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MACROECONOMIC CREDIT RISK ANALYSIS: A COMPUTATIONAL EVALUATION OF SECTOR CYCLICALITY, LEVERAGE, LIQUIDITY, AND BETA

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ABSTRACT

This study presents a computational framework to evaluate corporate vulnerability to recession and macroeconomic deterioration using sector cyclicality, financial leverage, liquidity, and systematic market exposure. The proposed Credit Risk Analyzer is developed in Python using Flask, yfinance, pandas, NumPy, and scikit-learn-related analytical tools. The application receives three corporate stock tickers, retrieves company information, classifies each issuer according to sector cyclicality, and compares beta, debt-to-equity, and current ratio. The model identifies the issuer with the highest recession vulnerability by prioritizing cyclical exposure and financial leverage. This approach connects market information with fundamental credit-risk concepts and provides a practical screening mechanism for comparative corporate risk analysis. Rather than replacing complete credit underwriting, the analyzer functions as a first-stage analytical dashboard that helps identify issuers requiring deeper financial and macroeconomic review.

Keywords: Credit risk; recession risk; sector cyclicality; leverage; liquidity; beta; macroeconomic analysis; corporate vulnerability; financial risk.

1.0 INTRODUCTION

Credit risk analysis seeks to determine the probability that a borrower or issuer will experience financial deterioration that affects its ability to meet obligations. In a macroeconomic downturn, this risk can increase because weaker demand, higher financing costs, tighter credit conditions, and declining asset prices may pressure corporate cash flows. The effect, however, is not identical across firms. Companies operating in cyclical sectors are generally more exposed to contractions in economic activity, while firms in defensive sectors may display greater resilience.

The practice file used as the basis for this study operationalizes this idea through a compact computational dashboard. The application accepts three corporate tickers and retrieves sector,

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beta, debt-to-equity, and current-ratio information through yfinance. It then classifies sectors as cyclical, defensive, or sensitive and identifies the most vulnerable issuer using cyclicality and leverage as the principal ranking criteria. The source code explicitly defines Consumer Cyclical, Financial Services, Real Estate, Industrials, Basic Materials, and Technology as cyclical sectors, while Consumer Defensive, Utilities, and Healthcare are classified as defensive. □filecite□turn2file0□L13-L23□

This framework matters because credit risk is multidimensional. Leverage can amplify financial distress, liquidity indicates the firm's short-term capacity to meet obligations, and beta provides a market-based measure of systematic sensitivity. Combining these variables with sector characteristics creates a more informative screening process than evaluating any single ratio in isolation.

2.0 GENERAL OBJECTIVE

Develop a computational credit-risk screening framework that evaluates the recession vulnerability of three corporate issuers by combining sector cyclicality, systematic market exposure, financial leverage, and liquidity indicators.

3.0 SPECIFIC OBJECTIVES

- Classify companies according to the cyclical or defensive characteristics of their sectors.
- Retrieve and compare beta, debt-to-equity, and current-ratio indicators.
- Identify the issuer with the greatest recession vulnerability using the ranking logic incorporated in the analyzer.
- Explain how leverage, liquidity, and systematic risk can affect corporate credit quality during an economic contraction.
- Demonstrate how a Python-based dashboard can support an initial credit-risk screening process.

4.0 THEORETICAL FRAMEWORK

4.1 Credit Risk

Credit risk refers to the possibility that a counterparty or borrower will fail to meet its contractual financial obligations. In corporate analysis, the assessment normally considers financial strength, leverage, liquidity, profitability, cash generation, industry conditions, and the broader economic environment. Regulatory credit-risk frameworks also emphasize the importance of identifying changes in borrower quality and measuring the potential effect of adverse economic conditions.

4.2 Recession and Sector Cyclicality

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A recession can affect companies differently depending on the sensitivity of their revenues and cash flows to economic activity. Cyclical businesses are typically more exposed to changes in consumption, investment, employment, construction, and industrial production. Defensive businesses tend to have demand that is comparatively less sensitive to the business cycle. The source code reflects this distinction by assigning sectors to cyclical, defensive, or sensitive categories before evaluating issuer vulnerability. □filecite□turn2file0□L13-L23□

4.3 Beta and Systematic Risk

Beta measures the sensitivity of an asset's returns to movements in a broad market benchmark. A beta above one generally indicates greater systematic sensitivity than the market, while a beta below one indicates lower sensitivity. Within a credit-risk screening framework, beta should not be interpreted as a direct measure of default probability; instead, it provides information about market-related exposure that can complement fundamental credit indicators.

4.4 Financial Leverage

Debt-to-equity compares the financing provided by creditors with the financing provided by shareholders. Greater leverage can increase fixed financial obligations and amplify the effect of declining operating performance on equity and credit quality. In a recession, high leverage can therefore become particularly important because lower cash flows may coexist with debt service requirements.

4.5 Liquidity

The current ratio compares current assets with current liabilities and is commonly used as a basic measure of short-term liquidity. A higher ratio may indicate a larger accounting buffer for current obligations, although its interpretation depends on the quality and convertibility of current assets. Consequently, liquidity should be analyzed together with cash flows, debt maturities, working-capital structure, and industry characteristics.

4.6 Fundamental and Market Indicators

The analyzer combines market and accounting indicators. Beta provides a market-based measure, while debt-to-equity and current ratio provide fundamental balance-sheet information. This combination is useful because market risk and credit risk are related but not identical. A firm can exhibit high stock-market volatility without necessarily having weak liquidity, while a highly leveraged firm may present credit vulnerability even when its stock price appears relatively stable.

