Understanding Financial Crises: Lessons from History

Alp Simsek

MIT

Roadmap

1. Course logistics
2. The subprime crisis of 2007-2009
3. Some lessons from the history of crises

Alp Simsek: Introduction

Associate Professor of Economics

Raised in Turkey

MIT undergraduate in mathematics and computer science

MIT Ph.D. in economics, 2010

Specialize in macroeconomics and finance

Why should you take this mini-course?

We will take an academic look at financial-banking crises:

- How often do they happen?
- Why do we care? From Wall Street to Main Street?
- Why do they happen?
- How do they get out of control?
- What to do about them?

General mechanisms. Subprime crisis as case study/empirics

Course resources and requirements

Readings

No textbook.

Lectures: 8 lectures.

Grading: Pass/Fail

Participation: 30%

Take-home exam: 70%

Distributed at the end of the last lecture. Due in 24 hours.

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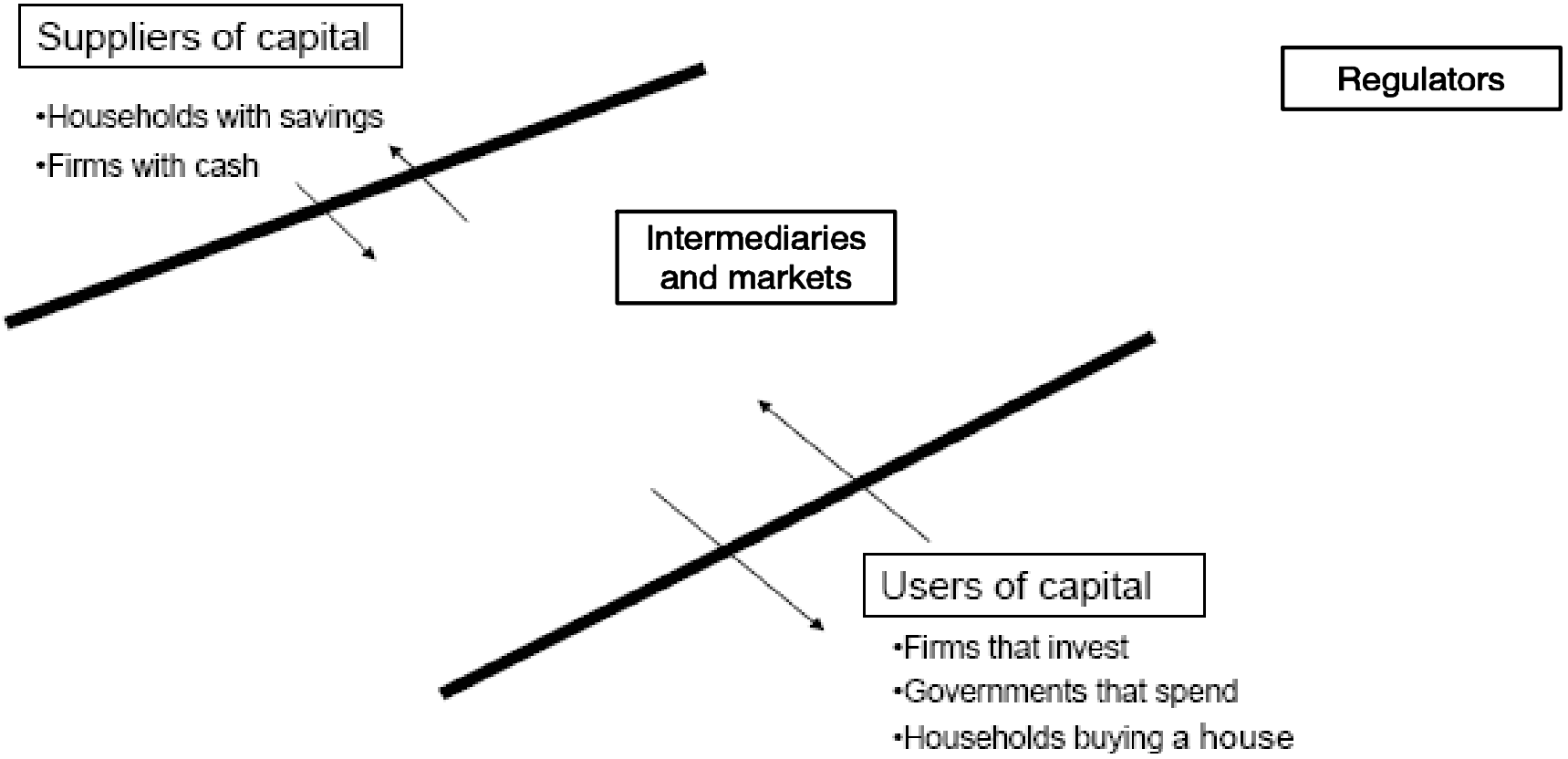
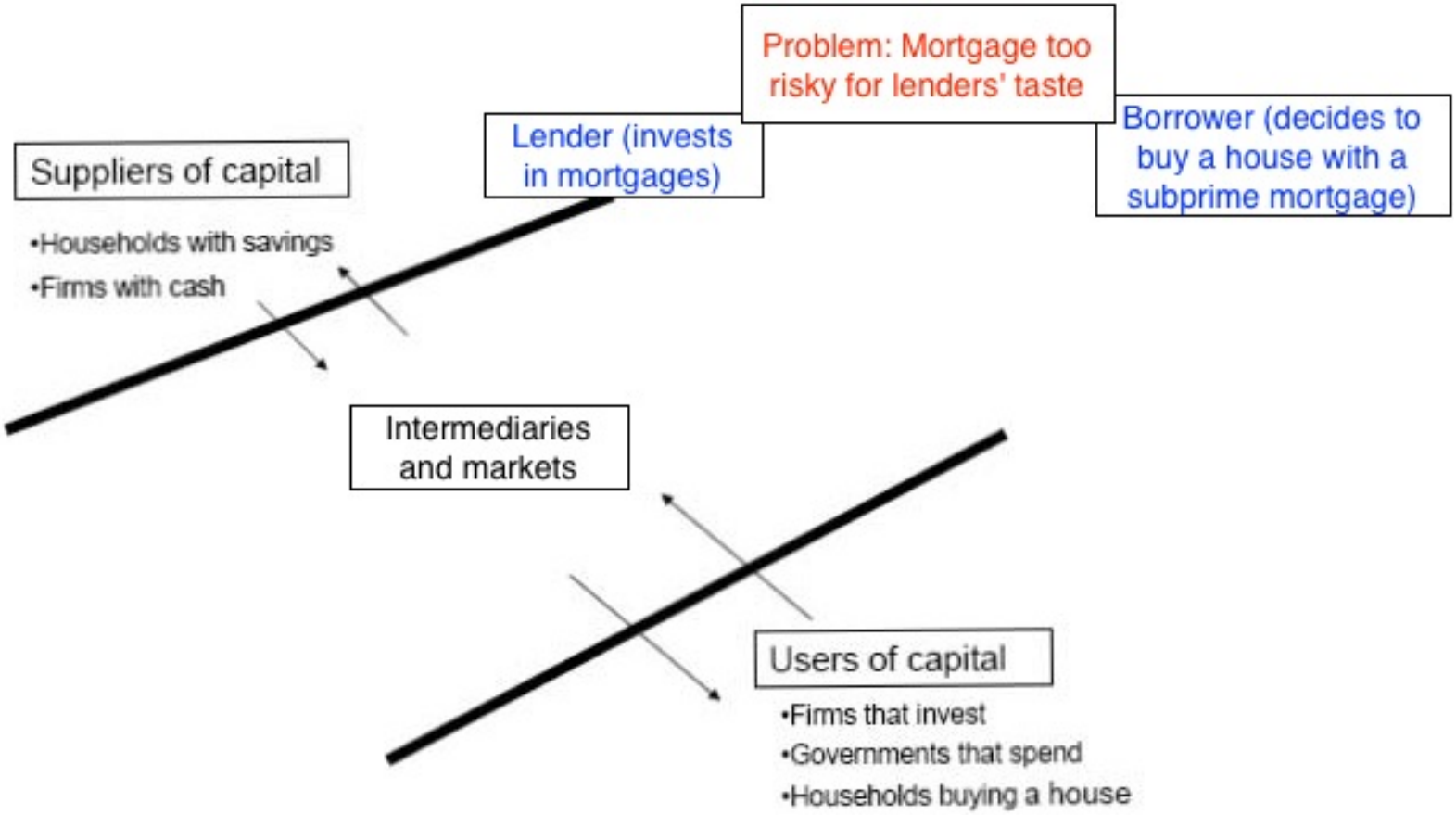
3. Some lessons from the history of crises

