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The Long-Run Relationship Between Real Exchange Rates and Real Interest Rate Differentials: A Panel Study

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Abstract

This paper empirically examines the long-run relationship between real exchange rates and real interest rate differentials over the recent floating exchange rate period, using a panel cointegration method, with data for a set of industrialized countries. The paper finds evidence of statistically significant long-run relationships and plausible point estimates, which contrasts with much existing evidence. The failure of others to establish such relationships may reflect the estimation method they use rather than any inherent deficiency of the fundamentals-based models.

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Contents

I. INTRODUCTION

This paper investigates the long-run relationship between real exchange rates and real interest rate differentials using recently developed panel cointegration methods. Although this kind of relationship has been studied by a number of researchers,[2] very little evidence in support of the relationship has been reported. For example, Meese and Rogoff (1988) and Edison and Pauls (1993) use the Engle-Granger cointegration method, and fail to establish a clear long-run relationship in their analysis.[3] Somewhat stronger evidence has been reported by Edison and Melick (1995) and MacDonald (1997) using the methods of Johansen. This paper provides perhaps the strongest evidence yet in favor of the real exchange rate-real interest rate differential (RERI) model. Our success in establishing clear long-run relationships comes from utilizing panel cointegration methods.

II. THEORETICAL MODEL

The RERI model may be derived from the Fisher parity condition [1], a real exchange rate identity [2], and the uncovered interest parity condition (UIP) [3]:[4]

$$\pi_{it} = r_{it} + E_{it}\Delta p_{it+1} \qquad [1]$$
$$s_{it} \equiv p_{it} - p*_{it} + q_{it} \qquad [2]$$
$$E_{it}\Delta s_{it+1} = \pi_{it} - \pi*_{it}\ , \qquad [3]$$

where s_{it} is the log of the nominal exchange rate (home currency price of a unit of foreign currency) for country i at time t ($i = 1, \ldots , N$ and $t = 1, \ldots, T$), q_{it} is the log of the real exchange rate, p_{it} is the log of the price level, π_{it} is the nominal interest rate, r_{it} is the real interest rate and $E_{it}\Delta p_{it+1}$ is expected inflation. An asterisk denotes a foreign variable, Δ is the first difference operator and $E_{it}(\ \cdot_{it+1})$ implies the expected value of (.) for time $t+1$, formed at time t using all relevant information. The Fisher parity condition [1] is also assumed to hold in the foreign country. The RERI relationship is derived using the expected version of equation [2]--$E_{it}s_{t+1} = E_{it}q_{it+1} + E_{it}\ p_{it+1} - E_{it}\ p*_{it+1}$--and combining this with equations [1] and [3]:

$$q_{it} = E_{it}q_{it+1} - (r_{it} - r*_{it}) \qquad [4]$$

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[2]See MacDonald (1998) for survey.

[3]To be consistent with these findings, Campbell and Clarida (1987), Huizinga (1987) and Baxter (1994) argue that real exchange rate movements can be largely explained by permanent factors which do not seem to be explained by real interest rate differentials.

[4]See Meese and Rogoff (1988) for an alternative way of deriving the real exchange rate-interest rate differential relationship.

This equation says that the current real exchange rate can be explained by the expected future real exchange rate and the real interest rate differential. The latter is assumed to be negatively correlated with the real exchange rate, as in the classic Dornbusch model. Single equation studies, which assume that the expected exchange rate is constant, generally fail to produce statistically significant long-run relationships (see, e.g., Meese and Rogoff, 1988 and Edison and Pauls, 1993). However, such significant relationships have been reported by researchers who assume the expected rate to be time-varying and a function of fundamentals which impart systematic variability into the long-run equilibrium exchange rate (see, e.g., MacDonald, 1997). In this paper we assume that the expected rate is constant. However, we attempt to increase the power of our test over existing studies which exploit this assumption by letting the expected rate vary across individual countries--that is, $E_t q_{it} = \alpha_i$.[5] Our econometric analysis is based on the following equation:

$$q_{it} = \alpha_i + \beta_i (r_{it} - r^*_{it}) + u_{it} , \qquad [5]$$

where α_i captures the fixed effect specific to country i, and the residual term is expressed as u_{it}. The term β_i is the vector of parameters which allows for the heterogeneous sensitivity of real interest rate differentials to real exchange rates, and is expected to be negative as shown in equation [4]. Finally, for operational reasons, we impose a symmetry restriction on interest rates.

