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# The Difference between Corporate Rating Migration Probability during Economic Contraction and Expansion in Indonesia

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## Abstract

Corporate Rating is one of the tools of Signaling Theory, expected to provide clear and standardized signals of a company's financial health and credit risk. However, according to the experts, the regulation of Corporate Rating issuance by Credit Rating Agency (CRA) becomes a hindrance to the timeliness of company information updates, especially during sudden large-scale economic shifts. Based on this issue, this research aims to examine the differences between Corporate Rating migration probabilities under two different economic conditions: contraction and expansion. Before conducted hypothesis testing, the secondary data from 73 sample companies were processed using Markov-Switching Autoregressive (MSVAR) and Multinomial Logistic Regression methods. Ther results of this study shows that there is no difference in the probability of a Corporate Rating downgrade during both economic conditions. On the other side, the probability of a Corporate Rating upgrade is smaller during economic contraction, and there is a difference in the probability of a Corporate Rating remained unchange between both economic conditions.

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## 1. INTRODUCTION

Signaling theory is an economic concept that explains the exchange of information between two parties through giving a signal (Connelly et al., 2024). On its application, Signaling theory facilitates communication between a company's internal and external stakeholders such as investors, capital fund providers, or the public (Huang, 2022). Corporate Rating is one of the tools of Signaling theory, whom reflecting the company's ability to meet its obligations in the long term. Corporate Ratings are issued by Credit Rating Agency (CRA) through specific regulations, expected to send clear and standardized information signals about the company's financial health and credit risk to financial market participants. When a CRA gave a high rating to a company, investors would interpret this as a good signal to invest in that company. On the other hand, if the CRA gave a company low rating, investors would perceive it as a signal that company is high risk, and might proceed with caution when considering investment.

However, according to Tran et al. (2021), business regulations imposed by CRA in issuing Corporate Ratings becomes a hindrance to the timeliness of company information

updates, especially during sudden large-scale economic shifts. In line with Tran et al. (2021), Telg et al. (2022) explained that the three major CRAs—S&P Global Ratings, Moody's Rating, and Fitch Ratings—were slow or even unable to detect potential disruptions in Corporate Rating stability during the Asian financial crisis in 1997-1998 and the global financial crisis (GFC) in 2007-2008. Many companies experienced significant rating downgrades, which were not anticipated. Canto et al. (2021) also noted that during the COVID-19 pandemic crisis, approximately 1,000 global companies across various sectors experienced declines in their ability to meet obligations between March and April 2020, resulting in drastic downgrades in their Corporate Ratings, and some even defaulted or went bankrupt without warning. Arising from these issues, it's clear that the signals provided by Corporate Ratings have become less accurate to use when sudden economic shift happens. Many researchers believe that the stability of Corporate Rating depends on the prevailing economic conditions, and begun to study the stability of Corporate Ratings in two different economic conditions: contraction and expansion.

Research by Bangia et al. (2002) shows a significant difference in bankruptcy probability during economic contraction compared to expansion, and Corporate Rating migration tends to be more stable during contraction. Inline with Bangia et al. (2002), Boreiko et al. (2017) evaluated the impact of macroeconomic conditions on Corporate Rating migration using a Markov Chain, where macroeconomic factors represent the strength of variables unexplained by traditional models. This study proved that companies with investment-grade ratings will be stable when the economic structure expands. On the other hand, during a recession, there is an increase in the likelihood of rating migration for both investment-grade and junk-rated companies. Boreiko et al. (2018) conducted further research on the same topic but with slightly different variables and methods. He examined the effect of business cycles on corporate rating migration, conditioning the rating migration matrix based on macroeconomic variables. This study showed that most cases of rating downgrades occurred during economic contraction. Companies with low ratings are highly impacted by volatile economic conditions, where their probability of bankruptcy is much higher than that of investment-grade companies.

