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Statement of integrity: By typing the names of all group members in the text boxes below, you confirm that the assignment submitted is original work produced by the group (excluding any non-contributing members identified with an “X” above).

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Team member 3	Regulavalasa Krishna Vamsi

Use the box below to explain any attempts to reach out to a non-contributing member. Type (N/A) if all members contributed.

Note: You may be required to provide proof of your outreach to non-contributing members upon request.

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Submission: Zahara Miriam

Step 1 Collateral Related Risks

Scenario	Financing Challenges	Collateral Challenges
1. Money at a fixed rate for an unsecured purchase (e.g., credit card) for an individual.	<p>Credit Risk: Determining the borrower's ability to repay is critical when no collateral is available, increasing the stakes for unsecured loans with fewer recovery options in default cases.</p> <p>Interest Rate Risk: A fixed-rate loan may become less profitable if market rates increase, leading to a potential loss of income compared to issuing new loans at those higher rates.</p>	N/A - In scenarios involving unsecured purchases, the primary risk stems from the absence of any asset that can be claimed in the event of a default, making the lack of collateral the central concern.
2. Money at a floating rate for a secured purchase (e.g., home or automobile) for an individual.	<p>Interest Rate Risk: The risk comes from interest rate fluctuations which can change the borrower's payment amounts. Rising rates may make it harder for the borrower to afford their payments.</p> <p>Prepayment Risk: Lower interest rates might encourage borrowers to refinance their loans at these new lower rates. This results in early repayment of the existing loan, leaving the lender to reinvest the capital at the now lower rates.</p>	Market value risk involves collateral, such as homes or cars, losing value, especially under worsening market conditions, potentially leading to the collateral's value falling below the loan amount. Additionally, physical damage or destruction can lessen the collateral's value, emphasizing the importance of adequate insurance.

Step 2: Statistical Related Challenges

Scenario	Volatility Challenges	Correlation Challenges
1. Money at a fixed rate for an unsecured purchase (e.g., credit card) for an individual.	<p>Fluctuations in the credit sector may influence both the bank's funding expenses and the fluctuating APRs for consumers.</p> <p>A borrower's fiscal solidity is subject to change, which may sway their capacity to fulfill financial obligations.</p>	<p>Economic recessions often walk hand-in-hand with heightened instances of nonpayment on non-collateralized debts.</p> <p>The steadiness of a debtor's earnings is frequently mirrored by overarching job market fluctuations.</p>

2. Money at a floating rate for a secured purchase (e.g., home or automobile) for an individual.	Swings in the real estate or vehicle markets can significantly steer the appraisal of secured assets and the calculus of loan-versus-asset worth. The fluctuations in interest rates hold substantial sway over the repayment sums expected from borrowers.	Ascending interest rates typically march in step with surging loan defaults, as climbing costs strain affordability. The interplay between overall economic vitality and asset valuations can be a pivotal factor in shaping a borrower's financial standing and repayment competence.
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Step 3: Identifying data

Credit Card Data sources:

<https://www.consumerfinance.gov/data-research/consumer-credit-trends/credit-cards/borrower-risk-profiles/>
<https://fred.stlouisfed.org/series/FEDFUNDS>

Scenario 1: Money at a fixed rate for an unsecured purchase (e.g credit card) for an individual.

Data Type: Credit

Data Processing: Credit Scores, Default Rates

Data Frequency: Quarterly for credit scores, Daily for default rates

Data Class: Credit

Data Source: Credit Bureaus like Experian, Equifax, TransUnion, and Central Banks

Data Variety: Observed Data for credit scores, Modeled Data for default probabilities

The credit scores and default rates data help in evaluating the borrower's creditworthiness and the likelihood of a default, which is crucial for managing the credit risk associated with unsecured loans.

Mortgage Rate Data Sources:

<https://fred.stlouisfed.org/series/OBMMIC30YFLVGT80FB700A719>

<https://www.consumerfinance.gov/data-research/consumer-credit-trends/mortgages/borrower-risk-profiles/>

Scenario 2: Money at a floating rate for an individual's secured purchase (e.g., home or automobile).