Edison and Melick (1995) demonstrate that the expected size of β_i will be positively proportional to the maturity of the bonds underpinning the interest rates; the absolute values of the coefficients on long-term real interest differentials should be greater than those of short-term rate differentials. More specifically, with quarterly data, the estimated value of β_i should equal k/4, where k is the maturity length. Thus, for the 3 month interest rate, we expect the estimated value of β_i to be 1/4, while for the 10 year maturity rate it should be 40/4.[6] However, in contrast, the size of the constant, α_i, may be model- and country-specific, since there is no particular economic theory to predict the expected level of real exchange rates.

III. DESCRIPTION OF THE DATA AND EMPIRICAL RESULTS

All data are obtained from *International Financial Statistics* of the International Monetary Fund (IMF), and cover the period 1976Q1-1997Q4 for 14 industrialized countries (Australia, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Switzerland and U.K.). Detailed definitions of the data used in this paper are given in Appendix I. The exchange rates are bilateral rates against the U.S. dollar, and, therefore, the United States is interpreted as the foreign country in our study. The consumer price index (CPI) is the price measure used to calculate inflation, and expected

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[5]Edison and Melick (1995) use a different type of proxy for the expected exchange rate.

[6]See Edison and Melick (1995) for detailed discussion on the expected level of parameters in specification [5].

inflation is calculated using a moving average filter. Both long- and short-term nominal interest rates are used to construct the real interest rates through equation [1].

We analyze orders of integration of the data using a standard unit root test, namely the Augmented Dickey-Fuller (ADF) test. The ADF statistics are calculated with a constant and a constant plus a time trend, respectively. The results are reported in Table 1 for both levels and differences of the series and indicate that the majority of real exchange rates are clearly I(1) processes. The results with respect to the real interest rates are ambiguous in the sense that some interest rate differentials appear to be stationary, thereby implying that there is no long-run relationship of the form [5]. In conducting the panel cointegration tests, we therefore present panel estimates based on the full panel, as well as panels in which the stationary real interest rate differentials have been excluded. For long- and short-bond yields this reduces the number of countries included to eight (Australia, Austria, Germany, Japan, Netherlands, Norway, Switzerland and U.K.) and seven (Australia, Austria, Belgium, France, Italy, Netherlands and Switzerland), respectively.

The existence of long-run relationships is examined using two types of cointegration tests. The individual country cointegration analysis is conducted using the multivariate cointegration test developed by Johansen (1988), and this technique is applied to countries whose exchange rates and interest rate differentials were established as the I(1) series. We estimate both Johansen Max and Trace statistics for each model. For the panel cointegration tests we exploit the methods of Pedroni (1997a). Pedroni's techniques have been applied to several areas in economics.[7] His panel analogue to the augmented Dickey Fuller (ADF) test statistic is calculated using the following formula:

$$ADF\ t = \left(\hat{s}^2 \sum_{i=1}^{N} \sum_{t=1}^{T} L_{11i}^{-2} \hat{u}_{it-1}^2\right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} L_{11i}^{-2} \left(\hat{u}_{it-1} \Delta \hat{u}_{it}\right) \qquad [6]$$

where the $\hat{u}_{it}$ are estimates of u_{it} which are obtained from equation [5]. The term $\hat{s}^2$ is the long-run variance ($\hat{s}^2 = (1/N)\Sigma_{i=1}^{N}\hat{s}_i^2$), and the $\hat{s}_i^2$ are obtained from individual ADF tests: $\hat{u}_{it} = \rho_i \hat{u}_{it-1} + \Sigma_{j=1}^{k} \phi_j \Delta \hat{u}_{it-j} + \zeta_{it}$, with the appropriate lag length, k, which ensures that ζ_{it} does not exhibit autocorrelation. Finally, L_i is the lower triangular component of Ω_i, where Ω_i is the long-run covariance matrix which is positive definite ($(I_N \otimes \Omega_i) > 0$) and which can be obtained using $\hat{u}_{it}$.[8] Thus, $L_{11i} = (\Omega_{11i} - \Omega_{21i}^2/\Omega_{22i})^{1/2}$. The finite sample distributions from the Monte Carlo simulations are tabulated in Pedroni (1997a), and the constructed t statistics

[7]See, for instance, Canzoneri, Cumby and Diba (1996), Chinn (1996), Pedroni (1997b) and Nagayasu (1998).

