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Full Length Research Paper

Trading behaviors among major investors in the United States Dollar (USD) currency futures markets: Evidence from South Korea

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The purpose of this paper is to investigate the behaviors of major traders (investment companies, banks, and foreigners) and return volatility of Won/USD futures in the South Korea currency market. The results indicate that there exists a significantly positive relationship between currency market volatility and unexpected trading volume in terms of both banks and foreigners, and unexpected open interest is also associated positively with market volatility for all three major traders. Regarding the asymmetric effect, only the banks' trading volume and foreigners' net positions are asymmetric on volatility direction. In spot markets, it is found that there exists uni-directional causal relationships in terms of investment trust companies and foreigners. On the other hand, for futures markets we also discover one-way causal relationships in both banks and foreigners. Based on the dispersion of beliefs models and noise trading theories, investment trust companies appear to be uninformed in Won/US futures markets.

Key words: Market volatility, trader behaviors, currency futures, net positions.

INTRODUCTION

The purpose of this study is to uncover the linkage between volatility range of daily exchange rates and trading volumes among United States Dollar (USD) futures in South Korea. After the inception of derivatives trading in early 1970s, research interests focusing on the effects of financial derivatives on their underlying assets have grown dramatically. Trading of derivatives attracts not only hedgers but also speculators whose trading behaviors might destabilize spot prices and trading volumes. Kaldor (1939) indicates that futures could provide an opportunity of speculation and destabilize the cash markets more. Consequently, an increase in trading futures contracts might cause an increase in spot volatility.

After futures were introduced and traded on major stock exchanges, the economic literature intensified the debate on the impact of derivatives trading on spot price volatility. According to Bessembinder and Seguin (1993), an increase in volatility lowers the demand for currency, commodity, and interest rate futures markets. Chatrath et al. (1996) further indicate that futures activity has a positive impact on the conditional volatility changes in exchange rate, and has a weaker feedback from exchange rate volatility to futures activity. Bhargava and Malhotra (2007) then find mixed relationships between futures trading and volatility in spot rates of BP, DM, JY and CD against USD over the period of 1982 through

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Abbreviations: USD, United States Dollar; **BP,** British pound; **DM,** Deutsche mark; **JY,** Japanese yen; **CD,** Canadian dollar; **ITC,** investment trust companies; **KOSCOM,** Korea Securities Computing Corporation; **F,** Foreigners; **B,** Banks; **OI,** Open Interest; **ADF,** Augmented Dickey-Fuller; **AIC,** Akaike information criterion; **VAR,** vector autoregression.

March 2000.

The trading of derivatives has grown tremendously, especially in South Korea's financial markets. Futures contracts are traded in the Korea Exchange (KRX), accounting for 18% of all contracts traded around the world. The Bank for International Settlements (BIS) triennial survey of foreign exchange and derivatives market activity also shows that the turnover in traditional foreign exchange markets increased to $3.2 trillion in April 2007. Hence, the trading of exchange derivatives plays a decisive role.

During the peak of the financial crisis in December 1997, South Korea's exchange rate system shifted to a totally free floating mechanism from a fluctuating one, while implementations of foreign exchange transactions replaced ex-management and accelerated the liberalization of assets. Due to a lack of proper risk management, the government realized the importance of derivative tool and has issued a wide range of derivative products. In order to avoid facing volatility in exchange rate and foreign exchange risk, South Korea launched currency futures trading in 1999 and the trading volumes has grown dramatically. This study then intends to examine the connection between daily volatility of exchange rate and major traders' trading behaviors. To further address this connection, this paper not only uses trading volume and open interest, but also uses net positions, which could distinguish hedgers from speculators or day traders. Finally, the impact of foreign exchange rate on the trading behaviors of market major participants and if traders' trading destabilizes the markets would be discussed as well.

Our study introduces a test of the dispersion of beliefs models and noise trading theories in futures markets, assuming that there exists a relationship between trading activity and volatility that depends on the information that traders possess.

Literature review

The mixture of distribution hypothesis (MDH) was addressed by Clark (1973), under the assumption that daily price change is supposed as being a random variance and also a sum of intra-day price changes. Clark (1973) supports that there is a positive relationship between the absolute value of price change and trading volume, while price volatility also is impacted by trading volume directly. Epps and Epps (1976) bring up the framework named the two-parameter portfolio selection model, which considers the market to be composed of short and long positions. Following the assumption of MDH, Tauchen and Pitts (1983) address the general model, which describes that under the assumption of the fixed traders, the square of price change is the positive function of the covariance of trading volume. There exists a positive correlation between price volatility as well as trading volume. As with the suggestion of Clark (1973), there is large volatility when the largest transactions happen. Luc et al. (2005) shed new light on the mixture of the distribution hypothesis by means of the weekly exchange rate volatility of the currency Norwegian Krone (NOK). The novelty of their study is that the impact of changes in the number of information events is positive and statistically significant. Recent studies about the impact of information intensity on exchange rate volatility mostly support MDH. Copeland (1976) brings another essential model - the sequential information arrival model that explores price volatility and trading volume - under the major assumption that market traders receive the latest information randomly and continuously; or in other words, every single trader does not receive a new message simultaneously. On the contrary, the new message is only sent to one trader, and therefore the final price equilibrium results after all traders attain the same information. Karpoff (1987) criticizes that those traders who do not attain information might not acquire any information from the market price or the trading behavior of those traders who do attain information.

The conclusion - when market traders are all optimistic or pessimistic, the trading volume is the largest - is inconsistent with the empirical findings. MCarthy and Najand (1993) test near-month contracts from the Chicago Mercantile Exchange (CME) of daily currency futures during the period from January 1979 to May 1990. Their results indicate a positive relationship between the absolute value of price change and trading volume other than the Japanese Yen. Volumes and lagged absolute returns are also found to be related. Fleming (1997) analyzes the volume-volatility relation of U.S. treasury securities, and finds out that there is a positive impact on the stock of foreign markets. Daigler and Wiley (1999) indicate that the general public and traders who are uninformed drive the positive relation between volume and volatility. Trades by floor traders are often associated with decreased volatility, indicating the contemporaneous relation between volatility and net position by categorized traders - speculators and hedgers in conjunction with small traders.

Previous studies, though, contribute little about the effects of trading in futures on the underlying spot market, with most of them focusing on the linkage between exchange rate volatility and stock price and return. Some studies provide empirical results that futures trading could destabilize the spot market. Bae et al. (2004) investigate that introducing Korea Composite Stock Price Index (KOSPI) futures trading has resulted in both larger spot price volatility and greater market efficiency (allowing for quicker adjustment of market prices to information) overall. Their study suggests that there exists volatility spillover to stocks against futures. Chen and Shen (2004) also find a common volatility factor that drives the dynamics of stock return and exchange rate.

