Does Exchange Rate Volatility Matter in the South Korean Economy?

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This paper empirically examines the effect of KRW-USD exchange rate volatility on the real export growth rate in South Korea. Using Korea's export data from January 1995 to December 2006, this study finds that the effect of exchange rate volatility on export is negative for SME, but positive for big firms. Furthermore, SME' export is much more sensitive to the volatility than big firms' export. The study also finds that the statistical significance and the estimated sensitivity of the model are not consistent across data sets-aggregate versus disaggregate data. Export growth of both all and SME are negatively affected by the volatility and it is statistically significant at the 5 percent level. Conversely, export growth of big firms is positively affected by the volatility with a time lag of 3 and it is statistically significant. Furthermore, the analysis on the export data by types of goods shows that 7 out of 9 export goods by big firms are statistically insignificant, whereas 8 out of 9 export goods by SME are significant. The relationship is negative for export goods of SME and positive for those of big firms. These results highlight the importance of the disaggregate date in analyzing the relationship between exchange rate volatility and export. Finally, the results of this study suggest the potential benefits of a stable foreign exchange market, which helps to reduce exchange rate volatility and thus increases firms' exports.

Field of Research: International Economics, Exchange Rate and Trade

1. Introduction

Globalization has led the world economy to a dramatic increase in international trade than ever before. With increased trade flows among countries, the exchange rate has had a bigger impact on the economy because it determines

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the terms of trade in goods and services. The predictability of exchange rate thus becomes an important issue in international trade. However, the exchange rate has become more unstable due to increased volatility in exchange rate under the floating exchange rate system. In addition, frequent government interventions to maintain price competitiveness have made it even harder to predict future exchange rates (Bayoumi and Eichengreen (1998)).

The decreased exchange rate predictability increases the volatility of exchange rate and makes it difficult to forecast the profitability of international trade and investment, reducing trade flows in the future. In addition, the increased volatility of exchange rate causes the firm's hedging costs to rise, and thus affects the price competitiveness of domestic products and the flow of financial assets. In particular, for an export-driven economy such as that of South Korea's, the increased volatility could be a major factor affecting its exports and national income after all.

Many previous studies have examined the relationship between exchange rate volatility and trade, but results have been mixed. Some studies have shown that in the short run, volatility has little impact on international trade for developed countries due to a well functioning financial system where options and futures are readily available for hedging against the exchange rate uncertainty. In the long run, however, it does have an impact because of the increasing hedging costs over time ((Sercu and Vanhulle (1992), Cho, Sheldon and McCorriston (2002), DeGrauwe and de Bellefroid (1986), Obstfeld (1995), and Peree and Steinherr (1989)). Other studies have also shown that the volatility has an negative impact on firms' profitability and thus decreases the trade, both in the short run and in the long run, for developing countries with an underdeveloped financial system, and for small firms with liquidity constraints due to high hedging cost and imperfect hedging tools (Doroodian (1999), Krugman (1989), Mundell (2000), Wei (1999)). Dellas and Zillberfarb (1993), and Broll and Eckwert (1999)).

The mixed results can be explained as follows. First, there exists an aggregation problem in the data. The effect of exchange rate volatility on export can vary, depending on the firm size, types of goods exported, and the country's income level (Bini-Smaghi (1991), Klein (1990), Maskus (1986), and McKenzie (1999)). Several factors contribute to the differing effects, including the use of hedging instruments, degree of competition, terms of contracts, payment currency, production capacity of exporting firms, degree of openness, degree of homogeneity, storage potential, and degree of pass-through.

Second, there is a difference in measuring the exchange rate volatility. To measure it, many studies used the moving average of the exchange rate standard deviation, the moving average of the exchange rate variance, and the absolute value of exchange rate volatility (Chowdury (1993), Kim (1992), Arize et al (2000), Abbott et al (2001), Klaassen (2004)). Other studies used GARCH type models, using the conditional mean and conditional variance instead (Kroner and

Lastrapes (1993), Lee and Kim (1994), Song (1997), Chou (2000), Baum, Caglayan and Ozkan (2004), Lee (2005), and Grier and Smallwood (2006)).