Gera et al. (2020) built an empirical model for Corporate Rating migration that is sensitive to economic cycles using the Markov Regime Switching process in their study. They argued that this model can anticipate prediction errors and reduce variations in forecasting rating migration in the future. This research mentioned that companies with high ratings have a high chance of maintaining their rating level in both expansion and contraction conditions, while companies with ratings below BBB are more sensitive to changes in the economic cycle, with a significant difference in probability. During economic contraction, the probability of rating downgrades is higher than the probability of upgrades. Edirisinghe et al. (2022) created a structural model to predict the migration probability of Corporate Ratings in U.S. companies based on macroeconomic conditions, using the financial ratios of Altman's Z-Score formula. Their study showing that Corporate Rating migration probabilities vary depending on economic conditions, and the probabilities would vary between investment-grade ratings and junk ratings. Kalkbrener & Packham (2024) used a time-homogeneous Markov chain to build a credit rating migration model in their research. The model they developed captures the effects of economic conditions and their impact on credit rating migration probabilities. This study shows that economic conditions greatly influence company rating migration, particularly for companies whose asset values are lower than their liabilities.

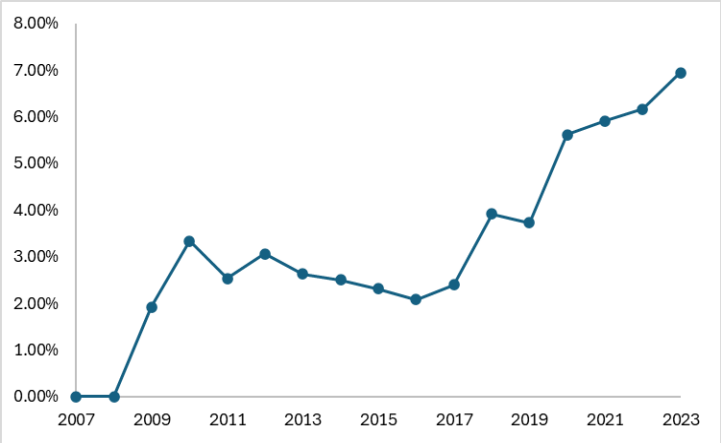


**Figure 1.** Default Rate of Companies Ranked by PEFINDO
Source: Economic Research of PEFINDO (2023)

In Indonesia, based on Figure 1, the default rate of companies has shown an upward trend since after the Global Financial Crisis (GFC) in 2008. The default rate saw a downward trend during 2011-2016, alongside improvements in Indonesia's economy, which was marked by a consistent annual Gross Domestic Product (GDP) growth rate above 5%. However after 2015, Indonesia's economic growth slowed again, peaking in another crisis during 2020-2021 as the COVID-19 pandemic spreaded (Indonesia-Investments, 2024). In relation to that, there have been small numbers of Indonesian researchers that linking the studies between economic contraction and expansion with the probability of Corporate Rating migration, despite the clear evidence that economic conditions directly affect Corporate Rating stability. Therefore, this research is conducted with the aim of examining the differences in the effects of economic contraction and expansion on the Corporate Rating migration probabilities for companies in Indonesia. The framework that used in this research was adopted from Edirisinghe et al. (2022) study, whose presented a new structural model to predict rating migration using economic indicators and company financial data. The economic indicators used in this research are as follows:

a. Gross Domestic Product Growth Rate (GDP): This is a comparison of per capita GDP growth over a specific period with the previous period.
b. Inflation Rate (INF): An indicator that reflects the overall increase in the prices of goods and services over a certain period.
c. Indonesia Leading Economic Indicator Composite Index (LEI): This index is formed from various economic indicators such as manufacturing production, export and import prospects, employment figures, and other indicators related to consumer spending.
d. Interest Rate Spread (INT): This indicator is calculated using the difference between the yield on 10-year government bonds (SUN10Y) and the benchmark interest rate in Indonesia, the BI-7 Day Reverse Repo Rate (BI-Rate). This indicator reflects the investment market conditions in Indonesia.

To predict the probability of Corporate Rating Migration, we used the ratios from Altman's Z-Score (Altman, 2018) formula as follows:

a. Net Working Capital per Total Assets Ratio (NWC)
b. Retained Earnings per Total Assets Ratio (RE)
c. Earnings Before Interest and Tax per Total Assets Ratio (EBIT)
d. Market Value of Equity per Book Value of Debt Ratio (MVE)
e. Sales per Total Assets (SALES)

The predicted probabilities of Corporate Rating migration were used for conducted hypothesis testing. The hypothesis tested in this research as follows:

a. The probability of a Corporate Rating downgrade ($P(Y_t = 1)$) during economic contraction is bigger than during economic expansion.

b. The probability of a Corporate Rating upgrade ($P(Y_t = 2)$) during economic contraction is less than during economic expansion.
c. There is a difference between the probability of a Corporate Rating remained unchange ($P(Y_t = 0)$) during both economic conditions.

