

Foreign exchange intervention and foreign exchange market development in Korea

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1. Foreign exchange market intervention in Korea

1.1 Foreign exchange system

Over two or three decades, the Korean exchange rate system has been shifted from a fixed to a flexible one. From March 1990, Korea adopted a market average exchange rate system, a form of managed floating exchange rate system. Under this system, the daily exchange rate movements were limited within certain bands.¹ After the currency crisis, Korea changed to a floating exchange rate system in December 1997. In principle, the exchange rate in this system is supposed to be determined by the interaction of foreign exchange supply and demand in the foreign exchange market. Along with this change in the exchange rate system, inflation targeting was chosen as Korea's monetary policy framework.

The objectives of exchange rate operations have changed as the exchange rate system has. Under the managed floating system, the objectives mostly lay in achieving current account equilibrium or maintaining real effective exchange rate stabilisation. Since the adoption of the floating exchange rate system, however, major emphasis is now laid on attaining foreign exchange market stabilisation through alleviating excessive short-term exchange rate volatility. This is partly because under an inflation targeting system achieving the inflation rate target and exchange rate target simultaneously is very difficult. Furthermore, the exchange rate now serves as an information, rather than a policy variable.

There are two administrative bodies involved in Korean exchange rate operations: the Ministry of Finance and Economy (MOFE) and the Bank of Korea (BOK). According to the Foreign Exchange Transaction Act (FETA) and the Bank of Korea Act, the MOFE and the BOK are to serve in partnership as the exchange rate administrative body. The FETA states that the Minister of the MOFE has overall responsibility for foreign exchange policy, including exchange rate operations. The Bank of Korea Act stipulates that the BOK also formulates foreign exchange policy, in cooperation with the MOFE. That is, the BOK is authorised to supervise the money changers and foreign exchange brokers, as well as to oversee foreign exchange transactions, and it endeavours to develop the foreign exchange market as a member of the Seoul foreign exchange market committee.²

The MOFE established the foreign exchange stabilisation fund in March 1967 and has managed it for the purpose of achieving foreign exchange market stability. As legal administrator of the foreign exchange stabilisation fund, the Minister of the MOFE makes overall decisions concerning the means of funding and the operation of the fund.³ However, the actual operation details and ordinary management of the fund are delegated to the Governor of the BOK. The Bank of Korea, as the central bank, holds and manages the nation's international reserves, composed of the foreign exchange stabilisation fund and the BOK's own reserves, and is also in charge of implementing foreign exchange market intervention operations in consultation with the MOFE.

¹ The daily bands were initially set at $\pm 0.4\%$ from the average rate of the previous day. They were widened gradually as follows: $\pm 0.6\%$ (Sep 1991) \rightarrow $\pm 0.8\%$ (Jul 1992) \rightarrow $\pm 1.0\%$ (Oct 1993) \rightarrow $\pm 1.5\%$ (Nov 1994) \rightarrow $\pm 2.25\%$ (Dec 1995) \rightarrow $\pm 10.0\%$ (20 Nov 1997).

² The Seoul foreign exchange market committee was initially established in 1989 as a self-regulating body for consultation among market participants. It established the Seoul code of conduct in December 2001 to promote efficient market practices, to ensure fair competition and relationships between market participants, and to minimise disputes between counterparties.

³ Issuance of foreign exchange stabilisation bonds is used as a main instrument for funding.

1.2 Foreign exchange market intervention

Foreign exchange market intervention has been used as a main instrument in achieving foreign exchange market stabilisation in Korea. As is also the case in other countries with floating exchange rate systems, the objective of foreign exchange intervention in Korea is to (i) mitigate short-term exchange rate volatility, (ii) stabilise the foreign exchange market, (iii) pre-empt speculative attacks, and iv) acquire foreign reserves, rather than to maintain a certain exchange rate target. In fact, it is true that with its thin foreign exchange market Korea faces the possibility of severe exchange rate volatility caused by various external shocks, due to changes in the global economic environment and even geopolitical risks surrounding the Korean Peninsula. In addition, the Korean foreign exchange authorities have also played the role of market maker through intervention by supplying sufficient liquidity in the market and filling the gaps between bids and offers in the market. After the currency crisis in 1997, intervention was, unusually, utilised to increase international reserves in order to enhance Korea's credit rating and avoid the possibility of additional crisis.

As for the intervention tools, verbal intervention by the authorities (MOFE and BOK) and real intervention in the spot market are typically used. Verbal intervention is used to facilitate foreign exchange market stability beforehand or to give speculative forces a warning by conveying the authorities' concerns and intention related to exchange rate movements. However, intervention in the forward market has been employed as rarely as possible, except during the currency crisis period and in the second half of last year, when there was severe speculative trading in the off-shore non-deliverable forwards (NDF) market. In fact, intervention in the NDF market should be done cautiously: intervention operations could become all too frequent since the settlement for intervention is not needed immediately, and the effect of intervention on the exchange rate at maturity would then be the opposite of what was initially intended.

