Group Number: 3507

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Six different scenarios -

1. Money at a fixed interest rate for an unsecured purchase
2. Home Mortgage: Money at a floating rate for secured purchase for an individual
3. Money at a fixed rate for a construction loan
4. Publicly traded stock (useful for short-selling by borrowers)
5. 10-year US Treasury Bonds : Publicly traded bonds
6. An illiquid asset, (You can choose any)

Part 1: Analyze Fallout Risk

Scenario	Model Failure	Financial Crises
Money at a fixed interest rate for an unsecured purchase	There is a lack of diversification as lending to all retail borrowers are usually associated with higher risk than institutional borrower that default risk is higher and relatively unpredictable Consumer can be not able to repay or close the debt position at anytime that the firm will not be able to recover the principal without any collateral, this case might even be common among borrowers during tough economy such that default rate is higher	There is a lack of diversification as lending to all retail borrowers are usually associated with higher risk than institutional borrower that default risk is higher and relatively unpredictable Consumer can be not able to repay or close the debt position at anytime that the firm will not be able to recover the principal without any collateral, this case might even be common among borrowers during tough economy such that default rate is higher
Mortgage Loan	Mortgage loans use lots of components while defining the Model and its structure. Both lender and borrower play important roles in establishing the model. From lender perspective- ● One of the main components of this financial investment is the interest rate on the principal for time of loan. And the interest rates are dependent on the market, we can think of interest rates as a strong two way link between two. If we develop a model	Financial Crises are a major fallout risk. They happen rarely but they have a huge impact on different financial securities differently when they do occur. In financial model perspective financial crises can impact directly or indirectly on security in consideration. Directly implies the underlying financial element (mortgage loan in this case) is the main or one of the main components in a Financial crisis. On the other hand, indirectly means they do not have a major

	based highly on interest rate (maybe by overfitting), we may lose a lot of our investment as a lender. ● Interest rates are in model to represent the market, on the other hand, 5 C's are in model to represent the borrower. 5 C's are capacity, capital, conditions, character, and collateral. If any one of them are calculated or collected irresponsibly or wrong, they may impact on returns hugely. ● News, Social information, community or local government of collateral, etc have their respective contribution in the model on different stages of model. For example, News may affect the local mortgage prices, local government can include or exclude some terms from the contract or may involve with taxes. From borrower's perspective- ● Borrowers should consult with others before taking mortgage loans from any institute. They may have flexible or strict legal terms which may be difficult for normal citizens to understand.	role in the financial crisis, but they are affected by it. ● In the Mortgage loan case,we already had a global crisis in 2008, in which MBS(mortgage backed securities), CDO(Collateralized debt obligations) were the main culprit, and which have mortgage loans as building blocks. ● Last point can be seen as a global crisis, financial crises can be of local level, like natural disaster,etc can impact loan rates. ● Other forms of crises may also impact mortgage loans indirectly through mass default in particular regions, huge fluctuation in interest rates,etc.
Money at a fixed rate for a business for a construction loan	As a way of avoiding extreme situations (losses in this case), there are regulations that govern issuance of loans and the amount of leverage that is acceptable. Construction Loans are not an exception. Financing of projects should be diversified to ensure all fund are not channeled into one project. Incase of non-completion, or any other factor affecting payment of the loan, the losses would be detrimental to the financial institution (lender)	Financial crises see that many financial institutions get strained. Due to inflation, the cost of construction materials and labour increase. Due to this factor, projects that were ongoing will need to be refunded, otherwise they will be not completed within the budget projected prior to inflation. This is likely to lead to default and in most cases underwater projects are realised.