There are still many veins of studies regarding the causal relationship between futures trading and currency market volatility. Darrat et al. (2002) suggest that index futures trading might not be blamed for the observed volatility in the spot market. However a stronger and more consistent support alternative posture that volatility in the futures market is an outgrowth of a turbulent cash market. Bessembinder and Seguin (1993) over argue whether more prosperous futures trading activity is associated with greater equity volatility and suggest equity volatility is positively related to spot trading activity and to contemporaneous futures trading shocks. Adrangi and Chatrath (1998) examine the relationship between exchange rate variability and futures trading activity in the context of disaggregated open interest. The techniques employed allow for more specific inferences regarding which groups of traders contribute to exchange volatility. Their results suggest that while ‘typical’ levels of futures commitments are not destabilizing, surges in the level of the commitments of large speculators and small traders do cause exchange rate volatility. The actual release of the commitment-of-traders data, however, has no impact on spot prices.

Yang et al. (2005) examines the lead-lag relationship between futures trading activity (volume and open interest) and cash price volatility for major agricultural commodities. The results of Granger causality tests show that an unexpected increase in futures trading volume leads an increase in cash price volatility for most commodities. Likewise, there is a weak feedback causal relationship between open interest and cash price volatility. These findings are consistent with the destabilizing effect of futures trading on agricultural commodity markets. Bhargava and Malhotra (2006) find that speculators and day traders destabilize the market for futures, though whether hedgers stabilize or destabilize the market is not inconclusive. The results suggest that speculators’ demand for futures goes down in response to increased volatility. They also indicate that open interest activity either stabilizes or destabilizes markets for speculators.

Agnieszka and Samuel (2007) investigate Euro currency futures on the U. S. dollar, British pound, Japanese yen, Swiss franc, Swedish krona, and Canadian dollar. Their most important finding is that speculative trading in futures has a day-to-day destabilizing effect on the volatility of both the spot and futures exchange rates for all currencies. On the other hand, there is evidence that some lagged activities of hedgers can stabilize the volatility of spot and futures exchange rates. Cai et al. (2008) use a new high-frequency data set to investigate informational linkages in the euro–dollar and dollar–yen exchange rates across five trading regions. Information is proxied by exchange rate return, direction of return, volatility, trading activity, and order flow. They find that informational linkages are statistically significant at both own-region and inter-region levels, but own-region spillovers dominate in economic significance, especially for volatility and trading activity.

DATA AND METHODOLOGY

Data

Most previous studies have investigated the effects of futures trading on spot market volatility, index price, or commodity price, but only some research focuses on currency futures. In this paper we especially focus on relationships between volatility of Won/USD exchange rate and USD futures in South Korea’s financial markets. We categorize South Korea’s capital markets into three major traders - investment trust companies (ITC), banks, and foreigners - who frequently have high trading activities in the spot and futures foreign exchange markets. Therefore, this paper further investigates dynamic relationships between these three major traders and return volatility among the spot, USD futures and exchange rate markets. The daily data used in this study covers the period from years of 2004 to 2008 which obtained from the Korea Securities Computing Corporation (KOSCOM).

Methodology

We assume that traders use their expectations of the volatility range of the futures return to adjust their spot or USD futures positions in advance. We explore if the fluctuation of price change affects spot and USD futures trading behaviors among the three major traders and relationship between spot and USD futures volume. In addition, we also consider the variation of net positions, which can be defined as long contracts less the short contracts.

The proxy for the level of trading activity is trading volume, which is standardized by open interest, according to Chatrath et al. (1996). Daily futures volume largely impacts on speculation, since a hedger’s transaction is composed of minor proportions of daily futures volume. Open interest generally represents longer-than-intraday positions that mostly capture hedge activity, while futures volume relatively to open interest reflects speculation. Therefore, open interest may provide more information on trading activity than volume alone. Bessembinder and Seguin (1993) indicate the relation between volatility, volume and open interest among agricultural, financial and metal futures in eight countries. In this study we not only take trading volume of each trader, but also adopt open interest, which as a result it represents the market momentum and provides certain information to market traders. Moreover, we incorporate with net position, which is defined as long contracts less short contracts, to measure the position each trader holds.

$$R_{i,t} = \log\left(\frac{P_{i,t}}{P_{i,t-1}}\right) \times 100, \qquad (1)$$

Where $P_{i,t}$ represents the daily clothing price or rates of the series i at day t, that i equal to USD futures prices and Won/USD rates as spot price. $P_{i,t-1}$ represents the daily clothing price at day t-1, we measure the variance of return in the data series t by using $R_{i,t}$. On the other hand, we define the volatility of both the trading volume and open interest as a logarithm of the ratio of the daily trading volume is as following:

$$V_{i,t} = \log\left(\frac{V_{i,t}}{V_{i,t-1}}\right) \times 100 , \qquad (2)$$

where $V_{i,t}$ represents the trading volume of the series i at day t, that i equal to investment companies (In), Foreigners (F), Banks (B), as well as Open Interest (OI), respectively. $V_{i,t-1}$ represents the trading volume of series i at day t-1, and $V_{i,t}$ is the rate of the change of volume in the data series t.

Estimation of conditional means and volatilities

We follow the procedure as that of Bessembinder and Seguin (1993) and Schwert (1990), which is referred to as the Schwert volatility estimator. This procedure allows for an unbiased estimation of conditional daily standard deviations on observable variables. In order to measure market depth, we consider open interest and net position. Bessembinder and Seguin (1993) conclude that expected open interest may mitigate volatility. Typically, unexpected open interest not only helps explain volatility, but also volume, and no matter how the changes fluctuate, large changes in unexpected open interest increase volatility.