Financial system channels resources to uses

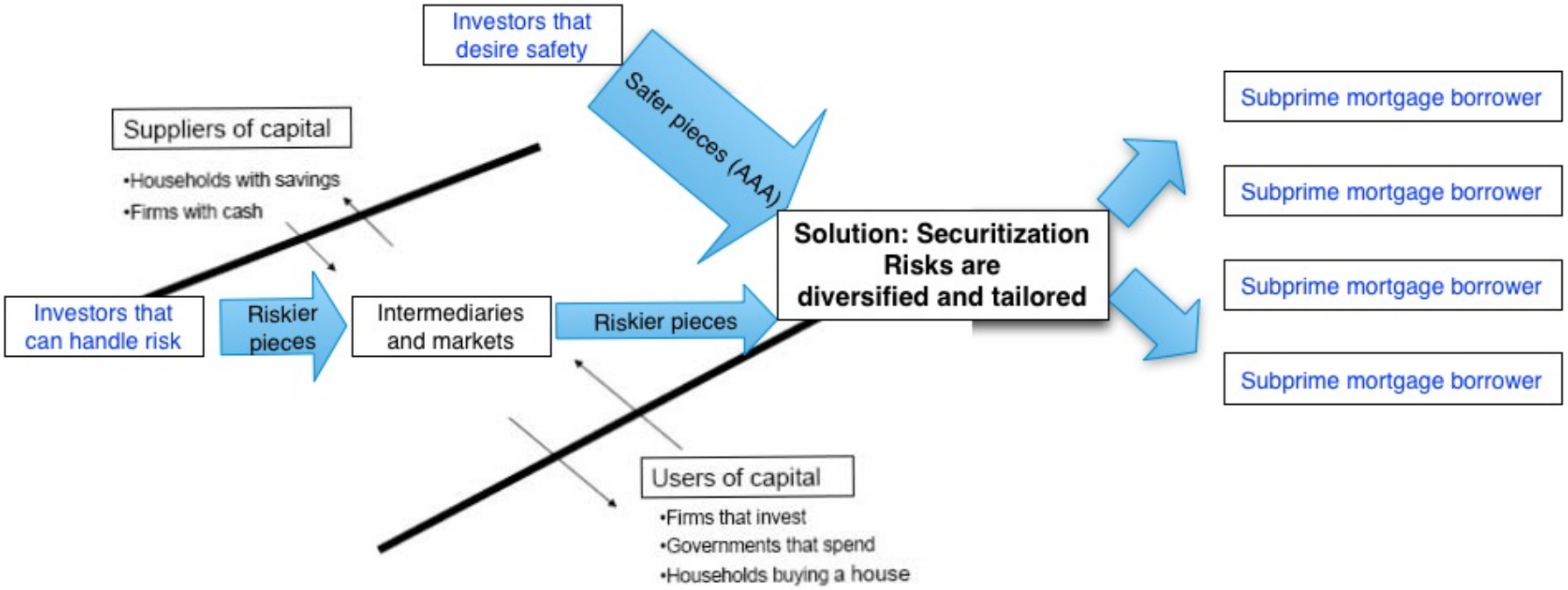


Mortgages: Loans collateralized by houses



Subprime mortgage: Borrowers with lower credit ratings.

Solution: Securitization redistributes mortgage risks



Aside: Derivatives and securitization

Derivative security: Value derives from another security.

Financial innovation created new derivatives in recent years.

An interesting example is collateralized debt obligations (CDOs).

These are constructed in two steps:

- Pool underlying securities (mortgages, but also corporate bonds, loans etc).
- Sell claims to parts of the cash flows on the pool ("tranches").

Structure of a CDO

Consider a bond with promise (or face value) of \$100.

Suppose (for simplicity) it pays \$0 in case of default.

Construct an equally weighted portfolio of many such bonds.

Create tranches by seniority:

> The most senior tranche has a face value of \$70. It pays in full unless over 30% of the bonds default, in which case it pays the remaining value of the bonds.
> The next most senior has a face value of \$15. It pays in full unless over 15% of the bonds default, in which case it pays whatever remaining value is above \$70.
> And so on until you reach the equity tranche, which has a face value of \$3 and pays only the value of the bond portfolio above \$97.

Structure of a CDO

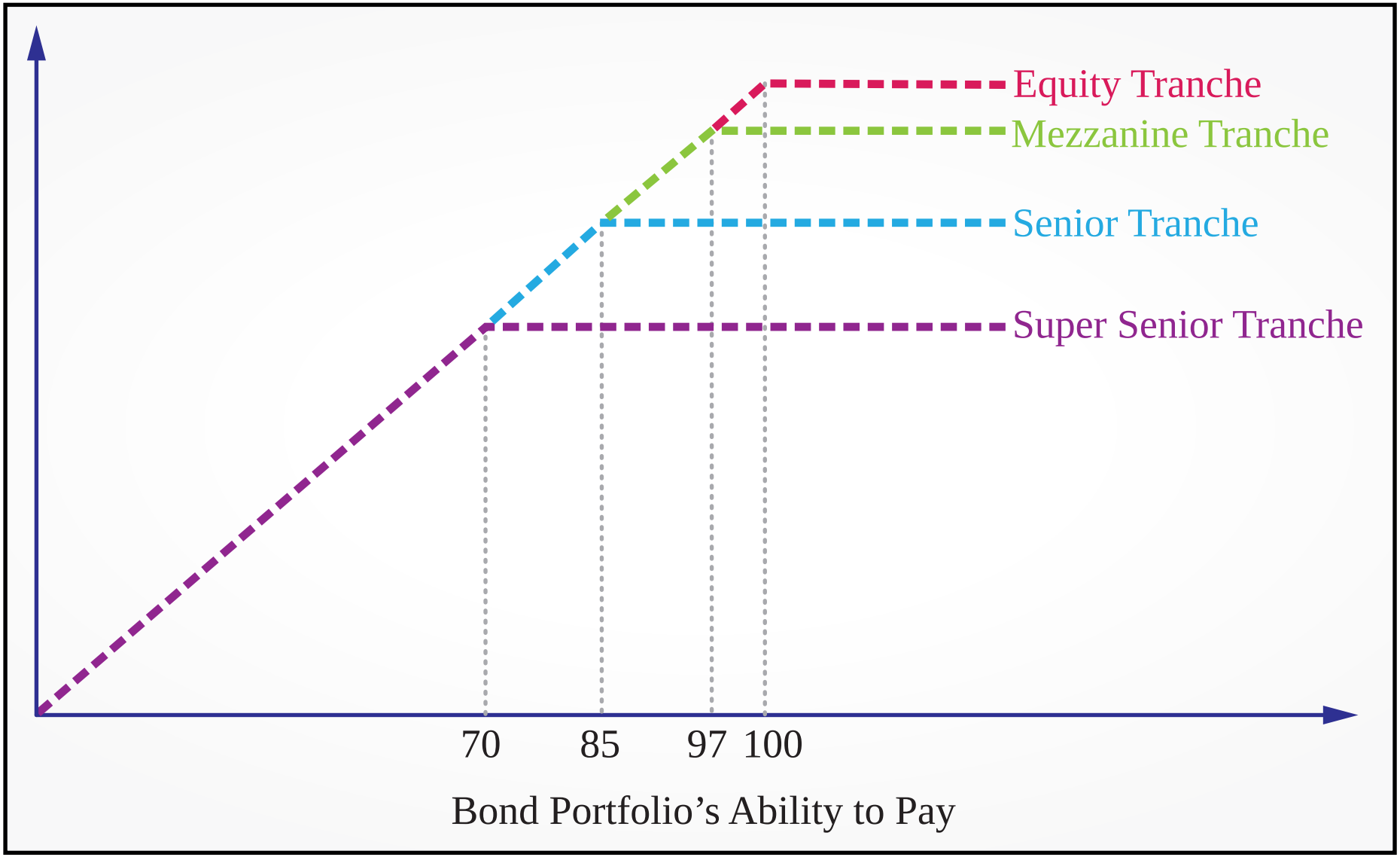


Image by MIT OpenCourseWare.

