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Risk Assessment and Hedging in Indian Energy Sector Using Commodity Derivatives

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ABSTRACT

The Risk assessment and hedging remark about figuring out how bad price swings in things you buy (like coal) could hurt your business. Hedging is like taking out an insurance policy with commodity derivatives to protect yourself from those price swings. The study analyses hedging effectiveness for crude oil and natural gas. Hedging, however, mitigated certain elements of the price risk. A fractional hedge, whereby not all price fluctuations were neutralized, is suggested by the hedge ratios. The Multi Commodity Exchange of India (MCX) provided the additional information for the study. The data was examined applying statistical and financial methods, including standard deviation, correlation coefficients, efficacy, and hedge ratio analysis. According to the findings, products derivatives can help Indian energy corporations mitigate risk, but only if they are utilized systematically. The efficacy of hedging may be increased, and businesses should take into account variables other than price swings, such as laws and new technology.

KEYWORDS: Risk Assessment, MCX, Derivatives, Risk, Hedging

1. INTRODUCTION

A steady and reliable supply of energy is essential to India's flourishing economy. On the other hand, price fluctuations brought on by shifting fuel prices, climate conditions, and international crises presents serious issues for the power business. Indian energy businesses might use commodities derivatives and risk analysis and hedging techniques to reduce these risks and guarantee seamless operations. Financial agreements based on fundamental material commodities, such as petroleum and coal, are known as derivatives of commodity. Businesses may safeguard oneself against variations in prices by employing these techniques. Futures contracts protect investors from unforeseen price increases by locking in a fixed price for future delivery. By granting the opportunity, but not taking on the duty to purchase or sell a good at a given price by a given date, contracts for options provide versatility.

The Indian petroleum industry may profit from hedging in a number of ways. First, by ensuring consistent costs and profits, it encourages pricing stability. Second, it makes it possible to make plans and budget more precisely in a market that is prone to volatility.

Settlements for options can aid by reducing possible losses in the event that prices diverge from what a corporation had anticipated. Lastly, a company's trustworthiness may be enhanced and finance can be more easily obtained through efficient hedging. There are several pertinent mechanisms available on the Indian Commodity Derivatives market. Indian refiners may protect themselves from changes in the price of crude oil on the global market by using MCX Crude Oil. Corresponding to this, power plants that burn coal and gas producers, distributors, and consumers may control price risks related to their separate fuels with the use of MCX Natural Gas and MCX Coal Futures.

In a nutshell the Indian energy industry will need to use commodity derivatives for offsetting and implement robust risk assessment processes in order to manage market uncertainty. Indian energy firms can guarantee economic stability, foster sustainable development, and help assure a secure and reasonably priced energy environment for the country by addressing pricing risks efficiently.

2. REVIEW OF LITERATURE

Halkos et al., (2019) outlined the substantial fluctuations in the petroleum market, the evaluation delivered highlights the need of creating a successful pricing risk mitigation plan for portfolios of investments consisting of energy assets. Leveraging on generally acknowledged scholarly research, the work investigates the alterations of models based on GARCH and the implementation of the Markov-Switching the GARCH model approach for fully evaluating the price of energy fluctuations.