Data Type: Economic, Asset

Data Processing: Raw prices/yields for collateral valuation; Implied Volatilities for interest rates

Data Frequency: Daily for asset prices, Intraday for interest rates

Data Class: Real Estate for homes, Fixed Income for interest rates

Data Source: Real Estate Indexes like Zillow, National Association of Realtors; Central Banks; Financial Market Data Providers like Bloomberg, Reuters

Data Variety: Trade Data for real estate; Actual Data for interest rates; Adjusted Data for seasonal real estate variations

Asset prices are monitored to assess the collateral value, while interest rate volatilities are important for understanding changes in payment amounts. This information is essential in managing volatility and correlation risks for loans secured with real estate.

Step 6: Describe how the data can help to meet the challenge

These plots represent time series and distribution of financial rates, showing the behavior of interest rates and credit activity over time. Here's what they could suggest:

1. The trends in origination volume for credit cards and mortgages indicate market confidence and borrowing habits, important for financial and collateral planning.
2. A comparison of the Fed Funds Rate with credit card and mortgage rates reveal how changes in the national interest rate environment can influence rates that consumers pay, illustrating volatility challenges.
3. Histograms of rates display the distribution and frequency of specific interest rates over time, hinting at the stability or volatility of those rates.
4. There's a strong link between what the Fed does with interest rates, the rates people pay on credit cards, and the usual rates for a 30-year mortgage. When the Fed's rates move, it often leads to similar changes in credit card and mortgage rates.

Submission: Pragati Thakur

Step 1 Collateral Related Risks

Scenario-1: Publicly traded bond - I'm focusing on **Municipal Bonds**.

Scenario-2: Illiquid Security- I'm focusing on **The Blackstone Group**.

Data read and took reference from the: " Office of Investor Education and Advocacy: *Municipal Bonds Understanding the Credit Risk*, U.S Securities and Exchange Commission
<https://www.sec.gov/files/municipalbondsbulletin.pdf> "

Scenario	Financing Challenges	Collateral Challenges
Municipal Bond (Publicly Traded)	- Although credit risk is generally lower with municipal bonds, there's still a slight possibility of default especially for revenue bonds backed by revenues from a specific project or source.	- Market risk : One of the reasons for this risk is due to price fluctuations because of changing interest rates this happens with nearly all bonds. - Liquidity risk : Municipal bonds are

	<ul style="list-style-type: none"> - There are higher chances of call risk as there is a possibility that the issuer will be able to redeem the bond early at par value, allowing us to reinvest at a cheaper rate. 	usually less liquid than Treasury bonds, especially for smaller issuers. Bonds must be liquidated by funds to generate cash when investors withdraw their funding.
Private Equity (Illiquid Security - The Blackstone Group)	<ul style="list-style-type: none"> - The inability to obtain easily accessible market data makes it difficult to value the private equity investment with accuracy. There's a chance that the private equity investment may perform poorly or collapse completely. Possible lock-up period preventing the sale of the private equity before a predetermined date. 	<ul style="list-style-type: none"> - It is only easily convertible into money with a substantial investment of time or energy. Lenders may need help if the collateral is illiquid since it could be hard to sell or liquidate to pay off the outstanding debt. - Limited influence over The Blackstone Group's management of the underlying assets.

Step 2 Statistical-Related Challenges

Scenario	Volatility Challenges	Correlation Challenges
Municipal Bond (Publicly Traded)	<ul style="list-style-type: none"> -Even though municipal bonds are less riskier than other bonds for example corporate bonds, there is still a possibility of defaulting on certain bonds like revenue bonds as the revenue generated will be from fixed projects or rather single sources. -Price volatility in municipal bonds can also be explained by differences in supply and demand. Existing municipal bonds may lose value if the supply of new bonds rises unexpectedly 	<ul style="list-style-type: none"> -There are very few correlation challenges as the price movement of Municipal bonds is less influenced by other investments as compared to stocks and other corporate bonds. -Investors are generally ready to settle for a lower yield on municipal bonds because they are tax-exempted. This minimizes the ability of municipal bond prices for fluctuations in overall market interest rates, perhaps further reducing correlation with other interest-rate-sensitive assets.
Private Equity (Illiquid Security - The Blackstone Group)	<ul style="list-style-type: none"> -One of the biggest problems we can face with illiquid security is the valuation of equity due to the lack of availability of data in the market. -If the illiquid security is a private equity then the performance of the overall security 	<ul style="list-style-type: none"> -It is challenging to calculate the correlation with other assets due to the lack of data as it is private equity. -Unlike publicly traded assets, whose price changes can be influenced by investor emotion, private equity, is

