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A Study on Risk and Return Analysis and Data Envelopment Analysis of Public and Private Sectors Banks: A Five -Year Study (2018-2022)

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ABSTRACT:
Risk and returns are like two faces of the same coin, if an investor wants to gain higher returns, he must also accept the fact that this would also increase the amount of risk involved. Most of the times, individual decision process is influenced by risk and return analysis. The study is focused on analysing the performance of those nationalized banks listed in the NSE with respect to return, risk and beta for the period 1st January 2017 to 31st December 2017. The term risk is a situation in which the possibility of the consequence can be predicted, but uncertainty is the situation where the possibility cannot be predicted. Risk and uncertainty are part and parcel of investment The possibility of risk is a loss for the investors. The methodology adopted includes analysis of the performance of banking sector considering Bank Nifty Index as benchmark. Risk and return of banking stocks as well as Data Envelopment analysis method is used for analysing the efficiency of banks. The entire study is based on secondary data collected from the NSE. The data collected was based on the monthly prices of the bank stocks listed in Bank Nifty. The reason for selecting monthly prices is to measure the shortterm variations in the banking stocks due to various other internal and external factors. The findings of the study revealed that if the investors are ready to take high risk for more returns, the investors are suggested to invest in stocks like Bank of India and Punjab National Bank in which risk and return are high. The investors who prefer low risk and return are suggested to invest in Axis Bank stock.

Keywords: Risk, Return, Beta, Data Envelopment Analyse.

1. INTRODUCTION:

Banks plays a vital part in building the financial matters of an economy and also individual. In India managing a banking division frames the life saver of financial movement for both rural and urban areas. So the Adjustments in stock value unpredictability of banks will impact the person and also the country. Every investment is subjected to risk to some extent or the other. The best investment is that increases the return by taking minimum risk into consideration. For the purpose of minimizing the risk the market information is necessary. Expected return is the amount of return predicted by the investors for the future period of time. It may or may not occur. Investors those who are willing to purchase security based on expected return is most adequate but sometimes the return expected may not be the same.

The source of risk may be dividends and the securities prices that happened to be expected. The term Risk is a situation in which the possibility of the consequence can be predicted, but Uncertainty is the

situation where the possibility cannot be predicted. Further the risk is divided in to Unsystematic and Systematic Risk. Unsystematic risk is the risk which is due to the internal factors of the organization within. These factors are controllable from point of view of organization. It should be planned in such a way that should be flexible and necessary action can be taken by the organization to control the risk and its effects. The systematic risk are those risk which are external to the firm and cannot be controlled, which effects the entire market. This type of risk arises out of Industry, market and state of economy. The external factors are normally uncontrollable from organization point of view. It is macro in nature and it cannot be planned by the organization.

Data Envelopment Analysis is one of the nonparametric techniques which is applied in research operations and economics for the valuation of frontiers in production. It is one of the means to measure the efficiency in the production unit for decision making. This tool is used has benchmarking the service in production and manufacturing operations. The primary objective of this study was to analyse the bank nifty movements and development towards the equity stocks listed by the public and private banks. The principle goal of this study was to evaluate the Performance of banks stock, with prime concentration towards identifying the rate of return and the risk involved in the existing market and the various other Internal and external factors. The Study was undertaken for a short period to examine the Performance of the listed stocks with the period of 1 year from January 2017

2. STATEMENT OF THE PROBLEMS:

The study aims to analyse the performance of nationalized banks listed in the NSE in terms of return, risk, and beta for the period of January 1st, 2017, to December 31st, 2017. It seeks to understand the relationship between risk and return in investment decisions, particularly in the banking sector, and how investors' preferences for risk influence their investment choices. The study also examines the efficiency of banks using Data Envelopment Analysis (DEA) and evaluates their performance relative to the Bank Nifty Index benchmark. Additionally, it aims to differentiate between risk and uncertainty in investment contexts and identify the types of risks faced by investors, such as systematic and unsystematic risks. Through the analysis of monthly stock prices, the study intends to capture short-term variations influenced by internal and external factors affecting banking stocks. Furthermore, it aims to provide recommendations for investors based on their risk preferences, suggesting higher-risk, higher-return options like Bank of India and Punjab National Bank for those seeking greater returns, and lower-risk options like Axis Bank for investors preferring stability."

