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Interest Rates in East Asian Countries: Internal Financial Structures and International Linkages

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RÉSUMÉ

Les progrès de la libéralisation financière en Asie ont donné lieu à une abondante littérature économique, surtout centrée sur les aspects externes. L'appartenance des économies asiatiques à une zone monétaire constitue la question principale de ces études. Les résultats généralement obtenus montrent que le dollar occupe encore une importance dominante dans la région de l'Asie orientale. Les méthodes employées reposent souvent sur des tests de parité de taux d'intérêt, dont l'hypothèse implicite est que l'ensemble des conditions monétaires d'un pays peut être représenté par un seul taux d'intérêt. Or cette hypothèse paraît contestable, dans le cas de pays qui n'ont pas achevé leur processus de libéralisation financière interne.

Cette étude adopte donc une méthode en deux étapes, qui vise à évaluer l'intégration financière interne, en préalable à l'estimation des liaisons internationales. Dans une première étape, des tests de cointégration sont effectués afin d'estimer les relations entre le taux directeur de la banque centrale et l'ensemble des taux d'intérêt internes, créditeurs ou débiteurs. La deuxième étape évalue ensuite l'influence des taux américain ou japonais sur les taux d'intérêt des pays asiatiques, au moyen de tests de causalité à la Granger. L'échantillon comporte huit pays : la Corée, Hong Kong, l'Indonésie, la Malaisie, les Philippines, Singapour, Taiwan et la Thaïlande. Afin de capter d'éventuels changements récents, les tests sont menés sur données hebdomadaires sur une période récente.

Différents schémas ont été identifiés. En Corée, il existe une influence claire du taux d'intérêt américain, qui est répercutée sur l'ensemble des taux internes. A Singapour, l'influence américaine s'exerce aussi mais le taux du crédit n'y est pas soumis. A Hong Kong, du fait du *currency board*, le taux d'intérêt directeur est très lié à celui des Etats-Unis ; pourtant en pratique l'existence de réserves excédentaires permet d'assouplir la contrainte stricte d'un pur *currency board*, et les taux des crédits et des dépôts ne suivent pas nécessairement le taux directeur. En Thaïlande, le taux au jour le jour est soumis à l'influence américaine, mais ses variations n'affectent pas les autres taux. En Indonésie, en Malaisie et aux Philippines, aucune influence des taux étrangers n'a été détectée.

Bien que l'échantillon porte sur des données très récentes, les tests montrent que le rôle du yen est très faible, puisque aucun pays sur les huit de l'échantillon n'a son taux d'intérêt lié à celui du Japon. Le statut dominant du dollar dans la région est confirmé.

Cependant, les influences externes ne sont pas nécessairement répercutées à l'ensemble de l'économie.

SUMMARY

The progress of financial liberalisation in East Asian countries has led to an abundant economic literature, especially as far as its external aspects are concerned. Without doubt, the main issue hinges on whether these countries participate in a monetary zone, as this has important implications for the role of the yen and the dollar in the international monetary system. Research generally suggests that the dollar is still the dominant currency in East Asia. The methods used to obtain such results are often based on interest rate parity tests, with the implicit assumption that the overall monetary stance of a country may be revealed by a single rate of interest. However, this assumption can be challenged for countries which have not yet completed internal financial liberalisation.

The present study uses a two-step method to look at this issue, by first evaluating internal financial integration prior to estimating international links. To begin with, cointegration tests are carried out to estimate the relationship between central bank benchmark rates and other domestic interest rates, deposit or lending rates. Thereafter, the influence of American and Japanese rates on Asian rates is evaluated, using Granger causality tests. The sample studied includes eight countries: Korea, Hong Kong, Indonesia, Malaysia, the Philippines, Singapore, Taiwan and Thailand. In order to include any possible recent developments, tests are carried out on recent, weekly data.

Various patterns of behaviour have been identified. For Korea, a clear influence of American interest rate can be found, and this is reflected across all domestic rates. Singapore too is influenced by the American rate, though not the lending rate. Given Hong Kong's currency board, the benchmark rate is very closely tied to the United States; however, in practice surplus reserves allow such a strict currency board constraint to be somewhat moderated, with deposit and lending rates not necessarily following the benchmark rate. In Thailand, the call rate is subject to an American influence, but its fluctuations are not passed on through to other rates. In Indonesia, Malaysia, and the Philippines, no foreign influence could be found on nominal rates

Although the sample is based on recent data, the tests show that the role of the yen is still very limited, as no country out of eight has its interest rate linked to the Japanese one. The dominant status of the dollar in the region is thus confirmed. Nevertheless, external influences are not necessarily carried over into the whole of the economy.

***Interest Rates in East Asian Countries :
Internal Financial Structures and International Linkages¹***

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INTRODUCTION

Financial liberalization has greatly advanced in East-Asian countries, while the flows of international capital have been increasing. GATS negotiations have also given an impulse to this trend in the nineties. Some ASEAN countries were urged to commit themselves to improving foreign access to their banking and financial markets, in the perspective of additional negotiations by 1997. For example, Korea and Thailand made proposals in this direction. Liberalization has been twofold: on the domestic side, and also on the international side.

The economic literature has recently emphasized external aspects, since the issue is particularly important for international financial integration: Chinn and Frankel (1994), (1995), Philaktis (1995), Fukasaku and Martineau (1996), have studied the financial linkages between the Pacific Basin region, the United States and Japan. Levasseur and Serranito (1996) has focused on linkages within the East-Asian area. All these papers have addressed the issue of a monetary zone in this region. The main issue is certainly to find out if the Asian countries submit themselves to financial influences from the United States or from Japan. The question of a dollar versus a yen zone has also been examined in Bénassy-Quéré (1996). Until now, evidence shows that the dollar still exercises a strong influence in the area. But, trends to an increasing role of the yen have also been noticed. However, the external aspects are only a part of the matter. Some key monetary interest rates may react to international rate movements, but other financial markets may be isolated from those movements, if the financial markets are still segmented. Therefore, focusing on a single interest rate by country may be misleading.

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The purpose of this paper is first to assess the integration of the different domestic financial markets. Then it will be possible to return to the question of external monetary integration. As the financial environment is changing very rapidly in the area, it is important to use recent data so as to identify new trends, if any. The weekly data used in this paper allow us to focus on the late eighties and the nineties. Given the availability of the data, this paper considers the following countries: Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand.

The rest of the paper is organized as follows. Section 1 briefly describes the main steps of financial liberalization in these countries, looking at the domestic aspects. Section 2 investigates the links between domestic interest rates, using cointegration tests. Section 3 raises the issue of the international financial openness, while recalling the main stages of the external liberalization. The existence of a monetary area around Japan or the United States is also raised and tested by Granger causality.

