

## Analysis of Carbon Tax Implementation on the Probability of Default of Coal Mining Companies in Indonesia

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**ABSTRACT:** This study aims to determine the effect of the application of carbon tax to coal companies in Indonesia that allows the Probability of Default for coal companies. The sample of this study consisted of 17 companies listed on the Indonesia Stock Exchange (IDX). With a quantitative approach. The data analysis technique uses descriptive statistical analysis. The data used is secondary data in the form of panel data. Panel data (pooled data) is a combination of time series data over a three-year period, namely 2018-2022 with cross section data in the form of publicly available company secondary data. Based on the results of the Merton model calculation, the probability of company failure on average reaches 90.76% and some have reached 100%. The achievement of the probability of failure of mining companies is inseparable from the price of coal which is quite varied during the study period.

**KEYWORDS:** Greenhouse Gas, Carbon Tax, Climate Change, Coal Mining Company, Probability of Default.

### 1. INTRODUCTION

Increasing greenhouse gas (GHG) emissions due to the use of fossil fuels that produce carbon will increase the earth's temperature, change the climate, and have a negative impact on human existence. The more CO<sub>2</sub> gas in the atmosphere, the more heat waves reflected from the earth's surface are absorbed by the atmosphere. As a result, the earth's surface temperature will increase. The increase in surface temperature results in extreme climate change that destabilises forests and other ecosystems. This in turn limits their ability to absorb carbon dioxide in the atmosphere. The amount of carbon emitted by Indonesia in 2022 reached 700 million tonnes per year. This is an 18.3% increase from the previous year, and the highest increase compared to other countries. According to the report, the increase in Indonesia's emissions was contributed by the use of fossil energy, especially coal. Another source is Indonesia's high land conversion and deforestation (<https://databoks.katadata.co.id/>).

Fuel consumption for the power plant subcategory in 2018 was 504 million BOE, this data is coal sales data for domestic sales allocation. This figure has increased since 2008 with an average growth of 7.08% per year. Fuel consumption is dominated by coal from 2008 to 2018, with a share of 53.94% to 75.92%. This shows that the government still relies on Steam Power Plants (PLTU) in the electricity sector policy for the community. In the subcategory of solid fuel

production and other energy industries, the activity that produces GHG emissions is the processing of coal into other forms of energy, so the activity data used in the calculation is the volume of coal processed. Fuel consumption for the coal processing subcategory in 2018 was 42 thousand BOE. If seen in Figure 4, the volume of coal used in the processing process from 2008 to 2018 fluctuates. However, overall, the volume increased by an average of 15% per year (MEMR Data and Information Technology Centre, 2018).

To address climate change and its consequences, world leaders, including Indonesia, declared the Paris Agreement on 12 December 2015 during the UN Climate Change Conference (COP21). The Paris Agreement, signed on 4 November 2016, aims to reduce global greenhouse gas emissions and limit global temperature rise to 2.0°C and seeks to limit temperature rise to below 1.5°C. Indonesia, as one of the signatory countries, has ratified and signed the agreement, and established its commitments through the Law of the Republic of Indonesia. The agreement calls on governments to strengthen their commitments and adapt to the impacts of climate change.

Countries are implementing carbon levy schemes to reduce emissions. The Indonesian government has made laws and regulations on carbon tax to address climate threats. Proponents argue that a carbon tax can encourage greener economic activities and reduce CO<sub>2</sub> emissions, while critics argue that a carbon tax can increase production costs and

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worsen the business climate. The implementation of climate policy will be a pressure for the coal mining business sector. Due to the large role of coal in the country's economy, research related to the potential bankruptcy due to the implementation of carbon tax needs to be conducted. According to the International Energy Agency (IEA), Indonesia was the world's largest coal exporter in 2020, contributing around 28% of global coal exports. In addition, coal contributes about 4% to gross domestic product (GDP). Coal is currently the world's second largest source of primary energy after petroleum.

