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Capturing the risk premium of commodity futures: The role of hedging pressure

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ABSTRACT

We construct long–short factor mimicking portfolios that capture the hedging pressure risk premium of commodity futures. We consider single sorts based on the open interests of hedgers or speculators, as well as double sorts based on both positions. The long–short hedging pressure portfolios are priced cross-sectionally and present Sharpe ratios that systematically exceed those of long-only benchmarks. Further tests show that the hedging pressure risk premiums rise with the volatility of commodity futures markets and that the predictive power of hedging pressure over cross-sectional commodity futures returns is different from the previously documented forecasting power of past returns and the slope of the term structure.

1. Introduction

While commodity futures have moved into the investment mainstream only over the last decade,[2] the academic debate over the existence and source of a commodity futures risk premium has been intense ever since the 1930s. The first hypothesis for the source of a commodity futures risk premium was the risk transfer or hedging pressure hypothesis of Keynes (1930) and Hicks (1939), where a risk premium accrued to speculators as a reward for accepting the price risk which hedgers sought to transfer. This theory was extended by several authors culminating in the equilibrium-based generalized hedging pressure hypothesis of Hirshleifer (1989, 1990) where non-participation effects lead to hedging pressure influencing the risk premium of commodity futures. The theories of Working (1949) and Brennan (1958) relate the variation in futures prices to issues of storage and inventories rather than issues of risk transfer, with recent papers giving credence to this approach.[3] Hirshleifer's (1990) main contribution is to link backwardation,[4] the mainstay of the Keynesian theory, to lower levels of hedgers' hedging pressure, and contango,[5] the mainstay of the Working (1949) viewpoint, to higher levels of hedgers' hedging pressure, where hedging pressure measures the propensity of market participants to be net long. By so doing, the Hirshleifer (1990) generalized hedging pressure hypothesis synthesizes the viewpoints of Keynes (1930) and Working (1949).[6]

The early empirical tests of the hedging pressure hypothesis focused on the role of own commodity hedging pressure as a determinant of either futures prices (Houthakker, 1957; Cootner, 1960; Chang, 1985; Bessembinder, 1992) or of the CAPM risk premium (Dusak, 1973; Carter et al., 1983). More recent studies centered on the role of hedging pressure as a systematic risk factor. DeRoon et al. (2000) find cross-commodity hedging pressure effects for individual commodity futures risk premium, as suggested in Anderson and Danthine (1981). Acharya et al. (2010) show that

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[2] Commodities institutional investments rose from $18 billion in 2003 to $250 billion in 2010 according to a Barclays Capital survey of over 250 institutional investors.

[3] Routledge et al. (2000) show that time-varying convenience yields can arise in the presence of risk-neutral agents from the presence of an embedded timing option, while Gorton et al. (2013) model the risk premium of commodity futures as a function of inventory levels.

[4] Backwardation occurs when commodity producers are more prone to hedge than commodity consumers and processors. The then net short positions of hedgers translate into low hedgers' hedging pressure, leading to the necessary intervention of net long speculators and to the rising price pattern associated with backwardation. Backwardation is also linked to scarce inventories as explained in footnote 9.

[5] Contango arises when commodity consumers and processors outnumber producers. The then net long positions of hedgers translate into high hedgers' hedging pressure, leading to the intervention of net short speculators and to the falling price pattern linked to contango. Contango is also associated with abundant inventories (see footnote 9).

[6] There have been several attempts to connect the theory of storage to the hedging pressure hypothesis (Cootner, 1967; Khan et al., 2008, for example).

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systematic hedging pressure effects can arise in the context of limits on risk-taking capacity of speculators.[7]

In this paper we construct factor mimicking portfolios to examine the systematic effects of hedging pressure on the commodity futures risk premium. We first sort our cross section of commodity futures on each contract's hedging pressure. Using single- and double-sorts,[8] we then systematically (i) buy the contracts for which hedgers are the shortest and/or speculators are the longest and (ii) sell the contracts for which hedgers are the longest and/or speculators are the shortest. As the hedging pressure hypothesis does not specify investment horizon, we consider different ranking and holding periods for our hedging pressure portfolios ranging from 4 to 52 weeks. Our empirical results support the hypothesis that hedging pressure is a systematic factor in determining commodity futures risk premiums. Over the period analyzed (1992–2011), our fully-collateralized hedging pressure long–short portfolios present Sharpe ratios that range from 0.27 to 0.93 with an average at 0.51. By contrast, a long-only equally-weighted portfolio of all commodities generates a Sharpe ratio of only 0.08, while that of the S&P-GSCI stands at merely 0.19.