This study employs a non-overlapping window estimation to measure monthly exchange rate volatility, using daily KRW-USD exchange rate data. Also, the study defines a function of real growth rate of export using an autoregressive distributed lag model (ARDL). It then examines the effect of volatility on different goods classified by MTI. The main reason for using non-overlapping window estimation is to remove the serial correlation. Specifically, when there is serial correlation present in the independent variables, the OLS estimation of standard deviation is underestimated. This leads to an erroneous statistical inference.

Different from previous studies, this study examines the effect of exchange rate volatility on export of small and big firms over the long run. The volatility would not have a big impact on exporting goods of big firms because of their high brand power, price competitiveness, relatively low hedging costs, diversified export markets, global network among subsidiaries, transaction without a letter of credit, and open account payment transactions. On the other hand, on exporting goods of small firms the effect of the volatility will be greater.

The rest of this paper is organized as follows. Section 2 presents and discusses the data. Section 3 describes model specification and estimation of the models. The estimation results are presented and analyzed in Section 4. Concluding remarks and some policy recommendations are provided in Section 5.

2. Data

The data includes South Korea's exports by products of big firms and Small and Medium Enterprises[1] (hereafter SME), KRW-USD exchange rate, South Korea's consumer price index, industrial production indices of major trading partners, and the world price index. All data is monthly data, except USD-KRW exchange rate. The sample period is from January 1995 until December 2006 and all data were seasonally adjusted for.[2] The USD-KRW exchange rate is daily data and the sample period is from January 3, 1995 until November 31, 2006. The classification of exporting commodities is based on MTI one unit of export. To calculate the real export amount, the monthly export is divided by the monthly consumer price index.

The industrial production indices of the major trade partners are weighted by their monthly trade volumes. Then the weighted average of the industrial production index is used as a proxy for the world income.[3] Therefore, the variables used in this study include Korea’s real export by products from big firms and SME, the weighted average of industrial production index, and the nominal exchange rates.

The augmented Dickey-Fuller unit root test is conducted for our model specification. The test can not reject the null hypothesis that there exists unit root

for all real exporting products and nominal exchange rates except the growth rate of industrial production index. It is shown that all the unit roots exist for the log level series. For the difference log series, it is found that none of the unit roots exist. The results are usual and therefore are not reported here.[4] This study uses the first difference series of all variables except the industrial production index for specification and estimation of our model.

3. Model Specification and Estimation

The volatility is measured using the simple 24 month moving standard deviation, Garch (1,1) and non-overlapping window regression method. As suggested by Breuch-Godfrey, a serial correlation test is conducted for any serial correlations on the exchange rate volatility data.

3.1. Simple 24-Month Moving Standard Deviation

Following equation (1) below, we calculate a simple 24-month moving standard deviation using monthly exchange rate data and used it as a proxy for the volatility measure (See Figure 1(a)).

$$\sigma_t = \frac{1}{24}\sum_{i=1}^{24}(\Delta WD_{t-i} - \Delta\overline{WD})^2, \qquad (1)$$

where,

$\Delta WD = \log \text{differeceKRW - USD}$

$\Delta\overline{WD} = 24 \text{ month average of monthly KRW - USD average}$

3.2. GARCH (1,1)

The estimation of GARCH (1,1) model is done by the following steps. First, using the Schwartz Criterion (hereafter SC), an optimal conditional mean model is set up and estimated using the least squares method. To assess the reliability of the model, we employ Chow's F-test for the structural change in the exchange rate movement. We also perform the Breusch-Godfrey LM test for serial correlation in the residuals. In addition, Engle's ARCH test is done to examine if there exists ARCH effects. Finally, we use the Waldo test to compare the efficiency of the two models- (1) GARCH model which includes the conditional mean equation and the conditional variance model and (2) the conditional mean equation model. Then, the final model of the exchange rate equation is selected as shown in the equation (2) and (3) below:

$$\Delta WD_t = C_1 + \sum_{i=1}^{12} \beta_i \Delta WD_{t-i} + \delta Dum + \varepsilon_t \quad (2)$$

$$\varepsilon_t \rightarrow N(0, \sigma_t^2)$$

$$\sigma_t^2 = C_2 + \alpha \varepsilon_{t-1}^2 + \gamma \sigma_{t-1}^2 \quad (3)$$

The dummy variable reflects a series of institutional changes after the Korean liquidity crisis in December 1997, which includes opening the Korean capital markets to stabilize the foreign exchange market and to promote foreign investment. Thus, the Dum equals 1 when the time period is between January 1998 and December 2006, and equals 0 otherwise.