Why CDOs?

Credit rating agencies rate bonds according to probability of paying in full.

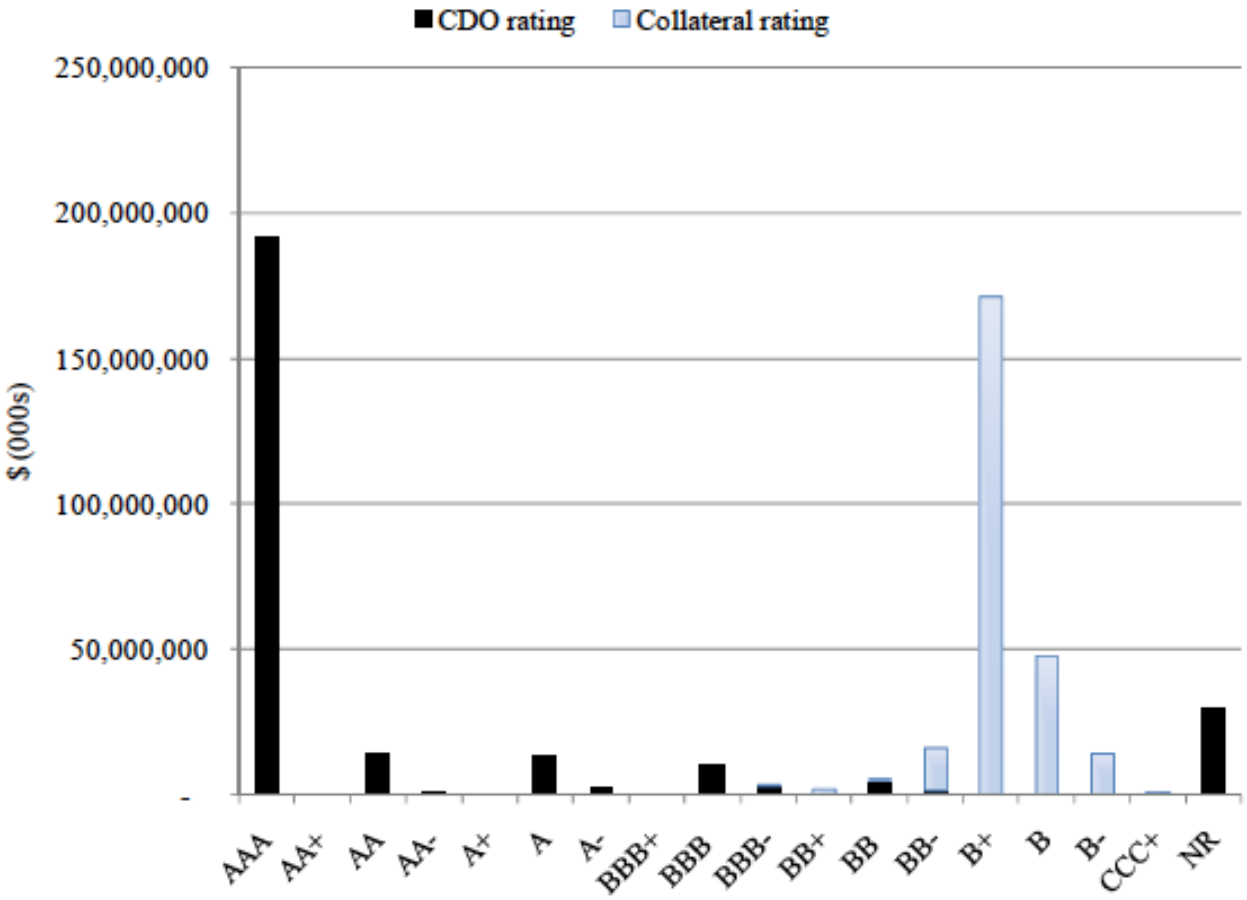
There is a scarcity of the bonds with the highest rating (AAA):

- These bonds account for only about 5% of the supply of corporate bonds,
- But many institutional investors are restricted to hold only high-rated bonds.

CDO creates a supply of AAA tranches even if no individual bond is rated AAA.

The low-rated tranches can be sold to hedge funds and other investors who are looking for high yield and can tolerate high risk.

CDO alchemy



Courtesy of Efraim Benmelech and Jennifer Dlugosz. Used with permission.

Figure: From Benmelech and Dlugosz (2009).

Are CDO ratings reliable?

Pitfalls with CDO ratings:

Unlike AAA bonds, AAA tranches of CDOs are "optimized" so that there is just enough collateral to ensure AAA rating.

Riskier than a AAA bond (marginally AAA).

In view of diversification, the risk of AAA tranches depends on the probability of a negative aggregate shock (recession, falling house prices etc.) that affects many underlying securities simultaneously.

Rating agencies are good at modeling idiosyncratic default risk. Not so good at modeling aggregate shocks (and correlations).

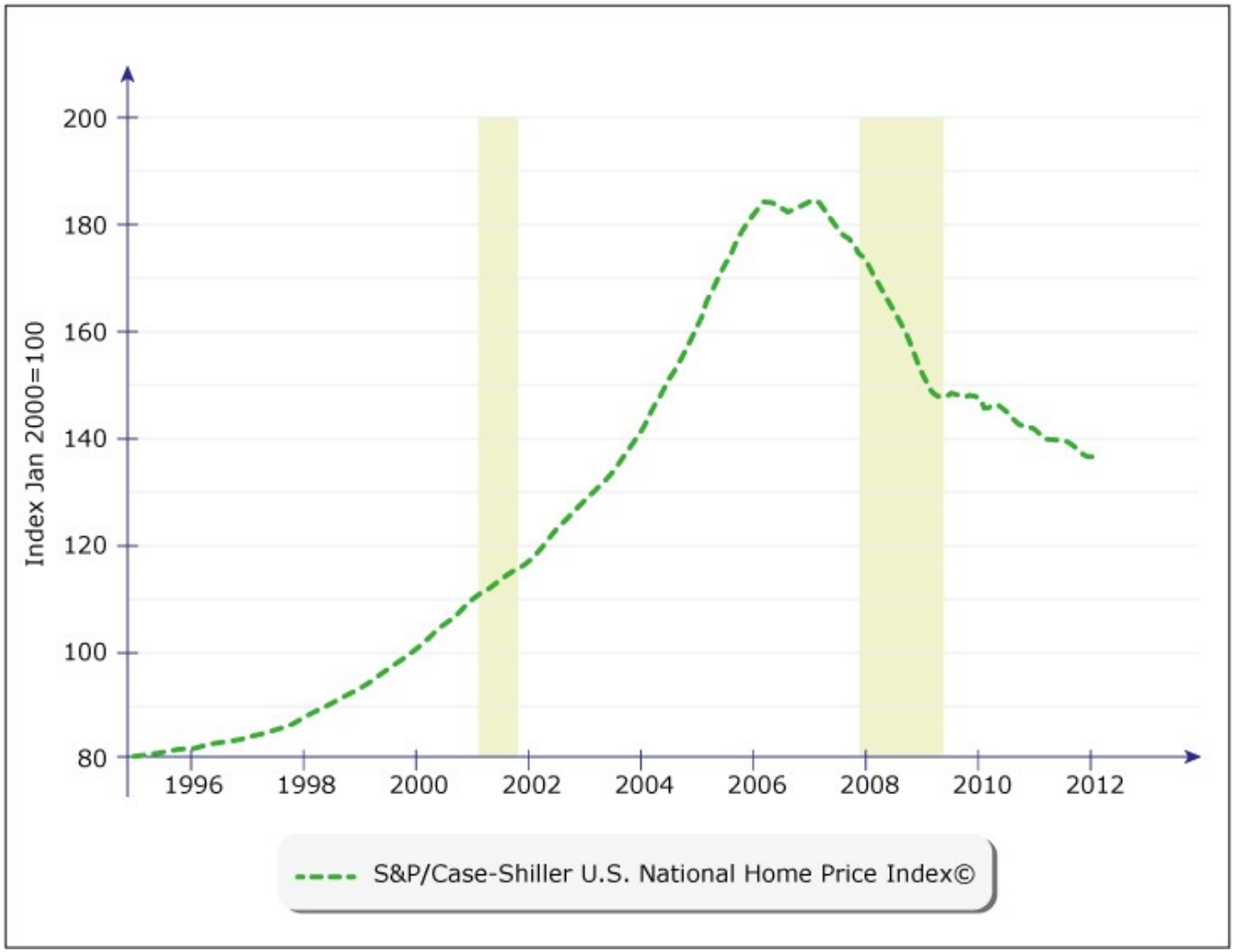
Back to story: Subprime mortgages securitized

