Do Jumps and Co-jumps Improve Volatility Forecasting of Oil and Currency Markets?

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Executive summary

This study models and forecasts oil and USD exchange rate volatilities using high-frequency data. Intraday data are obtained from Bloomberg database and cover the period from September 1, 2014, to April 30, 2018. During this period, we compute 5-minute logarithm returns for the West Texas Intermediate (WTI), the DXY index and for the six exchange rates included in the DXY: euro, jpy gbp, cad, chf and sek. Accordingly, we use this recent intraday data to investigate how jumps, both bivariate and multivariate co-jumps between the oil and USD markets, and news improve forecasting of their realized volatility (RV). The originality of this paper is twofold: i. We specify the intraday relationship between the two markets in terms of intraday jumps, ii. We test their effects on volatility.

Accordingly, on the one hand, instead of detecting the trading days that contain jumps, we propose rather to identify intraday jumps. To this end, we apply the most well-known intraday jump tests proposed by Andersen el al. (2007) and Lee and Mykland (2008). After detecting intraday jumps in the two markets, we estimate a TOBIT model and we show that the existence of a significant contemporaneous relationship between jumps in the exchange and the oil markets. This finding suggests that jumps occur simultaneously in foreign exchange and oil markets, which raises the hypothesis of co-jumps between the two markets. We confirm this hypothesis by applying the co-jump test of Andersen et al. (2008). Moreover, we propose to investigate the connection between the information flow arrival and co-jumps occurred simultaneously in the oil and the exchange rate markets. Specifically, we propose to test whether simultaneous jumps (co-jumps) occurring in the oil and the exchange rate markets might coincide

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with information flow arrival. Our information arrival proxy is based on unanticipated US macroeconomic news headlines recorded by Bloomberg database. To test the association between public information releases and violent price changes (jumps) occurring simultaneously in both markets, we regress co-jumps against the number of unanticipated macroeconomic news announcements published through Bloomberg terminals. Our results show that the coefficient measuring the impact of news is statistically significant, confirming the assumption for which co-jumps between the two markets do coincide with the timing of macroeconomic news announcements. This finding confirms the hypothesis according to which co-jumps are subordinated to macroeconomics news, which is in line with the MDH hypothesis.

On the other hand, we extend the Heterogeneous Autoregressive (HAR)-RV model of Corsi (2009) through the consideration of jumps and co-jumps to forecast the dynamics of oil price and USD exchange rate RV. We find that both the oil and USD exchange rate markets co-move during shocks through common abrupt price jumps that are always driven by news. Further, we find that our extended HAR-RV outperforms Corsi (2009)'s model in forecasting volatility while showing a significant contribution of co-jumps and unexpected news to forecasting the future dynamics of RV. In particular, while unexpected news drives USD exchange-rate volatility, the co-jumps–HAR-RV model produces more accurate forecasts for the oil market.

Keywords: Volatility; oil price; US dollar exchange rate; co-jumps; forecasts.
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