Publicly traded stock	Diversification could be done by investing in shares from different sectors, but no hedging is performed to prevent a macro bearish trend on the equity market When there is financial crisis, the equity sector would usually be adversely affected first as investors prefer to put investment in safer asset class such as bond, thus share price would usually decrease which leads to a decreasing return on the team's portfolio after receiving back the lended shares; there could also be risk that company defaults in such times	Diversification could be done by investing in shares from different sectors, but no hedging is performed to prevent a macro bearish trend on the equity market When there is financial crisis, the equity sector would usually be adversely affected first as investors prefer to put investment in safer asset class such as bond, thus share price would usually decrease which leads to a decreasing return on the team's portfolio after receiving back the lended shares; there could also be risk that company defaults in such times
10-year US Treasury Bond	Again Interest rates,indexes like S&P500, Inflation are major player in development of model on 10-year Treasury Bonds. If any one of them is used incorrectly or ignored, we may perform in terms of returns. ● Since Treasury bonds are backed by the government, they are only affected in price by market participants like pension fund managers, retailers, financial institutes,etcs. ● Bonds are viewed as safe investments, especially government bonds because of low risk involved, low default rates (government almost never default),but if we have inflation and central bank have to adjust interest rates, it will impact the bonds highly. We have to make sure to take inflation in account during the model formation.	Since the treasury bonds are issued by the government, they are also backed by the government. It is also never going to default because the government is backed by the central bank. And in the worst case, treasury bonds yield is nullified by inflation but the government makes sure we will get our funds back. It may impact us indirectly in the form of increased tax regimes, inflation, low employment rates, etc. Bonds are the most secured investment in all of them. That's why they give low yield to balance the low risk, which means making sure we will get our investment back in crises.
An illiquid Security	Limited Options (non- diversification). Buyers expect a pool of options from which they can choose from since	Financial crises lead to decline in the value of assets and properties in real estate. Customer will be

	needs and want are varying. With fewer options to choose from, buyers may not find properties that meet their criteria. Sellers therefore, need to ensure sufficient amounts of properties. This has a direct impact on the growth of commercial real estate industry as growth I depended on the liquidity of the properties. Listing a variety of products will ensure the pool is well diversified hence less risk is involved in regards to model failure.	unable to pay their debts and financial institution declare bankruptcy. This is followed by a Steep decline in the value of currency for most regions, hence the value of goods that a certain amount of currency can purchase will decline. This is in most cases an effect of uncontrolled inflation. As lenders reclaim real estate properties whose mortgage loan / Construction loans have not been paid for (defaulted), they are worth less than the cot paid for their purchase.

Part 2: Identify Data

Data source: https://fred.stlouisfed.org/

https://www.investing.com/

Scenario	Data	Notes
1:Money at a fixed interest rate for an unsecured purchase	Revolving Consumer Credit Owned and Securitized	monthly data with earliest availability from 1968
4:Publicly traded stock (useful for short-selling by borrowers)	S&P 500	Daily data with earliest availability from 1999

Scenario	Required Data	Reason for required data	Features of required data
2:Mortgage loan with fluctuating	Inflation rate	Inflation has huge impact on mortgage loans, since they	• Data Type: Economic rate • Data Processing: Historical data (calculated by different methods) • Data Frequency: Annually,

rates		represent the market in model of mortgage loans	semi-annually, quarterly (depend upon other factors which to use) ● Data Class: common market rate which compares the market values with past and future value of assets. ● Data Source: Government, Financial institutes,etc . Its easily available data. ● Data Variety : Actual data(from past) and also estimated data (to discount the future prices, Inflation rates have there own models to calculate)
	Credit scores	It represent the borrowers 5 C's as number form, Since we can't use categorical data as good or bad in modeling the mortgage rates. We need numerical data which represent the some borrowers properties and credit score is one to them.	● Data Type: Rating ● Data Processing: Represent the character of the borrower in the model. Calculated by its own model which is based on historical data of the borrower. ● Data Frequency: Its depend upon how we use credit source, we may use as one time thing during loan processing or can use how credit score changes as borrower default,etc ● Data Class:Combination of past financial data and private assets of borrower ● Data Source: Primary institutes like private or government banks specially Cental Bank, credit rating agencies. ● Data Variety:Estimated Data, since we can't represent ones character, collateral or thinking in numbers, we use some historical data to identify the borrowers attitude financial debt or bank account.
	Default Rate	Its another data that represent borrowers in model. While credit scores are individual scores, it can be difficult to use them in	● Data Type: Rate ● Data Processing:Historical data (represent the percentage of defaults) ● Data Frequency:Can be Annually, Semi-Annually, Quarterly ● Data Class:Rates ● Data Source: Government, private

