Keio University

Thesis Abstract

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Thesis Title

Essays on Macroeconomics, Energy Prices and Policies

Thesis Summary

This dissertation, called *Essays on Macroeconomics, Energy Prices and Policies,* is a series of research papers on links between macroeconomics, energy prices and policies over the last two decades. The thesis consists of the following four original chapters.

Chapter One investigates the recent oil price drivers and compares the role of supply and demand factors in recent oil price formation providing theoretical oil price modelling framework which is followed by empirical analysis. Until 1990s the Organization of the Petroleum Exporting Countries (OPEC)[1] played a key role in oil pricing, however, recent rapid economic growth in developing economies has boosted the demand for oil, making oil prices vulnerable to a wider range of factors. This chapter proposes an alternative methodology of estimating the impact of oil demand on oil price by using a proxy of industrial production index. It also compares the impact of demand from Organisation for Economic Co-operation and Development (OECD)[2], People's Republic of China (PRC) and India.

The purpose was to identify the contributions of the most significant oil consumers to oil price movements and compare the role of advanced and developing countries in global oil price determination. The empirical evidence obtained shows the scale of the contributions of the abovementioned factors to global oil prices and suggests that over the last two decades, oil prices were mostly driven by oil demand from large energy consumers namely OECD and PRC. In addition, this paper test whether the oil prices were in equilibrium during the estimated period and shows that oil prices were adjusting instantly, which confirms the existence of the equilibrium on

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[1] As of October 16, 2020, Organization of the Petroleum Exporting Countries or OPEC members include Algeria, Angola, Equatorial Guinea, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Republic of the Congo, Saudi Arabia, United Arab Emirates, Venezuela (according to https://www.opec.org).

[2] As of October 16, 2020, Organisation for Economic Co-operation and Development or OECD members include Australia, Austria, Belgium, Canada, Chile, Colombia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States (according to https://www.oecd.org).

the oil market.

Chapter Two focuses on the impact of oil price changes on the economy of one of the largest non-OPEC oil exporting countries - Russian Federation. This study investigates the interrelationship between the Russian Federation's gross domestic product (GDP), consumer price index (CPI) inflation rate, Ruble/US Dollar exchange rate, interest rate and world oil prices using a vector autoregression (VAR) approach. The results suggest that the impact of the oil price fluctuations on the country's GDP, CPI inflation rate, interest rate, and exchange rate was more significant between 2000 and 2016 than between 1993 and 1999. The reason for this might be growing dependence of the economy on oil export revenues. The sharp increase of the world oil prices in late 1990s benefited Russia's economy and helped it to recover from 1998 financial crisis, on the other hand, made the economy vulnerable to oil price fluctuations.

In addition, to examine the monetary policy rule for the Russian Federation, the modified Taylor equation that includes oil price gap is estimated. The evidence suggests that the oil price gap significantly affected the post-global financial crisis monetary policy of the Russian Federation (2008-2016). This highlights a reluctance of monetary authorities to take action when oil price growth rate is high (2000-2008) but a willingness to adjust monetary policy when oil price growth rates are low or negative (2008-2016). This chapter concludes by discussing useful policy implication for economies highly relying on energy exports.

Chapter Three examines Asia's progress in energy security and its impact on real GDP per capita growth. To do so, the 4-As energy security framework — energy availability, applicability, affordability and acceptability dimensions — is developed using a quantitative indicator for each of the 4-As dimensions. This framework is then integrated into the cross-country generalized method of moments (GMM) model and empirically estimated using data from 20 Asian countries (1995–2015). Results indicate that energy security measured by expanding renewable energy use, increase in electricity access and electric power consumption per capita growth are positively associated with real income per capita growth. On the other hand, larger share of imported energy and higher energy intensity hinder growth. Meanwhile, climate security is included in the energy security framework; the results suggest that an increase in carbon dioxide (CO_2) emissions has a negative impact on economic growth. Finally, a wide menu of energy policy options for improving energy security in Asia is discussed in concluding section of this chapter.

Chapter Four examines asymmetry of oil prices pass-through to gasoline prices. While fluctuations in oil prices have been widely covered in the literature, its pass-through to gasoline prices and the asymmetry of pass-through has received less attention. To fill the gap, this research estimates and

compares pass-through of oil prices to retail gasoline prices and to net retail gasoline prices (adjusted for taxes and non-oil costs). This approach allows to better understand which stage of retail gasoline price formation causes the asymmetry of oil-gasoline price pass-through. For quantitative analysis, South Korea and Russia, which both have adopted market-based pricing systems for fuels, are considered based on data availability. For empirical analysis nonlinear autoregressive distributed lags (NARDL) model was adopted and estimated using monthly data. The evidence obtained captures the signs of asymmetry of oil prices transmission to gasoline prices for both countries but of different magnitudes. Based on the obtained results, relevant energy-policies for energy pricing are discussed in concluding section of this chapter.