1. ASSESSING THE DOMESTIC FINANCIAL LIBERALIZATION AN OVERVIEW

It is common knowledge that public deficits have largely contributed to the development of bond markets in OECD countries, and have triggered the whole liberalization process in increasing direct finance. In contrast, the fiscal stance in South-East Asia does not seem to be linked to the liberalization process. In some countries, as in Malaysia, large fiscal deficits have not triggered an increase in bond markets, nor the launching of financial liberalization. In other countries like Singapore, surpluses recorded since at least 1970 have not hindered the extension of the bond market. In the 90s, the GATS negotiations brought about new reasons to speed up financial deregulation, which has mainly focused on money markets and on the stock market.

Roughly speaking, most countries have followed the same pattern. In the first stage, ceilings on deposits and lending rates were progressively removed, though at different times. The bulk of the interest rate liberalization process took place in the mid-to late seventies in Singapore and Malaysia, in the early eighties in Indonesia. It was delayed till the late eighties in Taiwan and Thailand and until the nineties in Korea. For the latter, the prospect of becoming an OECD member was instrumental in the move towards liberalization. The removal of interest rate controls were still pursued in Malaysia, as commercial banks and finance companies were allowed to quote their base lending rate below the computed ceiling, based on a weighted average of the three-month interbank rate for the preceding month as of November 1995, in order to foster competition among financial institutions.

In the second stage, some measures were implemented to make competition keener within the financial sector, even if things are far from being completed. The usual package of measures includes desintermediation of financial circuits, integration of the financial markets, deregulation of the banking system and possibly the transformation of the specialized institutions. For example in Indonesia, the banking sector was reformed as

soon as 1988; public banks were partly privatized from 1992 onwards, more foreign banks were allowed to carry out their business.

As far as the conduct of monetary policy is concerned, direct control through credit quota and reserve requirements have prevailed throughout the eighties. Moral suasion has also been current practice by the central bank to entice banks into implementing its monetary directives. It is still used in some countries, like Indonesia. In order to streamline a generally narrow monetary market and to control the monetary aggregates through interest rates, monetary policy instruments were modified in a more recent stage. Repurchase agreements (Repos) and reversed Repurchase agreements have been introduced for public bonds, or treasury bills in the countries where they were sufficiently numerous, as in Thailand or in Taiwan and the Philippines. These Repos possibly bear on central banks securities, in the countries where public bonds are rare, as in Indonesia where the central bank has been using S. B. I. (Bank of Indonesia Certificates) since 1994. In Korea, central bank securities (Monetary Stabilization Bonds) are no longer allocated to banks administratively. They have been auctioned since mid-1993. In the Philippines, central bank bills were issued under the reverse repurchase facility, instead of treasury bills, because budget deficits dwindled away. New products have also been introduced in the money market, as certificates of deposit and commercial papers in most countries, in order to stimulate the money market.

Great emphasis has been put on the spectacular developments of direct finance in these so-called « emerging markets », mainly because of the opportunities offered to foreign investors by external liberalization. Malaysia, Hong Kong and Singapore recorded large market values for shares in 1995 (table 1). Nonetheless, compared to gross fixed investment, new capital raised by firms never climbed over 12% overall, though in Singapore new capital raised by firms amounted to over 20% of gross fixed investment in 1994. The weakness of this ratio highlights the relatively scarce use of financial markets

Generally speaking, the higher the equity market capitalization, the larger the ratio of new capital to gross investment. The first ratio seems to be consistent with the equity market capitalization, Indonesia and Korea being the poorest performers for both ratios. Thus, as far as the equity market is concerned, this confirms that Hong Kong and Singapore are the largest financial centers, that Korea and Indonesia are the least developed, while Malaysia, Thailand, and Taiwan are in an intermediate situation. Ceilings on the number of shares that foreign investors may buy in these countries bear out this statement. Whereas in Singapore, Hong Kong and Malaysia, investment by foreigners in domestic firms is free of regulation, other countries such as Indonesia and Thailand allow foreigners to buy up to 49% of listed shares, and up to 40% in the Philippines. In Korea, this quota amounts to only 12% of listed shares as of 1994, and in Taiwan, a global

³ As in Europe (except the United Kingdom and more recently in France).

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ceiling of \$13 billion is set for foreign investment (including Global Deposit Receipts, etc.). Foreign investment is limited there to 20% of listed shares as of March 1996.

Table 1: Market values of shares and bonds compared to bank credit

as a percentage of GDP, except last column as a % of investment

	Market capitalization of shares (1)	Market capitalization of bonds (2)	<i>of which:</i> <i>public bonds</i> (3)	Bank credit (4)	New capital raised by firms/investment (5)
Hong Kong	210,9	n.a.	<i>n.a.</i>	143,6	10,6
Indonesia	39,7	0,2	<i>0,1</i>	50,8	5,5
Korea	40,2	35,9	<i>19,8</i>	43,1	4,8
Malaysia	263,7	4,3	<i>0,0</i>	85,0	11,6
Philippines	80,9		<i>0,0</i>	38,3	11,5
Singapore	194,1	193,6		87,8	21,2
Taiwan	73,9	12,6	<i>13,9</i>	93,6	12,7
Thailand	82,6	1,1	<i>1,1</i>	88,3	8,7

Sources: *FIBV Annual Report and Statistics*, for equity and bond market values, national central bank reports and *International Financial Statistics of the IMF* for credit banking, *IMF* database for GDP of Indonesia, Korea and the Philippines and *Goldman Sachs Asia* Economic Quarterly for GDP of HK, Thailand, Singapore and Malaysia, *Bank of Taiwan* annual report for GDP of Taiwan, *FIBV* for NKR, and *Agence Financière pour l'Asie du sud-est*, 1996/08/13 for Singapore NKR, *IMF* for GFIC, *Hong Kong and Shanghai Banking Corporation* Economic report, March 1996 for Hong Kong GFIC, Taiwan statistical data book 1995 for Taiwan GFIC.

- (1) Market capitalization of shares of domestic companies at end 1995, main and parallel markets, excluding investment funds unless specified; Singapore: including investment funds; Thailand: including investment funds, convertibles and warrants.
- (2) Total market value of bonds listed at year-end 1995.
- (3) Total market value of bonds of the domestic public sector at year-end 1995.
- (4) Bank credit of commercial banks in 1995, including loans, overdrafts and bills to the non-financial domestic private sector and to public enterprises unless specified. Hong Kong, Malaysia and the Philippines: December 1995, Korea: November 1995, Thailand: June 1995, Indonesia and Singapore: March 1995, Taiwan: 1994.
- (5) New capital raised by firms as a percentage of gross fixed investment; Hong Kong, Indonesia, Korea, Philippines: 1995; Malaysia, Singapore, Taiwan and Thailand: 1994.