It starts by outlining a wide range of GARCH-type models together with the necessary econometric tests and techniques to build a solid forecasting model for precisely and consistently estimating the volatility of energy prices. In addition, it carefully examines the likelihood of future changes in the unconditional variance of the models, taking into account the impact of economic downturns and unanticipated geopolitical developments. Gupta, S., Choudhary, H., & Agarwal, D. R. (2017): - This article evaluates the hedge ratio and the efficacy of hedging for commodities traded on the National Commodity and Derivative Exchange (NCDEX) and Multi Commodity Exchange (MCX) in India, either agricultural (like castor and guar seed) and non-agricultural (like copper, nickel, gold, silver, natural gas, and crude oil). Both constant and dynamic hedging ratios are calculated via a variety of statistical models. The outcomes indicate that the Indian futures market is more successful at hedging versus industrial metals and energy commodities (less than 50%) than it is with precious metals (varying from 65% to 75%). Furthermore, how well natural gas hedging works. Kallepalli, M. (2017) : - The global financial crisis of 2008 profoundly impacted the world's major economies. Prior to this event, there were two primary methods for trading derivatives. One involved exchange, where various regulatory bodies had set forth regulations that traders were required to follow. The other method was a more unregulated Over-The-Counter (OTC) approach. In comparison to exchange-based trading, OTC trading saw a significantly higher volume of transactions. This was largely due to the flexibility it offered in customizing contracts, unlike the standardized contracts mandated by exchanges. Sahoo, A. (2016): - The paper investigates corporate risk management practices in leading non-financial companies in India, aiming to mitigate various business risks that may impede achieving business objectives. It explores the utilization of financial derivatives by corporations and identifies forwards and swaps as the predominant derivative products in India. Futures emerge as the preferred alternative to traditional risk management tools for Indian enterprises due to their standardized nature. Derivatives are primarily employed in the Indian economy to hedge foreign currency risk, with interest rate risk being the most prevalent exposure based on international derivative outstanding positions. Information technology stands out as the sector with the highest recorded derivative usage according to industry classification. Kumar, B., & Pandey, A. (2009, August): - The usefulness of hedging for 7 other than agriculture and 4 agro futures agreements exchanged within India is investigated in this article. It discovers that, in comparison to non-agricultural futures (20%), agricultural futures contracts show greater hedging efficacy. Furthermore, compared to previous years, Indian futures markets show increased hedging

efficacy. An examination of the efficacy of hedging in Indian other than agriculture futures exchanges vis-à-vis global spot exchange indicates a significant improvement in mitigating exposure to swings in global prices. Lower hedging efficacy in Indian futures contracts may be caused by poor contractual layout, high fees for transactions in the immediate market, and insufficient participant knowledge of futures markets. These difficulties are common to emerging nations' fledgling futures markets and are predicted to change with time.

3. METHODOLOGY

Problem Statement: The Indian energy sector faces risks like volatile commodity prices and needs to better utilize commodity derivatives for hedging. However, many companies lack awareness, find them complex and expensive, and are unsure about the tax implications. Research is needed to understand these challenges and other aspects like:

- ✓ Best hedging strategies for different energy companies.
- ✓ Hedging's impact on financial performance.
- ✓ The government's role in promoting derivative use for risk management.

Objectives of the Study

- ✓ Identify the most common risks faced by energy companies in India.
- ✓ Examine how energy companies in India are currently using commodity derivatives to hedge their risks.
- ✓ Develop hedging strategies for different types of energy companies in India.
- ✓ Identify the challenges faced by energy companies in India in implementing hedging programs.

Hypothesis

H0: Commodity derivatives are not effective in managing risk in the Indian energy sector.
H1: Commodity derivatives are effective in managing risk in the Indian energy sector.

Research Design

In this investigation, I utilized a cross-sectional research methodology, which involves analysing data gathered from a group of individuals within a particular period of time. On the basis of certain interest-related factors, participants were chosen. Cross-sectional research are widely used in social science, education, psychology of development, and other domains. They are descriptive observational studies that do not establish causation or relationships, and therefore cannot determine the cause of a phenomenon like an illness. Researchers collect data from a population without manipulating any variables. While cross-sectional studies are useful for identifying characteristics within a community, they are not suitable for establishing causal relationships between variables. This approach is often used to explore potential connections or to gather preliminary data for further research and experimentation.

Data collection method

This research primarily utilizes secondary data.

Population: The target population for a study on risk assessment and hedging in the Indian energy sector using commodity derivatives is all type of energy commodities in India.

Sampling Method: Sample method for a study on risk assessment and hedging in the Indian energy sector using commodity derivatives is stratified sampling. This is because the Indian energy sector is a diverse sector with commodities. Stratified sampling ensures that the sample is representative of the population, which is important for obtaining accurate and reliable results.