Using SC, we find that the exchange rate equation with a lag of 1 month is the optimal model. To see whether a series of institutional changes following the 1997 Korean liquidity crisis has an impact on foreign exchange supply and demand or not, Chow's Breakpoint test is performed.[5] The test results show a p-value of 0.01, rejecting the null hypothesis at the 5% significance level. It indicates that the institutional changes cause a structural change in exchange rate growth (see Table 1). Thus, the model for the exchange rate growth in this study includes the conditional mean equation with AR(1) and a dummy variable, and the conditional variance equation following the GARCH(1,1) process. Also, the conditional variance is used as a proxy for the exchange rate uncertainty (see Figure 1 (b)).

Table 1. GARCH (1,1) Model Specification Test

Test	Null Hypothesis	F-Statistic	P-value
Chow's Structural Change Test	No structural change for the period of 1997 -2006	4.36	0.01
Breusch-Godfrey's LM Test	No serial correlation in error	1.30	0.27
Engle's ARCH Test	No ARCH effect in error	12.58	0.00

3.3 Non-overlapping Window Estimation

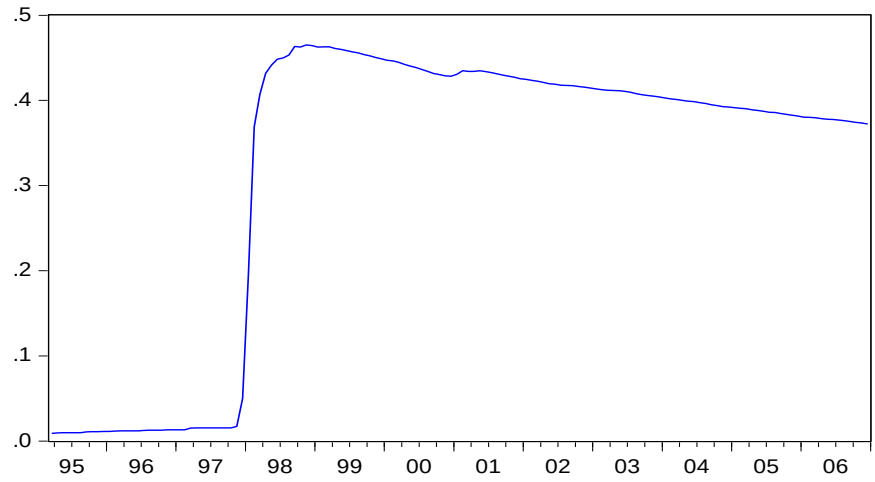
The estimation of the volatility proxy is done in the following steps. First, the daily KRW-USD exchange rates are divided into monthly non-overlapping window and the estimation is conducted. From January 1995 through December 2006, we estimate volatility in each month using daily exchange rates from the previous month. Using SC, we test lag models up to 5 months and decided the optimal lag structure. Finally, we use the OLS to estimate the AR model with the optimal lags.

Figure 1 shows the volatility measured by using the three steps. The volatility measured by the GARCH (1,1) and the volatility measured by the Non-

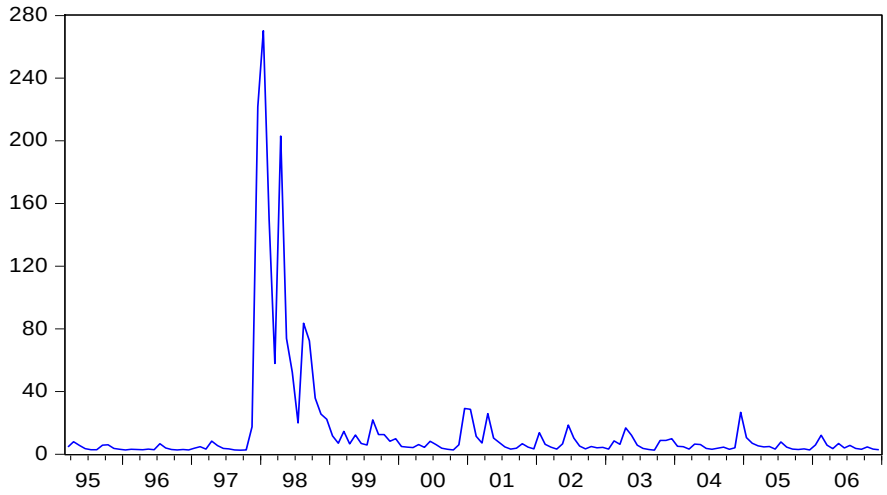
overlapping Window method are almost identical to one another. The 24-month moving SD dramatically increases after the liquidity crisis in December 1997 and continues the pattern until the end of 2006.

