Global Financial Systems
Chapter 10
Credit Markets

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To accompany
Global Financial Systems: Stability and Risk
http://www.globalfinancialsystems.org/
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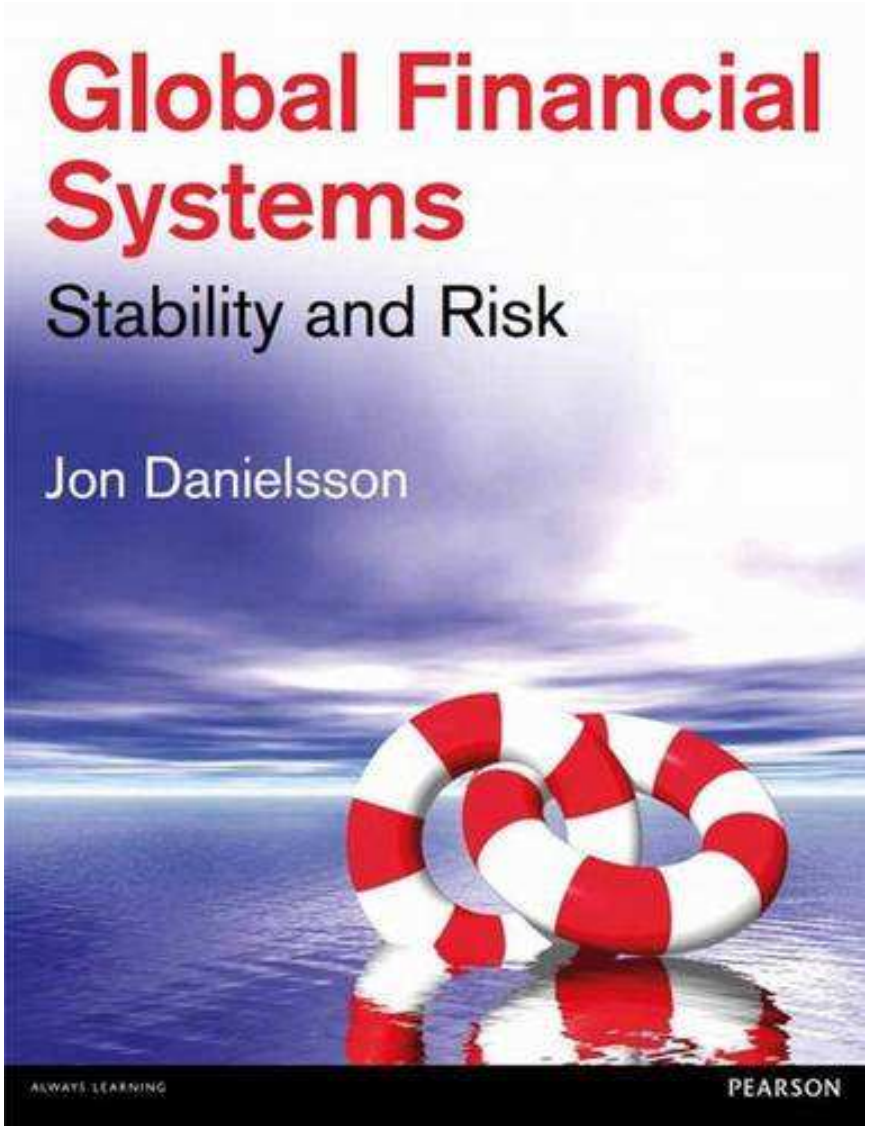
Book and slides



- The tables and graphs are the same as in the book
- See the book for references to original data sources
- Updated versions of the slides can be downloaded from the book web page

  `www.globalfinancialsystems.org`

Credit Markets

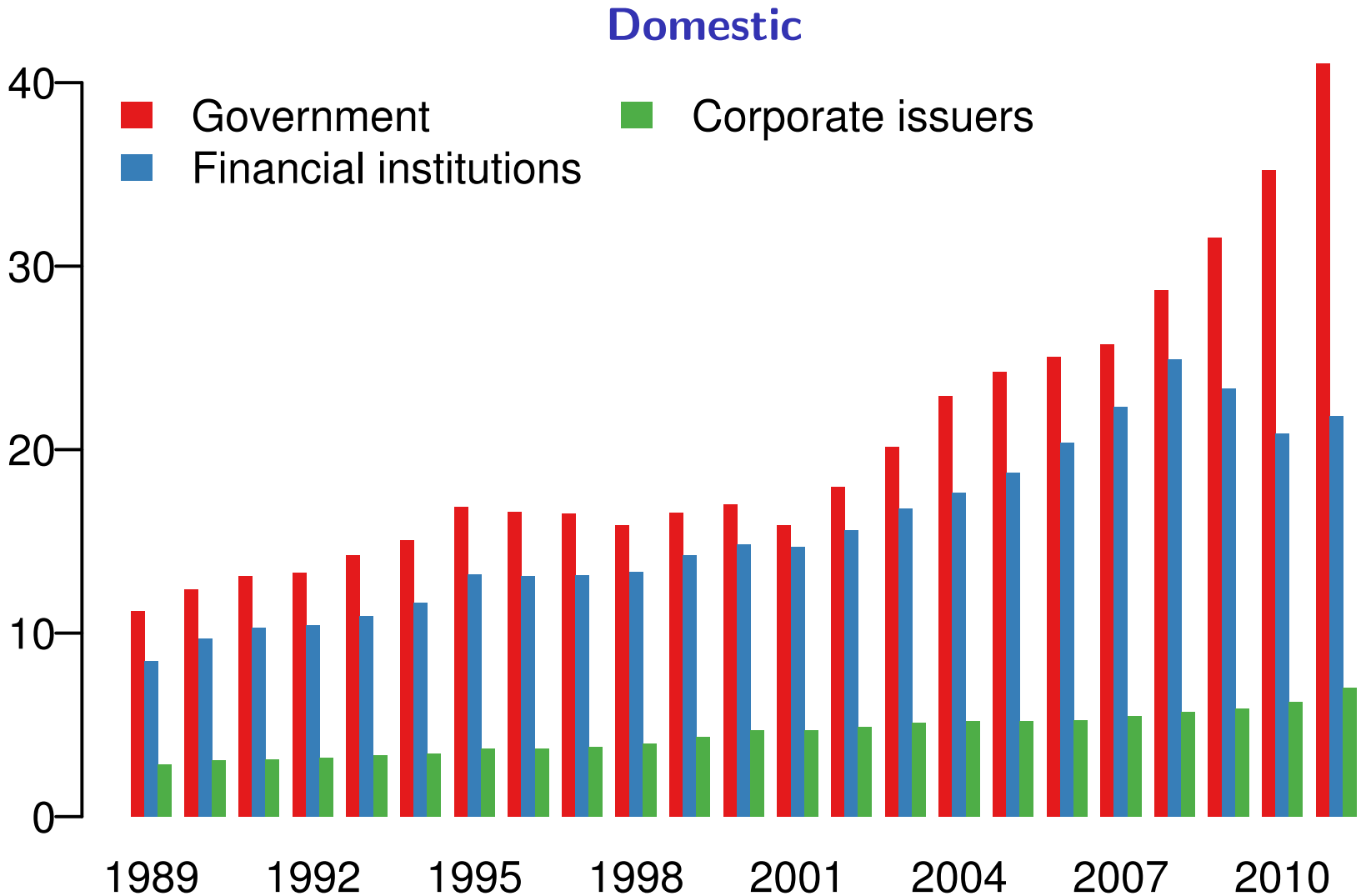
Where is the risk?

