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INTRODUCTION TO *MACROECONOMIC DYNAMICS* SPECIAL ISSUE ON DYNAMICS OF OIL AND COMMODITIES PRICES

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This special issue of *Macroeconomic Dynamics* presents a timely and fresh body of high-quality research on the complexity and evolution of the international oil markets, the dynamics of the price of oil, and the financialization and the interconnections of oil, energy, and nonenergy commodity markets.

With major changes in the global energy scene in the aftermath of the global financial crisis and the changing energy and climate debate, there is great interest worldwide in the determinants of oil prices, as well as in the relationship between the price of oil, the level of economic activity, the prices of oil products, the prices of nonenergy commodities, and the role played by financial speculation. Among academics and applied professional economists, a high demand for qualified research is clearly perceived on a number of topics, which are subjects of current debate in the literature.

An example of those major issues is the relationship between economic activity and oil prices. Although many empirical contributions suggest that this link is asymmetric, recent studies that use new methodologies to test for asymmetries have cast some doubts on that premise. Should those findings be confirmed by further research, important implications for the typical channels of transmission of oil price shocks would follow.

Not only are asymmetries likely to characterize the link between economic activity and oil prices, but also they are often employed to offer more accurate descriptions of the pricing relationships between crude oil and refined products. In this respect, the effects of volatility in oil prices on the degree of asymmetry in the

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response of product prices to increases or decreases in oil prices are particularly important.

The price of crude oil has traditionally been treated as exogenous with respect to macroeconomic aggregates. However, in recent years, the consensus view is that the macroeconomy and the oil and stock markets react to the same factors, such as global demand. Moreover, studies of the impact of oil shocks on real and financial variables have generally failed to distinguish the causes underlying oil price increases. Recent research has linked both the financial and the macroeconomic literature on oil shocks. Relying on previous work by Lutz Kilian on different definitions of oil shocks (i.e., aggregate demand, oil-supply, and oil-demand shocks), this literature relates oil shocks to stock market volatility. Volatility is shown to respond significantly to oil price shocks caused by sudden changes in aggregate demand, while the impact of shocks specific to the oil market is negligible.

Expectations should always be considered among the determinants of the dynamics of oil prices. Actually, there is a sizeable empirical literature on the effect of the crude oil status report issued by the Energy Information Administration in the United States on the dynamics of spot and futures prices of crude oil, while there is little empirical evidence on the effect of the oil status report on options markets.

Another important body of research deals with oil price forecasting. Notwithstanding a resurgence in research on out-of-sample forecasts of the price of oil in recent years, there is one important approach to forecasting the real price of oil which has not been studied systematically to date. This approach is based on the premise that demand for crude oil derives from the demand for refined products such as gasoline or heating oil. Oil industry and financial analysts widely believe that there is predictive power in the product spreads, defined as the difference between suitably weighted refined product market prices and the price of crude oil. Research should be carried out to verify this proposition.

The identification and discernment of the forces that shape oil and commodities prices require thoughtful empirical work and intelligent use of econometric tools. This special issue of *Macroeconomic Dynamics* contains much of each. Even a casual reading of the papers in this issue will bear considerable benefit for the reader. A careful reading will yield many valuable insights. In what follows, we briefly describe the papers.

The first paper, by Dimitri Dimitropoulos and Adonis Yatchew, "Discerning Trends in Commodity Prices," follows a large literature that builds on the Hotelling (1931) seminal paper and emphasizes the use of data-driven techniques to discern trends in commodity prices. The objective is to explore the relationship between the prices of nonrenewable resources and time trend effects and to propose models for commodity prices where trend effects are incorporated nonparametrically and macroeconomic variables enter parametrically. The authors analyze data on 11 commodities—three hydrocarbons (oil, natural gas, and coal) and eight metals (copper, nickel, zinc, iron, tin, silver, lead, and aluminum)—for the period from 1901 to 2014. They reject quadratic specifications of price trends for all

commodities, except zinc, and conclude that joint semiparametric estimation with common trends across equations may lead to further fruitful results.

The second paper, by Ana María Herrera, "Oil Price Shocks, Inventories and Macroeconomic Dynamics," investigates the time delay in the response of US economic activity to oil price shocks. The analysis is conducted at the aggregate as well as disaggregate level, using quarterly data (from 1959 to 2000) comprising three manufacturing aggregates (total manufacturing, durables, and nondurables), nineteen 2-digit SIC industries, and two 3-digit SIC sectors (motor vehicles and other transportation equipment). The paper documents the pattern of responses of the economy using nonlinear vector autoregressive (VAR) models and finds that the industry-level output reacts to oil price shocks earlier than the aggregate output, that significant declines in production occur in industries that are energy intensive, and that the motor vehicle industry experiences fast and largest declines in its output. It also shows that the responses in the VAR model are consistent with the profit-maximizing rational behavior of firms driven by a linear-quadratic inventory model.

The third paper, by John Elder, "Oil Price Volatility: Industrial Production and Special Aggregates," adds to a large literature that shows that volatility in oil prices has negative effects on the level of economic activity in several countries. The empirical model used is based on a structural VAR model that is modified to accommodate multivariate GARCH-in-Mean errors, as detailed in Elder (2004) and Elder and Serletis (2010). The paper investigates the effect of oil price volatility on disaggregated measures of industrial production, known as special aggregates. Results are reported for three categories of special aggregates: indexes for industrial production excluding two major industries (technology and motor vehicles), energy-related special aggregates, and nonenergy-related special aggregates. The results indicate that oil price volatility negatively affects a broad range of nonenergy-related market groups, including markets groups by user, which are consumer goods and business equipment, as well as motor vehicles and parts.