## 2. METHODS

This research used quantitative approach, that aims to examining the differences in the effects of economic contraction and expansion on the Corporate Rating migration probabilities for companies in Indonesia through hypothesis testing. The population in this study consists of companies listed on the Indonesia Stock Exchange (IDX) from 2007 to 2023 that have been rated by CRAs recognized by the Finansial Services Authority (OJK). A total of 73 companies were selected as the sample through purposive sampling, based on the following criteria:

a. Non-banking companies listed on the IDX that have been rated by CRAs recognized by OJK during the 2007-2023 period.
b. Companies that publish quarterly interim financial reports and annual audits in Rupiah currency.
c. For companies with double ratings (rated by two different CRAs), the rating with the longest history will be chosen.

This research uses secondary data, collected from various third-party sources. Corporate Rating historical data, LEI index, SUN10Y yields, and companies' financial data were obtained from Revinitiv Eikon, historical BI-Rate data was obtained from the Bank Indonesia website, and historical GDP growth and inflation data were obtained from the Central Bureau of Statistics (BPS) website. All the data that used in this research were observed quarterly.

The first step of this research was modeling the economic conditions using Markov-Swiching Autoregressive (MSVAR). This method could detect the changes for all economic indicators silmutantly, allowing us to know when economic shift happen and how long the contraction and expansion period will be lasted. The second step is modeling the probability of Corporate Rating migration using five financial ratios that have been mentioned before as predictor variables, with Multinomial Logistic Regression method. This method allowing us to predict the probability of response variable with more than two categories, by making one of the categories as the basis of odds ratio calculation. In this research, the category of Corporate Rating remained unchange ($Y_t = 0$) is used for the base. After modeling and predicting the probability, we conducted the hypothesis testing that have been mentioned before using t-test to answer the research objectives.of Determination ($R^2$), Predictive relevance ($Q^2$), and Path coefficient.

## 3. RESULTS AND DISCUSSION

### The Economic Condition Periods in Indonesia

To determine when economic contraction and expansion occur and how long these conditions last in Indonesia, we used the MSVAR method, which can capture an overview of Indonesia's economic conditions using all four economic indicators simultaneously. The MSVAR model gave us an output of Markov Transition Probabilty as we can see in Table 1. The economic condition has a high probabilty of consistently remaining in the same state, whether in contraction or expansion. This indicates that transitioning from a contraction to an expansion, or vice versa, takes a considerable amount of time Edirisinghe et al. (2022).

**Table 1.** Markov Transition Probability

| Economic Condition | Contraction | Expansion |
|---|---|---|
| Contraction | 0,881 | 0,119 |
| Expansion | 0,042 | 0,958 |

Source: Data Processed (2024)

The classification of contraction and expansion periods are based on the highest likelihood value in each quarter. If the likelihood in contraction is greater than expansion, then the relevant period is classified as a contraction period. Likewise, if the likelihood in expansion is greater than contraction, then the relevant period is classified as a expansion period. The results of this classification were projected onto quarterly economic indicator values, which can be seen in figure 2.

