Chapter 2
Do Oil Price Fluctuations Alter the Exchange Rate in Japan?
A New Look into an Old Question

Nasim Sydee
Department of Human Resource and Skills Development, Canada

Gazi Salah Uddin
Linköping University, Sweden

ABSTRACT
Determinants of exchange rate fluctuations have long been a topic of interest for the economists. Although there exists a large number of studies that attempt to decipher the exact relationship between the price of oil and exchange rate, a clear answer still remains absent. Most studies suffer either from ambiguous findings or from the severe limitations stemming from the assumption of non-stationarity. In this chapter, the relationship between oil price differentials and real effective exchange rate of Japan is thoroughly investigated by utilizing sophisticated research tools that provide additional degree of rigor to the results. Maximal Overlap Discrete Wavelet Transform (MODWT) is used to decompose the time series into different frequencies and then the relationship between the two series at different time frequencies are examined with the use of standard econometric techniques. This chapter finds that international oil prices vibrate the exchange rate at the short term frequency bands. However, no evidence of causal relationship is found at the lower time scales, although such evidence is found at higher time scales.

1. INTRODUCTION
The price of oil is widely considered as one of the commodity prices that has crucial implications for both the real economy and financial markets. The observation remains that, during the last decade high leaps in oil prices was held responsible for economic recessions, high inflation, trade deficits, high uncertainty and low values for stocks and bonds (Chaudhuri and Daniel, 1998). In contrast, there is also evidence that a depreciation of the dollar triggers an increase in the price of oil...
Do Oil Price Fluctuations Alter the Exchange Rate in Japan? (Yousefi and Wirjanto, 2004). However, although different relationships between oil prices and exchange rates have been identified, the question of the causality has not been clarified yet and still remains to be one the researchers are interested in. The price of crude oil has been a key factor in explaining the movements of foreign exchange rates, particularly those measured against the US dollar (Huang and Tseng, 2010). There are several other studies revolving around this same issue which notably include Amano and van Norden (1998), Chen and Chen (2007), Bénassy-Quéré et al. (2007) and Lizardo and Mollick (2010). As per these studies, increasing oil prices appreciates economic growth along with the currencies of oil-exporting economies relative to those of oil importers (see Ding and Vo, 2012). On the flip side, a number of recent studies suggest that exchange rate, particularly the US dollar one, has significant influence on oil price.

Much of the empirical literature appealed to vector auto-regression, cointegration and the Granger causality method in examining the relationship of the oil prices-real exchange rate. The empirical results demonstrated either a double causality, one-way causality or no causality between oil prices and RER. However, all these techniques can be applied successfully in case of a stationary time-series condition; yet neither the oil prices nor the exchange rate proves to be stationary. When the non-stationary series is affiliated with a “transformation” of the initial series it requires special treatments, such as; differentiation and cointegration. This is imperative to evade biased (doubtful) results which can distort the economic interpretation of the analysis.

This paper is going to make a fourfold contribution to the economic literature. In order to sidetrack the problem of non-stationary aspect of a series, we use Wavelet Transform framework. To decompose the time series into different frequencies, wavelet time-scale decomposition based on Maximal Overlap Discrete Wavelet Transform (MODWT) is utilized and immediately following that, to assess the cohesion at different time-frequencies, we use traditional econometric techniques. Use of these tools enables us to reveal several economic time-frequency relationships that remain veiled when a classical one-shot Granger causality test is applied. It is understood by the results of wavelet approach that the real effective exchange rate (REER) shares a strong relationship with the oil price. Our findings confirm that the international oil prices vibrate the exchange rate at the short term frequency bands. However, we do not find causal relationship at the lower time scales, there is evidence of causality at higher time scales only.

To follow, we investigate the particular case of Japan. Japan is characterized by a below par level of retail fuel prices and with insignificant changes in the oil prices as compared to other Asian economics. While analyzing the case of Japan, testing for the double-causality relationship between oil prices and REER was not our concern, which is typically the case with most literatures. A strong influence of exchange rate on the oil price is unlikely to exist particularly in the case of Japan. Rather, our intent in this paper is to examine the impact of the international oil price dynamism on the exchange rate. Accordingly, the focus of our work is on the one-way causality involving oil prices and Japan’s REER.

We investigate how the frequency movement (growth) of the REER is being impacted by the frequency movement of oil price. This allows us to add the short, medium and long term aspects of both the frequencies.

Next, from the oil prices, we mine the positive and negative shocks to see which ones play the vital role in the REER movements.

The rest of the paper follows this chronology; Section 2 presents a background of this study which includes a brief review of the existing literature followed by Section 3 which lays out the