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THE INTEGRATION OF CAPITAL MARKETS:
An Study of Market Integration Principles and the Effects of
Macroeconomic Shocks on National Stock Market Comovements

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ABSTRACT:

Traditionally, international investors seek to determine whether international capital markets are integrated or segmented. That is, do similar assets yield similar risk-adjusted returns, or significantly different returns given certain informational and capital flow barriers? With this in mind, this research chooses to focus on the rapidly developing financial markets of Southeast Asia and determine the degree to which international stock market movements may be correlated with each other. Through panel data and OLS regression analysis, the research will show an increasing correlation between these capital markets over time, and the significant impact certain macroeconomic variables may have on capital markets. Included in the analysis are the effects of capital flow barriers, economic development, exchange rate regimes, and discount rate differentials.

I. INTRODUCTION

International capital markets are becoming increasingly more important to the world economy as investors look to diversify their portfolios on a global basis in an effort to minimize systematic risk. Significant attention has been given to those nations with rapidly growing economies and whose capital markets are only now showing signs of market integration. Based on available information and capital flow barriers, investors determine risk-adjusted returns not only in their domestic markets, but also in the capital markets of nations abroad. Evidence indicates that markets all over the world vary considerably in terms of their trading patterns, and that the differences between these trading patterns are especially marked in regard to that nation's level of market integration and degree of sensitivity to certain macroeconomic shocks. With this in mind, the challenges and decisions confronting today's investors become even more critical as markets integrate and exhibit an increasing dependence on numerous macroeconomic effects throughout the global economy.

Clearly, in a world consisting of only perfectly integrated markets, similar assets should in fact yield perfectly identical returns. However, international economists have shown that even the most integrated of markets do not always yield such perfectly correlated returns. Conversely, segmented capital markets should tend to move in a relatively idiosyncratic direction with little regard to the global economy. However, moments of uncharacteristically similar market movements have been observed among such nations' stock markets. Ranked below in Table 1 are the seven Southeast Asian nations used in this study and the United States, with the nation exhibiting the highest degree of market correlation listed first, and the nation exhibiting little correlation to the

other seven nations listed last. The numeric value to the left of each nation indicates its average degree of correlation to the other seven nations in the analysis from July 1997 through December 1999. This information in Table 1 clearly demonstrates that not all capital markets are perfectly integrated, but rather vary in their own movements. Moreover, as international capital markets integrate in light of what appears to be a mass era of globalization, the question as to whether a particular nation's capital market is segmented or integrated becomes clouded with uncertainty.

Table 1:
Average Stock Index Correlation

Singapore	(0.867)
Korea	(0.841)
Indonesia	(0.825)
Hong Kong	(0.812)
Japan	(0.764)
Thailand	(0.613)
China	(0.484)
United States	(0.438)

In today's global economy, nations are often found to exhibit qualities representative of both integrated and segmented markets and past research has often struggled with this dilemma of market identification. Researchers question how macroeconomic shocks throughout the economy might affect international capital markets, in light of this market integration phenomenon. This research will seek to establish a criterion for market integration and, given the various assumptions of the market integration hypothesis, attempt to explain how these factors influence the market movements of seven Southeast Asian nations in comparison to the United States' own S&P 500. Lastly, the research will look at a number of macroeconomic factors that may create unexpected returns among those markets, either encouraging highly correlated asset returns, or causing capital assets to yield returns significantly different returns from that of

other capital markets. Through OLS regression analysis and panel data, the effects of interest rates, exchange rate regimes, global consumer pricing and certain capital barriers will be investigated as they pertain to differences in market returns, regardless of a nation's existing degree of market integration.

The following section will identify some of the past literature dealing with international capital markets, focusing primarily on market integration and complications that may arise with international diversification. Section three provides the basic theoretical framework that will aid in the derivation of section four's empirical model. Section five discusses the results of the empirical model and analyzes the implications that certain macroeconomic variables may have on the aforementioned nations' capital markets as they relate to the research findings. Finally, section six will provide conclusions and ideas for continuing studies in this area.