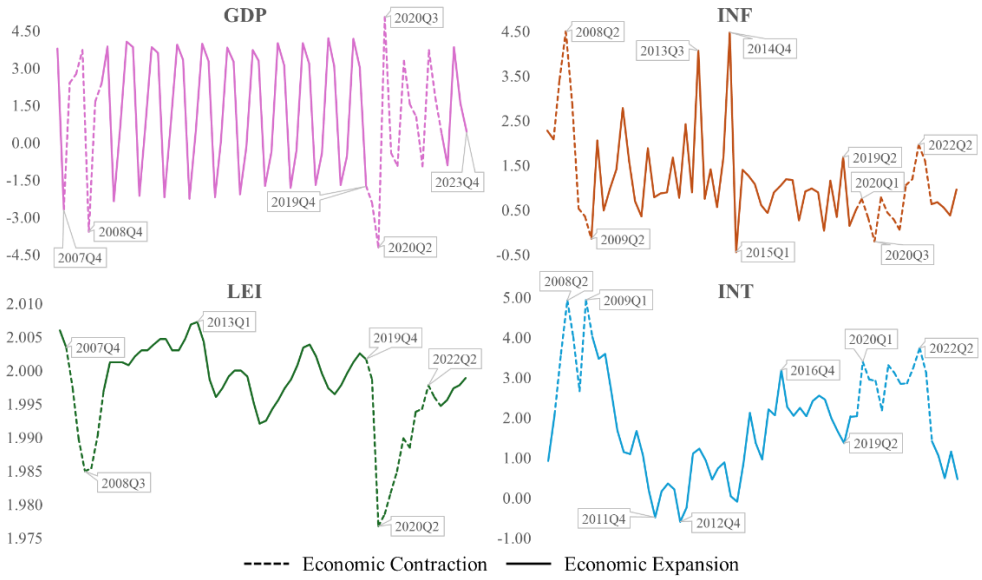


**Figure 2.** The Results of MSVAR Method for Economic Indicators
Source: Data Processed (2024)

Based on Figure 2, economic contraction occurred during the periods of 2008Q1 – 2009Q2 and 2020Q1 – 2022Q4, which coincided with the Global Financial Crisis (GFC) in 2008, and the crisis caused by the COVID-19 pandemic in 2020. This demonstrates that the MSVAR method has proven capable of detecting periods of economic crisis in Indonesia that occurred during these two periods. Based on this result, the Corporate Rating migration can be clustered into both economic conditions, allowing us to move to the next step of the analysis.

## The Estimate of Corporate Rating Migration Probabilites

Using the 5 financial ratios from Altman's Z-Score (Altman, 2018) formula as predictor variables and the Corporate Rating migration that had been clustered as response variable, we obtained the coefficients of the Multinomial Logistic Regression model as we can see in Table 2. Based on the result, we can imply four information.

**Table 2.** The Coefficients of Multinomial Logistic Regression Model

| Variable | Odds Ratio Coefficients for $\frac{P(Y_t=1)}{P(Y_t=0)}$ | | Odds Ratio Coefficients for $\frac{P(Y_t=2)}{P(Y_t=0)}$ | |
|---|---|---|---|---|
| | Contraction | Expansion | Contraction | Expansion |
| Constant | -1.72 | -1.51 | -4.61 | -3.50 |
| NWC | -1.16 | -0.29 | -1.68 | 0.20 |
| RE | -0.41 | 0.04 | 2.30 | -1.51 |
| EBIT | -12.47 | -2.45 | 12.13 | 25.58 |
| MVE | -0.32 | -1.56 | -0.04 | -0.12 |
| SALES | -8.52 | -2.21 | 0.98 | 0.37 |

Source: Data Processed (2024)

First, if economic contraction happened, the increase in all five ratios would cause the odds ratio of P(Yt=1)/P(Yt=0) to decrease. Thus, the probability of a rating downgrade would decrease as the probability of a rating remained unchange would increase.

Second, if economic expansion happened, the increase of NWC, EBIT, MVE, and SALES ratio would cause the odds ratio of P(Yt=1)/P(Yt=0) to decrease. Thus, the probability of a rating downgrade would decrease as the probability of a rating remained unchange would increase. Meanwhile, the increase of RE ratio would cause the odds ratio to increase too. This means the increase of RE ratio would make the probability of a rating downgrade went up as the probability of a rating remained unchange went down.

Third, if economic contraction happened, the increase of NWC and MVE ratio would cause the odds ratio of P(Yt=2)/P(Yt=0) to decrease. Thus, the probability of a rating upgrade would decrease as the probability of a rating remained unchange would increase. On the other hand, the increase of RE, EBIT, and SALES ratio would cause the odds ratio of P(Yt=2)/P(Yt=0) to increase. This means the increase of those three ratios would make the probability of a rating upgrade went up as the probability of a rating remained unchange went down.