The decision of when and how much to intervene in the market depends on the authorities' discretionary judgment, rather than on any implicit rule. Many elements, such as the strength and nature of the external shock, the movements of market indices, market sentiments and the volume of funds available, are all taken into account in making the discretionary decision. To that end, the BOK monitors exchange rate developments and the foreign exchange market situation on a real-time basis, through incessant contacts with dealers and analysis of various reports from the banks.⁴

In determining the best timing for intervention, the authorities consider the degree of exchange rate misalignment and the permanency of the market distortion. Exchange rate misalignment should not, however, be a strict yardstick for deciding when to intervene at least in the short time horizon, since each method of calculating the equilibrium exchange rate has its own advantages and disadvantages. Furthermore, under the free floating exchange rate system the exchange rate produced by foreign exchange market forces could be regarded as an equilibrium exchange rate in a market behavioural sense. Meanwhile, the magnitude of intervention depends on market participants' order flows, the risk premium and market expectations. The BOK recognises that the effects of identical intervention amounts may differ depending on market participants' expectations.

To gauge the scope of foreign exchange market instability, the following market indices are employed: (i) the pace of exchange rate change, (ii) the magnitude of exchange rate volatility, (iii) the bid-offer spread, (iv) the transaction volume. However, even if foreign exchange market instability does appear, other factors are also broadly considered before intervention is executed, including the source of economic disturbances, the duration of the shock, compatibility of intervention with the current macroeconomic policy, and the availability of intervention resources.

The Bank of Korea intervenes in the market through agents selected among major banks. In doing this, the BOK imposes a confidentiality requirement on these agent banks, to maintain secrecy concerning intervention. As for the criteria used to select the agent banks, priority is given to institutions with the following characteristics: no danger of default risk, ability to provide the BOK with instant market information, and active roles as market makers. Even though these agents trade in the market to meet the intervention goals, the decision-making procedure is, of course, carried out by the BOK, in consultation with the MOFE.

⁴ Since April 1999, the Bank of Korea has managed and operated a foreign exchange information system to closely monitor foreign exchange transactions.

Like other countries, Korea sterilises changes in its domestic money supply brought about by foreign exchange market intervention. The major sterilisation instrument for the BOK is issuance or withdrawal of monetary stabilisation bonds (MSBs).⁵ In some instances, the government has shared the burden of managing the money aggregates by using the foreign exchange stabilisation fund after intervention by the BOK. In the case of the MOFE's intervention in the market using the foreign exchange stabilisation fund, sterilisation by BOK issuance of MSBs is not necessarily required since the money supply does not change.⁶

Despite the absence of any effect of money supply changes on the exchange rate, sterilised intervention is known to be effective in the short run through the signalling channel, the portfolio balance channel and the noise trading channel. Among these, the signalling channel is believed to be most effective in Korea, since the credibility of the central bank, a key element in intervention effectiveness, is considered to be good. In addition, the liquidity effect in the foreign exchange market seems to be significant because of the large scale of intervention relative to market turnover in Korea's thin foreign exchange market.

In principle, the Korean authorities have maintained secrecy regarding foreign exchange intervention. While it necessitates a loss of transparency in exchange rate operations, the secrecy principle aims to achieve the positive effects of avoiding superfluous controversy over the validity of intervention, inducing autonomous exchange rate adjustments through market participants' trading, and preventing speculative forces from benefiting from the relevant information. Another consideration is the fact that most countries, with the exception of some developed countries, do not disclose the details of their interventions.

2. Recent exchange rate and foreign exchange market development

2.1 Exchange rate operation since adoption of free floating system

Since Korea's adoption of the free floating exchange rate system in December 1997, evaluation of its exchange rate operations has shown that on the whole application of market mechanisms to exchange rate determination has been enhanced in comparison to previous periods. On the other hand, some economists have expressed negative views on the policy perspective behind exchange rate operations, arguing that the authorities still have a fear of floating for sharp exchange rate fluctuations. As rationale for this argument, they point to (i) the increase in international reserves due to foreign exchange intervention, (ii) the limited extent of exchange rate volatility, (iii) suspicions that the Korean authorities target a certain level of exchange rate for assuring export price competitiveness.

Notwithstanding these arguments, it is clear that the authorities in Korea have maintained the principle that the exchange rate should be determined in the market by interaction of the demand for and supply of foreign exchange. Foreign exchange market intervention is implemented not to target a certain level but to smooth radical changes in the exchange rate when there is a transient external shock or a bid-offer gap due to one-sided exchange rate expectations.

