

# The Risk and Term Structure of Interest Rates

The interest rate of a certain financial instrument may reflect

1. The aggregate economic conditions: general economic perspectives, inflation expectations, systemic risk;
2. Factors specific to that instrument:
  - (1) Risk structure: liquidity, default risk, taxation
  - (2) Term structure: Bonds with longer maturities lead to larger fluctuations in rates of return and in interest rates. Thus, the interest rates tend to increase with maturities.

# 1 The Risk Structure of Interest Rates

Default risk is the major types of risks in the credit markets.

Government bonds are considered default-free, because the government has the monopoly power in printing money and collecting taxes.

Risk premium = spread between interest rates on bonds with default risk and default-free risk (of the same maturity).

How to measure risk premium?

Consider the interest rates on bonds that are given different categories of credit ratings.

## 1.1 Determinants of the Risk Premium

Certain relationships between the risk premium and other economic variables are important in understanding why the risk premium behaves as it does. One of the largest risk premiums in U.S. history occurred in the early 1930s when the Great Depression was at its worst. In times of economic prosperity, the risk premium tends to be much smaller. For example, in the boom year of 1984, the risk premium for Aaa corporate bonds almost vanished. Clearly, the risk premium varies inversely with the business cycle.

While the risk premium seems to be sensitive to all other factors - business conditions, maturity, marketability, and the level of interest rates - the size of the risk premium is itself a gauge of another more important factor. The risk premium essentially measures the risk of default. The greater the chance of default, the larger is the risk premium that a bond must pay to attract investors.

**FIGURE 1**  
**Long-Term Bond Yields,**  
**1919–2005**

Sources: Board of Governors of the Federal Reserve System, *Banking and Monetary Statistics, 1941–1970*; Federal Reserve: [www.federalreserve.gov/releases/h15/data.htm](http://www.federalreserve.gov/releases/h15/data.htm).

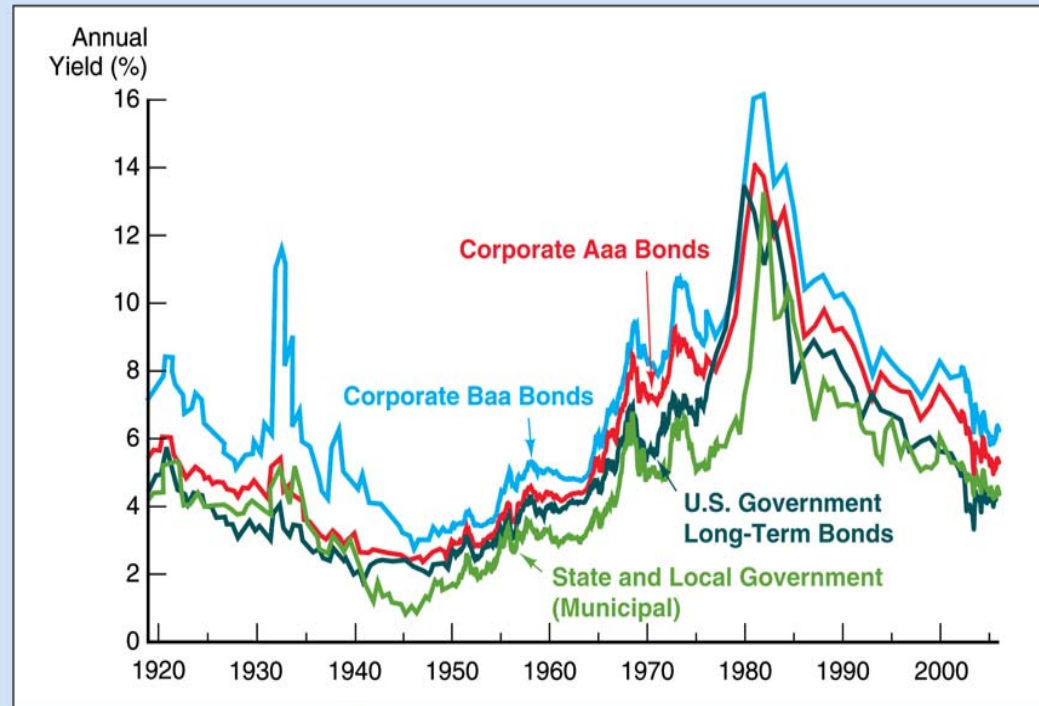


Figure 1:

## 1.2 Risk Premium as a Predictor of Economic Activity

The slope of nominal yield curve, or the term spread, was shown by studies published in the late 1980s and early 1990s to have significant predictive content for future real economic activity, both in the United States and in Europe. However, the predictive power of the term spread was undermined when it failed to predict the 1990–91 U.S. recession (Stock and Watson (1989) and Estrella and Hardouvelis (1991)). Mody and Taylor (2003) find that the predictive content of the term spread appears to be unique to the 1970s and 1980s, which was due to high and volatile inflation at that time.

Gertler and Lown (1999) and Mody and Taylor (2003) find that the high-yield spread (HYS) between “junk bond” and government bond or AAA-rated corporate bond yields predicts real activity during the 1990s.

The intuition why HYS predicts future economic activity is as follows. Frictions in the credit market, such as asymmetric information or costs of contract enforcement, introduces a wedge between the cost of external funds and the opportunity cost of internal funds—the “external finance premium” (EFP). This premium is an endogenous variable that depends inversely on the balance sheet strength of the borrowers. Balance sheet strength is itself a positive function of aggregate real economic activity, so that borrowers’ financial positions are procyclical and hence movements in the EFP are countercyclical (Mody and Taylor (2003)).

This mechanism is particularly relevant in the high-yield bond market because those high yield bonds issuers are precisely those firms that are more likely to be affected by the market frictions.

Thus, the spread between high-yield bonds and government debt or AAA-rated debt is likely to be a good indicator of the EFP and the aggregate economic activity.

## 1.3 The Sub-Prime Mortgage Market – A Digression

- Sub-Prime Mortgage: mortgage lending that do not meet Fannie Mae or Freddie Mac guidelines (FICO score  $< 620$ , who has become delinquent on some form of debt repayment in the previous 12 to 24 months, or who has even filed for bankruptcy in the last few years). These mortgages tend to be initiated by subprime originators (mortgage companies or brokers) that are owned or controlled by major financial institutions
- The adjustable rate sub-prime mortgages are designed so that (Gorton (2008))
  - Both borrowers and lenders can benefit IF house prices are appreciating over short horizon.

- After the initial 2-3 years of paying a lower fixed interest rate, homeowners must refinance with the same lender and pay a higher floating interest rate (LIBOR+markup) and the lender has the option to provide a new mortgage, depending on the current value of the house.
- Particularly sensitive to changes in house prices.
- With the rapid increase in mortgage securitization and the continuing rise in house prices, the subprime lending soon expanded its credit to borrowers with heterogeneous characteristics (high loan-to-value ratios or zero-downpayment, unwilling to disclose financial status, high loan-to-income ratio): the subprime lending no longer focused on only poor credit borrowers, but also on borrowers who would have been considered prime based on their FICO score, but are perceived to have higher credit risk because of other characteristics (Gerardi (2007)).



- Mortgage loans are pooled in Real Estate Mortgage Investment Conduits (REMICs), which are a type of special purpose vehicles (SPVs), for issuing residential mortgage-backed securities (RMBSs).

### **1.3.1 The Role of Investment Banks**

- Glass-Steagall Act 1933 separated commercial banking and investment banking, because underwriting (by investment banks) was considered to have conflict of interests with commercial banking and was held liable for the 1929 bank panic. The separation was then weakened by bank holding Co. (BHC) and now considered against the economy of scope. It was repealed by GLB Act 1999.
- Security underwriters, dealers, and brokers; consultants on transactions such as mergers and acquisitions.