Figure 1. Volatility Measures for KRW-USD Exchange Rate

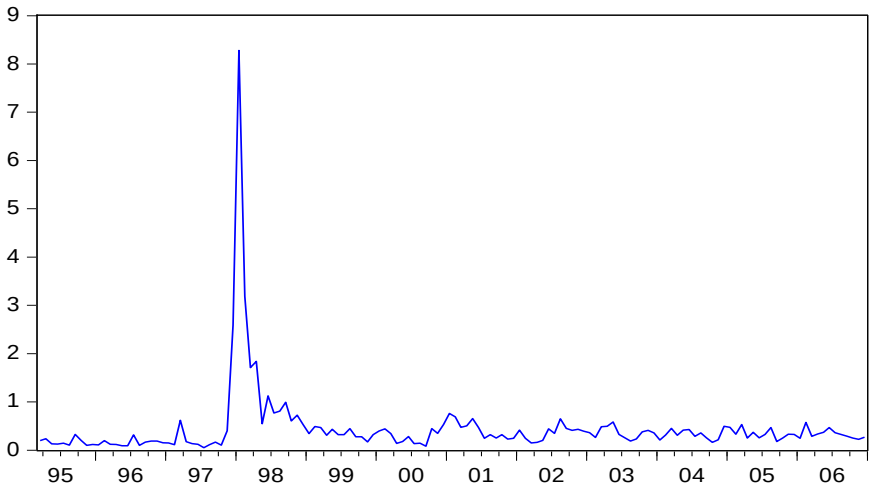
(a) Simple 24 Month Moving SD



(b) GARCH(1,1) on AR(1) with Dummy Model



(c) SD of One Month Nonoverlapping Window AR Regression



To select the optimal volatility proxy, we employ Breuch-Godfrey's LM test. The test results on the AR (1) model with the second order of serial correlation show that there exists the serial correlation on both the 24-month moving SD and GARCH (1, 1). On the other hand, non-overlapping window estimation of volatility is found to be the optimal proxy since there is no serial correlations present (See Table 2).

Table 2. Breusch-Godfrey Serial Correlation LM Test

Volatility	F-Statistic	P-value
24 Month Moving SD	81.204	0.000
GARCH(1,1)	3.681	0.028
SD of Non-overlapping One Month Window AR Regression	0.843	0.433

3.4. Export Growth Rate Model

According to economic theory, the export growth rate is determined by income growth rate of trading countries. The exchange rate volatility was included in the model to see if the volatility affects the export growth rate. Thus, the model shows that the current export growth rate is determined by the past own growth rate, past income growth rate of the trading partners, and the past volatility of the exchange rate. The general ARDL model for the analysis is shown in the equation (4) below.

$$\Delta EX_t = C + \sum_{t=1}^{p} \alpha_i \Delta EX_{t-i} + \sum_{j=1}^{q} \beta_i \Delta IP_{t-j} + \sum_{k=1}^{r} \delta_k VOL_{t-k} + \varepsilon_t \qquad (4)$$

where,

ΔEx_t = export growth rate in time t.
ΔIP_t = weighted average of major trading partners' industrial production growth rates in time t.[6]
VOL_t = volatility of exchange rate in time t.
p, q, r = different time lag, respectively.[7]

Please note that the major trading partners' industrial production growth rate is used for a proxy for their income growth rate.

To examine the relationship between exchange rate volatility and exporting goods of different firms in size-big vs. SME, this study estimates the term, $\sum_{k=1}^{r} \delta_k$. The statistical significance of the volatility model is examined using the Wald's F-test. The test is useful because the exchange rate volatility includes the 3, 6, 9, and 12 month time lags. For example, in case of 3-month lag volatility, the null hypothesis is a joint hypothesis which states that $\delta_1 = \delta_2 = \delta_3 = 0$. It implies that the past 3-month volatility does not have an impact on the current exchange rate growth. Therefore, when the F-value is greater than the critical value in a 5% significance level, it shows that the volatility does have an impact on the export growth rate. The estimation results are shown in Table 3, 4, and 5. In addition, we used the equation (5) below to quantify the long-run impact of the exchange rate volatility on the export growth rate.

$$\text{Long-run Effect} = \frac{\sum_{k=1}^{r} \delta_k}{1 - \sum_{i=1}^{p} \alpha_i} \sigma_{vol} \qquad (5)$$

where,

σ_{vol} = the standard deviation of the exchange rate volatility.

