Financial Risk and Management: An International Journal
Volume 3, Number 1, 2024

Hedging Strategies for Commodity Price Risk in Volatile Global Markets

Bobi Adimasta[1]

[1] Universitas Diponegoro, Semarang, Indonesia

Abstract

Article history:
Received: January 8, 2024
Revised: February 21, 2024
Accepted: April 3, 2024
Published: June 30, 2024

Keywords:
Commodity Price Risk,
Derivatives,
Enterprise Risk Management,
Hedge Effectiveness,
Hedging Strategies.

Identifier:
Zera Open
Page: 1-13
https://zeraopen.com/journal/frmij

This study conducts a systematic literature review of hedging strategies for commodity price risk in increasingly volatile and integrated global markets. The evidence shows that overlapping shocks from health, geopolitical, policy, and climate factors amplify price swings in energy, metal, and agricultural commodities, making risk management a strategic necessity. Derivatives such as futures, options, and over the counter contracts remain the main tools for stabilizing cash flows and reducing earnings volatility, but their effectiveness is highly state dependent due to basis risk and changing market conditions. Dynamic, time varying hedge ratios and more sophisticated models that capture shifting correlations and volatilities are therefore needed to sustain hedge performance over time. The review also indicates that hedging is closely connected to firms' financing, investment, and governance decisions, supporting higher capital expenditure, firm value, and lower distress risk when aligned with underlying exposures and supported by deep, transparent derivative markets and robust institutional frameworks.

1. Introduction

Commodity price volatility has intensified in recent years as global markets grapple with overlapping shocks from the COVID-19 pandemic, the Russia Ukraine conflict, changing trade policies, and climate-related disruptions. These shocks have produced sharp and often sudden swings in energy, metal, and agricultural prices, with major implications for producers, processors, traders, and end users across advanced and emerging economies (World Bank, 2023). In such an environment, commodity price risk management is no longer a purely tactical concern but a strategic necessity for firms seeking to stabilize cash flows, safeguard margins, and support long term investment decisions in volatile global markets.

A large body of recent research shows that financial hedging instruments remain at the core of commodity risk management. Futures and options contracts, as well as over the counter derivatives, are widely used to lock in prices, reduce earnings volatility, and align risk exposures with firms' risk appetite. Meta analytic evidence on commodity futures hedge ratios suggests that optimal hedge ratios typically fall within the effectiveness bands required for hedge accounting, indicating that derivatives can deliver substantial variance reductions when properly calibrated (Białkowski et al., 2023). Empirical studies on agricultural and energy commodities likewise confirm that futures contracts can significantly reduce income and price risk for producers and market participants across different exchanges and time horizons (Penone et al., 2021; Rajesh & Nandini, 2023).

At the same time, recent work stresses that hedging effectiveness is highly state dependent. Episodes of non-convergence between futures and spot prices,

structural changes in storage and transportation costs, and evolving market microstructure can weaken the traditional minimum-variance hedge framework and increase basis risk, particularly during periods of market stress (Goswami et al., 2023). More advanced approaches that allow for time varying hedge ratios, cross hedging across related commodities, and integration of firm specific risk profiles are therefore gaining prominence. Strategic hedging choices such as which contracts to use, how aggressively to hedge, and over what horizon are increasingly viewed as central to firms' overall risk management and value-creation strategies rather than purely mechanical exercises (Ghoddusi et al., 2023).

Against this backdrop, further assessment of corporate approaches to managing commodity price risk is needed to shed light on how firms can effectively handle exposure in volatile global markets. This study examines the evolving evidence on the design, effectiveness, and limitations of commodity hedging strategies across sectors and regions, with particular attention to how changing market conditions and structural shifts shape the performance of traditional and more sophisticated risk-management tools.

2. Literature Review

Recent studies on commodity price risk emphasize that volatility is increasingly shaped by financialization and cross market spillovers rather than purely local supply demand imbalances. Using high frequency data, Lu et al. (2019) document significant volatility spillovers between crude oil and major agricultural commodities since the global financial crisis, underscoring that firms exposed to

energy or agricultural inputs face a highly integrated risk environment where shocks transmit rapidly across markets. In parallel, evidence from energy markets shows that oil and natural gas prices are closely connected through return and volatility spillovers, reinforcing the view that commodity price risk must be managed in a portfolio and system wide perspective rather than at the level of isolated contracts.

