



RESEARCH ARTICLE

The Impact of COVID-19 on the Credit Rating of Companies by Separate Industry

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Abstract

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Credit risk is an essential factor for attracting resources in a competitive business environment. This research investigated the impact of COVID-19 on companies' credit risk across industries to identify sectors that need government support and help improve the economic situation. This paper used 298 companies admitted to the Iranian capital market between 2019 and 2020. According to this research, credit ratings have increased in the automobile industry, parts, and essential metals. Given the increase in credit ratings in some industries, it can be concluded that other factors, such as inflation, the rise in the dollar, the withdrawal from the JCPOA, and economic variables, also affected credit ratings as COVID-19 spread.

Keywords:

Credit rating, credit risk,

COVID-19

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1. Introduction

The business environment for companies is growing and very competitive. Accordingly, companies have to compete with various factors at the national and international levels and expand their operations through new investments to continue their activities. For this purpose, they need financial resources ([Hosseinpour Bahabadi, 2014](#)). Since creditors consider a company's credit rating when financing, companies are concerned about their credit rating. First, they may avoid a financial crisis by being unable to pay their principal and subsidiary debts. Secondly, lest the credit decisions of the managers today endanger the future financial flexibility of the company. The credit status of companies is essential to the companies themselves and other stakeholders (such as creditors, potential and actual investors, and lenders) ([Mahmoudabadi and Ghiori Moghadam, 2019](#)). Given the importance of credit risk from different perspectives, the effective factors should be identified. One of the factors was COVID-19, which had significant effects on credit risk ([Yin et al., 2022](#)).

Many recent studies have examined the economic impact of the COVID-19 pandemic across several aspects. According to [Hao et al. \(2022\)](#), credit risk significantly increased following the spread of the pandemic. Thus, the pandemic caused serious concerns about consumption consolidation, fiscal capacity, and export volatility. The COVID-19 pandemic led to economic crises and decreased investment in most areas, thereby affecting the economic growth rate ([Shamshiri et al., 2019](#)). The COVID-19 epidemic negatively affects various fields, such as the stock market ([Xue et al, 2021](#)), people's income, consumption, and, as a result, business income ([Chetty et al., 2020](#)), economic health, and credit risk ([Baker et al., 2023](#)).

In response to disease outbreaks, governments implemented strict preventive measures, such as restricting travel between cities and suspending business operations, which decreased economic growth. Consumption declined, supply chains were disrupted, and workers were in short supply ([Xue et al., 2021](#)).

The decline in consumption among non-essential categories, including restaurants, hotels, clothing, and department stores, was enormous, and the decline in essential categories was quite noticeable ([Cox et al., 2020](#)). The impact of COVID-19 was different in several industries. The essential life security, manufacturing, retail, and service sectors, and transportation were negatively affected by the epidemic. Services have suffered huge losses during the globalization outbreak as governments have suspended business operations and customers have reduced demand. Conversely, the demand for services such as healthcare information technology has increased ([Xue et al., 2021](#)).

Therefore, the purpose of this research is to investigate the impact of COVID-19 on the credit risk of companies across industries and identify sectors that need government support to improve the economic situation and industries.

2. Literature review

2.1 Theoretical review

Financing decisions have a prominent role in determining growth, investment, and production strategies. Access to low financing costs is one of the requirements of economic feasibility in development projects, and credit rating plays an essential role in financing. A credit rating is an independent assessment of a company's ability to pay its debts. Creditors are always looking for ways to ensure the company's ability to repay its debt ([Vazifehdust et al., 2016](#)). In light of the importance of credit ratings, this study investigates how COVID-19 has impacted investor uncertainty across industries.

The novel coronavirus emerged in Wuhan, China, in late December 2019, and then spread rapidly across China and other countries. According to the World Health Organization report, the

coronavirus emerged in early 2020, quickly spread into a global epidemic and caused severe economic contraction (Hao et al., 2022).

As a result, the Coronavirus crisis began, reduced investment in most areas, and changed economic growth rates (Shamshiri et al., 2019). Due to the shock of the pandemic, COVID-19 triggered a very different economic downturn than the 2008 financial crisis. A global pandemic can weaken a country's economic health and increase its credit risk, according to Baker et al. (2023). COVID-19 affects both short- and long-term credit risks of a firm, since a country's consumption usually recovers after a negative shock (Augustin, 2018).

2.2. Empirical review of related studies

Panahi et al. (2021) studied the prevalence of COVID-19 and its risk factors in two groups of industries, with and without occupational health management systems. The results indicated a significant difference between the values of occupational medicine parameters and the occupational health information management system, biological hazards risk management, employee training and participation, COVID-19 disease management, and disease prevalence between industries with and without occupational health management systems.

