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Exchange Rate, Inflation and the Demand for Money in an Open Economy : Case of Korea

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In developing countries with limited access to foreign financial markets, a change in exchange rates may affect the demand for money via a change in expected inflation through the real market. In addition, a persistent inflation inherent in the development process may also affect the demand for money. Using Korea as an example, our study shows these effects by estimating a general money demand function that incorporates the partial adjustment mechanisms of both money demand and price level. Thus, the method and results of this paper differ from those of previous studies on money demand in open economies.

Past studies on the demand for money in open economies (see e.g. Frenkel [10], Arango and Nadiri [1], Bordo and Choudhri [4], and Cuddinton [8]) have emphasized the role of foreign exchange rates, using a portfolio approach to financial markets. For instance, Arango and Nadiri [1] argue that among developed countries, depreciation of domestic currency may cause the value of foreign security holdings to rise in the eyes of domestic residents, and hence with an increase in wealth, increase the demand for money. That is, an increase in the nominal exchange rate (domestic currency per unit of foreign currency) increases the demand for real balances.

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For developing countries, however, with a limited access to foreign financial markets (e.g. due to exchange control), a change in real exchange rates may work through the external trade balance and expected inflation, thereby affecting the demand for money. Krugman and Taylor [18] in particular argue that when the domestic currency depreciates, the larger the trade surplus, the greater the trade surplus would show up whereas the larger the trade deficit, the greater the trade deficit would turn out.[1] Since the depreciation shifts up the production cost schedule, an increase in trade surplus would raise the price level via an upward shift in aggregate demand, resulting in a higher inflationary expectation and a lower money demand. On the other hand, an increase in trade deficit would lower the price level, if an upward shift in cost is more than offset by a downward shift in aggregate demand steming from a greater trade deficit. This would tend to lower the expected inflation and hence to increase the demand for real money balances. Under these circumstances, an increase in the real exchange rate decreases money demand in case of the trade surplus while increasing money demand in case of the trade deficit. Thus, the demand for real money balances is adjusted through the real rather than financial market via changes in the real, but not the nominal, exchange rate.

Aside from the exchange rate effects, money holdings may also be affected by a persistent or permanent inflationary trend in prices. While numerous studies (see e.g. Spencer [23] and Goldfeld and Sichel [12]) have attempted to show these effects, their analyses depend on an unrealistic assumption that while money demand adjusts gradually, the price level is completely rigid without any adjustment process. Recently, however, Lee and Chung [20] have developed a model of gradual adjustments for both the price level and nominal balances and showed that inflation rates have a negative impact on the demand for money even in a developed country like the U.S. Extending such a model, we shall attempt to incorporate the role of exchange rate in Korea's money demand as an example of developing countries where there is a limited access to foregin financial markets. Since Korea has long

1) According to Krugman and Taylor [18], when the depreciation takes place with an existing trade deficit, an increase in the price of imported goods results in the increased payments to foreign countries which tend to exceed any increase in the receipts of domestic residents from exports, causing a contractionary effect on the domestic economy. As shown in a study by Chung [6], this is particularly true when a country like Korea heavily imports intermediate goods from a foreign country such as Japan for the value-added exports elsewhere. On the other hand, when the trade balance is initially in surplus, the depreciation further stimulates the exports over imports, resulting in an economic expansion.

experienced a large trade surplus against U.S. and a large trade deficit against Japan, we shall test the Krugman-Taylor hypothesis by using bilateral real exchange rates with the respective countries. Our study also estimates and tests the effect of persistent inflation on money demand which has not been adequately analyzed in the past for developing countries.

I. The Model

Allowing the letters of variables to stand for log level, we assume that the long-run demand for real money balances $(M_t^*-P_t^*)$ depends on the permanent or long-term magnitudes of real income (y_t), interest rate (r_t), exchange rate (x_t) and inflation rate (P_t-P_{t-1}) in the log-linear form:

$$(M_t^*-P_t^*) = g+\sum_{i=0}^{n1} a_i y_{t-i}+\sum_{i=0}^{n2} b_i r_{t-i}+\sum_{i=0}^{n3} c_i x_{t-i}+\sum_{i=0}^{n4} d_i (P_{t-i}-P_{t-i-1}) \qquad (1)$$

where the explanatory variables are in the general form of adaptive expectation form similar to Friedman's scheme [11] of permanent income formulation. The interest rate variable represents a set of domestic and foreign rates while the exchange rate denotes either the nominal or real exchange rate. The rate of inflation is included in the long-run demand function, following Goldfeld and Sichel [12].

