Introduction to Asset-Backed Securities

Abstract

Contents

12a	Calculate and interpret price, income and cross-price elasticities of demand and describe factors that affect each measure
12b	Compare substitution and income effects
12c	Distinguish between normal goods and inferior goods
12d	Describe the phenomenon of diminishing marginal returns
12e	Determine and interpret breakeven and shutdown points of production
12f	Describe how economies of scale and diseconomies of scale affect costs

1. Benefits of Securitization for Economies and Financial Markets

Traditionally, the purchase of securities related to houses and autos has been financed by loans originated by financial institutions. For investors to gain exposure to these loans, they must hold ties directly with those institutions - through a combination of deposits, debt or equity. Therefore, the bank was the important intermediary with great frictions and the investors where not only exposing themselves to the underlying securities but the additional operative profile of the bank (bank's other activities).
In practice, investors investing and risk profiles was not as tailored as they would like to be and greatly dependent of the banks.
Securitization aims to:

- Allows investor to tailor their risk and yield profiles through credit enhancements. For example, the same pool of assets creates different investment securities with different risks and opportunities to better fit investor's portfolios.
- Lessening of the role of the intermediaries (disintermediation). Investors are no longer exposed to the financial institutions with the creation of SPV.
- Economies of scale - securitization connects a broader market of investors and borrowers by lowering the costs paid by borrowers and improving the risk-adjusted returns of investors

- Securitization improves banks bottom line, increasing the funds available to lend

In short, securitization benefits individuals, governments and companies. The risks from asset-backed securities fall into two categories:

- *Contraction and extension risks* - the risks of mismatch of the expected and real cash flows. Contraction risk bears the risk of reinvestment into lower interest rates. The extension risk is the risk of borrowers deferring payment due to deteriorating credit quality or economic conditions.
- *Credit risk* inherent to the loans and receivables of the underlying ABS

2. How securitization works

Introduction Let's suppose an hypothetical company is a manufacturer of medical equipment that ranges from the 50k to 300k a piece. The majority of the sales are made through delayed payments or loans granted by the company to its customers, with the medical equipment serving as the collateral. These loans are structured with a fixed interest rate and maturity of 5 years. They are fully amortized with monthly payments, with the borrower making payments each month consisting of interest and principal payments.

Securitization Lets now assume these loans are totaling 200 million. This amount shows on Mediquip's balance sheet as an asset. Lets assume the company wants to raise 200 million through securitizing loans rather than issuing corporate bonds - because this is potentially the lower cost alternative.
To do so, Mediquip sets up a separate legal entity called Medical Equipment Trust (MET) to which it sells the loans on the medical equipment. Such legal entity is called a **special purpose entity** or **special purpose vehicle**.
The SPV entity finances the acquisition of the loans by issuing a securitized loan and selling it to investors. In this simplified example (ignoring frictions or transaction/intermediary costs), the cash flows are as follows:

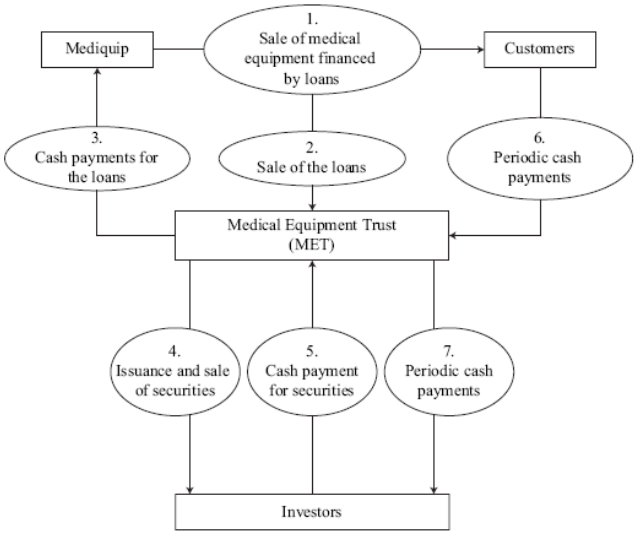

Figure 1

- The sale of the medical equipments are financed by Mediquip loans (*first oval*)
- Mediquip sells the 200 million of loans (*second oval*)
- Mediquip receives the 200 million in cash from MET (*third oval*)
- MET issues and sells securities backed by the pool of securitized loans (*fourth oval*)