Currently, the government has designated the Steam Power Plant (PLTU) as the subject of carbon tax in Indonesia. Starting from 2025, other sectors will be subject to carbon tax in stages. The mining sector, including coal mining, is currently not subject to a carbon tax, which in the future will certainly be the subject of the carbon tax. The subject of carbon emissions from coal mining is coal carbon emissions that are not subject to the imposition of carbon tax on coal burned in PLTU. In the context of coal mining, carbon emissions come from various stages of its activities from mining itself, transport, stockpiling and utilisation (Pandey et al. 2018).

In the face of policies related to carbon tax, a study was conducted Analysis of Carbon Tax Implementation on Probability Of Default of Coal Mining Companies in Indonesia. Which aims 1) to find out the low carbon economic policy through the implementation of carbon tax policy will significantly affect the company's balance sheet. 2) To determine the impact of low-carbon economic policies through the application of carbon tax policies that will have an impact in the event of Probability of Default of coal mining companies in Indonesia. 3) To find out the tax rate that allows an increase in the Probability of Default of coal mining companies in Indonesia. 4) To find out the company can overcome it if there is Probabilty of Default (managerial implications).

**II. RESEARCH METHODS**

The research design used in this study is descriptive statistical analysis research method, inference.

The data used is secondary data in the form of panel data. Panel data (*pooled data*) is a combination of *time series data* over a three-year period, namely 2018-2022 with *cross section data* in the form of secondary company data that is publicly available in the form of financial report data and other reports and company stock data traded on the stock exchange in the 2018-2022 period. The population that is the subject of this study is publicly listed companies listed on the Indonesia Stock Exchange (IDX) in the 2018-2022 research period in the coal mining sector and is also an expansion data

from Manurung *et al.* (2020). During this period the author identified 17 publicly listed companies in the coal sector listed on the Indonesia Stock Exchange (IDX), namely:

**Table 1. Research sample**

1. PT Bukit Asam	10. PT Delta Dunia Makmur
2. PT Adaro Energy Indonesia	11. PT Resources Alam Indonesia
3. PT Indo Tambangraya Megah	12. PT Perdana KaryaPerkasa
4. PT Medco Energi International	13. PT Golden Eagle Energy
5. PT Bayan Resources	14. PT Golden Energy Mines
6. PT Atlas Resources	15. PT Garda Tujuh Buana
7. PT Bumi Resources	16. PT Harum Energy
8. PT Samindo Resources	17. PT Petrosea
9. PT Toba BaraSejahtera	

In this study, the research variables used are Probability of Default (PD) as an indicator of the company's potential bankruptcy, and the company's ratio variables in the form of Current Ratio (CR), Debt to Equity (DER), Gross Profit Margin (GPM), Net Profit Margin (NPM), Times Interest Earned (TIE), Currency Exchange Rate, and Oil Price (OIL). This research variable aims to:

Knowing how significant the relationship between Current Ratio (CR), Debt to Equity (DER), Gross Profit Margin (GPM), Net Profit Margin (NPM), Times Interest Earned (TIE), Currency Exchange Rate (EX), and Oil Price (OIL) on Probability of Default (PD) of the coal mining companies studied.

Knowing how significant the effect of carbon tax implementation is on the balance sheet and financial ratios of the companies mentioned above and how significant the effect of these changes is on the Probability of Default (PD) of the coal mining companies studied.

The *Probability of Default* calculation uses the Merton KMV Model. Merton (1974) explains that corporate failure can be estimated using several variables such as the total value of the company's assets, equity and corporate debt. The value of debt continues to swell and the company's dwindling assets can certainly not pay the debt, resulting in default.

