DEBT SECURITIES

Topic 2: Bond sectors and instruments

LA TROBE UNIVERSITY — Faculty of Business, Economics and Law

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Student learning objectives

2.1 Describe the features, credit risk characteristics and distribution methods for government securities;

2.2 Describe the types of securities issued by the U.S. Department of the Treasury (e.g., bills, notes, bonds and inflation protection securities), and distinguish between on-the-run and off-the-run Treasury securities;

2.3 Describe how stripped Treasury securities are created and distinguish between coupon strips and principal strips;

2.4 Describe the types and characteristics of securities issued by U.S. federal agencies;

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Student learning objectives

2.5 Describe mortgage-backed securities (including mortgage pass-through securities and collateralized mortgage obligations, and explain the cash flows, prepayments and prepayment risk for each;

2.6 State the motivation for creating a collateralized mortgage obligation;

2.7 Describe the types of securities issued by municipalities in the United States, and distinguish between tax-backed debt and revenue bonds;

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Student learning objectives

2.8 Describe the characteristics and motivation for the various types of debt used by corporations (including corporate bonds, medium-term notes, structured notes, commercial paper, negotiable CDs and bankers acceptances);

2.9 Define an asset-backed security, describe the role of a special purpose vehicle in an asset-backed securities transaction, state the motivation for a corporation to issue an asset-backed security, and describe the types of external credit enhancements for asset-backed securities;

2.10 Describe collateralized debt obligations.

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References

> **Fabozzi F. J. (2007).** *Fixed Income Analysis*. John Wiley & Sons Inc. New Jersey. Chapter 3.

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Objective 2.1

Sovereign (Government) bonds

- Sovereign bonds are securities issued by a country's central government
  - Tradable either in the domestic, foreign or Eurobond markets
  - Usually denominated in the currency of the issuing country, but not always
- U.S. government bonds are virtually free of credit risk
  - Although the U.S. credit rating was downgraded below AAA by Standard & Poor's (S&P) in 2011
- Sovereign bonds issued by other governments are rated by credit rating agencies
  - There are two types of sovereign ratings - local currency debt ratings (bonds issue in the domestic currency of the issuing government) and foreign currency debt ratings (bonds issued in a foreign currency)
  - Default ratings are generally greater on foreign currency bonds

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Objective 2.1

Sovereign (Government) bonds

- Four methods are used by governments to distribute new bonds they issue:
  - **Regular auction cycle/multiple-price method**: there is a regular auction cycle and successful bidders pay their bid price
  - **Regular auction cycle/single-price method**: there is a regular auction cycle and successful bidders pay the highest bid price offered by any bidder
  - **Ad hoc auction method**: auctions are held on an ad hoc basis when prevailing market conditions are deemed favorable, for amounts and maturities determined at the time of auction
  - **Tap method**: Previous bond issues are extended by offering additional bonds for issue

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Objective 2.2

U.S Treasury securities

- The **primary market** for U.S. Treasury securities issues securities by sealed-bid auctions conducted regularly based on the single-price method (whereas Australia uses the multiple-price method)
- The **secondary market** for U.S. Treasury securities is an over-the-counter market where a group of U.S. government securities dealers offer continuous bid-offer prices on outstanding Treasury issues
  - The **on-the-run issue** is the most recently auctioned issue for each maturity
  - **Off-the-run issues** are issues replaced by the on-the-run issue
- The main types of U.S. Treasury securities are:
  - Fixed-principal Treasury securities
  - Inflation-indexed Treasury securities
  - Treasury STRIPs

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Objective 2.2

Fixed-principal U.S. Treasury securities

There are three main types of fixed-principal US Treasury securities

- **Treasury bills:**
  - issued at a discount to par value
  - have no coupon rate (zero coupon securities)
  - mature at par value
  - have a maturity of less than 12 months
- **Treasury notes**:
  - coupon securities
  - maturity of between one to ten years
- **Treasury bonds**:
  - coupon securities
  - maturity greater than ten years

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Objective 2.2

Inflation-indexed U.S. Treasury securities

Treasury inflation protection securities (TIPS)

- These are Treasury notes and bonds that provide protection against inflation risk
- The coupon rate established by the auction process is the “real rate” that will be earned by the investor above the inflation rate
- The inflation index used by the U.S. government for the inflation adjustment is the non-seasonally adjusted U.S. City Average All Items CPI for All Urban Consumers
- Each time a coupon payment is to be made, the par value is adjusted by the inflation rate for the preceding six months and then multiplied by the coupon rate to determine the coupon payment

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Objective 2.2

Inflation-indexed U.S. Treasury securities

Treasury inflation protection securities (TIPS)

- Note that because payments are made semi-annually, the inflation rate and the coupon rate must be divided by 2 to find the semi-annual inflation rate and the semi-annual coupon rate
- The inflation-adjusted principal is not only used to calculate the coupon payment, but becomes the par value payable when the security matures
- Due to the fact that disinflation might reduce the inflation-adjusted principal below par, the principal at maturity is set to equal the higher of the inflation-adjusted principal and the initial par value

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Example 2.2.1

Inflation-indexed U.S. Treasury securities

?

