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INTEGRATION OF EMERGING EQUITY MARKETS: MAJOR ASIAN PLAYERS

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This paper analyzes the most advanced part of the emerging capital market of East Asia in order to assess its weak-form efficiency and to test for the convergence of market returns in the different countries. The analysis of convergence addresses the question of whether the markets in East Asia are becoming a single market rather than a group of segmented ones and whether they behave efficiently. We have found support for the fact that the returns of East Asian capital markets are converging within selected group and "limiting" group mean returns are weak-form efficient.

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I. MOTIVATION AND FACTS

This paper analyzes the most advanced part of the emerging capital market of East Asia in order to assess its weak-form efficiency and to test for the convergence of market returns in the different countries. The analysis of convergence addresses the question of whether the markets in East Asia are becoming a single market rather than a group of segmented ones and whether they behave efficiently.

A comprehensive market return analysis allows us to formulate several conclusions that are based on our combined methodological approach. The results of this paper are supportive of convergence in general. Differences in market returns be-

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come smaller and the convergence effect is most pronounced in the case of dollar returns, while nominal and real returns in local currencies converge at a very similar pace. Another finding is that the point at which these markets are going to converge is, for some groups of countries, consistent with a weak form of market efficiency.

Recently a number of new equity markets have emerged in East Asia. These markets can be characterized by high volatility and low correlation with the developed capital markets in Europe and North America (see Harvey (1995)). Though not entirely "emerging" in the usual sense because of their increasing maturity, some markets still retain certain original characteristics such as restraints on foreign investors, insufficient regulations, inside trading opportunities etc.

The economic performance of East Asian countries has been remarkable for the past several decades. The region has enjoyed relative macroeconomic stability, a consistently high rate of growth, free trade, and an increasing openness to inflows of international capital.[1] Korea specifically has gone through many vital changes. The most important have been those affecting savings and those allowing penetration of the market, which was orginally closed and oriented predominantly towards local investors.

The performance of equity markets in the region as a mirror of economic performance is of great interest. During the 80's Asian capital markets experienced a high growth rate. The stock prices in these countries increased substantially. For instance, the Korean Composite Index increased by 750% during the period 1980-1989 whereas the Taiwan Weighted Index gained 1,600% in the same period. Kwok (1992) did not find clear links between real and financial sectors for Korea and Taiwan, though. This may be due to the fact that these markets had been closed for a long time and were therefore considered inefficient. More recent studies, for example Fung et al. (1995), have shown that changes of share prices do reflect macroeconomic information in the region, a finding that supports a semi-strong efficient market hypothesis.

Dominance of high capital inflows and free trade should be taken into account together with growing informational links among East Asian equity markets. Early studies of emerging markets, see Rowley (1987), Skully (1984), and Errunza and Losq (1985) among others, suggested that barriers to international investments led to market segmentation and to various irregularities. Note that limits on foreign participation in Korean companies gradually rose from 10% in 1993 to 12% 1994, 15% in 1995, and 18% in 1996 and that this tendency is set to continue (20% in 1997). Not surprisingly, with barriers lifted, the segmentation of the Korean market has gradually disappeared. Similarly, Taiwan adjusted the ceilings for foreign participation as a percentage of the overall market capitalization from 12 to 15 in

[1] For instance, gross cross-border equity flows increased from about US$300 billion in 1984 to about US$1.7 trillion in 1990, an annual rate increase of about 30 per cent. The sources of economic growth in the region are analyzed in detail by Kim and Lau (1994), Krugman (1994), and Young (1994) among others.

1995, and to 25 in 1997.

