Saving, Investment and the Financial System

The World of Finance and its Macroeconomic Significance

Outline

1. The Financial System

2. Determinants of Borrowing Costs

3. (Expanded) Loanable Funds Model

- Textbook Readings: Ch. 6 pp. 186-191, Ch. 10 pp. 329-337

Introduction

- In a capitalist economy, the **financial structure** that facilitates economic activity is a **dominant force**

- **Linking** financial market dynamics to real economy trajectories is important

What is Finance?

- The management, creation and study of:
  - Money
  - Banking
  - Credit
  - Investments
  - Assets and Liabilities

Finance

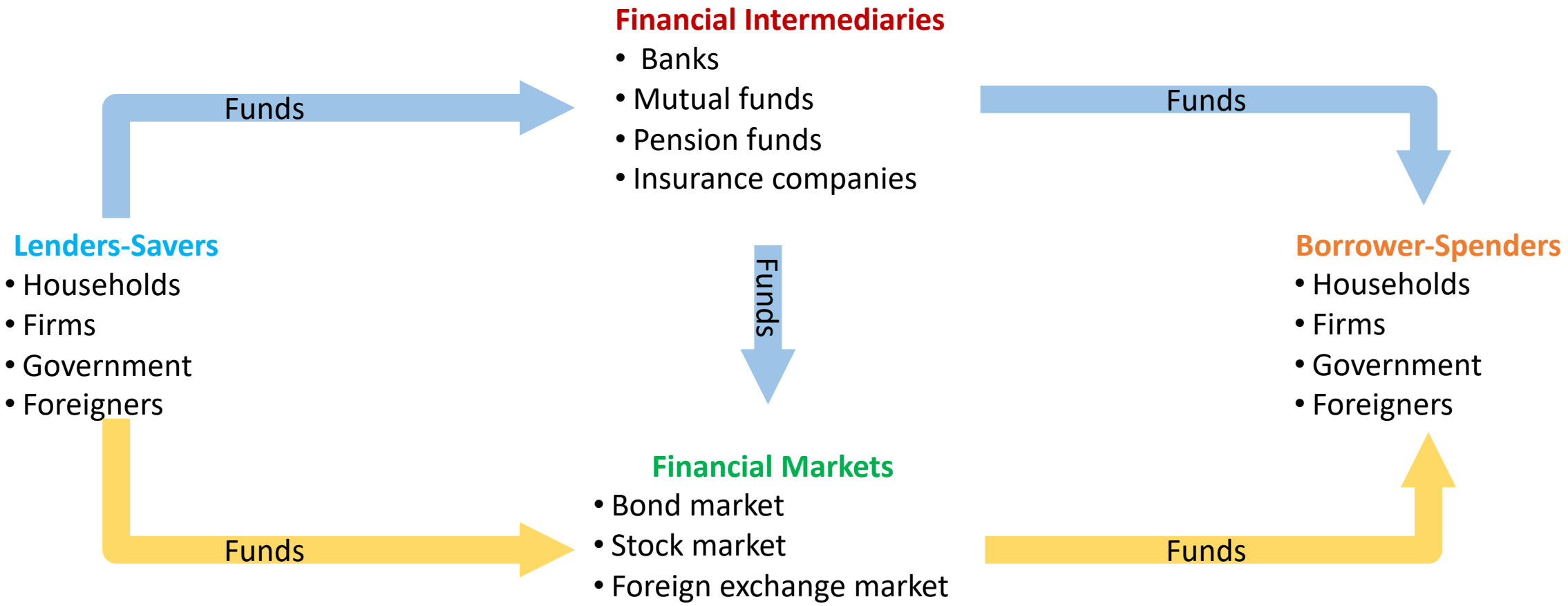
- Matching those with **cash** to those with **ideas** on how to use it

  Lender → Gives up cash today → Collects cash in the future

  Borrower → Collects cash today → Pays back in the future

- Lenders want to get back **more** than what they lent
  - Time value of money: **Compensation** for temporarily foregoing use of the funds

The Financial System in a Nutshell



- A financial system operating efficiently improves economic welfare of everyone in society

Some Key Players in Finance

- **Banks**
  - Borrow from depositors, lend to homebuyers and businesses
- **Bonds**
  - Bond buyers provide loans for businesses and governments
  - Bond buyers are promised a guaranteed interest payment
- **Stocks**
  - When firms issue new equity, they receive funds from share buyers
  - Share buyers are **not** promised a guaranteed interest payment
  - They own a piece of the gain in good times but they can lose everything if things go awry

Basics of Stock Terminology

- Limited liability
- Initial Public Offering
- Retained earnings
- Dividends

Basics of Bond Terminology

- Face value or principal: $1,000
- Coupon payments (interest payments): $40
- Coupon rate: 4%
  - $40/$1,000
- Maturity: 30 years
- Bond price: $950
- Interest rate: 7%

The World of Finance: 4 Key Functions

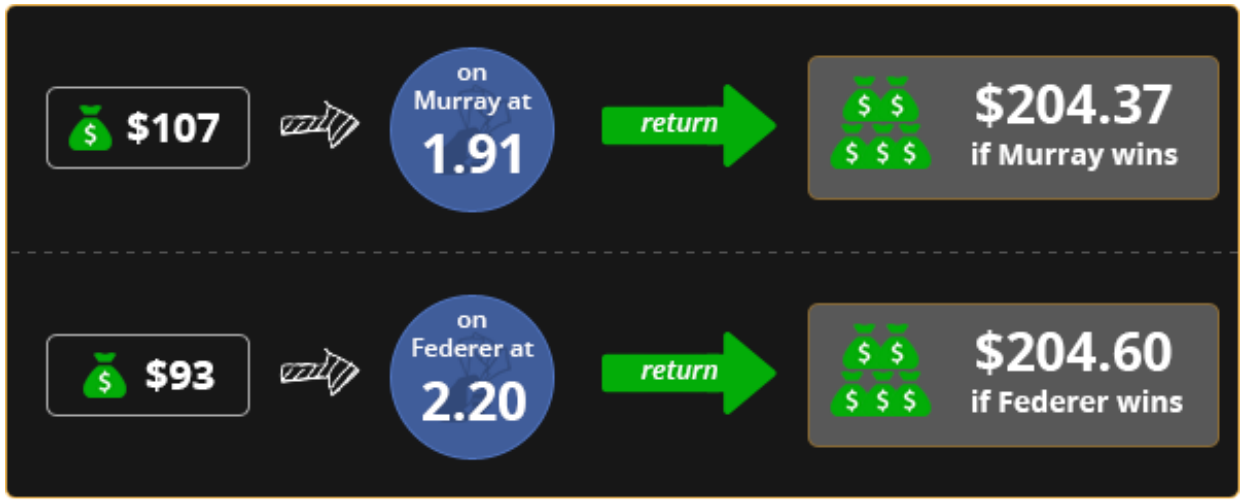
- Matching Savers and Borrowers
  - Financial **intermediaries** and financial **markets**
- Risk-sharing
  - Investors can **spread** their money over different assets, **reducing** their risk
- Liquidity
  - Allows savers to **convert** their investments **into cash**
- Information
  - Prices of financial securities represent **beliefs about the future**

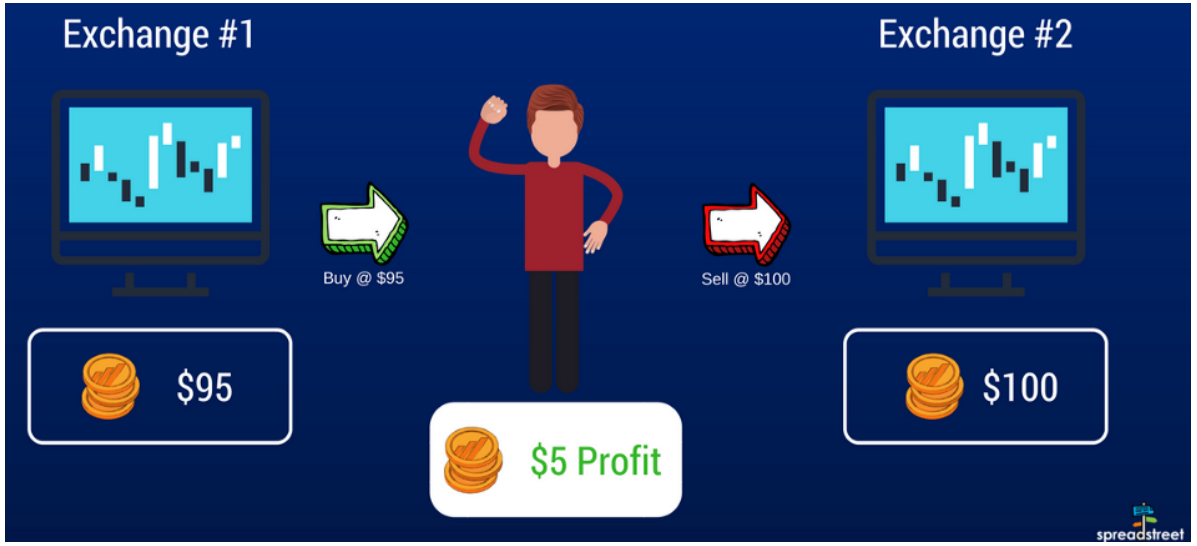
The Efficient Market Hypothesis (EMH)

- An efficient financial market is one in which security **prices** always **reflect all available information**
  - Investors buy/sell assets as the news flow changes opinion about future
  - Nearly instantly → hard to profit from trading on emerging news

- Assumptions:
  1. Investors are assumed to be **rational** (e.g. 3% vs 8%)
  2. If some are irrational, their actions are **random** and **cancel**
  3. If irrational in similar ways, **rational speculators** reverse effects on prices

Arbitrage Eliminates Any Riskless Wagers





Arbitrage and Efficient Markets in Action

Efficient Markets In Action					
	Statistics for 03/15/07				
Date Of Issuance	Years Remaining For Instrument	Coupon Rate	Date Of Maturity	Bond Price Secondary Market	Yield-to-Maturity
2/15/2007	10	4 5/8	2/15/2017	100	4.57
5/15/1987	10	8 3/4	5/15/2017	132	4.64

What Forces Drive Asset Prices?