- An investor purchases a TIPS with $100,000 par value on 1 January
- The TIPS coupon rate is 4% pa and the inflation rate is 3% pa in the first six months, and 2.5% pa in the second six months.

- **Calculate the inflation adjusted principal at the end of the first and second six-month periods, and the coupon dollar amount.**

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Example 2.2.1

Inflation-indexed U.S. Treasury securities

- An investor purchases a TIPS with $100,000 par value on 1 January
- The TIPS coupon rate is 4% pa and the inflation rate is 3% pa in the first six months, and 2.5% pa in the second six months.

	First 6 months	Second 6 months
Coupon rate	4% / 2 = 2.00%	4% / 2 = 2.00%
Inflation rate		
Inflation-adjusted principal		
Coupon payment		

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Objective 2.3

Treasury STRIPs

- The U.S. Treasury does not issue zero-coupon notes or bonds but, due to the demand for zero-coupon bonds with no credit risk, the private sector has created such securities
- An example of a Treasury STRIP is as follows:
  - A $100 million Treasury note with a 10-year maturity and a coupon rate of 10% is purchased
  - The cash flows from the note are 20 semi-annual coupon payments of $5 million each plus one payment of principal of $100 million
  - A receipt, representing a single payment claim on each payment, is issued through the Treasury Separate Trading of Registered Interest and Principal Securities (STRIPs)
- Coupon STRIPS are created from coupons and principal STRIPS are created from principal cash flows

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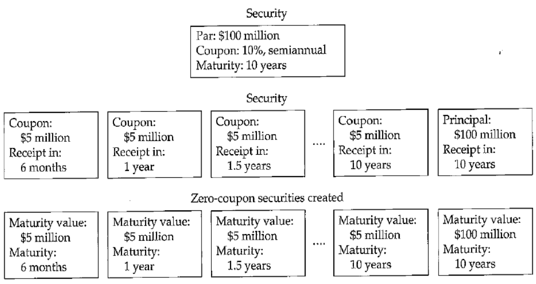
Objective 2.3

Treasury STRIPs



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Objective 2.4

Semi-government agency bonds

- Semi-government or agency bonds are issued by a government instrumentality and may have either a direct or an implied government guarantee
- U.S. federal agency securities are issued by two types of entity:
  - **Federally-related institutions** – These are arms of the federal government. These securities are backed by the full faith and credit of the U.S. government; e.g. Government National Mortgage Association (Ginnie Mae).
  - **Government-sponsored enterprises (GSEs)** – These are privately owned, publicly chartered entities created by Congress to reduce the cost of capital for certain groups. There are six GSEs issuing securities, including the Federal National Mortgage Association (Fannie Mae), the Federal Home Loan Mortgage Corporation (Freddie Mac), the Student Loan Marketing Association (Sallie Mae) and the Federal Agricultural Mortgage Corporation (Farmer Mac)

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Objective 2.4

GSE debentures and discount notes

- Generally, GSE's issue two types of debt:
  - **Debentures** – These can be notes or bonds
    – Notes have maturities between 1-20 years
    – Bonds have maturities greater than 20 years
  - **Discount notes** – These are short-term obligations with maturities ranging from overnight to 360 days
- Two GSEs charged with providing liquidity to the mortgage market, Fannie Mae and Freddie Mac, also issue securities backed by the mortgage loans that they purchase
- There are two types of agency mortgage-backed securities:
  - **Mortgage pass-through securities**
  - **Collateralized mortgage obligations** (CMOs)

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Objective 2.5

Mortgage loans

- The first requirement is to define a **mortgage loan**
- A mortgage loan is a loan secured by the collateral of some specified real estate property which obliges the borrower to make a predetermined series of payments.
  - A mortgage gives the lender the right, if the borrower defaults, to foreclose on the loan and seize the property in order to ensure that the debt is paid off
  - The interest rate on the mortgage loan is called the "mortgage rate"
  - There are many different types of mortgage designs; however the most common in the U.S. is the fixed-rate, level-payment, fully amortising mortgage