3. OBJECTIVES OF THE STUDY:

- To analyze the risk and return of private and public sector banks listed on Bank Nifty
- To rank the stocks on the basis of risk and returns.
- To measure the efficiency of the banks using Data Envelopment analysis.

4. RESEARCH METHODOLOGY:

To provide recommendations Data Collection the study relies on secondary data collected from the National Stock Exchange (NSE). Monthly prices of bank stocks listed in the Bank Nifty are collected for the period from January 1st, 2017, to December 31st, 2017. This data provides the basis for analyzing the performance of nationalized banks in terms of return, risk, and beta. Analysis Framework The study adopts multifaceted analysis framework. It involves analyzing the performance of banking stocks,

understanding the relationship between risk and return, benchmarking against the Bank Nifty Index, and assessing efficiency using Data Envelopment Analysis (DEA). Risk and Return Analysist the study employs risk and return analysis to evaluate the relationship between the two factors in investment decisions. It assesses the risk-return profiles of various banking stocks to understand investors' preferences and behaviors. Benchmarking Against Bank Nifty Index the performance of analyzed banks is benchmarked against the Bank Nifty Index, a widely recognized benchmark for the banking sector. This benchmarking provides insights into the relative performance of banks in the market. Data Envelopment Analysis (DEA) DEA is used to assess the efficiency of banks in terms of their operations and performance. This non-parametric technique allows for the evaluation of the relative efficiency of banks compared to industry benchmarks, helping identify areas for improvement.

5. REVIEW OF LITERATURE:

Vikkraman & Varadharajan (2009) - The author has analyzed the risk and returns involved in the stock market of Indian automobile industry from 2004 till 2007 data from NSE. On the basis on risk - return trade - off, the five top companies in automobile industry, Mahindra and Mahindra motors has a risk of 97.33% and return of 7.5% which is best for investment, even though TATA motors and Ashok Leyland has highest risk in the period 2004 - 2007 of 119.9% and 200.17% these companies should produce highest return, but shockingly these two companies yielded a negative return of -8.6% and -13.84%. In the case of Hindustan motors the expected return is of 128.29% at a higher risk of 2092% which is more than the normal level. Author concluded that the investor cannot be induced by such values. An in - depth study about the firm in terms of the capital structure, pattern of share holdings, financial market knowledge are required for decision making for right investment. **Karthika & Karthikeyan (2011)** -The author analysis the risk and return of 10 companies (TCS, Maruti, Sun Pharma, SBI, ONFC, ACC, Bharati Airtel Limited, Tata power, L&T and ITC) among Sensex 30 companies for a period starting from Jan 2008 till May 2011. The author finds that the value of beta of pharmaceutical, automobiles and housing related sector are less risky whereas banking, oil and gas, and construction sector are high risky, which tells that these are most aggressive stocks.. The sector which moves the performance of the entire economy and there products are priced highly like Banking and power have high risk. The sector which does not move the performance of the entire economy like Pharmaceutical, FMCG, and Housing related are of low risk. If the investor is planning to buy and sell for a short duration of time beta is one of the good instruments to measure risk**. Nagarajan and Prabhakaran (2013) -** The author has conducted analysis on equities of HUL, ITC, Nestle India limited, Dabur India Limited, and GCPL of selected FMCG for 12 months. They have founded that the variance of HUL is 0.76 and ITC is 0.84, which is maximum compared to other companies. This indication shows that these two companies are highly volatile than any other companies which is considered for the study **(Awalakki&Archanna ,** 2021)The study examines the relationship between economic and financial indicators and stock returns for 28 selected firms listed on the National Stock Exchange over an eight-year period (2010-2017). Utilizing panel data regression, the results indicate that Return on Equity (ROE) and Price to Book Value (PB) exert a positive and significant impact on stock returns. The findings suggest that managers can enhance stock valuation by understanding and effectively utilizing key resources, emphasizing the importance of informed decision-making for investment strategies and market predictions. (Awalakki&Archanna, 2021). The research paper investigates the impact of key accounting ratios, including ROE, ROA, P/E, P/B,P/S, and P/C, on stock prices of the National Stock