- What forces drive stocks, bonds and all other asset prices?

- Changing expectations!
  - Expectations about real growth rates, inflation rate, profitability, probability of repayment

- Example: U.S. share prices (S&P500)
  - **Confidence** in a growing economy, 2002 through 2007 : **800 to 1450**
  - **Panic** about collapsing economy, 2007 through early 2009: **1450 to 666**

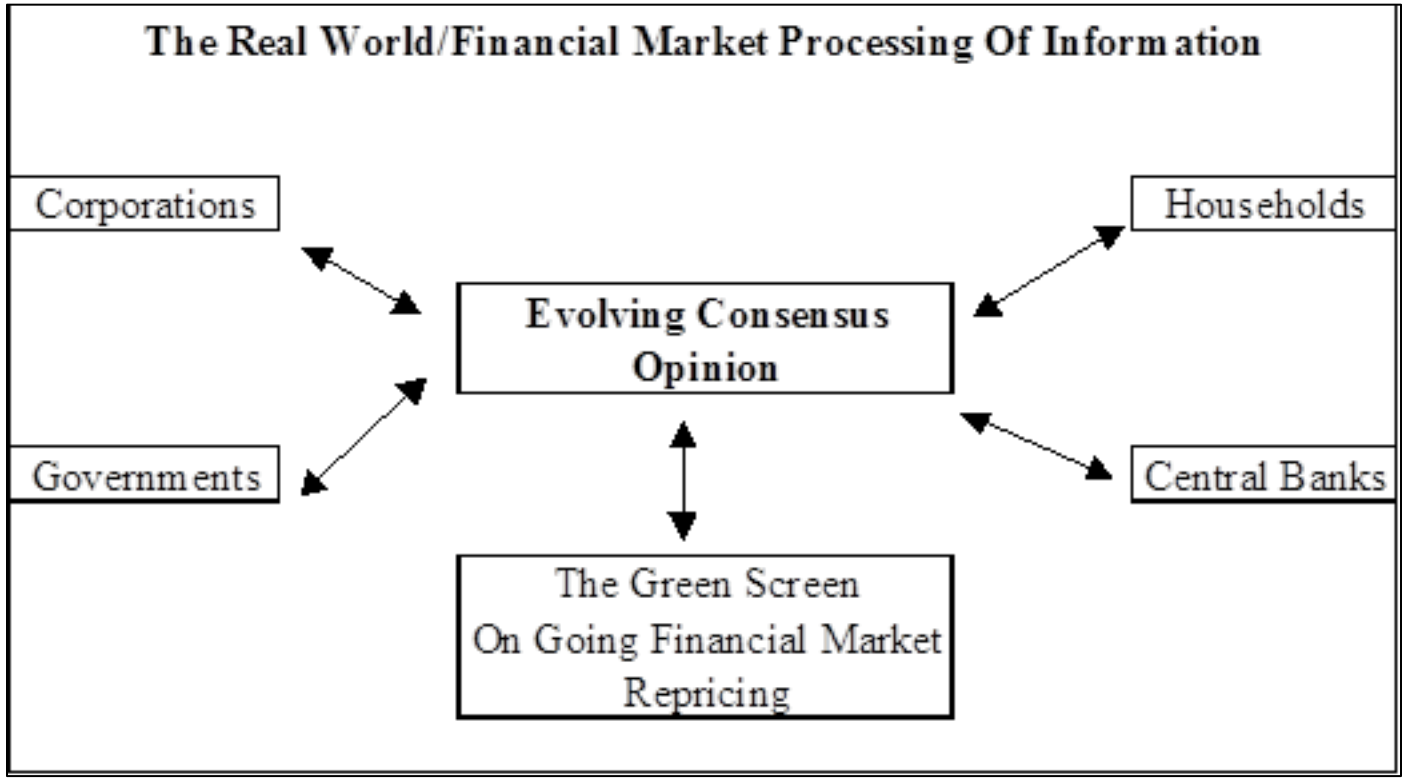
S&P 500


SPX C 1710.14 +6.94 1709.17 / 1712.66
On 14 Oct d O 1699.86 H 1711.03 L 1692.13 Prev 1710.14
SPX Index 95) Save As 96) Actions 97) Edit 98) Table Line Chart
12/31/2001 - 12/31/2009 Last Price Line 11) Compare Mov. Avgs Volume USD
1D 3D 1M 6M YTD 1Y 5Y Max Daily Security/Study Event
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2013 Bloomberg Finance L.P.
SN 636398 EDT GMT-4:00 G457-3220-1 15-Oct-2013 09:19:14

But Rational Expectations Swim Against Uncertainty

- We assume **instantaneous**, **rational** absorption of economic news
- Rational investors want to pick higher paying assets
- But for many investment decisions, it is **not obvious** which will deliver the better payoff
- '**Nobody Knows, But Everybody Has to Guess**'

How the Consensus Opinion About the Future Evolve?



- **Consensus opinion** about the **outlook** for overall trends
- Implied forecasts **embedded** in financial market asset prices

2013 Nobel Prize in Economics: E. Fama vs R. Shiller

- Two competing schools of thought concerning the collective insights of the many

- Eugene Fama (University of Chicago):
  - Markets are **efficient**, most of the time
  - The centerpiece of ‘freshwater economics’

- Robert Shiller (Yale University):
  - Markets can be **irrational**, over long periods
  - Acceptable commentary at ‘saltwater schools’

Credit Markets: Types of Instruments

- Simple loan
  - Borrower repays the **principal** amount plus an **interest payment**
- Fixed-payment loan
  - Car loan, home mortgage
- Coupon bond
  - **Periodic** interest payments until **maturity**, face value repaid at maturity
- Discount bond
  - Bought at a price below its **face value**, face value repaid at maturity

Treasury Securities

- Discount bond
  - **T-Bills** (matures in **1 year or less**)
- Coupon bonds
  - **T-Notes** (matures between **2 to 10 years**)
  - **T-Bonds** (matures between **10 to 30 years**)
  - **TIPS**

Basics of Bond Valuation

- Coupon bonds make payments **at different times** in the future
- How to value future cash flow payments?
- **Price of a bond**: Present value of all future cash flows
- **Yield to maturity**: Interest rate that equates the present value of future cash flows to its value today

Relationship Between Prices and Yields

- Imagine you pay $200 for a bond that pays **$15** per year **forever**
- The yield to maturity on your bond is 7.5%
- Imagine that later:
  - Interest rates in other bonds have increased to 10%
  - You want to sell your bond
- How do you sell a bond that pays 7.5% when others pay 10%?
- What if interest rates would have gone down to 5%?

- **Key**: **Negative** relationship between prices and yields!

What Is the Effect of Inflation on the Cost of Borrowing?

- Instead of buying a $1,000 computer today, Ernie lends the money to Bert for 1 year at a 5% interest rate
- After 1 year, Ernie receives $1,050 from Bert but realizes that the computer now costs $1,100
  - I got less than nothing for lending to Bert!

- Inflation can destroy **purchasing power**
- **Moral**: When you lend money, you want to be paid the **real interest rate**!