The long-run effect calculated by the equation (5) indicates how the export growth rate responds to one standard deviation shock occurred in exchange rate volatility in the long run. Many previous researches employ an impulse response analysis on the estimated error correction model to measure the long-term effect. The long-run effect will be negative because the exporting companies adjust their export contracts, given the volatility increase over the long run.

4. Estimation Results and Discussion

4.1. Big firms vs. SME

One of the main interests of this study is to examine the findings provided by Doroodian (1999), Krugman (1989), Mundell (2000), Wei (1999) and Grier and Smallwood (2006). These studies claimed that the volatility has a negative

impact on both long and short term trade for developing countries and SME due to imperfect hedging tools available and high hedging costs. This study examines if this is the case for Korean economy. Using the Korean export data from January 1995 through December 2006, we estimate the model shown in equation (4) for the total export by all firms, export by big firms, and export by SME. The estimation results are shown in Table 3.

Table 3. Effect of Exchange Rate Volatility on Export Growth

Firm size	Statistics	Lag structures of volatility			
		3	6	9	12
Total	F STAT	5.991*	5.35*	4.821*	4.01*
	p-value	0.016	0.002	0.000	0.000
	lag length	(1,1)	(1,2)	(2,2)	(2,2)
	LR effect	-0.044	-0.022	-0.065	-0.069
Big firms	F STAT	2.793*	2.054	1.772	1.566
	p-value	0.043	0.063	0.08	0.111
	lag length	(1,2)	(1,2)	(1,2)	(1, 2)
	LR effect	0.025	0.003	0.005	0.026
SME	F STAT	23.507*	12.892*	8.518*	7.086*
	p-value	0.000	0.000	0.000	0.000
	lag length	(2,2)	(2,2)	(2,2)	(2,2)
	LR effect	-0.144	-0.166	-0.157	-0.152

Note: In the parenthesis, the first number indicates a time lag of export growth rate and the second number indicates industrial production growth rate of the major trading partners.
*Significant at the 5 percent level.

First, this study finds that Waldo statistics for all the lags of the volatility are significant at the 5% significant level for both total export and SME export, but it is significant for only 3 lags of the volatility for big firms. We also find that the long-run impact of the volatility on total exports and SME export is negative and statistically significant. That is, over the sample period, both export by total and SME decrease as the volatility increases. This result is consistent with the results found by Kim (1992) and Lee (2005).[8] On the contrary, Lee and Kim (1994) and Grier and Smallwood (2006), using GARCH-M and nonlinear Threshold GARCH model, respectively, find a positive relationship between the volatility and export.

In addition, the impact of the volatility on the export growth rate is smaller for big firms than for SME, indicating exports by SME are much more sensitive to the volatility. For example, in case of time lag of 3, the long-term effect is 0.025 on big firms and -0.144 on SME. The effect on SME is almost six times that of big firms. For SME, the effect is consistent for all different time lags.

The mixed results presented in Table 3 can be attributed to the aggregate data problem suggested by previous empirical studies. For example, Bini-Smaghi (1991), Klein (1990) and Mascus (1986) argued that the effect of the volatility on

export may be different for different industries and products. Specifically, they differ in many aspects including the degree of competition, type of contract, payment currency, hedging tools employed, production capacity, degree of openness, degree of homogeneity, and storing ability.

4.2. Analysis of Exports by Products

This study analyzes the relationship between the volatility and export growth rate for 9 out of 10 products classified by the MTI. The 9 products are agricultural, forest and marine, chemical industry manufactures, electrical and electronic, living ware, machinery, plastic, rubber or leather, mineral, iron or steel and metal, textile and apparel.[9] The analysis results for big firms and SME are shown in Table 4 and 5, respectively.

