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Corporate Foreign Exchange Risk Management: The Role of Forward Contracts in Mitigating USD/IDR Volatility

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Abstract

This study analyzes the effectiveness of forward contracts as a hedging instrument in reducing USD/IDR exchange rate risk at PT Krakatau Steel (Persero) Tbk. The company reports in USD while most of its revenue is generated in Indonesian Rupiah, creating exposure to exchange rate fluctuations. The study applies the parametric Value at Risk (VaR) method using the variance-covariance approach based on daily USD/IDR JISDOR exchange rate data from Bank Indonesia during 2023 (239 trading days). A debt exposure of USD 1,000,000, converted using the year-end exchange rate of Rp15,439/USD, is used as the basis for the analysis. The results show that the unhedged 20-day VaR at a 95% confidence level is Rp435,009,418, equivalent to 2.82% of the exposure value. Hedging simulations with different hedge ratios indicate that a full hedge (100%) theoretically eliminates exchange rate risk, while a 50% hedge ratio reduces VaR by approximately 75%. These findings demonstrate that forward contracts are effective in mitigating exchange rate risk, with greater risk reduction achieved as the hedge ratio increases. The study provides practical insights for corporate treasury management in managing foreign currency liabilities and supporting more effective financial risk management.

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INTRODUCTION

Changes in the value of currencies can occur and are a reasonable risk for companies that conduct transactions using foreign currencies. For companies that have obligations in the United States Dollar (USD), the weakening of the Rupiah exchange rate can make the cost of paying these obligations even heavier, especially if the company's main income comes from domestic transaction activities using the Rupiah. This condition causes a currency mismatch between the company's liabilities and revenue, which is a source of risk for exchange rate fluctuations that can affect business continuity.

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The risk of exchange rate changes not only affects the magnitude of a company's liabilities, but it can also change the expected cash flow and market response to the company's financial condition. This is especially relevant for companies that have import, export, or liabilities in foreign currencies because changes in exchange rates can increase the uncertainty of a company's costs and revenues (Risman et al., 2017)

PT Krakatau Steel (Persero) Tbk, abbreviated as KRAS, is one of the Indonesian government-owned companies in the steel sector and has risks related to currency exchange rate changes that need to be considered. Based on the company's annual financial statements, the currency used for reporting (functional currency) is the United States dollar (USD). As of December 31, 2023, the exchange rate used for conversion was IDR 15,439 per USD. However, the company's steel product sales are still dominated by domestic customers. In 2023, sales to the local market reached USD1,195,054 thousand, which is much larger than overseas sales of only USD54,387 thousand. On the other hand, KRAS has considerable debt to banks, with total long-term and short-term bank debt (total amount, gross) reaching USD1,514,876 thousand until the end of 2023. The combination of the domestic income structure and liabilities in USD makes currency exchange risk management critical to the company's financial health.

One of the tools that is often used to manage risks related to exchange rate changes is a forward contract, which is an agreement to buy or sell an asset at a predetermined price from a certain point in the future (Maulidah et al., 2022) . Forward contracts provide a definite exchange price, so that it can reduce changes in the amount of money companies can pay obligations in foreign currencies. To find out how much losses can be reduced with this instrument, this study uses the Value at Risk (VaR) method. This method is used to estimate the largest losses that may occur to an existence in a certain period of time with a certain level of confidence, as explained by Jorion (Ririh Windayu , 2024).

Based on this background, this study establishes the problem: how much risk does KRAS face related to changes in USD/IDR exchange rates due to exposure to obligations in USD, as well as how effective is forward contracts in reducing these risks in various hedging ratio scenarios. The purpose of this study is to estimate the Value at Risk (VaR) of USD KRAS bonds using the variance-covariance parametric method, and to analyze how effective the forward contract is in reducing this risk through a simulation of the variance reduction ratio.

LITERATURE REVIEW

Currency Risk

Currency exchange risk is the possibility of losses due to changes in the exchange rate between domestic currencies and the currencies of other countries, which may affect the value of the Company's assets, the size of liabilities, receipts, or cash flow. This risk is systematic and influenced by macroeconomic factors, so it cannot be completely eliminated by diversifying investments, but can be minimized by using a hedging strategy (Bis, 2022).

Forward Contract and Hedging

A forward contract is an agreement between two parties to exchange assets at a pre-agreed price at a specific date in the future. Hedging is a way used to reduce risk by making transactions in two markets, namely the physical market and the derivatives market, simultaneously. In this case, the position taken has opposite directions, so the two transactions protect each other from possible losses. By locking in future rates through contracts, companies can clearly know how much money to pay in the future, even if the current exchange rate changes up or down.