II. BACKGROUND AND LITERATURE REVIEW

With the rapid development of countless international markets, investors and researchers have become increasingly aware of the difficulties surrounding international diversification. The question of such diversification remains significantly different from those problems facing investors focused solely on their domestic markets. In this respect, market efficiency takes on an entirely new face. Investors are forced to take into consideration foreign market integration, which is characterized by the level of free flowing information and capital across international borders, among other elements to be addressed. Investors must be aware of the changes within a developing economy, and how such aspects will affect returns on their capital assets. Numerous economists have focused on the economic development of the global economy and in particular, national capital market

returns and comovements. This section will review literature concerned with these issues including the impact of discount rates, global and competitive shocks to the economy, exchange rate regimes and capital controls.

Researcher Kenneth Kasa has been one of many to ask how the integration of capital markets has been theorized to affect asset returns. Kasa posits that the extent of integration is reflected in the correlation of those returns among varying countries. Kasa derives a model in which he studies the correlation between national stock market movements under the hypothesis of integrated markets; the fundamental hypothesis being that market integration should lead to greater correlation of markets movements, *ceteris paribus*. Fundamental to the model was the differential of discount rates among nations. If the movement and proximity of real discount rates remain close, then it should be assumed that these nation's capital markets are integrated, and that it is the free movement of capital and information that allows for such efficient market adjustments (1995).

Kasa and other researchers maintain that the discount rate remains an inherent indicator of market integration and reflects the level of free flowing capital and information across international borders. Kasa's research looks at the stock market movements of the United States and Japan. He justifies his analysis with the assumption that the aforementioned nations remain two of the world's most integrated markets and that they share similar capital markets and discount rate movements. More simply, Kasa hypothesizes that integrated markets are those economies that have grown increasingly dependent on each other, and thus more sensitive to each other's economic conditions and policies. This, in turn, is reflected through the two nations' discount rate differential (1995).

Conversely, those nations with relatively static and inconsistent discount rates, Kasa posits, lack significant correlation with most integrated markets, as governmental controls and market barriers impede the efficient pricing of national stock markets. Kasa concludes that the discount rate and its relative movements with other nation's discount rates throughout the world should serve as the basis for measuring risk/return tradeoffs among international capital markets, (see also Wongbangpo and Sharma, 2000).

Kasa's results somewhat simplify the approach to measuring a particular nation's adjusted risk/return tradeoff and he admits there are drawbacks within his model for which other researchers have later accounted. Specifically, an efficient and integrated market does not always provide for correlated asset returns among foreign markets. Given the nature of international specialization and the presence of various macroeconomic conditions, inconsistent returns are often observed among integrated capital markets. Karolyi and Stulz posit that while Japan and the United States might appear to have nearly perfectly integrated markets, certain shocks to the international economy might either encourage or discourage related asset returns, causing large variances in stock comovement. Stulz and Karolyi maintain that integration remains an important factor, but look also at the role of these shocks, which they have coined as being either *global* or *competitive* in nature. Fundamentally, global shocks are those that influence similar industries in the same direction with respect to stock price, while competitive shocks may benefit one nation's industry at the expense of a similar industry abroad (1996).

In their study, Karolyi and Stulz analyze the market comovements of the United States, and Japan. Preliminary studies have shown these nations' capital markets to be among the most heavily traded markets in the world, and among the most integrated. Given

these assumptions, and the assumption that no two markets are perfectly integrated, Karolyi and Stulz sought to determine what factors might cause changes in the aforementioned nations' market comovements. In other words, under what circumstances do markets exhibit higher than normal degrees of correlation in their price movements, and when do those markets significantly differ in that same respect (1996).