For big firms, Table 4 shows that the relationships for 7 out of 9 commodities are statistically insignificant. This is probably because large businesses engaged in hedging to avoid losses from price changes due to unexpected exchange rate changes. In addition, in an effort to maintain their targeted economies of scale, market share, and demand, they continue to export regardless of exchange rate fluctuations. Another reason is that as multinational corporations they have global presence in both production and sales, trade without letter of credit, expanded O/P trading, diversified markets for export, all of which promotes their exports as well.

For SME, Table 5 shows that the relationships for all 9 products except one (agricultural, forest and marine) were found to be negative and statistically significant in the 5% level. Unlike big firms, most SME tend to stop exporting and focus on the domestic market because of high costs involved in exporting. When the volatility rises, their exporting costs increase because of their thin profit margin, small-scale exports, poor brand image and sales network, and short history of trading with customers.

The magnitude of the long-run effect is examined only for statistically significant goods. For example, in case of metal goods with a time lag of 6, the effect is 0.027 for big firms and -0.092 for SME. Even though the effect is opposite with different sign, the effect on SME is almost 3.5 times the effect on big firms. This indicates that exporting by SME is much more sensitive to the exchange rate volatility than exporting by big firms. In addition, the effects on the SMEs are generally the same for all different time lags of exchange rate volatility.

Table 4. Effect of Exchange Rate Volatility on Commodity Export Growth by Big Firms

Commodity	Statistics	Lag structures of volatility			
		3	6	9	12
Agricultural, forest, marine products	F STAT	0.795	0.472	0.522	0.399
	p-value	0.499	0.828	0.856	0.961
	lag length	(2,1)	(5, 1)	(5, 2)	(5, 2)
	LR effect	0.04	0.014	0.002	-0.002
Chemical industry manufactures	F STAT	0.852	1.396	1.653	1.319
	p-value	0.468	0.221	0.108	0.218
	lag length	(3,2)	(3,2)	(3,2)	(3, 2)
	LR effect	0.03	0.025	0.007	-0.001
Electrical articles, electronic articles	F STAT	1.642	1.503	1.185	1.492
	p-value	0.183	0.183	0.311	0.137
	lag length	(1,2)	(1,2)	(1, 2)	(1, 2)
	LR effect	0.058	0.047	0.091	0.152
Living ware	F STAT	2.336	1.162	1.036	0.803
	p-value	0.077	0.331	0.416	0.646
	lag length	(2,1)	(2,1)	(2,1)	(2, 1)
	LR effect	0.054	0.027	0.007	0.005
Machinery	F STAT	0.759	0.97	1.894	1.424
	p-value	0.519	0.449	0.059	0.165
	lag length	(3,1)	(4, 1)	(4, 1)	(4, 1)
	LR effect	0.027	0.029	0.064	-0.056
Articles of plastic, rubber or leather	F STAT	1.662	0.954	0.764	0.750
	p-value	0.178	0.459	0.650	0.700
	lag length	(1,1)	(1,1)	(1,1)	(1, 1)
	LR effect	0.083	0.083	0.046	0.028
Mineral products*	F STAT	3.410*	2.174*	1.511	1.59
	p-value	0.020	0.050	0.152	0.104
	lag length	(2,1)	(2,1)	(2, 2)	(2, 2)
	LR effect	0.085	0.039	0.049	-0.02
Articles of iron or steel, metals*	F STAT	1.642	2.295*	1.688	1.419
	p-value	0.183	0.039	0.099	0.167
	lag length	(1,1)	(1,1)	(1,1)	(1, 1)
	LR effect	0.058	0.027	0.049	-0.10
Textile & apparel	F STAT	1.637	1.822	1.751	1.519
	p-value	0.184	0.100	0.085	0.128
	lag length	(1,2)	(1,2)	(1, 5)	(1, 5)
	LR effect	0.01	0.003	0.036	0.05

Note: In the parenthesis, the first number indicates a time lag of export growth rate and the second number indicates industrial production growth rate of the major trading partners.

*Significant at the 5 percent level.