Fisher Equation

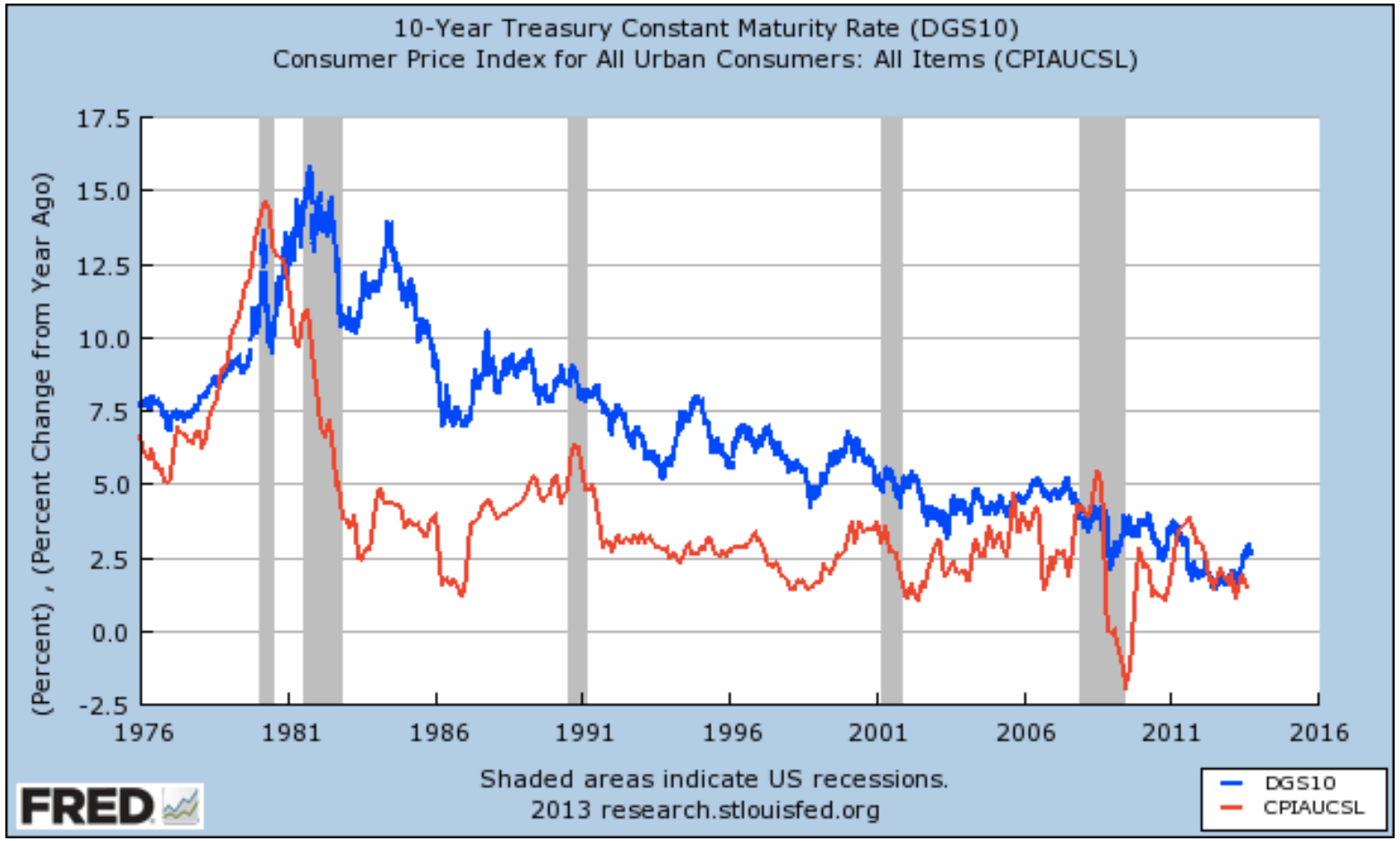
Nominal Interest Rate = Real Interest Rate + Inflation Rate

$$i = r + \pi$$

- Bond yields driven by real growth expectations and inflation

The Great Disinflation, 1980-2000

- As inflation expectations fell, long rates fell



Real Interest Rate: Ex-Ante vs Ex-Post

- **Ex-ante** real interest rate: adjusted for **expected** inflation ($\pi = \pi^e$)
  - Very important and what economists typically mean by r
- **Ex-post** real interest rate: adjusted for **actual** inflation ($\pi = \pi^{past}$)
  - How well the lender/borrower did in real terms *after the fact*
  - Real purchasing power of a loan
- Low real interest rate ➞ greater incentives to borrow, fewer to lend

What Do People Expect Inflation Will Be?

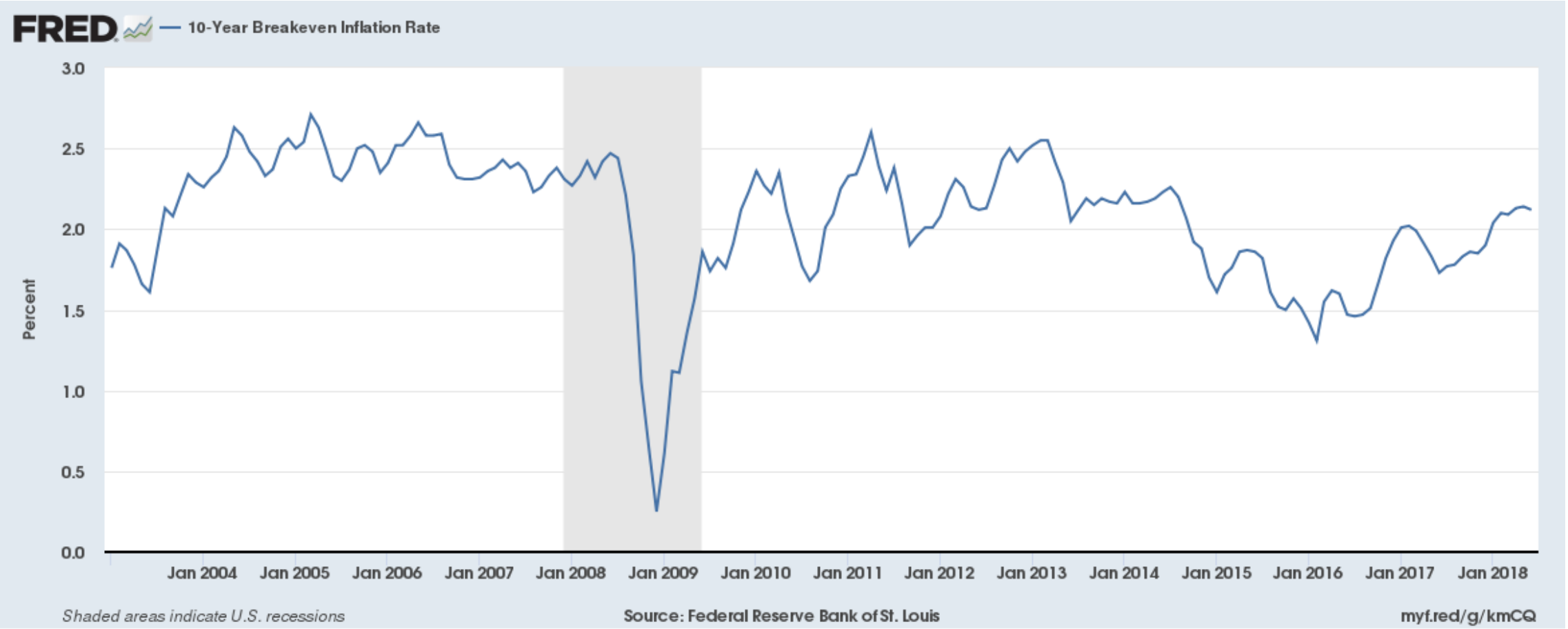
- One possibility is to assume inflation will behave as in the past
  - $\pi^e = \pi_{t-1}$

	10yr Yield	12-month Core CPI	Actual 10yr Rate of Inflation	Ex-ante Real 10yr Rate	Ex-post Real 10yr Rate
1970	6.4	4.6	7.9	1.8	-1.5
1980	12.8	9.6	4.8	3.2	8.0
2017	2.4	1.7	??	0.7	??

What Do People Expect Inflation Will Be?

- U.S. Treasury offer inflation ‘protected’ bonds
- TIPS (Treasury Inflation Protected Security) bonds tell us just that
  - Alternative to $\pi^e = \pi_{t-1}$
- The bond will pay you its (real) YIELD + the year-on-year change for the CPI, over the life of the bond
- Provide information about **market expectations for inflation**
  - Spread between the Treasury rate and the TIPS rate

The 10-Year Breakeven Inflation Rate



Breakeven Inflation

- By subtracting the TIPS yield from the regular bond yield, we derive **break-even inflation rates**

	Dec-99	6-Dec	16-Dec
10 year Tips Yield	4.30%	2.40%	0.16%
10-year T-note Yiled	6.40%	4.70%	1.79%
10-year breakeven inflation	2.10%	2.30%	1.63%

- Why does this hold?

Borrowing Rates As a Window on Future Rates

- You can lend to the federal government for 2 years by buying 2-year notes
- Do that every **2 years 5 times**, and you have lent to the federal government for 10 years
- Alternatively, buy a 10-year note, and lend for **10 years in one step**
- But if **EXPECTATIONS** are that 2 year rates will be rising, you want a higher rate to lend for 10 years

(Expected) Future Rates

- The interest rate for 1 year is 8%
- The interest rate for 2 years is 10%
- What is the implied 1 year interest rate **in 1 year**?

$$(1.08)(1+y) = (1.1)^2$$

- y = 0.1204 or 12.04%
- y is the **forward rate** that makes the returns equal
- Approximation:

$$\frac{8\% + y}{2} = 10\% \Longrightarrow y = 12\%$$

A Menu of Borrowing Costs: Governments and Firms

- Most macro models focus on **the** interest rate
- In reality, there are **many** interest rates

U.S. 3-month:	0.25%
U.S. 2-year:	0.90%
U.S. 10-year:	1.80%
Portuguese 10-year:	3.40%
High-grade company:	3.60%
Risky company:	4.35%
Junk company:	5.50%

- Patterns? Why do they differ?