Exchange over a 15-year period (2005-2020). The study aims to analyze how these financial indicators influence stock returns, emphasizing their importance for investors, creditors, and stakeholders in evaluating the financial condition and profitability of companies listed on the exchange. (Markowitz, , 1952)Portfolio investment was the first modern theory proposed by Markowitz (1952). assumed that the rates of return of individual assets covariance with one another ,and there is a rather stable covariance, or correlation coefficient, between the rates of return of every two assets. Thus, he stated that it is theoretically possible to construct a variance covariance matrix of all risky assets.(Awalakki&Archanna, 2023)This non- empirical research paper delves into the interplay between investor attention and financial market volatility, leveraging insights from behavioral finance. It explores the determinants of investor attention, including cognitive biases and social factors, and analyses their impact on market dynamics, offering a thorough review of existing literature and theoretical frameworks to enhance comprehension of this intricate relationship.(Abedi ,Dargiri, &Rasiah, 2012). This study emphasizes the importance of the risk-return relationship in aiding investors and organizations in decision-making. By reviewing theories, empirical studies, and performance measures like Treynor, Sharpe,and Jansen Indices derived from the Capital Asset Pricing Model (CAPM), it aims to enhance the understanding of industry sectors' risk-return constructs for improved decision support.(Awalakki&Archanna, 2023). This study explores the impact of overconfidence biases on investment portfolios, examining cognitive and emotional mechanisms such as illusion of knowledge and emotional attachment. Rooted in behavioral finance literature, it highlights consequences like excessive trading and loss aversion, proposing mitigation strategies like diversification, passive investing, and behavioral coaching for more informed and rational portfolio decisions.(Subramanyam, Nalla, &Kalyan, 2018). The study aims to educate investors on mutual funds, emphasizing the potential for maximizing returns amidst India's growing capital market. It sheds light on investor awareness, risk tolerance, and preferences, showcasing the role of mutual funds in diversifying investments for optimal returns and risk mitigation.(Awalakki, 2022). This article explores the interplay between neurotransmitters (dopamine, serotonin, and norepinephrine), emotions, and investment outcomes, unraveling their role in shaping investor behavior and decision-making. It emphasizes the neural mechanisms driving decision diversification and addresses biases, underscoring the significance of education for cognitive function and bias mitigation in managing investor behavior within the finance domain.(Moolbharathi&Sugandi, 2021). This study analyzes the Risk and Return of stocks in the Auto, Banking, Finance, FMCG, and IT sectors from 2017-2021, using statistical tools like Standard Deviation, Beta, and Regression Analysis. It guides investors by assessing sector-wise performance against benchmark indices, aiding in informed investment decisions based on risk and return considerations.(Awalakki S. M., 2015). The study in Kalaburagi, Karnataka, reveals that salaried employees predominantly consider investments for retirement, and recent survey results indicate a lack of significant increase in their investment levels compared to businesspersons. Despite a historical focus on retirement, the growing awareness of investment options suggests an evolving landscape with increased choices for salaried individuals.(AWALAKKI, 2015)This study examines the capital structures of five prominent cement companies (ACC, Ultratech, Ambuja, J.K., Chettinad) from 2008-09 to 2013-14, assessing the impact of these structures on investment patterns and emphasizing the importance of debt-equity mix in effective financing decisions. The intra-company analysis aims to provide insights into the financial dynamics of these firms.

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SAMPLE SIZE:

The study encompasses banks listed on the NSE.

6. STATISTICAL TOOL AND WAYS

1. **Returns:** A company's stock price can fluctuate due to various factors, resulting in positive or negative outcomes. Market return refers to the profit earned over a period of time, where profit is considered positive and loss negative. Returns are calculated as the percentage change between the closing and opening prices.

$$R_i = \frac{\text{Ending price of the stock}_i - \textit{Beginning price of the stock}_i}{\textit{Beginning price of the stock}_i} \times 100$$