		modeling a model which can be universal. We can use default rates in modeling.	banks, Central Bank, agencies which calculate different rates related to market for private investors • Data Variety:Actual Data,Relative data
	Interest Rate	They define the interest rate payments from the borrower on the principal for the lender. They are the way of generating returns on mortgage loans.	• Data Type: Rate • Data Processing: Historical Data • Data Frequency: Based on legal documents of mortgage loans (Annually, Semi-Annually, Quarterly) • Data Class: Rates • Data Source: Government, Central Bank, private banks (primary banks) • Data Variety:Actual Data, Relative Data
5:10-year Treasury Bonds	Dividend Payment	They are the reason to invest in the bonds.	• Data Type:Accounting • Data Processing: Yield,Returns • Data Frequency: depend upon contract (Annually, Semi-Annually, Quarterly) • Data Class: Equity • Data Source: Financial Institutes, Government • Data Variety: Historical Actual data
	S&P500	Index like S&P500 has huge impact on bonds since they are alternative of bonds in market for investors.	• Data Type:Index • Data Processing:Yield • Data Frequency:Annually, Semi-Annually, Quarterly, Weekly, Daily • Data Class: Index • Data Source: Financial Institutes, exchanges,etc • Data Variety: Historical actual
	inflation	Inflation affect the bond prices as inflation represent the market in model	• Data Type:Rate • Data Processing:Implied volatility • Data Frequency:Annually, Semi-Annually, Quarterly • Data Class:Rate • Data Source: Financial Institutes, Government • Data Variety: Historical actual or

			future estimated data
	interest Rate (From Central Banks)	Interest rates define the return on principals in investment. They can be seen as involvement of FDs and other low risk-free investment in the model of bond yield	● Data Type:Rate ● Data Processing: Volatility ● Data Frequency:Annually, Semi-Annually, Quarterly ● Data Class: Rate ● Data Source:Government, Central Bank, Financial Institutes ● Data Variety:Historical actual data or future estimated data

Scenario 6 - An Illiquid Security

Security	Identification
Data Type	Asset, Accounting b) Asset / Economic data
Data Processing	a) Raw prices/ Yields, Return b) Raw prices, volatilities
Data Frequency	a) Varying Frequency
Data Classes	a) Derivatives, Equity, Real Estate b) Credit Data
Data Source	Exchanges, Brokers, OTC, Brokers, Audited Financial, Analytics Companies b) Exchanges, Dealers
Data Variety	Actual data vs. Estimated Data, Trade data vs. Quote data,

	Actual data vs. Estimated Data

Part 3: Identify Ethical Risk

Scenario	Ethical challenges	Undesirable results
1:Money at a fixed interest rate for an unsecured purchase	Consumer might provide false information for stress testing in order to get a lower borrowing rate that does not match their real credit rating	The firm is not balancing the risk with the correct premium, and might suffer from higher liquidity risk
4:Publicly traded stock (useful for short-selling by borrowers)	Some investors might borrow shares with insiders' information Company might provide misleading financial information to cover up instability	Cost and risk would be borne by the team without publicly available information to adjust the price of lending
Mortgage Loan	• Default: The borrower may go default on mortgage loan or may late on some interest rate payments. The reason can be any thing, personal, market like inflation, interest rate. And if default goes permanent and borrower may default completely on mortgage then lenders have some chooses based on contract but some time borrower can't do nothing which raises a ethical questions how to choose borrower and interest rates on principal. • Property value: value of underlying	Sometimes borrowers make default due to economic conditions or by personal reasons, which can be very bad for investors. If people went default on payments, which will affect the securities which are derived form these assets, in this case MBS. Mortgage loans also impact the housing market very strongly, as we know from the 2008 global crises