To specify the short-run adjustment process, we define the concepts of the equilibrium price level and money stock by assuming the current level of nominal GNP as predetermined (see e.g., Gordon [13] and Lee and Chung [20]). The long-run equilibrium price level (P_t^*) is defined as that which will make the predetermined current level of nominal GNP (Y_t) compatible with the natural level of real GNP (Q_t^*), viz.

$$P_t^* = Y_t - Q_t^* \qquad (2)$$

The long-run equilibrium nominal money supply (M_t^*) is defined as that which will be demanded in the long-run at the current level of nominal GNP, given the velocity of money (V_t),

$$M_t^* = Y_t - V_t \qquad (3)$$

which in turn defines V_t as $(Y_t - M_t^*)$.

Next, as in Laidler [19], Gordon [13] and Lee and Chung [20], we assume that the price level adjusts gradually with the adjustment cofficient μ:

$$P_t - P_{t-1} = \mu(P_t^* - P_{t-1}) \qquad 0 < \mu \leq 1 \tag{4}$$

Then, following Hwang [17], it is assumed that money holdings adjust in a hybrid model, with the parameter δ, of the nominal and real adjustment mechanisms:

$$M_t - M_{t-1} = \lambda(M_t^* - M_{t-1}) + \delta(1-\lambda)(P_t - P_{t-1}) \qquad 0 < \lambda \leq 1 \tag{5}$$

where λ is the adjustment coefficient of money demand. This adjustment model is quite general since $\delta=0$ and $\delta=1$ imply the partial adjustment models of nominal and real money balances, respectively. That is, it provides, respectively,

$$M_t - M_{t-1} = \lambda(M_t^* - M_{t-1}) \tag{6}$$

and

$$[(M_t - P_t) - (M_{t-1} - P_{t-1})] = \lambda\,[(M_t^* - P_t) - (M_{t-1} - P_{t-1})] \tag{7}$$

To derive a short-run demand function for money as in Lee and Chung [20], we first obtain M_t^* from (2) and (3), then insert this in (5), and in the resulting expression for $(M_t - P_t)$, further insert P_t^* from (4) to yield

$$\begin{aligned}(M_t - P_t) = {} & \lambda\,(Q_t^* - V_t) + (1-\lambda)(M_{t-1} - P_{t-1}) \\ & + (1/\mu)[(\lambda - \mu) + \delta\mu(1-\lambda)](P_t - P_{t-1})\end{aligned} \tag{8}$$

Since $(Q_t^* - V_t)$ is the long-run demand function $(M_t^* - P_t^*)$ in (1) from (2) and (3), the above equation is an implicit expression for the short-run demand function for money. Thus, inserting (1) in this expression and adding a disturbance term ε_t, we finally derive the explicit short-run demand function for money:

$$\begin{aligned}(M_t - P_t) = {} & \lambda g + \lambda \sum_{i=0}^{n1} a_i y_{t-i} + \lambda \sum_{i=0}^{n2} b_i r_{t-i} + \lambda \sum_{i=0}^{n3} c_i x_{t-i} \\ & + \lambda \sum_{i=0}^{n4} d_i (P_{t-i} - P_{t-i-1}) + (1-\lambda)(M_{t-i} - P_{t-i}) \\ & + (1/\mu)[\lambda\mu d_0 + (\lambda - \mu) + \delta\mu(1-\lambda)](P_t - P_{t-1}) + \varepsilon_t\end{aligned} \tag{9}$$

where ε_t is assumed to have the stochastic process of

$$\varepsilon_t = \rho \varepsilon_{t-1} + u_t, \qquad 0 \leq \rho < 1 \tag{10}$$

with a Gaussian white-noise error term, u_t. It should be noted that the coefficient on $(P_t - P_{t-1})$ reflects the combined effect of current inflation rates and other parameters, i.e., d_0, λ, μ, and δ, which requires the elaborate identification and testing to be carried out later.