We test the impact of volume and net positions on the volatility of USD returns in each trader's series, following Bessembinder and Seguin (1993), in order to take the phenomenon of volatility clustering into consideration. We add the lagged volatility variance into our formula to capture the unsymmetrical effects on return change, and we also adopt unexpected return. Conditional means and volatilities are estimated as:

$$R_t = \alpha + \sum_{j=1}^{n} r_j R_{t-j} + \sum_{i=1}^{4} \rho_i d_i + \sum_{j=i,b,f}^{n} \pi_j \hat{\sigma}_{t-j} + U_t, \quad (3)$$

$$\hat{\sigma}_t = \delta + \sum_{j=1}^{n} \omega_j \hat{U}_{t-j} + \sum_{i=1}^{4} \eta_i d_i + \sum_{j=1}^{n} \beta_j \hat{\sigma}_{t-j} + u_1 V_{t,k}^{e} + u_2 V_{t,k}^{u}$$

$$+ u_3 OI_{t,k}^{e} + u_4 OI_{t,k}^{u} + u_5 NP_{t,k}^{e} + u_6 NP_{t,k}^{u} + e_t. \quad (4)$$

R_t represents the daily returns of USD futures, d_i is the four dummy variables for the day of the week, and U_t is the unexpected return or residuals. $\hat{U}_t$ denotes estimated unexpected returns, which are used to estimate daily standard deviations, using the transformation: $\hat{\sigma}_t = |\hat{U}_t|\sqrt{\pi/2}$. We also have $V_{t,k}^{e}$ representing the expected volume of each trader on day t, where $V_{t,k}^{u}$ represents the unexpected volume of the three major traders, and k represents the three major traders: investment trust companies, banks, as well as foreigners. Here, $OI_{t,k}^{e}$ and $OI_{t,k}^{u}$ are equal to expected open interest and unexpected open interest in USD futures markets. Both $NP_{t,k}^{e}$ and $NP_{t,k}^{e}$ represent expected net positions and unexpected net positions from the three major traders on day t. Net positions are defined as the long open interests less the short open interests in our study.

To partition each trader's activity into expected and unexpected components, we first test whether the series of each trader's volume and open interest are stationary or not, whereby all tests for stationarity are conducted with the Augmented Dickey-Fuller (ADF) test for a unit root. As recommended by Bessembinder and Seguin (1993) and Valeria and Yiuman (2008), Equations 3 and 4 are estimated sequentially. The lagged return is included in Equation 3 to allow for short-term shifts in expected returns. The inclusion of a lagged unexpected return captures possible asymmetry in the relation between return and volatility. Lagged volatilities are included in Equation 4 to account for the effect of volatility's persistence. It is well known that volatility is positively related to an unexpected shock and negatively associated with an unexpected shock in the spot markets, as Wang (2002) supports the same aspect.

Asymmetric model

To examine the relation between the net positions of the three major traders and the volatility of USD futures, we take a similar procedure as in Bessembinder and Seguin (1993) and regress the volatility estimator on lagged volatilities, and expected and unexpected trading activities, including trading volume and open interest, as well as expected and unexpected net positions by each trader. In other words, we add the dummy variables of both volume and net positions into the estimation Equation 5 to test whether the impact of unexpected change on volume and traders' positions is asymmetric or not. The empirical model is of the following form:

$$\hat{\sigma}_t = \delta + \sum_{j=1}^{n} \omega_j \hat{U}_{t-j} + \sum_{i=1}^{4} \eta_i d_i + \sum_{j=1}^{n} \beta_j \hat{\sigma}_{t-j} + u_1 V_{t,k}^{e} + u_2 V_{t,k}^{u}$$

$$+\theta V_{t,k}^{u} \times V^{dum} + u_3 OI_{t,k}^{e} + u_4 OI_{t,k}^{u} + u_5 NP_{t,k}^{e} + u_6 NP_{t,k}^{u} + \chi NP_{t,k}^{u} \times NP^{dum} + e_t. \quad (5)$$

Here, V^{dum} and NP^{dum} represent the dummy variables of volume and net position, respectively. When the unexpected activity is greater than one, the dummy variable is equal to one, meaning that there exists a positive impact. Instead, as the unexpected activity is greater than one, the dummy variable is equal to zero, which means there exists a negative impact. The coefficients of the activity series imply that the marginal impact effect is negative (u_2, u_4), while on the other hand, the positive marginal impact can be estimated from the sum of the coefficients of unexpected activity and the product of unexpected activity in conjunction with activity dummy variables ($u_2 + \theta$, $u_4 + \chi$).

GARCH estimation

In order to realize the causality relationship between each trader's trading activity and market dynamics in both the spot and futures markets, we employ an estimated GARCH series to measure both Won/USD rate volatility and USD futures return volatility. Previous studies suggest that GARCH (1,1) should be the default when working with financial data in general and the variance of the spot and futures rates in particular. The parameterization for Conditional Variance is shown in Equation 6 as follows:

$$\varepsilon_t = v_t \sqrt{h_t}, \quad (6)$$

where $h_t = \gamma_0 + \alpha_i \varepsilon_{t-i}^2 + \beta_i h_{t-i}$. In general speaking, the GARCH variance equation can be written as:

$$\sigma_t^2 = \gamma_0 + \sum_{j=1}^{n} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{n} \beta_i h_{t-i}, \quad (7)$$

where $\sigma_{i,t}^2$ is the variance estimated by the GARCH model in time t. The coefficients α_i measure the impact of the sectoral volatility shocks, whereas the coefficients β_i accounts for the identical shock

Table 1. Summary statistics for returns and overall trading activities.

Variables	Returns	Won/USD	Open interest	Total vol.	Volumes by type of trader			Net positions by type of trader		
					Banks	ITC	Foreigners	Banks	ITC	Foreigners
Mean	0.02	-0.09	0.006	0.049	-0.04	-0.03	0.04	-1.47	-44.49	-42.40
Std. Error	0.01	56.35	0.04	20.39	42.67	36.66	31.44	368.89	2035.47	4041.95
Skewness	-0.52	-0.18	3.52	0.10	-0.04	-0.44	-0.43	-0.41	0.10	-0.02
Kurtosis	8.34	4.35	38.32	3.87	3.64	4.82	4.93	5.98	4.73	3.79
J-B	1531.12	102.02	66918.37	41.71	21.69	212.54	231.83	495.58	157.17	32.79
ADF Test	-36.175***	-13.675***	-11.6516***	-13.89***	-12.744***	-12.795***	-14.37***	-20.07***	-10.20***	-23.06***

This table presents the descriptive statistics for the logarithm values of USD futures trading volume on investment companies, banks, and foreigners. Net positions mean the long volume less the short volume. Return and Won/USD rate both measure the change rate of the daily closing price on USD futures and the volatility of the Won exchange rate. All measures are in logarithm process from January 2, 2004 to December 30, 2008. *** represents significance at the 0.01 level, ** represents significance at the 0.05 level, and * represents significance at the 0.10 level. All data are obtained from January 2, 2004 to December 30, 2008.

to volatility from the previous day.

