about what we consider savings and investment.
- Investing is **economic investment**
- Buying bonds/stocks is financial investment, and therefore considered **savings**



Expanding the savings equation

- We can split savings into those of individuals, and those of the government
- Individuals: $Y - C - T$
 - This is **private savings**
- Government: $T - G$
 - This is **public savings**
- National Savings = Private + Public
 $= (Y - C - T) + (T - G)$

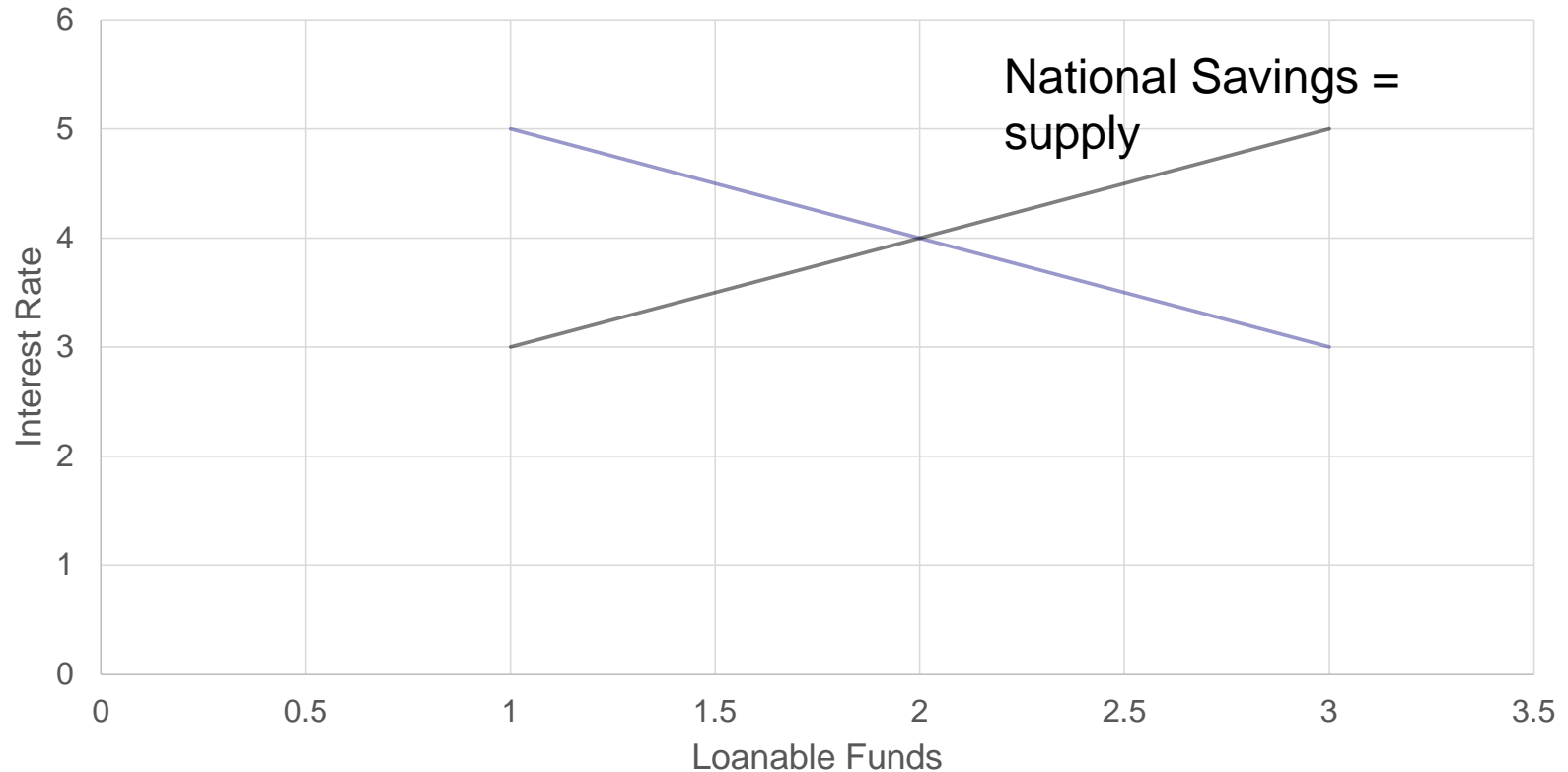


Market for Loanable funds

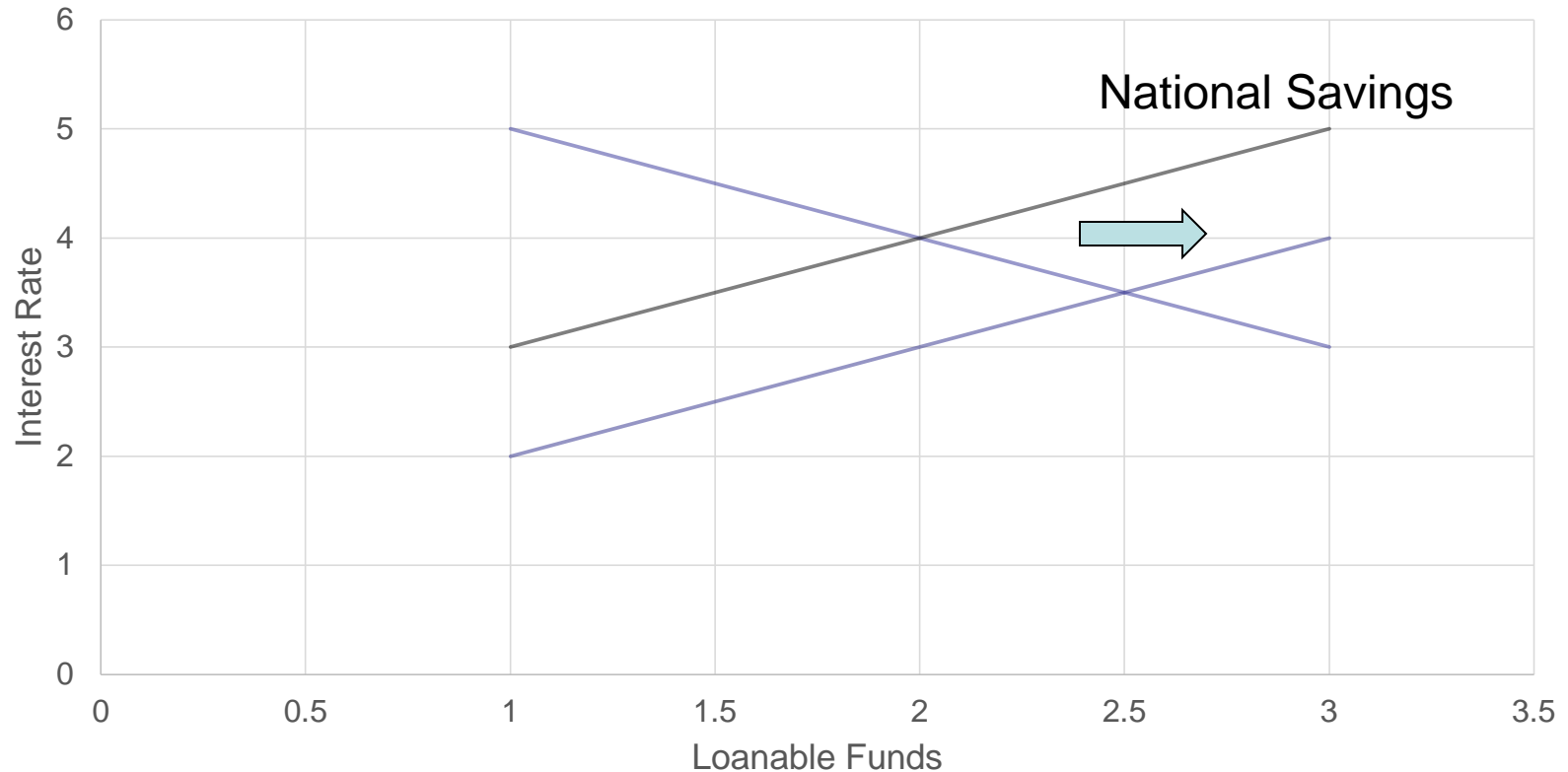
- The market in which those who want to **save** **supply** funds and those who want to **borrow** **demand** funds.
- Who supplies funds? What determines how much they supply?
- Who borrows funds? What determines how much they borrow?