Further to this main contribution, we also report a set of four results. First, we find a positive relationship between our hedging pressure risk premiums and the lagged volatility of an equally-weighted portfolio of all commodities. This result is consistent with the hedging pressure hypothesis, as speculators are deemed to demand, and hedgers should be willing to pay, a higher premium when the risk of commodity markets rises. Second, the hedging pressure risk premiums are found to diversify equity risk better than long-only commodity portfolios. However, the incremental mean returns and added diversification benefits of being long–short (as opposed to long-only) come at the cost of losing the inflation hedge that is naturally provided by commodities (Bodie and Rosansky, 1980; Bodie, 1983). Third, alongside with the slope of the term structure of commodity futures prices,[9] hedging pressure is found to command a positive and significant risk premium, while the prices of risk associated with the S&P-GSCI or an equally-weighted portfolio of all commodities are zero, both statistically and economically. This suggests that a failure to account for either hedging pressure or the slope of the term structure results in the misleading conclusion that there is no risk premium or risk transfer in commodity futures markets. Fourth, we show that the predictive power of hedging pressure over future commodity excess returns is different from the forecasting power of both past returns and the slope of the term structure (Erb and Harvey, 2006; Gorton and Rouwenhorst, 2006; Miffre and Rallis, 2007). The positions of speculators and the slope of the term structure are found to be the most important drivers of commodity futures returns, leading us to conclude that commodity futures risk premiums depend on considerations relating to both speculators' hedging pressure and inventory levels.

The rest of the paper is organized as follows. Section 2 presents the dataset. Section 3 highlights the methodology used to construct long–short mimicking portfolios for hedging pressure and analyzes the performance of these portfolios. Section 4 studies the strategic role of the hedging pressure risk premiums (namely, their risk diversification and inflation hedging properties). Section 5 considers the cross-sectional pricing of hedging pressure and identifies its marginal effect on commodity futures returns, while simultaneously controlling for the effects of other signals (momentum and term structure). Finally Section 6 concludes.

2. Data

The dataset includes Friday settlement prices for 27 commodity futures as obtained from *Datastream International*. The frequency, time series and cross section are chosen based on the availability of hedgers' and speculators' positions in the CFTC Aggregated Commitment of Traders Report. The cross section includes 12 agricultural commodities (cocoa, coffee C, corn, cotton no. 2, frozen concentrated orange juice, oats, rough rice, soybean meal, soybean oil, soybeans, sugar no. 11, wheat), 5 energy commodities (electricity, gasoline, heating oil no. 2, light sweet crude oil, natural gas), 4 livestock commodities (feeder cattle, frozen pork bellies, lean hogs, live cattle), 5 metal commodities (copper, gold, palladium, platinum, silver) and random length lumber. The positions of hedgers and speculators are collected every Tuesday and made available to the public the following Friday. The dataset spans September, 30 1992–March, 25 2011.

To model futures returns, we assume that investors hold the nearest contract up to the last Friday of the month prior to maturity. On that Friday, we assume that investors roll their position to the second-nearest contract and hold that contract up to the last Friday of the month prior to maturity. The procedure is then reiterated using the then second-nearest contract. Thus futures returns are always calculated using price changes on the same contract; namely, in a way that investors could replicate. The choice of nearest and second-nearest contracts (as opposed to more distant contracts) is driven by liquidity considerations.

The CFTC classifies traders based on the size of their positions into reportable and non-reportable. Reportable traders constitute 70–90% of the open interest of any futures markets[10] and are further classified as commercial (hedgers) or non-commercial (speculators). A trader's futures position is determined to be commercial if the position is used for hedging purposes as defined by CFTC regulations. According to CFTC Form 40, this requires that the trader be "...engaged in business activities hedged by the use of the futures and option markets." A reportable trader's futures position is otherwise classified as non-commercial.[11]

Hedging pressure for a category (say, speculators) is defined as the number of long open interest in that category divided by the total number of open interest in the category. For example, a hedgers' hedging pressure of 0.3 means that over the previous week 30% of hedgers were long and thus 70% were short. As explained in Section 3, we interpret the then net short positions of hedgers as

[7] In addition, two recent papers (Hong and Yogo, 2012; Tang and Xiong, 2012) suggest the presence of systematic factors in the cross section of commodity futures prices driven by the arrival of financial investors in these markets.

[8] The motivation for having two single sorts comes from the fact that the hedging pressure hypothesis implies two separate sub-hypotheses (Chang, 1985): the first one relates to naïve speculators who earn a risk premium by simply taking positions that are opposite to those of hedgers, while the second one relates to informed speculators who earn a risk premium as a compensation for both initiating trades with hedgers and identifying profit opportunities (Working, 1958).

[9] The theory of storage of Working (1949) and Brennan (1958) explains the slope of the term structure of commodity futures prices by means of the incentive that inventory holders have in carrying the spot commodity. When inventories are abundant, the term structure of commodity futures prices is upward-sloping (and the market moves into contango) to give inventory holders an incentive to buy the commodity spot at a cheap price and to sell it forward at a premium that exceeds the cost of storing and financing the commodity. However, when inventories are scarce, the term structure of commodity futures prices becomes downward-sloping (and the market moves into backwardation): then, the convenience yield derived from owning the commodity spot exceed the incurred costs, giving inventory holders an incentive to own the asset spot even though it is expensive compared to the futures contract.

[10] The remaining percentages cover the positions of non-reportable traders; these are not considered in this study since they cannot be identified as hedgers or speculators.

[11] While we treat commercial traders as hedgers and non-commercial traders as speculators, we appreciate that motives of participants in each category are not always easy to discern (Ederington and Lee, 2002, for example, show that commercial traders do not necessarily have known spot positions and thus their classification as hedgers might be inaccurate).