- Newspapers report equity markets (S&P 500, FT100, DAX, CAC40, NIKKEI, etc.)
- But the fixed income markets are much larger

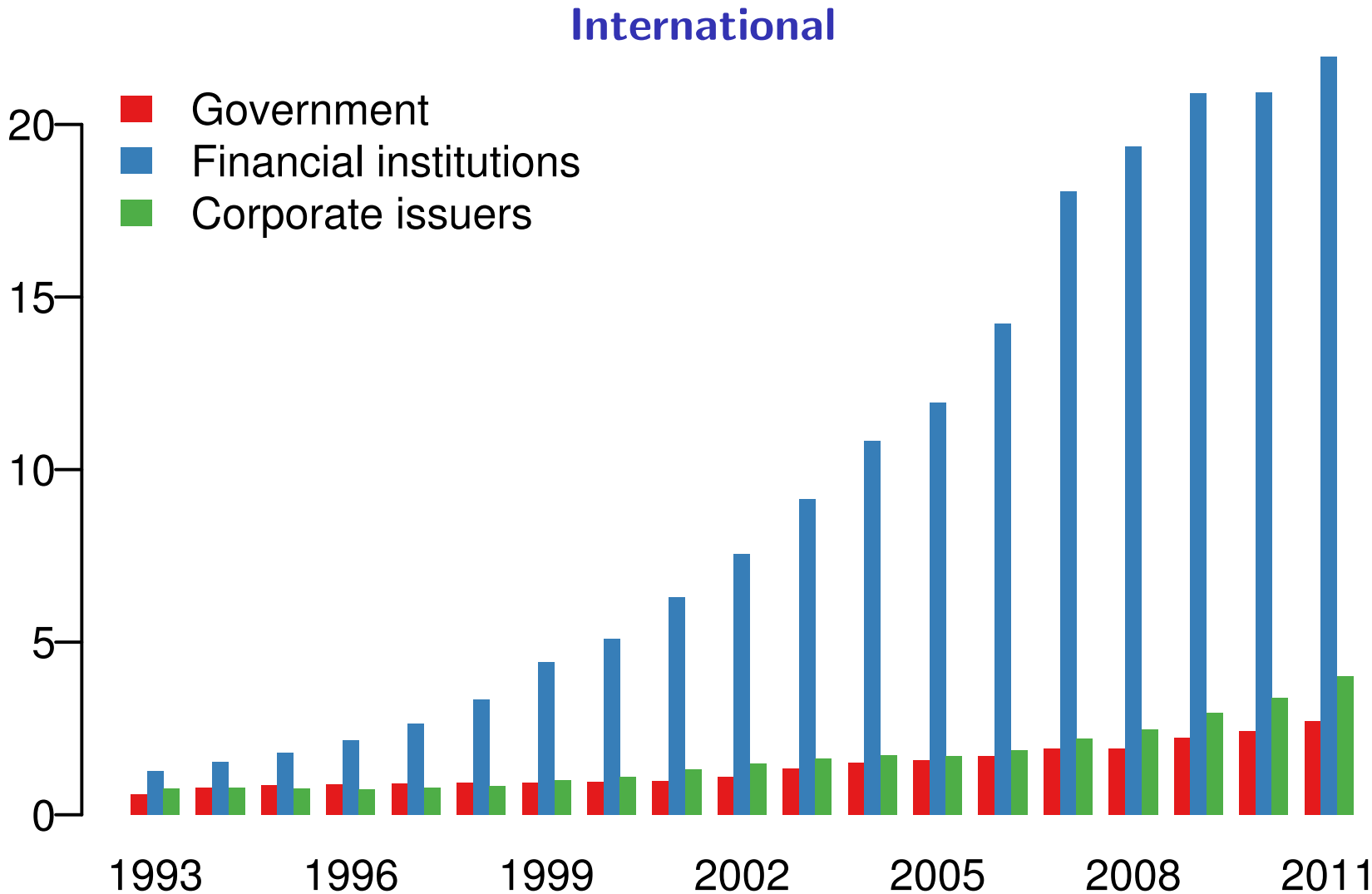
Fixed income assets

- Provide payments on a fixed schedule
- Involving creditor(s) and debtor(s)
- Many categories, e.g.
  - plain vanilla bonds
  - loans
  - credit derivatives
- Usually traded in OTC markets
- Volume dwarves equity markets
- And are much more important