	depends highly on the underlying asset as the performance of this asset will influence and have a great impact on the value of security.	less affected by short-term market volatility due to their lack of immediate trading.
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Step 3 Identifying Data**Scenario 1 - Municipal Bond (Publicly Traded)****Data Type:** Market Data, Asset Value**Data Processing:** Calculations like weighted average, IOR(Interquartile range)**Data Frequency:** Daily**Data Class:** Macro Economic factors**Data Source:** munifinace - University of Chicago, Federal Reserve Economic Data.**Data Variety:** Liquidity data, VIX index data, Rolling Sum[\[3\]](#)**Scenario 2 - Private Equity (Illiquid Security - The Blackstone Group)****Data Type:** Market Data**Data Processing:** Price to earning ratio, calculation measures.**Data Frequency:** Daily and Monthly**Data Class:** Price/Yield**Data Source:** Yahoo Finance and in Python via yfinance**Data Variety:** Stock data, Publicly traded private equity firm data(Stocks), Trade Data.**Step 6: How the data can help us with the challenges we are facing:**

1. Using MVA and understanding the volatility of daily returns are good methods to analyse the data of Publicly traded private equity firms as to understand the illiquid securities volatility as this data can ensure the holders that the underlying asset is performing well.
2. For municipal bonds, we can see the average trade volume, VIX index, and data specific to the geo level to understand its volatility as well as the frequency plot can help in giving an in-depth analysis of the data.

Submission: Krishna Vamsi

Step 1 Collateral Related Risks

Scenario-1: Money at a fixed rate for a business for a construction loan.

Scenario-2: Publicly traded Equity (e.g. common stock) – that is, securities lending of a stock.

Scenario	Financing Challenges	Collateral Challenges
1. Money at a fixed rate for a construction loan	<ul style="list-style-type: none"> - Risk of borrower default: This is a chance that the person borrowing money may not pay for it back. - Delays or cost overruns in construction: Loan repayment ability can be affected by delays in construction or going beyond budget. It could lead to construction delays or exceeding budget and consequently have an impact on loan repayment capability. - Economic downturn affecting the construction industry: The construction sector can be affected by macroeconomic fluctuations that potentially influence the borrower's loan repayment capacity 	<ul style="list-style-type: none"> - Inadequate or faulty security: The guarantee given may not sufficiently secure the loan. - Destructive physical injury to the undertaking may reduce its collateral value. - It becomes difficult for developers to sell completed projects upon which loans were lent.
2. Publicly traded Equity (e.g. common stock)	<ul style="list-style-type: none"> - Market volatility affecting stock value: Value of the stock provided as collateral may fluctuate due to market conditions. - Regulatory changes affecting market conditions: Stock prices can also be influenced by alterations in legislation, thus changing aspects of market dynamics. - Counterparty default risk: A situation where the borrower fails to return borrowed stock, thereby impeding lender's capability to sell bond security. 	<ul style="list-style-type: none"> - The probability of bankruptcy or insolvency by the borrower: Financial distress experienced in the borrowing company will impact negatively on the worth of security. - Depression in share price: Devaluation of shares in the stock market could undermine their adequacy as collateral. - Stock's liquidity problems: Limited market liquidity can result into non-saleable stocks.

Step 2 Statistical-Related Challenges

Scenario	Volatility Challenges	Correlation Challenges
1. Money at a fixed rate for a construction loan	<ul style="list-style-type: none"> - The unpredictability in budgeting and financial planning can be the result of project expenses being affected by fluctuation in construction material costs. - In view of loan repayment schedules, this may lead to potential delays or cancellations for constructing projects as a result of economic volatility. - Regulatory changes within the construction industry may introduce additional compliance costs or alter project timelines, introducing uncertainty into loan repayment projections. 	<p>Correlation between costs of construction materials and profitability of a project: Changes in material costs may affect directly profitability, making it impossible to continue with a project if it does not have financial feasibility.</p> <ul style="list-style-type: none"> - Relationship between economic conditions and performance in construction industry: Recession might result in decrease demand for new constructions thereby affecting risk profile of such loans <p>-Correlation between Project Delays and Regulation Revision :Modification in operating conditions can contribute to delayed completion and subsequential effects on repayment schedules.</p>
2. Publicly traded Equity (e.g. common stock)	<ul style="list-style-type: none"> - On the off chance that stock prices continue to be volatile due to market volatility, the equity collateral's valuation will also be impacted and so will the prospective investment returns. - Company earnings and financial performance's variability may have an effect on equity collateral's valuation as well as influence investment returns. - The worth of an equity collateral could change because of regulatory changes that impact market conditions which might affect investor sentiment and stock market behaviour. 	<p>This paper aims at studying whether there is a relationship between increased market volatility and heightened investor sentiment thus impacting stock prices as well as underlying loan security.</p> <ul style="list-style-type: none"> - This study examines how poor business performance may increase stock price volatility therefore affecting risk profile of loans. - A change in regulations can cause shifts in investor sentiment as well as market volatility hence influencing risk profile of loans.