Bond markets are not very developed in the region, except in Singapore and in Korea. In Malaysia, Taiwan or the Philippines, large budget deficits have not contributed to the development of bond markets.

In fact, credit remains the major source of financing for domestic firms. In the Philippines, Korea and Indonesia, there is some evidence of a lack of financial deepening, and deficiencies in the autonomy of bank management. In order to achieve a better distribution of credit across all groups of creditors, some countries (Indonesia, Korea, etc.) have introduced obligatory lending ratios, compelling banks to extend credit to small- and medium-sized firms. For instance in Indonesia, this ratio amounts to 20%.

2. EMPIRICAL EVIDENCE OF DEREGULATION IN DOMESTIC INTEREST RATES

In this section, an attempt is made to assess whether the processes of financial liberalization implemented in South-East Asian countries have resulted in increased linkages between interest rates. There is a double issue at stake. The first concerns the transmission of monetary policy, so that the link between domestic interest rates and the rate controlled by the central bank is examined. The purpose is to see if the variations in the rate used by the central bank to implement its monetary policy are passed through to other interest rates, or if, on the contrary, the other rates remain inert and unaffected by monetary policy, because of possible regulations or segmentation of the different credit markets. The second issue concerns the equally important question of assessing the links between the interest rate that can be used to manage the exchange rate and the other domestic interest rates.

2.1 *The data*

Weekly data from the DATASTREAM database has been used. This periodicity allows a recent period to be considered. The starting date of the sample is in the late eighties or the early nineties, according to the availability of the data. The precise period is reported at the end of table 2. Several interest rates are available in each country. These interest rates concern the money market, as well as the bank deposit and lending rates.

A benchmark interest rate has been identified for each country, based on the reading of the central banks reports. These benchmark interest rates are the following: for Indonesia, Bank of Indonesia 90 days certificates⁴, unfortunately, the interest rate available (SBI90D) gives only the upper value of the central bank's bracket not the average rate. For Thailand, it is the repo rate since 1989⁵ (TH1DREP). For Singapore, the monetary authorities report refers to the 3-month interbank rate as the reference rate (SNGIB3M)⁶. For Malaysia, over 60% of transactions in the money market are for overnight money, so

⁴ Cf: Bank of Indonesia , «Report for the financial year 1994-95», Jakarta, 1995, pp 28-32.

⁵ Bank of Thailand, «Quarterly statistical bulletin» vol.35, n°2, Bangkok, June 1995, pp. 43-44.

⁶ Monetary Authority of Singapore, «Annual report 1994/95 », Singapore, 1995, pp. 33-35.

the call rate is thought to be the benchmark rate (MYIBKCL)⁷. For Hong Kong, the reference rate is the 3-month HIBOR (HKIBK3M), according to the Hong Kong and Shanghai Banking Corporation reports⁸. For the Philippines, the 90 D T-Bill has been used, as Treasury bills (with Central bank bills) are the main instruments of monetary policy⁹ (s).

For Korea, the 3-month certificate of deposit rate (KOCD91D) is the interest rate most often discussed by market studies analysts¹⁰. Bank central instruments are repos on public and corporate bonds along with monetary stabilization bonds, but these rates were not available on a weekly basis. For Taiwan, the benchmark rate is the 3-month certificate of deposit¹¹, as it was not available, the money market 90D rate (TAMM90D), was used here.

It is assumed that the rate used by the central banks to defend their currency is a call rate¹²; except for Hong Kong, where it seems to be the 3-month rate (HIBOR3M). In Malaysia, as an offshore rate is available (MYOFS3M), it has been used for representing the rate submitted to external influences.

2.2 Unit Root Tests

Unit root tests were performed according to the procedure proposed by Dolado *et al* (1990), so as to test the order of integration of the variables. But as the data relate to interest rates, the procedure was not started with the most unrestricted model which includes a trend and a constant. This is because nothing in economic theory suggests that nominal interest rates should exhibit a deterministic time trend. Therefore, the natural null hypothesis is that the true process is a random walk without a trend. In the case of a stationary process, the process would have a positive mean, therefore a constant term has been included in the regression.

Starting with model (1), the unit root hypothesis $\mathbf{r} = 1$, was tested, using the Augmented Dickey-Fuller test¹³.

$$(1) \quad Y_t = \mathbf{m} + \mathbf{r} Y_{t-1} + \sum_j \mathbf{g}_j \Delta Y_{t-j} + \mathbf{e}_t$$

If the null hypothesis was rejected, the procedure was stopped and it was concluded that the series is stationary. Otherwise, the significance of the constant term

⁷ Bank Negara Malaysia, «Annual report 1995», Kuala Lumpur, pp. 112-115.

⁸ The Hong Kong and Shanghai Banking Corporation, «Economic Report», various issues, Hong Kong, 1996 -

⁹ World Bank «Report n°10053-PH «Philippines: Capital Market Study», 1992 and Goldman Sachs Asian Quarterly, various issues 1996

¹⁰ See for example Goldman Sachs Asian Quarterly

¹¹ Goldman Sachs Asian Quarterly.

¹² As the Financial Times of the 8/10/1996 suggests for exchange crises for Thailand, Malaysia and Indonesia.

¹³ The Akaike Information Criterion was used to determine the number of lags in the regression.

under the null hypothesis was tested. If it was significant, the unit root hypothesis was tested using the standard tables. If the constant term was not significant, the non-stationarity was tested in model(2)

$$(2) Y_t = \mathbf{r} Y_{t-1} + \sum_j \mathbf{g}_j \Delta Y_{t-j} + \mathbf{e}_t$$

If the null hypothesis was not rejected, the hypothesis of more than a unit root was then tested using the same procedure. The results are summarized in table 2.

Most interest rates are I(1). Moreover, as expected, tests show that all the I(1) variables are without drift. All the interest rates examined in Singapore, Hong Kong, Korea (except for this country the corporate money in trust 180D. rate) and Malaysia (except the base lending rate, which is at least integrated of order 2) are I(1). In Thailand, Indonesia, the Philippines and Taiwan, call rates or similar interbank short term rates are stationary.

In Thailand, the benchmark interest rate (TH1DREP) is I(0); therefore it cannot be used in the cointegration tests; the 3-month interbank rate (THIBK3M) was used instead. In Taiwan, as all rates are I(0), cointegration tests were not carried out.