The focus of most research is naturally the newly industrialized economies (NIE) in Asia : Hong Kong, Korea, Singapore and Taiwan. Because of their histories as trading centres, Hong Kong and Singapore have developed sophisticated financial sectors and have permitted free international capital flows with relatively low transaction costs for foreigners entering these markets. On the other hand, Taiwan and Korea have traditionally had more regulated and less developed financial markets. Severe restrictions on crosscountry investing in Korea and Taiwan caused these capital markets not to respond to innovations of foreign markets (see Rogers (1992)). Government control has retarded the development of efficient financial intermediaries in these two countries. However, both countries have recently undertaken step-by-step reforms to improve the functioning of their financial markets and have waived various investment restrictions, actiosn that have led to greater integration into world capital markets. It was shown by Chowdhurry (1984) that Hong Kong and Singapore, the countries with no restriction on foreign investment, were already linked to the stock markets of Japan and the U.S.

All the above mentioned factors might help to gradually reduce differences in market returns in the respective countries. Such a process would be characterized by the convergence of market returns in East Asian equity markets. Because of high average returns and little integration with the U.S. or European equity markets, investing in these markets is attractive for institutional and individual investors from mature markets.

The paper is organized in the following manner. Section 2 describes the econometric methodology used for testing the random walk hypothesis and convergence. Section 3 describes the data and presents empirical results. Section 4 briefly concludes.

II. TECHNIQUE

2.1. Formalization

A panel data analysis of market efficiency and of the convergence of market return differentials is conducted in order to fully exploit the effect of cross-variances in a pooled time series of moderate length.[2] Previous econometric research has demonstrated the specific advantages of utilizing panel data in studying a wide range of economic issues.[3]

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[2] For case of convergence Levin and Lin (1992) showed that the statistical power of unit root test for a relatively small panel may be an order of magnitude higher than the power of the test for a single time series.

[3] Ben-David (1996) performed an analysis of real per-capita income growth on numerous countries. Kočenda and Papell (1997) recently applied this methodology to study inflation convergence in the European Union.

We use this approach for another reason as well. A porfolio manager investing in equity markets within a certain region is forced to analyze such a regional market as a sort of interconnected economy which translates back to panel structure. Effective diversification of porfolios among international stock markets cannot be achieved if these amrkets possess a strong "lead-lag" relationship, i.e., if they are cointegrated. A weak form of market efficiency can also be tested using a unit root test (cross-country market efficiency).[4] Chan et. al. (1992) used unit root and cointegration tests to study the major Asian markets.

The following analysis is performed for three basic types of market returns (X_t), which are measured as percentage change in the respective market index over two successive periods. The nominal return for an individual country is defined as

$$nX_t = (MI_t / MI_{t-1}) - 1, \tag{1}$$

where MI_t denotes the nominal market price index at time t. In a consistent manner we define the real market return as

$$nX_t = ((MI_t / CPI_t) / (MI_{t-1} / CPI_{t-1})) - 1, \tag{2}$$

where CPI_t is the consumer price index at time t. Similarly, we define the dollar return as

$$dX_t = ((MI_t / e_t) / (MI_{t-1} / e_{t-1})) - 1, \tag{3}$$

where (e_t) denotes the nominal exchange rate of a local currency for a unit of US dollar at time t.

2.2. Convergence of Market Returns

Weak market efficiency is defined using all known prices available from the past. All such information should be reflected in the market index. We model the evolution of market returns (X_t) for a group of i individual countries with observations spanning over t time periods in the following way:

$$X_{i,t} = \alpha + \phi X_{i,t-1} + \varepsilon_{i,t}. \tag{5}$$

The fact that market return is modeled as an AR(1) process is based on the definition of weak market efficiency and does not represent any theory of how this variable is determined. The model constitutes a suitable form for the convergence test introduced later in this section.

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[4] If stock markets are collectively efficient in the long run, then these stock prices are not cointegrated. See Granger (1986) and Coleman (1990) among others.