Essentially, Karolyi and Stulz argue that integration is not the only determinant in stock price movements. To illustrate this more clearly, in their analysis of Japan and the United States, Karolyi and Stulz take into account changing oil prices. A dramatic increase in such a heavily consumed commodity not only represents an inflationary hazard, but also an adverse supply shock to both economies. Thus, it would not be surprising to find similar declines in stock markets throughout the world. Karolyi and Stulz refer to such macroeconomic disturbances as *global* shocks, which should result in possibly higher than normal correlated returns. Antithetically, if one were to compare stock movements of certain OPEC nations to Japan, a rise in oil prices would be viewed as a *competitive* shock. OPEC clearly stands to gain from this rise in oil prices, while harming Japanese manufacturers and consumers. On a more simplistic level, Karolyi and Stulz find that changes in currency valuation (exchange rates) generally serves as the best example of a competitive shock. Through an exchange rate shock, one nation's good(s) become relatively cheaper at the expense of similar goods produced in another country (1996).

Karolyi and Stulz hypothesize that given such competitive shocks, it might be possible to account for large variances in market comovements among highly integrated markets. Similarly, given certain global shocks, it becomes possible to account for abnormally high levels of correlation among foreign markets. Karolyi and Stulz's analysis

was successful in that they demonstrated competitive shocks to be highly significant, and found global shocks to be relatively insignificant. They postulate that perhaps global shocks become less significant when dealing with integrated markets, as movement is already relatively correlated. Logically then, they further hypothesize that perhaps less developed nations might be more significantly impacted by such shocks (1996).

Heretofore discussion has focused on predominantly industrialized nations, all demonstrative of integrated markets. In each case these past studies have failed to conclusively identify the determinants surrounding capital price movements of emerging markets, and their basic characteristics. There exists a basic understanding that integrated markets are those which allow for the free flow of capital and information, but beyond these simple assumptions lies a gray area consisting of lesser developed nations classified as segmented or emerging markets.

Robert Korajczyk of the World Bank Economic Review looks at market integration on a larger scale, taking into account the stock market movements of twenty-four different nations in comparison to the United States. Four of these nations supported developed markets, and the other twenty Korajczyk refers to as emerging markets. Korajczyk was less concerned with actual correlation to the U.S. market, but more concerned with the increase in correlation over time. Particularly in developing nations, it should be noted that a state of market segmentation is not a static one, but rather is constantly evolving. Economic development will allow levels of market integration to increase over time, as may the effect of certain macro-economic variables. As discount rates move more into alignment, governmental restrictions and barriers become lax, exchange rates more accurately reflect

relative prices, and foreign investment increases, there in turn should be an increase in correlated market movements (1996).

With this economic fundamental in mind, Korajczyk creates a panel of data comparing each nation's market movement over time with U.S. stock market movement. He finds that the majority of developing nations experienced increased correlation to U.S. stock movements. By comparing stock movements using a longer time horizon, he finds increasing integration leading to smaller pricing errors. Furthermore, Korajczyk observes a strong correlation among nations of similar geographic origin. By creating a composite of nations based on geographic distribution (Europe, Latin America, Asia and Africa), he not only discovers similar comovements among neighboring countries, but similar rates of market integration among those same neighboring countries. Most noticeably, he found the African and Latin American capital markets to be among the most segmented, and lacking any indication of movement toward economic and financial freedom, while it was the industrialized nations who were demonstrative of highly integrated markets. In between these two classifications were the nations of Southeast Asia who exhibited traits characteristic of both segmented and integrated markets, indicating a steady progression towards market integration. This important finding Korajczyk attributes to a type of market contagion, (see also Theodore, 1996).

Market contagion can effect the results of stock pricing when enthusiasm for stocks in one market brings about enthusiasm for stocks in other markets. These influential progressions could be within the same market or in closely related foreign markets as Korajczyk witnessed in his geographical analysis of market movement. Stock valuation and financial fundamentals play a minimal role in price determination, as these developing

nations become the victims of market trends. These artificial market trends can also be attributed however, to several factors, including the existence of capital-flow barriers and pegged exchange rates. Such market imperfections can affect the integration of capital markets by reducing intertemporal trade and portfolio diversification (Tamirisa, 1998).