The KMV Merton model in its application can calculate the potential failure of a corporation to run, especially in the presence of an additional tax burden on a company. Agus (2014) argues that the KMV Merton model has an advantage, which is focused on estimating corporate failure (default) when paying debt at the expiration date. The study used a panel data regression model. This study examines the effect of *Current Ratio* (CR), *Debt to Equity* (DER), *Gross Profit Margin* (GPM), *Net Profit Margin* (NPM), *Times interest Earned* (TIE), *Currency Exchange Rate* (EX),

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and Oil Price (OIL) on *Probability of Default* (PD). The analysis method used is panel data regression, which is formulated in the panel data regression model.

$$Y_{PD} = \alpha + \beta_a X_{CR} + \beta_b X_{DER} + \beta_c X_{GPM} + \beta_d X_{NPM} + \beta_e X_{TIE} + \beta_f X_{ER} + \beta_g X_{OIL} + \beta_h X_{CRB} + \beta_i X_{PND} + e$$

- YPD = Probability of Default
- $\alpha$  = Constant
- $\beta_a$ -g = Regression Coefficient
- XCR = A ratio that reflects the ability of at company's current assets to U cover current liabilities or short-term debt. T
- XDER = Debt ratio is the ratio of total debt and total assets owned by the company.
- XGPM = The ratio of gross revenue to sales or revenue earned by the company.
- XNPM = The ratio of net income to sales or revenue earned by the company.
- XTIE = A ratio that shows the company's ability to settle the interest expense.
- XER = Exchange Rate is a measure of the conversion of money in the form of foreign currency US Dollar with rupiah units.
- XOIL = Showing fluctuations in oil prices.
- XCRB = Demonstrate the effect of carbon policy.
- XPND = Shows the influence of the Pandemic period.
- e = standard error

**III. RESULTS**

**A. Uji Asumsi Klasik**

1. Uji Normalitas

The purpose of this analysis is to determine whether the confounding or residual variable regression model has a normal distribution. If the residual value does not have a distribution, then the statistical test becomes invalid for a small sample size. The method used to detect whether the residuals are normally distributed or not is by graphic design. If the data spreads around the diagonal line or follows the direction of the diagonal line or the histogram graph shows a normal distribution pattern, then the panel data regression model fulfils the normality assumption, and vice versa. If the significant value > 0.05 means that the data distribution is not normal, on the other hand, if the significant value is < 0.05, the data distribution is normal. In this study, the significant value based on the random effects method is 0.000002, thus the data in this study are normally distributed.

2. Uji Multikolinieritas

To determine whether or not there is a correlation between variables, it can be seen from the value less than 0.80. Table 8 presents the results of the multicollinearity test.

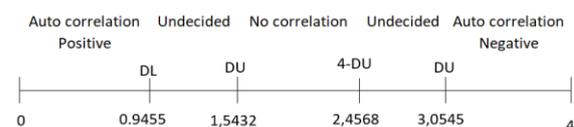
**Table 8. Multicollinearity test**

	DER	GPM	NPM	TIE	CR
DER	1	0.024	-0.103	-0.027	0.730
GPM		1	0.790	0.253	0.023
NPM			1	0.329	-0.108
TIE				1	0.011
CR					1

From the table above, it can be seen that the relationship between all variables has a correlation coefficient value between variables of less than 0.80, thus in this study it can be identified that there is no multicollinearity problem.

3. Uji Autokorelasi

Ghozali (2017) states that the autocorrelation test aims to test whether in the panel data regression model there is a correlation between confounding errors in period t and confounding errors in period t-1 (previous).



In the autocorrelation test, the Durbin-Watson stat value is 1.84242 and the value is between DU and 4-DU, thus there is no auto correlation.

4. Uji Heteroskedasitas

According to Yuandari (2017), the Heteroscedasticity Test aims to test whether in the panel data regression model there is an inequality of variance and residuals from one observation to another. A good regression model is homoscedasticity or no heteroscedasticity. The heteroscedasticity test is used to determine whether or not there are deviations from classical assumptions. Heteroscedasticity is the existence of inequality of variance of residuals for all observations in the regression model. A prerequisite that must be met in the regression model is the absence of heteroscedasticity symptoms.

1. If the prob value is < 0.05 then there are symptoms of heteroscedasticity in the research model.
2. if the prob value > 0.05 then there are no symptoms of heteroscedasticity in the research model.

