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The nexus between oil price and Russia's real exchange rate: Better paths via unconditional vs conditional analysis

Jamal Bouoiyour [a], Refk Selmi [b], Aviral Kumar Tiwari [c], Muhammad Shahbaz [d]

[a] CATT, University of Pau, France
[b] ESC, Business School of Tunis, Tunisia
[c] IFHE-IBS Hyderabad, India
[d] COMSATS Institute of Information Technology, Lahore, Pakistan, IPAG Business School, Paris, France

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ABSTRACT

Instead of analyzing the causality between two time series (unconditional analysis), as it is usually done, the present study deals with the nexus between oil price and Russia's real exchange rate conditioning upon potential control variables at well-specified horizons and on a frequency by frequency basis. This research accounts also for the possible transient linkages and signal discontinuities. A major finding of this paper is deeply suggestive of a sharp causality running from oil price to real exchange rate in lower frequencies. This implies that Russia should better tackle with turbulence triggered by oil price and continue to reduce its energy dependency via drastic and proactive measures. The economic and fiscal initiatives of Putin administration may help to cope with sudden shocks, to lessen the great oil dependence and to build confidence needed for economic recovery. While our research does not say much about the routes through which oil price may affect differently real exchange rate, it clearly indicates the presence of short-term relationship conditional to GDP, government expenditures, terms of trade and productivity differential. The conditional analysis and signal detection appear as meaningful exercises to find new insights into the focal issue.

1. Introduction

Since the 1973 oil crisis, the world has experienced several oil price jumps and declines. In fact, a burgeoning number of studies began to query about the possible effects of the excessive fluctuations of oil price on the dollar movements. This has duly shifted the focus towards the empirical linkage between oil price and real effective exchange rate. Although research about this link is increasing continuously, findings and interpretations, both theoretical and empirical, have been mixed. The different findings may be synthesized into two main evidences.

The first strand of literature presents the studies that assess the long-run interaction dynamic between real oil price and real effective exchange rate and figure out whether the reversal relationship could be permanent or not (Amano and van Norden, 1998; Chaudhuri and Daniel, 1998; Chen and Chen, 2007; Bénassy-Quéré et al., 2007). A significant cointegration between the two variables and a causality running from oil price to real exchange rate were found for the majority of cases. In contrary, very few works have supported the reverse link (Sadorsky, 2000 and Zhang et al., 2008).

The second aspect relies limitedly on the short-run dynamics between changes in oil prices and those of real exchange rate (Ghosh, 2011; Mansor, 2011; Narayan et al., 2008; Selmi et al., 2012). By using an indicator that explains the conditional variance between the two variables via generalized autoregressive conditional heteroskedasticity models, they show that there is a significant short-run linkage between the two considered variables. More recently and by employing copula-based GARCH model, Reboredo (2012) provide evidence that there is a significant interdependence between oil price and US dollar exchange rate that change substantially from one period to another.

Interestingly, when reviewing the existing literature, we clearly note a scarcity of studies that assess the focal link within nonlinear fashion. For instance, Raymond and Rich (1997) use a Markov switching regime model to evaluate the impacts of rising and falling oil price trends on fluctuations in aggregate U.S. economic performance before and after World War II. At the same context, Akram (2004) finds a significant connection between oil price and the Norwegian exchange rate that is relatively strong when oil price seems below 14 dollars.

The main novelty in the recent literature is the recognition that there are different time periods for decisions-making, while the previous

E-mail addresses: jamal.bouoiyour@univ-pau.fr (J. Bouoiyour), s.refk@yahoo.fr (R. Selmi), aviral.eco@gmail.com (A.K. Tiwari), shahbazmohd@live.com, Muhammad.shahbaz@ipag.fr (M. Shahbaz).

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empirical investigations are usually restricted to time domain or at least two time horizons, namely, the short-run and the long-run. Few works on this field have paid proper attention to how this link evolves over time by separately use different "sophisticated" techniques including discrete wavelet decomposition, continuous wavelet, frequency domain analysis and wavelet-based nonlinear ARDL approach (Bouoiyour and Selmi, 2015; Jammazi et al., 2015; Shahbaz et al., 2015; Tiwari et al., 2013). Notably, these researches consider the interdependence between oil price and real exchange rate without accounting for additional control variables that may explain potentially the focal relationship, which may be ineffective. Studying the bivariate relationship may not be robust when some relevant explanatory variables are not included.[1] Bivariate wavelets (wavelet-based unconditional data analysis) may lead to confusing outcomes since the occurrence of noise cannot be heavily neglected, disrupting then the linkage investigated (Aguiar-Conraria and Soares, 2011). This highlights the importance of the consideration of potential control variables (multivariate wavelets or wavelet-based conditional data analysis) to reach clearer and conclusive results into a "multi-sided" issue. The use of different econometric techniques (ARDL bounds testing approach-based structural breaks detection, wavelet coherence and frequency causality) within unconditional vs. conditional frameworks constitutes the main contribution of this study. Wavelet-based signal detection has been also applied to properly capture whether there is a transition in signal localization for the time series investigates.[2] This methodology differs from those previously used in the literature,[3] since it allows us to assess how the different time scales/frequencies involved of oil price interact with real exchange rate even if we incorporate relevant control variables including GDP, government expenditures, terms of trade and productivity differential, without overlooking to detect transient linkages or signal discontinuities.