[8]Conceptually, $\Omega_i = \overline{\Omega}_i + \Pi_i + \Pi'_i$, where $\overline{\Omega}_i = E(u_1 u'_1)$ and $\Pi_i = \Sigma_{z=2}^{\infty} E[u_1 u'_z]$, and for operational purposes, the Newey-West technique is applied to guarantee non-negative estimates for finite sample sizes.

Table 1. Unit Root Test a/

	Real exchange Rate (q)		Real interest Rate (LR, r-r*)		Real interest Rate (SR, r-r*)	
	Constant	Constant & Trend	Constant	Constant & Trend	Constant	Constant & Trend
			(A) Level			
Australia	-1.698	-1.781	-1.794	-1.674	-2.376	-2.312
Austria	-1.707	-1.912	-2.591	-2.823	-2.805	-3.045
Belgium	-1.796	-1.796	-2.998 b/	-2.993	-2.705	-2.723
Canada	-1.576	-1.876	-1.512	-3.420	-2.064	-1.957
Denmark	-2.073	-2.159	-1.550	-4.612 c/	-4.144 c/	-4.168 c/
France	-1.892	-1.906	-5.192 c/	-5.150 c/	-2.611	-2.585
Germany	-1.790	-1.861	-1.992	-2.652	-2.295	-2.803
Italy	-1.936	-1.963	-3.053 b/	-3.047	-2.600	-2.913
Japan	-1.671	-2.025	-2.526	-2.523	-3.229 b/	-3.206
Netherlands	-1.941	-1.939	-1.739	-2.177	-1.585	-1.408
New Zealand	-1.872	-2.029	-2.974 b/	-2.931	-2.781	-2.837
Norway	-2.052	-2.087	-1.893	-1.782	-2.948 b/	-2.937
Switzerland	-2.040	-2.189	-1.572	-2.868	-1.884	-2.550
UK	-2.285	-2.273	-2.359	-2.297	-4.202 c/	-4.057 b/
			(B) Difference			
Australia	-7.861 c/	-7.808 c/	-10.36 c/	-10.33 c/	-10.68 c/	-10.64 c/
Austria	-6.554 c/	-6.514 c/	-4.051 c/	-15.80 c/	-11.58 c/	-11.52 c/
Belgium	-6.362 c/	-6.340 c/	-9.818 c/	-9.754 c/	-8.734 c/	-8.699 c/
Canada	-2.997 b/	-2.960	-7.639 c/	-7.656 c/	-11.30 c/	-11.32 c/
Denmark	-6.750 c/	-6.710 c/	-9.913 c/	-9.830 c/	-12.63 c/	-12.55 c/
France	-6.433 c/	-6.391 c/	-13.33 c/	-13.23 c/	-10.46 c/	-10.41 c/
Germany	-6.551 c/	-6.514 c/	-4.454 c/	-4.452 c/	-2.975 b/	-2.955
Italy	-6.747 c/	-6.712 c/	-11.31 c/	-11.23 c/	-10.43 c/	-10.37 c/
Japan	-6.645 c/	-6.616 c/	-12.62 c/	-12.55 c/	-8.311 c/	-8.260 c/
Netherlands	-6.566 c/	-6.532 c/	-9.800 c/	-9.799 c/	-9.932 c/	-9.924 c/
New Zealand	-2.470	-2.441	-11.51 c/	-11.45 c/	-8.591 c/	-8.537 c/
Norway	-7.167 c/	-7.125 c/	-12.17 c/	-12.15 c/	-11.59 c/	-11.52 c/
Switzerland	-6.667 c/	-6.623 c/	-13.90 c/	-4.177 c/	-11.47 c/	-11.39 c/
UK	-7.444 c/	-7.399 c/	-5.823 c/	-5.805 c/	-6.587 c/	-6.780 c/

