



16th Annual Conference on Finance and Accounting, ACFA Prague 2015, 29th May 2015

The Relationship between Industrial Production, GDP, Inflation and Oil Price: The Case of Turkey

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Abstract

After the oil shock in 1973, the number of studies on causal relationship between oil price and macroeconomic variables has dramatically increased. This paper investigates the relationship among the oil price, inflation, GDP and industrial production for 1961 to 2012 period in the case of Turkey. Data used in the study was extracted from World Bank Development Indicators and the OPEC. Three different tests, namely unit root, co-integration and causality tests, have been employed to investigate the relationship among the variables. The results of Phillips-Perron (PP) as a unit root test suggests that all the variables under investigation are integrated of order one; I(1). Johansen co-integration results confirm a long-run relationship among these variables and Granger causality test illustrates the unidirectional relationship from oil price to industrial production.

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Peer-review under responsibility of University of Economics, Prague, Faculty of Finance and Accounting

Keywords: Oil price; Inflation; GDP; Causality.

1. Introduction

Since energy is essential to almost all economic sectors, oil has become one of the most strategic commodities for the global economy. Sharp increase in oil market has become one of the biggest economist's concerns since Hamilton (1983) who concludes the impact of oil price on the U.S economy after the 2nd World War. Moreover, crude oil has been playing a key role in all economic activities although the nature of this relationship may have changed over time (Arouri and Rault, 2011). So, changes in oil price can lead to a change in macroeconomic policies as well as microeconomic decisions.

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Given the importance of the oil, many studies have been conducted to investigate the relationship between oil price and different macroeconomic variables including: GDP, inflation, unemployment rate, industrial production, interest rate, stock price, government expenditure and etc. The results of the related studies might vary because of the different study assumptions like; different methodologies and variables, data frequency, structural breaks in the time span of the study and so on.

This article investigates the relationship between oil price, GDP, inflation and industrial production in the case of Turkey as an oil importing country for 1961-2012 period. For this purpose, Phillips-Perron (PP) is applied to check whether the data is stationary. Then, Johansen co-integration test is used to investigate any possible long-run relationship among the variables and finally Granger causality test is employed to estimate the direction of the founded long-run relationship. This article is unique since there is no previous related study of Turkey considering all the four variables. Hence, only a few studies include industrial production into their econometric models although it might be an important parameter in such economic analysis.

The article's structure will be as follows; the next section covers the empirical literature on highlighting the existence of relationship among oil price and each of the other three variables; inflation, GDP and industrial production. Section 3 includes two subsections, data and methodology part. Empirical result of the study is discussed in section 4 and the final section is the conclusion.

2. Literature Review

According to the literature, oil price is considered as an important input factor in variety of econometric models. Moreover, it has been always an attractive topic since Hamilton (1983) who argues that oil price changes has considerable impact in almost every U.S recession after the 2nd World War. However, there is no consensus in the literature on the causal relationship between oil price and several macroeconomic variables because of the mentioned assumption differences. For instance, Barsky and Kilian (2004) find a unidirectional relationship from macroeconomic variables to oil prices while the others like Kim and Willet (2000), Trehan (2005) and Ewing and Thompson (2007) believe that oil price affects the macroeconomic variables. Brown and Yucel (2002) aim to answer the question of why oil price affects the economic activities. They highlight their result into four general categories; 1. Reduction in supply of the input will result in decreasing the output. 2. Income transfer effect from oil importer country to the oil exporter one. 3. Real balance effect. 4. Monetary policy effect. However, they suggest that the best explanation is the supply side effect. Some of the previous studies focusing on the relationship between oil price and the rest of the variables (inflation, GDP and industrial production) are briefly discussed in the rest of this section.

In order to investigate the relationship between oil price and inflation, Hooker (2002) divides his study period (1962-2000) into two sub-periods because of the structural break occurred at the end of 1980. He finds a significant impact of oil price on inflation in the first period (1962-1980) but not in the second one (1981-2000). In 2005, Trehan supports Hooker's findings by studying the same topic and concluding the similar results. Roger (2005) analyzes some European countries and finds a short-run tradeoff between GDP and inflation which highlighted the importance of oil price for the European region at least in the short-run. Furthermore, Bermingham (2008) studies the small open economy of Ireland and finds the impact of increasing oil price on inflation. Jacquinet et al. (2009) focus on the same topic for the Euro area and find that oil price changes is a vital factor for estimating inflation in the short-run although this impact is much more complex in the long-run. Additionally, Castillo et al. (2010) also find that an increase in oil price volatility may lead to a higher inflation level.

Gross domestic product (GDP) is another common macroeconomic variable appears in the literature when the impact of oil price is concerned. Jimenez-Rodriguez and Sanchez (2005) investigate the relationship between oil price and GDP and find a nonlinear one among them. They realize that this impact would be larger in case of increasing the oil price rather than decreasing it. Their result also suggests that an increase in oil price will negatively affect the GDP for the oil importing countries except Japan; while it has a positive effect on the oil exporter countries' GDP. Furthermore, Kim and Willet (2000) apply the panel analysis on the same topic for OECD countries and find a strong negative relationship between GDP and oil price. In case of North Korea, Glasure and Lee (1997) find the same relationship between oil price and GDP.

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