Capital controls constitute any restriction inhibiting the free flow of capital across international borders. Most commonly, capital controls exist to protect a nation's domestic capital market by restricting various forms of foreign investment. In the presence of capital controls, financial intermediation is less efficient, and local financial institutions often enjoy substantial market power. Naturally such imperfections will lead to the mispricing of capital assets on an international level for many reasons. Central to this, capital controls often result in overvalued exchange rates due to investors' inability to hedge financial risk and engage in financial speculative activity. The end result is an overvalued capital market (Tamirisa, 1998).

While in principle, capital controls may help limit short-term speculation and exchange rate volatility, many governmental institutions choose to compound this inefficiency through pegged exchange rates. By fixing their currency to that of another nation, short-term currency speculation is made near impossible. And, as has already been established, such limitations may lead to overvalued exchange rates, which again produce overvalued capital markets (Tamirisa, 1998). It goes without saying that such financial policies may prevent the integration of capital markets. (See also Demerguc-Kunt, et al., 1996.)

III. THEORETICAL FOUNDATION

After taking into consideration the various works of other economic researchers, it becomes necessary to selectively draw from their studies the hypotheses and findings relevant to this particular analysis. Throughout this section, various factors that are believed to be significant in the integration of capital markets will be outlined and discussed to assist in the derivation of the final empirical model. Beginning with the most basic principles of market integration, integrated markets are those markets allowing for the free flow of capital across international borders and those markets highly vulnerable to changes in the international economy. This Kasa argues can be seen by the degree in similarity in interest rate movements. As capital markets strive to keep in equilibrium with one another, over time the differences of those nations' real interest rates should decrease. Similarly, as interest rate adjustments become more accurate and efficient indicators, there becomes an inherent free flowing of capital. In turn, these nations' integrated markets will tend to share highly correlated stock comovements (1995).

More specifically, capital flow restrictions and exchange regimes provide further indication of a market's level of integration. Both factors may inhibit international portfolio diversification, market speculation, and the ability to hedge financial risk. As a result, markets with such restrictions may suffer from pricing inefficiencies in the form of overvalued exchange rates and capital markets. As explained in the previous section, these restrictions make it near impossible to naturally integrate into the global economy causing even greater variances in market comovements (Tamirisa, 1998).

However, it is also assumed from Karolyi and Stulz that market integration does not always allow for highly correlated capital market movements. In every economy, there

exist certain unforeseen shocks that Karolyi and Stulz characterize as global and competitive. In this sense, highly integrated economies may not always imply correlated market movements. Furthermore, segmented stock markets may produce highly correlated returns, given the appropriate macroeconomic shock. In the previous section, Karolyi and Stulz's concept of exchange rate fluctuations were explained as potential competitive shocks that may alter trading patterns among national stock market indices. More specifically, exchange rate shocks may benefit one market at the expense of another, causing a decrease in comovement correlation (1996).

Every foreign investor must take into account these international exposures, which may potentially alter the returns and comovements of two highly integrated markets. Conversely, two segmented markets may experience high degrees of correlation through some sort of global shock, either harming or benefiting both involved nations. This occurs most frequently when nations produce similar goods or are consumers of similar goods that are directly affected by these global shocks (Karolyi and Stulz, 1996). In the previous section we noted changes in oil as a global shock to oil consuming nations, regardless of their market integration levels. A rise in oil prices would result in the decline of capital market returns for two oil consuming nations, while a drop in oil prices would subsequently raise the return on capital in both nations.

Lastly, this research must note that while one may characterize nations as being either integrated or segmented, this state of development is not static. To understand the impact of market integration on national stock comovements, one must insure that the time-horizon for analysis allows for these changes. Developmental economic theory posits that levels of correlation can change over time as well as can the significance of certain

variables in determining market variance. Capital and informational barriers decrease, and market adjustments become increasingly more rapid, particularly as foreign speculation in their capital markets increases (Korajczyk, 1996).