A growing strand of work examines how commodity derivatives support price risk management for producers and intermediaries. Chowdhury and Bhuiya (2023) review the role of agricultural commodity derivatives in Bangladesh and find that futures and options markets can stabilize farm incomes, improve price discovery, and reduce the bargaining power of intermediaries in fragmented supply chains. Practitioner oriented analyses similarly argue that structured hedging programs using exchange traded and over the counter contracts enable firms to lock in input costs, smooth cash flows, and support credit access, especially for agricultural and food businesses that operate with thin margins and high working capital needs. This evidence positions derivatives as core instruments in commodity risk management architectures.

Empirical work on hedging effectiveness has increasingly moved beyond static minimum variance models. For the Turkish derivatives market, Buyukkara et al. (2022) show that optimal hedge ratios for commodity and financial futures are time varying and that dynamically estimated hedges can deliver substantial reductions in portfolio variance compared with naïve one to one hedges. Tetik and Özen (2022) reach similar conclusions for emerging equity index futures, finding that hedge performance depends strongly on market conditions and that flexible

estimation methods such as dynamic least squares better capture shifts in risk transmission. Complementing these results, Sharma (2023) compares alternative specifications of minimum variance hedge ratios and reports that models allowing for changing correlations and volatilities generally outperform constant parameter approaches, particularly during stress periods when basis risk widens. Together, these studies highlight the importance of time varying hedge design and careful model choice when managing commodity price risk.

Another line of research links hedging strategies to firms' real decisions and valuation outcomes. Ullah et al. (2023) analyse a large panel of non-financial firms and show that corporate hedging with derivatives is associated with higher capital expenditures and firm value, suggesting that risk management relaxes financing frictions and supports long term investment. Evidence from emerging markets indicates that derivative use can enhance firm value by mitigating cash flow volatility and reducing the likelihood of financial distress, although benefits are contingent on governance quality and the alignment between hedging policies and underlying exposures (Frensidy, 2019). Overall, the contemporary literature portrays commodity hedging not merely as a mechanical exercise to reduce variance, but as a strategic tool that interacts with firms' investment, financing, and governance choices in an environment of heightened and interconnected commodity price risks.

3. Methods

The study employs a systematic literature review (SLR) approach to synthesize existing evidence on hedging strategies for commodity price risk in volatile global

markets. The review begins with the formulation of clear research questions focusing on how firms design, implement, and evaluate financial and operational hedging strategies for energy, metal, and agricultural commodities. Relevant publications are identified through structured searches in major academic databases and search engines using combinations of keywords such as "commodity price risk," "hedging strategies," "commodity futures," "options," "derivatives," "hedge effectiveness," and "risk management." The search is complemented by backward and forward citation tracking to capture additional studies that may not appear in the initial database results. Titles and abstracts are screened to remove studies that do not address commodity markets or that examine risk management exclusively in non-commodity financial assets. Full-text screening is then conducted based on predefined inclusion criteria, focusing on journal articles and institutional publications that provide conceptual, empirical, or methodological insights into commodity hedging, including the use of derivatives, cross hedging, dynamic hedge ratios, and links between hedging, firm performance, and financial stability. Duplicates and purely descriptive market reports without an explicit risk management perspective are excluded.

The remaining studies are systematically coded according to commodity type, hedging instruments, methodological approach, measures of hedging effectiveness, and main findings regarding determinants and outcomes of hedging. The evidence is synthesized through a combination of descriptive mapping (for example, by instrument, commodity class, and methodological design) and thematic analysis that clusters results into key themes such as volatility transmission, time-varying hedge

ratios, integration of hedging with corporate finance decisions, and the interaction between market structure and hedge performance. This structured procedure is intended to enhance transparency, replicability, and consistency in the way the literature on commodity price risk hedging is collected, evaluated, and interpreted.