- Less regulated than commercial banks (e.g., no capital adequacy requirement), highly leveraged.
- Underwriting (also lending): securitization (ABSs (asset-backed securities), MBSs (mortgage-backed securities), structured notes, ...) and all types of off-balance sheet activities and financial derivatives.
- Invest in MBSs, derivatives, and structured products.

### **1.3.2 CDOs**

- Tranches of sub-prime MBSs were repackaged into securities by CDOs that were purchased by banks, hedge funds, SIVs, CDOs, Insurance Co. all over the US, European and Asian markets.

- A collateralized debt obligation (CDOs, a certain type of Special Purpose Vehicle (SPV)) can be considered a financial intermediary which issues different classes of bonds (tranches A-D) and equities to acquire MBSs (mortgage-backed securities), corporate loans, and other ABSs (asset-backed securities). CDOs are typically issued by investment banks.
- Products of CDOs are popular among asset managers and investors, including insurance companies, mutual fund companies, investment trusts, commercial banks, investment banks, pension fund managers, private banking organizations, SIVs, asset-backed commercial papers conduits (ABCPs), other CDOs ( $CDO^n, n \geq 2$ ), etc..
- A structured investment vehicle (SIV) can be thought of as a virtual bank. It borrows money by issuing short-term commercial papers (CPs) and invests in MBSs, ABSs, ...

- Re-Securitization: A series of primary markets
  - The losses of information to investors are more and more as the chain of structure – securities and special purpose vehicles – stretches longer and longer (Gorton (2008)).
  - This is different from the “originate-to-distribute” view, which says that loan originators transfer credit-risk to market participants by way of securitization, and this fosters moral hazard amongst mortgage originators, leading them to expand credit to credit-unworthy borrowers
  - Failure of credit rating agencies to precisely assess the risk of CDOs products.
  - Lack of secondary markets (liquidity is low)

- Typical a financial institution may purchase a CDO-issued bond and at the same time purchase protection on the bond with a credit default swap (CDS).

## **1.4 Impacts and Spillover Effect**

- Standardization and financial innovations promote the liquidity of mortgage-related securities and structured products. These structured products can be easily sold across borders.
- When house prices were rising, homeowners were building up home equities and they were able to lower their outstanding debts by refinancing. Thus,

they had an incentive to keep their houses even though interest rates became higher. But when house prices are falling in 2006–2007, their home equities were declining and refinancing became more difficult. When their outstanding debts are larger than their accumulated home equities, they have an incentive to default. Defaults and foreclosure rose dramatically.

- Liquidity drying up is exacerbated by fire sale of assets in order to meet collateral call in derivative trading. The TED (LIBOR - 3-month T-bill rate) spread surged.
  - Buyers of credit protection, such as credit default swap (CDS), can make collateral calls when interest rate spreads rise (e.g., AIG collapsed due to collateral calls under CDS, rather than actual defaults occurred).

- JP Morgan Chase was accused of pushing Lehman Brothers into bankruptcy and Merrill Lynch into Bank of America merger by exercising collateral calls.
- Runs on SIVs and ABCPs by not rolling over their commercial papers and repos (Repurchase Agreements).
- Liquidity crunch spills over to commercial papers and repos collateralized by other real estate related assets.
- A cascade of runs for liquidity: healthy financial institutions and businesses across the world with no direct connection to US sub-prime mortgage problem started facing financial distress due to perceived rising risk and liquidity shortage.
- Feedback effect

- Kiyotaki and Moore (1997): Small perturbation lead to large fluctuations by way of interactions between credit constraints and asset prices. The feedback from asset prices to the economic activity is large and persistent.
- The sub-prime mortgage market basically follows a classic scenario of boom-bust cycle in credit and real estate markets.
- US and West European countries
  - Spillovers to credit cards loans, auto loans, ... and ABSs and financial derivatives based on these assets.
- South Korea, Iceland, Eastern European, and Latin American countries



- Relying on foreign debt (denominated in Dollars)
- Capital outflow, banking distress and currency crisis leads to currency crisis and feedbacks to banking crisis: foreign debt in terms of domestic currency surges when domestic currency depreciates. This is reminiscent of the Asian financial crisis in 1997.