VAR models

Here we conclude whether trading activities of each trader in the USD futures markets influence the volatility of the Won/USD rate and futures return performing the method of the vector autoregression (VAR) approach, which is commonly used for forecasting the interrelated series and for measuring the impact of random disturbances on the system of variables. Moreover, VAR treats every endogenous variable as a function of the lagged values of all endogenous variables in a system. Hence, we use VAR to determine the interaction in the market among the activities of the three traders (investment companies, banks, as well as foreigners) and the change in the Won/USD rate. The application of VAR models in this study can be written as follows:

$$\mathrm{Vol}_i = \alpha_i + \sum_{j=1}^{n} \beta_i \mathrm{Vol}_{i,t-j} + \sum_{j=1}^{n} \gamma_i V_{i,t-j} + \varepsilon_i \,, \quad (8)$$

$$V_i = a_i + \sum_{j=1}^{n} b_i V_{i,t-j} + \sum_{j=1}^{n} r_i \mathrm{Vol}_{i,t-j} + \varepsilon_i \,, \quad (9)$$

$$\mathrm{Vol}_i = \alpha_i + \sum_{j=1}^{n} \beta_i \mathrm{Vol}_{i,t-j} + \sum_{j=1}^{n} \gamma_i \mathrm{NP}_{i,t-j} + \varepsilon_i \,, \quad (10)$$

$$\mathrm{NP}_i = a_i + \sum_{j=1}^{n} b_i \mathrm{NP}_{i,t-j} + \sum_{j=1}^{n} r_i \mathrm{Vol}_{i,t-j} + \varepsilon_i \,, \quad (11)$$

where α_i, β_i, and γ_i are coefficients of constant, lagged regressor and lagged independent variables respectively; j is the number of lags; Vol equals volatility of the Won/USD rate and USD futures; V_i and NP_i represent logarithm of trading volume and net positions for banks (i=B), investment trust companies (i=In), as well as foreigners (i=F). As described by Agnieszka and Samuel (2008) and Bhargava and Malhotra (2006), the appropriate number of lags for VAR models is determined by performing each VAR model with one to four lags, and also relying on the lowest reported value for Akaike information criterion (AIC) and Schwarz information criterion (SIC). After running the VAR models above, we use Granger casualty test to figure out if traders' activities, including trading volume and their net positions, significantly affect the volatility of the Won/USD rate and futures return, or on the contrary, whether the change in the Won/USD rate and futures return have a significant impact on the trading activities of each trader.

EMPIRICAL RESULTS

Descriptive statistics

Table 1 reports the summary statistics for the returns, the Won/USD rate, and trading activities of each trader. Table 1 represents the mean daily return, the Won/USD rate, and the logarithm of the ratio of overall trading volume and open interest in USD futures. Futures return is also the logarithm of the daily closing prices of the contract closest to expiration, except within the delivery month.

When the change in the second nearest contract is used, the results are obtained with the means, standard error, skewness, and kurtosis in conjunction with the Jarque-Bera normality test, which shows how the distribution is not like a normally distributed series. According to the results as follows, we conclude that the mean daily return, overall open interest, and trading volume are all positive, but the Won/USD rate is negative, which means the trend of the Won exchange rate was undergoing depreciation over the period from 2004 to 2008.

Table 1 also reports summary statistics for the trading volume and net positions, which are long contracts less short contracts for each trader. It appears that the logarithm of the volume of banks and investment companies is negative, whereas instead the logarithm of the volume of foreigners is positive. In terms of net positions, banks, ITC, and foreigners are all negative, implying hedgers always take net long positions, while speculators take net short positions. We may conclude that the three major traders in South Korea's currency markets mainly undertake speculator positions. For each of the series, the results of the ADF tests show that these data reject the null hypothesis of having a unit root and being stationary. The existence of a unit root has implications for decomposing a variable into expected and unexpected components.

Table 2. Time series models of daily return.

Variables	ITC		Banks		Foreigners	
Intercept	0.0067, (4.04)	***	0.0063, (3.63)	***	0.0060, (3.75)	***
Day of the week dummy						
Monday	-0.0024, (-1.38)		-0.0020, (-1.26)		-0.0015, (-0.89)	
Tuesday	-0.0011, (-0.63)		-0.0015, (-0.93)		-0.0007, (-0.41)	
Wednesday	-0.0018, (-1.03)		-0.0018, (-1.14)		-0.0015, (-0.91)	
Thursday	-0.0013, (-0.76)		-0.0006, (-0.39)		-0.0012, (-0.70)	
Sum of 10 Lagged Volatilities	-0.3447, (2.24)	**	-0.3224, (3.13)	***	-0.3151, (3.01)	***
Sum of 10 Lagged Unex. Returns	-0.3018, (0.05)		-0.1768, (0.09)		-0.2836, (0.09)	
Durbin-Watson	2.0122		2.0096		2.0090	
Adjusted R^2	0.0130		0.0086		0.0012	

Net position is defined as long volume less short volume, and volume and net positions are decomposed into expected and unexpected components based on the AR (p) model, while volatility is estimated by using the Schwert volatility estimator obtained from Equation (3). Test statistics for individual coefficients are t statistics for the null hypothesis that the coefficient is zero. Test statistics for the sum of lagged volatilities and sum of lagged unexpected returns are F statistics for the null hypothesis that the sum of the coefficients of lagged volatilities and lagged unexpected returns is zero, respectively (Table 1).

Table 3. Overall trading activity and volatility.

Variables	ITC		Banks		Foreigners	
Intercept	0.004, (3.54)	***	0.006, (5.25)	***	0.0043, (3.96)	***
Expected volume	-1.14E-05, (0.52)		-3.93E-05, (-2.33)	**	-3.11E-05, (-0.85)	
Unexpected volume	7.37E-06, (0.61)		4.98E-05, (4.96)	***	1.28E-04, (9.39)	***
Expected open interest	3.83E-04, (2.66)	***	3.1E-05, (2.36)	**	4.95E_04, (3.36)	***
Unexpected open interest	1.85E-04, (3.77)	***	2E-05, (4.59)	***	3.42E-04, (6.78)	***
Expected net position	-5.80E-08, (-0.05)		3.86E-06, (0.85)		9.10E-07, (1.56)	
Unexpected net position	-3.83E-07,m (-1.96)	**	9.68E-07, (0.96)		-1.70E-07*, (-1.69)	
Day of the week dummy						
Monday	-0.0013, (-1.05)		-0.0006, (-0.48)		-0.0018, (-1.51)	
Tuesday	-0.0032, (-2.49)	**	-0.0031**, (-2.70)	**	-0.0037, (-2.98)	***
Wednesday	0.0005, (0.40)		-0.0002, (-0.16)		-0.0009, (-0.72)	
Thursday	-0.0006, (-0.47)		-0.0012, (-1.02)		-0.0007, (-0.54)	
Sum of 10 Lagged Volatilities	0.8032, (61.47)	***	0.6311, (71.22)	***	0.8164, (56.55)	***
Sum of 10 Lagged Unex. Returns	0.0380, (5.72)	***	-0.2723, (7.11)	***	-0.2868, (7.28)	***
Durbin-Watson	1.9969		2.0156		2.0316	
Adjusted R^2	0.2738		0.1546		0.3262	

Net position is defined as long volume less short volume, and volume and net positions are decomposed into expected and unexpected components based on the AR model, while volatility is estimated by using the Schwert volatility estimator obtained from Equation (3). Test statistics for individual coefficients are t statistics for the null hypothesis that the coefficient is zero. Test statistics for the sum of lagged volatilities and sum of lagged unexpected returns are F statistics for the null hypothesis that the sum of the coefficients of lagged volatilities and lagged unexpected returns is zero, respectively (See Table 1).