	Total Mortgage Originations (Billions)	Subprime Originations (Billions)	Subprime Share in Total Originations (% of Dollar Value)	Subprime Mortgage Backed Securities (Billions)	Percent Subprime Securitized (% of Dollar Value)
2001	$2,215	$190	8.6%	$95	50.4%
2002	$2,885	$231	8.0%	$121	52.7%
2003	$3,945	$335	8.5%	$202	60.5%
2004	$2,920	$540	18.5%	$401	74.3%
2005	$3,120	$625	20.0%	$507	81.2%
2006	$2,980	$600	20.1%	$483	80.5%

Image by MIT OpenCourseWare.

This is vulnerable to a drop in nationwide house prices. Why?

House prices rose and then fell...



Defaults and delinquencies increased

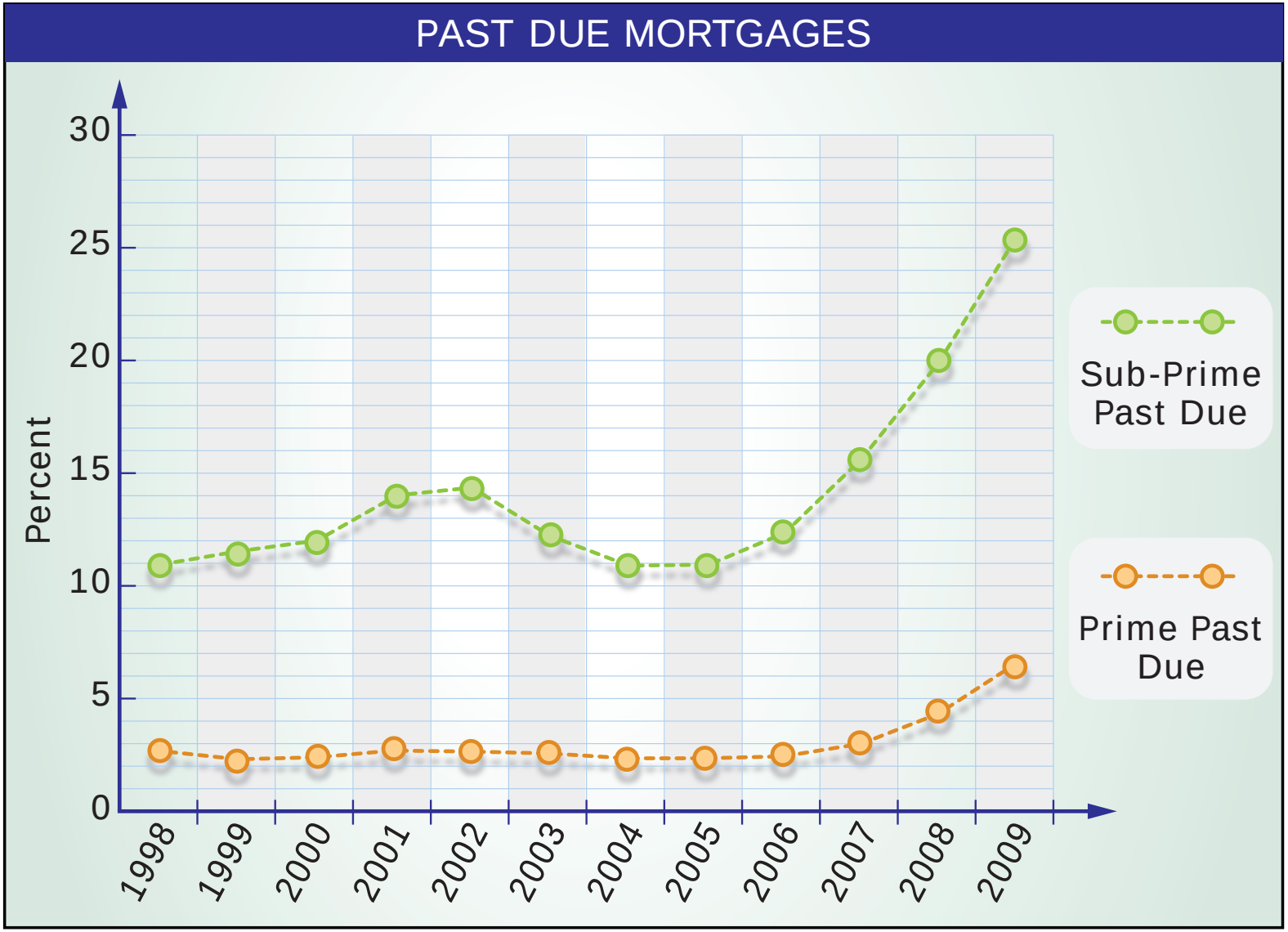


Image by MIT OpenCourseWare.

Markets recognized risks in AAA tranches

Figure: From Brunnermeier (2009).

Courtesy of Markus K. Brunnermeier. Used with permission.

The spreads are calculated from CDS prices. They provide a measure of the default probability for corresponding tranches.

Aside on credit default swaps (CDS)

A CDS is an insurance contract on the default of a particular bond.

For example, suppose you own a corporate bond from company XYZ with principal $1,000. If company XYZ defaults, you might get back $500 instead of $1,000.

You may buy a CDS for XYZ from someone (CDS seller). In this case, you will definitely get $1,000.

If XYZ defaults, the CDS seller pays you $1000 (in exchange for the bond) so that your total of $1000 is guaranteed.

You "swap" the default risk with the CDS seller.

Example

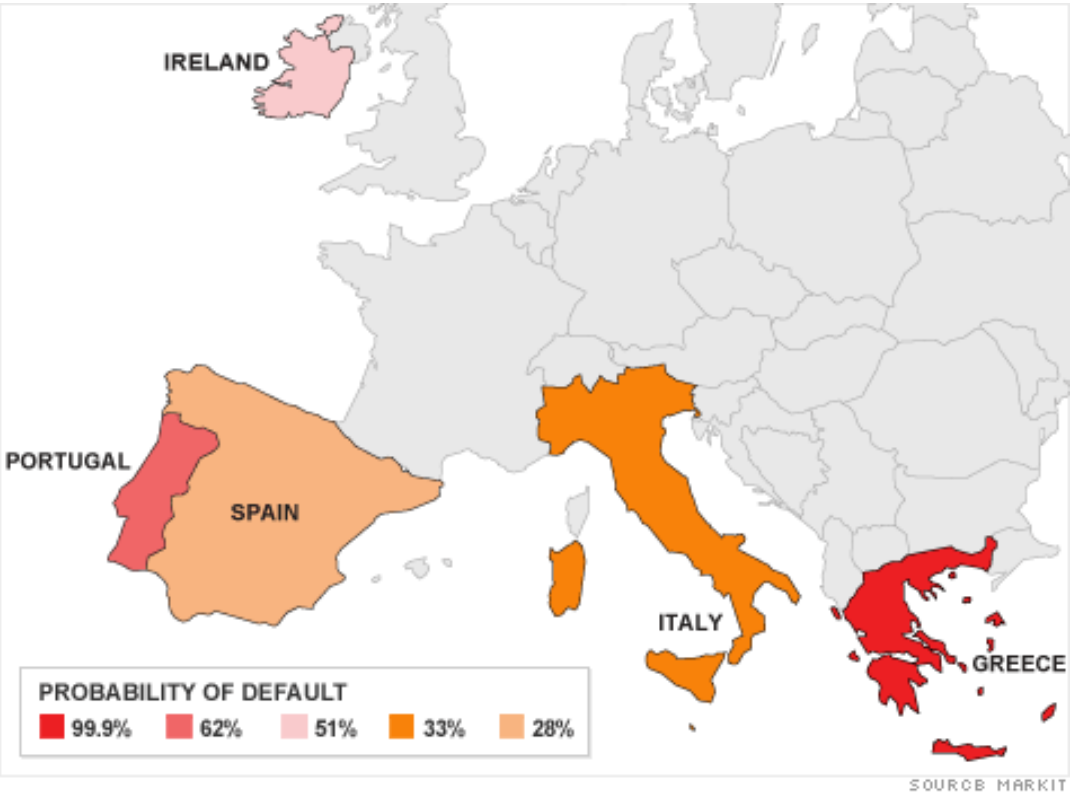
In October 2008, the 5-year CDS rate on Morgan Stanley debt with face value \$10,000 was \$1,000.