From the results of the heteroscedasticity test using the white method, the probability value is 0.65 > 0.05 so it can be concluded that there are no symptoms of heteroscedasticity in the research model.

**B. Descriptive Statistics**

In this study there are several variables presented in table 2.

**Table 2. Descriptive Statistics**

	Prob.	DER	GPM	NPM	TIE	CR	Kurs	Oil Price
Minimum	-0,071	-2,114	-1,940	-20,719	1100,308	0,169	13473	45,410
Maximum	1,000	324,578	1,000	13,978	724,310	146,130	15592	80,470
Rata-rata	0,908	5,826	0,246	0,003	27,341	4,336	14214	60,687
Simpangan Baku	0,202	31,557	0,294	2,394	178,953	16,646	700	13,118
SKEW	-3,412	9,255	-3,644	-3,818	-1,537	7,614	1,308	0,527
Kurt	12,490	91,072	26,915	57,531	19,898	59,084	2,554	-1,044
Jarque Bera	774,27	45896,17	3541,93	17181,24	1671,625	19137,87	39,89	98,971
	9		33	51	783	38	88	84

Table 4.8. shows the minimum, maximum, average standard deviation, Skewness, Kurtosis and Jarque Bera of the DER, GPM, NPM, TIE, CR Exchange Rate and Oil-Price variables. Debt to Equity Ratio (DER) is a measure of the amount of leverage or the amount of debt used by the Company and compared to the Company's equity. The lowest DER is -2.114x, the highest is 324.58x and the average is 5.8261x and the standard deviation is 31.5572. This DER data has a normal distribution indicated by the Jarque Bera value which is higher than the table value.

Gross Profit Margin (GPM) is a ratio that states the amount of gross profit earned by the company. usually this ratio is used to state the sustainability of the Company's business. The lowest GPM is -1.9404, the highest is 1x and the average is 0.2462x and the standard deviation is 0.2938. This GPM data has a normal distribution indicated by the Jarque Bera value which is higher than the table value.

Net Profit Margin (NPM) is a profitability ratio that states the company's ability to get net profit on sales made by the company. The lowest NPM is -20.719, the highest is 13.9777 and the average is 0.0027 and the standard deviation is 2.3942%. This NPM data has a normal distribution indicated by the Jarque Bera value which is higher than the table value. Time Interest Earnings (TIE) is a ratio that states the ability of operating profit to pay interest on Company loans. This ratio can also be expressed as the Company's ability to make loans so that loan fees can be paid. The lowest TIE is 0.1691 the highest is 146.1302 and the average is 4.336 and the standard deviation is 0.2129. This TIE data has a normal distribution indicated by the Jarque Bera value which is higher than the table value.

Current Ratio (CR) is a ratio that measures the Company's liquidity, the Company's ability to pay short-term debt. The lowest CR is -2.114x, the highest is 324, 58x and the average is 0.908x and the standard deviation is 15.2%. This CR data has a normal distribution indicated by the Jarque Bera value which is higher than the table value.

Exchange Rate (Kurs Dollar, symbolised in this study EX) is a measure of the conversion of money in the form of foreign currency US Dollar with units of rupiah. The lowest dollar exchange rate is 13473, the highest is 1592 and the average is 14214 and the standard deviation is 700.05. This Dollar Exchange Rate data has a normal distribution indicated by the

Jarque Bera value which is higher than the table value.

Oil Price is a society's ability to spend to survive during its lifetime. Oil prices can fluctuate due to several factors. The lowest oil price is 45.41, the highest is 80.47 and the average is 60.6871 and the standard deviation is 13.1178. This Oil Price data has a normal distribution indicated by the Jarque Bera value which is higher than the table value.