John R. Hicks: A Theory of Interest

- The interest rate a lender charges depends on:

- **DURATION**
  - How **long** the loan lasts

- **DEFAULT**
  - How much **risk of bankruptcy** exists

- Duration and default (D&D) drive borrowing costs

Duration

- Bonds with **same default risk** (same issuer) may have different yields because their times to maturity are different

	10/12/16	10/12/17
U.S. 3-month:	0.25% (annualized)	1.05% (annualized)
U.S. 2-year:	0.90% per year	1.50% per year
U.S. 10-year:	1.80% per year	2.35% per year

- **Yield Curve**: Plot of yields on bonds with different maturities by the same issuer

Default Risk

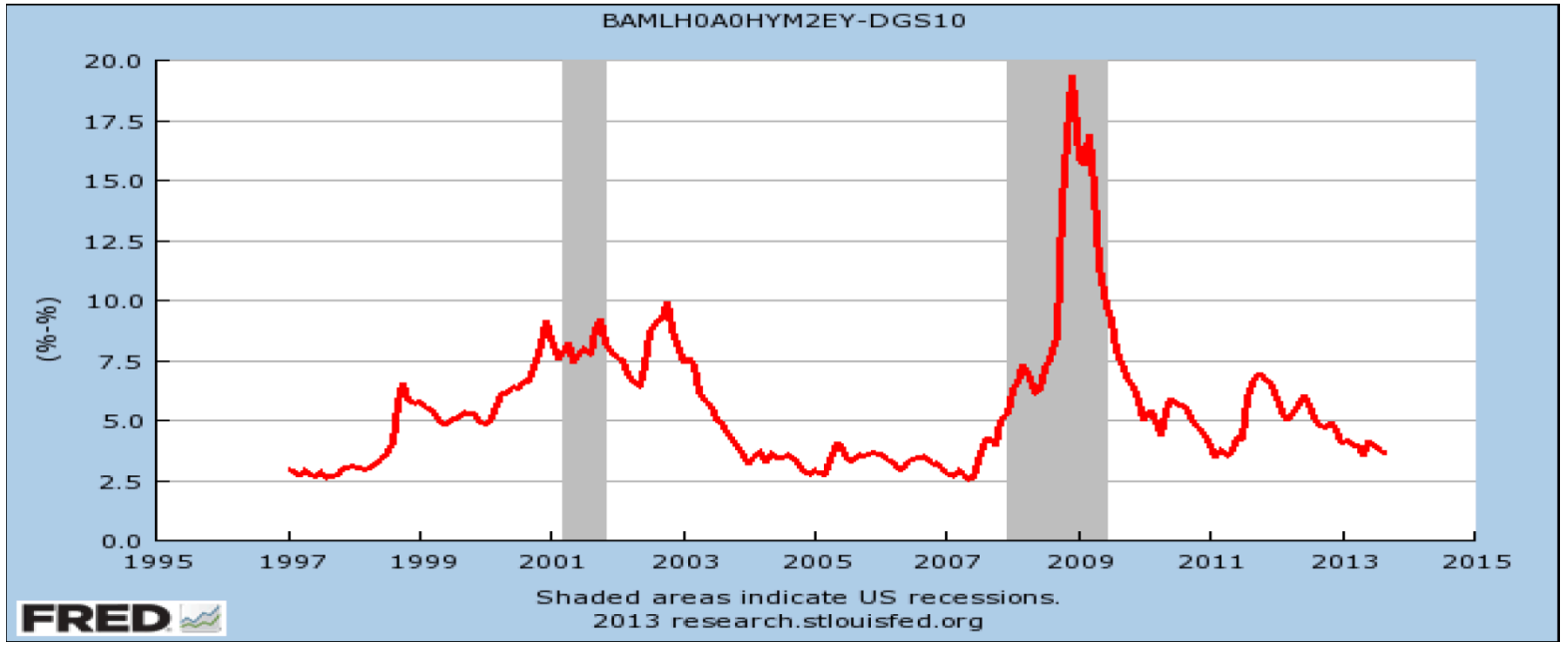
- We can also look at *promised* interest payments on bonds of the **same duration** with different risk levels

Risk-free:	10-year U.S. government	1.8% per year
Risky:	10-year note from Sears	5.8% per year

- Risky rates are higher
  - You are promised a much higher interest if you lend to Sears for 10 years
- But risky bonds are riskier
  - If you lend to Sears, they may go bankrupt → You may not get your money back

Bond Spreads

- Risky/risk-free **spread**: The interest rate on risky bonds minus the interest rate on risk-free bonds



- Risky/r-f spreads leap in recessions, recede as economy improves

Spreads as Collective Opinion About the Future

- Investors' collective opinion about the **future**
- Spreads between **long-term** bonds and **short-term** notes:
  - Tell us whether investors think short-term rates are *going up or down*
- Spreads between **corporate** bonds and **government** bonds:
  - Tell us how much *risk of bankruptcy* investors see in the world

What Drives Bond Prices Up and Down (and Bond Yields Down and Up)?

- In 1962, 10-year T-note yields were 4%
- In 1980, 10-year T-note yields were 13%
- In 1993, 10-year T-note yields were 5.5%
- In 1999, 10-year T-note yields were 6.5%

Drivers of Borrowing Costs

- Our macroeconomic understanding requires **several** interest rates
- We need to understand the effects of **real growth** and **inflation** (expectations):
  - Real vs nominal interest rates
- We need to understand **duration**:
  - Short-term vs long-term interest rates
- We need to understand **default**:
  - Risk-free vs risky interest rates

Loanable Funds Model

The Macroeconomics of Saving and Investment

- Begin with the GDP identity:

$$Y = C + I + G + NX$$

- Assume a closed economy:

$$Y = C + I + G$$

- Rearrange terms:

$$I = Y - C - G$$

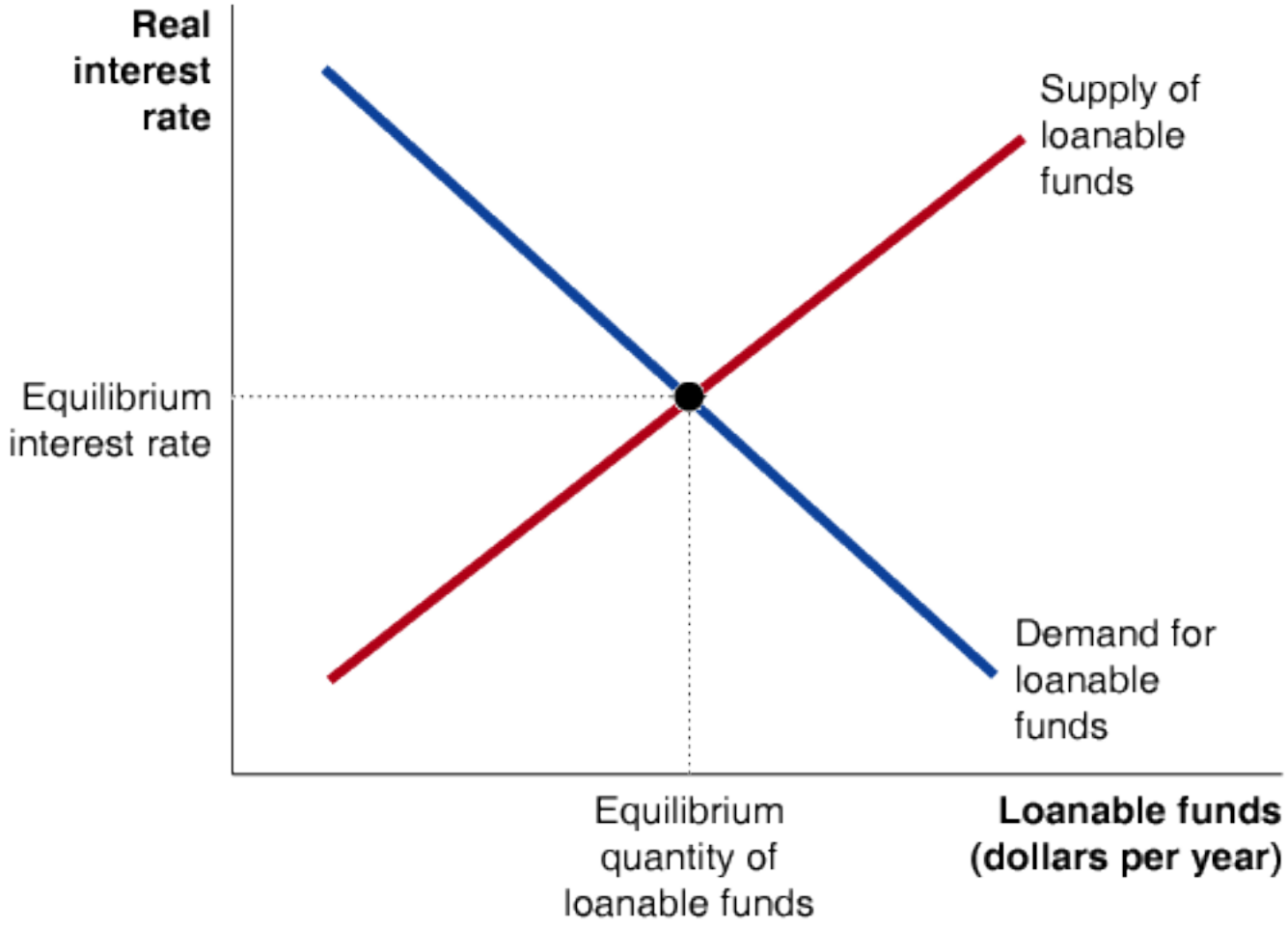
Our Flow Model: S = I

- Define: $S_{private} = Y - C - T$, $S_{public} = T - G$
- Total (domestic) saving: $S = S_{private} + S_{public}$
- Substitute: $S = (Y - C - T) + (T - G)$
- Simplify: $S = Y - C - G$
- Therefore, total saving must equal total investment ($S = I$)