Table 5. Effect of Exchange Rate Volatility on Goods Export Growth by SME

Goods	Statistics	Lag structures of volatility			
		3	6	9	12
Agricultural, forest, marine products	F STAT	1.702	1.365	1.937	2.106
	p-value	0.17	0.234	0.053	0.072
	lag length	(2,2)	(2,2)	(2,2)	(2,2)
	LR effect	-0.047	-0.028	-0.037	0
Chemical industry manufactures	F STAT	11.465*	6.428*	4.439*	3.733*
	p-value	0.000	0.000	0.000	0.000
	lag length	(2,2)	(2,2)	(2,2)	(2,2)
	LR effect	-0.098	-0.116	-0.142	-0.113
Electrical articles, electronic articles	F STAT	16.293*	8.94*	5.847*	4.827*
	p-value	0.000	0.000	0.000	0.000
	lag length	(1,2)	(1,2)	(1,2)	(1,2)
	LR effect	-0.19	-0.208	-0.196	-0.137
Living ware	F STAT	5.207*	3.229*	3.298*	2.316*
	p-value	0.002	0.006	0.001	0.011
	lag length	(2,2)	(2,2)	(2,2)	(2,2)
	LR effect	-0.061	-0.071	-0.036	-0.031
Machinery	F STAT	10.071*	5.791*	4.241*	3.586*
	p-value	0.000	0.000	0.000	0.000
	lag length	(1,1)	(1,1)	(1,1)	(1,1)
	LR effect	-0.194	-0.274	-0.236	-0.258
Articles of plastic, rubber or leather	F STAT	11.405*	7.000*	4.488*	3.632*
	p-value	0.000	0.000	0.000	0.000
	lag length	(1,2)	(1,2)	(1,2)	(1,2)
	LR effect	-0.104	-0.122	-0.121	-0.078
Mineral products*	F STAT	1.586	1.627	2.120*	2.133*
	p-value	0.196	0.145	0.033	0.020
	lag length	(1,1)	(1,1)	(1,1)	(1,1)
	LR effect	-0.426	-0.524	-0.300	-0.632
Articles of iron or steel, metals*	F STAT	2.089	2.174*	1.656	1.619
	p-value	0.105	0.05	0.107	0.096
	lag length	(1,2)	(1,2)	(1,2)	(1,2)
	LR effect	-0.038	-0.092	-0.086	-0.108
Textile & apparel	F STAT	6.905*	4.097*	2.846*	2.927*
	p-value	0.000	0.001	0.005	0.001
	lag length	(2,2)	(2,2)	(2,2)	(2,2)
	LR effect	-0.045	-0.043	-0.032	-0.052

Note: In the parenthesis, the first number indicates a time lag of export growth rate and the second number indicates industrial production growth rate of the major trading partners.

*Significant at the 5 percent level.

Interestingly, the agricultural, forest and marine of both big firms and SME are found to be statistically insignificant at the 5% level. This result is in line with Chou's (2000) study, which shows that exports of food and drinks and cigarettes are statistically insignificant in China. However, the result is in sharp contrast to the findings of Mascus (1986) and Pick (1990), which show that the agricultural goods are the most sensitive to exchange rate volatility. Given the opposite results in the literature, we offer some insights to explain why the volatility does not affect the export of agricultural goods in Korea. First, the specialty food exporting, which occupies the largest portion of the Korean agricultural export, has low price elasticity and is not affected by exchange rate fluctuations.[10] Second, fish and farm goods should be exported even though their prices are affected by the exchange rate fluctuations, because they cannot safely be stored for a long time and because their storage costs are too high.

In summary, the KRW-USD exchange rate volatility has a negative effect on all exporting goods except agricultural, forest and marine goods for SME. On the other hand, the volatility has a positive effect on export of minerals and iron goods for big firms. Also, exporting goods by SME was far more responsive to the volatility than exporting goods by big firms. Furthermore, the mixed results are obtained from the analysis on the total export data (aggregate data) and individual export data (disaggregate data) by firm, respectively. Export growth by both all and SME are negatively affected by the exchange rate volatility, whereas export growth by big firms is positively affected by the volatility with a time lag of 3. Furthermore, the analysis on the export data by types of goods showed that 7 out of 9 exporting goods by big firms are statistically insignificant, whereas 8 out of 9 exporting goods by SME are significant. The relationship is negative for exporting goods of SME and positive for those of big firms. Also, the analysis using the aggregate data is significant only for a time of 3, while the analysis using the disaggregate data is significant only for a time lag of 6 for two goods-mineral and steel and metal goods.