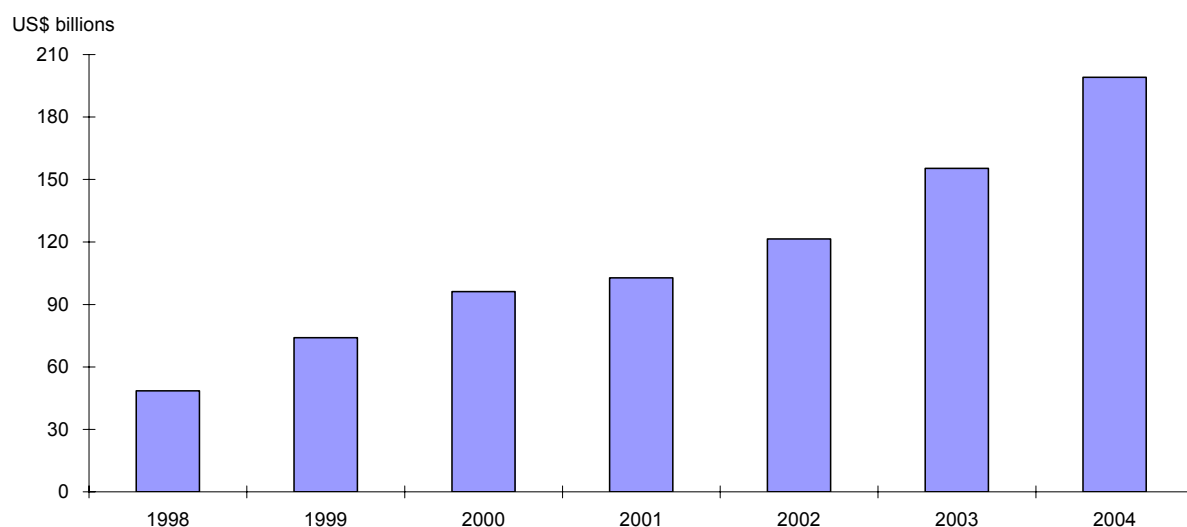
As for the first rationale behind the pessimistic views, it is true that the international reserves of Korea have been increased rapidly, from US\$ 48.5 billion at the end of 1998 to US\$ 199.1 billion at the end of 2004. Nonetheless, in addition to the foreign exchange market intervention, this increase is also largely attributable to the issuance of Foreign Exchange Stabilisation Bonds (US dollar-denominated) by the Korean government, the withdrawal of foreign exchange deposits from commercial banks, and the interest earnings accrued from international reserve management.

⁵ MSBs are issued and circulated based on the Bank of Korea Act and the Monetary Stabilisation Bond Act, to control the monetary aggregates.

⁶ FESF is financed by issuing foreign exchange stabilization bonds for the purpose of foreign exchange market stabilisation. MOFE needs permission from the Congress in the process of issuing the bonds because it affects the fiscal balance of the government.

Trends of international reserves

(End of period)



With regard to the second claim, the fact of the matter is that won/dollar exchange rate volatility has increased significantly since adoption of the free floating system. That is, the daily ex post volatilities measured by the differences between each day's and each previous day's closing rates and between the daily highs and lows have both more than doubled compared to the period before introduction of the free floating system.

Trends of daily won/dollar exchange rate volatility

(Period average)

(%)

	Before free floating system ^{1, 3}	After free floating system ^{2, 3}	1998	1999	2000	2001	2002	2003	2004
			Apr - Dec						
Day-on-day percentage change ⁴	0.16	0.36	0.70	0.29	0.28	0.37	0.31	0.29	0.30
Daily percentage change ⁵	0.26	0.59	1.22	0.57	0.46	0.52	0.50	0.45	0.40

¹ 3.1.1995 - 31.10.1997. ² 1.4.1998 - 30.9.2004. ³ Excluding the currency crisis period (1.11.1997-31.3.1998). ⁴ Averaged absolute value of (each day's closing rate - previous day's closing rate)/previous day's closing rate. ⁵ Average of (daily high - daily low)/each day's average rate.

Thirdly, the assertion that the Korean authorities have actively intervened in the market to target an exchange rate sustainable for maintaining price competitiveness is not unambiguous. The nominal effective exchange rate (NEER) indexes show that since 1998 changes in yearly averages have been widening to 5.3%, from 2.0% during the periods before the currency crisis. In 2003 and 2004, the figures represent a stable pattern, implying that the Korean won has kept pace with the movements of other currencies. Similarly, the yearly changes in the real effective exchange rate (REER) indexes have also increased since adoption of the free floating system, while the won has appreciated a bit compared to other currencies since 2002. These figures may imply that the won has not been operated for the purpose of targeting a specific exchange rate level, but that its value has instead been determined in the market, reflecting the global trends of major currencies.