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Table 2 : Unit root tests

	P. value of ADF(with cst)	constant (1)	P.value of ADF (without cst)	number of optimal lags	Integration order
Thailand					
THDEP1Y	0.292	0	0.226	2	1
THDEP3M	0.333	0	0.397	8	1
THMINOR	0.313	0	0.487	10	1
THIBK3M	0.091	0	0.160	2	1
THAIBCL	0.017	n.a.	-	7	0
THAIBON	0.003	n.a.	-	4	0
THMNLEN	0.287	0	0.409	10	1
THMNOFF	0.272	0	0.418	10	1
TH1DREP	0.047	n.a.	-	10	0
Singapore					
SGPRIME	0.341	0	0.687	16	1
SNGDP1Y	0.476	0	0.412	6	1
SNGDP3M	0.472	0	0.388	2	1
SNGDPCL	0.637	0	0.357	16	1
SNGIB1Y	0.380	0	0.418	6	1
SNGIB3M	0.437	0	0.396	9	1
SNGIBCL	0.601	0	0.359	16	1
Philippines					
PHPRIME	0.025	n.a.	-	7	0
PHRF180	0.763	0	0.235	6	1
PHRF90D	0.702	0	0.256	3	1
PHIBKCL	0.009	n.a.	-	14	0
PHTBL3M	0.380	0	0.334	3	1
PHTBL6M	0.518	0	0.304	3	1
Hong-Kong					
HKIBK1Y	0.299	0	0.476	7	1
HKIBKCL	0.226	0	0.357	16	1
HKDEP1Y	0.303	0	0.445	5	1
HKDEP3M	0.297	0	0.376	5	1
HKDEPCL	0.332	0	0.350	7	1
HKIBK3M	0.175	0	0.393	10	1
HKPRIME	0.524	0	0.693	2	1
Taiwan					
TADEP1Y	0.926	0	0.163	2	1
TADEP3M	0.944	0	0.070	2	1
TAPRIME	0.714	0	0.221	3	1
TAIBKON	0.008	n.a.	-	5	0
TAMM90D	0.008	n.a.	-	4	0

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Malaysia					
MLBASEL	0.702	0	0.926	10	more than 1 (2)
MYDEP1Y	0.602	0	0.685	5	1
MYDEP3M	0.580	0	0.649	6	1
MYIBKCL	0.496	0	0.520	5	1
MYIBK1Y	0.766	0	0.733	3	1
MYIBK3M	0.696	0	0.648	4	1
MYOFS3M	0.754	0	0.611	6	1
Indonesia					
IDLENDR	0.421	0	0.552	11	1
IDDEP1Y	0.233	0	0.460	15	1
IDDEP3M	0.359	0	0.533	11	1
IDIBCAL	0.017	n.a.	-	3	0
IDSBI90	0.681	0	0.560	6	1
Korea					
KOBDIT1	0.248	0	0.199	9	1
KOCALLA	0.177	0	0.422	6	1
KOCALLV	0.112	0	0.392	6	1
KOCALLO	0.156	0	0.426	6	1
KOCD91D	0.658	0	0.222	4	1
KOCP91D	0.533	0	0.400	7	1
KOFB91D	0.529	0	0.401	6	1
KOHHMON	0.490	0	0.649	4	1
KOTB91D	0.470	0	0.365	6	1
KOLD91D	0.349	0	0.321	5	1

(1) $cst = 0$ if the constant is not different from zero with a 95% confidence interval.

$cst = n.a.$ if the variable is stationary in model (1), the constant is not tested.

(2) The P-values reported here are those of equation (1) and (2). Similar tests done for the first difference of this variable show that it is I(2), but P. values are not reported here.

Time Sample:

Each sample is as long as possible, according to the availability of the data.

- Thailand: 1/2/1991 to 4/24/1996, except for THDEP1Y and THDEP3M, for which the sample ends in 5/31/1995 and for THIBK3M and THMINOR for which it ends in 11/8/1995 and in 4/26/1995, respectively.
- Singapore: 1/7/1987 to 4/24/1996
- Philippines : 1/3/1990 to 4/24/1996, except for PHPRIME, for which the sample starts in 8/4/1993.
- Hong-Kong: 1/1/1986 to 4/24/1996, except for HKIBK1Y and HKIBKCL for which the sample starts in 1/14/1987.
- Taiwan: 1/8/1992 to 4/24/1996.
- Malaysia: 8/11/1993 to 4/24/1996.
- Indonesia: 1/4/1989 to 4/24/1996.

- Korea: 8/4/1993 to 4/24/1996, except for KOHHMON, for which the sample ends in 12/13/95 and for KOLD91D for which the sample ends in 01/03/96.

2.3 Cointegration tests

The link between domestic interest rates is tested through cointegration tests. These tests allow a long term relationship between each interest rate and the benchmark rate to be assessed. The test consists in determining whether there is a linear combination of two I(1) series that is stationary. Cointegration tests have been performed in two ways. First, using the Engle-Granger (1987) methodology: the cointegrating coefficient, α , has been estimated in equation (3)¹⁴ and the unit root hypothesis $r=1$ has been tested in equation (3') on residuals from the regression (3):

$$(3) \quad r_t = \mathbf{a} Br_t + cte + \mathbf{e}_t$$

$$(3') \quad \hat{\mathbf{e}}_t = \mathbf{r} \hat{\mathbf{e}}_{t-1} + \sum_j \mathbf{g}_j \Delta \hat{\mathbf{e}}_{t-j} + \mathbf{h}_t$$

with Br the benchmark rate of the central bank, r another interest rate.

If \mathbf{e} is stationary, then r and Br are cointegrated.

Second, the cointegrating vector was fixed at one, and so unit root tests of $r=1$ were performed on spreads¹⁵ in (4):

$$(4) \quad (\mathbf{r} - Br)_t = \mathbf{r} (\mathbf{r} - Br)_{t-1} + cte + \mathbf{e}_t$$

The results are summarized in table 3.

Obviously, some variables may be simultaneously cointegrated in the Engle-Granger method and their spread be I(1). This simply means that their cointegrating vector is different from (1, -1); they are considered as cointegrated. The opposite case is less trivial. When the spread is I(0) and the two interest rates are not cointegrated by Engle-Granger, the interpretation is more problematic. This case occurs for 3 series (MYDEP1Y, KOTB91D, KOHHMON). For one series out of three (MYDEP1Y), Engle-Granger cointegration appeared when the order of the variables is switched in equation (3). For the two other (KOTB91D and KOHHMON), no Granger cointegration was obtained by inverting the variables. In both cases, the cointegrating vector was very close to (1, -1), which is that of the spread, so the value of the test statistics were very close, for the $t(\mathbf{r})$ in both equation (3') and (4) (-1.80 and -1.77 respectively for KOTB91D; -1.78 and -1.73 for KOHHMON). However, although these tests are constructed in the same way, the critical values differ greatly when they are applied to an univariate process as in

¹⁴ In the absence of cointegration in the model with a constant term, cointegration has been tested in the model without constant.