This progression in economic development is more clearly seen through a broad base panel of nations. Both Theodore (1996) and Korajczyk (1996) were able to show that the more underdeveloped and segmented markets were generally those Latin American nations, whose capital markets suffered from heavy market contagion and mispricing, while it was the developed nations who most often exhibited the characteristics of integrated markets. Most importantly, in between these two degrees of integration were typically the Southeast Asian nations, which often times reflected mixed results and characteristics of both segmented and integrated markets.

Table 2:

	Capital Controls	Capital Controls prior to 7/97	Pegged Exchange	Pegged Exchange prior to 7/97
China	X	X		
Hong Kong			X	X
Indonesia		X		X
Japan				
Singapore	X	X		
South Korea	X	X		X
Thailand		X		X

Source: Tamirisa, 1998

Such findings have provided an impetus to devote further research to this geographic area, particularly in light of the vast economic development that has taken place in Southeast Asia over the last several years. The justification behind such hypotheses is better illustrated in Table 2. Note that all tested nations excluding Japan and Hong Kong have at one point before July 1997, enforced certain capital flow barriers, and four out of seven have at one point had their exchange rates pegged to another currency. This

information provides further indication of Asia's rapid movement towards market liberalization and economic development.

The information conveyed throughout this section has helped outline the primary hypotheses that will aid in the derivation of an empirical model. Together these various factors not only determine a capital market's degree of integration, but also help to explain the reasons behind variations in capital market comovements. Those specific variables to be considered are discount rates, capital controls, exchange rate regimes, exchange rate fluctuations, and changing oil prices.

IV. EMPIRICAL MODEL

In this section, an empirical model will be formulated for the purposes of testing the hypotheses set forth in section three. Through OLS regression and panel data analysis, the empirical model will attempt to determine which factors influence the capital market comovements of various Southeast Asian nations (China, Hong Kong, Indonesia, Japan, South Korea, Singapore, & Thailand) in comparison to the United States. Furthermore, it will be determined if these seven nations exhibit qualities characteristic of either an integrated or segmented market, or both. The analysis will show a decreasing variance in international market comovements over time, as economies develop and respond more expeditiously to various macroeconomic factors. A similar test will also be conducted substituting Japan for the United States in the analysis as the basis for comparing Southeast Asian stock comovement. Results should provide insight to the changing importance of the explanatory variables as the geographic composition of nations grows in specificity.

The data for the analysis in the initial test spans July 1997 through December 1999. Rather than separate out each nation in its comparison to the United States, all seven

Southeast Asian nations will be compared as a group in one regression through panel data with the help of explanatory dummy variables and various macroeconomic variables. Ultimately, results should provide an indication of how these nations' market comovements as a whole are influenced by such factors. The dependent variable is represented by DIF, and is the percentage change over a one-month period in the given nation's stock index minus the monthly percentage change in the S&P 500. This difference in percentage movement between stock indices will serve as a standardized measurement for those nations' market comovements with the United States. The research will seek to determine how discount rate differentials, crude oil prices, exchange rate movements, exchange rate regimes, and capital controls impact these market comovements. Equation 1 and Table 3 below illustrate and summarize the model more clearly.

Equation 1:

$$\text{DIF} = \alpha + \beta_1 \text{DISCOUNT} + \beta_2 \text{OIL} + \beta_3 \text{EXCHANGE} \\ + \beta_4 \text{INFLATIO} + \beta_5 \text{PEGGED} + \beta_6 \text{CAPITAL} + \varepsilon$$

Table 3:
Empirical Model

Dependent Variable	Definition	Predicted Sign
DIF	Monthly percentage stock index movement minus the monthly percent movement of U.S. S&P 500	(N/A)
Independent Variable		
DISCOUNT	Three month deposit rate minus the U.S. three-month deposit rate.	(-)
EXCHANGE	Monthly percentage change in exchange rate to US\$	(-)
OIL	Crude oil prices (dollar/barrel)	(-)
INFLATIO	Inflation rate minus U.S. inflation rate	(N/A)
PEGGED	Indicates existence of pegged exchange rate	(+)
CAPITAL	Represents restriction on non-resident purchasing of securities.	(+)