The convergence measure adopted here is based on a relationship that describes the dynamics of market return differentials in a panel setting as

$$X_{i,t} - \overline{X_t} = \phi(X_{i,t-1} - \overline{X_{t-1}}) + \varepsilon_{i,t} . \quad (6)$$

where $\overline{X_t} = \frac{1}{n} = \sum_{i=1}^{n} X_{i,t}$. Convergence in the context of our analysis requires that market return differentials become smaller and smaller over time. Thus, a necessary condition for convergence is that ϕ must be less than one. In other words, ϕ greater than one indicates divergence. Further, one of sufficient conditions for convergence in our context is, that sample average of squared return differentials (i.e. sample dispersion) must decrease over time.[5]

The convergence coefficient ϕ for a particular group of countries can be obtained using the Dickey and Fuller (1979) test on equation (6). An augmented version of this test (ADF) is used in order to remove possible serial correlation from the data.[6] Since the analysis is performed on panel data, there will be no intercept by construction. Denoting the market return differential as $d_{i,t} = X_{i,t} - \overline{X_t}$, and its difference as $\Delta d_{i,t} = d_{i,t} - d_{i,t-1}$, the equation ofr the ADF test is written as

$$\Delta d_{i,t} = (\phi - 1)\mathrm{d}_{i,t-1} - \sum_{j=1}^{k} r_j \Delta d_{i,t-j} + z_{i,t} \quad (7)$$

where the subscript $i=1, \cdots, k$ indexes the countries in particular group. Equation (7) tests for a unit root in the panel of market return differentials. The null hypothesis of a unit root is rejected in favor of the alternative of level stationarity if $(\phi - 1)$ is significantly different from zero or, implicitly, if ϕ is significantly different from one. The number of lagged differences (k) is determined using a parametric method proposed by Campbell and Perron (1991) and Ng and Perron (1995).

Reccent work has established that a sub-unity convergence coefficient ϕ is indeed a robust indication of convergence.[7] Ben-David (1995) performed 10,000 simulations for each of three possible cases where data portrayed the processes of convergence, divergence, and neutrality. His numerous simulations provide ample evidence of convergence or divergence when these processes truly portray the situation. When neutral data with no strong inclination in either direction are used, the convergence coefficient tends towards unity.

The common critical values for panel unit root tests tabulated by Levin and Lin (1992) do not incorporate serial correlation in disturbances and are, therefore, incorrect for small samples of data. Using a Monte Carlo technique, Papell (1997)

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[5] See seminal paper on convergence of output by Barro and Sala-i-Martin (1992).

[6] We have found that in cases of real and dollar returns the correlation sensitivity threshold was about 0. 50. The encountered multicollinearity was taken care of by employing the ridge regression of Hoerl and Kennard (1970).

[7] ($\phi > 1$) respectively for divergence

tabulated critical values taking serial correlation into account and found that, for both quarterly and monthly data in his data sets, the critical values were higher than those reported in Levin and Lin (1992). Because of these findings, the exact finite sample critical values for the resulting test statistics were computed using Monte Carlo methods described in papell (1997).

2.3. Testing of Weak Market Efficiency : Variance-ratio Test

If East Asian equity markets are weakly efficient, then returns should follow a random walk. This means that the process (time series of market returns) can be described as

$$X_t = \mu + X_{t-1} + \varepsilon_t,\ E[\varepsilon_t] = 0,\ Var[\varepsilon_t] = \sigma^2,\ for\ all\ t = 1, \cdots N. \tag{8}$$

To test for a random-walk (i.e. equation 8) we employed the variance-ratio test that is frequently used in applied finance. We opted to use this test strictly in order to be consistent with similar studies. Since market returns exhibit significant differences from a normal distribution, it is useful to employ distribution-free tests to verify findigns. As a complementary test we have used a non-parametric runs-test of the random walk hypothesis introduced by Levene (1952).

