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Does Exchange Rate Volatility Affect Korea's Seaborne Import Volume?

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ABSTRACT

This study used monthly data from 2000 to 2015 to analyze the effects of USD/KRW exchange rate volatility on seaborne import volume in Korea. The results of an autoregressive distributed lag (ARDL) analysis indicate that USD/KRW exchange rate volatility has a statistically significant negative influence on Korea's seaborne import volume. Moreover, the results of a vector error correction model (VECM) analysis found that the USD/KRW exchange rate volatility exhibited short-term unidirectional causality on import volume and real income, and confirmed bidirectional causality between the real effective exchange rate and exchange rate volatility.

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1. Introduction

Maritime transport plays a very important role in terms of geographical characteristics, connectivity with trade, reducing foreign currency expenditure, and its relationship with other industries in Korea. Given the importance of the shipping industry, understanding the variables that influence seaborne trade volume is essential for establishing competitive strategies for Korean port and infrastructure plans of transportation and logistics. However, in long-term and short-term aspects, few studies seek to understand the determinants of seaborne trade volume in Korean ports and analyze their direction and magnitude on volume. Furthermore, studies on the impact of exchange rate volatility on seaborne trade volume are very rare.

Previous studies selected income, price, and exchange rate volatility as the main factors that influence international trade and empirically analyzed the effects of exchange rate volatility on trade flows in a variety of ways. However, these studies were unable to come to an agreement on the effect of exchange rate volatility on trade flows. A series of studies

claimed that exchange rate volatility leads to a contraction in international trade (e.g., Arize *et al.* 2000; Bahmani-Oskooee, 2002; Grier and Smallwood, 2007; Bahmani-Oskooee and Hanafiah, 2011), while other studies argued that exchange rate volatility leads to an expansion in international trade (e.g., McKenzie and Brooks, 1997; Kasman and Kasman, 2005). The theoretical foundations for the exchange rate volatility's positive and negative influences on international trade can be explained in the following manner. If exchange rate volatility brings about higher costs and more transaction risk to the risk-averse trader, then it will lead to a decrease in trade. On the other hand, if the expected marginal utility of export revenues increases or the expected marginal costs of import expenditures decrease owing to an increase in exchange rate volatility, then such exchange rate volatility can increase trade volume (De Grauwe, 1988). Furthermore, a small number of studies observed that exchange rate volatility had either a very slight effect on international trade or no statistically significant effect at all (Bahmani-Oskooee *et al.*,

2013; Haile and Pugh, 2013).

So far, studies have primarily focused on analyzing the effects of exchange rate volatility on export value or export volume, and literature that analyzes the effects of volatility on import value and import volume is quite scarce. Meanwhile, import has close links with export in securing stable raw materials and capital goods in Korea, which is a resource-poor country. Moreover, seaborne import flow plays a large role in securing port competitiveness and ensuring regional economic growth in Korea. Seaborne import volume accounted for approximately 71% (average of yearly data from 2000 to 2015; www.spidc.go.kr:10443) of total seaborne trade volume. Therefore, this study focuses on the seaborne import volume of Korea and makes a key contribution in the following three aspects, which are different from existing studies. First, this study is the first to investigate the influence of USD/KRW exchange rate volatility on the seaborne import volume of Korea. Second, this study analyses the extent of the long-term and short-term direction and magnitude of exchange rate volatility on import volume. Third, it applies autoregressive distributed lag (ARDL), which takes into account level variables and difference variables to analyze dynamic causal linkages (DCL).

Against this backdrop, this paper uses monthly data from January 2000 to December 2015 to select Korean real income, the real effective exchange rate of the Korean Won, world commodity prices, and USD/KRW exchange rate volatility as determinants of seaborne import volume. It then analyses the long-term and short-term influence and dynamic causality of exchange rate volatility on seaborne import volume. This thesis is structured as follows. In section 2, previous studies that investigate the relationship between exchange rate volatility and trade flows are reviewed. In section 3, a theoretical model is constructed based on empirical analyses and the econometric methodology is explained. section 4 reviews the results of empirical analyses, and in section 5, the conclusion and policy implications are proposed.