This means that you could enter a swap where you paid \$1,000 a year for five years, and in return you get payment \$10,000 if MS defaults (in exchange for the MS bond).

This price provides a measure of the probability that MS will default. For example, if the recovery rate on MS debt is 50% (in a default, MS would only pay fifty cents on the dollar), this (roughly) implies:

> 20% chance that Morgan Stanley would default in the next year,
> About 70% chance of default in the next five years.

CDS during the Euro-debt crisis



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Estimated probability of default on sovereign bonds over the next five years in September 2011 (CNNMoney article on September 16).

Back to story: Markets recognized risks

Courtesy of Markus K. Brunnermeier. Used with permission.

Figure: From Brunnermeier (2009).

Key aspect: Some financial institutions made losses

Krishnamurthy (2010), "How Debt Markets Have Malfunctioned in the Crisis."

Table 3

Losses, by Financial Institution and Debt Instrument

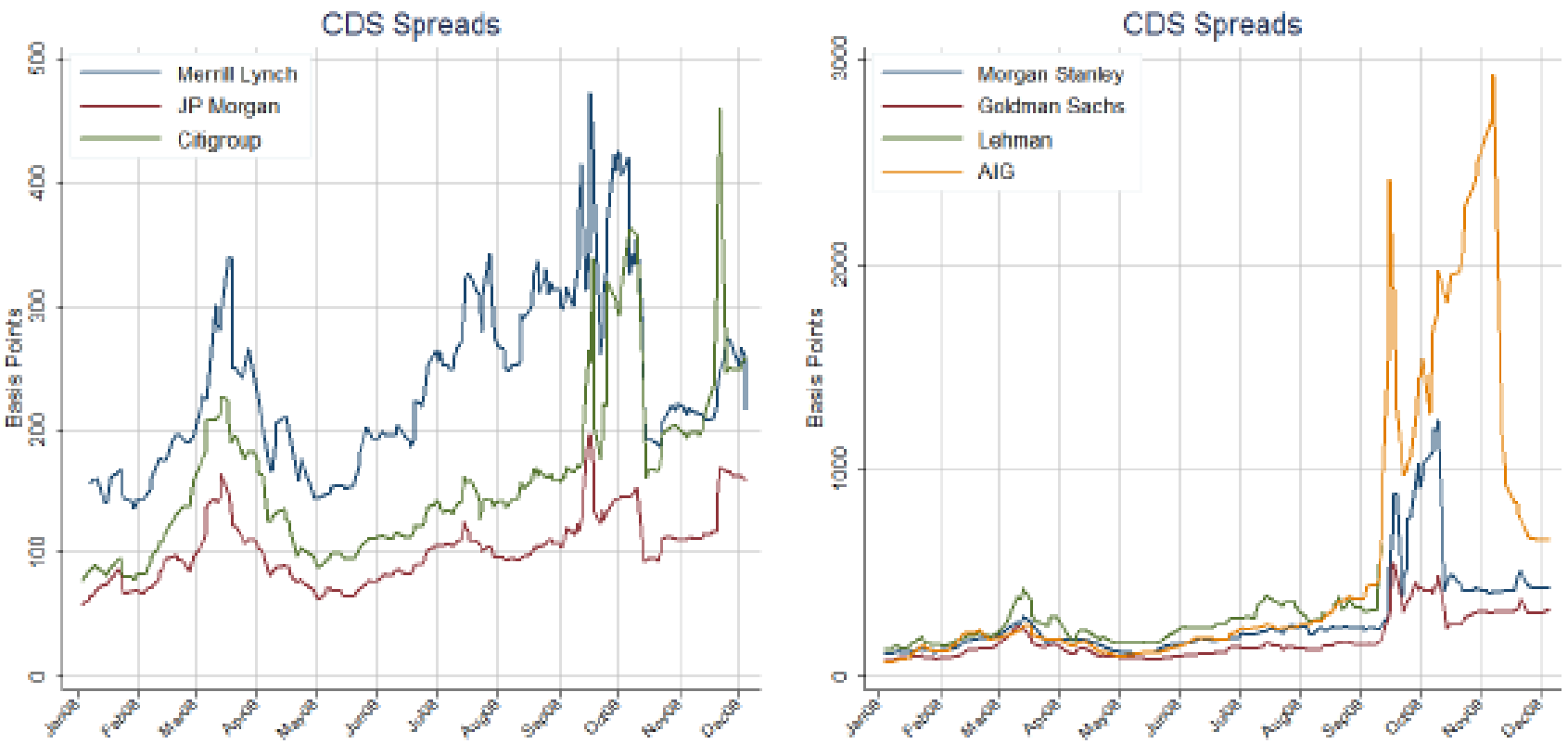
(billions of dollars)

	Amounts outstanding ($ billions)	*Estimated losses and write-downs ($ billions)*		
		Banks	*Insurers*	*Hedge funds + other*
Real estate loans	7,100	150	15	40
Asset-backed securities (ABS) + collateralized debt obligations of ABS	2,150	260	110	40
Prime mortgage-backed securities	3,800	20	10	< 5
Commercial mortgage-backed securities	940	85	25	20
Corporate debt + collateralized loan obligations	4,650	135	40	30
Total	**17,920**	**650**	**200**	**135**

Source: IMF *Global Financial Stability Report*, October 2008, Table 1.1.

Courtesy of the American Economic Association. Used with permission.

Their default risks increased



Courtesy of Markus K. Brunnermeier. Used with permission.