The idea of the variance-ratio test (see Lo and MacKinlay (1988) for details) is straightforward : under the null hypothesis of the random walk, the variance of the qth difference has to grow proportionally with q, and therefore alternative estimators of σ^2, say σ_q^2, for each q must be close to each other. In other words, variance -ratio statistics $M_r(q) = \hat{\sigma}_q^2 / \hat{\sigma}_1^2 - 1$ should be close to zero. For large values of $N = nq$, an saymptotic test can be considered:

(1) Under homoskedastic normally distributed ε:

$$z_1(q) \equiv \sqrt{nq}\, M_r(q) \left(\frac{2(2q-1)(q-1)}{3q} \right)^{-1/2} \approx N(0, 1) \tag{9}$$

and

(2) under heteroskedastic normally distributed ε

$$z_2(q) \equiv \sqrt{nq}\, M_r(q)\, \hat{V}^{-1/2}(q) \approx N(0, 1) \tag{10}$$

where

$$\hat{V}(q) = \sum_{j=1}^{q-1} \left[\frac{2(q-j)}{q} \right]^2 \frac{\sum_{k=j+1}^{nq} (X_k - X_{k-1} - \hat{\mu})^2 (X_{k-j} - X_{k-j-1} - \hat{\mu})^2}{\left[\sum_{k=1}^{nq} (X_k - X_{k-1} - \hat{\mu})^2 \right]^2} \tag{11}$$

However, kthere is a slight complication in correctly using the variance-ratio test. In order to have the size of the test (probability of Type I error) equal to α,

one has to choose a particular q with thich to run the test in advance. In fact, several recent studies use multiple comparisons with a simple variance ratio test computed for different q's. Of course, the size of such a multiple test is not α, and hence the decision of whether we reject/accept the hyothesis on level α might be different. The problem of the appropriate size of the test was addressed and solved by Chow and Denning (1993). The design of the new test is based on test statistics

$$z_1^* = Max\{z_1(q),\ q=1, \cdots, r\} \text{ and } z_2^* = Max\{z_2(q),\ q=1, \cdots, r\} \qquad (12)$$

The critical values for z_1^* and z_2^* are upper α points of the Studentized Maximum Modulus (SMM) distribution, with parameters r (number of z's) and N (degrees of freedom).

Thus, the simple multiple test is just a modification of the well-known variance-ratio test and the testing procedure is the following. First, we compute variance-ratio tests for q= 1, ···, k, and construct z_1^* and z_2^*, respectively. The critical values of SMM can be found in Stoline and Ury (1979).

Note that a random walk has a unit root and that the increments of random walk process are uncorrelated. In other words, a random walk process is a subset of the unit root hypothesis.[8] In fact, one would expect that ϕ in (6) would be close to zero based on market efficiency hypothesis. However, when testing the weak market efficiency we study a single time series, while for convergence we use a panel data structure, with the same mean and an autoregressive parameter ϕ imposed on all countries. Moreover, since we expect that innovations were correlated across countries, the mean return for a group of countries might show weak-form efficiency even if such efficiency was rejected for one or more countries studied alone.

III. EMPIRICAL FINDINGS

3.1. Data

The time span of the data is from 1986:2 to 1995:12. The monthly market price indices and exchange rates were obtained from various issues of the Emerging Stock Markets Factbook published by the International Financial Corporation. The monthly consumer price indices were obtained from the International Monetary Fund's International Financial Statistics. We use the three different returns to capture various aspects of the equity market. Dollar returns are most important for foreign investors, returns in local currency simply give a picture of the market's evolution in nominal terms, while real returns in local currency remove the influence of inflation.

[8] See also a decomposition of the unit root process into a random walk and a stationary process in Beveridge and Nelson (1981).