Step 3 Identifying Data**Scenario 1: Money at a fixed rate for a business for a construction loan.**

Data Type: Economic, Asset

Data Processing: Raw prices, Levels, Returns

Data Frequency: Quarterly, Annually

Data Class: Real Estate, Credit

Data Source: National Association of Home Builders (NAHB), Federal Reserve Economic Data (FRED)[\[1\]](#)

Data Variety: Actual Data, Estimated Data, Adjusted Data, Relative Data

Scenario 2: Publicly traded Equity (e.g. common stock) – that is, securities lending of a stock.

Data Type: Market Data

Data Processing: Price-to-earning ratio, Price-to-book ratio, Dividend yield

Data Frequency: Daily, Monthly

Data Class: Equity

Data Source: Yahoo Finance, Bloomberg, yfinance API[\[2\]](#)

Data Variety: Stock Data, Publicly Traded Private Equity Firm Data, Trade Data, Actual Data

Step 6. Describe how the data can help to meet the challenge.

Scenario 1: For construction loans, we need data on:

1. Volatility Index (VIX): to gauge overall market volatility affecting construction material costs and economic conditions.
2. Construction Material Cost Indices: to monitor fluctuations in expenses.
3. Economic Indicators: to understand broader economic conditions affecting loan repayment.
4. Loan Delinquency Rates: to assess borrower financial stability and market conditions.

Scenario 2: For securities lending of publicly traded equities, we need data on:

1. Stock Price Volatility: to assess overall stock volatility impacting lending risk.
2. Trading Volume Data: to evaluate the liquidity of the equity.
3. Borrowing Rates: to understand the demand for short-selling and lending profitability.
4. Short Interest Data: to gauge investor sentiment and potential volatility in stock price.

These datasets help lenders make informed decisions to manage risks associated with construction loans and securities lending.

References:

[1]U.S. Bureau of Labor Statistics, Producer Price Index by Industry: Building Material and Supplies Dealers [PCU44414441], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/PCU44414441>, March 27, 2024.

[2]S&P Dow Jones Indices LLC, S&P 500 [SP500], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/SP500>, April 2, 2024.

[3]Office of Investor Education and Advocacy: *Municipal Bonds Understanding the Credit Risk*, U.S. Securities and Exchange Commission <https://www.sec.gov/files/municipalbondsbulletin.pdf>

[4]Consumer Financial Protection Bureau (CFPB). (2019, December). Consumer Credit Trends – Credit Cards: Borrower Risk Profiles. Retrieved April 2019 data [CSV file]. Available at [CFPB Consumer Credit Trends](<https://www.consumerfinance.gov/data-research/consumer-credit-trends/credit-cards/borrower-risk-profiles/>)

[5]Federal Reserve Bank of St. Louis. "30-Year Fixed Rate Conforming Mortgage Index: Loan-to-Value Greater Than 80, FICO Score Between 700 and 719." Accessed from FRED, <https://fred.stlouisfed.org/series/OBMMIC30YFLVGT80FB700A719>. Data reflects mortgages conforming to set standards with specific borrower credit scores and loan-to-value ratios.

[6]Consumer Financial Protection Bureau (CFPB). (2019, December).[Consumer Credit Trends – Mortgages: Borrower Risk Profiles.]
“<https://www.consumerfinance.gov/data-research/consumer-credit-trends/mortgages/borrower-risk-profiles/>” Note: The dataset includes provisional data up to April 2019, and figures from the last six months may be subject to revision.

[7]Federal Reserve Bank of St. Louis. "Federal Funds Effective Rate." Accessed from FRED, [Federal Funds Effective Rate Series](<https://fred.stlouisfed.org/series/FEDFUNDS>). This series tracks the daily effective federal funds rate, which is the interest rate at which depository institutions trade balances held at the Federal Reserve with each other overnight.