

# 論文審査の要旨及び担当者

No.1

報告番号	甲 乙 第 号	氏 名	Narjes ZAMANI
論文審査担当者	主 査	マッケンジー, コリン (慶應義塾大学教授 (経済学部) Ph.D.)	
	副 査	大垣昌夫 (慶應義塾大学教授 (経済学部) Ph.D.)	
		櫻川昌哉 (慶應義塾大学教授 (経済学部) 博士 (経済学) )	
	面接担当	藤原一平 (慶應義塾大学教授 (経済学部) 博士 (経済学) )	
		星野崇宏 (慶應義塾大学教授 (経済学部) 博士 (経済学) )	
(論文審査の要旨)			
<p>Ms. Narjes Zamani's dissertation is entitled "Economic Analysis of Global Fossil Energy Markets" and comprises six chapters. These chapters investigate the relationships between three primary energy markets, crude oil, coal and natural gas. The thesis studies both short-run and long-run relationships between fossil fuels markets, and its purpose is to study the effects of each market on the other markets in the short-run and in the long-run. Chapters two, three, and four also study short-run relationship between fossil fuels markets and world aggregate demand.</p> <p>The oil market is approximately a global market, and it is easy to obtain data on world oil production, world oil consumption and oil prices. In contrast, the coal market seems to be somewhat segmented and natural gas market seem to be regional in nature regionally markets. Technology advances and the establishment of a new cartel for natural gas may mean the coal and natural gas markets are gradually moving toward becoming a global markets. It is rather difficult to obtain data on the world production of coal and natural gas. In the short-run, this forces Ms. Zamani to investigate the relationships between crude oil and natural gas, and crude oil and coal, using price information for coal and natural gas. For this purpose, this thesis uses the recently introduced decomposition of the real price of crude oil proposed by Kilian (2009), namely, crude oil supply shocks, global demand shocks, and crude oil precautionary demand shocks, to distinguish between the effects of oil market shocks and global aggregate demand shocks.</p> <p>Chapter one of thesis provides a general introduction to fossil fuels. Chapter two studies the relationship between crude oil and natural gas using a four-variable structural vector autoregressive model (SVAR) where the four variables are: oil production, real activity, oil prices and natural gas prices. Chapter three investigates the relationships between crude oil and coal prices using a four-variable SVAR model where the four variables are: oil production, real activity, oil prices and coal prices. The results of chapters two and three provide some evidence that oil supply shocks have no significant effect on the real prices of crude oil and natural gas, while they have significant effect on the coal prices.</p> <p>The SVARs in chapters two and three indicate that a positive aggregate demand shock has a positive significant effect on the oil, coal and natural gas prices. This is consistent with the expectation that an increase in</p>			

the demand increase for goods and services leads to increase in the demand of energy sources, which are mainly fossil fuels, and leads to an increase in their prices. A positive aggregate demand shock has a positive and significant effect on the oil production. The results in chapters two and three are consistent with the view of some researchers that the natural gas market has no effect on the oil prices, while the coal market can affect the oil prices.

The precautionary demand for oil that Kilian (2009) introduced as oil specific demand shock indicates the fear of a lack of crude oil in the future. The precautionary demand for oil is found to have significant effects on coal and natural gas prices during some months gradually. It is argued that in response to an increase in the precautionary demand for oil some demand is transferred to the coal and natural gas markets, the main substitutes for crude oil, and this causes their prices to increase.

Chapter four focuses on the effect of an aggregate demand shock on oil production. While Kilian's (2009) results show that an aggregate demand shock has no significant effect on oil production, this chapter first shows that using Kilian's data set and specification with a shorter sample that includes the second oil shock and the subsequent decade exhibit a puzzle, namely, a positive aggregate demand shock has a negative and significant effect on the oil production, but a positive and significant effect on the price of oil. As the results on the relationships between the price of natural gas and the price of oil in chapter two and the price of oil and the price of coal in chapter three show that aggregate demand shock has a significant positive effect on the oil production, chapter four investigates this relationship further. The "puzzle" suggested by the initial analysis of Kilian's data is solved by adding the prices of coal and natural gas to the three variables in his analysis: oil production, real activity and oil prices. Extending the sample period to December 2012 also leads to a situation where aggregate demand shocks have both a positive and significant effect on oil prices and oil production. The results in chapter four indicate that ignoring high interactions between fossil fuels may lead to misleading results.

Chapter five investigates the long-run relationship between the prices of crude oil, coal and natural gas using two cointegration tests, first Johansen maximum likelihood test, and second Park's Canonical Cointegration Regression (CCR) test. The results show some evidence that there are at least two long-run (cointegration) relationships between fossil fuels prices.

Chapter six offers conclusion. The results of the empirical analysis in this thesis indicate that there are high interactions between the crude oil, coal and natural gas markets in both the short-run, and long-run. The oil market has significant effects on the coal and natural gas markets in the short-run, while the effect of natural gas market on the oil market is not significant, and coal market affects the crude oil market prices for some months. Meanwhile, in the long-run the cointegration relationships between crude oil, coal and natural gas prices show they affect other fossil fuels markets.

## 【評価】

The chapters in this thesis carefully examine the relationship between the oil, natural gas and coal markets using SVAR models and cointegration analysis. The examination committee would like to highlight in particular the academic contribution of chapter 4 which re-evaluates the results in Kilian's (2009) using his original data set. Although Kilian's (2009) paper was published in the *American Economic Review* and has been extremely influential on research in this area by highlighting the importance of aggregate demand shocks on oil prices, Ms. Zamani shows that some of his key results are not robust to the choice of the sample nor to the specification of the SVAR. Extending Kilian's data set from the end of 2007 to the end of 2012 also leads to different results from those in Kilian (2009). Although they use a different sample to Kilian (2009), both chapters two and three also show that positive aggregate demand shocks have a positive and significant effect on oil production in contrast to Kilian's (2009) results. Chapter two suggests that the apparent connection between oil and natural gas prices comes through an indirect connection due to the positive effect of aggregate demand shocks on both oil and gas prices.

In the discussion of the results of the thesis various doubts were raised about: (1) the use of Kilian's index of global real economic activity as a measure of economic activity; (2) whether in response to aggregate demand shocks substitution on the supply and/or demand side of the oil market really worked as fast as Ms. Zamani argued; and (3) the lack of a connection between the long-run analysis in chapter five and the short-run analyses in chapters two, three, and four. None of these doubts detract from the overall value of this thesis, but provide suggestions for avenues for future research in this area.

Part of chapter two of the thesis has been published in the *International Journal of Energy Economics and Policy*.

For these reasons, all five examiners of this thesis are unanimously of the view that Ms. Narjes Zamani should be awarded a Doctoral Degree in Economics from Keio University.