Estimation of conditional means and volatilities

The estimations of the conditional means of daily returns are shown in Table 2. According to this table, the independent variables have somewhat explanatory power for realized returns, with the largest adjusted R^2 (1%). Most of dummy variables are insignificant, however, both lagged unexpected returns and lagged volatilities are negative, but only the lagged volatilities are significant at level of 0.05. Bessembinder and Seguin (1993) indicate that volatility is positively related to trading volumes and find the impact of unexpected volume on volatility is greater than that of expected one. The net positions of speculators and small traders, on average, are positively associated with volatility, while there is a negative impact between an unexpected change in the net positions of hedgers and volatility.

Table 3 presents the results of regressing daily volatility

Table 4. Relationship between daily return volatility and trader positions

Variables	ITC		Banks		Foreigners	
Intercept	0.0042, (3.50)		0.0075, (5.74)	***	0.0035, (2.73)	***
Expected volume	1.10E-05, (0.49)		-4.03E-05, (-2.40)	**	-3.29E-05,m (-0.89)	
Unexpected volume	7.80E-06, (0.64)		4.08E-05, (4.79)	***	1.27E-04, (9.29)	***
Expected open interest	0.0004, (2.59)	***	2.79E-04, (2.13)	**	4.85E-04, (3.27)	***
Unexpected open interest	0.0002, (3.73)	***	1.93E-04, (4.30)	***	3.34E-04, (6.60)	***
Expected positions	-6.85E-08, (-0.05)		4.05E-06, (0.90)		9.06E-07, (1.55)	
Unexpected positions	-3.78E-07, (-1.94)	*	7.43E-07, (0.74)		-1.70E-07*, (-1.69)	
D× unexpected volume	0.0006, (0.61)		-0.0019, (-2.74)	***	-7.80E-04, (-1.03)	
D× unexpected positions	-0.0007, (-0.91)		-0.0003, (-0.49)		0.0019**, (2.31)	
Day of the week dummies						
Monday	-0.0013, (-1.04)		-0.0004, (-0.37)		-0.0017, (-1.42)	
Tuesday	-0.0032, (-2.50)	**	-0.0029, (-2.50)	**	-0.0036, (-2.91)	***
Wednesday	0.0004, (0.35)		-0.0003, (-0.24)		-0.0009, (-0.74)	
Thursday	-0.0006, (-0.50)		-0.0011, (-0.99)		-0.0008, (-0.67)	
Sum of 10 lagged volatilities	0.8032, (61.47)	***	0.6311, (71.22)	***	0.8164, (56.55)	***
Sum of 10 lagged unex. returns	0.0380, (5.72)	***	-0.2723, (7.11)	***	-0.2868, (7.28)	***
Durbin-Watson	1.9958		2.0205		2.0168	
Adjusted R^2	0.2733		0.1588		0.3289	

Allowing for the asymmetric activity.

$$\hat{\sigma}_t = \delta + \sum_{j=1}^{n} \omega_j \hat{U}_{t-j} + \sum_{i=1}^{4} \eta_i d_i + \sum_{j=1}^{n} \beta_j \hat{\sigma}_{t-j} + u_1 V^e_{t,k} + u_2 V^u_{t,k} + \theta V^u_{t,k} \times V^{dum} + u_3 OI^e_{t,k}$$

All trading activities, including trading volume and net positions, are decomposed into expected and unexpected components following the method of AR. Volatility is transferred by the Schwert estimator. Term D is a dummy variable that is equal to one for a positive shock and zero for a negative shock otherwise. Test statistics for each coefficient are t statistics for the hypothesis that the coefficient is zero. Test statistics for the sum of lagged volatilities and sum of lagged unexpected returns are F statistics for the null hypothesis that the sum of the coefficients of lagged volatilities and lagged unexpected returns is zero, respectively (See Table 1).

estimates on expected as well as unexpected overall trading activity variables. According to the results, we find a Tuesday effect, which is associated with volatility negatively in South Korea's currency markets. Our study further finds that the explanatory of both the sum of lagged volatilities as well as the sum of lagged returns for volatility is significant among three traders. The coefficients on expected volume are negative for all and there is an insignificant effect, with only the bank series displaying significance at 0.05 levels. For unexpected volume, they show the same signs, with a positive and significant relationship to volatility, other than the series of investment companies. Consistent with the results of Bessembinder and Seguin (1993), the coefficient on unexpected and expected trading volume is positive and significant, along with the coefficient estimate on expected and unexpected open interest. These results show that all of coefficients are significant positively at 0.05 levels. There is evidence that change in open interest facilitates market depth, and the MDH is supportive in South Korea's currency market.

The estimated coefficients on expected net positions are all positive, but all t-statistics are insignificant. In contrast, we find that the negative impacts in the net positions of each trader are associated with an increase in volatilities, while the coefficients of unexpected net positions are significant, except for banks. The coefficients of unexpected net positions on investment companies and foreigners are both negative, which means these two traders perform hedging strategies for the most of time. However, the coefficients on banks are negative, indicating that they usually have speculator positions. It is noted that the adjusted R^2 values on these three type investors are from 0.15 to 0.32, and the value for foreigners is the highest among the three traders.

Asymmetric model

Admati and Pfleiderer (1988) point out that market depth may depend on whether changes in volume to be expected or unexpected. They contend that markets should be deeper when trading volume is expected to be higher. Both positive and negative shocks may have different impacts on price volatilities. Table 4 explores whether positive and negative shocks of unexpected trading volume and net positions have varied impacts on volatility. The coefficients of activity series show the marginal impact effect is negative (u_2 , u_4), on the other hand, the positive marginal impact can be estimated from the sum of the coefficients of unexpected activity and product of unexpected activity in conjunction with activity dummy variables ($u_2 + \theta$, $u_4 + \chi$). If the absolute value of the interaction variable is greater than that for the unexpected variable, then the effect of a positive shock on volatility is greater than that of a negative effect. Our results from Table 3 indicate there is no significant effect on the interaction variable of unexpected volume (θ) except for the series of banks.

We also find the interaction variable of unexpected net positions to have significant explanatory power for the series of foreigners. The coefficient of unexpected volume is positive except for banks, and the coefficient for the unexpected volume is negative other than investment trust companies. Sum of the coefficients for unexpected volume and for the interaction variable, which represents the positive effect on volatility, is also negative except for investment companies.