Note:
a/ The Augmented Dicky-Fuller test is implemented to examine the null hypothesis of I(1) for the test labeled "Level" and that of I(2) for the test indicated with "Difference." The critical values are obtained from MacKinnon (1991). A full sample is used for calculations.
b/ Statistics that are significant at the 5 percent level.
c/ Statistics that are significant at the 1 percent level.

need to be smaller than the critical values to reject the null hypothesis of non-cointegration. Pedroni (1997a) also demonstrates that the size distortion of this test is small with large observations (*T*), as long as the moving average coefficients are positive. His experiment also shows the high power of the test in particular when $T \geq 100$. Finally, the panel estimates of β_i and the corresponding standard errors are calculated using the panel fully modified ordinary least squares (FMOLS) estimator of Pedroni (1996).

Both the Johansen and Pedroni tests examine the null hypothesis of non-cointegration against the alternative of cointegration. The results from our cointegration analysis are summarized in Table 2, and confirm the findings of previous studies: with a constant equilibrium exchange rate there is a very weak long-run relationship between real exchange rates and real interest rate differentials on the basis of the individual country results. Thus our Johansen test results (reported in part (A) of Table 2) offer evidence of the existence of a long-run equilibrium for only the Swiss franc real exchange rate relationship, where the null hypothesis of non-cointegration can be rejected at the 5 percent significance level.

In contrast, our panel estimates provide clear empirical evidence for the existence of a statistically significant long-run RERI relationship, especially when long-term interest rates are used. For the full panel of countries, the estimated value of the panel ADF statistic easily facilitates rejection of the null hypothesis at the 1 percent level, regardless of the length of maturity. However, as was mentioned previously, the full panel contains some country pairings that have stationary real interest differentials; and these may be causing the result to be biased toward rejection of the null. The panel cointegration tests are therefore also implemented on the panels comprising only non-stationary combinations of real exchange rates and real interest rates, as discussed above. The sub-panel containing long rates also produces a convincing rejection of the null of non-cointegration, although the sub-panel with short rates does not. The relatively stronger empirical support for the model when long-term interest rates are used is consistent with the fact that long-term interest rates contain more relevant information on the long-run movements of financial markets.

Further confirmation of our model specification comes from the estimated values of β_i. As expected, most parameters are significantly negative, and there is a clear term structure relationship since the absolute magnitude of this coefficient rises as the maturity of the bonds increases. Numerically, the point estimates on short rates are close to their expected levels, and, indeed, both are statistically indistinguishable from -0.25. Although both long rate coefficients are below -1.0, they are statistically different from minus 10.

Table 2. Cointegration Results

	Exchange Rates-Long-Run Interest Rates				Exchange Rates-Short-Run Interest Rates			
	(A) Single Country Johansen Tests a/							
	Null (max)		Null (Trace)		Null (max)		Null (Trace)	
	r == 0	r <= 1	r == 0	r <= 1	r == 0	r <= 1	r == 0	r <= 1
Countries								
Australia	7.893	4.616	12.51	4.616	6.526	3.926	10.45	3.926
Austria	8.201	4.174	12.37	4.174	10.06	3.022	13.08	3.022
Belgium	--	--	--	--	7.738	4.587	12.32	4.587
Canada	--	--	--	--	--	--	--	--
Denmark	--	--	--	--	--	--	--	--
France	--	--	--	--	5.278	4.027	9.305	4.027
Germany	7.383	5.408	12.79	5.408	--	--	--	--
Italy	--	--	--	--	7.578	4.750	12.33	4.750
Japan	9.404	3.177	12.58	3.177	--	--	--	--
Netherlands	6.726	6.319	13.04	6.319	6.789	4.394	11.18	4.394
New Zealand	--	--	--	--	--	--	--	--
Norway	11.33	4.242	15.57	4.242	--	--	--	--
Switzerland	16.08 b/	3.210	19.29	3.210	12.49	3.083	15.57	3.083
UK	11.75	6.776	18.53	6.776	--	--	--	--
	(B) Panel Tests d/							
No. of countries	ADF t-value	FMOLS β_i estimate	FMOLS Adj. t-value $H_0: \beta_i = 0.0$	FMOLS Adj. t-value $H_0: \beta_i = -10.0$	ADF t-value	FMOLS β_i estimate	FMOLS Adj. t-value $H_0: \beta_i = 0.0$	FMOLS Adj. t-value $H_0: \beta_i = -0.25$
N=14	-8.962 c/	-3.639	-7.375 c/	12.910 c/	-7.629 b/	-0.834	-2.285 b/	-1.538
N=8	-7.733 b/	-3.747	-7.336 c/	9.694 c/	--	--	--	
N=7	--	--	--		-4.731	-0.609	-0.918	-0.444