Outstanding bond volumes, 2011 prices. USD trillion



Outstanding bond volumes, 2011 prices. USD trillion



Outstanding bond volume June 2011. USD trillions

	Domestic			International		
	Gov.	FI	Corp.	Gov.	FI	Corp
US	11.61	10.94	2.93	0.01	5.48	1.84
Japan	12.09	1.18	0.90	0.00	0.36	0.05
France	1.94	1.32	0.31	0.07	1.74	0.46
Italy	2.17	0.78	0.38	0.27	1.12	0.11
China	1.49	1.05	0.60	0.00	0.09	0.02
Germany	1.92	0.52	0.41	0.34	2.47	0.15
UK	1.38	0.31	0.02	0.12	2.83	0.32
Rest	8.46	5.72	1.48	1.86	7.88	1.02

Bond pricing

$$P = \sum_{t=1}^{T} \frac{c_t}{(1 + r_t)^t}$$

- Interest rates r_t
- Cash flow $\{c_t\}_{t=1}^{T}$, that is the *coupon payments*, where the last payment, c_T, also includes the principal
- Note inverse relationship between interest and price

Credit risk

- Probability of default
- More generally chance of losing money
  - interest
  - rating
- Loss given default

Pari passu

- Debtors are considered in default as soon as they do not meet a payment obligation on any coupon or principal payment
- "*Pari passu*" clauses mean that debtors are considered in default on all their debt obligations as soon as they default on any particular one
- Note how this influences crises resolutions

Rating Agencies

Rating agencies

- Standard & Poors
- Moody's
- Fitch
- + some new ones

- Issue ratings on creditworthiness of borrowers

"A credit rating is S&P's opinion of the general creditworthiness of an obligor, or the creditworthiness of an obligor with respect to a particular debt security or other financial obligation, based on relevant risk factors."

Ratings

S&P	Moody's	
AAA	Aaa	investment grade
AA	Aa	
A	A	
BBB	Baa	
BB	Ba	non investment grade
B	B	
CCC	C	
Default		

some grades missing from table

Ratings process

- Financial analysis of balance sheet and P&L account
- Quality of management, expected growth of the industry
- Nature of this assessment is subjective
- Ratings usually reviewed once a year

Limitations of ratings

- Do not consider the impact of business cycles
- Assume transition probabilities constant over time
- Rating assumed to be *sole* determinant of default risk
- Not founded on a theory of the firm or on any theoretical stochastic processes for leveraged firms
- Not possible to use default correlations

Ratings and regulations

- Ratings are legally required for many purposes
- E.g. for a security to be repo–able with central banks
- Or as an input into bank capital calculations
- Many entities restricted to rated investments, often investment–grade
- Many take them seriously — others do not
- This makes ratings very sensitive politically

EU sovereign debt crisis

- Some EU countries have an AAA rating, others do not
- We discuss the sovereign debt crisis in detail later

They can make people angry

As Greece got further downgraded, European policies got undermined, provoking rage from EU politicians

"Europe can't allow three private US enterprises to destroy the euro." Either their "cartel" was smashed or "independent" European and Asian ratings agencies would be set up. "We can't have a situation where a cartel of three US enterprises decides the fates of entire national economies and their citizens,"
Viviane Reding, the EU justice commissioner

Conflict of interest

- Ratings are generally solicited by the issuer of fixed income instruments
- Good ratings enhance marketability of the debt issue
- A rating agency is there to perform due diligence
- But it is paid a percentage based on the amount of financing
- If no debt issue, it will not get paid!

The rating agencies are amongst the most profitable financial firms

Case: Hannover Re and Moody's

- CRAs made a big push into Europe in the early 1990s
- Allegedly used aggressive tactics to collect fees
- Moody's informed the German insurance company Hannover Re in the mid 1990s that it had decided to rate the company at no charge, but was looking forward to the day Hannover Re was willing to pay for the ratings
- Hannover Re refused, and never paid Moody's
- Moody's rated Hannover Re anyway, starting with Aa2, in 1998, downgrading three times, eventually to Baa1 (near junk) in 2003
- S&P, which did get paid by Hannover Re, has rated it AA- from 2003 until 2012
- Moody's stopped rating Hannover Re in 2008

Quality of ratings

- Rating agencies have always been criticized for the quality of their ratings
- They have missed spectacular corporate failures
- Also problems in individual countries
  - Asia before the 1997 crisis
  - European sovereigns before last year
- Perhaps their worst failure relates to structured credit — discussed later

So what can we do?