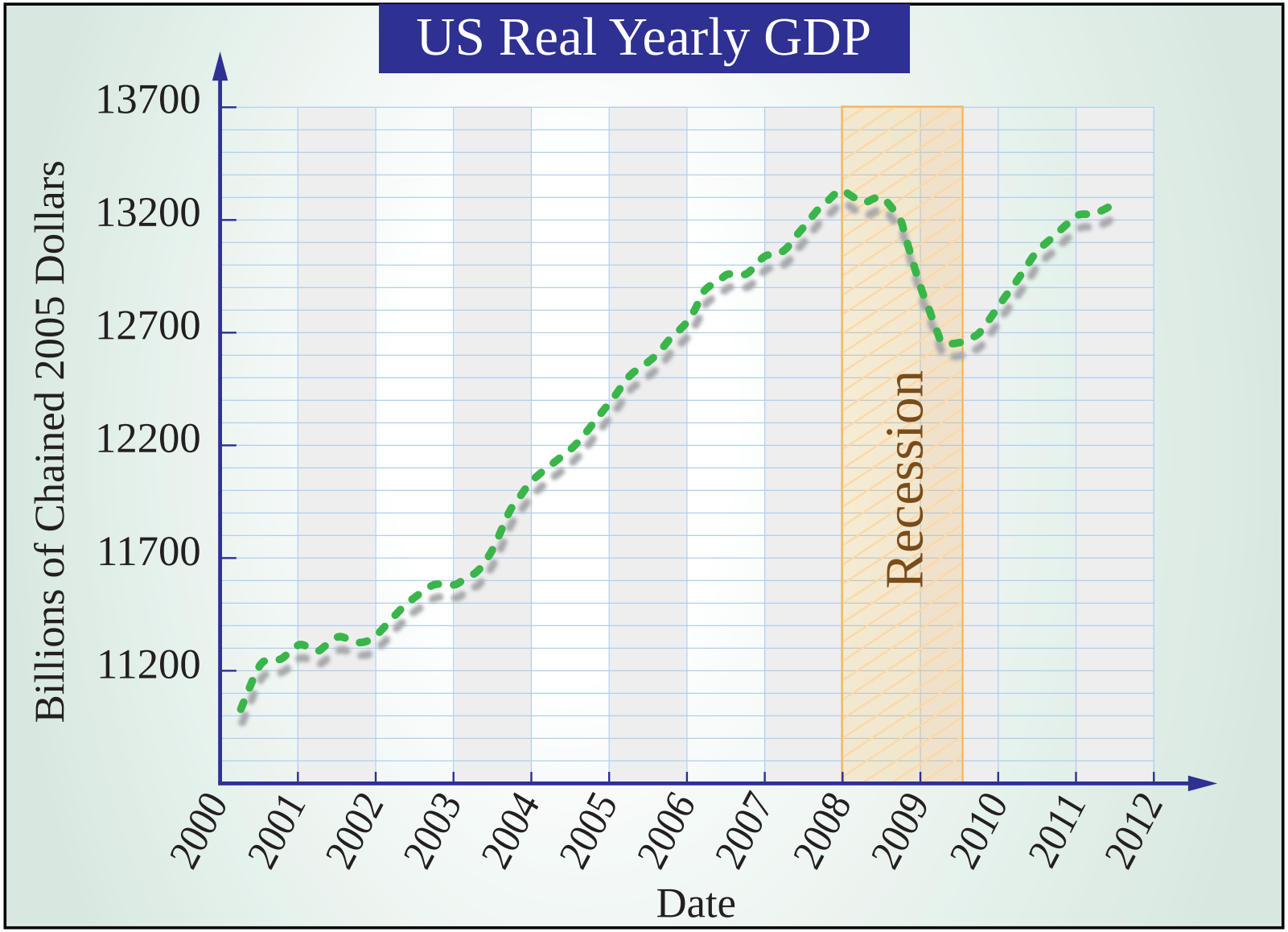
Figure: From Brunnermeier (2009).

Some of them became bankrupt

Some others (Bear Sterns, Freddie, Fannie, AIG...) were bailed out with government support.

Stock market crashed

The US economy entered the Great Recession



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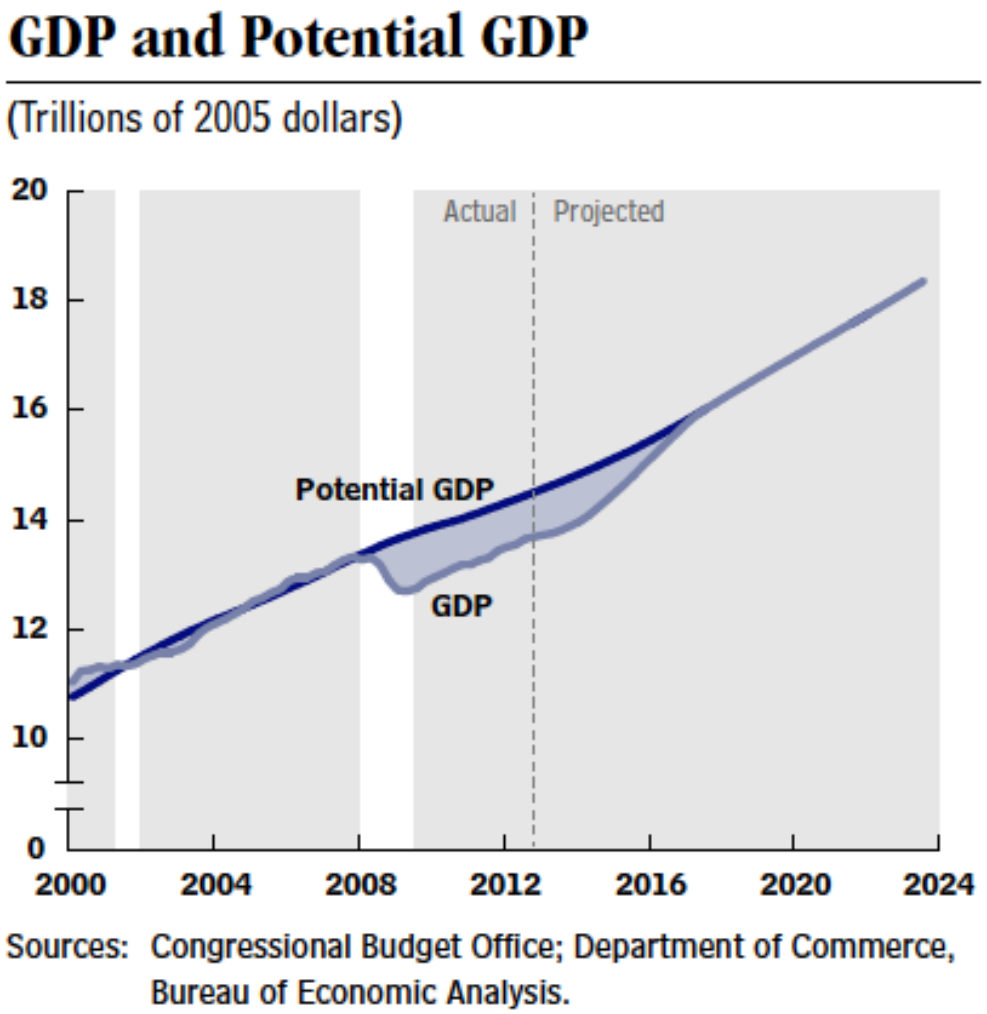
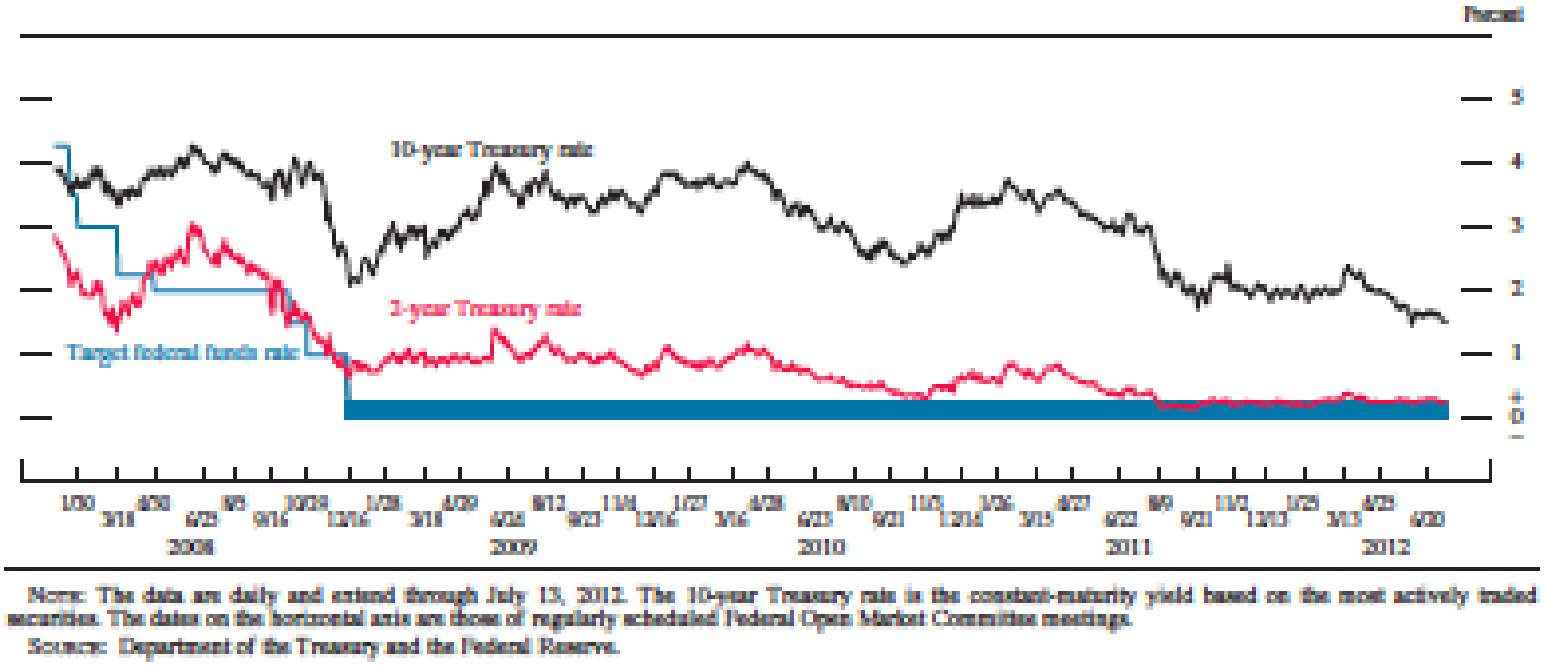
Economic activity fell below potential