2. **Standard Deviation**: Standard deviation measures the extent of dispersion of a dataset relative to its mean. It is determined by taking the square root of the variance. A stock with high volatility will have a higher standard deviation, while a stable blue-chip stock will have a lower standard deviation. The standard deviation is a fundamental statistical measure that quantifies the amount of variation or dispersion in a set of values. It is a measure of the average distance of each data point from the mean (average) of the dataset. A low standard deviation indicates that the data points are very close to the mean, suggesting a tightly clustered dataset. Conversely, a high standard deviation indicates that the data points are spread out over a wider range, reflecting a more dispersed dataset. The standard deviation is expressed in the same units as the data, making it a directly interpretable measure of variability. For populations, the standard deviation is calculated using the formula (\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(X_i-\mu)^2}), where (\sigma) represents the population standard deviation, (N) is the number of values in the population, (X_i) denotes each value in the population, and (\mu) is the population mean. This formula is derived from the definition of variance, which is the average of the squared differences from the mean. When dealing with samples rather than the entire population, the formula for calculating the standard deviation is slightly adjusted to account for the estimation of the population standard deviation with a sample. The adjusted formula is (\sigma = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i-\overline{x})^2}), where (n) is the number of values in the sample, (x_i) represents each value in the sample, and (\overline{x}) is the sample mean. This adjustment, dividing by (n-1) instead of (n), corrects for the bias in the estimation of the population standard deviation. The standard deviation is a crucial measure in statistics because it provides insight into the spread of data points around the mean. It is particularly useful for understanding the variability of data in normal distributions, where data is symmetrically distributed with no skew. The standard deviation tells you how spread out from the center of the distribution your data is on average, making it a valuable tool for comparing the distributions of different samples and making inferences about the larger populations they came from.

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n} x_{i-\bar{x}}}{n-1}}$$

σ=standard deviation

x_i= i the value

$\bar{X}$= mean of values

n= number of data value

$\sum_{i=1}^{n} x_i - \bar{x}$

√=Square root

3. **Average return:** The average stock typically refers to the mean value of a group of stocks within a specific market index or sector. It's calculated by summing up the values of individual stocks and dividing by the total number of stocks in the group. This metric is used to gauge the overall performance or valuation of the stocks within the group. It provides a general indication of how the stocks are performing collectively, which can be useful for investors in making decisions about their portfolios.

Average return for i; stock= $\frac{\sum Stock\ Returns_i}{n}$

- First returns of five stocks will be calculated.
- Then find the standard deviation for every stocks.
- Returns of both industries.

Formula for calculating the returns

$$Return_i = \frac{Ending\ price_i - Begining\ price_i}{Begining\ price\ _i}$$

Formula for calculating the standard deviation

$$SD_i = \sqrt{Variance_i}$$

$$Variance\ (\sigma) = \frac{\sum(R_i - R_j)^2}{n-1}$$

Formula for getting average returns of the stocks.

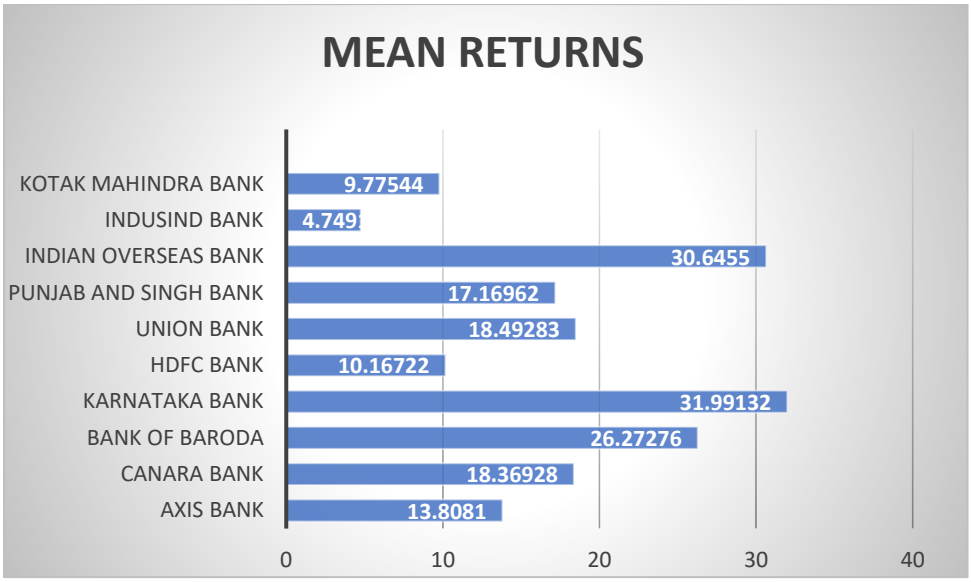
$$Average\ return\ for\ i; Stock = \frac{\sum Stock\ Returns_i}{n}$$