Trends of NEER and REER

(Period average)

(%)

	Before free floating system ^{1,3}				After free floating system ^{2,3}							
		1995	1996	1997 Jan-Oct		1998 Apr-Dec	1999	2000	2001	2002	2003	2004 Jan-Aug
NEER	2.04	0.8	0.2	-4.9	5.34	-18.5	2.6	6.6	-5.9	2.8	-0.3	0.3
REER ⁵	2.34	1.0	1.6	-4.3	5.24	-17.0	2.8	7.6	-3.5	3.4	0.9	1.4

¹ Jan 1995 - Oct 1997. ² Apr 1998 - Aug 2004. ³ Excluding the currency crisis period (Nov 1997 - Mar 1998). ⁴ Figures represent the averages of the absolute values of the yearly appreciation(+) or depreciation(-) ratios. ⁵ CPI-weighted.

2.2 Foreign exchange transaction trends

The daily average turnover of total foreign exchange transactions in the inter-bank and customer markets amounted to US\$ 20.4 billion in the second quarter of 2004, more than double the figure of US\$ 9.2 billion in 2001. The proportion of spot transactions has declined from 58 % to 47 %, while those of forwards, foreign exchange swaps and foreign exchange derivatives have increased.

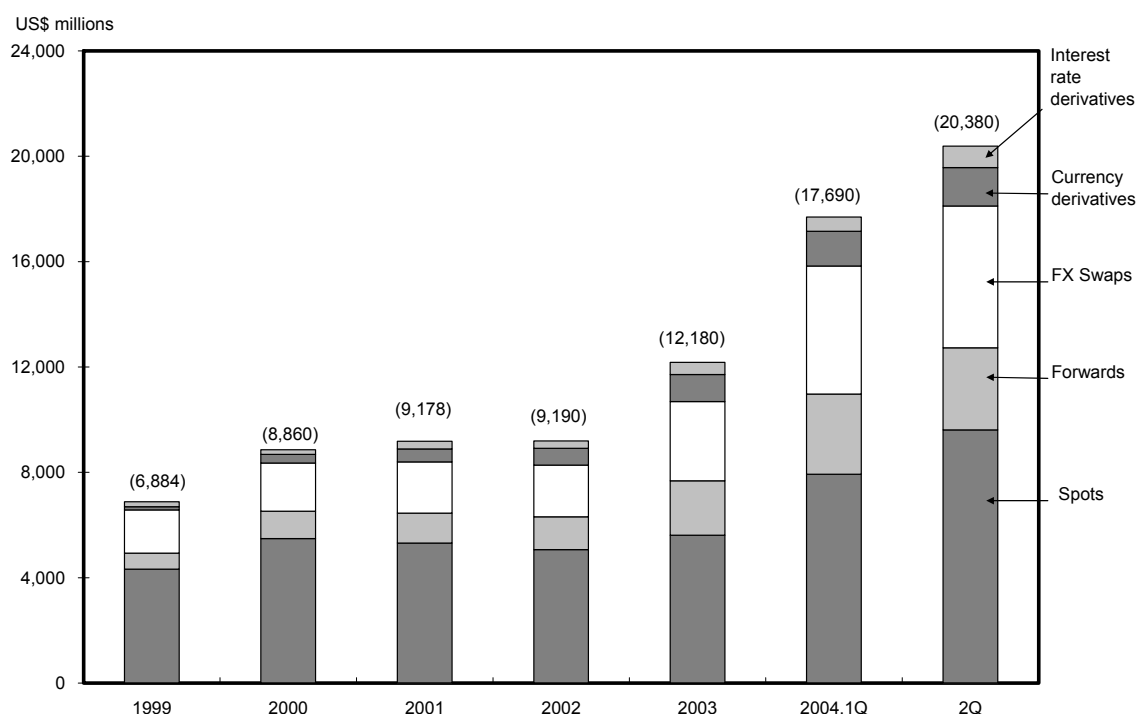
Foreign exchange turnover

(Daily average)

(US\$ 100 m)

	1999	2000	2001	2002	2003	2004	
						1/4	2/4
Spots	43.3	54.9	53.2	50.7	56.1	79.3	96.1
Forwards	6.0	10.4	11.3	12.5	20.7	30.4	31.2
FX swaps	16.5	18.3	19.5	19.6	30.1	48.6	53.8
Traditional FX transactions (A)	65.8	83.5	84.0	82.8	106.9	158.3	181.1
Currency derivatives	1.2	3.3	4.9	6.4	10.2	13.2	14.6
Interest rate derivatives	1.9	1.8	2.9	2.8	4.7	5.4	8.1
FX derivatives (B) ¹	3.0	5.1	7.8	9.1	14.9	18.6	22.7
Total (A + B)	68.8	88.6	91.8	91.9	121.8	176.9	203.8

¹ Equity and credit-related derivatives excluded.