- Investors buy those securities and MET receives cash (*fifth oval*)
- The periodic cash flows made by the Mediquip customers are collected by MET (*sixth oval*)
- These cash flows are used to make periodic payments to security holders (investors) (*seventh oval*)

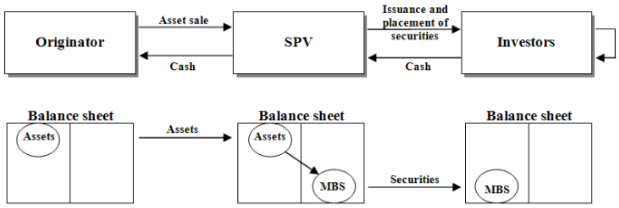

Figure 2. Financial flows in a securitization transaction

2.1 Parties to a Securitization and their Roles

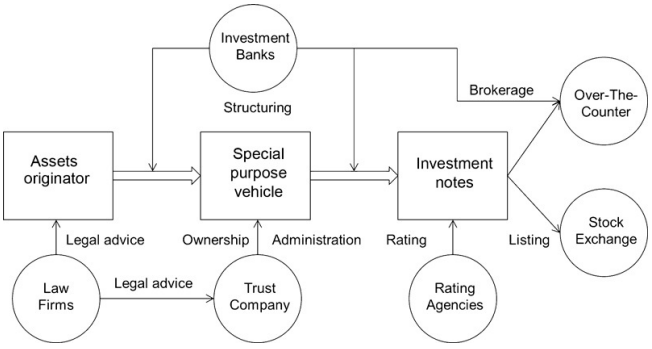

Figure 3

The main parties to a securitization are:

- *the seller of the collateral* (assets), sometimes called the *depositor* or *originator*
- *the SPE* that purchases loans or receivables and uses them in the collateral
- *the servicer* of the loans
- *the trustee* (the trust companies which oversee the process). A trustee is an institution with trust powers that safeguards the assets after they have been sold to the SPE and holders the funds due to ABS holders until they are paid.
- *independent accountants and lawyers or attorneys* which help set important documentation according to legislation and financial requirements
- rating agencies which provide ratings to the ABS so they can then be sold
- *financial guarantors* which guarantees that some emergency funds that can be used if some debtors default and thus absorb some losses (such as monoline insurers)
- *investment banks* are usually all round intermediaries which help selling the securities to private investors or brokerages. They can help as financial guarantors, trust divisions, legal requirements, underwriting etc as well.

2.1.1 Documentation

Purchase agreement The purchase agreement between the seller of the collateral and the SPE sets for the warranties that the seller makes about the assets sold. These representations assure investors about the quality of the assets and the risks associated with the ABS.

Prospectus The prospectus describes the structure of the securitization, including the priority and amount of the payments to be made to the servicer, administrators and the ABS holder. It also documents the credit enhancements which are provisions used to reduce credit risk.

2.2 Structure of a Securitization

A simple securitization may involve the sale of a single class of bonds. However, the structure of securitization is more complicated than that. The most common forms of securitization include a form of internal credit enhancement called **subordination** or **credit tranching**.

Bond Class	Par Value (US$ millions)
A (senior)	180
B (subordinated)	14
C (subordinated)	6
Total	200

Figure 4

Subordination The bond classes created are classified as *senior* bonds, *subordinated* and *mezzanine* bonds. Subordinated bonds function as a credit protection for the more senior bonds through a cascade or *waterfall* structure of payments between the classes in the event of default.
Lets consider the example of MET where it is issued 180 million in par value of Bond Class A, 14 million in Bond Class B and 6 million Bond Class C. In this structure, Bond Class A is the senior bond whereas bond Class B and C are subordinated bond classes. The distributions are as follows:

- All losses on the collateral are absorbed by bond Class C before any loss is realized by class A and B. That is, Class C will absorb losses up to 6 million. If losses are equal or higher Class C bondholders will received nothing
- If the losses exceeds 6 million, Bond Class B will absorb those losses up to 14 million (in addition to the 6 million).

- If the losses exceed 20 million, Bond Class A realizes a loss as well.

The structure of securitization not only allows the redistribution of *credit risk* but **prepayment risk**. Prepayment risk is the uncertainty relating to cash flows, in particular to the ability of the borrower to repay earlier by refinancing into lower interest rates. **Time tranching** is the process of creation of bond classes with different expected maturities.