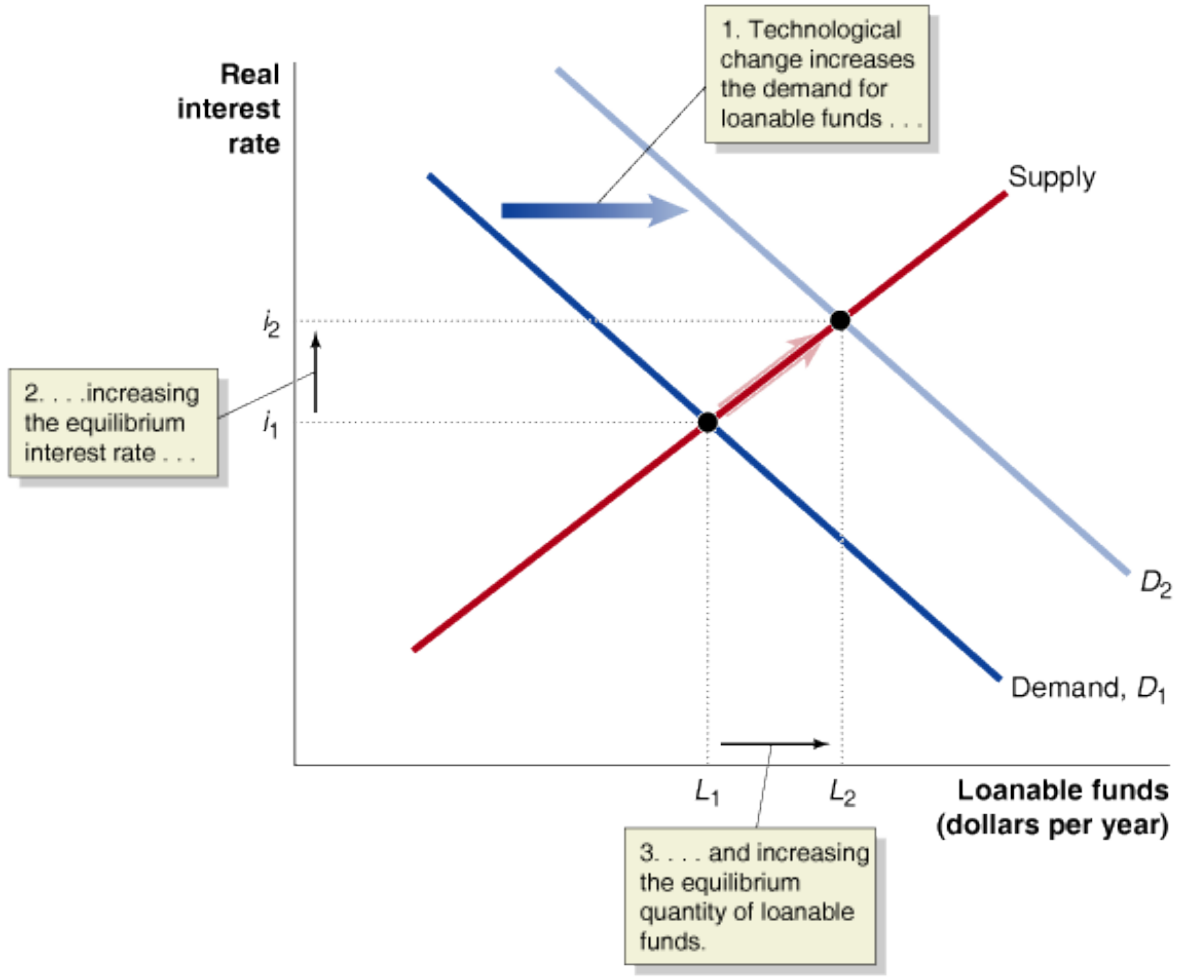
The Market for Loanable Funds

- Households **supply** funds
  - They lend to firms and the government
- Firms and the government **demand** funds
  - They borrow from households
  - **Note**: Through its saving and dissaving, the government affects the quantity of funds that "pass through" to firms
- The interaction of borrowers and lenders determines the **market interest rate** and the **quantity of loanable funds** exchanged
  - What interest rate? Nominal or real?

The Loanable Funds Model

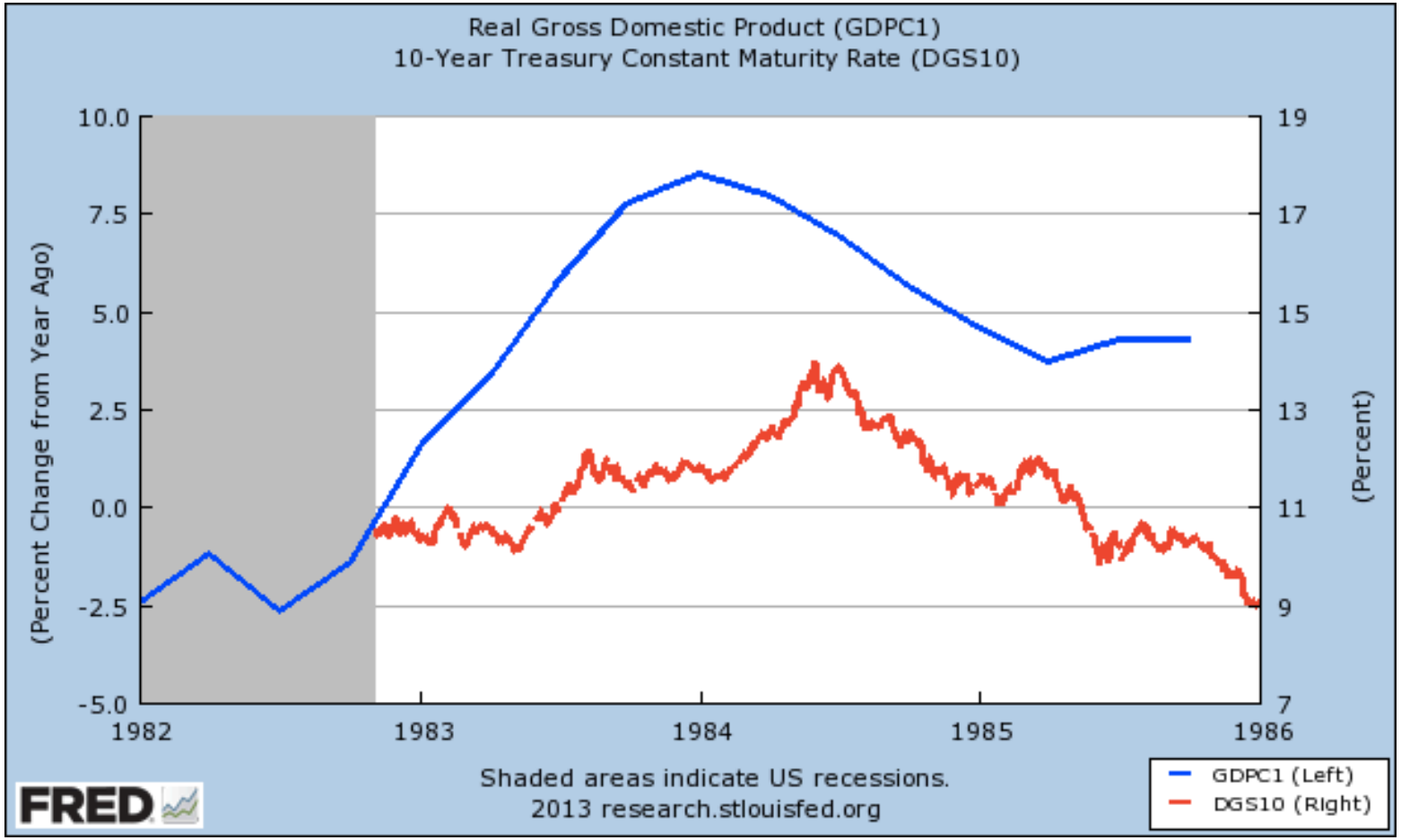


Shock: Real Activity Jumps (Technological Change)