5.0 METHODOLOGY

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The research follows a quantitative, applied, and computational approach. The original practice application is implemented in Python with Flask and retrieves corporate information using yfinance. The interface requests three corporate tickers and processes each company individually. The source code uses the company's sector, beta, debt-to-equity ratio, and current ratio as the principal analytical inputs. □filecite□turn2file0□L116-L145□

Methodological characteristic	Description	Application
Research approach	Quantitative and computational	Numerical comparison of corporate risk indicators
Research level	Applied and analytical	Initial screening of recession vulnerability
Unit of analysis	Corporate issuer	Three selected stock tickers
Main variables	Beta, debt/equity, current ratio, sector	Market, leverage, liquidity, and sector risk
Classification	Cyclical / Defensive / Sensitive	Sector-based macroeconomic exposure
Decision rule	Cyclicality + leverage	Highest vulnerability issuer
Data source	yfinance	Company and market information

5.1 Data Collection

For each ticker, the application creates a yfinance Ticker object and retrieves the company's information. The code extracts the sector, debt-to-equity, beta, and current ratio, while also storing the company name and ticker. filecite☆turn2file0☆L126-L145

The default example in the application is AMZN, F, and PG, although the user can replace these with three other corporate tickers. The interface explicitly asks for three corporate tickers separated by commas and returns an error if fewer than three are provided. filecite☆ turn2file0☆L46-L64

5.2 Sector Classification

The classification function separates sectors into three categories. Consumer Cyclical, Financial Services, Real Estate, Industrials, Basic Materials, and Technology are treated as cyclical. Consumer Defensive, Utilities, and Healthcare are treated as defensive. Any other sector is classified as sensitive. filecite☆turn2file0☆L13-L23

5.3 Vulnerability Ranking

The application identifies the most vulnerable issuer by sorting the three observations first according to the cyclical indicator and then according to raw debt-to-equity, both in descending order. Consequently, a cyclical issuer receives priority in the ranking, and leverage differentiates issuers within that classification. filecite☆turn2file0☆L145-L155

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This decision rule is intentionally simple and should be interpreted as a screening mechanism rather than a complete probability-of-default model. A robust credit model would normally incorporate additional variables such as interest coverage, profitability, cash-flow generation, maturity structure, credit spreads, default history, ratings, and macroeconomic forecasts.

6.0 RESULTS

Because the supplied practice file contains the application code rather than a completed live run for a specific final group of companies, the following results describe the analytical output structure and the model's expected interpretation rather than presenting current market values as if they had been calculated in this document.

Indicator	Role	Higher-risk signal	Interpretation	Use in analyzer
Sector cyclicality	Macro sensitivity	Cyclical classification	Greater exposure to economic contractions	Primary vulnerability criterion
Beta	Systematic market risk	Higher beta	Greater sensitivity to market movements	Comparative market-risk indicator
Debt / Equity	Financial leverage	Higher leverage	Greater fixed financial burden	Secondary vulnerability criterion
Current Ratio	Short-term liquidity	Lower ratio	Smaller accounting liquidity buffer	Liquidity diagnostic

The dashboard visually highlights the company selected as the highest-risk issuer. It displays the ticker, company name, sector, cyclicality, beta, debt-to-equity, and current ratio for each of the three companies. The interface also provides an analyst verdict explaining that the most vulnerable issuer faces the highest performance risk in a recession. 🗨filecite☆turn2file0☆ L65-L107🔃

6.1 Strategic Function in Finance

The main contribution of the Credit Risk Analyzer is its ability to transform several financial indicators into an accessible comparative decision tool. For an analyst, the dashboard can be used as a first filter before conducting deeper credit research. If an issuer is simultaneously classified as cyclical and highly leveraged, the combination can justify additional analysis of debt maturities, interest coverage, operating cash flow, refinancing needs, and sensitivity to economic growth.

The tool can also support portfolio and risk-management decisions. An investor or credit analyst can compare several issuers and identify concentrations of cyclical exposure. During

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periods of slowing growth or tighter financial conditions, this information can be incorporated into position sizing, diversification, monitoring frequency, and scenario analysis.

However, the model should not be interpreted as a formal credit rating or default-probability estimator. The code's ranking rule uses cyclicality and debt-to-equity as the decisive criteria, while beta and current ratio are displayed as complementary indicators. filecite☆turn2file0 ☆L142-L155

7.0 CONCLUSION

The Credit Risk Analyzer demonstrates how computational tools can support the initial evaluation of corporate vulnerability during recessions. By combining sector cyclicality with beta, leverage, and liquidity, the framework connects macroeconomic conditions with company-level financial characteristics. Its principal advantage is simplicity: an analyst can enter three corporate tickers and obtain a standardized comparison that identifies the issuer considered most vulnerable under the model's decision rule.

The analysis also shows the importance of interpreting indicators jointly. Cyclicality provides information about exposure to the economic cycle, debt-to-equity indicates financial leverage, current ratio provides a basic liquidity perspective, and beta captures systematic market sensitivity. None of these measures alone is sufficient to determine credit quality. Therefore, the analyzer is best understood as a first-stage screening instrument that should be complemented with cash-flow analysis, profitability, interest coverage, debt maturity analysis, credit spreads, ratings, macroeconomic scenarios, and qualitative assessment.

Overall, the project illustrates the practical value of Python-based financial analytics for credit-risk monitoring. Its modular structure could be expanded in future research by adding probability-of-default models, Altman Z-score, interest coverage, cash-flow ratios, credit ratings, scenario analysis, machine-learning classification, and historical recession backtesting.

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