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Objective 2.5

Fixed-rate, level-payment, fully amortising mortgage

> Monthly payments are calculated as follows

$$MP = B\left[\frac{r(1+r)^n}{(1+r)^n - 1}\right] or\ MP = B / \left[\frac{1-1/(1+r)^n}{r}\right] \quad \text{(DBS 2.5.1)}$$

> All monthly repayments in a level-payment mortgage are equal
  – The interest portion equals 1/12 of the fixed annual interest rate multiplied by the outstanding balance at the end of the previous month
  – The difference between the interest portion and the total payment, the **scheduled principal payment** comprises a payment of a portion of the outstanding mortgage principal

> The interest portion of each payment declines each month, and therefore the principal payment increases

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Example 2.5.1

Fixed-rate, level-payment, fully amortising mortgage

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> A mortgage loan has a 30-year maturity, a principal of $100,000 and an 8.125% mortgage rate

> **Calculate the monthly repayments.**

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Objective 2.5

Fixed-rate, level-payment, fully amortising mortgage

> The **servicing fee** on a mortgage with a rate of 8.125% might be 50 basis points, which leaves **net interest** of 7.625% for lenders (investors)

> A **prepayment** is a non-scheduled payment of the principal amount

> **Prepayment risk** refers to the fact that the amount and timing of cash flows are uncertain

> An investor in a mortgage loan receives the monthly repayment comprising:
  – Net interest (interest less servicing fees)
  – Scheduled principal payments
  – Any prepayments

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Example 2.5.2

Fixed-rate, level-payment, fully amortising mortgage

?

> A mortgage loan for $100,000 is obtained for 30 years. The mortgage is level-payment, fixed rate, fully amortised mortgage. The mortgage rate is 7.5% and the monthly mortgage payment is $699.21.

> **Compute an amortisation schedule for the first six months**

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Example 2.5.2

Fixed-rate, level-payment, fully amortising mortgage

✓

> A mortgage loan for $100,000 is obtained for 30 years. The mortgage is level-payment, fixed rate, fully amortised mortgage. The mortgage rate is 7.5% and the monthly mortgage payment is $699.21.

Month	Opening balance	Payment	Interest	Principal	Ending balance
1	100,000.00	699.21			
2		699.21			
3		699.21			
4		699.21			
5		699.21			
6		699.21			

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Objective 2.5

Mortgage pass-through securities

> A mortgage passthrough security is a security created when one or more holders of mortgages form a pool of mortgages and sell shares or participation certificates in the pool

> For example:
  – An investor purchases 2,000 mortgage loans of $100,000 each
  – He then issues 200,000 certificates of $1,000 each secured by the pool of mortgages, with each certificate entitled to 1 / 200,000 of the cash flow (0.0005%)

> The effect is to reduce the prepayment risk to any one certificate holder (because prepayment patterns are more predictable)

> Mortgage pass-though securities are issued by Ginnie Mae, Fannie Mae and Freddie Mac

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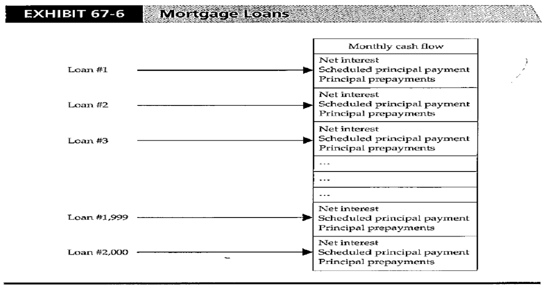
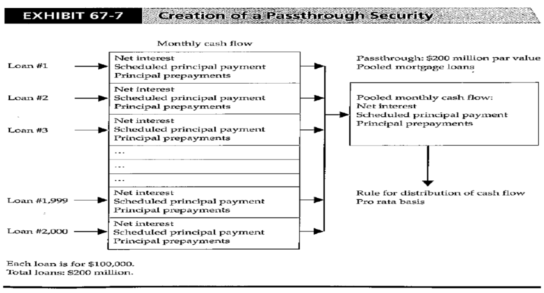
Objective 2.5

Fixed-rate, level-payment, fully amortising mortgage



Objective 2.5

Mortgage pass-through securities



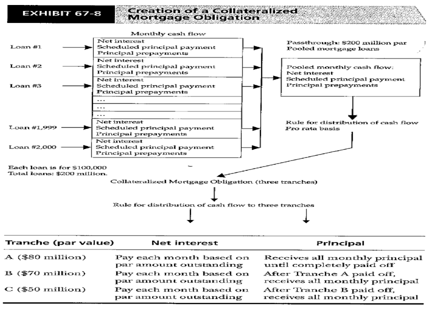
Objective 2.5 & 2.6

Collateralised mortgage obligations (CMO)