Data Analysis and Interpretation

Return on unhedged (RU) = (St+1)-St

Return on Hedged (RH) = (St+1-St) - H*(Ft+1-Ft)

Hedge ratio = correlation *(std dev. future price / std dev. spot price)

Variances of an unhedged and a hedged portfolio are:

$$Var(U) = \sigma_S^2$$

$$Var(H) = \sigma_S^2 + H^2\sigma_F^2 - 2H\sigma_{S,F}$$

- Effectiveness

$$Effectiveness(E) = \frac{(Var(U) - Var(H))}{Var(U)}$$

➢ Descriptive statistics for crude oil.

Standard Deviation (Spot Price)	501.702
Standard Deviation (Future Price)	494.57
Variance (Unhedged return)	17860.56
Variance (Hedged return)	12693.58
Correlation	0.6872
Hedge ratio	0.6774
Effectiveness	0.2892

➢ Descriptive Statistics for natural gas

Standard Deviation (Spot Price)	35.9531
Standard Deviation (Future Price)	34.28
Variance (Unhedged return)	93.48
Variance (Hedged return)	63.40
Correlation	0.8695
Hedge ratio	0.8291
Effectiveness	0.32176

4. DATA ANALYSIS & FINDINGS

- Standard deviation of spot price for crude oil is 501.702. whereas the standard deviation for future price is 494.57.
- Variance for unhedged return is 17860.56 and for hedged return is 12693.58.
- The correlation coefficient of 0.6872 indicates a moderately A favourable relationship between the hedged position and the price of the actual resource. This suggests that the derivative partially moved in the same direction as the commodity, reducing some of the price risk.
- The hedge ratio of 0.6774 signifies a weaker partial hedge. This implies that only 67.74% of the price movements were offset by the hedge, leaving a larger portion of the position exposed to risk.
  Effectiveness of 0.2892, our conclusion is Moderate evidence for H1.
- Standard deviation of spot price for natural gas is 35.9531. whereas the standard deviation for future price is 34.28.
- Variance for unhedged return is 93.48 and for hedged return is 63.40

- The correlation coefficient of 0.8695 indicates a moderately A favourable relationship between the hedged position and the price of the actual resource. This suggests that the derivative partially moved in the same direction as the commodity, reducing some of the price risk.
  The hedge ratio of 0.8291 signifies a weaker partial hedge. This implies that only 82.91% of the price movements were offset by the hedge, leaving a larger portion of the position exposed to risk
- Effectiveness of 0.32176, our conclusion is Moderate evidence for H1.

Limitations of the study

- To evaluate sample units' performance, only quantified finance data and secondary data have been employed.
- The data collected is restricted to past one year includes a small selection of financial metrics.
- Factors outside the scope of the study, such as regulatory changes, technological advancements, or competitive landscape shifts, can impact the price.

5. CONCLUSION

The effectiveness of offsetting and the risk-minimizing offset ratio for specific commodities like —natural gas and crude oil—in the Indian commodity futures marketplace are investigated in the present research. The constant hedge ratios are determined using a correlation model. Recently, there has been a noticeable rise in market activity, leading to an expanded Indian commodity futures markets' function in hedging. Additionally, we explore potential stronger connections between Indian commodity futures markets and international futures markets, particularly for industrial metals and energy commodities. While commodity derivatives hold immense potential for the Indian energy sector, their effective utilization demands a balanced approach acknowledging both benefits and drawbacks. By proactively addressing the challenges and capitalizing on the opportunities, Indian energy companies can navigate market uncertainties and achieve sustainable growth. The study underscores the critical role of risk assessment and hedging through commodity derivatives in safeguarding the Indian energy sector against uncertainties. By adopting sophisticated risk management practices and aligning strategies with market conditions, companies can enhance their resilience and contribute to the overall stability of the energy market in India.

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