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Another look at the interaction between oil price uncertainty and exchange rate volatility: The case of small open economies

Refk Selmi[a], Jamal Bouoiyour[b], Fethi Ayachi[c]*

[a] PhD at High Institute of Trade of Manouba, Tunisia.
[b] Professor at the University of Pau, France.
[c] Professor at High School of Economics and Trade of Tunis and Researcher at CEMAFI of Nice, France.

Abstract

The objective of this paper is to study the impact of the variability of oil prices on the real exchange rate for a small oil-importing economy (Morocco) and a small oil-exporting country (Tunisia) to compare the effect of fluctuations in oil prices on the volatility of exchange rate depending on the nature of the country. We used GARCH specifications taking into account several effects (symmetrical, asymmetrical, linear, nonlinear, threshold, power, level shift and jump intensity) in order to evaluate the empirical relationship between these variables and identify which of these effects is the most powerful. Our results reveal that whether for importing or exporting-oil economy, the real price of oil is negatively and significantly related to the variability of real exchange rate, which is remarkable across all estimates and all the effects considered. By introducing a dummy variable representing the two oil crises and the Asian crisis, the relationship between oil prices and the exchange rate has become more volatile and more persistent for the importing country and less intense for the exporting country, which means that the interaction oil price-exchange rate volatility depends greatly on switching regime.

Keywords: price of oil; real exchange rate; volatility; GARCH specifications

* Corresponding author: Refk Selmi; Tel.: +216 97 675 635.
E-mail address: s.refk@yahoo.fr.

1. **Introduction**

During the period 1971-2009, the crude of oil has fluctuated widely. The demand and supply are the cause of these price increases. These high prices of petroleum products may lead to harmful consequences of such economy especially in the developing countries. Several studies have been developed using different specifications involving interaction of oil prices to the exchange rate.

Narayan and al. (2008), Ghosh (2010), Zahid, Khouhy and Suleiman (2011) and Mansor H-I. (2011) examined the impact of real oil prices on the real exchange rate of oil exporting countries. They found a negative relationship between fluctuations in oil prices and the movements of their national currencies vis-à-vis the U.S. dollar. They built a new indicator replaces the simple change of oil prices in accordance with fluctuations in the exchange rate used the variance between the yield variation in crude prices and that of the real exchange rate. We standardized the unanticipated changes in real prices for the conditional variance of real exchange rate movements following a GARCH process (Generalized Autoregressive Conditional Heteroskedasticity). This indicator serves to emphasize the role of oil price volatility in determining the volatility of real exchange rate. From the literature covered this subject, it is clear that most of the work have been made to the Canadian economy, Nigerian (Olomola P-A. And AdejumoA-V., 2006) and to our knowledge no empirical study has treated the case of Morocco or Tunisia. An important element to highlight is that the effect of an oil shock depends on the nature of the country and depends on whether the country is an exporter or importer of oil.

Our goal is to contribute to the literature on cases of small oil importing and small oil exporting countries by examining the effects of symmetry, asymmetry, linearity, nonlinearity, threshold, power, level shift and jump intensity in the link between oil prices and exchange rate for Morocco and Tunisia. The results of this analysis could help policy makers to respond to an innovation in oil prices.

2. **Modeling the Relationship oil price-exchange rate**

To investigate possible links between variability of oil prices and exchange rate for the cases of Tunisia and Morocco and verify if this effect is significant, we estimate various GARCH specifications taking into account these effects: symmetrical, asymmetrical, linear, nonlinear, threshold, power, level shift and jump intensity. To do this, we use data for the period from second quarter 1972 to fourth quarter 2010. The data of oil prices are the spot price of oil collected from Energy Information Administration (EIA) of the United States. For the real exchange rates, the data are from the Econstats and the International Monetary Fund. Returns of exchange rate in real terms are denoted $r_{RER\ t}$ while the return of oil prices is denoted $r_{OIL\ t}$.

$$r_{RER\ t} = log\ (RER_t/RER_{t-1})\quad (1)$$
$$r_{OIL\ t} = log\ (OIL_t/OIL_{t-1})\quad (2)$$

To examine the link between exchange rate and price of oil, we rely on models from the work of Mansor H-I. (2011). First, a linear link will be estimated between two variables which is written as follows:

$$r_{RER_t} = \alpha + \beta r_{OIL_t} + \mu_t \quad (3)$$

2.1. Symmetrical effect in the relationship oil price-exchange rate

The direct link between oil prices and the exchange rate after the oil shock of 1973 was described as symmetrical and linear. Thus, Rashe and Taton (1977) and Hamilton (1983) used a log-linear modeling to measure the impact of oil price developments on several monetary aggregates. But, the against oil shock 1979 is an innovation that can dramatically change the relationship. Among the models that take into account the