- A CMO is a mortgage-backed security, secured by a pool of pass-through (mortgage) securities held in trust, which redistributes prepayment risk among investors in the CMO
- For example:
  - The $200 million principal in the pool is divided into three tranches, each ranking differently for the priority of repayment of principal
  - All scheduled and prepaid principal payments are directed to the first tranche until its principal is repaid, then to the second and finally to the third
  - Each tranche is securitised into a number of certificates
- The effect of the CMO is to create a number of mortgaged-backed securities with more clearly defined and distinguishable maturities

Objective 2.5 & 2.6

Collateralised mortgage obligations (CMO)



Objective 2.7

Municipal securities

- Non-central government entities, such as state and local governments, also issue bonds – these are referred to as **municipal securities** or **municipal bonds**
- Municipal bonds are sold in over-the-counter markets supported by municipal bond dealers across the country
- These are issued by states, counties, cities, towns and school districts
- Municipal securities are categorised either as:
  - **Taxable securities**
  - **Tax-exempt securities**
    - interest (though not capital gains) is exempt from federal income tax
    - these securities may or may not be tax-exempt in respect of state or local taxes
    - the majority of municipal securities are tax-exempt

Objective 2.7

Municipal securities

- Municipal securities may also be categorised as:
  - **Tax backed debt –** instruments that are secured by some form of tax revenue
    - **General obligation debt –** *Unlimited tax general obligation debt* is secured by the full faith and credit of the issuer, including it's full taxing power. *Limited tax general obligation debt* is a tax pledge limited by statute to certain tax rates the issuer may levy to service the debt.
    - **Appropriation-backed obligations –** Bonds which carry a potential state liability for making up any shortfall, subject to approval of the appropriation by the state legislature. The moral obligation of the state is non-binding.
    - **Debt obligations supported by public credit enhancement programs –** These include a legally enforceable obligation of the state to guarantee the obligations of the issuer (often used to raise funds for schools).
  - **Revenue bonds –** where the obligations of the issuer are secured by the revenues generated by the completed project financed by the bonds

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Objective 2.8

Corporate debt securities

- Corporations may raise debt funds either via:
  - A bank loan
  - Issuing debt securities
- Securities issued by corporations include:
  - Corporate bonds
  - Medium-term notes
  - Commercial paper
  - Negotiable certificates of deposit
  - Bankers acceptances
  - Asset-backed securities

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Objective 2.8

Corporate bonds

- Secured debt
  - Either real property or personal property may be pledged as security
  - **Mortgage bonds** require the issuer to grant the bond holder a lien against the pledged assets which allows the bond holder to sell the mortgaged property to satisfy unpaid obligations to the holder
  - **Collateral trust bonds** require the issuer to grant a lien over stocks, notes, bonds or other financial assets, in the absence of any real property
- Unsecured debt
  - **Debenture bonds** are not secured by a specific pledge of property, but have the claim of general creditors on all assets of the issuer not specifically pledged to secure other debt

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Objective 2.8

Corporate bonds

- Default rates
  - **Issuer default rate**: number of issuers defaulting as a percent of all issuers
  - **Dollar default rate**: par value of defaulting issues as a percent of par value of all outstanding issues
  - The lower the credit rating the greater the probability of default
  - A number of studies place the annual dollar default rate for all original issue high-yield bonds at between 3% and 4%
- Recovery rates (also known as default loss rates)
  - It is often difficult to determine the value of what has been recovered
  - Moody's measures the recovery rate as the trading price at the time divided by the par value, and found the recovery rate was 38% for all bonds
  - The higher the level of seniority, the greater the recovery rate

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Objective 2.8

Medium-term notes (MTN)

- A MTN is a debt instrument with the unique characteristic that notes are offered continuously to investors by an agent of the issuer
- MTNs offer several maturity ranges from 9 mths to 1 year, 1 year to 18 mths, 18 mths to 2 years and annually thereafter up to 30 years
- MTNs differ from bonds in that they are sold in smaller issues and sold on a best-efforts basis by agents of the issuer (as opposed to being underwritten, which is usually the case with bonds)
  - The issuer files a shelf registration with the Securities and Exchange Commission for the offering of securities of between $100 million and $1 billion
  - The agent posts a rate schedule for securities with the desired maturity ranges as spreads over the equivalent Treasury securities
  - The actual date of maturity is negotiable within the stated ranges

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Objective 2.8

Medium-term notes (MTN)