Courtesy of the Congressional Budget Office. This work is in the public domain.

Triggered strong policy response by the Fed and the treasury.

Monetary policy appears to be constrained

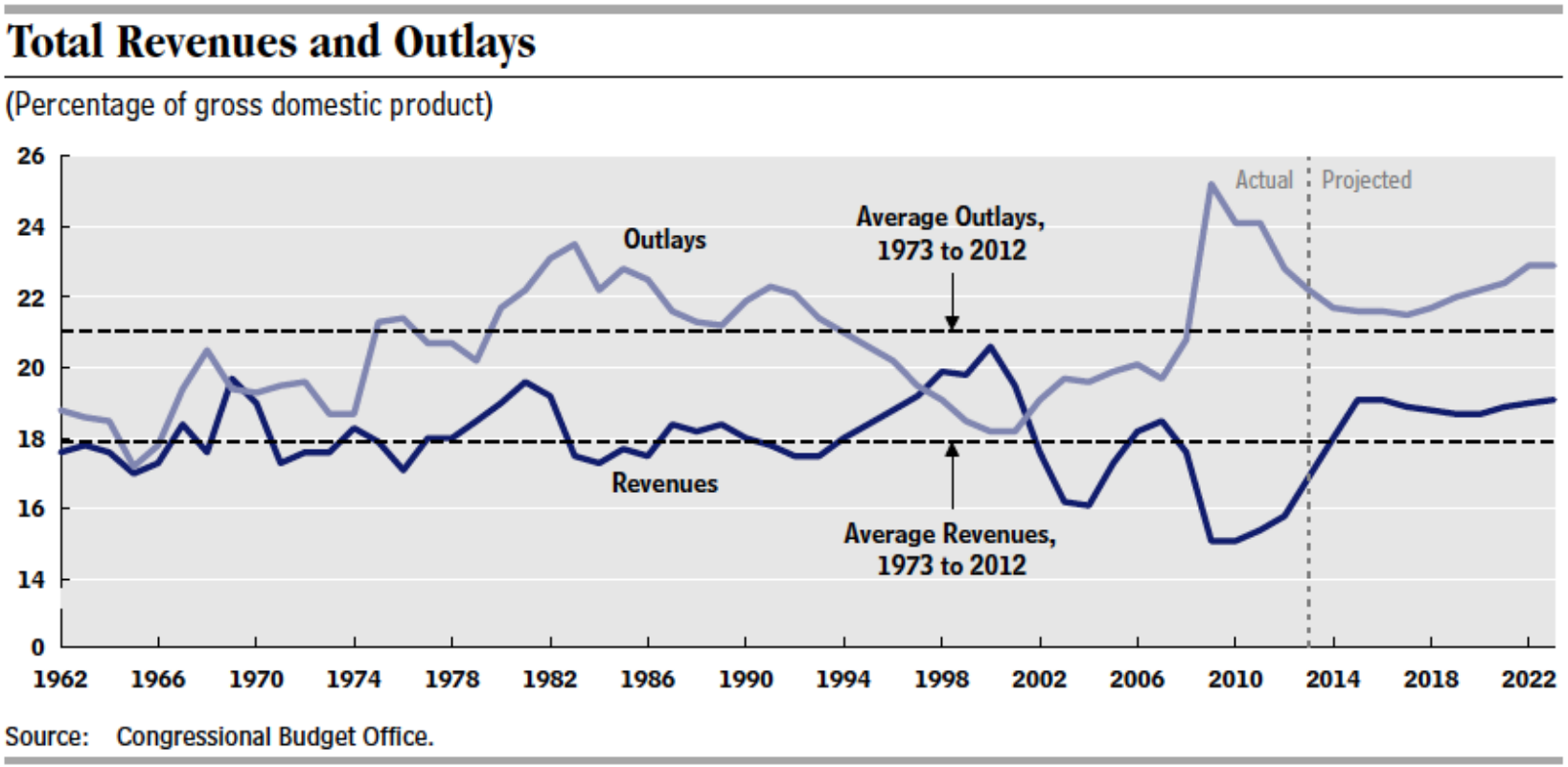


Courtesy of the Board of Governors of the Federal Reserve. This image is in the public domain.

Triggered unconventional policies: Quantitative easing etc.

Triggered also bailouts and stabilizers, which raised deficits....

Fiscal policy steps in, raising government deficits



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The shock seemed small relative to damage

- One feature of the subprime crisis is that the initiating shock seemed to be small relative to the ultimate damage it caused.
- Blanchard (2009, "The Crisis: Basic Mechanisms and Appropriate Policies") notes that:
    - The estimated losses in the U.S. subprime market in October 2007 was around $250 billion dollars
    - The cumulative world output loss relative to trend between 2008 and 2015 (based on IMF estimates) was around $4700 billion dollars. About 20 times the initial loss in the subprime market!
    - The cumulative loss in the world stock markets from July 2007 to November 2008 was about $26400 billion. About 100 times the initial loss!

The mystery of the subprime crisis: Whodunit?

The subprime crisis features many candidates for a culprit:

Extension of subprime loans by banks, e.g., lax lending standards.

Securitization and the CDOs.

Rating agencies.

CDS (looks innocent so far, but still a key character)

Large financial institutions that made the losses.

Government (Fed+treasury) suport or bailout of banks

In fact, books written (movies made) about each candidate.

But economics is about prioritizing & focusing on first order.

Where should we focus our efforts? Some history could help...

Roadmap

1. Course logistics
2. The subprime crisis of 2007-2009
3. Some lessons from the history of crises

Lessons from history: Crises are "universal"

Allen and Gale (2009): Crises are "universal" phenomena.

They happened in different periods and in different countries.

They happened in developing and developed countries.

AG discuss Bordo et al. (2001), who analyze the incidence of crises in 21 countries over 120 years.

Banking crises: Erosion of most banking capital.
Currency crises: Forex attacks and devaluation (not our focus).
Twin crises: Both at the same time...

Bordo et al. (2001) find that:

Banking crises are relatively common in most time periods (except for 1945-1971---highly regulated)

They also happen in developed countries--albeit less frequently

Their aftermath is typically associated with severe output losses.

Schularick-Taylor (AER, 2012) analyze the relationship between banking crises and output more systematically...

Schularick-Taylor (AER, 2012):

They date 79 banking crises (denoted by year 0 in the figure) and analyze the evolution of investment and output in their aftermath.