	collateral can go down and borrower may return the collateral with no future payments. On top of that if contract is non-remorse then borrower has no obligations with his/her personal assets to return the principal with interest. Which raise another ethical question, is non-remorse mortgage are beneficial for lenders ● Fake news on price and surrounding properties: Fake news like construction of highways, big companies may increase the property values, which impact significantly on mortgage loans interest rates	
10-year Treasury Bonds	● Since Treasury bonds are issued by government they have less ethical challenges as compared to other investments. ● If bonds are traded in secondary markets like exchange platforms or OTC, there can be some ethical challenges like fake news to increase or decrease bond price, fake data generation regarding other party or fraud, etc	● We do know treasury bonds are backed by government and government has ways to handle any mishaps happened with bonds. ● The main problem is increase in inflation which can nullify bond yield completely. And inflation can be created by fake news, generated data ,etc to manipulate the market by competitors of treasury bonds which are mainly corporate bonds

An Illiquid Security	Non-disclosure of assets full information. Most real Estate agents and sellers will withhold information that could affect the decision of the buyer. For instance, damages in the property they about to purchase, compromises in security or building materials. This is to avoid losing potential buyers.	Without complete information about a property, client is lured into buying assets that they would otherwise not have purchased. This is acting in bad faith since they client was not fully aware of the deal they were getting into. It's a problem of conflict of interest a well because the seller might want to get rid a property that has been on sale for a while.
Construction Loan	Use of false information To attract lenders, construction companies could fake reviews so as to paint a different impression from the actual picture. Lenders will be attracted to information that is different from the actual performance of the construction company.	Fake reviews will lead to lenders making uninformed decisions that will likely lead to failure. Without a good background check, the lender is likely to be trapped in unfavorable situations. Unfortunately, the damage may be realized when it too late and losses have already been incurred.

Part 4: Identify Ethical Risks Associated With Data Acquired

Scenario	Data	Ethical Considerations
Mortgage Loans	Inflation Rate	Inflation rates can be fake generated by competition. To insure that, collect the data from different or trusted provided.

		Most of the data is provided by government, which we can accept as trusted.
Mortgage Loans	Credit Score	Credit score can be manipulated by borrower to get loan easily. There are lots of ways by which a borrower can fake the credit score. He/She may borrow low principal loans and payback on time to create a good illusion for big loan. To avoid such fraud accept credit score form trusted rating agencies.
Mortgage Loans	Default Rate and Interest Rate	It has same problems as inflation. Collect the data and try to explore it with different techniques to ensure the data
10-year Treasury bond	Dividend Payment	These are highly related to issuer, and this case issuer id government, which can be trusted unless until there is internal unethical practices
10-year Treasury bond	inflation	Again most trusted inflation data provider is government itself
10-year Treasury bond	S&P500	Index data can be manipulated bt investors with high quote data, etc. Also data providers like exchanges and other platforms may generate data.
10-year Treasury bond	Interest Rate (From Central Banks)	Same as Inflation
4:Publicly traded stock (useful for short-selling by borrowers)	JPM share price	There are smoothing performed on the data as data is not at the tick-by-tick level, but at an estimate level with daily frequency, e.g. if