4. Results and Discussion

The synthesis of the selected studies confirms that commodity price risk has become more complex and systemic, with volatility increasingly driven by global shocks and cross market linkages rather than isolated supply demand imbalances. Evidence on sharp and sudden swings in energy, metal, and agricultural prices supports the view that firms across the commodity value chain now operate in an environment of persistent uncertainty. This is consistent with findings on volatility spillovers between crude oil and major agricultural commodities, which show that shocks originating in one market are rapidly transmitted to others, creating an integrated risk environment for firms exposed to multiple inputs (Lu et al., 2019). Together, these results underline that commodity price risk management can no longer be treated as a peripheral or short term issue, but must be embedded in strategic planning, capital budgeting, and financing decisions.

Across the literature, financial derivatives emerge as the central toolkit for managing commodity price risk. Meta analytic evidence on commodity futures indicates that optimal hedge ratios generally fall within the bands required for hedge accounting, implying that well designed derivative positions can deliver substantial variance reductions in firms' cash flows and earnings (Białkowski et al., 2023).

Empirical applications in agricultural and energy markets further show that futures contracts are effective in reducing income and price risk for producers and intermediaries across different exchanges and contract maturities (Penone et al., 2021; Rajesh & Nandini, 2023). Complementary findings on agricultural derivatives highlight that futures and options not only stabilize farm incomes but also improve price discovery and weaken the bargaining power of intermediaries, thereby enhancing the resilience of fragmented supply chains (Chowdhury & Bhuiya, 2023). Taken together, these results reinforce the view that derivatives based hedging remains the backbone of commodity risk management architectures, especially where physical or contractual flexibility is limited.

However, the review also shows that hedging effectiveness is far from uniform and depends critically on market conditions, contract design, and model choice. Studies documenting episodes of non-convergence between futures and spot prices, as well as shifts in storage and transportation costs, warn that traditional minimum variance hedge frameworks can break down when basis risk widens, particularly during periods of market stress (Goswami et al., 2023). Empirical work on derivatives markets provides further support for a state dependent perspective: time-varying hedge ratios estimated with dynamic methods are found to deliver larger reductions in portfolio variance than naïve or constant hedge ratios, both in commodity and financial futures (Buyukkara et al., 2022; Tetik & Özen, 2022). Comparative analyses of hedge models indicate that specifications allowing for changing correlations and volatilities consistently outperform constant parameter approaches, especially when markets are turbulent and correlations become unstable

(Sharma, 2023). These converging findings suggest that effective hedging requires continuous model updating, careful monitoring of market microstructure, and flexibility in adjusting hedge intensity and instruments.

A further set of results links hedging strategies to firms' real decisions and valuation outcomes, highlighting the strategic dimension of commodity risk management. Evidence based on large panels of non-financial firms shows that the use of derivatives is associated with higher capital expenditures and firm value, implying that risk management can ease financing constraints and support long term investment by stabilizing internal cash flows and reducing perceived risk by external investors (Ullah et al., 2023). Studies from emerging markets similarly indicate that derivative use mitigates cash flow volatility and lowers the likelihood of financial distress, but also stress that these benefits are conditional on governance quality and the alignment between hedging policies and underlying exposures (Frensidy, 2019). This aligns with the broader argument that strategic choices regarding which contracts to use, how aggressively to hedge, and over what horizon are central components of firms' overall risk management and value creation strategies rather than purely mechanical exercises (Ghoddusi et al., 2023).

Overall, the results suggest that contemporary hedging strategies for commodity price risk are evolving along two main directions: deeper integration with corporate finance and governance decisions, and greater sophistication in modelling and implementing dynamic, state contingent hedges. Derivatives remain indispensable, but their effectiveness depends on firms' ability to recognize and adapt to changing patterns of volatility transmission, basis risk, and market structure.

For practitioners and policymakers, the evidence underscores the importance of developing robust derivative markets, promoting transparency and liquidity, and encouraging firms to adopt risk management frameworks that combine quantitative sophistication with strategic alignment to their broader investment and financing objectives.