- Ratings are necessary
- And we don't want them provided by the government, or under government control
- The current European attitude seems to be based on a desire to shoot the messenger
- More competition is beneficial — it is on the way
- It would be better if the issuers did not pay for rating
- It is tricky whether they should be held legally accountable
  - 1st amendment protection in US
- We do rely too much on them in regulation

Securitization

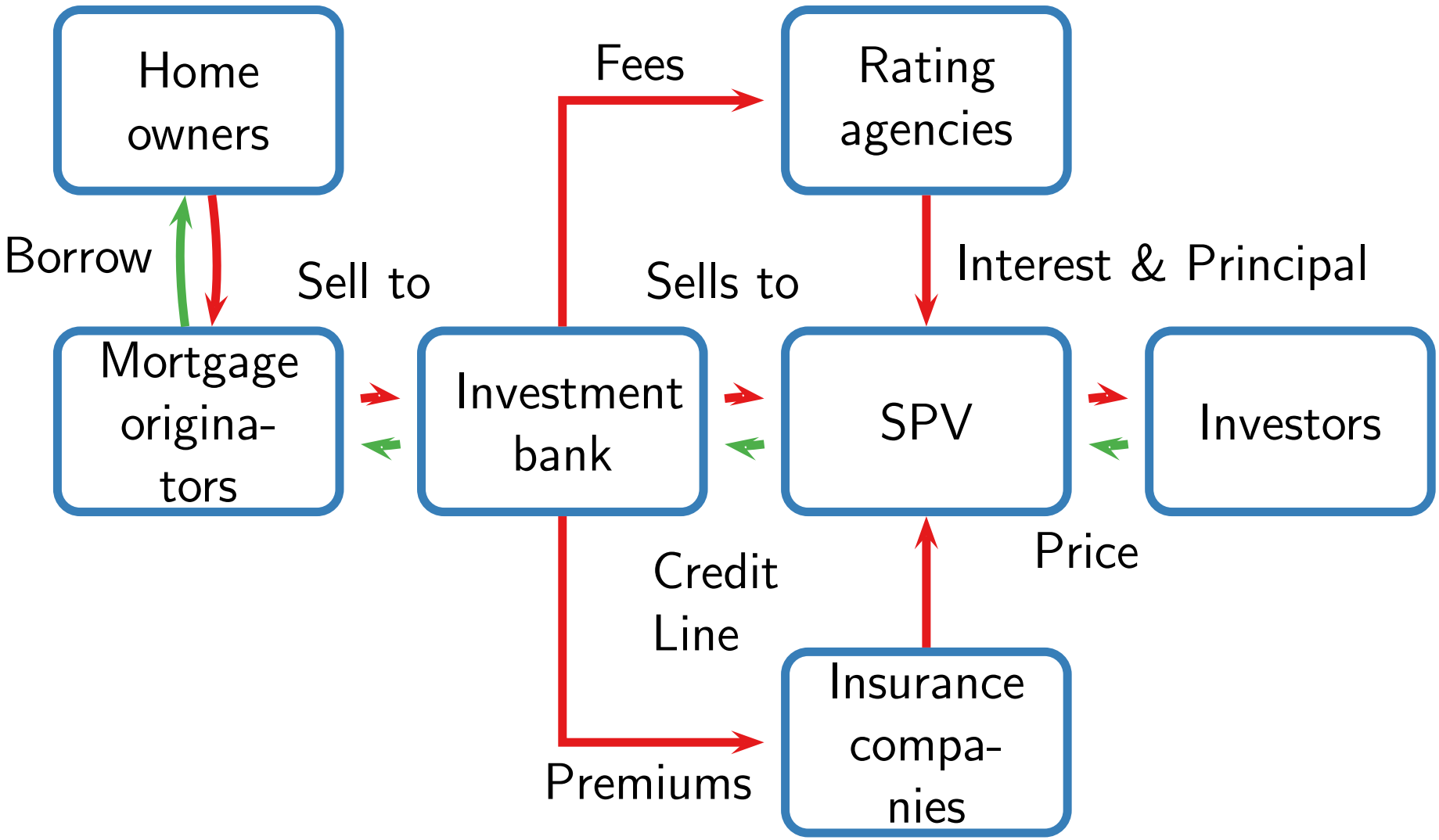
Securitization

- The process of creating *asset–backed securities*
- Various types of credit type assets are *pooled* together (in a portfolio) and sold in various forms to creditors
- For example, credit card debt, car loans and mortgages
- Securitization with subprime mortgages was at the core of the crisis from 2007

Mechanics

- A firm has a pool of assets
  - e.g., corporate loans, mortgages credit card receivables
  - this company is known as the *originator*
- The originator creates a *special purpose vehicle* (SPV)
  - a separate legal firm under the control of the originator
- The SPV buys the assets from the originator and sells rights to the payment flow from the SPV
- The SPV is typically *overcollateralized*
  - value of assets exceeds the value of rights
- The difference is equity

Securitization chain



"Bowie Bonds"

Bonds backed revenues of David Bowie's 25 albums recorded before 1990. (Bowie was a 1960s and 1970s rock star). They were issued 1997, $55 million, paid an interest rate of 7.9% and had an average life of ten years.

Why securitise

- It allows banks to transfer risk
- Hence free up regulatory capital
- Credit becomes cheaper
- Investors can invest in previously inaccessible assets
- Credit risk resides with those who are most able to manage it

Drawbacks

- Lemon problem for buyer
- Moral hazard
  - e.g. originator only intends to hold on to a mortgage for a few months
  - so cares less about quality than if intending to hold to maturity
- Exposes originators to liquidity risk — like Northern Rock

Marking, Margins and Haircuts

Margins, haircuts and leverage

- Borrowed money and securities are used as *leverage* to increase the purchasing power of traders' capital

Margins

- Type of collateral
- Initial margin
- Maintenance margin
- Provide protection
- But are also a channel for instability (recall liquidity models and ER models)
- Potential for firesale externalities

Haircuts

- Similar to initial margin
- Securities pledged for collateral, only a portion of the current market value counts as pledge, the rest is haircut
- Term has other meanings, such as losses to bondholders in credit restructuring, like Greece