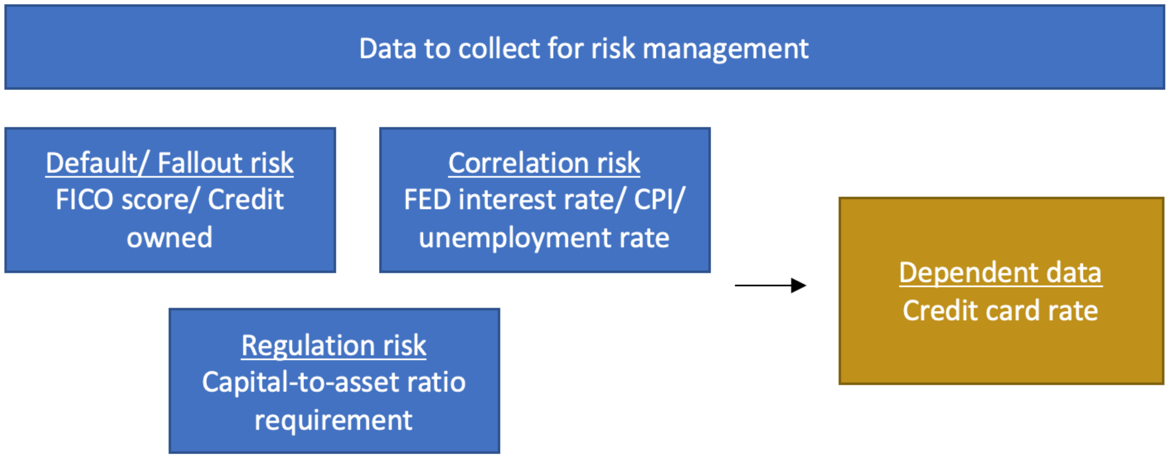
		only close price is used, volatility might not be taken into account; share price is highly affected by market sentiment or manipulation that could be related to company news or analysts' estimates which might not be true all the time or in the longer term
4:Publicly traded stock (useful for short-selling by borrowers)	Trading volume	Institutional investors might perform huge chunk of transaction that greatly affect the daily trading volume for instance to avoid liquidity risk which could greatly affect the underlying value in a short period of time
4:Publicly traded stock (useful for short-selling by borrowers)	Company's credit rating	Credit rating performed by agency are usually based on their analytical work that looks at company's financial data, while sometimes if company chooses not to disclose certain high-risk project or does not obey accounting or regulatory rules, default risk might be overlooked with a misleading credit rating resulted
Illiquid Security	data defined in part 3	**Creating misleading data on purpose** Dealers may create misleading information, either by adding data that is untrue or by withholding bad information that could negatively impact the

		purchase. They could also use data that I misrepresented by using simulated results other than real trade data. This will lead to client making decision based on data that is untrue. This is an illegal practise that could lead to revocation of one's license. **How to minimize / avoid occurrence of the problem** conducting a background check on the property before purchase to determine accuracy of the information provided to should be the first step. Online reviews can be misleading hence one should check several rating agencies to determine certainty of the information. Going further to conduct a background check on the dealer/agent would also be a step in the right direction. One should also seek the advice of other experts as well as other customers who have made similar purchases to as to be able to make an informed decision
Construction Loan		**Extrapolation of Data** Construction companies, in order to attracts customers may use data that is beyond their region, hence creating a misrepresentation of what

		the actual data would look like. This, in most cases, is to cover loopholes that may be occurring in their models, that are favourable when used on a wider range. Extrapolated data may not produce data that represent the region in question. Therefore, they do not reflect the true expected results. **How to minimize / avoid occurrence of the problem** The consumer of these services need to compare different model in the market that cover the same region. The results may not be the same but at least there should be some consistency. Different rating agencies will bring out different results hence one is able to compare the results and make a more informed decision.

Part 5: Enact money lending of unsecured purchase

Workflow diagram



One of the common money lending alternatives is lending at a fixed rate with unsecuritized purchase. Though it could be a relatively simple product in terms of its product nature, multiple risk factors should be taken into consideration for choosing an acceptable interest rate and borrowers to lend.