Table 1 shows all the countries included in our analysis and describes the composition of various groups for which we tested the convergence and random walk hypothesis. The broadest group represents Asia as our smaple of the whole continent and contains Korea, Malaysia, Thailand, Taiwan, the Philippines, Indonesia, India, Pakistan, Sri Lanka, China, Hong Kong and Singapore. East Asia is then comprised of Korea, Malaysia, Thailand, Taiwan, the Philippines, and Indonesia. The Tigers group consisting of Korea, Taiwan, Hong Kong, and Sigapore was created to conform to the literature studying the NIEs. The Core group of countries resulted after Korea, Malaysia, Thailand, and Taiwan were grouped together. Such a grouping is natural because the market capitalization of each of these countries is over 100 billion US dollars. They are also in first place in terms of market liquidity. Finally the Core group was reduced by one country at a time so that four resulting control groups containing three remaining countries could be used as a robust check of sensitivity related to the elimination of a country from the Core group.

We would like to stress that the purpose of our paper is to show that the markets in the region are becoming integrated. It is behind the scope of this analysis to show whether and which country has an important role of integration of equity markets. Pooling countries in certain groups is meant to show not only consistency but also sensitivity of our results.

We do not present basic statistics of nominal, real and dollar returns for each country. It was found that market returns were on average positive over time. This was most visible in the case of nominal returns, but caution should be used because removal of inflation did not provide dramatically improved results. Values of both skewness and kurtosis suggested that distributions of all types of returns were quite far from normality. Similar results were obtained when our groups of countries were analyzed.[9]

3.2. Weak Market Efficiency

In general, if we allow for heteroskedasticity of disturbances, the hypothesis of weak market efficiency for any principal country group (East Asia, Core, and Tigers) was not rejected at the 5% level. As for the robustness check we reject the weak-form market efficiency only for the Core group without Taiwan. This could be partly due to the fact that the Taiwan capital market had been isolated for a long time before gradually increasing ceilings for foreign investors. Other reason might be the size of the Taiwan market—the tenth largest in terms of market capitalization and the fifth biggest in terms of volume of trading.

Recent papers dealing with the period studied conclude that the simple variance ratio tends to reject an efficient market hypothesis for these markets for several different lags. It is clear that since several different tests were run, the size of the tests

[9] Detailed results are available from the authors upon request.

must be adjusted. For instance, Ayadi and Pyun (1994) use the variance-ratio test with several lags on daily data from 1984 to 1988 for the Korean stock market. Their results of the variance-ratio test *per se* rejected an efficient market hypothesis for a different number of lags. Nevertheless, we adjusted the size of the test according to the number of lags used. The results are then in accord with our findings and we do not reject a weak form of market efficiency.

We note that descriptive statistics for East Asian market returns were quite for from the values we expect for normal distribution. Therefore, the results of the variance-ratio test might be sensitive to the assumption of normality (see Fama (1965) among others). We tested robustness of our findings using non-parametric (disribution free) runs-test. Under the null hypothesis of random walk, the z-statistic is approximately standard normal. Our results do not reject weak market efficiency for any country group; see Table 3. Note that in some cases, such as when the full set of Asian markets was studied, we had only a few data points and the short data set exhibited a trend in growth.

3.3. Convergence

Results of the convergence test for the three types of market retruns are presented in Tables 4-6. We would like to point out that the estimates of the coefficient ϕ contain no information of the degree of the markets' integration. One should rather interpret the differences between coefficients ϕ as a different speed of convergence. Nevertheless, our coefficient estimates are not significantly different from each other. Due to the fact that ($\phi < 1$) *per se* does not necessarily imply convergence, we computed the sample average of squared return differentials (i.e. sample dispersion). We did not reject hypothesis that sample dispersion was decreasing over time for all groups of countries listed in Table 1.

In general, we see that differences in market return differentials diminish continuously over time. The coefficient ϕ is clearly smaller than one and statistically significant at the 1% time. The convergence effect is quite strong in all three kinds of returns. From the test it follows that as the positive value of the statistically significant coefficient ϕ approaches unity, then the convergence effect becomes smaller. A slightly more pronounced effect can be detected in dollar returns. This comes as no surprise since severe inflation did not plague East Asian economies during the period studied and the nominal and real returns should behave in a very similar fashion.