5. Conclusion

This study examines the effect of KRW-USD exchange rate volatility on the real export growth rate of big firms and SME using sample data from January 1995 to December 2006. To measure the exchange rate volatility, we define a monthly AR model using daily exchange rates and then estimate the standard deviation by a non-overlapping window technique. The function of the real export growth is set up as an ARDL model, which includes the past export growth rate, income growth rate of major trading partners, and exchange rate volatility as independent variables. Waldo's F-test is performed for statistical significance of the model. Also, long-term effect is examined. The results are as follows.

First, we show that the exchange rate volatility negatively affects SME exporting goods except agricultural, forest and marine goods while the volatility positively affects big firms exporting goods including mineral and steel and metal goods.

Furthermore, SME exporting goods responded to the volatility far more than big firms exporting goods.

Second, we also show that the statistical significance and the estimated sensitivity of the model are not consistent across data sets being used. Export growth by both all and SME are negatively affected by the exchange rate volatility and statistically significant at the 5% level. Conversely, export growth by big firms is positively affected by the volatility with a time lag of 3 and is statistically significant. Furthermore, the analysis on the export data by types of goods shows that 7 out of 9 exporting goods by big firms are statistically insignificant, whereas 8 out of 9 exporting goods by SME are significant. The relationship is negative for exporting goods of SME and positive for those of big firms. Also, for the big firm, the analysis using the aggregate data is significant only for a time of 3, while the analysis using the disaggregate data is significant only for a time lag of 6 for two goods-mineral and iron and steel and metal goods. The results with aggregate and disaggregate data are quite different from each other. Hence, these results suggest that the analysis using the disaggregate data would produce more accurate results because lag structure of volatility and responsiveness to the volatility vary depending upon exporting industry and commodities.

Finally, the results of this study suggest the potential benefits of a stable foreign exchange market, which helps to reduce exchange rate volatility and thus increases firms' export. Therefore, this study recommends that Korea's foreign exchange policy should be predictable in an effort to reduce the future exchange rate volatility. Also, the policy need to consider stabilizing the foreign exchange market, maintaining appropriate level of foreign exchange reserves for emergency, expanding foreign exchange swap agreements, and target exchange rate band. This study also suggests that SME, to mitigate the negative effect of the exchange rate fluctuations, need to seek increasing brand awareness, improving transaction and payment method, increasing productivity, expanding trading without letter of credit and open account payment trading, and diversifying export markets.

End Notes:

[1] In Korea, SME is defined as the firm having employee up to 400 and so on……

[2] Export data by firm size are acquired from the Korean Small Business Research Institute, Korea's consumer price index and KRW-USD exchange rate from Bank of Korea, and the industrial production index and the price index of the major trading partners from the IMF website.

[3] We selected China, the United States, Japan and the EU as the major trading partners, and calculated monthly growth rate from previous year's month. The weight is given by the ratio of each partner's monthly trading volume divided by the monthly trading volume of all partners.

[4] The unit root test results are readily available upon request.

[5] Since the liquidity crisis, a series of institutional changes was implemented to facilitate the direct foreign investment. The changes included (1) opening the corporate bond market (December 1997), (2) allowing the purchase of short-term financial products (February 1998), (3) abolishing the limit of domestic equity investment (May 1998), (4) allowing hostile M&A activities (April 1998), (5) opening more industries for foreign investment (May 1998), (6) enacting the Foreign Investment Promotion Act (November 1998. Especially, in September 1998 the Foreign Exchange Management Act was abolished. Subsequently, in April 1999 the Foreign Exchange Trade Act was enacted and implemented to minimize regulations on foreign trade and to expand foreign exchange trading.

[6] During January 1995 through December 2006, the weighted average of four trading partner's industrial production index was calculated, using the weight as the ratio of total trade to each partner's trade. Then, the growth rate of the weighted average was obtained as compared to the same month one year ago. This is consistent with the way which China reported its data.

[7] In equation (4) it is determined by the SIC and has a value of 3, 6, 9, and 12, respectively.

[8] Kim (1992) and Lee (2005) used the exchange rate volatility estimated by the average variance model and EGARCH model, respectively. Also, Lee (2005) used a shock-response test to show that the volatility negatively affected the export after the Korean liquidity crisis

[9] The industry consisted of miscellaneous products is excluded.

[10] As of December 2006, specialty food accounts for 35.6%, fishes 13.3%, and farm goods 11.5% out of total agricultural, forest and marine goods.

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