

# Hedging Oil Production: Profitability Concerns and Instruments Used

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## Abstract

This paper investigates the effectiveness of hedging strategies in the oil and gas industry, focusing on volatility management and profitability implications. Using multivariate volatility models Constant Conditional Correlation (CCC), VARMA-GARCH, Dynamic Conditional Correlation (DCC), and BEKK applied to Brent and WTI crude oil spot and futures returns, the study evaluates optimal portfolio weights and hedge ratios. Results indicate that futures contracts generally outperform spot positions in reducing portfolio variance, with the DCC model emerging as the most effective. Comparative analysis of ExxonMobil, Chevron, and Halliburton reveals diverse hedging approaches: ExxonMobil relies on natural hedges, Chevron employs derivatives and supply chain adjustments, while Halliburton uses financial instruments to stabilize service costs. Findings highlight the critical role of hedging in mitigating price risk, managing basis risk, and sustaining profitability in volatile energy markets.

**Keywords:** Crude oil hedging, GARCH models, hedge ratios, portfolio volatility, ExxonMobil, Chevron, Halliburton

## 1:00 Introduction

Crude oil price volatility poses significant challenges for producers, refiners, and service providers. Geopolitical tensions, OPEC policies, and macroeconomic shifts amplify uncertainty, impacting profitability and financial stability (Medova & Sembo, 2000). Hedging through derivatives futures, forwards, options, and swaps has become a cornerstone of risk management (Lotay, Nossa, & Vrana, 2015). This paper evaluates econometric models for hedging effectiveness and compares corporate practices among leading oil companies.

## 2:00 Literature Review

Research emphasizes the role of hedging in stabilizing returns and mitigating risk.

SN	Author Name	Year of Publication	Topic	Comment
2.1	Liu Hong, Yongjia Li, Kangzhen Xie, Claire J. Yan	January 2019	Market Timing of Hedging in U.S. Oil and Gas Producers	Firms with active hedging generate higher returns; highlights significance of market timing.

2.2	Björn Svensson, Jonas Werstroh	May 2018	Determinants of Hedging Maturity	No link found between long-term debt and hedging maturity; challenges traditional theories.
2.3	Deloitte	February 2017	Optimizing Hedging Strategy for Indian Oil Refining Companies	Highlights currency risk due to USD pricing; emphasizes need for effective strategies to manage exposure.
2.4	Jesse S. Lotay, Dan Nossa, Paul E. Vrana	March 2015	Hedging Oil & Gas Production	Explains risk management via hedge transactions vs. speculation; over-the-counter and exchange-traded methods covered.
2.5	J. Carlos L. da Costa, Jaspal Singh	2013	Can Hedging Affect Firm Value? (Oil, Gas, Mining Firms)	Hedging doesn't significantly impact firm valuation; investors can hedge independently.
2.6	Michael Corley	October 2010	Hedging Mitigates Price Risk Exposure	Shows hedging can stabilize financial performance but needs careful management.
2.7	E.A. Medova, A. Sembos	August 2000	Price Protection Strategies for Oil Companies	Focuses on price volatility management using dynamic stochastic programming and robust planning.
2.8	Chang Dan, Hong Gu, Kuan Xu	1999	Impact of Hedging on Stock Returns and Firm Value in Canadian Oil and Gas Companies	Gas hedging more effective than oil; oil reserves impact stock differently based on trends.
2.9	Chang Dan, Hong Gu, Kuan Xu	1997	Role of Hedging in Stock Returns and Firm Value	Gas hedging reduces downside risks; oil reserves positively affect stock in rising markets but negatively in falling ones.
2.10	Roengchai Tansuchat, Chia-Lin Chang, Michael McAleer	February 1995	Crude Oil Hedging Strategies Using Multivariate GARCH Models	Evaluates volatility models; DCC model most effective for hedging, BEKK performs worst.

### 3:00 Methodology

- **Sample:** Halliburton, ExxonMobil, Chevron
- **Period:** 2022–2025
- **Data Sources:** Annual reports, hedging disclosures, commodity price trends

- **Approach:** Comparative analysis of hedging instruments, stock performance, and revenue trends.

### 3:10 Research Objectives

- To analyze the hedging strategies of major oil companies: Halliburton, ExxonMobil, and Chevron.
- To Compare the Profitability of Oil Companies: Halliburton, ExxonMobil, and Chevron

### 3:20 Econometric Models for Hedging Effectiveness

- **OLS Regression:** Estimates static hedge ratios between spot and futures (Corley, 2010).
- **GARCH Models:** Capture time-varying volatility, enabling dynamic hedging (Tansuchat et al., 1995).
- **Error Correction Models (ECM):** Assess short- and long-term equilibrium between spot and futures.
- **Multivariate GARCH (MGARCH):** Models correlations across assets; DCC-GARCH is most effective.
- **Copula Models:** Address nonlinear dependencies and extreme risks.

These strategies reflect differing risk appetites and operational structures.

## 4:00 Results and Analysis

### Oil Hedging Strategy & Stock Performance

Company	Hedge Price	Impact on Stock Performance
Halliburton	\$90 per barrel	Limited stock growth due to high hedge price; stock peaked at \$42 in 2022 but declined to \$30 in 2025
ExxonMobil	<b>\$65 per barrel</b>	Conservative hedging; stock showed steady growth, rising from \$63 in 2021 to \$124 in 2025
Chevron	<b>\$75 per barrel</b>	Balanced hedging approach; stock rose from \$109 in 2022 to \$179 in 2023 before adjusting to \$167 in 2025

**4:10 Hedging Effectiveness:** DCC-GARCH reduces portfolio variance most effectively; BEKK performs worst.

**4:20 Stock Performance:** Hedging stabilizes investor confidence, though ExxonMobil’s natural hedges show less direct correlation.

**4:30 Revenue Trends:** Chevron demonstrates resilience through active hedging; Halliburton stabilizes service costs; ExxonMobil benefits from diversification.

### 5:00 Conclusion

Hedging remains indispensable for oil companies navigating volatile markets. Futures and derivatives provide effective risk mitigation, though strategies vary by firm structure. The DCC-GARCH model offers superior variance reduction, supporting dynamic hedging approaches. Companies must balance cash flow protection with earnings stability, tailoring strategies to operational realities.

### 6.00 Suggestions

**Adopt Flexible Hedging:** Companies should consider dynamic hedging strategies to better align with market price trends and avoid capping potential gains.

**Diversify Revenue Streams:** Expanding into alternative energy or related sectors can reduce dependence on volatile oil prices.

**Enhance Cost Efficiency:** Maintaining operational discipline helps protect profitability during oil price downturns.

**Leverage Cash Flow for Investments:** Strong cash flows, like ExxonMobil's, should be strategically reinvested into innovation and infrastructure.

**Monitor Market Trends Closely:** Real-time market analysis can support better hedging decisions and improve stockholder value.

## References

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