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Forecasting oil prices with penalized regressions, variance risk premia and Google data

This paper investigates whether augmenting models with the variance risk premium (VRP) and Google search data improves the quality of the forecasts for real oil prices. We considered a time sample of monthly data from 2007 to 2019 that includes several episodes of high volatility in the oil market. Our evidence shows that penalized regressions provided the best forecasting performances across most of the forecasting horizons. Moreover, we found that models using the VRP as an additional predictor performed best for forecasts up to 6–12 months ahead forecasts, while models using Google data as an additional predictor performed better for longer-term forecasts up to 12–24 months ahead. However, we found that the differences in forecasting performances were not statistically different for most models, and only the Principal Component Regression (PCR) and the Partial least squares (PLS) regression were consistently excluded from the set of best forecasting models. These results also held after a set of robustness checks that considered model specifications using a wider set of influential variables, a Hierarchical Vector Auto-Regression model estimated with the LASSO, and a set of forecasting models using a simplified specification for Google Trends data.

Keywords: oil price; variance risk premium; Google Trends; VAR; LASSO; Ridge; Elastic Net; principal components, partial least squares.

JEL classification: C22; C32; C52; C53; C55; C58; G17; O13; Q47.

1. Introduction

The real price of oil plays an important role almost in every economic sector. Accurate forecasting of this macroeconomic variable provides an opportunity for oil-importing and exporting countries, investors, and other economic agents to develop more efficient business strategies and plan more balanced economic activity. Moreover, the forecast is also important for energy policy modelling, energy system planning, and carbon emission regulations, see (Baumeister, Hamilton, 2019; Bhattacharyya, 2019; Fantazzini et al., 2011; Fantazzini, 2016; Hamilton, 2008, 2009, 2013; Kilian, 2008, 2009, 2016; Kilian, Zhou, 2022; Schwarz, 2017) for a broader discussion.

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