The lowest Probability Default is -0.0712, the highest is 1 and the average is 0.9076 and the standard deviation is 20.23. This Probability Default data has a normal distribution indicated by the Jarque Bera value which is higher than the table value. Based on the results of the Merton model calculation, the company's failure probability on average reaches 90.76% and some have reached 100%. The achievement of the probability of failure of mining companies is inseparable from the price of coal which is quite varied during the study period.

**C. R-Square**

*R square* is a value that shows how much the independent variable (exogenous) affects the dependent variable (endogenous). R squared is a number that ranges from 0 to 1 which indicates how much the combination of independent variables together affects the value of the dependent variable. The R-squared (R2) value is used to assess how much influence a particular independent latent variable has on the dependent latent variable. There are three categories of grouping on the *R square* value, namely the strong category, the moderate category, and the weak category (Hair *et al.*, 2011). Hair *et al.* state that the *R square* value of 0.75 is included in the strong category, the *R square* value of 0.50 is in the moderate category and the *R square* value of 0.25 is in the weak category (Hair *et al.*, 2011). The table below displays the r-square value in this study.

**Table 3. r\_square**

	Random Effects (Cross)
R-squared	0,425436

The fixed effects method has an r\_square value of 0.804482 or the variables in this study have a contribution of 80.44% to the *Probability of Default (PD)* while 19.56% are outside the research model. The random effects method has an r\_square value of 0.425436, in other words, the constituent variables in this study contribute 42.54% to the *Probability of Default (PD)* while 57.46% are outside the research model.

**D. Hypothesis Test**

This Hypothesis Test is to determine how much influence each variable has on *Probability of Default (PD)*. variables are declared to contribute if the probability is less than 0.05. The table below shows even the effect of each variable on *Probability of Default (PD)*

**Table 4. Hypothesis Test**

Variable	Random Effects (Cross)			
	Coeff	Std. E	t-Stat	Prob.
CR	0,004795	0,000851	5,633619	0
DER	-0,00395	0,000553	-7,14541	0
GPM	0,202335	0,112646	1,796203	0,0765
NPM	0,030179	0,056144	0,537522	0,5925
TIE	7,06E-05	6,29E-05	1,122222	0,2653
KURS	0,530728	0,422436	1,256352	0,2129
OIL	-0,20401	0,088897	-2,29492	0,0245
CARBON	0,1423	0,048274	2,947772	0,0043

**Hypothesis 1a**

H10a : Current Ratio (CR) has no significant effect on the Company's Probability of Default (PD).

H 1aa : Current Ratio (CR) significantly affects the Probability of Default (PD) of the Company.

From the table above, it can be concluded that the current ratio has a probability below 0.05 both with the Fixed Effects method and with the Random effects method so that  $H_a$  is accepted and  $H_0$  is rejected. This is in line with research by Ameilia Damayanti and Rianto (2020) which states that the *current ratio* (CR) has a significant effect on Financial Distress (FD).

If a company has a low current ratio, it could be a sign that the company has low liquidity and will likely struggle to pay additional tax obligations such as carbon taxes. Reducing carbon emissions and investing in sustainability can be an important factor in maintaining the long-term success of a company. Companies with a high current ratio may be better able to make the strategic changes necessary to reduce their carbon emissions, thereby reducing the impact of carbon taxes on their finances.

Companies with a high current ratio may also be better able to manage risks related to environmental regulations, including carbon taxes. They can allocate funds to comply with these regulations and avoid fines or additional costs that may arise from violations. Companies with a high current ratio may have more resources to invest in energy efficiency and sustainability projects. Such investments can help them reduce their carbon emissions, thereby reducing the carbon tax they have to pay.

**Hypothesis 2b**

H 10b : Debt to Equity (DER) has no significant effect on the Company's Probability of Default (PD).

H 1ab : Debt to Equity (DER) has a significant effect on the Company's Probability of Default (PD).

From the table above, it can be concluded that DER has a probability below 0.05 both with the Fixed Effects method and with the Random effects method so that  $H_a$  is accepted and  $H_0$  is rejected. This is in line with research by Ameilia Damayanti and Rianto (2020) which states that DER has a

significant effect on Financial Distress (FD).

