World Academy of Science, Engineering and Technology
International Journal of Agricultural and Biosystems Engineering
Vol:12, No:02, 2018

Modelling Agricultural Commodity Price Volatility with Markov-Switching Regression, Single Regime GARCH and Markov-Switching GARCH Models: Empirical Evidence from South Africa

Authors : Yegnanew A. Shiferaw

Abstract : Background: commodity price volatility originating from excessive commodity price fluctuation has been a global problem especially after the recent financial crises. Volatility is a measure of risk or uncertainty in financial analysis. It plays a vital role in risk management, portfolio management, and pricing equity. Objectives: the core objective of this paper is to examine the relationship between the prices of agricultural commodities with oil price, gas price, coal price and exchange rate (USD/Rand). In addition, the paper tries to fit an appropriate model that best describes the log return price volatility and estimate Value-at-Risk and expected shortfall. Data and methods: the data used in this study are the daily returns of agricultural commodity prices from 02 January 2007 to 31st October 2016. The data sets consists of the daily returns of agricultural commodity prices namely: white maize, yellow maize, wheat, sunflower, soya, corn, and sorghum. The paper applies the three-state Markov-switching (MS) regression, the standard single-regime GARCH and the two regime Markov-switching GARCH (MS-GARCH) models. Results: to choose the best fit model, the log-likelihood function, Akaike information criterion (AIC), Bayesian information criterion (BIC) and deviance information criterion (DIC) are employed under three distributions for innovations. The results indicate that: (i) the price of agricultural commodities was found to be significantly associated with the price of coal, price of natural gas, price of oil and exchange rate, (ii) for all agricultural commodities except sunflower, k=3 had higher log-likelihood values and lower AIC and BIC values. Thus, the three-state MS regression model outperformed the two-state MS regression model (iii) MS-GARCH(1,1) with generalized error distribution (ged) innovation performs best for white maize and yellow maize; MS-GARCH(1,1) with student-t distribution (std) innovation performs better for sorghum; MS-gjrGARCH(1,1) with ged innovation performs better for wheat, sunflower and soya and MS-GARCH(1,1) with std innovation performs better for corn. In conclusion, this paper provided a practical guide for modelling agricultural commodity prices by MS regression and MS-GARCH processes. This paper can be good as a reference when facing modelling agricultural commodity price problems.

Keywords : commodity prices, MS-GARCH model, MS regression model, South Africa, volatility
Conference Title : ICASDA 2018 : International Conference on Agricultural Statistics and Data Administration
Conference Location : London, United Kingdom
Conference Dates : February 15-16, 2018