5. Conclusion

The review concludes that commodity price risk in contemporary global markets is systemic, persistent, and tightly linked across energy, metal, and agricultural markets. In this environment, commodity price risk management has clearly shifted from a narrow, technical function to a strategic capability. The evidence consistently shows that derivatives such as futures and options remain the backbone of hedging architectures, enabling firms to reduce earnings volatility, stabilize cash flows, and protect investment plans. At the same time, the effectiveness of these instruments is highly state dependent: shifts in market structure, volatility spillovers, and episodes of futures spot non-convergence can erode the performance of traditional minimum-variance hedges. Dynamic, time varying hedge ratios and more flexible modelling approaches therefore emerge as essential tools for managing basis risk and preserving hedge effectiveness under changing conditions.

Beyond their immediate impact on price and income stabilization, hedging strategies are closely intertwined with firms' real decisions and valuation outcomes. The literature indicates that well designed hedging programs can ease financing

frictions, support higher capital expenditure, and reduce the likelihood of financial distress, particularly when embedded in sound governance frameworks and aligned with underlying exposures. These findings imply that commodity hedging should be viewed as an integral part of enterprise wide risk management and corporate finance policy rather than a stand alone technical exercise. For practitioners and policymakers, the results highlight the importance of deep, liquid, and transparent derivative markets, as well as regulatory and institutional environments that support sophisticated, state contingent risk management practices. For future research, the evidence points to the need for more work on the interaction between hedging, corporate governance, and real investment, especially in emerging markets and under evolving climate and geopolitical risks.

References

Białkowski, J., Bohl, M. T., & Perera, D. (2023). Commodity futures hedge ratios: A meta-analysis. *Journal of Commodity Markets, 30*, 100276.

Buyukkara, G., Kucukozmen, C. C., & Uysal, E. T. (2022). Optimal hedge ratios and hedging effectiveness: An analysis of the Turkish futures market. *Borsa Istanbul Review, 22*(1), 92–102.

Chowdhury, T. U., & Bhuiya, M. M. M. (2023). Necessity of agricultural commodity derivatives market for overcoming the problems in the agricultural supply chain of Bangladesh: A review and way forward. *Journal of Supply Chain Management: Research and Practice, 17*(1), 1–16.

Frensidy, B., & Mardhaniaty, T. I. (2019). The effect of hedging with financial derivatives on firm value at Indonesia Stock Exchange. *Economics and Finance in Indonesia, 65*(1), 20–32.

Ghoddusi, H., Titman, S., & Tompaidis, S. (2023). Hedging commodity price risk. *Journal of Financial and Quantitative Analysis, 58*(3), 1202–1229.

Goswami, A., Karali, B., & Adjemian, M. K. (2023). Hedging with futures during nonconvergence in commodity markets. *Journal of Commodity Markets, 32*, 100364.

Lu, Y., Yang, L., & Liu, L. (2019). Volatility spillovers between crude oil and agricultural commodity markets since the financial crisis. *Sustainability, 11*(2), 396.

Rajesh, R., & Nandini, A. S. (2023). Hedging efficiency of energy commodities between Indian and American commodity exchanges: Constant and time-varying approaches. *International Journal of Energy Economics and Policy, 13*(6), 537–546.

Sharma, U., & Karmakar, M. (2023). Measuring minimum variance hedging effectiveness: Traditional vs. sophisticated models. *International Review of Financial Analysis, 87*, 102621.

Tetik, M., & Özen, E. (2022). Time-varying structure of the optimal hedge ratio for emerging markets. *Scientific Annals of Economics and Business, 69*(4), 521–537.

Ullah, S., Irfan, M., Kim, J. R., & Ullah, F. (2023). Capital expenditures, corporate hedging and firm value. *The Quarterly Review of Economics and Finance, 87*, 360–366.

World Bank. (2023). *Commodity markets outlook: October 2023*. World Bank. Retrieved February 9, 2024, from https://openknowledge.worldbank.org/entities/publication/0e4e7e1e-6db9-4011-b179-806d28aa0b91