The first explanatory variable, DISCOUNT, will represent the differences between each nation's three-month bank deposit rate and the three-month bank deposit rate of the United States. Due to an insufficient amount of data, the actual central bank discount rates could not be used, however this three-month deposit rate is expected to suffice. Borrowing from Kasa's research, it will be assumed that the difference in discount rates among nations serves as a general proxy for integration levels, and that a greater differential should in fact lead to a greater variance in stock comovements. Conversely, should discount rates be relatively aligned, so should national stock comovements. A higher discount rate in say Japan should lead to a decline Japan's market returns relative to the United States, *ceteris paribus*. With this in mind, DISCOUNT should have a negative effect on the dependent variable. Furthermore a significant impact should support Kasa's integrated market hypothesis in that the responsiveness of market movements to the discount rate differential serves as an important indicator of a market's integration level.

The variable CAPITAL is a dummy variable, which identifies those nations that restrict the purchasing of securities and bonds by non-residents of that country, and more generally identifies a nation that inhibits the free flow of capital across international borders. Among the nations analyzed in this study, those that have such restrictions in place are China, Singapore, and Korea. It is hypothesized that capital controls in such economies will result in larger variances in market comovement, and furthermore, restrict the integration of capital markets. This is primarily attributed to the fact that markets with enforced capital controls tend to outperform markets than those without capital controls (Tamirisa, 1998). The result is an overvalued capital market that prevents speculation and pricing efficiency. Because the existence of capital controls restricts speculation, capital

controls are associated with overvalued financial markets, and for the purposes of this study carry a positive coefficient. However, intuition may also find that capital flow restrictions may result in undervalued financial markets. Essentially such segmented capital markets may suffer from demand distortions that inhibit accurate market pricing, and may potentially occur in either direction. Still the important fact remains that capital controls have been empirically observed to have a positive effect on capital markets.

Like CAPITAL, PEGGED also represents traits associated with segmented markets; more specifically, those nations with fixed exchange rates. Pegged exchange rates are often used to control the speculation of the domestic currency and keep commodity pricing and inflation within reasonable levels. Again, such a financial control has been associated with an overvalued capital market, and is expected to have a positive effect on the DEPENDENT variable. In this data sample only Hong Kong is still a pegged currency.

If proven significant, both CAPITAL and PEGGED should help to explain the large variance in comovements among these markets. The question remains whether or not these nations are progressing towards a reasonable level of market integration with which to foster efficient capital asset pricing. It is here that the significance of the discount rate differential will be most beneficial. Should all three variables be found to have a significant impact on the dependent variable, it can be deduced that these nations have in fact grown into more integrated economies, despite capital flow and exchange controls. A significant value in the DISCOUNT variable will indicate that the markets as a whole remain relatively correlated despite such controls, however, still carry an adverse effect on the integration of these capital markets in comparison to those without any financial restrictions.

Lastly, the model will take into consideration Karolyi and Stulz's concept of global and competitive shocks, in determining how these external macroeconomic factors affect international capital markets. The variable OIL measures a weighted average of crude oil prices per barrel throughout the global economy, and given that oil is a commodity consumed by all nations, serves as a proxy for global shock to the entire international economy. Should OIL be found significant to the model, it can be concluded that both the U.S. and the Asian nations in question are equally and similarly affected by changing oil prices, making it an important global shock to consider in international diversification. Such a possibility may furthermore imply that the nations tested still possess many characteristics associated with segmented markets. This can be attributed to the observations made by Karolyi and Stulz, who hypothesize that global shocks may have a relatively small impact on developed nations, as market movements tend already to show a significant degree of correlation (1996).