- MTN coupon rates can be fixed or floating. There are several types:
  - **Fixed rate, non-callable debentures**
  - **Structured notes** – These are MTNs that have a floating rate over all or part of their life with a coupon linked to a benchmark interest rate, equity index, stock price, exchange rate or commodity price. For example:
    - **Deleveraged floaters**: The coupon equals a fraction of a reference rate plus a margin.
    - **Dual-indexed floaters**: The coupon equals a fixed rate plus the difference between two reference rates.
    - **Range notes**: The coupon equals a reference rate so long as the reference rate is within a defined range at the reset date; if not, it equals zero.
    - **Index amortising notes**: The coupon is fixed; however, principal is repaid over the life of the security (i.e. it is amortising) based on some reference rate – the time to maturity increases when the reference rate increases, and vice versa.

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Objective 2.8

Commercial paper

- Commercial paper is a short-term unsecured promissory note issued in the open market – typically as a zero-coupon bond sold as a discount security
- The maturity of commercial paper is typically less than 270 days, and the most common maturity is 50 days or less
- Maturing paper is usually "rolled over" – new commercial paper is sold and the proceeds used to pay off maturing paper
- It is usually backed by unused lines of credit to ensure that the issuer can pay off maturing issues even if new paper cannot be issued
- There is minimal secondary market activity for commercial paper

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Objective 2.8

Certificates of deposit

- A certificate of deposit is a financial asset issued by a bank indicating a specified sum of money has been deposited at the issuing institution
- A CD bears a maturity date and a specified interest rate
- In the US, CDs are insured by the Federal Deposit Insurance Corporation (FDIC) for amounts up to $100,000
- In the case of a **non-negotiable** CD, the initial depositor must wait until maturity to withdraw the funds
- **Negotiable CDs allow** the initial depositor to sell the CD in the open market prior to maturity date
- These are usually issued in denominations of $1 million or more, and the investor is exposed to credit risk for any amounts over $100,000

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Objective 2.8

Bankers acceptances

- A bankers acceptance means a bank has accepted ultimate responsibility to repay a loan
- It is a vehicle created to facilitate commercial trade transactions; e.g.
  - Luxury Cars offers IFA $900,000 on 60 days terms for 45 cars and arranges with its bank, Doylestown Bank, to issue a letter of credit indicating the bank will make good on the settlement 60 days after shipment. The letter of credit is sent to the car manufacturer's (IFA's) bank, Banco di Francesco
  - On receipt of the letter of credit, Banco di Francesco notifies IFA who ships the cars and presents shipping documents to Banco di Francesco, and receives payment equal to the present value of $900,000
  - Banco di Francesco presents the letter of credit and the shipping documents to Doylestown, which stamps "accepted" on the letter of credit, creating a bankers acceptance, whereby Doylestown agrees to pay the holder $900,000 at maturity

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Objective 2.9

Asset-backed securities

- Asset-backed securities are securities backed by a pool of loans or receivables, including auto loans and leases, consumer loans, commercial assets, credit cards and home equity loans
- Companies can use special purpose vehicles to establish "bankruptcy remote" entities which can issue asset-backed securities with a higher rating than the original company
  - The original company establishes a "special purpose vehicle" and then sells receivables or other assets into that vehicle
  - The special purpose vehicle can use credit enhancement mechanisms to obtain a higher credit rating from a credit ratings agency
  - The special purpose vehicle can then issue securities, using the assets as collateral, at a lower cost of funds because they are unaffected by the credit rating of the original company

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Objective 2.10

Collateralized debt obligations (CDOs)

- A CDO is a product backed by a diversified pool of the following:
  - U.S. domestic investment-grade and high-yield corporate bonds
  - U.S. domestic bank loans
  - Emerging market bonds
  - Foreign bank loans
  - Special situation loans and distressed debt
  - Asset-backed securities
  - Residential and commercial mortgage-backed securities
  - Other CDOs
- A CDO involves an asset manager managing a portfolio of assets funded by the issuance of the CDO, which is structured into tranches (as is with a CMO), each of which is rated by a ratings agency
- The motivation is usually either to profit from the spread between the yield on the products in the pool and payments to note-holders or to remove debt instruments (primarily loans) from a balance sheet

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Objective 2.10

Collateralized debt obligations (CDOs)

- Motivations for creating CDOs:
- Arbitrage transactions
  - Motivation is to earn the spread between the fixed income yield on the security portfolio and the required payments to noteholders
- Balance sheet transactions
  - Motivation is to remove debt securities from the sponsor's balance sheet
  - This is to reduce the capital requirements associated primarily with loans, which are classified as higher risk than other securities

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