This indicates that the Korean foreign exchange market has been developed in terms not only of its quantity, but also of its quality.⁷ Furthermore, this is mainly attributable to the increase in economic entities' transactions for the purpose of hedging under influence of the authorities' efforts to heighten market functioning of the exchange rate since adoption of the free floating system.

2.3 Determinants of the won/dollar exchange rate

The movement of the won exchange rate against the US dollar is basically influenced by foreign exchange flows including the current account balance, which has shown a surplus since 1998, and foreign portfolio investment in the Korean equity and bond markets. Recently, however, it has been greatly affected by external factors such as the movement of the Japanese yen due to the global trend of the US dollar, and off-shore NDF transactions by non-residents.

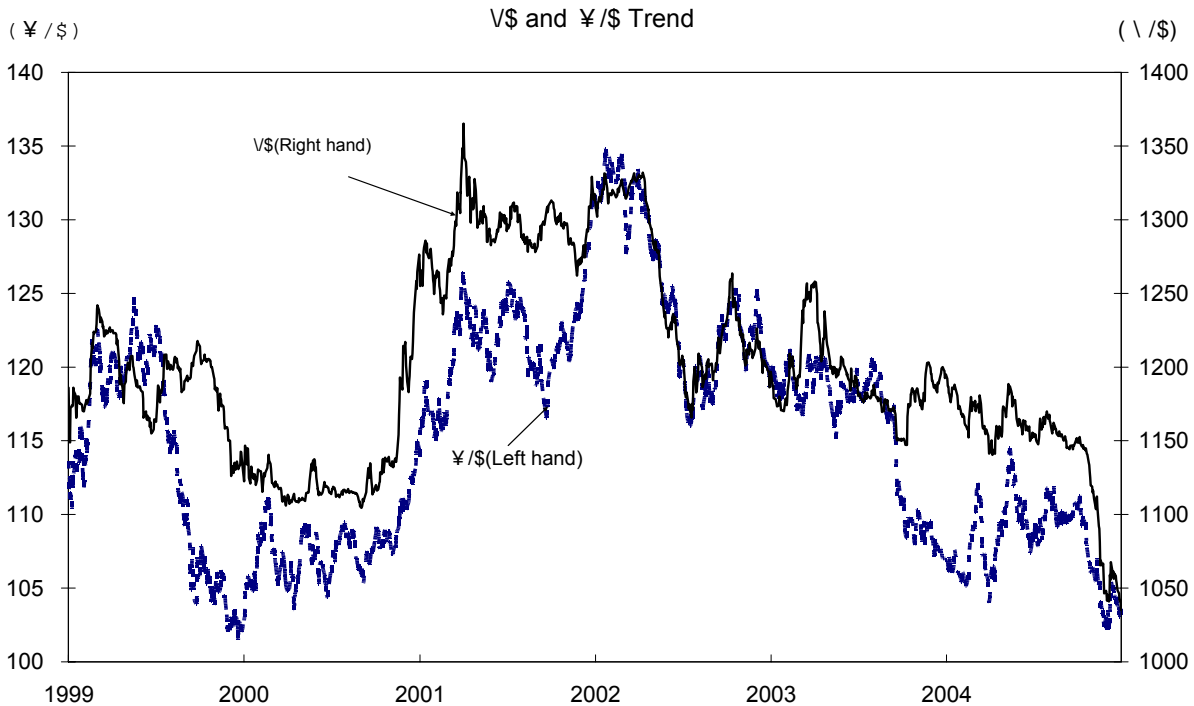
The recent movements of the won/dollar exchange rate have shown a pattern of synchronisation with the fluctuations of the yen against the dollar. This is mainly due to strong market participants' expectations that the won will trace the yen, in light of the intense export competition between Korea and Japan. Looking at the correlation coefficients between the two exchange rates, the co-movement turned out to be particularly noticeable in 2002 and in 2004.

Correlation coefficient between won and yen exchange rate

2000	2001	2002	2003	2004
0.20	0.35	0.77	0.39	0.80

Note: Period average of monthly figures which are calculated using daily data.

⁷ The ratio of the total daily turnover to nominal GDP has increased from 1.2% in 1998 to 3.3% in 2004, while the ratio of the daily turnover to trade has changed from 1.8% in 1998 to 5.4% in 2004.



Considering the intense export competition between the two countries, the won's exchange rate against the Japanese yen is obviously important. In this regard, before the currency crisis period the strengthening of the US dollar (and consequent weakening of the yen) caused an accompanying appreciation of the won and thus impaired Korea's export competitiveness. In contrast, the recent synchronised pattern of the won and yen exchange rate has mitigated the loss of Korean export competitiveness since the strong dollar results in weakening of the yen and won simultaneously (see Annex 1).