The fourth paper, by Martin Stuermer, "150 Years of Boom and Bust: What Drives Mineral Commodity Prices?," presents a new data set on annual prices and production for four mineral commodities—copper, lead, tin, and zinc—dating back to 1840, and provides long-run evidence on the dynamic effects of supply and demand shocks on commodity prices. In doing so, the paper uses a new identification scheme for disentangling demand and supply shocks in mineral commodity markets that differs from the type of short-run or sign restrictions commonly used in the related literature, which has primarily focused on crude oil. It is found that even historically much of the variation in mineral commodity prices was driven by aggregate demand shifts and very little by supply shocks, consistent with evidence from quarterly and monthly data for crude oil and other industrial commodities in recent decades.

The fifth paper, by Andrea Bastianin and Matteo Manera, "How Does Stock Market Volatility React to Oil Price Shocks?," estimates the global crude oil market model of Kilian (2009) and investigates the impact of oil price shocks

on stock market volatility in the United States. It jointly analyzes three different structural oil market shocks and stock market volatility using a structural VAR model. Identification is achieved by assuming that the price of crude oil reacts to stock market volatility with delay, implying that innovations to the price of crude oil are not strictly exogenous, but predetermined with respect to the stock market. It is shown that stock market volatility responds significantly to oil price shocks caused by unexpected changes in aggregate demand and oil-specific demand, while the impact of supply-side shocks is negligible.

The next paper, by Dongfeng Chang and Apostolos Serletis, "Oil, Uncertainty, and Gasoline Prices," investigates the relationship between crude oil and gasoline prices, and also examines the effect of oil price uncertainty on gasoline prices. The empirical models used are the multivariate GARCH-in-Mean model of Elder and Serletis (2010), a bivariate GARCH-in-Mean VAR with a BEKK variance specification, and the structural VAR model of Kilian and Vigfusson (2011). The authors use monthly data for the United States, over the period from January 1976 to September 2014, and find that there is an asymmetric relationship between crude oil and gasoline prices, and that oil price uncertainty has a positive effect on gasoline price changes. The results are robust to alternative model specifications and alternative measures of the price of oil.

The paper by Christiane Baumeister, Lutz Kilian, and Xiaoqing Zhou, "Are Product Spreads Useful for Forecasting Oil Prices? An Empirical Evaluation of the Verleger Hypothesis," explores the role of refined product spreads in monthly out-of-sample forecasting of (real) oil prices. This is because some industry analysts, notably Philip K. Verleger, contend that such spreads have predictive power for spot oil prices. The authors thoroughly consider a range of models where product spreads could be useful for forecasting oil prices and determine that the most accurate model is a time-varying parameter model of gasoline and heating oil spot price spreads that allows for structural change in product markets. This model improves on previous models particularly at longer horizons (between one and two years) in that it beats the no-change forecast.

The paper by Jean-Thomas Bernard, Lynda Khalaf, Maral Kichian, and Clement Yelou, "Oil Price Forecasts for the Long-Term: Expert Outlooks, Models or Both?," adds to the growing literature on forecasting the real price of oil. In contrast to the existing literature on oil price forecasting that is mainly concerned with short-term forecasts at monthly and quarterly frequency for horizons up to two years, this paper focuses on long-run annual expert forecasts produced at the Energy Information Administration (EIA). The focus is on how good the EIA forecasts are, how they compare to a range of alternative annual time series forecasting models that have not been examined to date, and whether pooling these forecasts helps. The conclusion is that it is possible to improve upon the benchmark random walk model, but only at the very short and at the longer ends of the forecast horizons.

The paper by Joseph Gruber and Robert Vigfusson, "Interest Rates and the Volatility and Correlation of Commodity Prices," proposes an explanation for the

observed increase in the correlation of several commodity prices in the decade ending in 2012. In contrast to theories that rely on the increased influence of financial speculators, it examines the effect of interest rates on the volatility and correlation of commodity prices via a panel GARCH model. In theory, lower interest rates decrease the volatility of prices, as lower inventory costs promote the smoothing of transient shocks, and can increase price correlation if common shocks are more persistent than idiosyncratic shocks. Empirically, the paper finds that price volatility attributable to transitory shocks declines with interest rates, while, particularly for metals prices, price correlation increases as interest rates decline.

The last paper, by Apostolos Serletis and Libo Xu, "The Zero Lower Bound and Crude Oil and Financial Markets Spillovers," investigates mean and volatility spillovers between the crude oil market and three financial markets—the debt, stock, and foreign exchange markets. The empirical model used is a four-variable VARMA-GARCH model with a BEKK representation, expanded to incorporate a structural break in the coefficients to investigate the possible effects of monetary policy at the zero lower bound. The authors find that the crude oil market and the financial markets are tightly interconnected, and that monetary policy at the zero lower bound has strengthened their linkages.

REFERENCES

Elder, John and Apostolos Serletis (2010) Oil price uncertainty. *Journal of Money, Credit and Banking* 42, 1137–1159.

Hotelling, Harold (1931) The economics of exhaustible resources. *Journal of Political Economy* 39, 137–175.

Kilian, Lutz (2009) Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market. *American Economic Review* 99, 1053–1069.

Kilian, Lutz and Robert J. Vigfusson (2011) Are the responses of the U.S. economy asymmetric in energy price increases and decreases? *Quantitative Economics* 2, 419–453.