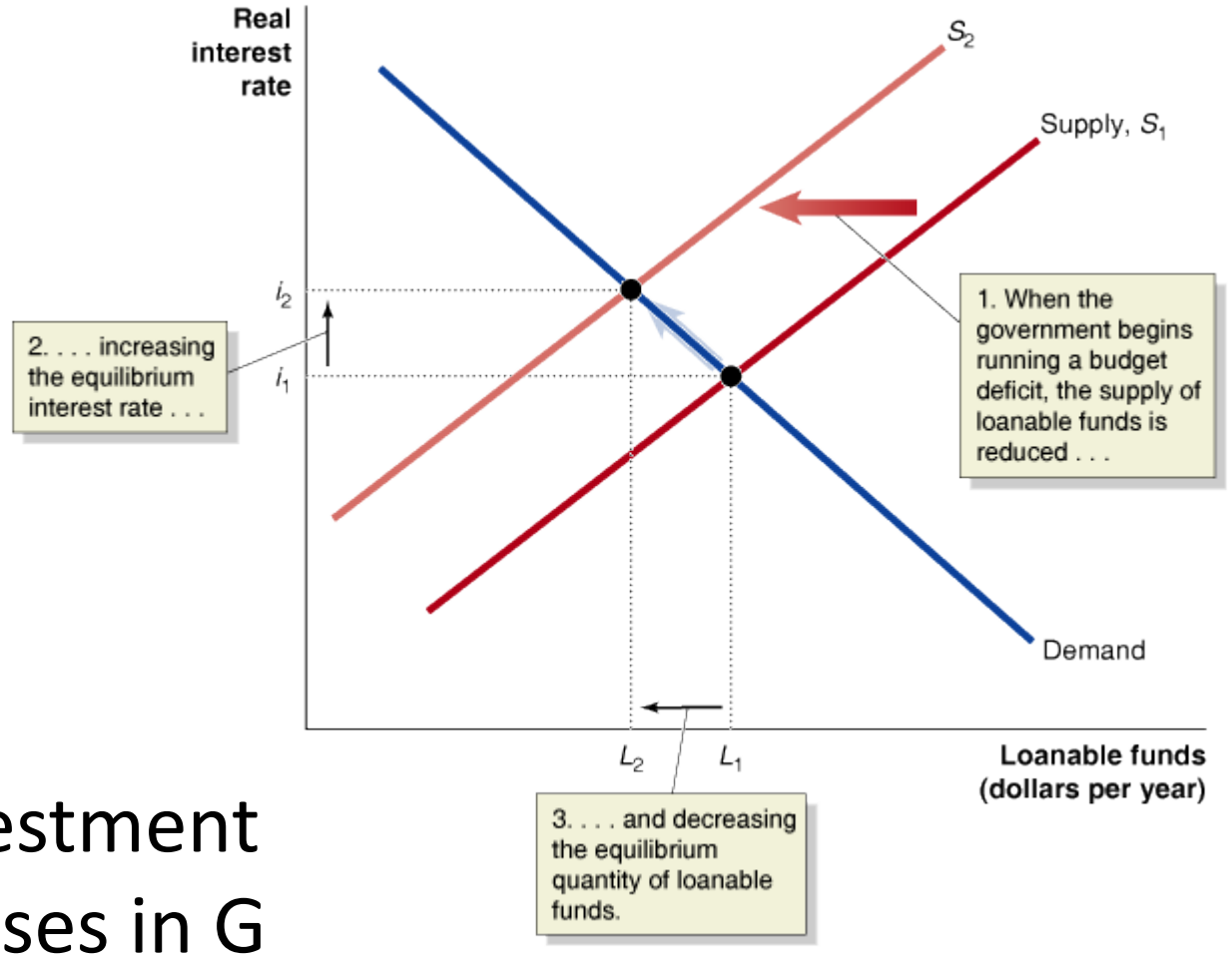
Shock: Real Activity Jumps

- In 1983-1984, real growth soared. In reaction, T-note yields leapt



Shock: Increase in Government Purchases (G)

- Suppose the government runs a budget deficit
- To fund the deficit, it sells bonds to households, decreasing the supply of funds available to firms
- **Crowding out**: Decline in investment spending as a result of increases in G

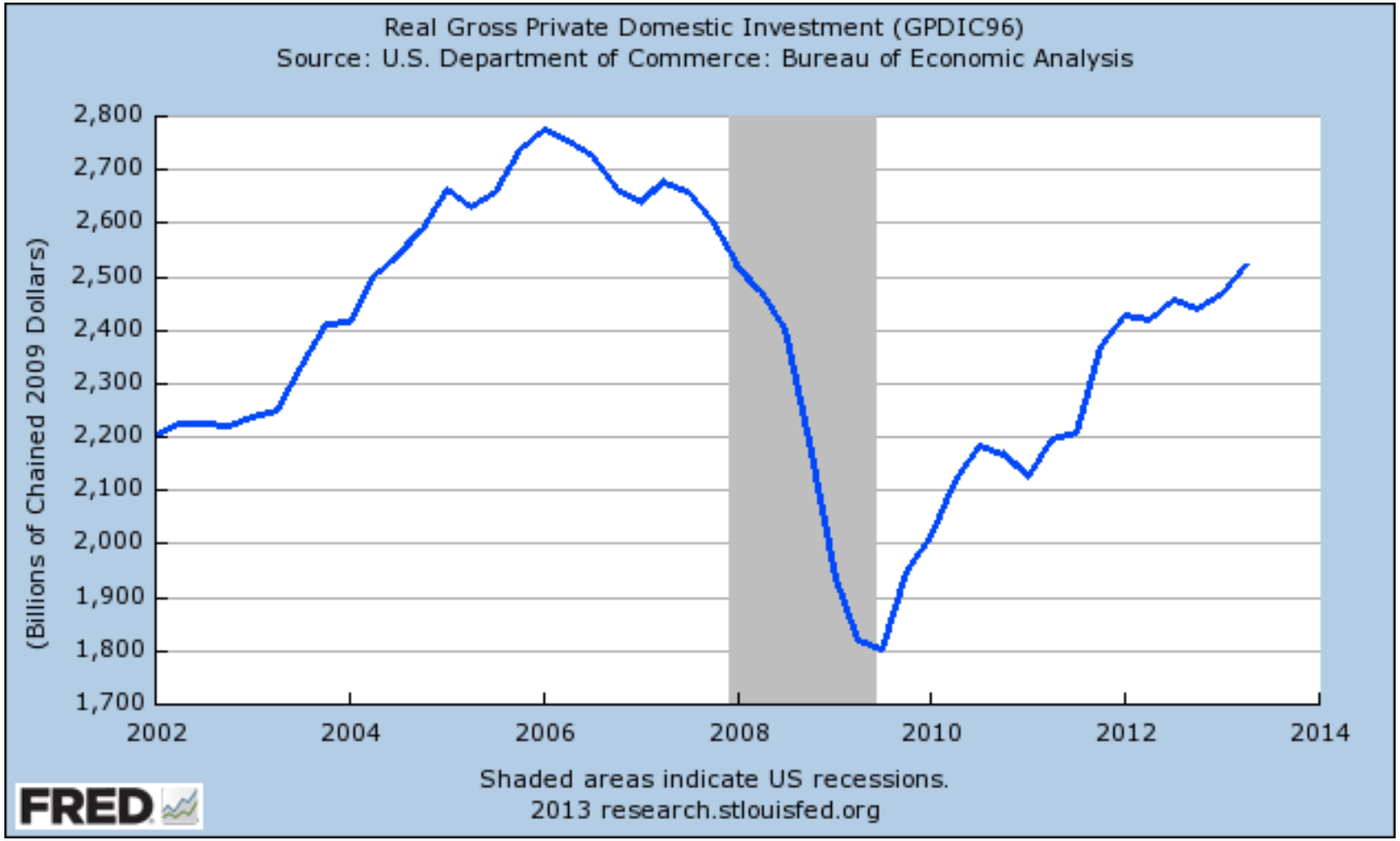


Shock: Savings Up

- According to the loanable funds model what happens when saving increases?
  - **Consumption decreases**
  - Supply of loanable funds increases → **lowers** the **real interest rate** and **increases** the level of **investment spending**
  - Increase in investment spending might offset some or all of the decline in consumption

- In 2009, saving surged
  - According to this model, the surge in saving in 2009 did not played a big role in the recession. Do you agree?

Investment in 2009



- A collapse reflecting **soaring** interest rates

Company Borrowing Costs Were At Record Highs In 2009

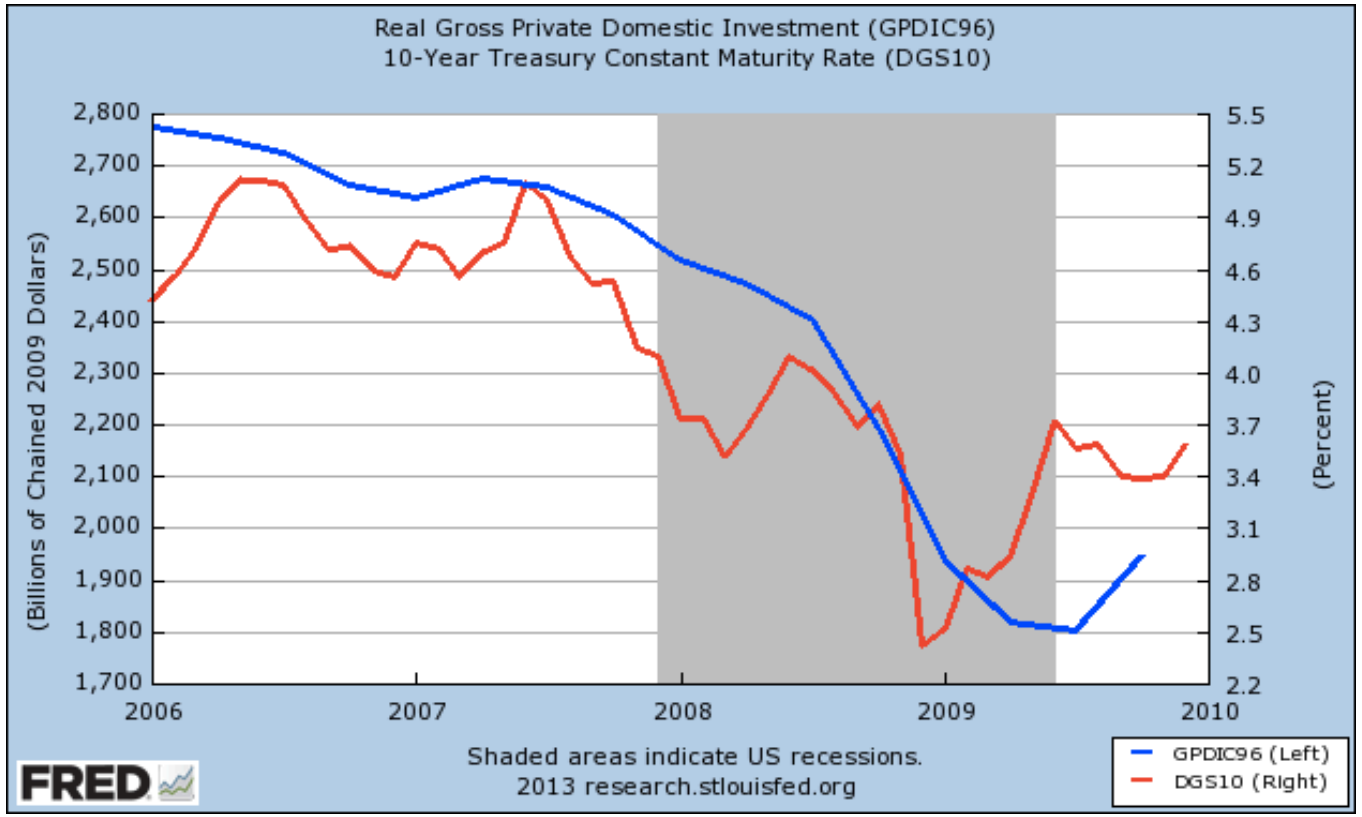
	1997	2006	2009
10-Year Treasury	5.5	5	2.5
Junk Bond	8.0	7	17.5
Spread (Junk – 10-Year)	2.5	2	15

Keynes and the Paradox of Thrift

- Saving = Investment
- But if everyone tries to **save more**
  - Demand plunges (later we'll see why)
  - Slashed jobs = Sharp declines in income
  - Sharp fall for output and income so **SAVING FALL**
  - Investment fall
- As everyone tries to save more, saving actually goes down!
- That is Keynes's **paradox of thrift**

Shock: Savings Up (cont.)