Lastly, if economic expansion happened, the increase of RE and MVE ratio would cause the odds ratio of P(Yt=2)/P(Yt=0) to decrease. Thus, the probability of a rating upgrade would decrease as the probability of a rating remained unchange would increase. On the other hand, the increase of NWC, EBIT, and SALES ratio would cause the odds ratio of P(Yt=2)/P(Yt=0) to increase. This means the increase of those three ratios would make the probability of a rating upgrade went up as the probability of a rating remained unchange went down.

## The Hypothesis Testing

Using the multinomial logistic regression model that we had, we tested the three hypothesis that we had already explained earlier in the introduction. Table 3 provide all of the probabilities and p-values for each hypothesis and rating level.

For companies with investment-grade ratings (AAA to BBB-), the probability of being downgraded during an expansion is higher than during a contraction, as seen in the probabilities for ratings AAA, AA+, AA, A+, A, A-, and BBB, leading to the rejection of Hypothesis 1. Many well-rated companies experienced rating downgrades between 2014 and 2019. Although the economy was in an expansion phase, inflation and investment risk were highly volatile, as indicated by the widening interest rate spreads during that period as we can see in Figure 2. This is likely what caused many companies to face financial difficulties, ranging from asset and sales depreciation to capital shortages, ultimately leading to a decline in their ability to meet financial obligations.

Although Hypothesis 1 was rejected at many levels, it was accepted at the AA-, BBB+, BBB-, BB, and CC levels. The acceptance of Hypothesis 1 aligns with research by Boreiko et al. (2018), Oh et al. (2019), and Gera et al. (2020), which suggests that the lower a company's rating, the more it is affected by economic contraction, increasing the probability of a rating downgrade, especially for junk ratings like BB and CC. Overall, the probability of rating

downgrades during an economic contraction is indeed higher than during an economic expansion. However, Hypothesis 1 was rejected at the 5% significance level, indicating insufficient evidence of a difference in the probability of Corporate Rating downgrades during economic contraction and expansion in Indonesia.

**Table 3.** The Results of Hypothesis Testing

| Corporate Rating Level | Hypothesis 1 | | | Hypothesis 2 | | | Hypothesis 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Contraction Prob. | Expansion Prob. | p-Value | Contraction Prob. | Expansion Prob. | p-Value | Contraction Prob. | Expansion Prob. | p-Value |
| AAA | 0.050 | 0.099 | 1.000 | No hypothesis can be tested | | | 0.918 | 0.867 | 0,000 |
| AA+ | 0.022 | 0.043 | 0.998 | 0.021 | 0.028 | 0.008 | 0,957 | 0,930 | 0,001 |
| AA | 0.013 | 0.023 | 0.974 | 0.025 | 0.033 | 0.001 | 0,962 | 0,944 | 0,001 |
| AA- | 0.022 | 0.015 | 0.026 | 0.025 | 0.029 | 0.010 | 0,953 | 0,956 | 0,312 |
| A+ | 0.027 | 0.037 | 0.977 | 0,025 | 0,035 | 0,000 | 0,948 | 0,928 | 0,000 |
| A | 0.043 | 0.036 | 0.195 | 0,021 | 0,030 | 0,000 | 0,936 | 0,933 | 0,742 |
| A- | -0.030 | 0.055 | 1.000 | 0,020 | 0,034 | 0,000 | 0,951 | 0,911 | 0,000 |
| BBB+ | 0.058 | 0.034 | 0.001 | 0,023 | 0,034 | 0,000 | 0,920 | 0,933 | 0,040 |
| BBB | 0.060 | 0.063 | 0.650 | 0,017 | 0,029 | 0,000 | 0,923 | 0,909 | 0,022 |
| BBB- | 0.066 | 0.023 | 0.000 | 0,013 | 0,031 | 0,000 | 0,921 | 0,946 | 0,000 |
| BB+ | 0.069 | 0.062 | 0.416 | 0,012 | 0,034 | 0,011 | 0,919 | 0,904 | 0,538 |
| BB | 0.050 | 0.009 | 0.000 | 0,021 | 0,035 | 0,000 | 0,929 | 0,956 | 0,001 |
| B+ | No data available | | | 0.027 | 0.032 | 0.001 | 0,934 | 0,920 | 0.016 |
| B | 0.048 | 0.051 | 0.582 | No data available | | | 0.940 | 0.907 | 0.030 |
| B- | 0.056 | 0.086 | 1.000 | 0,012 | 0,042 | 0,000 | 0.932 | 0.877 | 0.000 |
| CCC+ | 0.046 | 0.104 | 1.000 | 0,012 | 0,037 | 0,000 | 0.933 | 0.871 | 0.000 |
| CCC | 0.050 | 0.062 | 0.718 | 0,021 | 0,025 | 0,179 | 0.925 | 0.899 | 0.224 |
| CCC- | No data available | | | 0,026 | 0,039 | 0,116 | No data available | | |
| CC | 0.300 | 0.053 | 0.003 | No data available | | | 0.698 | 0.885 | 0.037 |
| C | 0.077 | 0.068 | 0.386 | 0,002 | 0,061 | 0,035 | 0.905 | 0.895 | 0.777 |
| ALL | 0.044 | 0.041 | 0.129 | 0,018 | 0,038 | 0,022 | 0.936 | 0.926 | 0.000 |