Osoolian and Koushki (2021) analyzed the risk in financial markets before the pandemic and during the COVID-19 period. The results of the research indicated that investing in a portfolio consisting of silver and gold, or silver and the total index, can be riskier during the epidemic period due to the increase in the level of correlation and mutual information between these pairs of markets. 2) Gold showed the lowest level of information deviation after the outbreak of the COVID-19 pandemic. Thus, the information perceived by gold investors did not affect their fear level during the pandemic. A safer investment portfolio can be created by investing in the S&P 500 and gold.

Shamshiri et al. (2019) investigated the risk of investment in research and development using the FMEA technique in light of the COVID-19 economic crisis. The research was conducted using a questionnaire, and 21 experts from the automotive industry were targeted. The results of the research showed that by examining previous studies and interviewing experts, the risks related to the field of investment were classified into four sections, including idea generation and design, initial and detailed evaluation stage, design and development stages, test and approval stage of mass production, and market introduction. Also, the risks related to the initial and detailed evaluation stage were prioritized over those associated with other locations related to the research and development.

Hao et al. (2022), in a study of COVID-19, examined consumption and absolute credit risk for a sample of 40 developed countries across several dimensions. The research results showed that the COVID-19 pandemic has increased credit risk.

Chetty et al. (2020) researched how COVID-19 and balancing policies affect spending and employment. For this purpose, they examined daily statistics on expenditures, business income, employment rates, and other key industry indicators, as well as the income group and business size of consumers. The results showed that people's income decreased as a result of COVID-19, and they drastically reduced their expenses, which led to a decrease in the income of small businesses.

Consumer behavior under the influence of COVID-19 was examined by Cox et al. (2020). They used bank account data at the household level to examine the heterogeneous effects of the pandemic on spending and savings. In general, the results indicated a decrease in costs. Among non-essential categories, reductions were made for restaurants, hotel accommodations, clothing, and large department stores. Among the essential types, the reductions in health care, ground transportation,

and fuel were the most significant.

Xue et al. (2021) investigated the stock market's reaction to the COVID-19 pandemic and the role of adjusting companies' big data strategies. This study empirically examines how stock markets react to the COVID-19 pandemic by developing a machine-learning-based learning criterion. Big data strategies protect the company from the impact of the epidemic. This issue is harmful across many sectors in China, except for information technology and healthcare, which have been affected by the COVID-19 outbreak.

3. Research methodology

The current research is applied in purpose and descriptive in terms of the data collection method. The research methodology is based on past necessary information measuring.

The study variables were collected from the audited financial statements of companies. Companies admitted to the Iranian capital market between 2019 and 2020 are the statistical population of this research after applying the following:

1. The end of the financial year of all companies should be the same.
2. In the study period, the company did not change the financial year.
3. The company's financial information is available in the study period.
4. It should not be a part of banks and financial institutions, and it should be accepted in the capital market by the end of 2017 and not be withdrawn from it during 2019-2021.

We obtained a sample of 298 companies admitted to the stock exchange by implementing the above restrictions. The limitations mentioned above are intended to enhance the integrity and consistency of the collected data. To collect the required data, the financial statements of listed companies were analyzed in Excel and classified using the affiliated equations. Following the summary of data, the Wilcoxon test was carried out using SPSS software.

Variables

Credit rating

An emerging-market score model was used to assess the company's credit rating using a quantitative risk approach. Jafari & Ahmadvand (2014) calculated a final adjusted ranking based on the evaluation of specific credit risks in the emerging market. In this model, first, the emerging market score and the equivalent value of the credit rating are extracted, then the equivalent rating of the emerging market score is based on three main factors, including;

- 1) Adjusted bond rating for foreign currency devaluation vulnerability
- 2) Adjusted for industry
- 3) Adjusted for competitive position

The emerging market score is measured using the following model (Altman and Hotchkiss, 1993):

$$EMS = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

$$X_1 = \frac{\text{working capital}}{\text{total assets}}$$

$$X_2 = \frac{\text{retained earnings}}{\text{total assets}}$$

$$X_3 = \frac{\text{operating income}}{\text{total assets}}$$

$$X_4 = \frac{\text{book value of equity}}{\text{total liabilities}}$$

Table 1. Z-score and equivalent credit ratings by Altman and Hotchkiss (1993)