- Loanable funds model: $r \downarrow$, $I \uparrow$. What does the data say?



- In 2009, T-note rates plunged but investment plunged as well! Why?

What Happens In This Case?

- The model points to ‘falling real interest rates’, as saving increases

- But **did the right interest rates fall?**
  - Absolutely not!
  - Government borrowing rate **plunges** as savers bought safe bonds
  - Company borrowing rates **soared**!

- Our more detailed look at the world of finance allows us to **reject** the simplistic loanable funds model!

We Need to Understand Household Investment Choices

- During recessions, investors violently change their demand for risky assets vs risk-free assets
- That means risky interest rates leap ➞ Investment plunges
- Therefore, we can **extend** the loanable funds model by incorporating **risk**

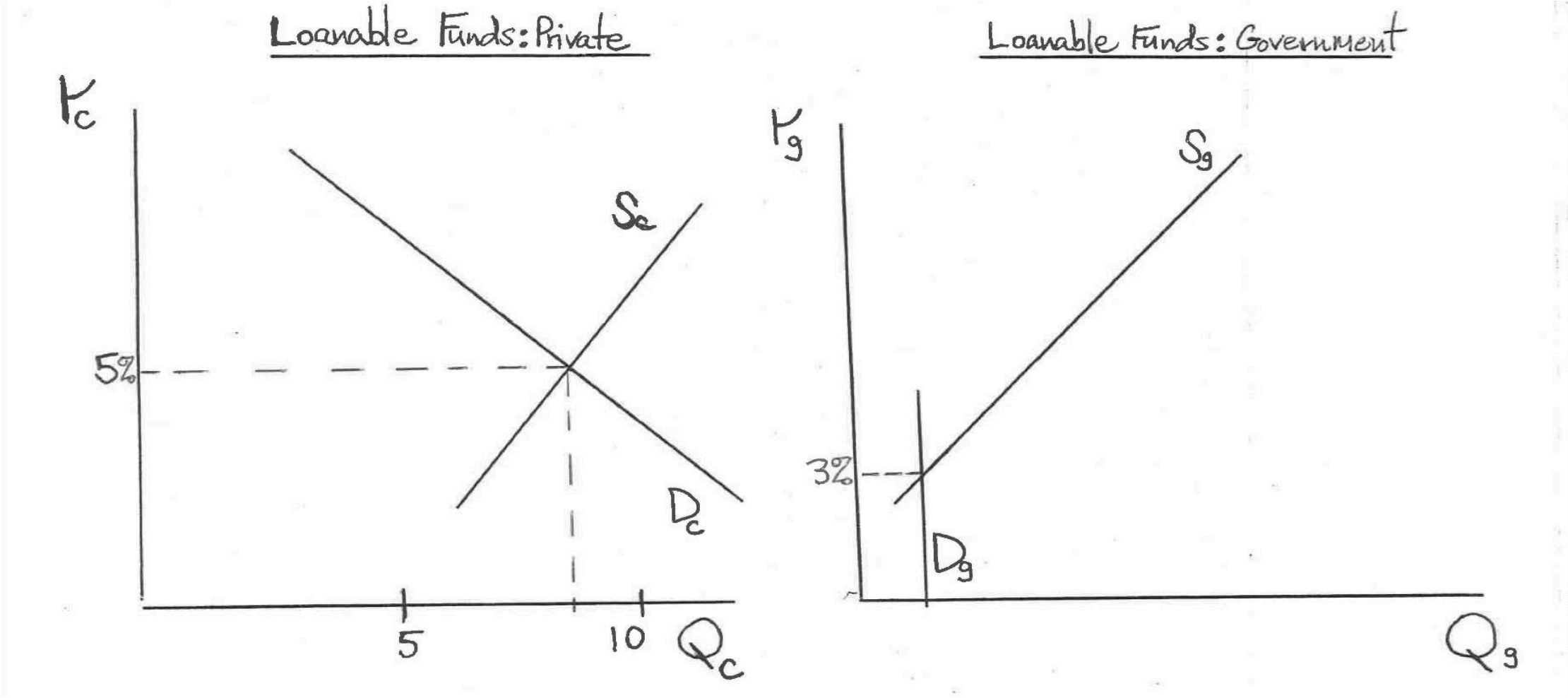
Expanded Loanable Funds Model

Part I

Definitions

- r_c = **real**, **long-term**, **corporate** borrowing rate
  - Inflation-adjusted interest rate risky borrowers pay for 10-year money
- r_g = **real**, **long-term**, **government** borrowing rate
  - Inflation-adjusted interest rate the government pays for 10-year money
- S_c = households' supply of funds to corporations
- S_g = households' supply of funds to the government

Expanded Loanable Funds Model

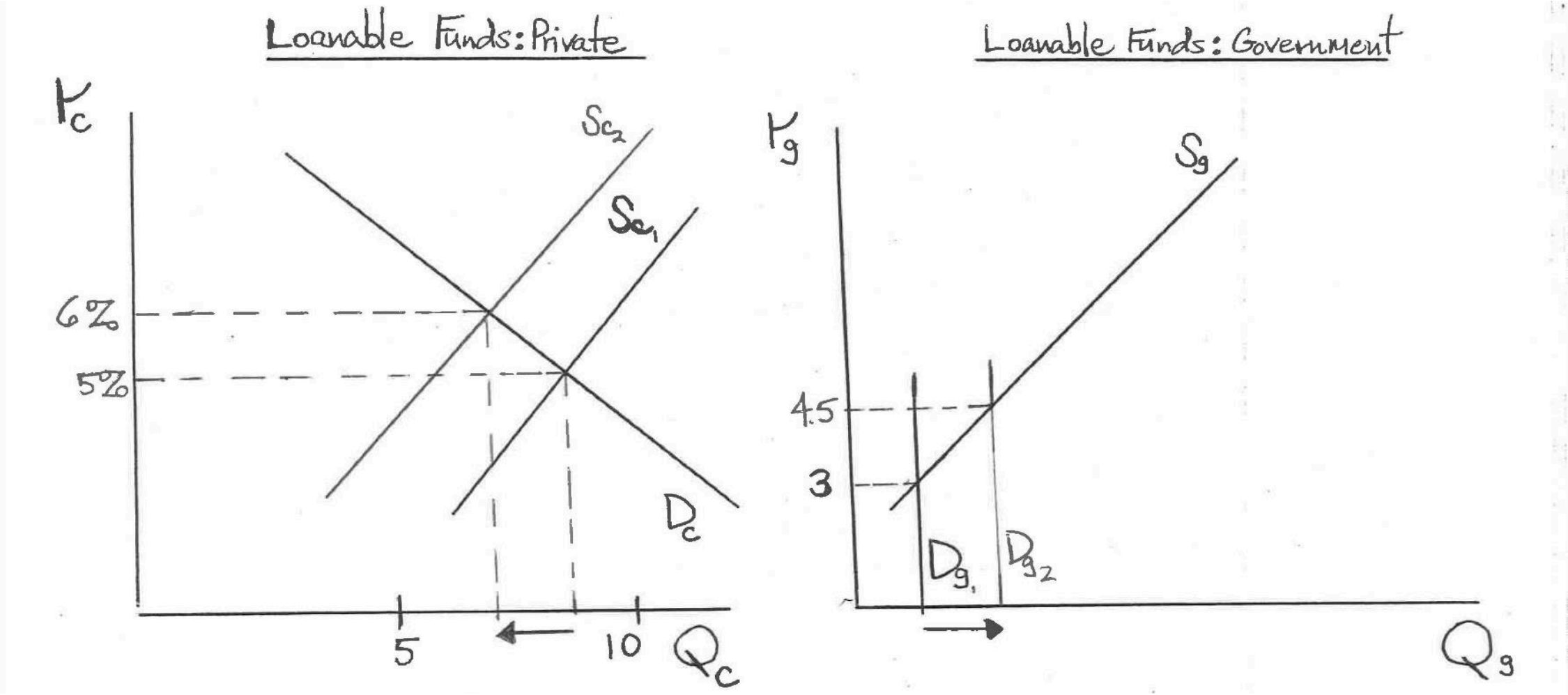


Why is D_c Downward Sloping and D_g a Vertical Line?