¹⁵ The "Dolado's procedure" has been followed here to.

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(4) or when they are applied to the residual from a spurious regression as equation (3)¹⁶. Eventually, coming back to the Granger representation theorem, these series were considered as cointegrated with the benchmark rate, as obviously there exists a linear combination (1, -1), the one of the spread, which is stationary.

¹⁶ see Hamilton pp. 592-596

Table 3 : Cointegration tests between Asian domestic interest rates

	Engle Granger test with a constant		Engle Granger test without a constant		Unit root test
	P-Value	Cointegrating vector (1)	P-Value	Cointegrating vector (1)	SPREAD stationary
Thailand, THIBK3M					
• Deposit rates					
THDEP1Y	0.018**	-0.677	-	-	0.003**
THDEP3M	0.229	-	0.071*	-0.819	0.033**
• Lending rates					
THMINOR	0.080*	-0.635	-	-	0.014**
THMNLEN	0.189	-	0.021**	-1.109	0.013**
THMNOFF	0.223	-	0.022**	-1.116	0.015**
Singapore, SNGIB3M					
• Money market rates					
SNGIB1Y	0.024**	-0.865	-	-	0.074*
SNGIBCL	0.016**	-1.071	-	-	0.006**
• Deposit rates					
SNGDP1Y	0.093*	-0.882	-	-	0.054**
SNGDP3M	0.207	-	0.059*	-1.020	0.033**
SNGDPCL	0.037**	-1.090	-	-	0.020**
• Lending rates					
SGPRIME	0.548	-	0.447	-	0,369
Philippines, PHTBL3M					
• Money market rates					
PHTBL6M	0.000**	-1.049	-	-	0.154
PHRF90D	0.028**	-0.818	-	-	0.008**
• Other rates					
PHRF180	0.000**	-0.820	-	-	0.000**
Hongkong, HKIBK3M					
• Money market rates					
HKIBK1Y	0.023 **	-0.842	-	-	0.014**
HKIBKCL	0.027**	-1.069	-	-	0.009**
• Deposit rates					
HKDEP1Y	0.043**	-0.819	-	-	0.028**
HKDEP3M	0.481	-	0.190	-	0.147
HKDEPCL	0.248	-	0.097 *	-0.834	0.101
• Lending rates					
HKPRIME	0.516	-	0.257	-	0.505

/...

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/...

	Engle Granger test with a constant		Engle Granger test without a constant		Unit root test
	P-Value	Cointegrating vector (1)	P-Value	Cointegrating vector (1)	SPREAD stationary
Malaysia, MYIBKCL					
• Money market rates					
MYIBK1Y	0.507	-	0.097*	-1.131	0.053*
MYIBK3M	0.633	-	0.066*	-1.070	0.058*
• Deposit rates					
MYDEP1Y	0.570	-	0.116	-	0.076*
MYDEP3M	0.627	-	0.084 *	-1.038	0.082*
• Off-shore rate					
MYOFS3M	0.676	-	0.616	-	0.180
Indonesia, IDSB190					
• Deposit rates					
IDDEP1Y	0.655	-	0.266	-	0.139
IDDEP3M	0.021**	- 1.050			0.009**
• Lending rates					
IDLENDR	0.399	-	0.150	-	0.422
Korea, KOCD91D					
• Money market rates					
KOCALLO	0.000**	-0.89	-	-	0.000**
KOCALLA	0.001**	-0.93	-	-	0.000**
KOCALLV	0.000**	-0.94	-	-	0.000**
KOCP91D	0.007**	-0.80	-	-	0.015**
KOLD91D	0.153	-	0.086*	-1.006	0.010**
• Lending rates					
KOFB91D	0.000**	-0.79	-	-	0.000**
KOTB91D	0.111	-	0.351	-	0.073*
• Other rates					
KOBGIT1	0.624	-	0.560	-	0.140
KOHMON	0.705	-	0.364	-	0.080*

For each country, each line specifies the results of the cointegration tests of the corresponding rate with the first interest rate in bold. * means that the two series are cointegrated at the 90% level of confidence. ** means that the two series are cointegrated at the 95% level of confidence. Sample periods are the same as reported in Table 2.

(1) value of the second component of the cointegrating vector; the first being 1.

In every country, all money market interest rates considered here are cointegrated with the benchmark rate. This provides evidence for the integration of the different money market compartments.

The only rates which are not cointegrated are some lending and deposit rates. In Indonesia, the lending and the one-year deposit rates are not cointegrated with the SBI90, only the 3-month deposit rate is. Nonetheless, this result may be due to the fact that the benchmark rate used here is not an average rate, but the upper value of the bracket set by the central bank.

In Singapore, all the rates included in our sample are cointegrated with the 3M interbank rate, except the DBS bank prime rate. In Thailand, all the rates are cointegrated with the 3M interbank rate, which suggests that financial integration might be high. In the Philippines, the same result is obtained, but as deposit and lending rates are not available, the conclusion is difficult to reach. In Korea, financial liberalization has occurred very recently, especially in the 1993-1997 financial package. Market mechanisms in the money market, such as auctioning of central bank instruments, as well as the decontrol of loan interest rates, have been ushered in recently. As our sample begins at mid-1993, our results catch this new stance and most interest rates are cointegrated with the benchmark rate.