2.3 Role of SPV

The key role of Special Purpose Entities are constrained in terms of protecting rights to the country's legislations. That is, not every country's legal system is equal and not every country offers the same protection to SPE asn the US.
The key role of SPV is the elimination of credit risk inherent to the originator - the Mediquip in our scenario. Lets assume Mediquip has a credit rating of BB or Ba2 - that means the costs of funding may be high as the company credit rating is below the investment-grade credit rating.
If the company were to raise funds using loans backed by collateral (those loans) the credit rating would be lower than the credit rating of unsecured bonds. However, the collateral only affects the credit spread only slightly. **Why?** Because while the absolute priority of credit distributions are based on the seniority ranking in case of liquidations, this not always upholds in court in case of reorganizations. Thus, investors may have absolute priority in relation to other investors but there is no assurance that these rights will be respected in court. For this reason the credit spread for corporate bonds does not increase dramatically.
In the case of securitization, the assets are sold to another company at arms length transaction. After the transaction, the originator does not own them anymore and the SPV is the new legal owner. This carries important legal implications as Mediquip creditors cannot claim those assets anymore because they are now legally owned by another entity, leaving those assets to be claimed by the SPV creditors - that is, the bondholders or different classes. In this scenario, the seniority ranking holds and the risks reflect not the Mediquip activities but the underlying pool of assets, lowering the costs of funding.

3. Residential Mortgage Loans

A **mortgage loan** is a loan secured by the collateral of some specified real estate property that obliges the borrower to make predetermined series of payments to the lender. The *mortgage* gives the right to **foreclosure**, allowing the lender to take possession of the mortgaged property and sell it in order to recover the funds.
The ratio of the amount of the property value is called **loan-to-value ratio** (LTV). It is the mortgage par value divided by the collateral value. The lower the LTV, the higher the borrower's equity and the higher the downpayment and the less likely the borrower is to default.
The mortgage markets are divided based on credit quality into *prime loans* and *subprime loans*. Generally, for a loan to be considered prime, the borrower must be viewed as having high credit quality: strong employment, credit history, income sufficient to pay the loan obligation, etc. If the borrower has lower credit quality, the loan is treated as subprime.

3.1 Interest Rate Determination

The interest rate on a mortgage is called the **mortgage rate**, **contract rate** or **note rate**. The four basic ways the mortgage rate can be specified are as follows:

- *Fixed rate*: the mortgage rate remains constant during the life of the mortgage
- *Adjustable or variable rate*: the mortgage rate is reset periodically and the determination of the new mortgage rate for an adjustable-rate mortgage (ARM) is the reference value or index at the reset date.
- Initial period fixed rate: mortgage rate is fixed for some initial period and is then adjusted. They adjustment may call for a new fixed rate or variable rate. When the adjustment rate is a fixed rate the mortgage is referred to as *rollover* or *renegotiable mortgage*. When the mortgage changes to adjustable rate after the intial term it's called *hybrid mortgage*.
- Convertible: this mortgage can either be fixed or adjustable rate. At some point the borrower has the option to convert the mortgage to a fixed or adjustable rate for the remainder of its life.

3.2 Amortization Schedule

In most countries residential mortgages are **amortizing loans**. The amortization consists in both interest and principal payment throughout the borrowing period. There are two types of amortizing loans: *fully amortizing* loans and *partial amortizing* loans, which include a *balloon payment* at maturity.
The loan is considered **interest-only mortgage** or **bullet mortgages** if there is no scheduled principal repayment.

3.3 Prepayment Options and Penalties

A prepayment is any payment toward the repayment of principal that is in excess of the scheduled principal repayment. The

mortgage contract may entitle the borrower to prepay all or part of the outstanding mortgage principal prior to its due date. Such contractual provision is called **prepayment option** or **early repayment option**.
Other mortgage designs include *prepayment penalty provisions* and are called **prepayment penalty mortgages**. The purpose of the prepayment penalty is to discourage the borrowers from prepaying and to compensate the lender for the difference between the contract rate and the prevailing mortgage rate if the borrower prepays when interest rates decline.