Value at Risk (VaR) Parametric

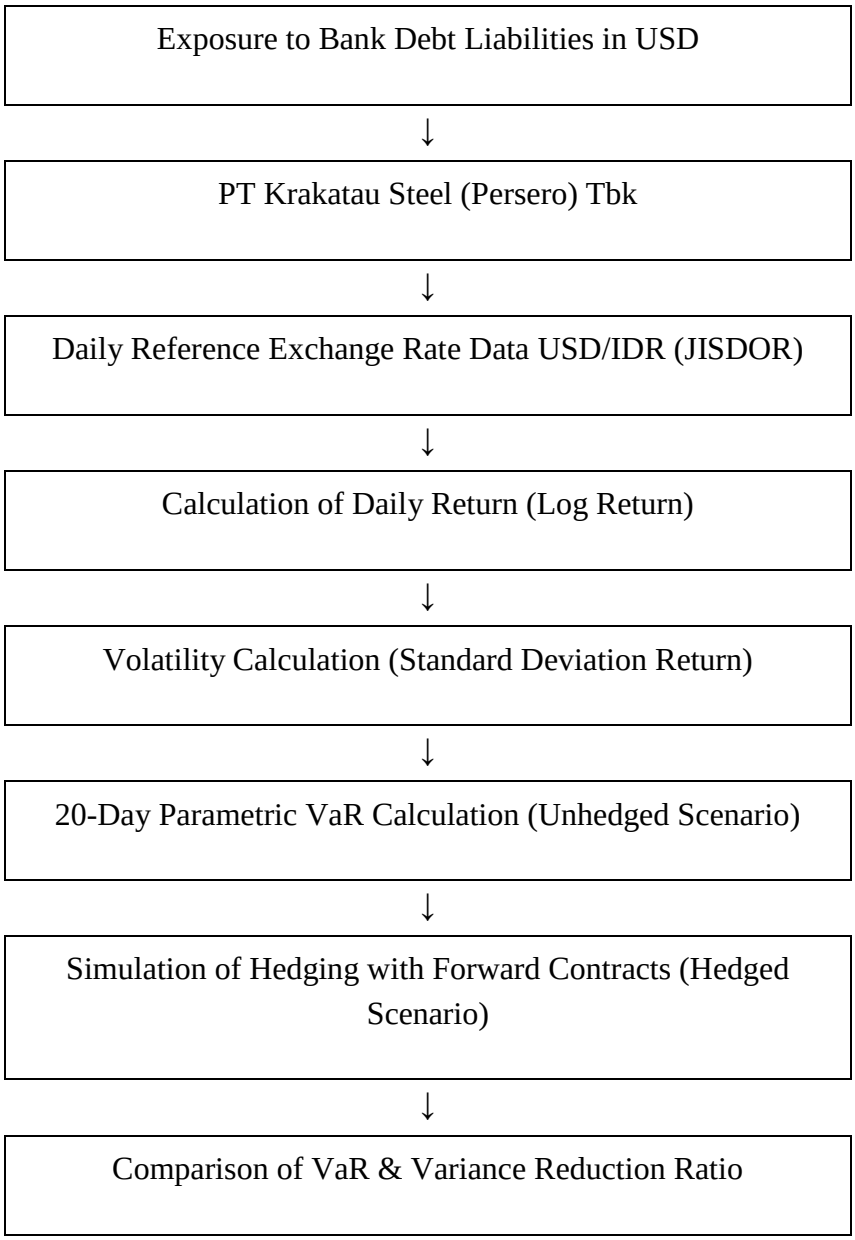
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Value at Risk (VaR) is a way of measuring risk by calculating the largest possible loss to an asset or exposure over a given period of time, at a certain confidence level, assuming market conditions under normal circumstances (Ririh Windayu , 2024). The parametric VaR method calculates VaR by assuming that returns have a normal distribution pattern, and uses standard deviation as a measure of volatility return. Mathematically, parametric VaR is formulated as:

$$\boldsymbol{VaR = V_0 \times Z_{\propto} \times \sigma \times \sqrt{t}}$$

Where V0 is the initial exposure value, Za is the critical value of the normal distribution at a given confidence level (e.g. 1.645 for a 95% confidence level), sigma is the standard deviation of the daily return, and t is the time duration used (Ririh Windayu , 2024).