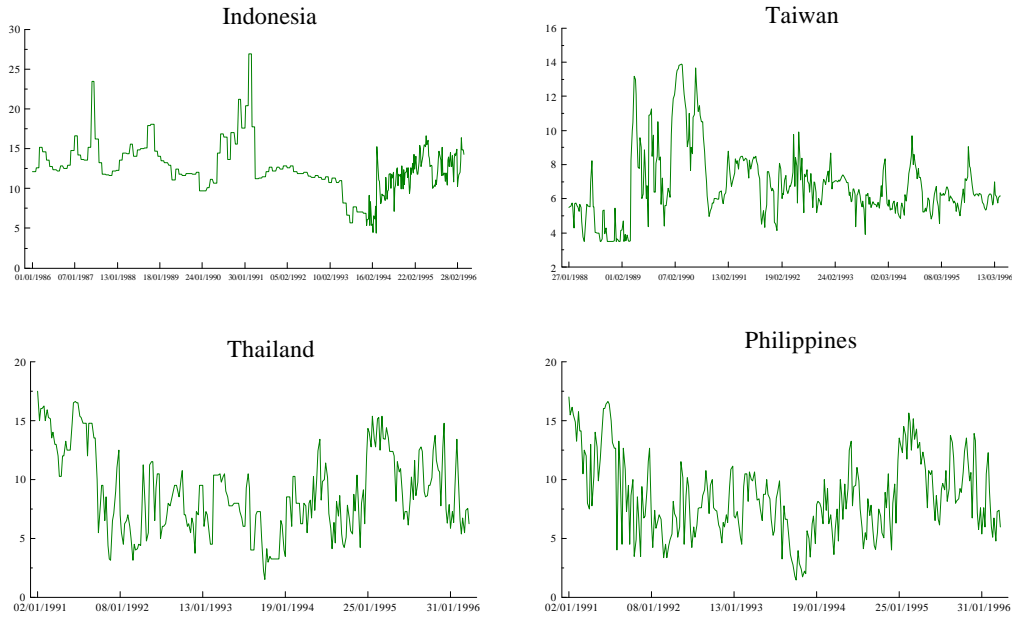
In Malaysia, cointegration tests show that domestic financial integration is already high as far as deposit rates are concerned. For lending rates, no tests have been performed as data were not available. However, financial liberalization is known to be in progress, as the base lending rate has been set on the basis of the 3-month interbank rate since November 1995. However, the offshore rate is not cointegrated with the interbank call rate. This could mean that the market segmentation between the domestic and the foreign sector is strong and stops local interest rates from being integrated with external ones.

The same situation occurs in Hong Kong. The three-month deposit and the prime rate are not cointegrated with the benchmark rate. While the benchmark rate is set by the monetary authorities in order to target the exchange rate, the lending and deposit rates are set by the Hong Kong Association of Banks for internal purposes. The results given here provide some evidence of disconnection between these two types of rates. Despite the existence of a Currency Board, all the monetary conditions applied to non-financial agents are not completely set by external capital flows in Hong Kong.

2.4 Speed of adjustment between the 3-month rate and the call rate

As call rates are I(0) in several countries, Indonesia, the Philippines, Thailand and Taiwan, their cointegration with the benchmark rates could not have been tested. In fact these call rates exhibit a strong variability, especially in the Philippines, as it can be easily seen on a graph.

Graph: call rates



A possible explanation may be that the flexibility of these rates allows the day-to-day management of the exchange rate. However a great part of this variability is not passed on through to the other domestic rates. It is then interesting to test how these rates are linked to others by assessing the speed of adjustment and the multipliers between the rates.

For Singapore and Korea, as the call rates are cointegrated with the benchmark rate an ECM has been estimated in order to present the dynamic model. For Malaysia, the offshore rate is not cointegrated with the benchmark rate; the equation (5) has been tested, so as to detect some short term relationship if any.

As benchmark rates are I(1), series have been differentiated to avoid *spurious* regression. When call rates are I(0), the following equation has been regressed:

$$(5) \quad \Delta Br_t = \sum_{i=1}^{i=m} a_i \Delta Br_{t-i} + \sum_{j=0}^{j=n} b_j \Delta CALL_{t-j}$$

with Br the benchmark rate and $CALL$ the call rate. Optimal lags m and n have been computed with the Akaike information criterion.

An error correction term has been added, when call rates are I(1), as in this case the two rates are cointegrated.

$$(6) \quad \Delta Br_t = \sum_{i=1}^{i=m} \mathbf{a}_i \Delta Br_{t-i} + \sum_{j=0}^{j=n} \mathbf{b}_j \Delta CALL_{t-j} - \mathbf{de}_{t-1}$$

where \mathbf{e}_t is the residual of cointegration between the benchmark rate and the call rate :

$$Br_t = mCALL_t + \mathbf{e}_t$$

For each country, the results are reported in table 4. The most striking result is certainly the very low long term multiplier from call rates to 3-month rates, in Thailand, Indonesia and Philippines. In these countries, the multiplier is less than 0.4. It is only 0.17 in Thailand. This means that the largest part of the variation in the call rate is not passed on through to the 3-month rate, possibly because external conditions are disconnected from domestic ones. It is particularly true in Malaysia as no relation was found between the offshore rate and the call rate even in the short run.

Table 4 : Adjustment of 3-month rates to call rates

	number of lags	impact coefficient	4-week impact	8-week impact	long term coefficient	adjusted R2	H test
Thailand	0 ; 4	0.05	0.17	0.17	0.17	0.07	
Philippines	1 ; 14	0.01	0.20	0.28	0.31	0.35	0.71
Malaysia (1)	- ; 0	0.00	0.00	0.00	0.00	-	-
Indonesia(2)	1 ; 7	0.03	0.12	0.21	0.21	0.02	-0.21
Taiwan(3)	3 ; 4	0.42	0.72	0.91	1.14	0.87	1.13
with an error correction term:							
Hong Kong	7 ; 14	0.25	0.58	0.70	1.06	0.42	0.40
Singapore	0 ; 1	0.11	0.37	0.54	1.04	0.24	dw=2.38
Korea	14 ; 3	0.16	0.49	0.73	1.08	0.64	0.67

(1) for Malaysia, the regression of the offshore rate on the call rate has been performed instead, but the offshore rate was not significant.

(2) sample from January 1994 to April 1996

(3) in level, because the two rates are I(0).

These results may be interpreted in different ways: 1) it could be a sign of the weak integration of monetary markets, 2), it could, more probably, be a sign of a deliberate policy of the central bank to isolate partially domestic interest rates from excess volatility in exposed money markets. The central bank sees that not too many erratic fluctuations are passed on through to domestic markets, by implementing sterilization measures.

The situation is different in Taiwan, Korea and Singapore. The long term multiplier is close to one, so any variation in the call rate is entirely passed on through to the benchmark rate. The largest part of the effect is achieved within 8 weeks. These results provide evidence of a high degree of financial integration for Asia's Newly Industrialized Countries.

3. EXTERNAL LIBERALIZATION

3.1. Main steps and present stance

Most countries have implemented a managed float of their exchange rate. They aim at stabilizing their nominal or real exchange rate either against a non-revealed, weighted basket of currencies (Malaysia, Singapore, Thailand) or against the dollar (Korea, Indonesia). Generally speaking, the dollar accounts for a major share of the basket (Bénassy-Quéré 1996). Official exchange regimes may differ from the observed practice. For example, in spite of a freely floating currency, the Bank of Taiwan states that it aims at reaching some stability of its nominal exchange rate.