According to the J-curve concept, a low or very high DER may increase the risk of bankruptcy. A low DER may indicate that the company is not utilizing debt well to expand their business, while a very high DER may indicate high risk due to large interest expenses. Debt is usually followed by fixed interest payments. The higher the DER, the more interest payments the company has to make. If the company's income is not enough to cover this interest expense, it could lead to financial difficulties and eventually bankruptcy. A high DER makes a company more vulnerable to economic volatility and market changes. When the economy worsens or market conditions change, companies with high DER may face additional pressure to repay their debts or manage their interest expenses, which may increase the risk of bankruptcy.

**Hypothesis 2c**

H 10c : Gross Profit Margin (GPM) has no significant effect on the Company's Probability of Default (PD).

H 1ac : Gross Profit Margin (GPM) has a significant effect on the Company's Probability of Default (PD).

From the table above, it can be concluded that GPM has a probability above 0.05 both with the Fixed Effects method and the Random effects method so that  $H_0$  is accepted and  $H_a$  is rejected. Companies with high GPM have more financial flexibility to deal with unexpected situations or short-term revenue declines. They have more margin to adjust pricing strategies or allocate resources to areas of greatest need. This flexibility can help reduce the risk of bankruptcy.

**Hypothesis 2d**

H 10d : Net Profit Margin (NPM) has no significant effect on the Company's Probability of Default (PD).

H 1ad : Net Profit Margin (NPM) has a significant effect on the Company's Probability of Default (PD).

From the table above, it can be concluded that NPM has a probability above 0.05 both with the Fixed Effects method and the Random effects method so that  $H_0$  is accepted and  $H_a$  is rejected. Companies with high NPM also have more financial flexibility to deal with challenges and changes in the market. They have more margin to invest in growth, allocate resources to the most profitable areas, or respond to external changes. This flexibility can help reduce the risk of bankruptcy as firms can be more responsive to changing market conditions.

**Hypothesis 2e**

H 10e : Times Interest Earned (TIE) has no significant effect on the Company's Probability of Default (PD).

H 1ae : Times Interest Earned (TIE) has a significant effect on the Company's Probability of Default (PD).

From the table above, it can be concluded that TIE has a probability above 0.05 both with the Fixed Effects method and the Random effects method so that  $H_0$  is accepted and  $H_a$  is rejected. Companies with high TIE may be better able to manage financial risks, including bankruptcy risk. They have

more financial flexibility and less pressure to fulfil interest payment obligations. This allows them to focus on business growth and long-term investment without worrying about financial stability.

Hypothesis 2f

H 10f : Foreign Exchange (EX) has no significant effect on the Company's Probability of Default (PD).

H 1af : Foreign Exchange (EX) has a significant effect on the Company's Probability of Default (PD).

From the table above, it can be concluded that EX has a probability above 0.05 both with the Fixed Effects method and the Random effects method so that  $H_0$  is accepted and  $H_a$  is rejected. Companies that have international operations or conduct business transactions with foreign currencies are exposed to currency exposure risk. Fluctuations in currency exchange rates can affect a firm's revenues, costs, and cash flows. If the firm does not use *hedging* instruments, these fluctuations can lead to volatility in revenues and costs, which in turn can affect the firm's profitability and ability to meet its financial obligations.

Hypothesis 2g

H 10g : Oil Price (OIL) has no significant effect on the Company's Probability of Default (PD).

H 1ag : Oil Price (OIL) has a significant effect on the Company's Probability of Default (PD).

From the table above, it can be concluded that *Oil Price (OIL)* has a probability below 0.05 with the Random effects method so that  $H_a$  is accepted and  $H_0$  is rejected. However, *Oil Price (OIL)* has a probability above 0.05 both with the Fixed Effects method so that  $H_0$  is accepted and  $H_a$  is rejected. Oil price fluctuations can also affect consumer demand for certain products and services. For example, an increase in oil prices may reduce consumer purchasing power and lead to a decrease in demand for motor vehicles or other transport products. Industries that are directly related to oil consumption, such as airlines and transport companies, can also be significantly affected by oil price fluctuations.