- **D_c, the corporate demand for loanable funds, is quite sensitive to interest rates**
  - If interest rate jumps company costs go up and can do less

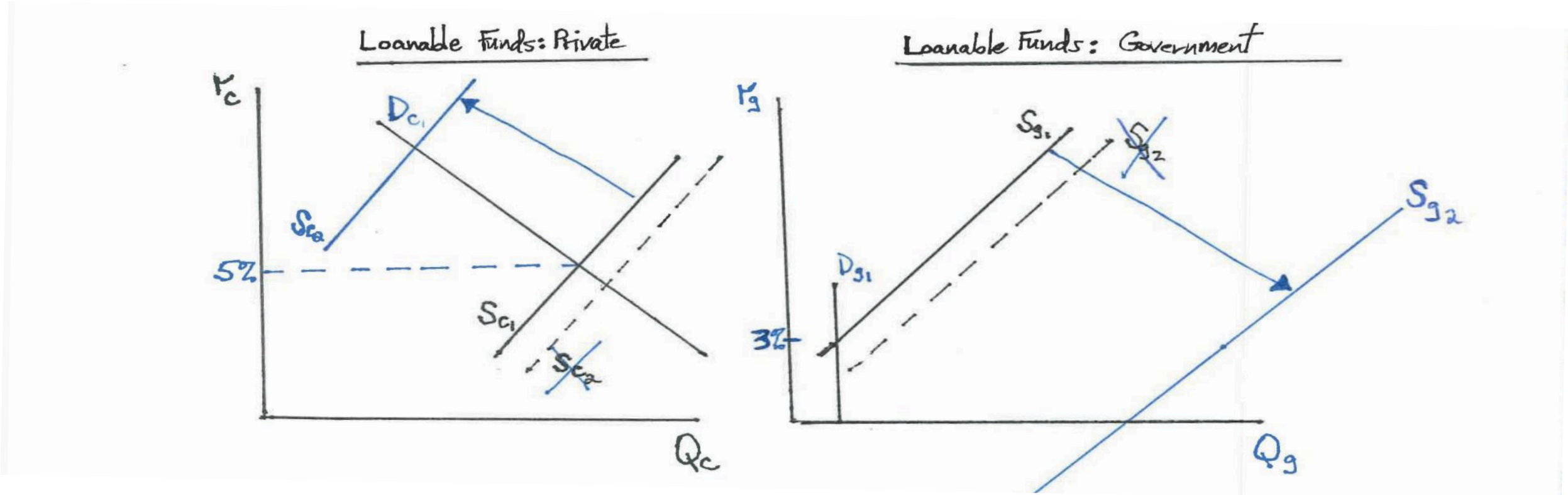
- **D_g, the government demand for loanable funds, ignores the level of interest rates**
  - Government borrows to pay for social security, defense, pay its bills, etc. **irrespective of the interest rate**

Expanding on Crowding Out



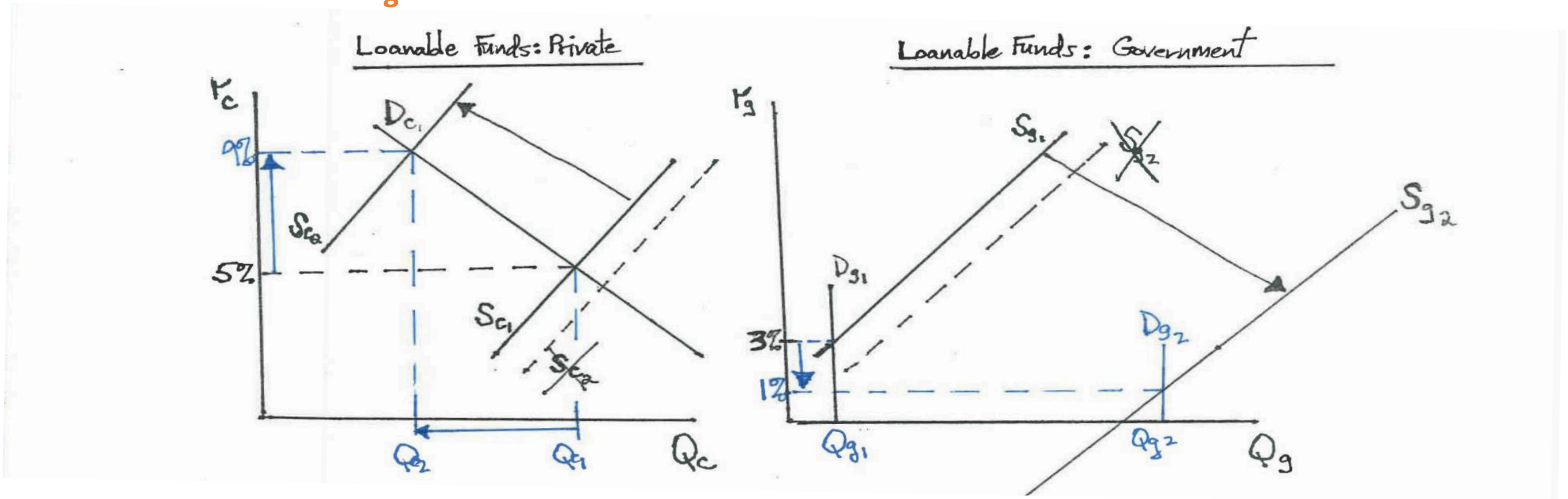
What Happens in an Economic Crisis?

- HH saving leaps. But the increased savings supply goes to **safe** government debt: **S_g soars**. Amid panic, HH radically reduce their willingness to fund corporations: **S_c plunges**



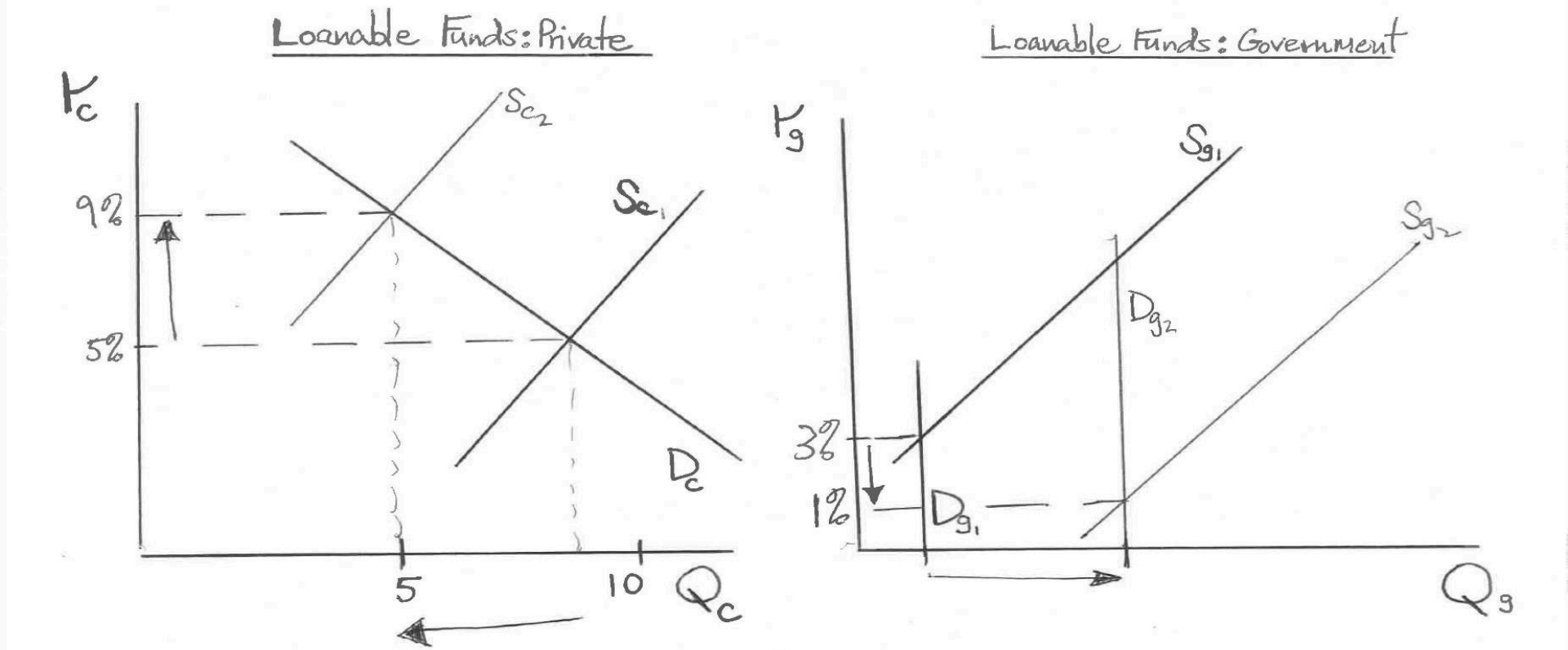
What Happens in an Economic Crisis?

- Corporate borrowing rate, r_c, **soars**, and lending to corporations, Q_c, **plunges**. Government borrowing, Q_g, **soars**, as tax collections plunge and transfers leap as a result of higher unemployment. Nonetheless, the government borrowing rate, r_g, **plunges**



Equilibrium in 2009

- r_c much higher, Q_c much lower; r_g much lower, Q_g much higher



- **Note**: The spread between risky and risk-free bonds increased significantly

We Now Have a Model in Line with the Great Recession