In tandem with the movements of the yen, off-shore NDF transactions are also crucial in determining the won/dollar exchange rate. NDF transactions between Korean foreign exchange banks and non-residents have been sharply increasing since they were first allowed in April 1999 as a part of foreign exchange liberalisation in Korea. For example, the daily turnover of NDF transactions between Korean foreign exchange banks and non-residents for the purpose of hedging and speculative demand has increased from US\$ 0.4 billion in 2000 to US\$ 1.5 billion in the third quarter of 2004.

Daily turnover of NDF transactions

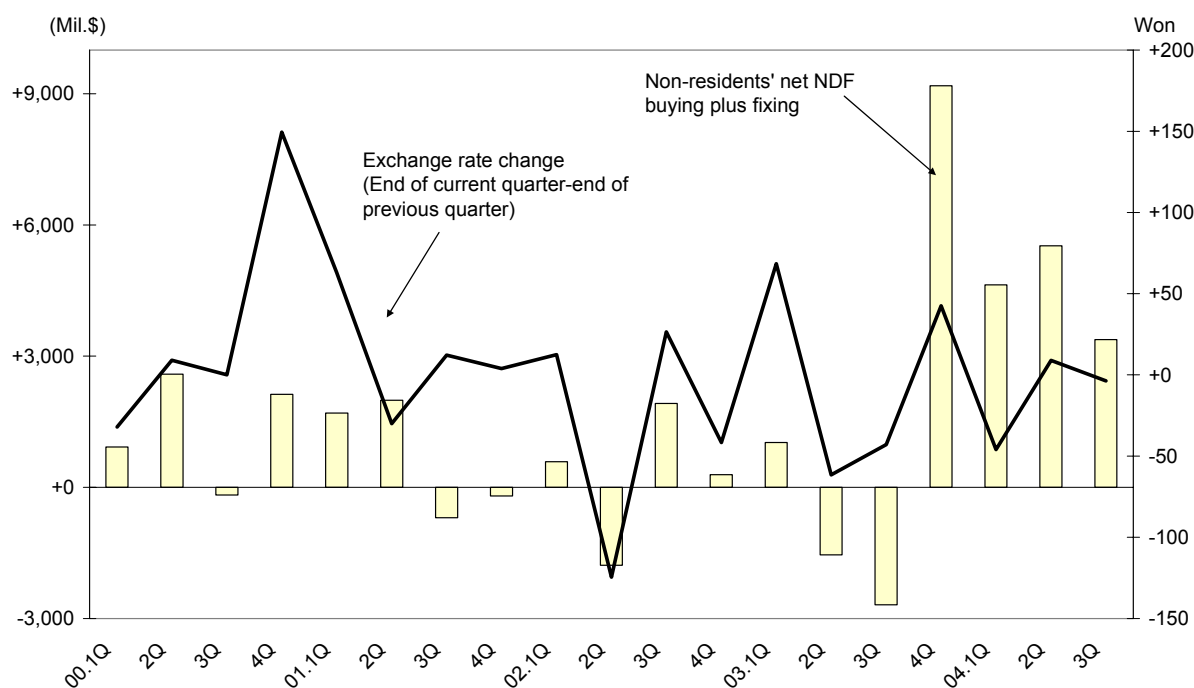
(US\$ 100 m)

2000	2001	2002	2003	2004 ^P		
				1/4	2/4	3/4
4.0	5.1	6.7	13.4	14.4	17.6	15.3

While NDF transactions between Korean foreign exchange banks and non-residents offer a convenient hedging tool, they also provide a chance to trade for speculative purposes and act as one of the significant determinants of the won/dollar exchange rate. For instance, non-residents' buying of dollars in the won/dollar NDF market results in the foreign exchange positions of their counterparty foreign exchange banks being short. The banks then usually take long positions in the spot market to square their exchange risk exposures, causing the won to be depreciated (see Annex 2). Meanwhile, an increase in NDF trading seems to be attributable to the co-movement of the won and yen exchange rates since non-residents normally take changes in the yen/dollar exchange rate as a reference in trading won/dollar NDF. That is, when the yen depreciates against the US dollar, non-residents buy

won/dollar NDFs and cause the won to depreciate. In contrast, when the yen appreciates against dollar, non-residents sell off won/dollar NDFs, bringing about the won appreciation.