Another contribution of this paper is related to the country studied. An analysis of Russian case may be interesting for at least five main reasons: Firstly, despite a general view that oil plays a "pulling" role in the Russian economy, there is surprisingly little research on how oil prices affect Russian macroeconomic dynamics. Very few studies have so far focused on Russian case by investigating for example the role of oil prices and the real exchange rate in the economy and the fiscal policy (Rautava, 2004) or the performance and the prospects of oil supply (Grace, 2005). Secondly, there is a common viewpoint that oil prices and real exchange rate have a major impact on Russian output. This perception is mainly attributed to the fact that more than one-third of Russia's exports to GDP and roughly half of export revenues generated by energy sources.[4] Thirdly, an increase in the energy commodity price on the world markets encourages more investment in the given sector, which in turn increases sectoral output (Rautava, 2013). However, the need for more labor to produce more output in the energy sector causes an increase in wages across sectors. This will necessarily threaten the competitiveness of the non-oil sector. Accordingly, Égert (2005) argues that countries rich in natural resources and especially those with economic structures relying heavily on oil exports such as Russia are usually good candidates for Dutch disease. Fourthly, the tendency of a currency to co-move with commodity prices, including oil price instability "the commodity-currency property" (Coudert et al., 2008) improve the need to be more attentive to the possible painful consequences of oil shocks, speculation and price cyclicality that mainly characterize the energy market. Lastly, despite the sharp deepening of the global financial crisis, the country studied remains highly dependent on energy prices. The recoveries from the recession as well as the economic growth were weaker despite the resurgence of oil prices. These outcomes need discussion among policy makers, advisers and analysts elsewhere and in Russia especially.

Given the aforementioned elements, there is an additional motivation to re-examine the nexus between oil price and real exchange rate with special reference to Russian case. As such, the article proceeds as follows: Section 2 gives a brief overview of exchange rate policy and oil price dynamic. Section 3 presents the empirical strategy. Section 4 reports our main results and discusses them. Section 5 deals with some economic implications and offers concluding remarks.

2. An overview of exchange policy and oil price evolution: Russian context

One of the most enticing and long lasting debates in economics revolves around the linkage between oil price ups and downs and real exchange rate movements. A thorough understanding of how interact oil price with real effective exchange rate over time requires delving succinct and accurate analysis of the specificities of the country investigated, in our case Russia. Since the dismantlement of the Soviet Union, this economy has experienced multiple events. As a result, Russia's exchange rate policy has passed through different regimes to better cope with external shocks.

The Russian oil stock is the seventh largest oil reserves in the world after Saudi Arabia, Venezuela, Iran, Iraq, Kuwait and UAE (Galkovskaya, 2011). Russia plays a substantial role as a supplier of energy in the world. In this country, oil exports account for almost 40% of total exports. In the period from 1994 to 2009, oil exports generated almost 50% of export revenues and therefore Russian economy depends heavily on this sector (statistical review of world energy 2010). Thus, Russia was and continues to be perceived as a major player in setting their own prices in the world market (i.e., "price maker"). However and given the ensuing decline in world commodity prices, countries highly dependent on the export of energy such as Russia were among those most severely hit. Indeed, Russia has to deal with sizable volatility in export earnings relating to commodity price developments – in particular oil price fluctuations – in international markets. The global recession of 1998, which started with the Asian financial crisis, has threatened widely the Russia's economy since Asia is one of the main trading partners of Russia.[5] In an effort to prop up the possible harmful consequences, the policymakers hiked interest rates to 150% while trying to attract buyers for government bonds. Unfortunately, the painful outcomes of Asian crisis and sharp slump in world oil prices were encouraging investors to withdraw from the country. As response, the Russian monetary authorities have given greater preference to massive currency interventions (Merlevede et al., 2009). The question here is whether the pursued exchange policy seems effective to overcome the detrimental effects of oil shocks, cyclical behavior of international commodity prices and speculative attacks that generally characterize energy markets.

From 1992 to 1995, real effective exchange rate is based on stabilization program. Despite this policy reform, tension between price of oil and exchange rate stills. Granville and Mallick (2006) attribute this outcome to the authorities' use of macroeconomic policy as a direct instrument of social welfare provision. Then and particularly in mid-1995, the Central Bank of Russia (CBR) has consistently limited the flexibility of exchange rate by introducing the corridor system that allows nominal exchange rate to move in a band within upper and lower limits. This exchange rate policy was instrumental in stabilizing the ruble and succeeded to lessen the violent inflation that distinguish this period (Rautava, 2004). However, the Asian crisis and the following decline

[1] When we consider only two variables, we generally fall on the problem of simple regression without control variable which is unable to capture appropriately proper results with regard to the nexus studied since it may distort the estimate.

[2] We thank enormously the reviewer for this suggestion.

[3] Past estimation techniques include ordinary least squares, vector autoregression, cointegration analysis and linear bivariate causal tests.

[4] Revenues from the energy sector fluctuate between 30% and 40% of central government total revenues (Rautava, 2004).

[5] China, for example, is the second export partner (7.0%) and import partner (14.0%) for Russia. Japan is the fourth import partner (4.4%) and Korea appears as the seventh import partner (3.8%). For details about the main trade partners of Russia, we can refer to: https://atlas.media.mit.edu/fr/profile/country/rus/.