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J. Int. Financ. Markets Inst. Money xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Journal of International Financial Markets, Institutions & Money

journal homepage: www.elsevier.com/locate/intfin

Commodity markets volatility transmission: Roles of risk perceptions and uncertainty in financial markets

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ARTICLE INFO

ABSTRACT

This paper uses GJR–GARCH estimations to analyze the price volatility transmissions among the crude oil, corn, soybeans, sugar, and wheat markets. Special role is also given to two driving mechanisms of the relationship: (i) the volatility index (VIX) as a measure of risk perceptions, and (ii) the equity market uncertainty (EMU) index as a measure of uncertainty in financial markets. The analysis covers the daily futures markets data from January 1, 1990 to July 31, 2015, and several sub-periods in the empirical strategy are also considered. The empirical results show that (i) crude oil return is positively related to four agricultural commodity returns; (ii) a higher risk perception in financial markets suppresses both the corn and soybeans returns over the period August 1, 2008–July 31, 2015; (iii) a higher uncertainty in financial markets is negatively related to the corn and soybeans returns for the period from June 1, 2010 to July 31, 2015; (iv) the results for the effects of risk perceptions and uncertainty on wheat market returns are not statistically robust; i.e., these results are time-specific in the different sub-period analyses.

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1. Introduction

In the last couple of years, the global economy faced the challenge of increased contagion across financial markets with increasing political and financial market uncertainties (Aboura and Wagner, 2016; Broadstock and Filis, 2014; Chen et al., 2013; Gozgor, 2014; Francis and Ofori, 2015; Kenourgios et al., 2011; Mensi et al., 2014; Smales, 2014a,b; Song et al., 2016; Yarovaya et al., 2016). In addition, the analysis of global commodity market linkages is one of the key areas of financial and economic research, but effects of political and financial market uncertainties are neglected in the literature (Chen and Lai, 2013; Gupta et al., 2014; Kang and Ratti, 2013; Lau and Bilgin, 2013; Mishra and Panda, 2016; Zhu, 2015). These issues promoted the discussion among financial regulators and academics about the role of financial market stability and economic stability in maintaining commodity market's stability (Creti et al., 2013). At this point, the transmission of the first moment (price) and second moment (volatility) shocks between crude oil and agricultural commodity markets is well discussed,[1] but

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lack of research on the role of the risk perceptions and uncertainty in financial markets in particular. The goal of this paper is to reassess the price volatility spillovers among the crude oil and agricultural commodity markets. To this end, a special role is given to two driving mechanisms of the relationship: (i) the volatility index (VIX) as a measure of risk perceptions, and (ii) the equity market uncertainty (EMU) index as a measure of uncertainty in financial markets.

Indeed, not only the level commodity prices, but also their volatility are important for several aspects, and the inferences are threefold. First, commodity price volatility can negatively affect consumers and producers as well traders and investors via uncertainty channel (Baker et al., 2015; Bloom, 2009). If empirical evidences are in favor of the "financialization of commodity markets" hypothesis (e.g., in Cheng and Xiong, 2014; Henderson et al., 2015), the magnitude of the uncertainty effect will be higher. Because now not only the uncertainty shocks in commodity markets, but risk perceptions and uncertainty in financial markets would also be able to affect the sentiments of consumers and producers as well as decisions of traders and investors. At this point, a distinction between uncertainty and risk is firstly done by Shewhart (1931), and he indicates that the risk has a "predictable variation", but uncertainty has an "unpredictable variation"; i.e., it has surprise, new or unexpected nature. As a matter of fact, we do refer to the risk perception, and it is a more complicated concept since perceptions depend on the subjective ideas of financial market participants. In short, this paper considers the VIX to capture the effects of risk perceptions and the EMU index to capture the effects of uncertainty that is shaped in financial markets. Therefore, it is aimed to analyze whether the risk perceptions and financial market uncertainty can be explanations for volatility spillover among commodity markets. In other words, it is tested whether the "financialization hypothesis" can be an alternative explanation for the commodity market volatility spillover from the crude oil market to agricultural commodity markets.

Second, the price volatility in commodity markets has importance in all open-economies, mainly due to the commodity price volatility can be related to the volumes of imports and exports, and these issues relate to welfare gains from international trade.

Third, price volatility in commodity markets would have also directly influence the real income, especially in developing economies, but affecting the real income mainly depends on a specific country context. Therefore, it is important to empirically examine the price volatility interactions among commodity markets for policy makers, consumers, and producers, traders and investors.

This paper conducts a multivariate Glosten–Jagannathan–Runkle (GJR) Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model of Glosten et al. (1993) to examine volatility spillovers from the crude oil to four agricultural commodity markets; corn, soybeans, sugar, and wheat. The empirical analysis covers the daily futures markets data from January 1, 1990 to July 31, 2015, and several sub-periods are also considered in the empirical strategy. The main contributions of the paper to the existing literature are as follows. First, to the best of our knowledge, this paper represents the first empirical results on the effects of risk perceptions and uncertainty in financial markets in the energy-agriculture commodity prices volatility spillover literature. Second, whole observations are divided into four sub-periods to examine the volatility spillovers among the crude oil, corn, soybeans, sugar, and wheat futures markets. In other words, the robustness of the benchmark findings are checked, i.e., whether the empirical results on the commodity markets volatility spillover are time-specific or not.

The remainder of the paper is organized as follows. Section 2 reviews the related literature on the price volatility transmission among crude oil and agricultural commodity markets. Section 3 explains the data and empirical model as well as discusses the methodology of the volatility model. Section 4 reports the empirical results and discusses implications. Section 5 concludes the paper.

2. Literature review

2.1. Motivation from previous findings

First, the price and the price volatility transmissions among energy and agricultural commodity markets are mainly biofuel-related in the recent literature. For instance, the Renewable Fuel Standard of the Energy Policy Act in 2005 has a crucial role in the rising ethanol production in the United States (U.S.) that leads to higher demand for biofuels, and this can be the main explanation of a stronger relationship between oil and agricultural commodity prices after 2006 (Serra, 2013). Indeed, the relationship between the energy and agricultural markets are heavily affected by policies to promote ethanol production (Hertel and Beckman, 2012; Trujillo-Barrera et al., 2012). According to Hertel and Beckman (2012), the dynamics behind the ethanol market, crude oil, and corn markets leads to the linkage among the three markets that did not exist before 2006, and the correlation of crude oil and corn markets from September 2007 to October 2008 is 0.92. In parallel, there are also several empirical findings suggesting significant price volatility spillovers from crude oil to the corn markets, and their explanations are based on biofuel production (Serra, 2013; Wu et al., 2011).[2] On contrary, for example, Natalenov et al. (2011) indicate that biofuel production is not the main reason for the co-movement between the oil and agricultural commodity markets.

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[2] See also Serra (2013) for the recent survey of the related literature on biofuels-related volatility.