3.4 Rights of the Lender in a Foreclosure

A mortgage can be a recourse loan or a non-recourse loan. In a **recourse loan**, the lender has a claim against the borrower for the shortfall between the amount of outstanding mortgage balance and the proceeds from the sale of the property. In a **non-recourse loan**, the lender does not have such a claim and thus can look only to the property to recover the outstanding mortgage balance.
These rights have special interest in *underwater mortgages* - mortgages for which the value of the property is below the outstanding mortgage amount. In this scenario, for non-recourse loans, the borrower may have an incentive to default and allow the lender to foreclose the property. This is called a *strategic default*. However, a strategic default has negative consequences for the borrower who will have a lower credit score and will have reduced ability to borrow in the future.

4. Residential Mortgage-Backed Securities

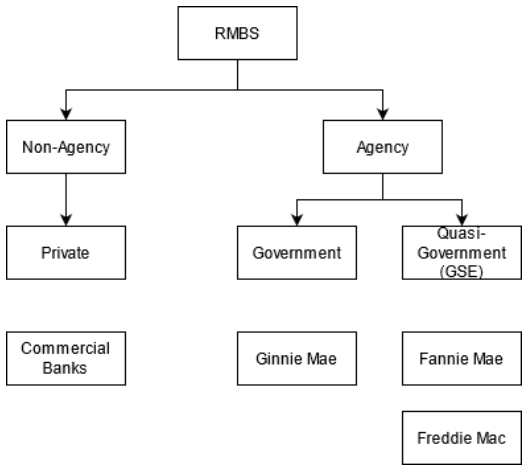

Figure 5

The bonds created from the securitization of mortgages related to the purchase of residential properties are **residential mortgage-backed securities** (RMBS).
In the United States, securities backed by residential mortgages are divided into three sectors:

- securities guaranteed by a federal agency
- those guaranteed by a government-sponsored enterprise (GSE) such as Fannie Mae (Federal National Mortgage Association) and Freddie Mac (Federal Home Loan Mortgage Corporation)
- those issued by private entities

The first two are called **agency RMBS** and the third is called **non-agency RMBS**. The main difference is that RMBS issued by government agencies (GSE's) are generally guaranteed by the government and the US Department of Housing and Urban Development. For a loan to be included in a pool of loans backing an agency RMBS it must meet specific underwriting standards; if the loan satisfies it, it is called a *conforming mortgage*, if not it is called a *non-conforming loan*.

4.1 Mortgage Pass-Through Securities

A mortgage pass through security is a security created when one or more holders of mortgages form a pool and sell shares or participation certificates. Because investors do not directly own the underlying assets but the cash flows arising from the pool of assets these mortgage shares give right to the payments and not the securities itself.

4.1.1 Characteristics

The timing of cash payments is not necessarily identical to the cash flow passe through security holders. In addition, the cash

flow collected from the borrowers is not equal to the cash flow paid to investors as there are servicing fees and other related charges. These services include the collecting of payments, forwarding proceeds, sending payment notices to borrowers, maintaining records of payments, initiating foreclosure proceedings, etc.

The difference between the underlying mortgage rate of the pool of securities and the servicing rate is the **pass-through rate** which is the coupon rate of the mortgage pass-through securities.

Because not all of the mortgages included have the same mortgage rate or maturities, the rate of each mortgage pass-through security is a **weighted average coupon rate** (WAC) and a **weighted average maturity** (WAM).

4.1.2 Prepayment Risk

The prepayment risk associated with pass-through securities has two components: *contractions risk* and *extension risk*.

Contraction risk Contraction risk is the risk that when interest rates decline, the percentage of prepayments will be higher than forecasted because homeowners will refinance at lower interest rates shorting the maturity of securities. This means investors must reinvest the proceeds at lower interest rates.

Extension risk Extension risk is the risk that when interest rates rise, prepayments will be lower than forecasted, making securities to have longer maturity than it was anticipated.

4.1.3 Prepayment Rate Measures

There are two key prepayment rate measures: *single monthly mortality rate* (SMM) and its corresponding annualized rate, *the conditional prepayment rate* (CPR)

$$SMM = \frac{\text{Prepayment for the month}}{\text{Beg. outstanding mortgage} - \text{Scheduled principal repay}} \tag{1}$$

A CPR of 6% means that approximately 6% of the outstanding mortgage balance at the beginning of the year is expected to be prepaid by the end of the year. A key factor in the valuation of a mortgage pass-through security is the forecast of future prepayment rates - this task involves *prepayment modeling*.