This reflects that the effect of a positive shock on volatility is larger than a negative shock, but only significant in the series of banks. We briefly suggest that both positive and negative shocks in the volumes of the investment companies are associated with an increase in volatility.

In terms of the banks, both positive and negative shocks are related to a decrease in volatility. Finally, a positive shock upgrades the volatility, but a negative shock lowers the volatility. However, for the foreigners, the effect of a negative shock among the three traders is smaller than that of a positive shock.

We also observe the interaction variable of unexpected net positions (χ), since the coefficient estimates on unexpected net positions are all negative except the banks, and the coefficient estimates for the interaction variable are also negative except the foreigners. Hence, the sum of the coefficient estimates for unexpected net positions and that for the interaction variable are negative other than for the foreigners, but their absolute values are larger than the absolute value of the coefficient for unexpected net positions. Therefore, we conclude that the effect of a positive shock on volatility is greater than that of a negative shock.

This suggests that both a positive shock and a negative shock are associated with a decrease in volatility for the investment companies. In terms of the banks, a positive shock is related to a decrease in volatility and a negative shock is related to an increase in volatility. In the end, a positive shock upgrades the volatility and a negative shock lowers the volatility for the foreigners. As with the unexpected volume, the effect of a negative shock among three traders is smaller than that of a positive shock for the net positions of each trader, respectively.

Vector autoregression (VAR) models

Trading volume in futures and the spot won/ United States Dollar (USD) rate volatility

Here we examines the relationship between the spot Won/USD rate volatility, which is a proxy by GARCH model, and the USD futures trading volume, which is standardized by natural logarithm. This study defines trading volume as the proper measure capturing the speculative activities in the USD futures market. In addition, we also investigate the influence that past fluctuations of the Won/USD rate have on present volatility. The VAR results are in Tables 5 to 8. The most interesting finding that can be drawn is that when trading volume is used as the independent series and the volatility of the Won/USD rate is the dependent series, only the coefficients for all lag terms on the series of investment companies are positive and significant at 0.01 levels. It means that only the speculation of investment companies has a day-to-day destabilizing effect on the Won/USD rate market. On the contrary, under the inverse relationship for when the volatility of the Won/USD rate is used as the independent series and trading volume is the dependent series, we indicate there is one lag term with at least explanatory power that is significant for the variable of each trader's trading volume. The fourth lag's coefficient is positive and significant at 0.05 levels for the series of banks, and the second lag's coefficient is negative and significant simultaneously at 0.1 levels for the series of investment companies. Moreover, the first lag's coefficient is negative and significant, but the second lag's coefficient is positive and significant at least at the 0.1 levels instead.

Net positions in futures and the spot won/ United States Dollar (USD) rate volatility

The net positions we use as measures capture the hedge activities on USD futures in South Korea's currency markets. In order to further indicate the nature of the relationship between the trading activities of hedging and the volatility of the Won/USD rate, we employ the VAR models. The most interesting findings are obtained when the net positions are used as the independent series in the VAR models, and the volatilities of the Won/USD rate, proxied by GARCH (1,1), are used as the dependent series in the VAR models. Through such a model we examine the impact of the lagged values of net positions on the volatility of the Won/USD, showing the stabilizing and destabilizing effects that traders have on the exchange rate volatility. Among the three traders' series, only significant lags are obtained in the banks' series which are found to destabilize the Won/USD rate volatility at three lagged times, indicating that an increased number of net positions on the last three trading days with larger volatility.

Table 5. VAR results with volume and estimator of WON/USD rate by Garch.

Independent variables	Lag	Dependent variables			Dependent variables		
		Won/USD rate garch	t-value		Volume	t-value	
			Panel A: banks				
Won/USD Rate	-1	0.077	2.70	***	-3155.893	-1.09	
	-2	0.044	1.56	**	3358.98	1.17	
	-3	-0.194	-6.87	***	-3336.618	-1.16	
	-4	-0.015	-0.54		5281.646	1.81	**
Volume	−1	-6.99E-09	-0.03		-0.579	-20.50	***
	−2	-2.11E-07	-0.68		-0.415	-13.13	***
	-3	-2.60E-07	-0.84		-0.303	-9.59	***
	-4	-1.21E-07	-0.43		-0.143	-5.09	***
			Panel B: Investment trust companies				
Won/USD Rate	−1	0.076	2.71	***	-1792.910	-0.70	
	−2	0.045	1.62	*	-3919.197	-1.52	*
	-3	-0.188	-6.70	***	3211.495	1.24	
Volume	−1	7.39E-07	2.41	***	-0.459	-16.45	***
	−2	9.41E-07	2.92	***	-0.299	-10.10	***
	-3	8.29E-07	2.73	***	-0.212	-7.60	***
			Panel C: foreigners				
Won/USD Rate	−1	0.080	2.87	***	-3176.045	-1.36	*
	−2	0.044	1.58	*	4990.350	2.13	***
	−3	-0.196	-6.97	***	-1086.863	-0.46	
Volume	−1	2.57E-07	0.76		-0.269	-9.60	***
	−2	-1.01E-07	-0.29		-0.147	-5.13	***
	−3	-4.51E-08	-0.13		-0.189	-6.77	***

See Table 1.

When we take volatility as an independent series and the trading activities of net positions as a dependent series, then according to the results from Table 6, only the second to fourth lags are jointly significant, while the second and the third lags are positive to the net positions of investment companies, but the fourth lag is negatively associated with it. The findings show that in the period of the last three trading days the volatility of the Won/USD rate increases, and the net positions of investment companies indeed diminish. However, the net positions of investment companies are positively to the volatility of the Won/USD rate on the last four days. For the remaining series, no evidence is found that Won/USD volatility significantly affects the net positions of USD futures.

The last important question, as far as the Won/USE rate is concerned and which could be obtained from VAR models, is whether the present Won/USD rate depends on the volatility in the days before. For the three traders' series, there exists a strong and positive relationship between the last two trading days' volatility and the volatility at the present time (t=0). This means that volatility increases two days before or the previous day which are followed by an intensified volatility today. Moreover, for both the series of banks and foreigners, the level of the volatilities at lag three days negatively and significantly influences the present time, while the level of volatility at lag three and four days is also associated negatively and significantly with the present time for the series of investment companies.

Trading volume in futures and the United States Dollar (USD) futures return volatility

Table 7 represents the results from the VAR models testing the relationship between the trading volume in the three traders' series and volatility of the USD futures returns. When trading volume of USD futures is used as the independent series and volatiles of futures return are the dependent series, only the coefficients for lagged volume are individually significant for all lags for the

Table 6. VAR results with net positions and estimator of WON/USD rate by garch.