Trends of NDF transactions and won/dollar exchange rate



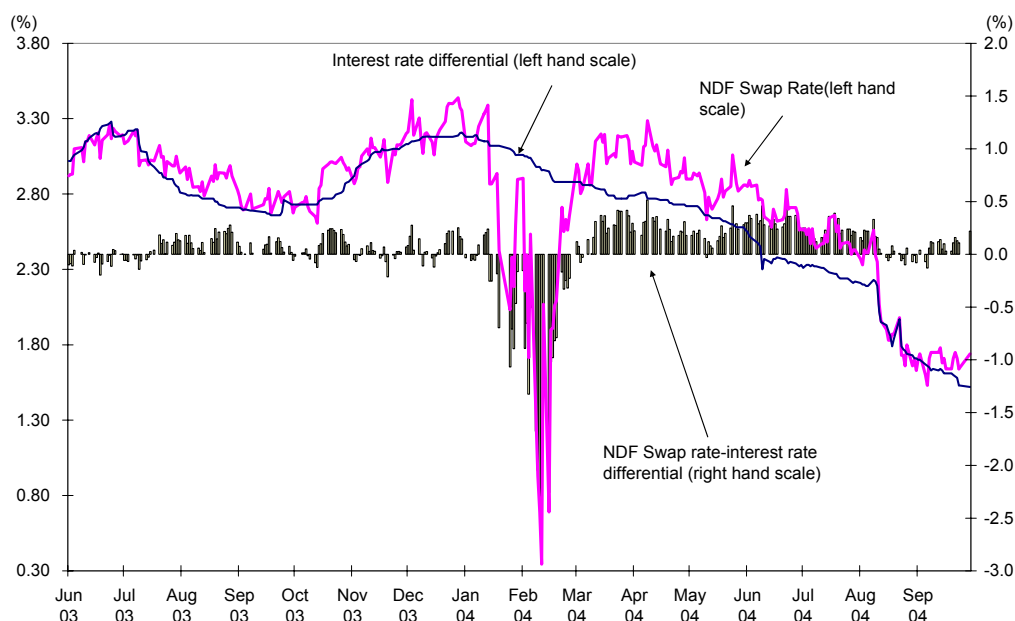
2.4 Regulation on NDF transactions

Under the growing impact of NDFs on the won/dollar exchange rate, non-residents' speculative NDF transactions have been prevalent since late 2003, bringing about a greater possibility of foreign exchange market turbulence. To cope with this, the Korean government implemented regulations on Korean foreign exchange banks' NDF transactions with non-residents in January 2004.

The regulations applied both to banks' overbought and oversold positions. That is, banks' NDF overbought positions resulting from trading with non-residents were required to be 110% or less of their NDF overbought positions as of 14 January 2004, in order to prevent banks from selling in the spot market. In turn, banks' NDF oversold positions resulting from trading with non-residents had to be 90% or more of their NDF oversold positions as of 16 January 2004, to prevent their selling due to NDF fixing. In short, the regulations were intended to prevent foreign exchange banks' buying of NDF, thus limiting excessive selling off by non-residents.

Even though these regulations on NDF transactions succeeded in preventing speculative NDF trading by non-residents and in stabilising the market, they also resulted in shrinkage of the NDF trading, in widening the gap between on-shore and off-shore swap rates, and in an increase in banks' losses from NDF transactions with non-residents. For instance, the off-shore swap rates dropped sharply to 0.34% on 12 February 2004 from 3.35% at the end of 2003, while the on-shore swap rates remained stable. The decline in the off-shore swap rate resulted in losses for foreign exchange banks from compulsory NDF trading with non-residents, while reducing the borrowing costs paid by non-residents.

NDF swap rate and interest differential



Furthermore, the decline of the swap rates below the interest rate differentials (domestic minus international interest rates) brought about hasty and massive capital inflows to the domestic bond market, magnifying uncertainties concerning capital flows. In other words, foreigners invested in domestic bonds such as government bonds and monetary stabilisation bonds, after raising domestic funds by foreign exchange swaps. The amount of bond investment during the period from 16 January to 20 February was estimated at US\$ 1.4 billion, surpassing the entire annual amount in 2003 of US\$ 1.0 billion.

Net investment flows into domestic bonds since NDF regulation

(US\$100 m)

2001	2002	2003	04.1.1 - 1.15	1.16 - 2.20	2.21 - 2.28	Mar - Apr
1.2	3.6	9.7	0.4	14.2	1.2	1.7

Note: Figures for 2004 are preliminary.

For these reasons, the regulations were gradually loosened and then abolished in April 2004, since the Korean government judged that speculative trading by non-residents had abated. Specifically, the banks' oversold position limit of 90% was reduced to 60% on 20 February and to 30% on 20 March. Finally, the swap rate recovered its ordinary level after the government abolished the oversold position limit on 20 April 2004.

3. Implications for future exchange rate operations

Since adoption of the free floating exchange rate system, the Korean authorities have actively endeavoured to achieve stabilisation of the foreign exchange market. In the process of overcoming the currency crisis, the Korean authorities tried to expand the nation's international reserves. Recently, they intervened in the foreign exchange market to smooth the pace of exchange rate changes resulting from over-supply of foreign exchange due to the current account surplus, from the whimsical movements of major currencies, and from non-residents' speculative trading in the off-shore NDF market.