The results are not sensitive to the elimination of a single country from the analyzed panel of Core countries. The convergence coefficients vary slightly within a reasonable range and the analysis is robust and provides consisten outcomes. Especially in the case of nominal and dollar returns it is evident that Korea plays a modest role because when Korea is missing from a group, the convergence slows down marginally.

Convergence of market returns is documented at a time when, in most of the

area, a spirit of free trade dominated international trade. At the same time, restrictions to entering local capital markets were being lifted and large investment schemes were attracting vast amounts of money from foreign investors. However, the fact that the two courses coincided precludes the possibility of telling exactly which process was superior in driving market returns to converge.

Ⅳ. SUMMARY

We have found evidence in support of the convergence of market returns in East Asian equity markets. This convergence is most pronounced for real and dollar market returns, while nominal returns converge more slowly. The results are exposed to a sensitivity analysis. Systematic modification of the Core group yields evidence of its robustness. Eliminating one ountry from the group does not seriously affect the magnitude of the convergence coefficient. Because trade barriers and capital market restrictions were simultaneously being eliminated, we cannot conclude which of the two processes was superior in driving convergence of market returns.

When studying the weak form of market efficiency, one has to take into account very high market volatility and heteroskedasticity of disturbances, caused primarily by state interventions, limitations on foreign participation and the enormous capital inflow in general. Therefore, to test the hypothesis of weak market efficiency, we had to allow for heteroskedasticity and/or employ a non-parametric approach.

To summarize, we have found support for the fact that the returns of East Asian capital markets are converging within selected groups and "limiting" group mean returns are weak-form efficient. As follows from our analysis, further amalgamation of the capital markets in the region is under way and should accelerate with expected growing foreign participation.

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[Table 1] Groups of Countries in Each Panel Data Set

Group	No.	Countries
		Logical Grouping:
Asia	12	Korea, Malaysia, Thailand, Taiwan, Hong Kong, Singapore, Philippines, Indonesia, India, Pakistan, Sri Lanka, China
East Asia	6	Korea, Malaysia, Thailand, Taiwan, Philippines, Indonesia
Tigers	4	Korea, Taiwan, Hong Kong, Singapore
Core	4	Korea, Malaysia, Thailand, Taiwan
Core without:		Systematic Grouping:
Korea	3	Malaysia, Thailand, Taiwan
Malaysia	3	Korea, Thailand, Taiwan
Taiwan	3	Korea, Malaysia, Thailand
Thailand	3	Korea, Malaysia, Taiwan

No. denotes number of countries in a particular group.

[Table 2] Multiple Variance-Ratio Test, No. of Lags 2-12 Logical and Systematic Grouping Period 1986: 1-1995: 12

Group	Nominal returns		Real Returns		Dollar returns	
	z_1^*	z_2^*	z_1^*	z_2^*	z_1^*	z_2^*
Asia	−5.771a	−3.207	−5.470a	−2.564	−5.180a	−2.234
East Asia	−5.410a	−2.885	−4.898a	−2.471	−5.408a	−3.054
Tigers	−5.164a	−2.050	−5.100a	−2.033	−5.164a	−2.124
Core	−5.591a	−3.015	−5.389a	−2.990	−5.604a	−2.707
Core without:						
Korea	−5.458a	−2.761	−5.076a	−2.567	−5.570a	−2.437
Malaysia	−5.375a	−2.601	−5.360a	−2.584	−5.320a	−2.498
Taiwan	−5.887a	−4.362a	−5.799a	−4.618a	−5.772a	−3.939a
Thailand	−5.406a	−3.180	−5.209a	−3.054	−5.426a	−2.960

z_1^* and z_2^* denote values of multiple variance-ratio test constructed under homoskedasticity and heteroskedasticity assumptions; a denotes significance at 1% level.