Hypothesis 2h

H 10h : Tax Carbon does not significantly affect the Company's Probability of Default (PD).

H 1ah : Tax carbon has a significant effect on the Company's Probability of Default (PD).

From the table above, it can be concluded that the current ratio has a probability below 0.05 both with the Fixed Effects method and the Random effects method so that  $H_a$  is accepted and  $H_0$  is rejected. This means that the existence of carbon emission tax will increase the probability of failure. The positive sign is also in accordance with the theory that states the existence of carbon emission taxes will reduce profit profits and lead to an increase in the failure of coal mining companies. Government policies that impose carbon emission taxes are policies that are less appropriate for new coal mining companies. Therefore, it is necessary to find a policy

that can be carried out but does not increase the probability of company failure. A carbon tax can increase operating costs for companies that have high levels of carbon emissions, especially for industries that depend on fossil fuels or production processes that emit large emissions. If companies are unable to adjust their operations to reduce emissions or are unable to transfer carbon tax costs to customers, this could lead to significant cost increases, squeeze profit margins, and increase the risk of bankruptcy. Companies must comply with carbon tax regulations set by the government. Strict enforcement of these regulations and fines imposed for violations can increase financial pressure on companies that do not comply, increasing the risk of bankruptcy. Some governments provide incentives or compensation to companies to help them adjust to carbon taxes and reduce their emissions. Such programmes can help mitigate the impact of carbon taxes on company finances and reduce the risk of bankruptcy.

### E. Managerial Implications

Based on the previous description, the results of this study will have managerial implications, namely:

Debt Equity Ratio (DER) positively and significantly affects the Probability of Default, meaning that an increase in DER will increase the probability of Bankruptcy. The managerial implications of DER can be significant and include the following:

1. Funding Decision: DER affects a company's funding decisions. Managers need to consider whether to use additional debt or equity to finance new projects or other capital needs. By understanding the implications of DER, managers can choose a capital structure that suits the long-term goals of the firm.
2. Financial Risk: A high level of debt can increase the company's financial risk. Managers must take into account the company's ability to pay interest and principal on its debt. If the DER is too high, the company may face the risk of default or other financial difficulties. Therefore, managers need to consider an acceptable level of DER to reduce financial risk.
3. Dividend Policy: The DER ratio can also affect a company's dividend policy. Managers may be more inclined to pay out dividends if the company has a low DER as it has fewer interest payment obligations. However, if the DER is high, managers may need to prioritise paying interest and principal on debt, which may limit the availability of funds for dividend distribution.
4. Investment Considerations: When considering new investments, managers need to take into account their impact on the company's DER. Large debt-financed investments can significantly increase DER, which may not be desirable for shareholders or creditors.

Therefore, managers need to select investment projects that can optimise firm value without excessively increasing DER.

5. Investor Perception: Investors and creditors often use DER as an indicator of a company's financial health. A low DER may indicate a company's financial stability and ability to manage risk. Conversely, a high DER may raise concerns about the company's ability to pay its debt obligations. Therefore, managers should consider investor perceptions when managing DER.

In order to manage DER effectively, managers need to understand the managerial implications of this ratio and take appropriate steps to ensure the company's capital structure supports its long-term goals.