Our estimating equation in (9) is quite general since it subsumes many specifications of the money demand function.[2] If it is assumed that $c_i = 0$ for all i and $d_m = 0$, the above equation becomes the short-run demand function without an open economy that Lee and Chung ([20], eq. (11)) derived for the U.S. If we further assume that $a_i = b_i = d_i = 0$ for all $i \geq 1$ with the restriction that $\mu = 1$, we have a short-run demand function with a lagged inflation rate but without a price adjustment as estimated by Goldfeld and Sichel ([12], eq. (6)). It can also be shown that our money demand function may be reduced to those by Milbourne [21], Hafer and Thornton [15], Spencer [23] and Hwang [17].[3] Thus, the money demand function to be estimated in this paper is quite flexible without any particular assumptions that are required for previous studies.

II. Data and Estimation

The data used in this study consist of seasonally adjusted quarterly observations of real M1 (currency plus demand desposits) and M2 (M1 plus time and savings

2) Our estimating equation can be specified in a more general form by introducing the perceived price level (P_t^*) on the right-side of equation (1) and then solving the system of equations for our model. This formulation allows us to test the long-run demand function for the zero degree homogeneity with respect to P_t^*. The derivation and resulting tests, though not reported here, have shown that our long-run demand function is indeed homogenous, indicating the appropriateness of our specification in (9).

3) If we assume that $a_i = b_i = 0$ for $i \geq 1$ and $c_i = d_i = 0$ for all i with the restriction that $\mu = 1$, our estimating equation (9) becomes that of Hwang ([17], eq. (8) with homogeneity assumtion) which incorporates a hybrid version of the nominal and the real adjustment models of money demand but without price adjustment mechanism. If we further add a restriction that $\delta = 0$, we have the nominal adjustment model of money demand function estimated by Milbourne ([21], eq. (8)) and Hafer and Thorntorn [15]. On the other hand, if $c_i = 0$ for all i and $(d_0 + d_1 + \cdots + d_n) = 0$ with the restriction that $\lambda = \mu = 0$, our estimating equation becomes that of Spencer ([23], eq. (9)) which does not incorporate the partial adjustment mechanisms of not only money demand but also price level.

deposits), real output (1985 price), the GNP deflator, the commercial bank time deposit rate (r^{TD}), the curb market rate (r^{CM}), the 3-month eurodollar rate (r^{ED}) and several measures of foregin exchange rates. The sources of data and the definitions of variables in detail are given in Appendix. The period of analysis is from 1973:1 to 1990:4 which may be characterized as the regime of floating exchange rates.

With these data, one might be attempted to apply a cointegration technique for the specification of long-run money demand function but it will not be used here. As pointed out by Cochrane [7] and Miron [22], unit roots and stationary processes cannot be distinguished in a finite sample and hence we cannot be certain about the cointegration results. Moreover, low-frequency movements of such series as money stocks and inflation rates in Korea may be due to shifts in means or non-linear trends rather than unit roots. For these reasons, we shall estimate equation (9) with disturbance term (10) by using the maximum likelihood method proposed by Beach and Mackinnon [3] and pay special attention to the Durbin-Watson statistics as indicator of possible misspecification. After some experiments for the final estimates, we have chosen four quarters of distributed lags (i.e., $n_1=n_2=n_3=n_4=4$) for regressors as in Gordon [13], Spencer [23] and Goldfeld and Sichel [12].

After dropping insignificant variables and adding dummy variables, alternative versions of money demand function for M1 are estimated and presented in Table 1.[4] In regression (1) for the real market model, aside from the inflation terms to be discussed later, all of the variables show statistically significant coefficients with appropriate signs. In particular, the coefficient on bilateral real exchange rate with U.S. (rx_t^{US}) is significantly negative while that with Japan (rx_t^{J}) is significantly positive. Since Korea has a large trade surplus against U.S., a rise in the bilateral real exchange rate with U.S. has brought about a higher inflationary expectation and lower real money balances. On the other hand, with a large trade deficit against Japan, a rise in bilateral real exchange rate with Japan could have brought about a deflationary impact a la Krugman-Taylor [18], causing a lower inflationary expectation and a higher money demand. Note that the disturbance term ε_t is not autocorrelated as shown in the estimate of ρ. Moreover, the Durbin-Watson statistics though not significant is higher than $\overline{R}^2$, implying that the estimated relationship is

4) The dummy variable D_1 is used to capture an effect of shifting deposit from M1 to M2 during 1981:3~1982:2 when a relatively higher interest rate was paid to the so-called family savings deposit. The dummy variable D_2 is to take account of the shifting away from M2 due to the introduction of certificate of deposits since 1984:2.