Default risk

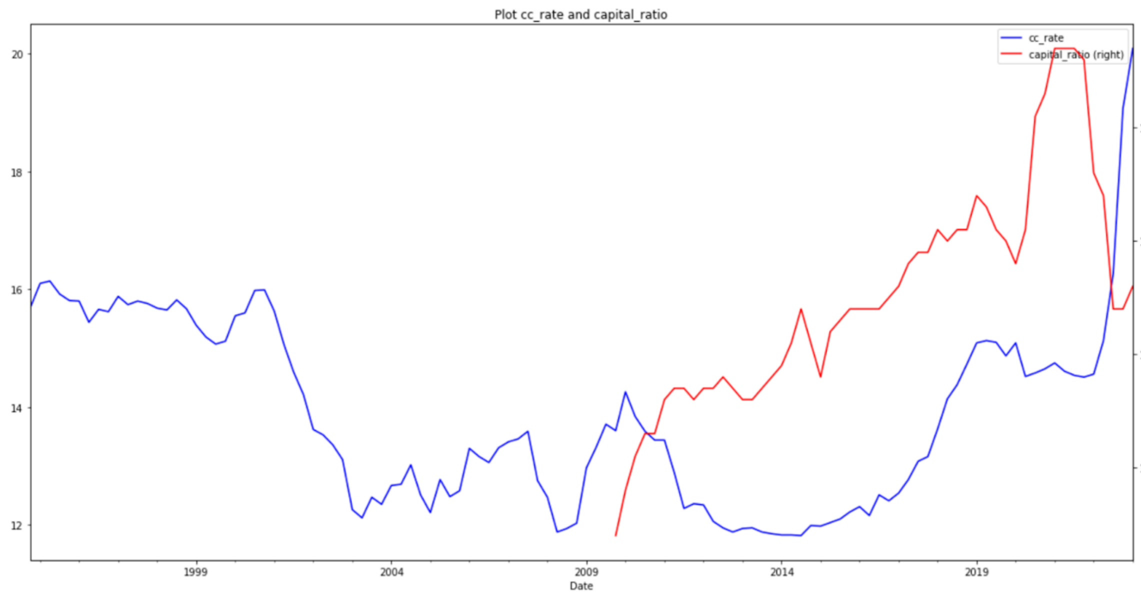
As the target borrower of the issuance are usually retail borrowers who are from diverse risk profiles, which could be affected by their income and asset level, as well as previous credit activity thus their credit rating. Hence, KYC (know-your-customer) research should be done as the first line of defense. This can help filter out untruthful customers who might be associated with high default risk from previous events, or to set up a higher fixed interest rate as compensation of the higher risk borne. While in general, the average FICO score of the country can be taken as a reference. As it is a useful metric to reflect credit worthiness of an individual basket.

Correlation risk

Apart from studying the borrower portfolio, there are a few macroeconomic factors which could possibly affect the profitability of the lending. For instance, interest rate risk could be a major concern. When the lending horizon is in longer term, e.g. more than a year, there could be possible interest rate adjustment from the market which is not captured by the initial fixed rate set. If such a case happens, the financing activity could be unprofitable for instance when the new interest rate is higher than the rate set. The lack of flexibility to adjust to the market's interest rate should be another consideration for the longer term of lending when setting the premium for the compensation of the uncertain time value of money.

Regulation risk

After several major financial crises, there are stricter requirements from regulatory bodies on corporations and banking institutions regarding the capital to asset ratio in order to minimize liquidity and better protect investors as well as the financial market. Hence, the lending activity should always obey the constraint of the ratio and ensure the capital is highly liquid to cover any debt position. It is also a common practice that whenever the capital-to-asset required ratio increases, there would also be an adjustment in the interest rate of money lending activity as an additional premium (as shown from the graph below).



Part 6

<u>Illiquid Securities & Construction Loans</u>

How this risk can be managed

Securities Lending – Securities lending is the provision of collateralized loan to persons who borrow from securities lenders.

Risks

- Default Risk – This is the possibility of the borrower not paying their debt which could lead to losses for the lender of the security. This can be mitigated through:
    - Keeping an updated risk register, a risk treatment plan and a risk mitigation plan to ensure expected risks are calculated and accounted for, and measures to mitigate them are taken.
    - Quality / in-depth assessment of credit accounts before lending. The Lender Should Perform qualitative and quantitative analysis before issuing loans.
    - Having limits to the amount that one can borrow so as to ensure huge amounts of loans are not concentrated on one borrower. This could lead to huge losses. – Diversifications of loans.

    - Maintaining acceptable collateral limits.
- Collateral Related Risks
    - This refers to the loss of financial assets that were expected to replace the value of the borrowed security, in the event of default. Lenders need to ensure:
    - Collateral is of good quality to facilitate a fair compensation depending on the value of the security at hand.
    - Proper documentation and control of property should be done to ensure ease of transfer from borrower to lender incase of default.
    - Updated records of the value of the property should be kept for accounting and audit purposes.

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