	Z" score	Equivalent credit ratings
	15.8 ≥	AAA
	60.7 -15.8	AA+
	7.30 – 60.7	AA
	7.00 – 7.30	AA-
	6.85 -7.00	A+
Safe Zone	6.65 – 6.85	A
	-6.40 6.65	A-
	6.25 -6.40	BBB+
	-5.85 6.25	BBB
	5.65 -5.85	BBB-
	5.25 -5.65	BB+
	95/4 -5.25	BB
Gray Zone	4.75 -4.95	BB-
	4.50 -4.75	B+
	-4.15 4.50	B
	-3.75 4.15	B-
	3.20 -3.75	CCC+
	-2.50 3.20	CCC
Distress Zone	1.75 -2.50	CCC-
	≤1.75	D

Based on the emerging-market score model, the scores were compared to the scores listed in Table 1. Based on the three factors mentioned, a credit rating equivalent to the score was obtained and adjusted in three stages:

Step 1: Adjusted bond rating for foreign currency devaluation vulnerability:

According to Jafari and Ahmadvand (2014) and Mohammadi et al. (2019), the effect of exchange rate changes on financing activity was reflected in the cash flow statement and liquidity ratio relative to current liabilities, both of which will be due in the next year. In this way, if the effect ratio of exchange rate changes on the company's cash or its current debt cash ratio is lower than the industry average, the equivalent credit rating will be adjusted by three degrees. For example, if the rating is BB+, it will be reduced to B+ after three grades. If the company's vulnerability status is neutral, a one-notch reduction in the equivalent credit rating is applied (e.g., from BB+ to BB). The credit rating does not change if the impact of exchange rate fluctuations on the company's cash or its cash-to-current-debt ratio is higher than the industry average.

Step 2: Adjusted for industry:

Finally, the z" model's average industry credit security rating is compared to the first step's comparable credit rating (Mohammadi et al., 2019). If the difference between these two ratings is 1 to 3 degrees, the adjusted equivalent credit rating in the first step has been changed by one degree. As an example, if the credit rating is BBB and the industry rating is BBB-, BB+, or BB, the equivalent credit rating is reduced by one grade. It is adjusted by two degrees if the difference is between three and six degrees; if the difference is more than six degrees, it is adjusted by three degrees.

Step 3: Adjusted for competitive position

The company's sales were divided by the industry's average sales to determine its competitiveness. According to Mohammadi et al. (2019), if this ratio is greater or less than one, the company is competitive or non-competitive.

After the above steps, the final adjusted credit rating was entered as a dependent variable in the research model. We divided the points assigned to the credit rating into seven categories based on previous research (MurciaI et al., 2014):

Table 2. Credit ratings classifications

	Credit Rating	Grade
	AAA	7
	AA+	6
	AA	6
	AA-	6
	A+	5
Good investment level (Safe Zone)	A	5
	A-	5
	BBB+	4
	BBB	4
	BBB-	4
	BB+	3
	BB	3
	BB-	3
Low investment level (Gray Zone)	B+	2
	B	2
	B-	2
	CCC+	1
speculative level (Distress Zone)	CCC	1
	CCC-	1
	D	1

Adapted from Ashbaugh-Skaife et al. (2006)

COVID-19:

The variable for the 2019 financial year was set to 1 as a result of the onset of the Coronavirus in early 2020, which quickly spread around the world. Before then, it was set to 0 since the Coronavirus disease had not spread to Iran yet.

4. Findings

4.1. Descriptive statistics

The descriptive statistics of the research variables are presented in Table 3. According to the results, the largest standard deviation is observed in the latex and plastic industry, indicating greater data dispersion and lower accuracy than in the other industries. Also, the average credit rating, calculated before and after the outbreak of coronavirus across all industries except food and beverage (excluding sugar), increased in the year compared to the previous year. We continued to perform statistical tests to assess the significance of this difference. Also, the probability of the Kolmogorov-Smirnov test statistic for all the variables of the research, except for agriculture industries and related services, latex and plastic, and machinery and equipment in 2020, is less than 5%. Thus, the research data are non-normal, so nonparametric tests (the Wilcoxon test) were used to test the hypotheses.