〈Table 1〉 The Demand Function for M1 (1973:1~1990:4)

Variables in log	Real Market Model		Financial Market Model	
	(1)	(2)	(3)	(4)
Const	2.824**	0.628*	1.023**	−0.694
	(0.586)	(0.287)	(0.297)	(0.551)
$\sum_{i=0}^{4} y_{t-i}$	0.205**	0.219**	0.397**	0.416**
	(0.069)	(0.076)	(0.097)	(0.101)
$\sum_{i=0}^{4} r_{t-i}^{TD}$	−0.146**	−0.080**	−0.061*	−0.048
	(0.037)	(0.031)	(0.026)	(0.029)
$\sum_{i=0}^{4} r_{t-i}^{CM}$				
$\sum_{i=0}^{4} r_{t-i}^{ED}$	−0.091**	−0.081**	−0.044*	−0.031
	(0.017)	(0.018)	(0.021)	(0.020)
$\sum_{i=0}^{4} rx_{t-i}^{US}$	−0.260**			
	(0.076)			
$\sum_{i=0}^{4} rx_{t-i}^{J}$	0.122*			
	(0.053)			
$\sum_{i=0}^{4} rx_{t-i}^{W}$		−0.086		
		(0.051)		
$\sum_{i=0}^{4} nx_{t-i}^{US}$			−0.106*	
			(0.047)	
$\sum_{i=0}^{4} nx_{t-i}^{J}$			−0.064	
			(0.040)	
$\sum_{i=0}^{4} nx_{t-i}^{W}$				−0.174**
				(0.054)
$\sum_{i=1}^{4} (P_{t-i}-P_{t-i-1})$	−0.572	−0.081	−1.068*	−0.865
	(0.394)	(0.386)	(0.452)	(0.451)
$M_{t-1}-P_{t-1}$	0.585**	0.684**	0.560**	0.546**
	(0.092)	(0.092)	(0.095)	(0.100)
P_t-P_{t-1}	−0.192	−0.323	−0.418*	−0.491*
	(0.226)	(0.231)	(0.211)	(0.207)
D_1	−0.043*	−0.041*	−0.049**	−0.061**
	(0.018)	(0.021)	(0.019)	(0.021)
D_2				
$\overline{R}^2$	0.992	0.991	0.992	0.992
ρ	−0.220	−0.063	−0.163	−0.033
	(0.115)	(0.117)	(0.116)	(0.118)
$D-W$	2.109	2.017	2.051	1.992

Note: Figures in parentheses are standard errors of estimates, and * and ** indicate significance respectively at .05 and .01 level.

〈Table 2〉 The Demand Function for M2 (1973:1~1990:4)

