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Modelling Volatility of Cryptocurrencies: Evidence from GARCH Family of Models with Skewed Error Innovation Distributions

Authors : Timothy Kayode Samson, Adedoyin Isola Lawal

Abstract : The past five years have shown a sharp increase in public interest in the crypto market, with its market capitalization growing from $100 billion in June 2017 to $2158.42 billion on April 5, 2022. Despite the outrageous nature of the volatility of cryptocurrencies, the use of skewed error innovation distributions in modelling the volatility behaviour of these digital currencies has not been given much research attention. Hence, this study models the volatility of 5 largest cryptocurrencies by market capitalization (Bitcoin, Ethereum, Tether, Binance coin, and USD Coin) using four variants of GARCH models (GJR-GARCH, sGARCH, EGARCH, and APARCH) estimated using three skewed error innovation distributions (skewed normal, skewed student- t and skewed generalized error innovation distributions). Daily closing prices of these currencies were obtained from Yahoo Finance website. Finding reveals that the Binance coin reported higher mean returns compared to other digital currencies, while the skewness indicates that the Binance coin, Tether, and USD coin increased more than they decreased in values within the period of study. For both Bitcoin and Ethereum, negative skewness was obtained, meaning that within the period of study, the returns of these currencies decreased more than they increased in value. Returns from these cryptocurrencies were found to be stationary but not normality distributed with evidence of the ARCH effect. The skewness parameters in all best forecasting models were all significant ($p<.05$), justifying of use of skewed error innovation distributions with a fatter tail than normal, Student-t, and generalized error innovation distributions. For Binance coin, EGARCH-sstd outperformed other volatility models, while for Bitcoin, Ethereum, Tether, and USD coin, the best forecasting models were EGARCH-sstd, APARCH-sstd, EGARCH-sged, and GJR-GARCH-sstd, respectively. This suggests the superiority of skewed Student t- distribution and skewed generalized error distribution over the skewed normal distribution.

Keywords : skewed generalized error distribution, skewed normal distribution, skewed student t- distribution, APARCH, EGARCH, sGARCH, GJR-GARCH
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