Mark–to–market

- Traditional accounting is historical values
- Misses changes in market values
- Hence marking–to–market
  - Relates to maintenance margin

Mark–to–model or magic

- What to do if there is no market?
- Exactly what happened in 2007
- Mark–to–model
- Those turned out to be unreliable
- So really marking–to–magic

Marking and financial stability

- Marking does provide useful protection
- But when used in a mechanistic fashion, it becomes *procyclical*
- People may stop trusting it in a crisis
- Giving rise to vicious endogenous risk feedback loops
- MTM is one of many approaches that fatten tails

Haircut (%) increases during 2007–9 crisis

Securities held as collateral	Jan.–May 2007	Apr. 2008
U.S. government bonds	0.25	3.00
Investment-grade bonds	0.00–3.00	8.00–12
High-yield bonds	10–15	25–40
Equities	15	20
Investment-grade CDS	1.00	5.00
Asset-backed CDOs, rated:		
AAA	2.00–4.00	15
AA	4.00–7.00	20
A	8–15	30–50
BBB	10–20	40–70
Mezzanine	50	100

and leverage

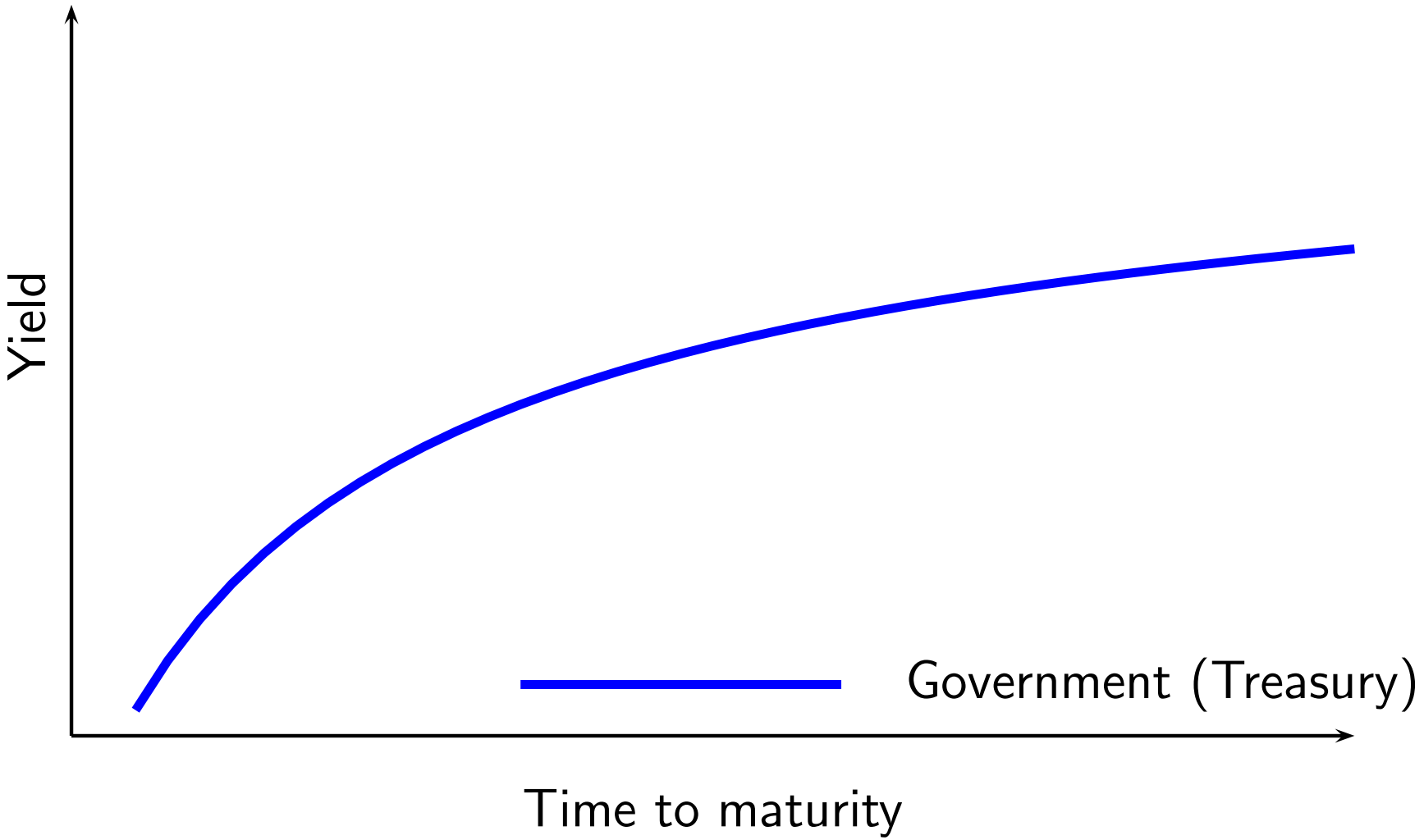
	Jan.–May 2007	Apr 2008
U.S.government bonds	399	32
Investment-grade bonds	∞ – 32	12 – 7
High-yield bonds	9 – 6	3 – 2
Equities	6	4
Investment-grade CDS	99	19
Asset-backed CDOs rated:		
AAA	49 – 24	6
AA	24 – 13	4
A	12 – 6	2 – 1
BBB	9 – 4	2 – 0
Mezzanine	1	0

Reduced Form Models

Term structure

- Shows interest rates over time
- We show it for different ratings
- The *credit spread* is the difference between yields on government securities and non–government securities, otherwise identical