Table 3. Descriptive statistics of research variables

Industry	Number	year	Max	Min	Std. Deviation	Mean	Kolmogorov-Smirnov Test	probability of the Kolmogorov-Smirnov Test
Mining of metal ores	10	98	6	1	1.751	5.2	0.476	0.000
	10	99	6	1	1.581	5.5	0.524	0.000
Transportation	10	98	6	1	2.22	3.5	0.270	0.038
	10	99	6	1	1.911	4.1	1.181	0.200
Automobiles and parts	33	98	5	1	1.43	2.24	0.322	0.000
	33	99	5	1	1.5	2.57	0.314	0.000
Computer and related activities	9	98	6	2	1.53	5.111	0.385	0.000
	9	99	6	3	1.26	5.111	0.314	0.011
Agriculture and related services	12	98	7	1	1.825	4.66	0.239	0.057
	12	99	7	2	1.775	4.66	0.274	0.013
Other non-metallic ore products	14	98	6	1	1.847	3.785	0.245	0.023
	14	99	6	1	1.703	3.857	0.320	0.000
Lime cement and plaster	24	98	7	1	2.126	4.791	0.423	0.000
	24	99	6	1	2.074	4.958	0.484	0.000
Petroleum products, coke, and nuclear fuel	12	98	6	1	1.83	4.916	0.390	0.000
	12	99	6	5	0.288	5.916	0.530	0.000
Essential metals	37	98	6	1	1.682	5.05	0.362	0.000
	37	99	7	1	1.322	5.594	0.512	0.000
Latex and plastic	10	98	6	1	2.162	3.7	0.226	0.159
	10	99	7	1	2.366	4.4	0.351	0.001
Machinery and equipment	10	98	7	2	1.629	4.63	0.225	0.126
	10	99	6	1	1.921	4.909	0.442	0.000
Chemical products	43	98	6	1	2.130	4.53	0.382	0.000
	43	99	7	1	1.988	5.000	0.413	0.000
Food and beverage products except sugar	28	98	6	1	1.722	4.678	0.314	0.000
	28	99	6	1	1.773	4.535	0.295	0.000
Pharmaceutical materials and products	39	98	7	2	1.385	5.359	0.447	0.000
	39	99	6	2	1.224	5.359	0.418	0.000

4.2. Discussion of findings

Due to the non-normality of the data, the Wilcoxon test was used to assess the significance of differences in credit ratings before and after the coronavirus pandemic and examine the impact of COVID-19 on credit ratings across industries. Aside from the automotive, parts, and chemical goods sectors, there is no discernible change in the credit ratings of industries before and after COVID-19. Consequently, the research hypotheses are dismissed. We can conclude that the coronavirus outbreak has led to higher credit ratings for the automobile and parts industries, essential metals, and chemical products. This conclusion is supported by Table 4, which shows that the average grade after the Coronavirus increased compared to before, and the p-value from the Wilcoxon test is less than 5%, indicating that we cannot reject the null hypothesis that the ranks before and after the Coronavirus differ. The findings are not consistent with the theoretical underpinnings and with those of Hao et al. (2022) and Xue et al. (2021).

5. Conclusion

Based on the research's theoretical underpinnings and historical context, the study examined the impact of the Coronavirus Pandemic on credit ratings across 14 industries. According to the hypothesis test, the credit ratings of the automotive, metal, and chemical product sectors were

significantly different before and after the virus. The findings were inconsistent with the theoretical underpinnings and with those of Hao et al. (2022) and Xue et al. (2021).

Table 4. The impact of the coronavirus on the credit rating of industries

Industry	t-Statistics	p-value
Mining of metal ores	1.000	0.317
Transportation	-1.169	0.242
Automobiles and parts	-2/066	0.039
Computer and related activities	0/000	1.000
Agriculture and related services	-0.061	0.951
Other non-metallic ore products	-0.378	0.705
Lime cement and plaster	-1.069	0.285
Petroleum products, coke, and nuclear fuel	-1/604	0.109
Essential metals	-3.165	0.002
Rubber and plastic	-1.841	0.066
Machinery and equipment	-0.647	0.518
Chemical products	-2.55	0.011
Food and beverage products except sugar	-0.464	0.642
Pharmaceutical materials and products	-0.189	0.850

The disparity may be attributed to the confluence of various factors, including inflation, a stronger dollar, withdrawal decision from the JCPOA, and sector-specific variables and economic circumstances. The prices of essential metals fell at the beginning of the Coronavirus outbreak. Still, data on domestic and international demand for them suggests that the price drops in the first few months have been more than offset by a significant increase in demand since the second quarter, with boosted profits. The US withdrawal from the JCPOA and sanctions on Iran's auto industry led to a decline in imports, prompting foreign automakers to exit the Iranian market, even as car sales dropped after the Coronavirus outbreak. A combination of factors, including a spike in the exchange rate, sharply increased car prices. Fortunately, the industry has recovered from the demand drop thanks to price hikes. In other words, the increase in profitability, the company's financial strength, and its credit rating are not due to increased demand for the relevant product. Still, the price increase due to changes in the dollar rate can contribute to inflation. In light of these results, it is suggested that supporting institutions pay special attention to industries affected by exchange rate changes, as they can contribute to inflation in the country. It is also suggested that researchers re-examine the research hypothesis using regression analysis, controlling for inflation and JCPOA withdrawal. Since the companies' financial statements have not been reevaluated and due to the severe impact of inflation in recent years, ignoring inflation has been a limitation of this research.

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