[Table 3] Random Walk Test-Run Test Logical and Systeatic Grouping Period 1986: 1-1995: 12

Group	Nominal returns		Real Returns		Dollar returns	
	Runs	z-statistics	Runs	z-statistics	Runs	z-statistics
Asia	23	0.412	24	0.541	19	−1.235
East Asia	44	−0.570	46	0.000	46	0.000
Tigers	81	0.657	79	0.219	81	0.657
Core	79	0.219	79	0.219	75	−0.657
Core without:						
Korea	79	0.219	77	−0.219	81	0.657
Malaysia	81	0.657	81	0.657	81	0.657
Taiwan	80	0.438	78	0.000	79	0.219
Thailand	81	0.657	79	0.219	83	1.095

a and b denote significance at 1% and 5% levels, respectively

[Table 4] Nominal Market Return Differentials Logical and Systematic Grouping Period 1986: 1-1995:12

Group	No.	ϕ	t-stat(ϕ)	k	Critical Values		
					1%	5%	10%
Asia	10	0.7642a	−10.43	12	−2.57	−1.94	−1.58
East Asia	6	0.8229a	−7.58	12	−2.71	−1.96	−1.61
Tigers	4	0.8249a	−6.51	8	−2.74	−1.99	−1.64
Core	4	0.6301a	−9.54	2	−2.69	−1.99	−1.64
Core without:							
Korea	3	0.7254a	−7.32	2	−2.70	−2.01	−1.66
Malaysia	3	0.6736a	−7.77	2	−2.76	−2.05	−1.67
Taiwan	3	0.7053a	−7.73	1	−2.83	−2.06	−1.67
Thailand	3	0.6649a	−7.95	2	−2.78	−2.02	−1.66

No. means number of countries in a particular group, k denotes number of lags. a and b denote significance at 1% and 5% levels, respectively.

[Table 5] Real Market Return Differentials Logical and Systematic Grouping Period 1986: 1-1995: 12

Group	No.	ϕ	t-stat(ϕ)	k	Critical Values		
					1%	5%	10%
Asia	10	0.6761a	−12.41	7	−2.67	−1.91	−1.54
East Asia	6	0.8249a	−7.52	12	−2.67	−1.97	−1.61
Tigers	4	0.8234a	−6.53	8	−2.70	−1.98	−1.62
Core	4	0.6290a	−9.54	2	−2.70	−1.99	−1.63
Core without:							
Korea	3	0.7024a	−7.48	2	−2.79	−2.01	−1.65
Malaysia	3	0.6773a	−7.72	2	−2.77	−2.05	−1.66
Taiwan	3	0.7146a	−7.60	1	−2.78	−2.05	−1.66
Thailand	3	0.6620a	−7.98	2	−2.77	−2.02	−1.67

No. means number of countries in a particular group, k denotes number of lags. a and b denote significance at 1% and 5% levels, respectively.

[Table 6] Dollar Market Return Differentials Logical and Systematic Grouping Period 1986: 1-1995: 12

Group	No.	ϕ	t-stat(ϕ)	k	Critical Values		
					1%	5%	10%
Asia	10	0.7541a	−10.60	12	−2.65	−1.92	−1.57
East Asia	6	0.8160a	−7.72	12	−2.65	−1.95	−1.60
Tigers	4	0.8172a	−6.65	8	−2.68	−1.99	−1.63
Core	4	0.6225a	−9.57	2	−2.73	−2.00	−1.64
Core without:							
Korea	3	0.7149a	−7.29	2	−2.70	−2.00	−1.62
Malaysia	3	0.6605a	−7.90	2	−2.78	−2.06	−1.68
Taiwan	3	0.6866a	−7.95	1	−2.80	−2.07	−1.66
Thailand	3	0.6573a	−7.99	2	−2.79	−2.05	−1.66

No. means number of countries in a particular group, k denotes number of lags. a and b denote significance at 1% and 5% levels, respectively.