Source: Data Processed (2024)

Companies with investment-grade ratings (AAA to BBB-) have a higher probability of experiencing rating upgrades during economic expansion compared to economic contraction, as indicated by the acceptance of the Hypothesis 2 across all those rating levels. This suggests that companies with investment-grade ratings are able to utilize expanding economic conditions to improve their performance, such as increasing revenue, expanding operations, or enhancing efficiency. For companies with junk ratings (BB+ to SD), Hypothesis 2 was accepted at all levels except for CCC+ and CCC. While the probability of a rating upgrade for companies with CCC+ and CCC ratings is indeed lower during economic contraction than during economic expansion, there is still insufficient statistical evidence to accept Hypothesis 2 at those rating levels. This indicates that some low-rated companies continue to struggle with meeting their obligations, whether during economic contraction or expansion.

Overall, the Hypothesis 2 was accepted at the 5% significance level, indicating sufficient evidence that the probability of a Corporate Rating upgrade is indeed lower during economic contraction than during economic expansion in Indonesia. This finding aligns with research by Boreiko et al. (2018), Gera et al. (2020), and Edirisinghe et al. (2022), which suggests that companies find it more difficult to improve their ratings during contractions due to tighter financial conditions, increased borrowing costs, and weakened consumer purchasing power.

Companies with investment-grade ratings (AAA to BBB-) have varying probabilities at each rating level for not experiencing a rating migration, whether during economic

contraction or expansion. However, Hypothesis 3 was rejected at the AA- and A levels, indicating insufficient evidence to conclude that the probability of  rating remained unchange at the AA- and A levels differs between economic contraction and expansion. For companies with junk ratings, the same applies at the BB+, CCC+, and C levels.

Overall, Hypothesis 3 was accepted at the 5% significance level, indicating that there is indeed a difference in the probability of rating remained unchange during economic expansion and contraction. This aligns with research by Bangia et al. (2002), Gera et al. (2020), and Edirisinghe et al. (2022), which suggests that there are differences in the probability of Corporate Rating remained unchange during economic contraction and expansion. Looking at the probabilities in Table 3, the probability of Corporate Rating remained unchange is higher during economic contraction. When linked to hypothess 1 and 2, it can be inferred that during economic expansion, Corporate Ratings tend to migrate to a higher level. However, during contraction, Corporate Ratings tend to maintain their position. This could also explain why Hypothesis 1 was rejected.

## 4. CONCLUSION

Based on the findings, we can conclude that: 1) The probability of a Corporate Rating downgrade during economic contraction is higher than during economic expansion, but this was not proven to be statistically significant. This indicates that overall economic conditions in Indonesia do not have a substantial impact on the likelihood of a Corporate Rating downgrade. 2) The probability of a Corporate Rating upgrade during economic contraction is lower than during economic expansion, and this was proven to be statistically significant. This indicates that in Indonesia, economic conditions have a significant impact on the probability of a Corporate Rating upgrade. 3) The probability of a Corporate Rating remained unchange during economic contraction is different from that during economic expansion, and this was proven to be statistically significant. This indicates that in Indonesia, economic conditions have a significant impact on the probability of a Corporate Rating to remain unchange. 4) The results of this study provide more insights of Corporate Ratings during different economic conditions. It could be used for as a guidlines for company management to prepare better plans for company stability, and as an additional signal for investors to decide where to allocate their funds.

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