Note:

a/ The constant term enters the long-run specification, and the Trace and Max statistics are adjusted using the sample correction of Reimers (1992). The critical values for the Johansen test are obtained from Ostwerwald-Lenum (1992). The critical values for Pedroni's ADF test are based on Pedroni (1997a) with N=10 and T=100.

b/ Denotes significance at the 5 percent level.

c/ Denotes significance at the 1 percent level.

d/ Study with N = 14 covers a whole set of countries, while N = 8 includes Australia, Austria, Germany, Japan, Netherlands, Norway, Switzerland and UK, and N = 7 Australia, Austria, Belgium, France, Italy, Netherlands and Switzerland.

IV. CONCLUSION

In this paper we have empirically analyzed the long-run relationship between real exchange rates and real interest rate differentials, using a panel data set comprising 14 industrialized countries for the recent floating exchange rate period. Our empirical results using the single equation method of Johansen provide evidence consistent with previous single country studies, since the RERI only produces a statistically significant long-run relationship for one currency pairing. However, the use of a panel cointegration test produced a clear rejection of the null hypothesis of non-cointegration, even when the equilibrium real exchange rate is assumed constant. The rejection of the null hypothesis is clearest when long-term interest rates are used. Furthermore, the estimated slope coefficients are in conformity with the model specification. Our results, therefore, would seem to provide further evidence that important fundamentals-based exchange rate relationships may be in the data after all, and the failure of others to establish such relationships may reflect the estimation method used rather than any inherent deficiency of the fundamentals-based models.

REFERENCES

Baxter, Marianne, 1994, "Real Exchange Rates and Real Interest Differentials: Have We Missed the Business-Cycle Relationship?," *Journal of Monetary Economics,* Vol. 33 pp. 5-37.

Campbell, John Y. and Richard H. Clarida, 1987, "The Dollar and Real Interest Rates", *Carnegie-Rochester Conference Series on Public Policy*, Vol. 27 (Autumn), pp. 103-140.

Canzoneri, Matthew B., Robert E. Cumby and Behyad Diba, 1996, "Relative Labor Productivity and the Real Exchange Rates in the Long Run: Evidence for a Panel of OECD Countries," NBER Working Paper No. 5676 (Cambridge, Massachusetts: National Bureau of Economic Research).

Chinn, Menzie D., 1996, "Sectoral Productivity, Government Spending and Real Exchange Rates: Empirical Evidence for OECD Countries," Working Paper (Santa Cruz, California: Economics Department, University of California).

Coughlin, Cletus C. and Kees Koedijk, 1990, "What Do We Know about the Long-Run Real Exchange Rate?," *Review/Federal Reserve Bank of St. Louis,* Vol. 72 (January/February), pp. 36-48.

Edison, Hali J. and William R. Melick, 1995, "Alternative Approaches to Real Exchange Rates and Real Interest Rates: Three Up and Three Down," *International Finance Discussion Papers,* No. 518 (August), Board of Governors of the Federal Reserve System, (Washington DC: Federal Reserve System).

Edison, Hali J. and B. Dianne Pauls, 1993, "A Re-Assessment of the Relationship between Real Exchange Rates and Real Interest Rates: 1974-1990," *Journal of Monetary Economics,* Vol. 31, pp. 165-187.

Hallwood, C. Paul and Ronald MacDonald, 1994, *International Money and Finance,* Oxford: Blackwell.

Huizinga, John, 1987, "An Empirical Investigation of the Long Run Behavior of Real Exchange Rates," *Carnegie-Rochester Conference Series on Public Policy*, Vol. 27 (Autumn), pp. 149-214.