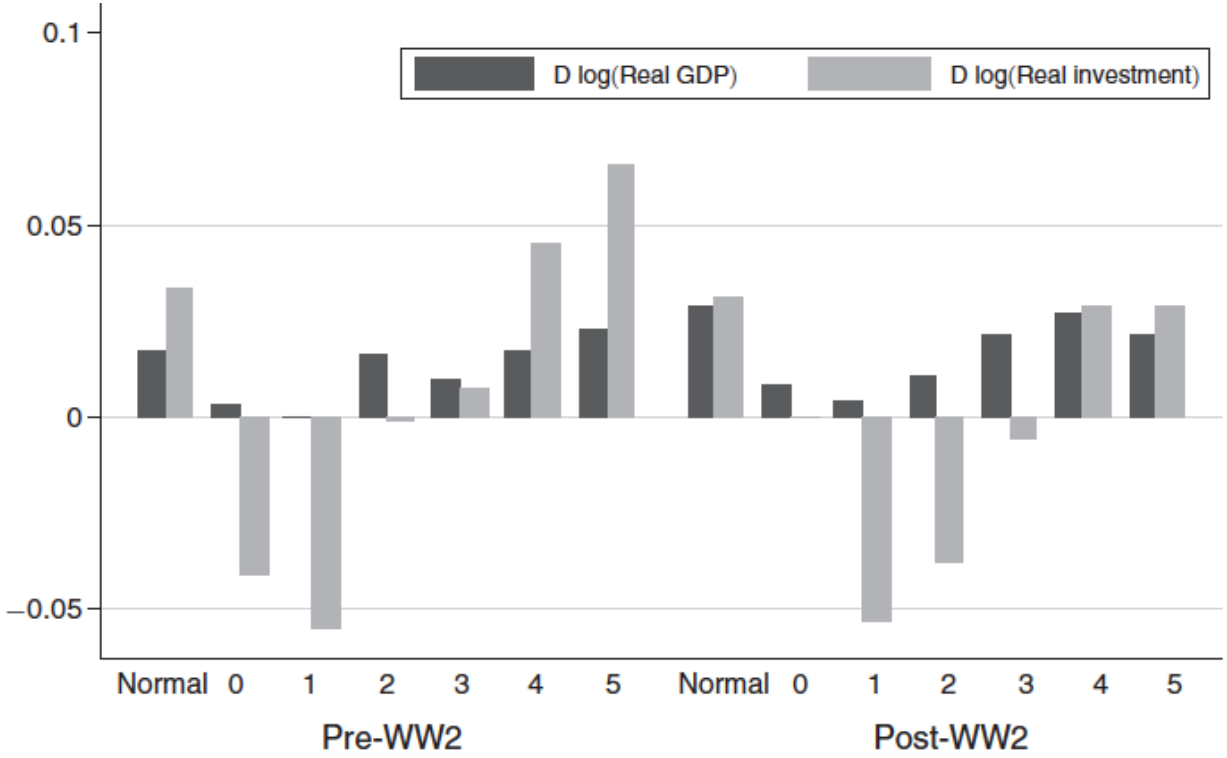

FIGURE 5. REAL VARIABLES (*Postcrisis Periods Relative to Normal*)

Courtesy of Moritz Schularick and Alan M. Taylor. Used with permission.

Severe drops in investment and output, partial recovery.

Cerra and Saxena (AER, 2008) do a similar analysis as Schularick-Taylor using an alternative data set that covers 190 countries between 1960-2001.

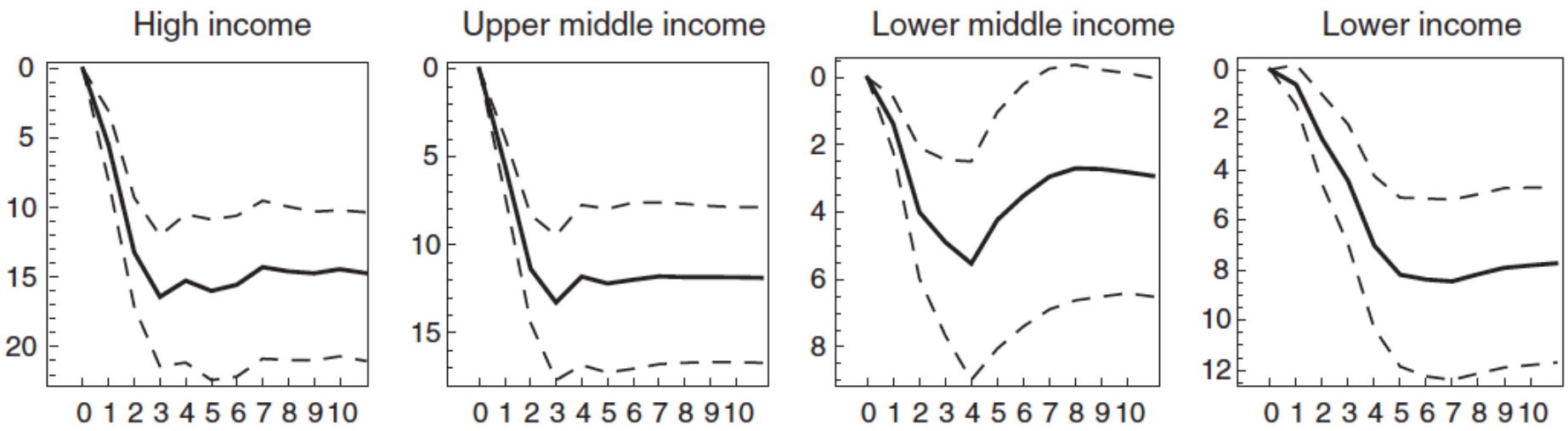

FIGURE 4. IMPULSE RESPONSES: BANKING CRISES

Courtesy of Valerie Cerra and Sweta Chaman Saxana. Used with permission.

They find much more persistent effects, little recovery.

Lessons from history: Optimism/bad news

- Cerra-Saxena also find optimism during the crisis. Growth forecasts systematically revised downwards as crisis unfolds.
- In their popular book, "This Time is Different," Reinhart and Rogoff also emphasize optimism before and during crises.
- As we will see, optimism was also arguably widespread before and during the subprime crisis.

Examples from recent history

Read Allen and Gale (2009) for a brief discussion of recent crises:

- Scandinavian crises (Norway, Finland, Sweden) of early 1990s.
- The Japanese crisis of early 1990s
- Asian crises of late 1990s (Asian "dragons" & "tigers"):
- Russian default of 1998 and the LTCM mini-crisis in the US.
- The Argentina crisis of early 2000s.

Lessons from history: Summary

History suggests:

Banking crises are common. Can happen in developed economies.

The following features are also quite common in crises:

2. Crises are typically followed by large drops in output.
3. Crises are associated with ex-ante optimism/ex-post bad news.

Back to the subprime crisis: Whodunit?

Recall that we had the following candidates for blame:

Extension of subprime loans by banks, e.g., lax lending standards.

Securitization and the CDOs.

Rating agencies.

CDS (looks innocent so far, but still a key character)

Large financial institutions that made the losses.

Government support of bailout of banks

Common denominator: Banks and the government

Universality suggests points 1-4 might not be so central:

Banking crises happened without subprime, CDOs, rating agencies, CDS....

In contrast, point 5 appears to be a common feature of crises.

> Severe financial events that don't involve banks need not generate crises. The bust of the NASDAQ bubble in 2001 wiped out a lot of wealth (more than subprime). But banks were not exposed. Only mild recession.

Point 6 is also in the mix. Most episodes feature gov support.

Roadmap for the rest of the course

We made a tiny bit of progress, but several issues remain:

Transmission: How do banks' problems affect the economy?

Amplification: How do "small" shocks generate large damage?

Causes: What are the ultimate causes of **bank losses**?

Panics: Why are crises often associated with a panic?

What is the role of **optimism/bad news** in losses or panics?

Solutions: Optimal policy during a crisis? How about before?

Roadmap for the rest of the course

Lecture 2: Borrowing constraints and the net worth channel

Lecture 3: Leverage, fire sales, and amplification mechanisms

Lecture 4: Understanding banks' losses: Moral hazard or mistakes

Lecture 5: Liquidity, part 1: Maturity mismatch and banking panics

Lecture 6: Liquidity, part 2: Debt, information-based panics, and flight to quality

Lecture 7: Interconnections and complexity.

Lecture 8: Optimal policy: How to mitigate or prevent crises?

For review, read the chapter by Allen and Gale (2009).

For tomorrow, read the intro of Holmstrom and Tirole (1997).

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