Apart from managed float, there is a free float in the Philippines and a fixed exchange rate in Hong Kong. In Hong Kong, a currency board pegs the HKD to the USD. Its rules stipulate that the domestic money supply denominated in HKD must be covered by Hong Kong's international reserves.

Foreign exchange deregulation has taken place from the early seventies onwards as in Singapore, Malaysia (except for transactions with Israel and the Federal Republic of Yugoslavia) and Indonesia, to the early nineties as in Thailand. All the countries considered have at least introduced the convertibility of their currency for current account transactions, coming under the provision of IMF Article VIII.

In contrast, convertibility on the capital account is still restricted except in Hong Kong. Korea plans to reach full convertibility by 1999. The reason given by countries for such late deregulation lies in the domestic monetary instability brought about by free capital movements. The inability to lead an independent monetary policy entails the need for sterilizing capital movements. To limit their undesired effects, most countries still impose quantitative restrictions on the holding of their currency by foreigners and on the ability of banks to borrow abroad.

Asian countries try to foster long term capital inflows, while trying to restrain short term flows volatility. Foreign direct investment has been deregulated in order to attract long term capital considered as being stable and non-debt-inducing. Debt-equity

conversion programs have been introduced in some countries in order to spur foreign investment.

Restrictions may be imposed on short term capital inflows and especially on bank borrowings abroad, in case of excess inflows. For example, in Indonesia, one year after 1990 when a surge in inflows was recorded, offshore borrowing was limited by ceilings. Swap operations were restricted to the central bank, that could then raise the three-month swap premium. In 1994 in Malaysia, residents were prohibited from selling short term monetary instruments with maturity of one year or less, along with corporate debt to non-residents. In Korea, firms are prohibited from issuing won-denominated bonds abroad.

Asian countries have generally deregulated capital outflows, in order to relieve the effects of capital inflows, but some restrictions remain. Malaysia and Singapore try to avoid the internationalization of their currencies by limiting credits for use outside the country. In Thailand, residents cannot freely purchase securities abroad.

3.2. Assessing external influences on Asian interest rates

The links between Asian interest rates and foreign rates are assessed by Granger-causality tests. The Asian interest rates chosen for these tests are those suspected to be used by central banks to manage the exchange rate. The foreign interest rates considered here are the United States and the Japanese ones, as the aim is to test for a possible yen or dollar zone.

The usual objective of this test is to investigate whether a series can help to forecast another¹⁷. Multivariate links are generally tested. In this case, the direction of causation is known, because American or Japanese rates are not likely to be caused by the rate of any of the Asian countries considered. Therefore, the implementation of the test is limited to estimating one, single equation by country and by foreign interest rate:

$$(7) \quad \Delta r_t = \sum_{i=1}^{i=m} a_i \Delta r_{t-i} + \sum_{j=1}^{j=n} b_j \Delta fr_{t-j} \quad ^{18}$$

with r the Asian interest rate and fr the foreign interest rate. Optimal lags m and n have been computed with the Akaike information criterion; then an F test of the null hypothesis $b_1 = b_2 = \dots = b_n = 0$ (the foreign rate fails to cause the Asian rate) is conducted.

The foreign rate is successively the US 3-month treasury bills rate or the Japanese 3-month interbank rate. For most Asian countries the test is performed on call rates, except for Hong Kong and Malaysia where the rates used by the monetary authorities to

¹⁷ It seems best to describe Granger-causality tests as tests of whether a series helps forecast another rather than tests of a general diagnostic for establishing the direction of causation between two series (Hamilton pp 302-308).

¹⁸ Stationary variables (first difference) are used in the regressions so as to avoid any "spurious regression".

target the exchange rate are supposed to be the 3-month interbank rate and the offshore rate respectively. The results are reported in table 5.

Table 5 : Causality tests between Asian and foreign interest rates

	United-States		Japan	
	P-values	lags	P-values	lags
Hong Kong 01/01/86	0.000**	7;13	0.002 ¹	7;12
Indonesia 12/22/93	0.141	14;4	no	
Taiwan 01/27/88	0.058*	15;2	no	
Thailand 01/02/91	0.015**	5;3	no	
Singapore 01/07/87	0.014**	15;9	no	
Korea 08/04/93	0.008**	9;3	no	
Malaysia 07/08/92	no		no	
Philippines 01/03/90	no		no	

Figures reported are P-values of F test, followed by the lags on r and fr in equation (7). "No" stands for the fact that adding the foreign rate to the regression does not improve the Akaike information criterion.

** means that the foreign rate "Granger-causes" the Asian rate at the 90% level of confidence.*

*** means that the foreign rate "Granger-causes" the Asian rate at the 95% level of confidence.*

(1) long term coefficient with a negative sign.

Dates reported are the starting dates of the sample; the ending date is 04/24/96.

Three main points can be drawn from the table.

1. The US interest rate is far more influential in the region than the Japanese rate, since the latter fails to "cause" any Asian interest rates. The only causality, that appears with the Japanese rate, is for Hong Kong. However, a closer examination

shows that the long term coefficient is negative; so, in spite of the p-value, it is not possible to say that Japanese rate causes Hong Kong rate.

2. The US interest rate "Granger-causes" the interest rates of Hong Kong, Taiwan, Thailand, Singapore and Korea. This result shows that central banks of these countries look to stabilizing their exchange rate mainly against the US dollar.

3. No relation with foreign rates is found, in the case of Malaysia, Indonesia and Philippines. This lack of any relationship with foreign rates is consistent for Philippines with the fact that the peso is allowed to float freely. However the high volatility of the call rate, which was attributed to external reasons, is still unexplained. The lack of causality with foreign rates is more surprising for Indonesia, as the monetary authorities are supposed to manage the exchange rate with reference to the US dollar. In the case of Malaysia, the failure to find causality with foreign rates may be due to the fact that the sample period (07/08/92 to 04/24/96) is relatively short and includes the year 1994, in which drastic measures were taken to limit capital inflows.

CONCLUSION

The economic literature on the yen block has focused recently on interest rate parity tests. All conclusions were drawn on the implicit assumption that one interest rate is able to represent the whole monetary stance of a country. This study has shown that this assumption is not valid for all the countries considered. In some countries, call rates have been identified as being linked to international influences. However the changes in these rates are not necessarily passed on through to the other domestic rates.