Credit spreads/yield spreads



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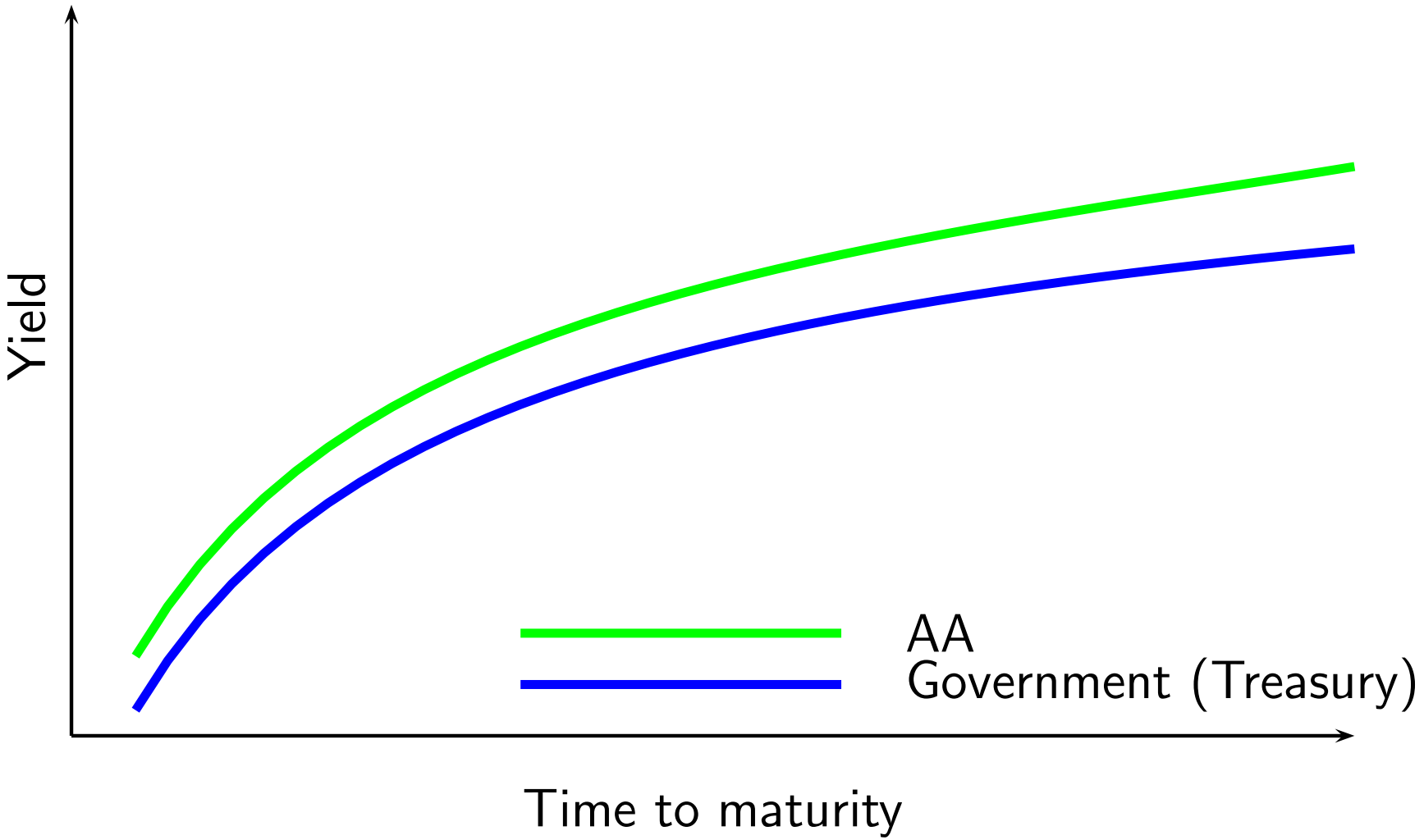

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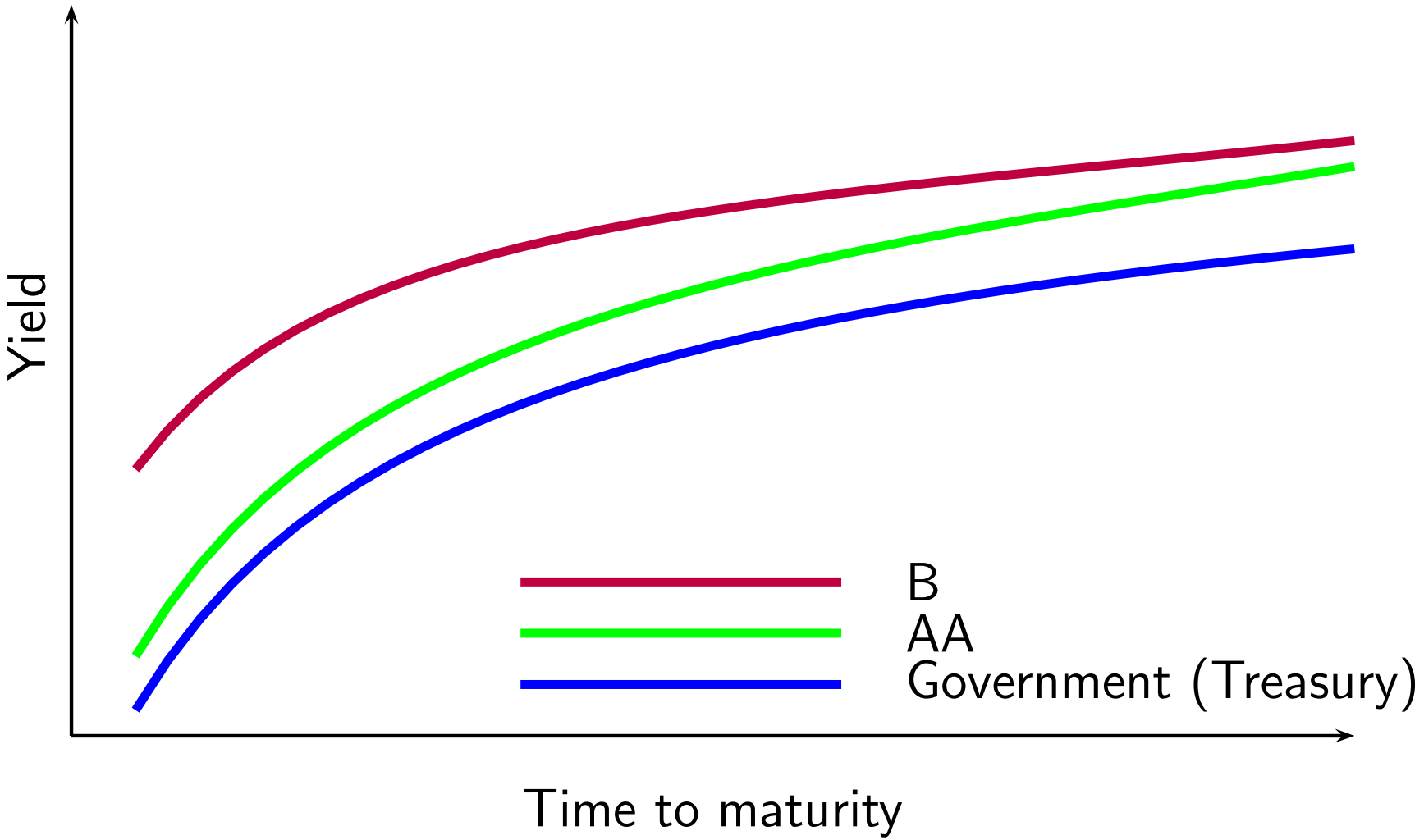