Variables in log	Real Market Model		Financial Market Model	
	(1)	(2)	(3)	(4)
Const	1.680**	0.980**	1.295**	0.831**
	(0.248)	(0.232)	(0.214)	(0.313)
$\sum_{i=0}^{4} y_{t-i}$	0.226**	0.205**	0.267**	0.146**
	(0.054)	(0.067)	(0.062)	(0.062)
$\sum_{i=0}^{4} r_{t-i}^{TD}$	0.017	0.036**	0.027*	0.042**
	(0.012)	(0.013)	(0.012)	(0.013)
$\sum_{i=0}^{4} r_{t-i}^{CM}$	−0.173**	−0.130**	−0.158**	−0.114**
	(0.026)	(0.029)	(0.025)	(0.029)
$\sum_{i=0}^{4} r_{t-i}^{ED}$	−0.016**	−0.028**	−0.022**	−0.034**
	(0.007)	(0.008)	(0.008)	(0.009)
$\sum_{i=0}^{4} rx_{t-i}^{US}$	−0.103**			
	(0.027)			
$\sum_{i=0}^{4} rx_{t-i}^{J}$	0.094**			
	(0.021)			
$\sum_{i=0}^{4} rx_{t-i}^{W}$		−0.031		
		(0.021)		
$\sum_{i=0}^{4} nx_{t-i}^{US}$			−0.052*	
			(0.021)	
$\sum_{i=0}^{4} nx_{t-i}^{J}$			0.043*	
			(0.017)	
$\sum_{i=0}^{4} nx_{t-i}^{W}$				−0.008
				(0.019)
$\sum_{i=1}^{4} (P_{t-i}-P_{t-i-1})$	−0.744**	−0.346*	−0.660**	−0.253
	(0.152)	(0.153)	(0.176)	(0.159)
$M_{t-1}-P_{t-1}$	0.685**	0.769**	0.677**	0.823**
	(0.060)	(0.068)	(0.069)	(0.061)
P_t-P_{t-1}	−0.890**	−0.855**	−0.860**	−0.866**
	(0.059)	(0.064)	(0.063)	(0.068)
D_1				
D_2	−0.024**	−0.028**	−0.030**	−0.022**
	(0.007)	(0.008)	(0.006)	(0.007)
$\bar{R}^2$	0.999	0.999	0.999	0.999
ρ	−0.080	0.128	−0.179	0.119
	(0.117)	(0.117)	(0.116)	(0.117)
$D-W$	1.966	1.933	1.986	1.934

Note: Figures in parentheses are standard errors of estimates, and * and ** indicate significance respectively at .05 and .01 level.

not spurious (see Granger and Newbold [14] and Hendry [16]). Thus, our regression is robust, showing the Krugman-Taylor effect of real exchange rates on the demand for real balances.

For the financial market model, we use the nominal, not real, bilateral exchange rates with U.S. (nx_t^{US}) and Japan (nx_t^J) in regression (3) of Table 1. The estimated coefficients, though not all significant, are negative, thereby contradicting the positive sign expected by the argument of Arango and Nadiri [1]. However, in a study by Arango and Nadiri for developed countries, the estimated coefficents on nominal exchange rates were positive but not statistically significant, thus showing a weak relationship at best. Since the general public in Korea is banned from owning foreign currencies and securities, it is not surprising to find that a change in nominal exchange rates does not affect domestic money holding through the wealth effect suggested by Arango and Nadiri. Thus, the portfolio approach via foreign financial market is not applicable to developing countries where there are exchange controls.

In lieu of bilateral exchange rates, we experiment the multilateral effective real exchange rate (rx_t^W) and nominal exchange rate (nx_t^W) for M1, respectively, in regression (2) and (4) of Table 1. The coefficient of rx_t^W for the real market model becomes closer to zero as might be expected from the offsetting effects of bilateral real exchange rates with U.S. and those with Japan. On the other hand, the coefficent on nx_t^W for the financial market model is significantly negative, which again contradicts the argument by Arango and Nadiri [1].[5]

The corresponding set of regressions for the demand for M2 are computed and presented in Table 2. While the results are quite similar to those for M1, the Krugman-Taylor effect turns out to be even more significant. In regression (1) of this table, estimated coefficients on the real exchange rate with U.S. (rx_t^{US}) and that with Japan(rx_t^J) have the opposite signs as before but become highly significant at the

5) Using a cointegration analysis on the Korean money demand, Bahmani and Rhee [2] obtained negative coefficient of M1 on their measure of multilateral effective exchange rates which was defined as the reciprocal of our measure. Thus, their result though not statistically tested is equivalent to a positive effect (in terms of our measure) rather than the significant negative effect obtained in our study. However, the estimate by Bahmani and Rhee appears to be spurious. In the estimated equation for M1 where the interest rate on demand deposits was also included, the estimated coefficient showed incorrect negative sign. Moreover, they use seasonally unadjusted money stock series without seasonal dummy variables while ignoring the institutional changes such as those expressed in dummy variables for our money demand functions.

.01 level. Nominal exchange retes yield incorrect signs on the estimated coefficients as in the case of M1, indicating inappropriateness of the financial market model for Korea.