A careful examination reveals that the situation regarding interest rates is rather different across the area. A single pattern cannot be identified. In Korea, there is a clear influence of the United States interest rate, and this is passed through the whole set of domestic rates. Singapore too is influenced by the American rate, though not the lending rate. In Hong Kong the benchmark interest rate is highly linked to the American rate. However, the lending and the deposit rates do not follow the long term fluctuations of the benchmark rate. In Thailand, the call rate is linked to the American interest rate; however the call rate is disconnected from the benchmark rate, in the sense that its variations are not passed on. In Indonesia, Malaysia, and Philippines, no foreign influence could be found on nominal rates.

The role of the yen seems weak, as no country out of eight has its interest rate linked to the Japanese one. This contradicts the results of Chinn and Frankel (1994, 1995), who highlight the increasing role of the yen in the Pacific basin.

The area is dominated by the dollar's influence, as for five countries out of eight a causality was found. However, external influences are weak, as they are not spread to the whole set of interest rates.

APPENDIX 1

Description of interest rates data:

- **Thailand:**

- Money Market Rates**

- Bank of Thailand:*

- TH1DREP: One day repurchase rate on government securities

- THAIBCL: Interbank call middle rate

- THAIBON: Interbank Overnight middle rate

- Commercial Banks:*

- THIBK3M: Interbank three-months

- Commercial Banks Lending Rates:**

- THMINOR: Minimum Overdraft Rate equivalent to a prime rate

- THMNLEN: Prime lending Rate (Minimum loan Rate)

- THMINOFF: Prime offered rate, middle rate

- Commercial Banks Deposit Rates:**

- THDEPD1Y: Deposit Rate one year

- THDEPD3M: Deposit Rate, three-month

- **Indonesia**

- Money Market Rates**

- Bank of Indonesia:*

- IDSB190: bonds sold by the central bank on the 3-month interbank market.

- Commercial Banks:*

- IDIBCAL: Interbank Call middle rate

- Commercial Banks Lending Rates:**

- IDLEDDR: Average Lending Rate

- Commercial Banks Deposit Rates:**

- IDDEP1Y: 1-year Deposit interest rate

- IDDEP3M: 3-month deposit interest rate of private national banks.

- **Taiwan**

- Money Market Rates**

- Central Bank of China:*

- TAMM90D: Taiwan money market 90 days - middle rate

- Commercial Banks:*

- TAIBKON: Taiwan interbank swap overnight - middle rate

- TAMM90D: Taiwan money market 90 days - middle rate

- Commercial Banks Lending Rates:**

- TAPRIME: Taiwan first bank prime rate - middle rate

- Commercial Banks Deposit Rates:**

- TADEP1Y: Taiwan deposit 12 month - middle rate

- TADEP3M: Taiwan deposit 3 month - middle rate

- **Philippines**

- **Money Market Rates**

- *Central Bank of the Philippines:*

- PHTBL6M: Philippines T-bill 182 days - middle rate

- PHTBL3M: Philippines T-Bill 91 days - middle rate.

- *Commercial banks:*

- PHIBKCL: Philippine interbank call loan - middle rate

- **Commercial Banks Lending Rates:**

- PHPRIME: Philippine MBTC - prime - middle rate

- **Commercial Banks Deposit Rates:**

- **Malaysia**

- **Money Market Rates:**

- *Bank Negara of Malaysia and commercial banks:*

- **MYIBKCL:** Malaysia interbank o/n - middle rate

- MYIBK3M: Malaysia interbank-3 months middle rate.

- MYIBK1Y: Malaysia interbank-1 year - middle rate.

- MYOFS3M: Malaysia offshore 3 months - middle rate.

- **Commercial Banks Lending Rates:**

- MLBASEL: Malaysia base lending - middle rate.

- **Commercial Banks Deposit Rates:**

- MYDEP1Y: Malaysia deposit-12 mth - middle rate.

- MYDEP3M: Malaysia deposit-3 mth - middle rate.

- **Korea**

- **Money Market Rates:**

- *Commercial Banks:*

- KOCALLA: Korea-call average - middle rate.

- KOCALLO: Korea-call overnight - middle rate.

- **KOCD91D: Korea-CD 91 days - middle rate.**

- KOCP91D: korea-comm. paper (discount) 91d - middle rate.

- KOLD91D: korea-large denom. RPs-91d - middle rate.

- **Commercial Banks Lending Rates:**

- KOFB91D: Korea-factoring bill (discount) 91d - middle rate.

- KOTB91D: Korea-trade bill (discount) 91d - middle rate.

- **Other rates:**

- KOBDIT1: Korea-bond investment trust-1 year - middle rate.

- KOHHMON: Korea-h/hold money in trust-1 year - middle rate.

- **Singapore**

Money Market Rates: *Monetary Authority of Singapore and Commercial Banks:*

SNGIB3M: Singapore interbank 3 months - middle rate (identical to SIBOR 3-months).

SNGIBCL: Singapore interbank call - middle rate.

SNGIB1Y: Singapore interbank 1 year - middle rate.

Commercial Banks Lending Rates:

SGPRIME: Singapore db's bank prime rate - middle rate.

Commercial Banks Deposit Rates:

SNGDPCL: Singapore deposit call - middle rate.

SNGDP3M: Singapore deposit 3 months - middle rate.

SNGDP1Y: Singapore deposit 1 year - middle rate.

- **Hong Kong**

Money Market Rates: *Monetary Authority of HK and Commercial Banks:*

HKIBK3M: Hong Kong interbank 3 months - middle rate (identical to HIBOR 3-months).

HKIBKCL: Hong Kong interbank call - middle rate.

HKIBK1Y: Hong Kong interbank 1 year - middle rate.

Commercial Banks Lending Rates:

HKPRIME: Hong Kong prime middle rate

Commercial Banks Deposit Rates:

HKDEPCL: Hong Kong deposit call - middle rate.

HKDEP3M: Hong Kong deposit 3 months - middle rate.

HKDEP1Y: Hong Kong deposit 1 year - middle rate.

APPENDIX 2

Summary Table

	Link between the benchmark rate and other domestic rates				Link between the benchmark rate and the "external*" rate	Link between Asian rate and foreign rate
	Money market rates	Deposit rates	Lending rates	"External*" rate		
Hong Kong	yes	no 3-month yes 1-year	no	-	same rate	US
Indonesia	-	yes 3-month no 1-year	no	-	weak	no
Korea	yes	-	yes	yes	strong	US
Malaysia	yes	yes	-	no	no	no
Philippines	yes	-	-	-	weak	no
Singapore	yes	yes	no	yes	strong	US
Taiwan	-	-	-	-	strong	US
Thailand	-	yes	yes	-	weak	US

* "external" rate refers to the rate suspected to be used by the central bank to manage the exchange rate.

"-" means that the relation has not been tested because data were not available or because series were I(0).

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