Independent variables	Lag	Dependent variables			Dependent variables		
		USD futures return garch	t-value		Volume	t-value	
			Panel A: banks				
Won/USD Rate	-1	0.082	2.93	***	2512.093	0.09	
	-2	0.043	1.52	*	-2254.647	-0.08	
	-3	-0.194	-6.90	***	-14274.22	-0.50	
Net Positions	−1	1.50E-08	0.38		-0.115	-4.06	***
	−2	-1.21E-08	-0.43		-0.103	-3.63	***
	-3	6.06E-08	2.17	**	-0.114	-4.01	***
			Panel B: investment trust companies				
Won/USD Rate	−1	0.077	2.70	***	136791.5	0.85	
	−2	0.046	1.63	*	-221745.3	-1.40	*
	-3	-0.192	-6.80	***	-204558.0	-1.29	*
	-4	-0.0161	-0.56		564037.6	3.50	***
Net Positions	−1	5.10E-09	1.00		-0.103	-3.63	***
	−2	-1.48E-09	-0.29		-0.036	-1.25	
	-3	-6.20E-09	-1.22		-0.033	-1.16	
	-4	3.40E-09	0.67		-0.006	-0.22	
			Panel C: foreigners				
Won/USD Rate	−1	0.078	2.86	***	-219578.0	-0.71	
	−2	0.043	1.53	*	-678758.9	-2.18	***
	−3	-0.196	-6.97	***	-689430.8	-2.21	***
Net Positions	−1	-1.38E-09	-0.54		-0.162	-5.69	***
	−2	-2.09E-09	-0.81		-0.054	-1.87	**
	−3	-1.92E-09	-0.75		-0.062	-2.17	***

See Table 1.

series of investment companies, except the first lag. For the series of banks and foreigners, we indicate there is no significant lag impact of trading volume on the volatility of USD futures returns. However, as far as the series of investment companies are concerned, all lags are positive, implying that this positive relationship between volume and the volatility exists for consecutive days (t=-2, -3, -4). Therefore, it can be concluded that the three traders in USD futures markets have no immediate (day to day) destabilizing effect on the variability of USD futures returns.

In order to investigate the inverse relationship, trading volume of USD futures is used as the dependent series while the GARCH estimation of USD futures returns are the independent series. The result shows that some lags of volatility can be said to affect trading volume. For the series of banks, all lags are positive significantly except the fourth lag, while the second lag has a significant impact on the trading volume of investment companies. In the end, only the coefficient of the first lag is positively significant for the series of foreigners. In brief conclusion, we find all significant lags of the individual effect of the increase in volatility do stimulate trading volume. It is definitely worth noticing, that the impact of the first lag volatility (yesterday) is much higher than the impact of the lags of higher order (days before yesterday) for the series of banks.

To examine whether today's volatility of the USD futures markets depends on the volatility in the past or not, lagged values of USD futures returns volatility are treated as the independent series, while today's volatility is the dependent series. We indicate that only the

Table 7. VAR Results with volumes and estimator of USD futures return by garch.

Independent variables	Lag	Dependent variables			Dependent variables		
		USD futures return garch	t-value		Volume	t-value	
			Panel A: banks				
USD futures return	-1	-0.026	-0.91		41578.35	8.49	***
	-2	-0.010	-0.34		10040.25	2.00	**
	-3	0.025	0.85		7443.879	1.48	*
	-4	-0.074	-2.54	***	-1550.37	-0.31	
Volumes	−1	4.66E-08	0.28		-0.592	-20.95	***
	−2	7.10E-08	0.39		-0.426	-13.47	***
	-3	2.95E-07	1.60		-0.309	-9.77	***
	-4	1.62E-07	1.01		-0.152	-5.50	***
			Panel B: investment trust companies				
USD futures return	−1	-0.0269	-0.94		3073.711	0.69	
	−2	-0.0083	-0.29		8879.265	1.98	**
	-3	0.0257	0.90		1160.663	0.26	
	-4	-0.0649	-2.27	***	-583.041	-0.13	
Volumes	−1	1.98E-07	1.10		-0.491	-17.33	***
	−2	3.12E-07	1.61	*	-0.343	-11.23	***
	-3	3.75E-07	1.94	**	-0.284	-9.32	***
	-4	2.93E-07	1.63	*	-0.150	-5.30	***
			Panel C: foreigners				
USD futures return	−1	-0.0263	-0.92		26978.15	6.67	***
	−2	-0.0125	-0.43		4273.283	1.04	
	−3	0.0319	1.10		-1026.039	-0.25	
Volumes	−1	1.42E-07	0.71		-0.276	-9.83	***
	−2	-1.08E-07	-0.53		-0.150	-5.21	***
	−3	2.48E-07	1.27		-0.185	-6.73	***

See Table 1.

coefficients of the fourth lags for both series of banks and investment companies are found to individually, significantly affect the volatility at present time (t=0), and hence for the series of banks and investment companies. We interpret this by saying that their volatilities in USD futures markets from four days ago have a negative effect on the volatiles today.

Net positions in futures and the USD futures return volatility

When the net positions are treated as the independent series in the VAR models and the futures volatility is the dependent series, the results show that only the series of investment companies have a destabilizing effect on the volatility for the first lag and second lag. This implies that an increase in the number of net positions in the near past (yesterday and two days ago) causes increased volatility in USD futures markets at the present time (t=0).

When the net positions are used as the dependent series, which are explained by lagged futures volatility, for the series of banks we indicate that the coefficients of first lag and second lag are both negative and related significantly to the net positions, suggesting that increased volatility in the USD futures markets yesterday and two days ago results in decreased futures contracts today. Therefore, it can be concluded that banks' net positions have a stabilizing effect on the variability of futures volatility. On the other hand, we also investigate that the coefficient of the first lag is positively significant, but the second lag is negatively significant for the series of foreigners, implying that an increase in volatility yesterday causes lower net positions today in USD futures markets. If the volatility in USD futures markets increases two days ago, then it can be expected that the

Table 8. VAR Results with net positions and estimator of USD futures return by garch.

