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A review of the literature on commodity risk management

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ABSTRACT

This paper analyzes research on commodity risk management by nonfinancial firms and provides a review of the findings to date. We discuss the theories and methodologies used including the models best suited for examining commodity risk management and exposure. In this study, we review how the research to date provides evidence to the following questions. Is commodity risk reflected in share price behavior? Is the use of commodity risk management tools (derivatives) associated with reduced risk? Is there a relationship between the use of commodity risk management and the value of the firm? What other factors are important to commodity risk management? Suggestions are provided for future research in this area.

"If we don't do anything, we are speculating. It is our fiduciary duty to hedge fuel price risk."

(Scott Topping, quote in 2003 when VP Treasurer at Southwest Airlines)

"*Hedging is a rigged game that enriches Wall Street.*"

(Scott Kirby, then President of American Airlines Group quoted in March 20, 2016 Wall Street Journal article)

1. Introduction

We lead in with these two quotes to illustrate the disparity in senior management views of the wisdom of hedging commodity price risk within the same industry. Mr. Topping's statement reflects a view that hedging commodity risk management is a financial policy that airlines should follow as part of their fiduciary duty. In fact, Southwest Airlines has continued to maintain an active fuel hedging program throughout most of the last 15+ years. However, risk management, including commodity risk management, varies dramatically across firms. Mr. Kirby's statement implies that airlines should not attempt to manage fuel price risk by entering into derivative contracts because Wall Street has "an advantage" in terms of pricing contracts. Furthermore, in a Modigliani and Miller

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world with perfect capital markets, corporate risk management should not matter, so shareholders should be indifferent about whether firms hedge or not. In the real world with imperfect capital markets, academic research has shown that managing risk can be a value adding activity by reducing expected taxes, decreasing cash flow and earnings volatility, lowering the costs of financial distress, decreasing the cost of capital, and alleviating the underinvestment problem.

This paper analyzes research on commodity risk management by nonfinancial firms and provides a review of important findings to date to help us better understand these issues.[1] Nonfinancial firms may approach commodity hedging differently than they approach, for example, interest rate and currency hedging. Anecdotal evidence, surveys, and studies indicate that some managers may have opinions about the direction of future commodity prices which influence their hedging. Yet managers are less likely to have a view about future interest rates or exchange rates. Therefore, we believe that a review of commodity risk management research is very valuable to the literature.

Within the corporate risk management area, empirical research in recent years has gravitated towards specific industries with an emphasis on commodity price risk management: gold mining, oil and gas, airlines, and electric and gas utilities.[2] A large reason for this focus is due to a change in data availability. Accounting requirements (SFAS 133, IAS 39) regarding corporate accounting and disclosure of derivative holdings have emphasized disclosures about market values of derivatives as assets or liabilities.[3] However, in the process, these same accounting requirements de-emphasized disclosures regarding notional values of derivative contracts. While the market value of derivatives is certainly an important piece of information regarding corporate disclosure, notional values were previously used to decipher how much firms were hedging. Without notional value disclosures, the ability of academic researchers to study the extent of hedging by nonfinancial firms has been significantly reduced in the modern accounting disclosure environment of the last 15+ years. Fortunately, SEC disclosure requirements about risk exposures have allowed researchers to continue to learn about hedging in the industries we mention above. We discuss the methodologies used including the models best suited for examining commodity risk management and exposure.

Better understanding the benefits of commodity risk management is not only helpful to nonfinancial firms but also highly relevant to regulators globally. For example, after the 2008 financial crisis, derivatives became a controversial part of the financial landscape. Government regulators imposed greater restrictions on these markets through the Dodd-Frank Wall Street Reform and Consumer Protection Act in the U.S. and similar legislation and regulations in other G20 nations. The restrictions included higher margin requirements, mandated clearing, and forcing over-the-counter (OTC) derivatives onto exchanges. But in so doing, corporate hedgers, which comprise less than 10% of the OTC markets, were also impacted. As Tom Deas at FMC Corporation states*: "Forcing end-users to put up cash for fluctuating derivatives valuations means less funding available to grow their business and expand employment. The reality treasurers face is that the money to margin derivatives has to come from somewhere and inevitably less funding will be available to operate their businesses."*[4]

In this study, we investigate how the research to date provides evidence to help answer the following questions and also provide suggestions for future research. To our knowledge, no other study has been performed at this level of detail on commodity risk management.

- Question 1: Is commodity risk reflected in the equity share price returns or behavior?
- Question 2: Is the use of commodity risk management tools (derivatives) associated with reduced risk?
- Question 3: Is there a relationship between the use of commodity risk management and the value of the firm?
- Question 4: Are there other factors that affect a firm's decision to manage commodity price risk?

This paper proceeds as follows. The next section presents a summary on theories of risk management and the following section discusses methodologies used to exam the four questions in commodity risk management. After this, results are presented on what we know from commodity risk management research to date. Finally, a conclusion is provided with suggestions for future research.

2. Theories of risk management

Corporate risk management theory begins with the Modigliani and Miller (1958) perfect capital market framework (i.e., "hedging has no effect on firm value"), then introduces market imperfections that imply risk management can alter firm value. Table 1 summarizes 15 of the leading theoretical papers on corporate risk management and provides the journal, year, authors, summary of what was examined and theoretical findings. In this section, we discuss selected theoretical frameworks that help us understand factors that may make risk management valuable (or not).

The earliest theoretical paper that specifically addresses hedging is Stulz (1984), who presents a model where value-maximizing

[1] There is another set of literature we do not cover that investigates other risk management topics. For example, Dewally et al. (2013) find that hedging is costly for producers when futures prices are depressed where there is imbalance in hedging. It is one of the few papers that addresses the market effects and costs of hedging. Other literature examines optimal hedge ratios, stochastic programming and risk decisions, VaR, CVaR, and related topics. For more information on areas, see Tomek and Peterson (2001), Fleten et al. (2002), Gerner and Ronn (2013), among others. We also exclude research on the use of insurance contracts in risk management such as Cornaggia (2013), who studies the agricultural industry. Refer to Smithson and Simkins (2005) for a broad review of the literature on how risk management adds value for hedging interest rates, exchange rates, and commodities.

[2] To our knowledge, there is only one commodity risk management paper that examines utilities, Pérez-González and Yun (2013) so we mention this industry for completeness, This study examines the use of weather derivatives. A number of papers examine the other industries.

[3] The effective dates of SFAS 133 and IAS 39 were June 15, 2000, and January 1, 2001, respectively.

[4] For more information on this topic, see Popova and Simkins (2015).