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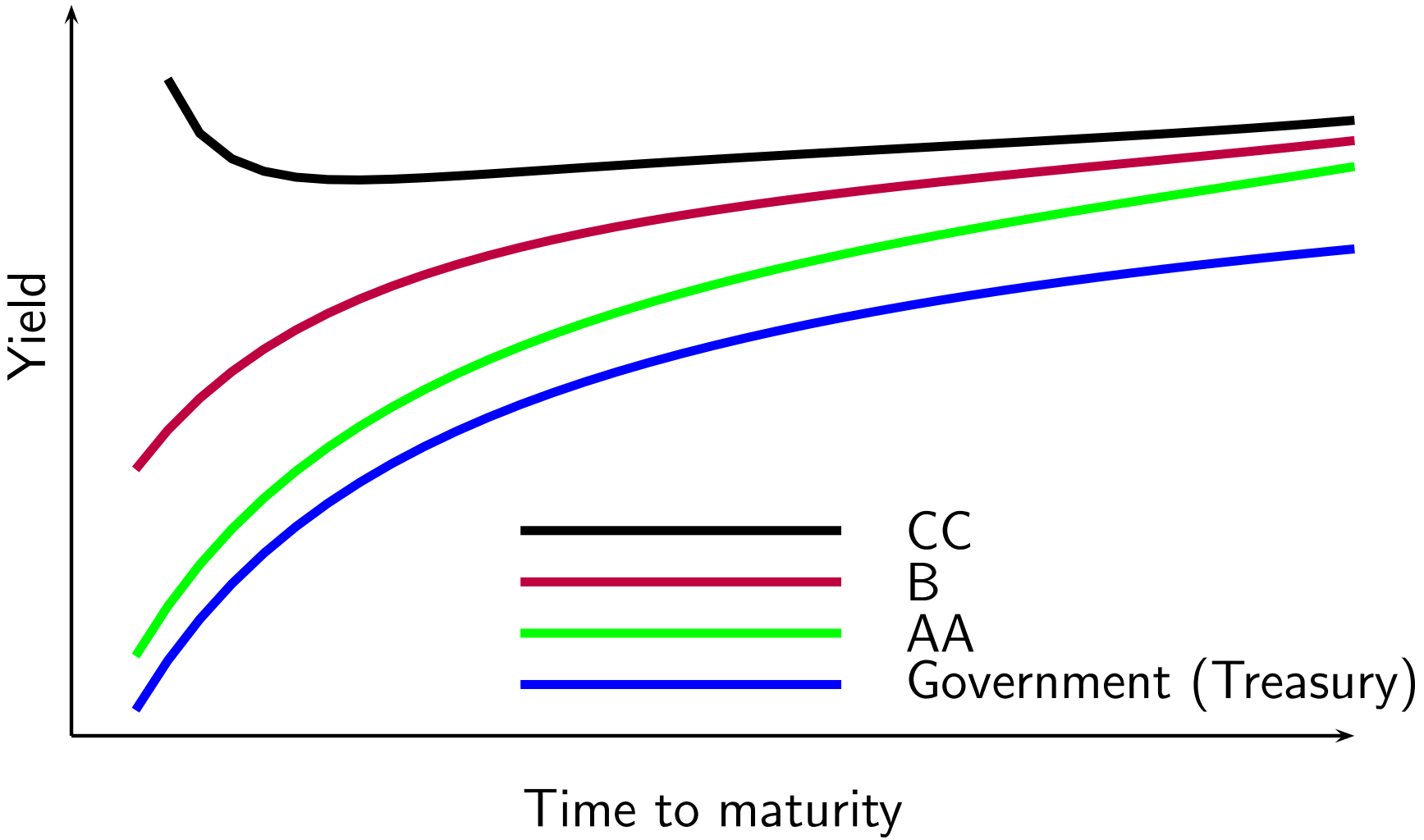