Independent variables	Lag	Dependent Variables			Dependent variables		
		USD futures return garch	t-value		Net positions	t-value	
		Panel A: Banks					
USD futures return	-1	-0.0283	-0.99		-363731.1	-7.40	***
	-2	-0.0047	-0.16		-137767.5	-2.74	***
Net positions	−1	1.01E-08	0.62		-0.115	-4.07	***
	−2	-2.19E-09	-0.14		-0.085	-3.08	***
		Panel B: Investment Trust Companies					
USD futures return	−1	-0.0296	-1.04		338428.2	1.22	
	−2	-0.0101	-0.36		123980.1	0.45	
Net Positions	−1	3.85E-09	1.32	*	-0.102	-3.59	***
	−2	3.95E-09	1.35	*	-0.036	-1.28	
		Panel C: Foreigners					
USD futures return	−1	-0.0277	-0.96		-6192649.0	-12.02	***
	−2	-0.0149	-0.49		2600352.2	4.77	***
	−3	0.0393	1.29	*	-4421.895	-0.01	
Net positions	−1	-1.22E-09	-0.77		-0.113	-3.96	***
	−2	1.13E-09	0.72		-0.047	-1.67	**
	−3	4.76E-10	0.32		-0.052	-1.96	**

See Table 1.

net positions of foreigners increase today.

Only the series of foreigners show that the present futures volatility depends on its past volatility. An individually significant and positive coefficient is found for the third lag in the series of foreigners. This result shows that increased volatility in USD futures markets three days ago has a positive impact on volatility in the futures markets at the present time (t=0).

Granger causality

In order to determine the lead-lag (causal) relationship, we employ the method of Granger Causality, which is a proper technique to more rigorously examine if there is any causation between variables.

Trading activities and the spot Won/USD rate volatility

Table 9 displays the results from the Granger Causality test for the Won/USD rate volatility, which is proxied by GARCH. We also focus on the different measures of the trading activities, including trading volume and the net positions. The results of the Granger Causality test reveal that three sets of significant uni-directional (one-way) causality exist: volume Granger causes Won/USD rate GARCH and Won/USD rate GARCH, Granger causes net positions for investment trust companies; and Won/USD rate GARCH Granger causes net positions for foreigners.

The results prove for the series of investment companies that the trading volume for investment companies has a significant impact on Won/USD rate volatility, but there is no evidence that the changes in the Won/USD rate influence the level of the trading volume for any series. Therefore, it can be concluded that, there does not exist a bi-directional causal relationship between trading activities in trading volume and the Won/USD rate in USD spot currency markets. As far as the net positions of each trader are concerned, it is found that the fluctuation of the Won/USD rate actually influences the level of the net positions for both investment companies and foreigners. However, there is no evidence to explain the opposite relation between Won/USD rate volatility and the net positions of each trader, such that changes in net positions cause the level of volatility in USD spot currency markets.

Trading activities and the USD futures return volatility

A similar test is employed to examine the relationship

Table 9. Results of granger causality test for Won/USD rate market.

Null hypothesis	F-statistics	
Panel A: Banks		
Volume does not granger cause Won/USD rate garch	0.2349	
Won/USD rate garch does not granger cause volume	1.9247	
Net positions do not granger cause WON/USD rate garch	1.7365	
Won/USD rate garch does not granger cause net positions	0.0896	
Panel B: investment trust companies		
Volume does not granger cause Won/USD rate garch	4.3622	***
Won/USD rate garch does not granger cause volume	1.4007	
Net positions do not granger cause WON/USD rate garch	0.8179	
Won/USD rate garch does not granger cause net positions	3.7658	***
Panel C: foreigners		
Volume does not granger cause Won/USD rate garch	0.2783	
Won/USD rate garch does not granger cause volume	2.0418	
Net positions do not granger cause Won/USD rate garch	0.4067	
Won/USD rate garch does not granger cause net positions	3.7444	***

See Table 1.

Table 10. Results of granger causality test for Won/USD futures market.

Null hypothesis	F-statistics	
Panel A: Banks		
Volume does not Granger Cause USD futures return GARCH	0.7343	
USD futures return GARCH does not Granger Cause volume	19.3453	***
Net positions do not Granger Cause USD futures return GARCH	0.2093	
USD futures return GARCH does not Granger Cause net positions	30.7028	***
Panel B: Investment Trust Companies		
Volume does not Granger Cause USD futures return GARCH	1.2822	
USD futures return GARCH does not Granger Cause volume	1.0942	
Net positions do not Granger Cause USD futures return GARCH	1.6300	
USD futures return GARCH does not Granger Cause net positions	0.8228	
Panel C: Foreigners		
Volume does not Granger Cause USD futures return GARCH	1.0137	
USD futures return GARCH does not Granger Cause volume	15.1191	***
Net positions do not Granger Cause USD futures return GARCH	0.4339	
USD futures return GARCH does not Granger Cause net positions	56.9740	***

See Table 1.

between trading activities and the USD futures return volatility in terms of the three traders. The results of the Granger Causality test are shown in Table 10 that uni-directional causality between variables exist: USD futures return GARCH Granger causes volume and net positions for both banks and foreigners. However, there is no significant lead-lag (causal) relationship found in reverse order. As far as the activities of trading volume and net positions are concerned, the main findings suggest that USD futures play a significant role to impact the trading activities for both banks and foreigners.

To sum up, the results from Granger Causality tests prove that there does not exist bi-directional causal relationship between trading activities and volatilities for both the Won/USD rate as well as USD futures return in South Korea’s futures markets.

SUMMARY AND CONCLUSIONS

The purpose of this paper is to investigate the effect of trading activities by type of major traders on return volatility in South Korea's USD futures markets, over the period of January 2, 2004 through December 30, 2008. Consistent with the mixture of distribution hypothesis, the principal finding in this paper is that an unexpected change (in either direction) in trading volume of both banks and foreigners is, on average, positively associated with volatility. In addition, unexpected open interest is also associated positively with market volatility for all three major traders. Regarding the asymmetric effect, only the banks' trading volume and foreigners' net positions are asymmetric on volatility direction. In spot markets, it is found that there exists a causal relationship in terms of investment trust companies and foreigners. It is also found that all lags of series of the investment trust companies have a significant and positive impact on the volatility of the Won/USD rate, which is consistent with the result of Granger Causality. Therefore, we conclude that the trading volume of investment trust companies has a day-to-day destabilizing effect on the volatility of the Won/USD rate. Moreover, regarding the relationship between net positions and Won/USD rate volatility, there exist a strong relationship between the net positions of both investment trust companies and foreigners and Won/USD rate volatility. It seems the fluctuation of the Won/USD rate may influence the net positions of investment trust companies and foreigners hold.

On the other hand, for futures markets we discover there are causal relationships in both banks and foreigners. According to the dispersion of beliefs models and noise trading theories, investment trust companies appear to be uninformed in USD futures markets. In contrast, banks and foreigners likely possess certain private information. It is not surprising that both banks and foreigners hold such private information, because they also have substantial cash transactions and potentially benefit from economies of scale in information gathering than investment trust companies. For the relationship between trading activities and USD futures return, the result shows there is no bi-directional causal relationship in the three traders' series. Briefly speaking, any trader in currency markets has no absolute impact on the change of USD futures return, which means the return, is mainly decided by the market mechanism.

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