Considering Korea's thin foreign exchange market as a small open economy, and the vulnerability of the won exchange rate to diverse external shocks and the changing global environment, the Korean authorities' efforts to stabilise the exchange rate could be regarded as inevitable. From a future policy perspective, however, it is more desirable to let the exchange rate be determined in the market, reflecting the economic fundamentals and foreign exchange flows. This seems to be a prerequisite for building up a mechanism for the self-regulation of exchange rate fluctuations and developing the foreign exchange market by encouraging autonomous foreign exchange trading.

In the case of a radical and unexpected change in the exchange rate, or of an existence of one-sided exchange rate expectations due to transient external shocks, the authorities will inevitably implement smoothing operations. Furthermore, to achieve the goals of exchange rate operations, it also seems to be indispensable for any speculative attacks to be swiftly dealt with as they increase the possibility of foreign exchange market turmoil. Furthermore, enhancement of the authorities' credibility and transparency in exchange rate operations is also an essential objective.

Annex 1: The effect of US dollar and Japanese yen on Korean won

The results of an empirical test using daily data indicate that before the adoption of the free floating exchange rate system (March 1990 - October 1997) the effect of the US dollar on the won showed plus sign and was statistically significant. Since adoption of the free floating system (April 1998 - March 2002), however, the impact of the Japanese yen on the won has become more crucial than that of the US dollar.

- Equation: $\log(\text{Won}/\text{CHF})_t = \alpha_0 + \alpha_1 \log(\text{US}\$/\text{CHF})_t + \alpha_2 \log(\text{Yen}/\text{CHF})_t + \varepsilon$

- Frequency: daily data

Sample period	α_0	α_1	α_2	R bar ²	F-value
Mar 1990 - Oct 1997	8.02 (39.67) ^{***}	0.94 (15.69) ^{***}	-0.31 (-6.87) ^{***}	0.752	142.3
Apr 1998 - Mar 2002	3.72 (7.94) ^{***}	0.21 (1.41)	0.70 (7.32) ^{***}	0.793	82.8

Notes: 1) Figures in parentheses indicate t values. 2) ^{***}, ^{**}, ^{*} indicate significance levels of 1%, 5% and 10%, respectively. 3) Won: Korean won, CHF: Swiss franc, Yen: Japanese yen.

Annex 2: The effect of off-shore NDF transactions on the won/dollar exchange rate

Using GARCH (Generalised ARCH) models, the effect of off-shore NDF transactions on the won/dollar exchange rate is tested. The empirical results show that the won/dollar exchange rate shows positive signs (indicating a weakening of the won) in reaction to depreciations of the yen and to non-residents' buying of won/dollar NDFs, while showing negative signs in reaction to foreign investment in domestic stocks, as expected. In addition, an increase in NDF transactions enlarges exchange rate volatility, as the coefficient α_3 shows statistically significant positive signs. This implies that the won/dollar exchange rate has been greatly influenced recently by external factors such as the movement of the yen against the US dollar and off-shore NDF transactions by non-residents.

- Equation:
$$s_t = \beta_0 + \beta_1 s_{t-1} + \beta_2 \text{yen}_t + \beta_3 \text{ksi}_t + \beta_4 \text{ndf}_t + \varepsilon_t$$

$$\varepsilon_t \sim (0, \sigma^2)$$

$$\sigma^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{t-1}^2 + \alpha_3 |\text{ndf}|$$

- Sample period: 1 Jan 2000 - 22 Oct 2002

- Frequency: daily data

	Equation 1	Equation 2	Equation 3
β_0	1.89 (0.89)	-49.50 (-3.22)***	-83.05 (-4.78)***
β_1	0.99 (587.8)***	0.99 (248.9)***	0.97 (176.9)***
β_2		13.81 (3.35)***	30.04 (5.34)***
β_3			-3.73 (-3.99)***
β_4	0.012 (13.57)***	0.012 (13.19)***	0.012 (12.83)***
α_0	-0.81 (-2.52)**	-0.73 (-2.17)**	-0.69 (-2.06)**
α_1	0.24 (5.87)***	0.29 (5.60)***	0.27 (5.58)***
α_2	0.69 (18.13)***	0.63 (13.37)***	0.64 (13.74)***
α_3	0.021 (7.49)***	0.024 (6.81)***	0.024 (7.21)***
Adjusted R ²	0.996	0.996	0.996
DW	1.93	1.90	1.93

Notes: 1) Figures in parentheses indicate t value. 2) ***, **, * indicate significance levels of 1%, 5% and 10%, respectively. 3) s: closing rate of won/dollar exchange rate in log transformation; yen: yen/dollar exchange rate in log transformation; ksi: KOSPI (Korean Stock Price Index) in log transformation; ndf: non-residents' net buying of NDFs; |ndf|: absolute value of non-residents' NDF transactions.

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