In the United States, market participants describe prepayment rates in terms of prepayment pattern or benchmark over the life of a mortgage pool. This pattern is the Public Securities Association (PSA) prepayment benchmark, produced by the Securities Industry and Financial Markets Association (SIFMA).

This benchmark model implies that at 100 PSA the prepayments will most likely follow the PSA benchmark, while PSA lower than 100 means prepayments will be slower and above 100 prepayments will be faster.

The generic PSA curve predicts low prepayment levels for newly originated loans and then an increased as the mortgages become seasoned.

4.1.4 Cash Flow Construction of Pass-Through Securities

- Underlying pool of mortgages has par value of 800 million
- Mortgages are fixed-rate, level payment and fully amortizing loans
- WAC is 6%
- WAM is 357 months
- Pass-through rate is 5.5%

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Month	Beginning Outstanding Mortgage Balance (US$)	SMM (%)	Mortgage Payment (US$)	Net Interest Payment (US$)	Scheduled Principal Repayment (US$)	Prepayment (US$)	Total Principal Repayment (US$)	Projected Cash Flow (US$)
1	800,000,000	0.111	4,810,844	3,666,667	810,844	884,472	1,695,316	5,361,982
2	798,304,684	0.139	4,805,520	3,658,896	813,996	1,104,931	1,918,927	5,577,823
3	796,385,757	0.167	4,798,862	3,650,101	816,933	1,324,754	2,141,687	5,791,788

Figure 6

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Month	Beginning Outstanding Mortgage Balance (US$)	SMM (%)	Mortgage Payment (US$)	Net Interest Payment (US$)	Scheduled Principal Repayment (US$)	Prepayment (US$)	Total Principal Repayment (US$)	Projected Cash Flow (US$)
29	674,744,235	0.865	4,184,747	3,092,578	811,026	5,829,438	6,640,464	9,733,042
30	668,103,771	0.865	4,148,550	3,062,142	808,031	5,772,024	6,580,055	9,642,198
⋮								
100	326,937,929	0.865	2,258,348	1,498,466	623,659	2,822,577	3,446,236	4,944,702
101	323,491,693	0.865	2,238,814	1,482,670	621,355	2,792,788	3,414,143	4,896,814
⋮								
200	103,307,518	0.865	947,322	473,493	430,784	889,871	1,320,655	1,794,148
201	101,986,863	0.865	939,128	467,440	429,193	878,461	1,307,654	1,775,094
⋮								
300	19,963,930	0.865	397,378	91,501	297,559	170,112	467,670	559,172
301	19,496,260	0.865	393,941	89,358	296,460	166,076	462,536	551,893
⋮								
356	484,954	0.865	244,298	2,223	241,873	2,103	243,976	246,199
357	240,978	0.865	242,185	1,104	240,980	0	240,980	242,084

Note: Since the WAM is 357 months, the underlying mortgage pool is seasoned an average of three months, and therefore based on a 165 PSA, the CPR is 0.132% in month 1 (seasoned month 4), and the pool seasons at 6% in month 27.

Figure 7

4.2 Collateralized Mortgage Obligations

Collateralized Mortgage Obligations (CMO's) are the tranches of mortgage pass-through securities which give rights to different cash flows.

4.2.1 Sequential-Pay CMO Structures

Sequential-pay CMO's are structured so that each tranche is retired sequentially. That is, first, all payments are distributed to Tranche 1 until the principal balance on Tranche 1 is zero. After Tranche 1 is paid off, the distributions are made to Tranche 2 until the principal balance is zero and so on.

Prepayment Rate	Average Life (years)				
	Collateral	Tranche A	Tranche B	Tranche C	Tranche D
100 PSA	11.2	4.7	10.4	15.1	24.0
125 PSA	10.1	4.1	8.9	13.2	22.4
165 PSA	8.6	3.4	7.3	10.9	19.8
250 PSA	6.4	2.7	5.3	7.9	15.2
400 PSA	4.5	2.0	3.8	5.3	10.3
600 PSA	3.2	1.6	2.8	3.8	7.0

Figure 8. Average Life on the Collateral and the Four Tranches for various Prepayment Rates

4.2.2 CMO Structures including Planned Amortization Class and Support Tranches

A problem arises or remains with the sequential-pay CMO's. Because senior tranches are the first to be retired in sequential structures, they are more prone to prepayment risks. In consequence, a common structure in CMO's include **planned amortization class** (PAC tranches) which offer greater predictability of the cash flow as long as the prepayment rate remains within a specified band over the collateral's life.
This structure includes the creation of **support tranches** or companion tranches. These tranches aim to absorb prepayment risk because all prepayment is absorbed by the support tranche. On the other hand, if the collateral prepayments are slow, support tranches only receive their principal payments when the PAC tranches are retired. As result, it minimizes risk by absorbing both prepayment and extension risk. Support tranches expose investors to the highest level of prepayment risk.