Ⅲ. Tests on Inflation Effects

Aside from the exchange rate impacts, the rate of persistent domestic inflation may also affect the demand for money in Korea. To examine whether there is any inflation effect without lag in the short-run, we can test the restriction that $d_0=d_1=d_2 \cdots =d_n=0$ in estimating equation (9). Since the coefficients of the equation are nonlinear in the parameters, a likelihood ratio test can be performed on the restrictions, given the alternative values of μ and δ in (9). Also, since the sum of the short-run inflation effects may be regarded as the long-run inflation effect, the long-run inflation effect can be examined by testing the restriction that $\sum_{i=0}^{n} d_i=0$, given the alternative values of μ and δ. However, since this restriction imposes a complicated nonlinear constraint on the parameter space, maximum likelihood estimation is not feasible and therefore, we do not use a likelihood ratio test. Instead, we employ the Wald test which is asymptotically equivalent to the likelihood ratio test, but only requires estimating the unrestricted model by maximum likelihood (see e.g. Engle [9]).

Using the real market model for M1, the likelihood ratio tests on the short-run inflation effects are provided in column (1) of Table 3. When δ is 1 for a wide range of values of μ excepting $\mu=1$, the likelihood ratios are significant, indicating the presence of a short-run inflation effect. In particular, with a slow price adjustment of $\mu=1/4$ or less, there is a short-run inflation effect regardless of whether money holding adjusts according to the nominal partial adjustment mechanism ($\delta=0$), the real partial adjustment mechanism ($\delta=1$) or a hybrid ($\delta=1/2$) of the two.

For the Wald test of the long-run inflation effect for M1, the conditional estimates of $\sum_{i=0}^{4} d_i$, for a wide range of values of μ and δ, are reported in column (2) of Table 3. The long-run inflation effect is significant with a negative sign when $\mu=1/2$ and $\delta=1$. Allowing the price level to adjust more slowly, particularly with $\mu=1/4$ or less, the long-run inflation effect becomes highly significant, regardless of whether $\delta=0$, 1, or 1/2, that is, whether the money demand represents the nominal,

〈Table 3〉 Conditional Estimates of $\sum_{i=0}^{4} d_i$ Based on Money Demand Functions for M1 and M2 with $\sum_{i=0}^{4} rx_{t-i}^{US}$ and $\sum_{i=0}^{4} rx_{t-i}^{J}$

	Demand Function for M1		Demand Function for M2	
Assumed Values of μ and δ	(1) Chi-square of $d_0=d_1=d_2=d_3=d_4=0$	(2) $\sum_{i=0}^{4} d_i$	(3) Chi-square of $d_0=d_1=d_2=d_3=d_4=0$	(4) $\sum_{i=0}^{4} d_i$
$\mu=1$ & $\delta=0$	9.244	−0.432 (1.143)	30.475**	−3.009** (0.714)
$\mu=1$ & $\delta=1/2$	9.160	−1.137 (1.137)	107.450**	−4.095** (0.755)
$\mu=1$ & $\delta=1$	8.986	−1.842 (0.952)	259.781**	−5.181** (0.899)
$\mu=1/2$ & $\delta=0$	8.640	−1.432 (1.143)	36.693**	−4.009** (0.714)
$\mu=1/2$ & $\delta=1/2$	10.991	−2.137 (1.137)	102.564**	−5.095** (0.755)
$\mu=1/2$ & $\delta=1$	17.456**	−2.842** (0.952)	325.202**	−6.181** (0.899)
$\mu=1/4$ & $\delta=0$	17.822**	−3.432** (1.143)	40.680**	−6.009** (0.714)
$\mu=1/4$ & $\delta=1/2$	28.384	−4.137** (1.137)	68.226**	−7.095** (0.755)
$\mu=1/4$ & $\delta=1$	46.320**	−4.842** (0.952)	129.706**	−8.181** (0.899)
$\mu=1/8$ & $\delta=0$	28.466**	−7.432** (1.143)	42.148**	−10.009** (0.714)
$\mu=1/8$ & $\delta=1/2$	36.468**	−8.137** (1.137)	53.476**	−11.095** (0.755)
$\mu=1/8$ & $\delta=1$	47.340**	−8.842** (0.952)	70.699**	−12.181** (0.899)
$\mu=1/16$ & $\delta=0$	32.718**	−15.432** (1.143)	42.681**	−18.009** (0.714)
$\mu=1/16$ & $\delta=1/2$	36.787**	−16.137** (1.137)	47.743**	−19.095** (0.755)
$\mu=1/16$ & $\delta=1$	41.498**	−16.842** (0.952)	54.099**	−20.181** (0.899)