Note: n = Number stocks

Data Analysis and Interpretation:

Table No:1 The Mean Returns on Bank

Name of the Bank	Mean returns
AXIS BANK	13.8081
CANARA BANK	18.36928
BANK OF BARODA	26.27276
KARNATAKA BANK	31.99132
HDFC BANK	10.16722
UNION BANK	18.49283
PUNJAB AND SINGH BANK	17.16962
INDIAN OVERSEAS BANK	30.6455
INDUSIND BANK	4.74916
KOTAK MAHINDRA BANK	9.77544

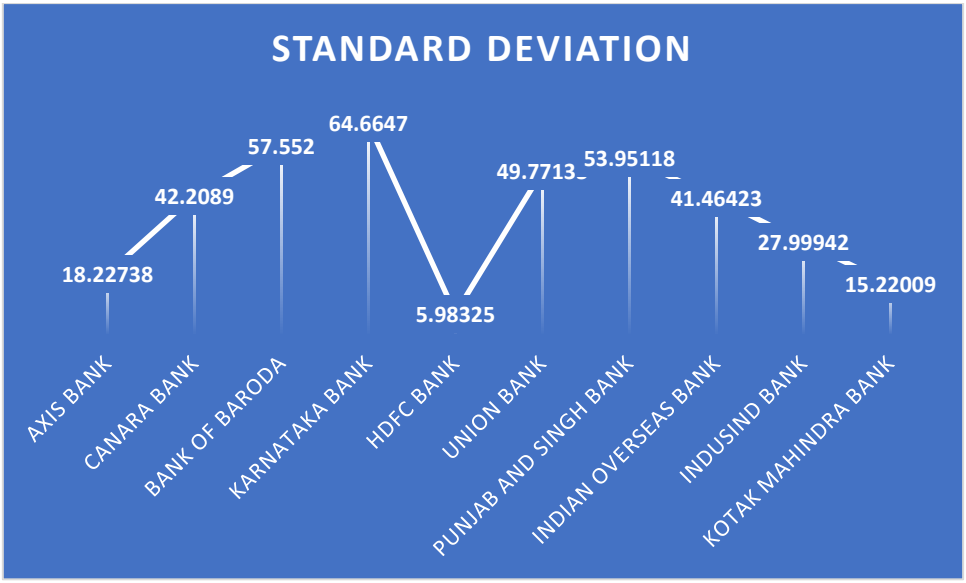


INTERPRETATION:

The data you've provided outlines the mean returns for several banks, offering insights into their average performance as investment options. Among them, Karnataka Bank stands out with the highest mean return of approximately 31.99%, indicating strong potential for returns on investment. Indian Overseas Bank follows closely behind with a mean return of about 30.65%, suggesting another promising investment opportunity. Bank of Baroda also demonstrates robust performance with a mean return of around 26.27%. Meanwhile, Axis Bank, Canara Bank, Union Bank, and Punjab and Singh Bank show respectable mean returns ranging from approximately 13.81% to 18.49%. On the lower end of the spectrum, HDFC Bank and Kotak Mahindra Bank exhibit mean returns of about 10.17% and 9.78% respectively, indicating comparatively lower returns. Finally, IndusInd Bank presents the lowest mean return of approximately 4.75%, suggesting a less favorable investment choice based on this metric. In summary, these figures provide investors with valuable insights into the historical performance of these banks, aiding in informed decision-making regarding investment allocation.

