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North American Journal of Economics and Finance

journal homepage: www.elsevier.com/locate/najef

The relationship between oil prices, the stock market and the exchange rate: Evidence from Mexico

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ARTICLE INFO

JEL Classification:

E30
E31
E58
F30
F31
F41

Keywords:

Exchange rate
Oil prices
Stock market
Mexico
VAR

ABSTRACT

This paper analyzes the variables of oil price, exchange rate and stock market index to explain how they interact with each other in the Mexican economy. The examined period includes monthly data from January 1992 to June 2017. A Vector Autoregressive Model (VAR) is implemented that includes oil prices, the nominal exchange rate, the Mexican stock market index, and the consumer price index. Results indicate that the exchange rate has a negative and statistically significant effect on the stock market index; this indicates that an appreciation of the exchange rate is related to an increase in the stock market index. It is also found that the consumer price index has a positive effect on the exchange rate and a negative effect on the stock market index. The results also indicate that oil prices are statistically significant against the exchange rate, concluding that an increase in oil prices creates an appreciation of the exchange rate. In addition, the impulse-response functions show that the effects found tend to disappear over time.

1. Introduction

In most industrial nations, energy expenditures account for a relatively large proportion of the Gross Domestic Product (GDP) and the variability in energy products, like oil, are an important factor that has an impact on the performance of important macroeconomic variables. For example, the spot prices in the West Texas Intermediate crude oil closed the year 2002 at \$29.4 U.S. dollars (USD) per barrel. Nevertheless, by July of 2008, the price had reached an all-time high of \$145.3 USD per barrel, which represented an increase of almost 400% in comparison with prices in 2002. Some years later, however, by March 2015, oil prices dropped to \$42.4 USD per barrel. The effect of such variability in oil prices over time has attracted attention from investors, policy makers and researchers.

In a pioneering work, [Hamilton \(1983\)](#) indicates that higher oil prices were responsible for almost all the U.S. economic recessions after World War II. [Jones and Kaul \(1996\)](#) document that energy expenditures were as high as 14% of the GDP in the United States during the 1980s. Nevertheless, because of the reduction in fuel prices, the U.S. Energy Information Administration reported that energy expenditures decreased to 6.2% in 2002. Even with a reduction in GDP participation, oil prices are still a relevant factor to determine the performance of important macroeconomic variables. Similar figures that show the importance of oil in a country's GDP have been documented in [Helliwell, Sturm, Jarrett, and Salou \(1986\)](#). Similarly, [Blanchard and Gali \(2007\)](#) and [Herrera and Pesavento \(2009\)](#) analyzed the connections between the variability in oil prices and the performance of different economic variables.

In the case of Mexico, [Bueno \(1981\)](#) stated that the importance of petroleum for the Mexican economy is not in dispute; Mexico's exports and its government revenue have historically been highly dependent on this natural resource. [Reyes and Benitez \(2016\)](#) state

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Received 7 December 2017; Received in revised form 13 March 2018; Accepted 22 March 2018

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that oil constitutes 11% of Mexico's total exports and around 30% of the government's budget. Given the importance of oil in the Mexican economy, diverse literature has emerged in which researchers analyze either the relationship between oil prices and the exchange rate or the relationship between oil prices and stock market returns. The most relevant literature about Mexico is described in Section 2, the literature review section. To the best of the authors' knowledge, there is only one prior paper, [Coronado and Rojas \(2016\)](#), that simultaneously analyzes the dynamism of oil prices, exchange rates and the stock market index for the Mexican economy. That study used an econometric model, which is highly different than the econometric model implemented in this paper.

[Aloui and Ben \(2016\)](#), in a paper that analyzed the dynamic relationship between those three variables stated: "It is important to understand the dependence between several variables interacting simultaneously, not in isolation of one another. The omission of one important variable in the extended system can be misleading because the channel through which the two other variables are connected is omitted from the incomplete system." In this sense, it is considered relevant to develop more research in this venue that analyzes the simultaneity among these three variables. For this reason, the objective of this paper is to help fill this gap in the literature regarding Mexico.