Notes: Figures in parentheses are standard errors of estimates, and * and ** indicate significance respectively at .05 and .01 level.

the real or the hybrid adjustment over time. When the corresponding set of tests for M2 are carried out in columns (3) and (4) of Table 3, the inflation effects of both short-run and long-run become greater and more significant. Since M2 more than M1 includes the demand for monetary assets as a substitute for real assets, it is reasonable to expect that the rate of inflation has more negative impact on the demand for M2. Thus, our results show that the persistent or permanent inflation has adversely affected the demand for money in Korea as those found by Goldfeld and Sichel [12] and Lee and Chung [20].

IV. Concluding Remarks

For developing countries with limited access to foreign financial markets, a rise in exchange rates may affect the demand for real money balances through the real rather than financial market. Since Krugman and Taylor have argued that the depreciation of domestic currency makes the trade surplus (deficit) larger, the larger the existing trade surplus (deficit), it may decrease (increase) money demand through a rise (fall) in expected inflation. Using Korea as an example, we have attempted to test this hypothesis by estimating a general money demand function that allows the gradual adjustments of both nominal balances and prices over time. Such a money demand function is also well suited for testing the short-run as well as long-run effect of a persistent inflation that often underlies in the developing country.

The empirical results of this paper show that in Korea a rise in bilateral real exchange rates with U.S. decreases the demand for real money balances whereas a rise in bilateral exchange rates with Japan increases the demand for real balances. Since Korea has long experienced a large trade surplus against U.S. and a large trade deficit against Japan, our finding indicates different impacts of bilateral real exchange rates with different countries through the Krugman-Taylor effect. When we use the nominal instead of real exchange rates, their coefficients show incorrect signs which do not support the adjustment of money demand through foreign financial markets. The results of this paper also show that the demand for real balances falls with a permanent increase in the rate of inflation. Thus, in a developing economy with high inflation and limited foreign financial markets, the demand for

real balances is affected by changes in the persistent rate of inflation as well as changes in the real, but not nominal, exchange rate.

Definitions and Data Sources

Variables	definitions
1	Seasonally adjusted real quarterly stocks of a narrow money (currency plus demand deposits)
M2	Seasonally adjusted real quarterly stocks of a broad money (M1 plus time and savings deposits at commercial banks).
y	Seasonally adjusted real quarterly GNP (1985 price).
P	Seasonally adjusted quarterly GNP deflator (1985 price)
r^{TD}	Interest rate on 12-month time deposits.
r^{CM}	Interest rate on curb market assets.
r^{ED}	Interest rate on 3-month Eurodollar.
nx^{US}	Korea's bilateral nominal exchange rate with U.S., i.e., the number of units of Korean currency per unit of U.S. currency (1985=100).
nx^{J}	Korea's bilateral nominal exchange rate with Japan, i.e., the number of units of Korean currency per unit of Japanese currency (1985=100)
nx^{W}	Korea's multilateral effective nominal exchange rate with the main trading partners (1985=100), defined as the reciprocal of the measure by Bahmani and Rhee [2]
rx^{US}	Korea's bilateral real exchange rate with U.S., i.e., nx^{US} times the ratio of U.S. GNP deflator to Korea's GNP deflator (1985=100)
rx^{J}	Korea's bilateral real exchange rate with Japan, i.e., nx^{J} times the ratio of Japanese GNP deflator to Korea's GNP deflator (1985=100)
rx^{W}	Korea's multilateral effective real exchange rate with the main trading partners (1985=100), defined as the reciprocal of the measure by Bahmani and Rhee [2]
D_1	1 for 1981:3~1982:2, 0 otherwise.
D_2	1 for 1984:2~1990:4, 0 otherwise.

Sources of Data: Bank of Korea, Federal Reserve Bulletin, International Financial Statistics of IMF.

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