METHOD



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The framework of this research began with the identification of the exposure of bank debt obligations in USD at PT Krakatau Steel (Persero) Tbk. The daily reference rate data of USD/IDR (JISDOR) was used to calculate the daily return, which was then used to estimate volatility (standard deviation return). This volatility is the main parameter in calculating the 20-day parametric VaR in the unhedged scenario. Furthermore, a simulation of the hedging scenario using forward contracts at various hedged ratios was carried out, and then compared with the unhedged scenario through the calculation of the variance reduction ratio, so that the level of effectiveness of the forward contract in reducing exchange rate risk can be deduced.

Data Analysis Methods

This study uses a quantitative approach with the aim of analyzing and simulating the effectiveness of forward contracts in reducing USD/IDR exchange rate risk in PT Krakatau Steel (Persero) Tbk through the parametric Value at Risk (VaR) method of variance-covariance approach. The data used are secondary data, consisting of:

1. Daily reference rate data of USD/IDR (Jakarta Interbank Spot Dollar Rate / JISDOR) published by Bank Indonesia for the period from January 2, 2023 to December 29, 2023 (239 trading days).
2. PT Krakatau Steel (Persero) Tbk's consolidated annual financial statements for the financial year 2023 published through the Indonesia Stock Exchange. The value of the analyzed exposure is assumed to be USD1,000,000, converted at the year-end 2023 reporting rate of IDR 15,439/USD, with a confidence level of 95% (Za = 1.645) and a time horizon of 20 days.

The stages of analysis in this study are carried out systematically as follows:

1. Calculating USD/IDR Exchange Rate Daily Return

The daily return is calculated using the logarithmic return formula (log return):

$$R_t = In\left(\frac{P_t}{P_{t-1}}\right)$$

Description:

Rt = daily return of the exchange rate on the t-day;

Pt = JISDOR exchange rate on the t-day;

Pt-1 = JISDOR exchange rate on the day (t-1).

2. Calculating the Standard Deviation (Volatility) of Daily Returns

$$\sigma = \sqrt{\frac{1}{n-1}\sum(R_t - \mu)^2}$$

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3. Calculating Parametric VaR Unhedged Scenarios

$$VaR_{(unhedged)} = \boldsymbol{V_0} \times \boldsymbol{Z_\propto} \times \boldsymbol{\sigma} \times \sqrt{\boldsymbol{t}}$$

4. Simulation of Hedged Scenarios and Variance Reduction Ratio

Forward contracts lock in exchange rates on the date the contract is agreed upon, so that the hedged portion of the exposure is no longer exposed to spot rate volatility, following the logic of forward contract calculation as illustrated in the case of hedging purchases in foreign currencies, where the difference between the spot rate at the time of payment and the locked forward rate determines the amount of savings (or additional costs) that the company earns. The variance reduction ratio (VRR) is calculated by the formula:

$$VRR = 1 - (1 - h)^2$$

$$VaR_{(Hedged)} = VaR_{(unhedged)} \times (1 - VRR)$$

Where h is the hedging ratio (the proportion of exposure protected by the forward contract to the total exposure). This formula is based on the assumption that the hedged portion of the exposure completely loses the rate risk variance (the forward rate has been locked), while the unhedged portion remains fully exposed to spot rate volatility.

RESULTS AND DISCUSSION

USD Liabilities Exposure and KRAS Revenue Structure

Table 1. Composition of Revenue and Exposure of USD Liabilities of PT Krakatau Steel (Persero) Tbk in 2023 (in thousands of USD)

Remarks	Value (Thousands of USD)
Steel Product Sales - Local Customers (IDR)	1.195.054
Steel Products Sales - Overseas Customers	54.387
Total Sales and Operating Revenue	1.453.968
Total Long-Term Bank Debt (gross)	1.497.674
Total Short-Term Bank Debt	17.202
Total Exposure to Bank Debt Liabilities	1.514.876

Source: Annual Financial Report of PT Krakatau Steel (Persero) Tbk for the Fiscal Year 2023, Stock Exchange Effects Indonesia .

Table 1 shows that KRAS steel product sales are dominated by local customers (around 95.6% of total steel product sales), while the company has a total exposure to bank debt liabilities of USD1,514,876 thousand. This combination of structures confirms that KRAS exchange rate risk comes mainly from the liabilities side, not from the export income side as is common for commodity exporting companies.