The rest of this paper is organized as follows: Section 2 reviews the empirical literature. Section 3 provides a description of the data, and explains the methodology and variables used in the implemented model. Section 4 summarizes the results obtained from the empirical tests, and Section 5 offers a conclusion of the paper's findings.

2. Literature review

Over the past few decades, a portion of the literature has analyzed the close relationship between oil prices and stock market returns, while a different portion of the literature has analyzed the connection between oil prices and exchange rates. Nevertheless, a small portion of the literature has addressed the relationship among all three variables—the exchange rate, oil prices, and the stock market index. The literature analysis is divided according to those segments and an additional section focuses on the literature developed regarding combinations of these variables in Mexico.

2.1. Studies on oil prices and the stock market

Although changes in oil prices are considered an important factor for understanding the volatility of stock markets, there is still no definite consensus regarding the relationship between oil prices and stock market returns. The diversity of results from different studies has encouraged many researchers to further analyze the connection between oil prices and stock market returns. For example, [Kaul and Seyhun \(1990\)](#) and [Sadorsky \(1999\)](#) found a negative effect of oil-price volatility on stock prices for the United States during the 1970s and 1980s. [Papapetrou \(2001\)](#), in a study developed for Greece during the late 1990s, reported that oil price shocks have a negative impact on stocks, since they negatively affect output and employment growth. [Hong et al. \(2002\)](#), in a study for the United States from 1970 to 2000, also identify a negative correlation between oil prices and stock market returns.

[Basher and Sadorsky \(2006\)](#) analyzed the impact of oil price risk on emerging stock markets. In the study, they pointed out that oil prices affect stock prices by having an impact on the cost structure of non-oil-producing companies. Evidence shows that such a change in the cost structure may not be fully transferred to consumers; therefore, stock prices are shocked by declining profits and dividends. In a similar approach, [Chung-Rou and Shih-Yi \(2014\)](#) studied the impact of oil price shocks on the stock prices of large emerging economies such as China, India, and Russia. They found that shocks in oil prices affect the stock returns in three of those emerging economies.

[Yanfeng and Xiaoying \(2017\)](#) analyze the relationship between oil price shocks and China's stock market. They state that the responses of stock return to oil shocks are different and are crucially related to the causes of the oil price changes, while the responses of stock volatility to oil shocks are almost insignificant. [Gogineni \(2008\)](#) explored the reaction of the stock market in different industries to daily oil price changes. He found that the direction and magnitude of the market's reaction to oil price changes depend on the magnitude of change in the oil price. He found that oil price changes caused by supply shocks have a negative impact on stock returns, while oil price changes caused by shifts in aggregate demand have a positive impact on the same day market returns.

In contrast, other studies have not found a significant relationship between oil prices and stock returns, such as [Huang, Masulis, and Stoll \(1996\)](#) who found that daily oil futures returns are not related with daily U.S. stock market returns. In contrast, [Sadorsky \(2001\)](#) found the opposite results, diverging from most of the literature—a positive relationship between oil prices and Canadian stock returns during the 1990s.

2.2. Studies on oil prices and exchange rates

[Chaudhuri and Daniel \(1998\)](#) investigated the relationship between oil prices and the exchange rate in 16 OECD countries. Their results show a non-stationary behavior of the U.S. dollar real exchange rate that is due to the non-stationary behavior of real oil prices. [Amano and Van Norden \(1998\)](#), in a study for Germany, Japan and the United States, analyzed the relationship between oil prices and the exchange rate. Their findings noted a robust and interesting relationship between the real domestic oil price and the real effective exchange rates.

[Chen and Chen \(2007\)](#), using a panel of G7 countries, tested whether or not exchange rates are cointegrated with real oil prices. Their results showed that real oil prices can be the dominant source of real exchange rate movements. In a more recent study, [Mensah, Obi, and Bokpin \(2017\)](#) examined the long-run dynamics between oil price and the bilateral U.S. dollar exchange rates for oil-dependent economies, such as India, Russia, South Africa, Ghana, and Nigeria, before the 2008–2009 financial crisis. Empirical

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