Loanable funds market is just like any other market



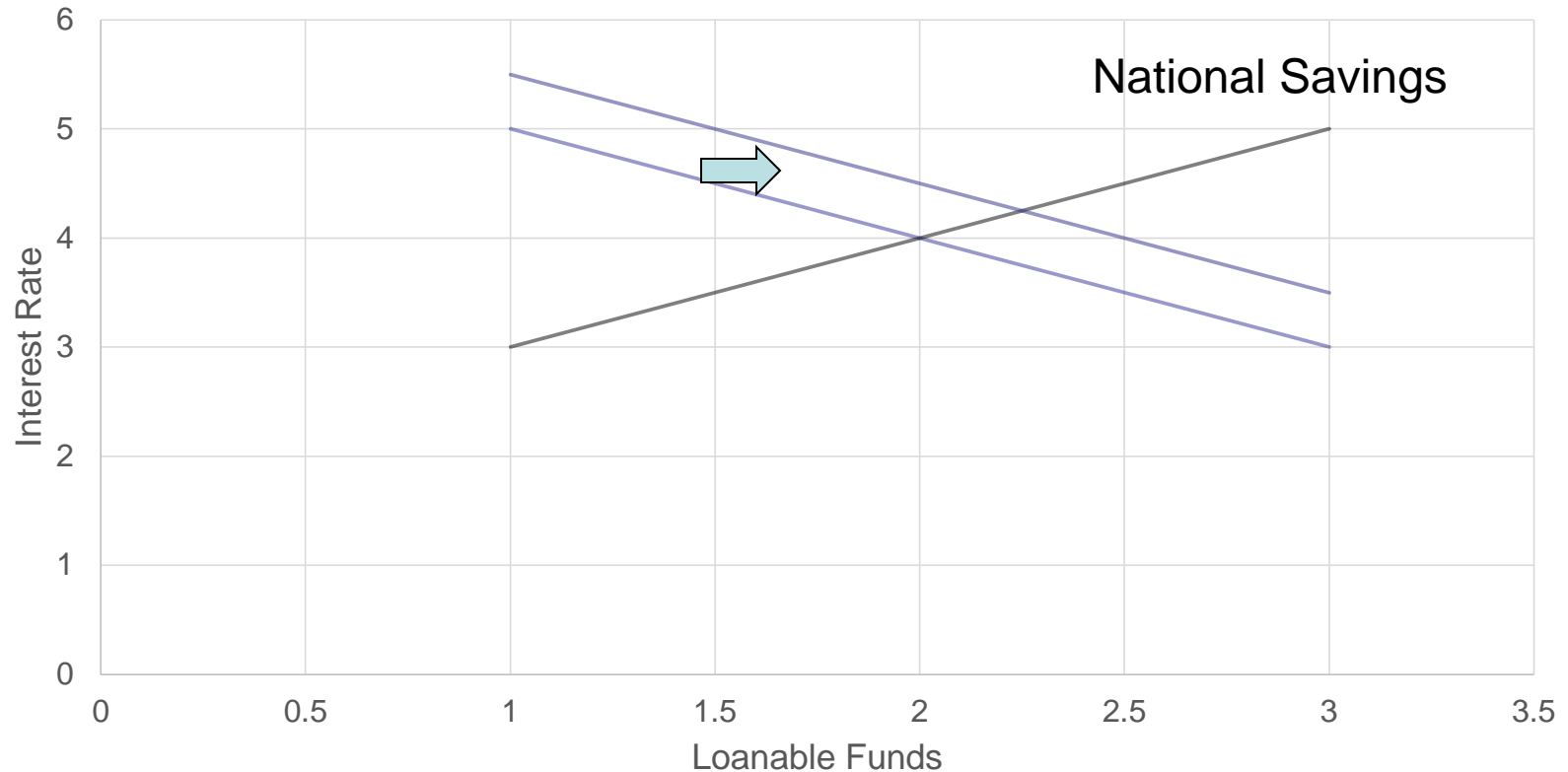
We analyze it the same way –
consider a tax credit that
increases incentive to save



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Tax credit to incentivize investment

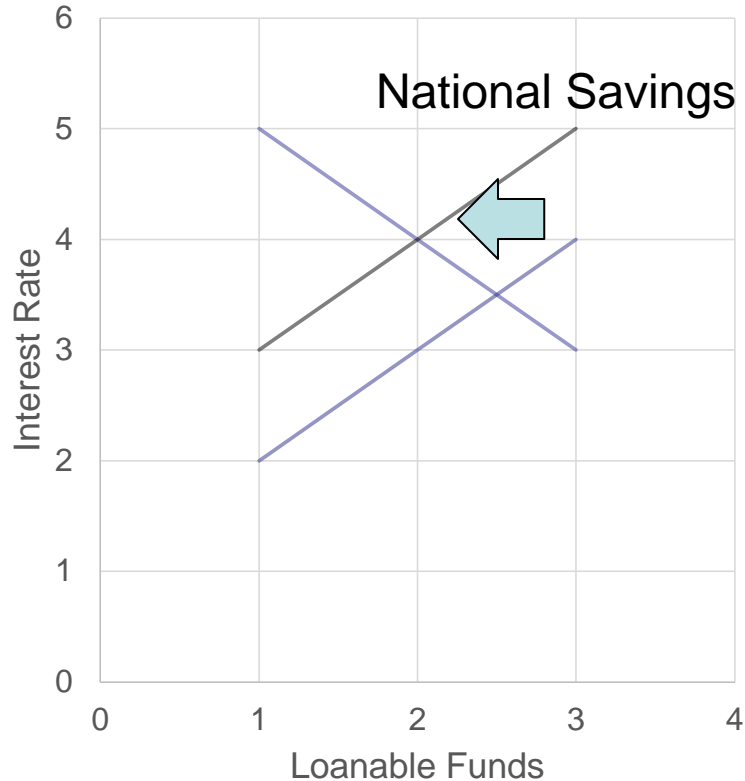


Crowding out

- What happens to savings if the government increases spending without increasing taxes?
 - Private savings? Public Savings?
- What happens to interest rates?



Crowding Out



- Interest rates go up
- Investments go down
- Definition: A decrease in investment that results from a decrease in public savings