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USD/IDR Exchange Rate Volatility in 2023

Table 2. Descriptive Statistics of USD/IDR (JISDOR) Daily Exchange Rate and Return (JISDOR) in 2023

Remarks	Value
Number of Observations (n)	239 days
Average Exchange Rate	IDR 15,254
Minimum Rate	IDR 14,632
Maximum Exchange Rate	IDR 15,946
Average Daily Return (mu)	-0,0000360
Standard Daily Return Deviation (sigma)	0,0038300
Daily Volatility (%)	0,38%

Source: Bank Indonesia , data JISDOR , processed (2026).

Parametric VaR Calculation and Hedging Effectiveness

Based on the daily volatility in Table 2, with an exposure (V0) of USD1,000,000 converted at the reporting rate of IDR 15,439/USD (V0 = IDR 15,439,000,000), a confidence level of 95% (Za = 1,645), and a horizon of 20 days, the following VaR calculation results are obtained:

Table 3. 20-Day Parametric VaR Calculation Results (Unhedged Scenario)

Remarks	Value
Exposure (V0)	IDR 15,439,000,000
Volatility (sigma)	0,0038300
Confidence Level (Za)	1,645
Horizon (t)	20 days
VaR 20 days (Rp)	IDR435.009.418
20-day VaR (%)	2,82%

Source: Data processed, 2026.

Table 3 shows that without hedging, KRAS has the potential to face losses due to exchange rate fluctuations of Rp435,009,418 (2.82% of the exposure value) in the next 20-day period, at a confidence level of 95%. Furthermore, Table 4 presents a simulation of the effectiveness of hedging at various hedging ratios using forward contracts.

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Table 4. Simulation of Variance Reduction Ratio and VaR on Various Hedging Forward Contract Ratios

Hedging Ratio (h)	Variance Reduction Ratio (VRR)	VaR Hedged 20 Days (Rp)	VaR Decrease
0% (Unhedged)	0,00%	435.009.418	-
25%	43,75%	244.692.797	43,75%
50%	75,00%	108.752.354	75,00%
75%	93,75%	27.188.089	93,75%
100% (Full Hedge)	100,00%	0	100,00%

Source: Data processed, 2026.

The simulation results in Table 4 show a non-linear relationship between the hedging ratio and the variance reduction ratio, according to the formula $VRR = 1 - (1 - h)^2$. At a hedging ratio of 50%, the forward contract is able to reduce the VaR by 75%, much greater than the proportion of the hedged exposure itself. This occurs because the variance (not standard deviation) decreases quadratically as the portion of the protected exposure increases. At the full hedging ratio (100%), the forward contract theoretically eliminates all residual exchange rate risk variance, since the exchange rate applicable to the exposure has been locked since the beginning of the contract period, in line with the basic principle of forward contracts as financial instruments used to protect against future price fluctuations by setting the price of the asset traded at a future date.

It should be noted that these results are theoretical based on the assumption that the hedged portion of the exposure no longer has a variance of exchange rate risk. The effectiveness of actual hedging in the field can be lower due to several factors, including:

1. limited liquidity of forward contracts for certain tenors,
2. premium costs or forward discounts arising from the difference in IDR and USD interest rates, and
3. the discrepancy between the maturity date of the forward contract and the date of realization of the actual obligation payment. The actual hedging ratio applied by KRAS to the total exposure of its USD liabilities cannot be fully ascertained from the available public data, so this study presents results in the form of simulations on various hedging ratio scenarios as a decision-making framework for corporate risk management.

CONCLUSION

This study analyzes the USD/IDR exchange rate risk faced by PT Krakatau Steel (Persero) Tbk and the effectiveness of forward contracts in reducing it using the parametric Value at Risk (VaR) method. The results of the study show that the company has significant exchange rate risk exposure, sourced from bank debt obligations of USD1,514,876 thousand, while the company's revenue is dominated by domestic sales in Rupiah. Based on the USD/IDR exchange rate volatility in 2023 (daily sigma 0.383%), the 20-day VaR without hedging on an exposure of USD1,000,000 is calculated at IDR 435,009,418 (2.82% of the exposure value) at a 95% confidence level. Simulations of various hedging ratios show that forward contracts provide a significant and non-linear risk reduction to the applied hedging ratio, with a hedging ratio of 50% able to reduce the VaR by up to 75%, and full hedging (100%) theoretically

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eliminates all residual rate risk variances. These findings confirm that forward contracts are an effective instrument in managing exchange rate risk for companies with USD liabilities and domestic income structures such as KRAS. Further research is recommended to obtain data on the actual hedging ratio and notional value of forward contracts from the Company's Financial Statements in more detail, as well as to extend the observation period to test the consistency of results under different market conditions.

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