5. Commercial Mortgage-Backed Securities

Commercial mortgage-backed securities (CMBS) are backed by a pool of commercial mortgages on income-producing property such as office buildings, industrial properties, health care facilities, etc.

5.1 Credit Risk

If a default occurs, the lender can foreclose the commercial property and has no recourse to the borrower's other assets or income for any unpaid balance.
Two measures are used as credit performance: the *loan-to-value* (LTV) and the **debt-service-coverage** (DSC) which is the ratio between the property's annual operating income (NOI) and (divided by) the annual amount of interest and principal payments.

5.2 CMBS Structure

The last tranche may not be rated by credit rating agencies - this tranche is called the *residual tranche* or *equity tranche*. There are usually two characteristerics inherent to CMBS structures in specific (distinguishing features from RMBS): the *call protection* and *balloon maturity provision*.

5.2.1 Call Protection

The call protection is the borrowers protection against early prepayments. This protection comes either at *structural level*, like RMBS, when CMBS are structured sequentially and lower rated tranches cannot be paid until higher rated tranches are paid.
This protection can also come at loan level, in four different mechanisms:

- *Prepayment lockout* - contractual agreement which prohibits prepayments during a specified time period
- *Prepayment penalty points* - are predetermined penalties that a borrower how wants to refinance must pay (each point is equal to 1% of outstanding loan balance)
- *yield maintenance charge*
- *Defeasance* - the borrower provides sufficient funds for the servicer to invest in a portfolio of government securities that replicates the cash flow that would exist in the absence of prepayments.

5.2.2 Balloon Maturity Provision

The balloon payments require substantial principal repayment at maturity which carries greater risk - *balloon risk*. So if the borrower fails to meet the payment, the lender may extend the loan over a period of time called *workout period*. By doing so, the lender usually charges a higher interest rate called *default interest rate* during the workout period.

6. Non-Mortgage Asset-Backed Securities

Non-Mortgage assets subject to securitization are lease receivables, credit card receivables, personal loans and commercial loans.

6.1 Auto Loan ABS

Auto Loan ABS are backed by auto loans and lease receivables. The cash flows arising from auto loan-backed securities consist of the same structures of other ABS. All auto loan-backed securities offer some form of credit enhancement, such as subordination and overcollateralization and reserve account (excess spread account).

6.2 Credit Card Receivables

For a pool of credit card receivables, the cash flows consist of finance charges, fees and principal payments. The collateral of these ABS (the credit card loans) are non-amortizing loans. Some provisions used in credit card receivable ABS require *early amortization* of the principal which is a provisions that includes an early amortization conditioned to some events in order to safeguard the credit quality.

7. Collateralized Debt Obligations

Collateralized debt obligation (CDO) is the generic term used to describe a security backed by a diversified pool of ABS. (it isn't quite the same as CMO)
CDO's can be backed by a variety of pools:

- CBO's or *collateralized bond obligations* are backed by corporate and emerging market bonds
- CLO's or *collateralized loan obligations* are backed by leveraged bank loans
- *Structured finance CDO's* are backed by ABS, RMBS and CMBS
- *Synthetic CDO's* are backed by credit default swaps for other structured securities

7.1 CDO Structure

A CDO involves the creation of the SPE and the involvement of CDO manager also called **collateral manager** which buys and sells debt obligations for and from the CDO's collateral in order to generate sufficient cash flows to meet the obligations to the CDO bondholders.
Debt obligations issued to fund CDO's are senior bond classes, mezzanine bond classes(credit ratings between senior and subordinated classes) and subordinated bond classes.
The return in excess of what is paid out to the bond classes accrues to the holders of the equity tranche and to the CDO manager. The proceeds to meet obligations to the CDO bondholders are: *interest payments* from collateral assets, *maturing of the collateral assets* and *sale of collateral assets*.

References

[cfa, 2019] 2019. *CFA program curriculum*. CFA Institute.