Table No:2 The Standard Deviation on Bank

Name of the Bank	STANDARD DEVIATION
AXIS BANK	18.2273
CANARA BANK	42.2089
BANK OF BARODA	57.552
KARNATAKA BANK	64.6647
HDFC BANK	5.98325
UNION BANK	49.77133
PUNJAB AND SINGH BANK	53.95118
INDIAN OVERSEAS BANK	41.46423
INDUSIND BANK	27.9994
KOTAK MAHINDRA BANK	15.2200



INTERPRETATION:

The data provided lists the standard deviations for the volatility of returns for various banks, offering insights into the degree of risk associated with investing in each institution. Standard deviation measures the dispersion of a dataset around its mean, indicating the extent of variability or volatility in returns. Among the banks listed, Karnataka Bank exhibits the highest standard deviation of approximately 64.66%, suggesting that investments in this bank are associated with the highest level of risk or volatility in returns. Following closely behind are Punjab and Singh Bank and Bank of Baroda, with standard deviations of about 53.95% and 57.55% respectively, indicating significant variability in their returns. Union Bank also demonstrates a notable standard deviation of around 49.77%, indicating a considerable degree of risk in investment outcomes. Canara Bank and Indian Overseas Bank show relatively high standard deviations of approximately 42.21% and 41.46% respectively, further highlighting the volatility in returns associated with investing in these banks.Conversely, HDFC Bank presents the lowest standard deviation among the listed banks, at approximately 5.98%, suggesting relatively lower variability or risk in returns. Kotak Mahindra Bank follows with a standard deviation of about 15.22%, indicating a moderate level of risk compared to the other banks.

Table No:3 The VARIANCE

Name of the Bank	VARIANCE
AXIS BANK	4.8825
CANARA BANK	142.0827
BANK OF BARODA	244.5978
KARNATAKA BANK	266.8878
HDFC BANK	4.3764
UNION BANK	244.5862
PUNJAB AND SINGH BANK	338.2208
INDIAN OVERSEAS BANK	29.2612
INDUSIND BANK	135.1436
KOTAK MAHINDRA BANK	7.4110

FINDING:

The provided data presents a comparison of mean returns and standard deviations for various banks, offering valuable insights into both the potential returns and the associated risks of investing in each institution. Karnataka Bank emerges as a standout performer in terms of mean returns, boasting an impressive average return of approximately 31.99%. Investors may find Karnataka Bank an attractive option for potentially higher returns on their investments. Following closely behind is Indian Overseas Bank, which also demonstrates strong performance with a mean return of about 30.65%. Meanwhile, Bank of Baroda presents a compelling option with a mean return of around 26.27%, suggesting favorable returns for investors. Canara Bank and Union Bank also offer respectable mean returns of approximately 18.37% and 18.49% respectively, providing investors with potential opportunities for moderate returns. Conversely, IndusInd Bank displays the lowest mean return among the listed banks, standing at approximately 4.75%. Investors may perceive IndusInd Bank as offering lower returns compared to other options. In terms of risk, Karnataka Bank exhibits the highest standard deviation of approximately 64.66%, indicating significant volatility in returns. Investors should be aware of the higher risk associated with investing in Karnataka Bank. Punjab and Singh Bank and Bank of Baroda also present considerable risk, with standard deviations of about 53.95% and 57.55% respectively. On the other hand, HDFC Bank showcases the lowest standard deviation among the listed banks, at approximately 5.98%, suggesting relatively lower volatility in returns. Kotak Mahindra Bank follows with a standard deviation of about 15.22%, indicating a moderate level of risk compared to other banks. In summary, investors can utilize this information to make informed decisions about their investment portfolios, balancing potential returns with associated risks based on their individual risk tolerance and investment objectives.

CONCLUSIONS:

The entire study is based on the analysis of the stocks listed in Bank Nifty. This provides an idea for the investors to decide whether the investor is required to purchase stocks on the basis of their expected returns and risk. A positive correlation indicates scrip stock is moving in the same direction as the benchmark index and vice versa. A stock with more beta value is not suggested has it is subjected to high market risk in which it cannot be diversified like systematic and unsystematic risk. Hence it is better to avoid such stocks. The study will not suggest the investors which is best stocks to invest and the worst stock not to invest, because the stocks rating are done on the basis of investment and type of investors. If the investors are ready to take high risk for more returns the investors are suggested to invest in stocks like Bank of India and Punjab National Bank in which risk and return is high. The investors who prefer low risk and return are suggested to invest in Axis Bank stock. Finally, from the study it is seen that many a time market has collapsed which was not happened earlier, which creates a fear in the investors to enter in to the market. By this analysis the investors will get an idea that the scrip returns will definitely get recovered if the market bounce back.

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