Johansen, Soren, 1988, "Statistical Analysis of Co-integration Vectors," *Journal of Economic Dynamics and Control,* Vol. 12 (June - September), pp. 231-54.

MacDonald, Ronald, 1995, "Long-Run Exchange Rate Modeling," *Staff Papers,* International Monetary Fund, Vol. 42 (September), pp. 437-89.

MacDonald, Ronald, 1997, "What Determines Real Exchange Rates: The Long and Short of It," IMF Working Paper, 97/21, (Washington DC: International Monetary Fund).

MacDonald, Ronald, 1998, "What do we Really know about Real Exchange Rates?" Oesterreichische Nationalbank Discussion Paper, 28.

MacDonald, Ronald, Ian W. Marsh and Jun Nagayasu, 1996, "Revisiting the Long-Run Relationship Between Real Exchange Rates and Real Interest Rate Differentials," ICMM Discussion Paper Series, No. 39, (Glasgow: Economics Department, University of Strathclyde).

MacKinnon, James G., 1991, "Critical Values for Cointegration Tests," *Long-run Economic Relationships: Readings in Cointegration,* ed. By R. F. Engle and C. W. J. Granger (Oxford: Oxford University Press).

Meese, Richard and Kenneth Rogoff, 1988, "What Is Real? The Exchange Rate-Interest Differential Relation over the Modern Floating-Rate Period," *Journal of* Finance, Vol. XLIII, No. 4 (September), pp. 933-948.

Nagayasu, Jun, 1998, "Does the Long-Run PPP Hypothesis Hold for Africa?: Evidence from Panel Cointegration Study," IMF Working Paper, 98/123, (Washington DC: International Monetary Fund).

Osterwald-Lenum, Michael, 1992, "A Note with Quantiles of the Asymptotic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics," *Oxford Bulletin of Economics and Statistics,* Vol. 54 (August), pp. 461-71.

Pedroni, Peter L., 1996, "Fully Modified OLS for Heterogeneous Cointegrated Panels and the Case of Purchasing Power Parity," Working Paper, 96-020, (Bloomington, Indiana: Economics Department, Indiana University).

Pedroni, Peter L., 1997a, "Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with An Application to the PPP Hypothesis," Working Paper, (Bloomington, Indiana: Economics Department, Indiana University).

Pedroni, Peter L., 1997b, "On the Role of Human Capital in Growth Models: Evidence from a Nonstationary Panel of Developing Countries," Working Paper (Bloomington, Indiana: Economics Department, Indiana University).

Reimers, Hans-Eggert, 1992, "Comparisons of Tests for Multivariate Cointegration," *Statistical Papers*, Vol. 33 pp. 335-59.

Definition of variables a/

	Exchange Rate (Period average)	Price (CPI)	SR Interest Rate	LR Interest Rate
Australia	rf	64	Treasury bill rate (60c)	Govt bond yield (61)
Austria	rf	64	Money market rate (60b)	Govt bond yield (61)
Belgium	rf	64	Money market rate (60b)	Govt bond yield (61)
Canada	rf	64	Money market rate (60b)	Govt bond yield (61)
Denmark	rf	64	Money market rate (60b)	Govt bond yield (61)
France	rf	64	Money market rate (60b)	Govt bond yield (61)
Germany	rf	64	Money market rate (60b)	Govt bond yield (61)
Italy	rf	64	Money market rate (60b)	Govt bond yield (61)
Japan	rf	64	Money market rate (60b)	Govt bond yield (61)
Netherlands	rf	64	Money market rate (60b)	Govt bond yield (61)
New Zealand	rf	64	Discount rate (60)	Govt bond yield (61)
Norway	rf	64	Money market rate (60b)	Govt bond yield (61)
Switzerland	rf	64	Discount rate (60)	Govt bond yield (61)
U.K.	rf	64	Money market rate (60b)	Govt bond yield (61)
U.S.	--	64	Treasury bill rate (60c)	Govt bond yield (61)

Note:
a/ The numbers in parentheses indicate the code numbers of the variables which is consistent with the IMF classification.