Current Ratio (CR) positively and significantly affects the Probability of Default, which means that the higher the CR value, the higher the probability of default. The managerial implications of this ratio include several important aspects:

1. Liquidity Management: The current ratio provides an overview of a company's ability to meet its short-term obligations with assets that can be liquidated within a short period of time. Managers need to monitor the current ratio on a regular basis to ensure that the company has adequate liquidity to cope with liabilities due in the near future. If the current ratio is too low, it could indicate a liquidity risk and may require measures such as debt restructuring or improved cash flow.
2. Cash Planning: The current ratio helps managers in planning for the company's cash requirements. By understanding the proportion of current assets to current liabilities, managers can identify whether the company needs to increase cash flow through asset sales or additional funding to meet its short-term obligations.
3. Operational Efficiency: The current ratio can also provide insight into a company's operational efficiency in managing its assets. If the current ratio is low, it could indicate problems in inventory management, receivables collection, or other asset management. Managers need to evaluate and improve operational processes to improve the current ratio and overall efficiency of the company.
4. Credit Analysis: The current ratio is often one of the factors taken into account by lenders and creditors in assessing a company's creditworthiness. Creditors may be more comfortable lending to a company with a high current ratio as it signals the company's ability to repay the loan. Therefore, managers need to consider the effect of the current ratio on creditor perceptions and the company's lending policy.
5. Investment Decision Making: The current ratio can also influence a company's investment decisions. Managers need to consider how easily the company can pay off its

short-term obligations when evaluating new investment projects. A low current ratio may indicate that the company has limitations in taking additional investment risks.

By paying attention to the managerial implications of the current ratio, managers can use this information to make the right decisions in managing the company's overall liquidity, operations, and finances.

Carbon tax policy has a positive and significant impact on Default Probability. So it is necessary to take the right steps for the company to avoid the Probability of Default. Here are some managerial implications that need to be considered in dealing with carbon tax policies:

1. Operating Costs: A carbon tax policy will increase a company's operating costs because the company has to pay taxes on the carbon emissions generated from its operations. Managers need to calculate these additional costs and integrate them into the company's financial planning.
2. Improved Energy Efficiency: To reduce the impact of carbon taxes on operating costs, companies need to improve energy efficiency and reduce carbon emissions. Managers need to identify and implement appropriate energy efficiency strategies to reduce carbon tax expenditure and improve the company's competitiveness.
3. Green Technology Innovation: Carbon tax policies can encourage companies to develop and adopt environmentally friendly green technologies. Managers need to identify green technology innovation opportunities that can help companies reduce carbon emissions and comply with carbon regulations more effectively.
4. Risk Management: Carbon taxes can introduce new risks for companies, such as reputational risk and compliance risk. Managers need to properly manage these risks by strengthening compliance policies and procedures, and improving transparency and accountability in carbon emissions reporting.
5. Market Selection and Financial Risk Mitigation: Carbon tax policies may affect product prices and market demand. Managers need to consider this impact in the company's strategic planning, including market diversification and mitigation of financial risks associated with price and demand fluctuations.
6. Staff Partnership and Engagement: Managers need to engage all staff in the company's efforts to comply with carbon tax policies. This may involve partnering with suppliers, customers, and other stakeholders to reduce carbon emissions in the company's supply chain.

With these managerial implications in mind, companies can plan and implement effective strategies to deal with carbon tax policies, minimise their negative impacts, and capitalise

on opportunities for innovation and long-term growth.

#### IV. CONCLUSIONS AND SUGGESTIONS

Based on the previous description, this research will provide the following conclusions and suggestions:

##### A. Conclusion

The conclusions in this study are as follows: DER strongly influences the probability of company failure where the relationship is negative.

1. Current ratio significantly affects the probability of company failure and has a positive relationship.
2. The carbon emission tax policy greatly affects the Company's probability of failure. The issuance of carbon emission tax policy increases the probability of failure and also increases tax revenue for the Company. However, the existence of carbon emission tax makes the probability of failure increase, so that capital owners do not want to invest in coal mining companies.

##### B. Suggestions

The suggestions for this research are:

1. We recommend that future researchers do not need to pay attention to the Gross Profit Margin, Net profit margin, time interest earnings variables as internal variables do not need to be used in the model, it is better to use other variables that can logically and scientifically affect it.
2. The variables of oil price and exchange rate do not need to be used as the influence of external variables on the probability of failure.
3. The carbon emission tax policy greatly affects the probability of failure but makes the company experience greater failure and *going-concern* may not occur.

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