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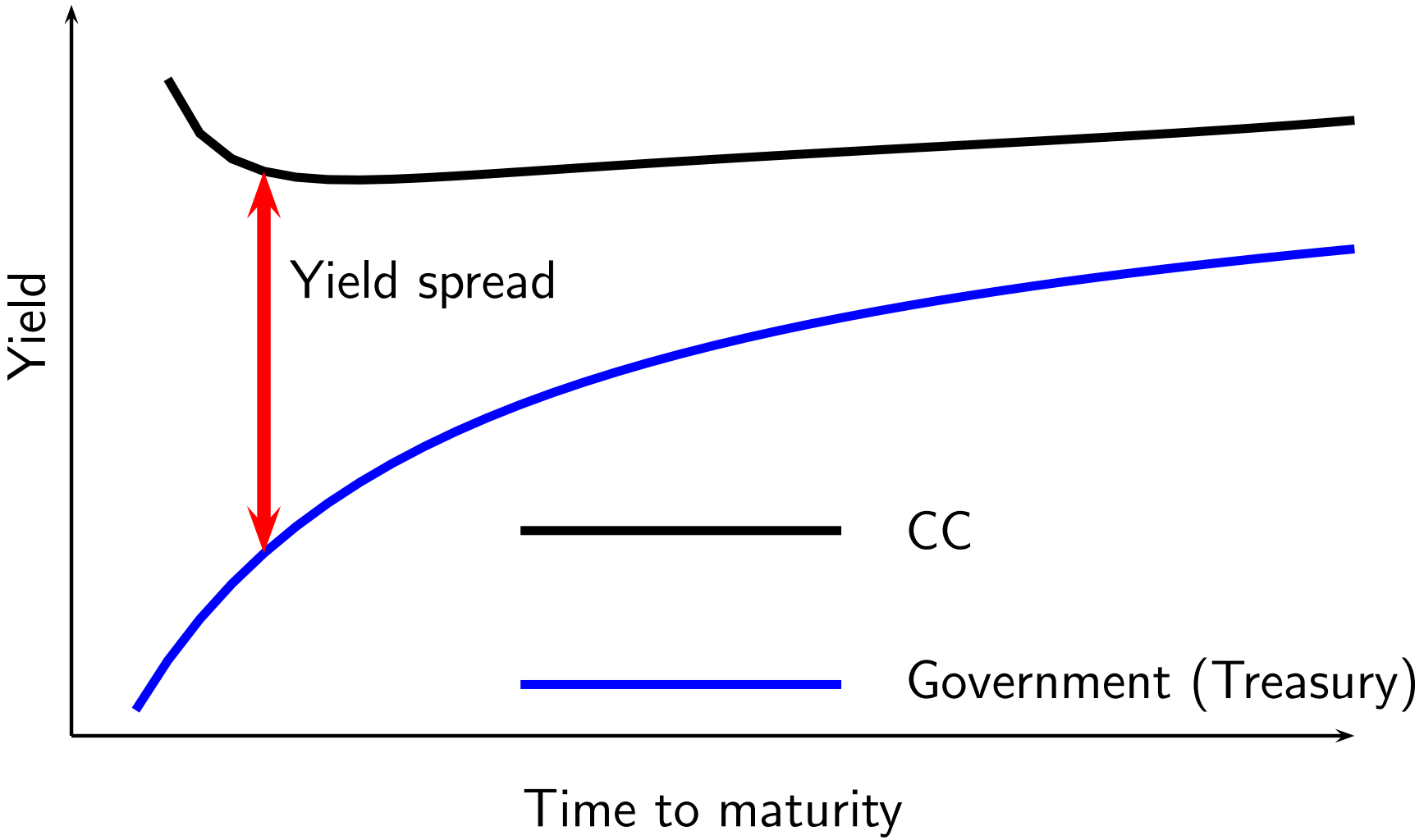

Reduced form models

- A purely statistical approach modeling default using an *exogenous default intensity process*
- Default is a stopping process with a hazard rate
- The default event does not relate to capital structure and happens at a random time
- Possible to infer a term structure of default probabilities from observed credit spreads
- This approach forms the basis of most credit derivative *pricing* models

From credit spreads to probability of default

- Recovery rate is z =1-LGD, and probability of default p_d
- *Risk–neutral* investor indifferent between *expected* return on a risky and risk free bond

$$(1-p_d)e^{(r_f+s)t} + p_d z e^{(r_f+s)t} = e^{r_f t}$$
$$(1-p_d) + p_d z = e^{-st}$$
$$p_d = \frac{1-e^{-st}}{1-z}$$

$z = 40\%$, $s = 15\%$, one year; then

$$p_d = \frac{1-e^{-0.15}}{1-0.4} = 23\%$$

EU example, December 2011

	Yield		Probability of default	
Maturity	German	Italian	Cumulative	Annual
1	0.079%	5.753%	9.19 %	9.19%
2	0.320%	5.956%	17.77%	8.57%
3	0.493%	6.254%	26.45%	8.69%
4	0.751%	6.436%	33.90%	7.45%
5	1.030%	6.665%	40.92%	7.02%

Merits

- Possible to derive the *implied* default probabilities from observed credit spreads
- Hence make pricing process faster and easier
- p_d can be dependent on macroeconomic variables, stock market indices, etc,
- Take into account the impact of economic cycles on default correlations

Shortcomings

- Requires estimation of values of p_d and LGD
- LGD is generally assumed to be *constant*, this does not seem plausible
- Different assumptions of p_d lead to different implementations of this approach
- Range of default correlations that can be achieved is limited