2. Literature review

Most studies review how income, relative prices, and foreign exchange rates affect seaborne trade volume. Coto-Millan *et al.* (2005) chose real income and relative prices as determinants of maritime imports and exports. The results showed that the existence of a long-term and short-term equilibrium relationship among the variables. Coto-Millan *et al.* (2011) demonstrated that income affects the volume of maritime exports and imports positively in Spain, but only ordinary, container, and bulk cargo showed statistical significance. Chi (2014) analyzed how much of an effect bilateral trade flows and income had on exchange rate in between the US and Canada over the long term. The results of this analysis indicated that income had a statistically significant effect on bilateral trade flows and exchange rate had an effect of various sizes according to the method of transportation.

A large body of literature has analyzed the impact of exchange rate volatility on trade flows as shown in Table 1 and Table2. ¹ A series of studies (*e.g.*, Arize and Ghosh, 1994; Doroodian, 1999; Arize *et al.* 2008) argued that an increase in exchange rate volatility could decrease international trade apparently, while another group of studies (*e.g.*, Holly, 1995; Arize and Malindretos, 1998; Rahmatsyah *et al.*, 2002; Rey, 2006;

Nishimura and Hirayama, 2013; Choudhry and Hassan, 2015; Chi and Cheng, 2016) presented empirical results that an increasing exchange rate volatility could have mixed results on trade flows.

Table 1.
Aggregate studies on the effects of exchange-rate volatility I

Authors (year)	Arize and Ghosh (1994)	Holly (1995)	Arize and Malindretos (1998)	Doroodian (1999)	Rahmatsyah <i>et al.</i> (2002)
Method	ARCH, Coint.	GARCH, Coint.	ARCH, Coint.	GARCH, Coint.	(G)ARCH, Coint.
Import /Export (Country)	Exports (USA)	Exports (UK)	Exports (Australia and New Zealand)	Trade (India, Malaysia, South Korea)	Bilateral trade (USA,Japan, Taiwan)
Time span (Frequency)	1970-1997 (Yearly)	1980-1996 (Monthly)	1973-1992 (Quarterly)	1973-1996 (Quarterly)	1970-1997 (Quarterly)
Main Findings	Negative Significant	Mixed Results (Negative Significant on supply, not demand)	Mixed Results (Positive for Australia; Negative for New Zealand)	Negative Significant	Mixed Results (Negative effect for exports to Japan; Inconclusive for exports to USA)

Table 2
Aggregate studies on the effects of exchange-rate volatility II

Authors (year)	Rey (2006)	Arize <i>et al.</i> (2008)	Nishimura and Hirayama (2013)	Choudhry and Hassan(2015)	Chi and Cheng(2016)
Method	GARCH, Coint., ECM	ARCH, Coint., ECM	EGARCH, ARDL	GARCH, Asymmetry ARDL	GARCH, GARCH-M, ARDL
Import/ Export. (Country)	Exports (6 Middle Eastern and North Africa countries)	Exports (8 Latin America countries)	Japan's exports (to China), China's exports (to Japan)	UK imports (from Brazil, China, and South Africa)	Australia's maritime export (to China, Japan, Korea, Taiwan, India, Indonesia, and Malaysia)
Time span (Frequency)	1970-2002 (Quarterly)	1973-2004 (Quarterly)	2002-2011 (Monthly)	1991-2011 (Monthly)	2000-2013 (Quarterly)
Main Findings	Mixed Results (Negative effect: Algeria, Egypt, Tunisia, and Turkey, Positive effect: Israel and Morocco)	Negative significant	Mixed Results (Japan's exports to China: no significant China's exports to Japan: Negative significant)	Mixed result (Third country volatility positive or negative significant for all countries)	Mixed Results (GARCH: prevail of positive effect, GARCH-M: prevail of negative effect)

The research findings in support of the negative impact of currency volatility on maritime import volume indicate that exchange rate volatility negatively affects maritime import volume because the risks associated with the volatility and the costs needed to react inevitably increase over the long term. This occurs even if there are factors that mitigate the impacts, such as a financial market that enables foreign exchange hedging.

3. Model specification

In much of the literature, income, price, and exchange rate volatility

¹ This study examines the literature using autoregressive conditional heteroskedasticity (ARCH) type as the method used to deduce exchange rate volatility.

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