Representative of competitive shocks is the variable EXCHANGE. EXCHANGE will measure the monthly percentage change of each nation's exchange rate to the U.S. dollar. Economic theory dictates that exchange rate fluctuations affect not only commodity pricing, but also capital asset pricing throughout the global economy. Undoubtedly exchange rate fluctuations will benefit one nation's market at the expense of another, making it the most basic and common of competitive shocks. This variable will therefore attempt to account for unexpected increases in variance among the S&P 500 and the Asian indices in question.

Contrary to the variable OIL, EXCHANGE should be most important in measuring the variance of stock movements among developed nations. Developing nations, Karolyi

and Stulz hypothesize, are comprised of highly segmented markets. Given these conditions, the additional variance caused by competitive shocks such as exchange rate fluctuations should be minimal. With this in mind, the variable EXCHANGE should not only confirm Karolyi and Stulz's findings and support the notion that competitive shocks result in unexpected variations in stock price comovement, but if found significant, help in labeling the analyzed nations as integrated or segmented.

An important point that should be noted is that all variables in this analysis are in nominal terms. As a control variable, inserted into the empirical model is the variable INFLATIO. This variable measures the inflation rates of the nations in question minus the inflation rate of the United States. Isolation of this variable strengthens the econometric specification by avoiding the potential hazards of autocorrelation. Despite this variable's deliberate intent of serving as a control variable, it goes without saying that inflation may certainly have a strong effect on capital markets. INFLATIO may very well prove to be a significant explanatory variable, and it should have a potentially negative effect on the dependent variable.

Noting that the time horizon for the analysis is limited by the availability of data for China, Indonesia, South Korea, and Thailand prior to July 1997, a second test will be conducted excluding these nations from the analysis in an effort to measure the effects of the explanatory variables over a longer time horizon. The primary justification is not only to increase the time span for analysis by an additional forty-two months, but to look solely at Southeast Asia's more developed economies: Hong Kong, Japan, and Singapore. While the empirical model remains the same, the research now hopes to identify any changes in the significance of the explanatory variable in light of the extended time horizon and use of

more developed capital markets. Furthermore, the analysis should determine whether these markets demonstrate a higher degree of integration than the previously tested group.

The third and final test will again consist of the same empirical structure, only slightly altering the independent variable. Now, Japan will be set a benchmark for comparing the six remaining Southeast Asian capital markets. Japan, like the United States, exhibits traits predominantly associated with integrated markets. However, the point of differentiation lies in Japan's close relation to the other six aforementioned nations. As previously explained, evidence indicates that a stronger relationship tends to exist among geographic neighbors in which there is greater possibility for cases of market contagion (Theodore, 1996). Furthermore, it is hypothesized that capital barriers and trade restrictions are often more lax and/or ignored in an effort to foster economic growth and strong business relations among such groups. With this in mind, it would be reasonable to expect higher degrees of integration among these nations than when previously comparing them to the United States.

V. RESULTS

Table 4 shows the results for Test 1. Recall that the nations being compared to the United States were China, Hong Kong, Indonesia, Japan, Singapore, South Korea, and Thailand. The time horizon for analysis spanned July 1997 through December 1999 using monthly panel data. Initial results have proven encouraging as every variable was significant to the 0.05 level or better and all but one (OIL) were significant to the 0.000 level. Furthermore, all coefficient signs were as-predicted. At first glance, it would appear that these capital markets are relatively correlated and integrated to the United States' own

capital market, given the high degree of significance of DISCOUNT on the dependent variable.

Table 4:
Dependent: (China, Hong Kong, Indonesia, Japan, Korea, Singapore & Thailand) - U.S.

	TEST 1		
	Beta	t-stat	Sig.
DISCOUNT	-0.687	-6.291	0.000
CAPITAL	10.951	6.984	0.000
PEGGED	17.879	9.737	0.000
INFLATIO	-0.273	-4.786	0.000
OIL	-0.243	-2.685	0.008
EXCHANGE	-1.19E-03	-4.657	0.000
Adj. R²			0.419
Durbin-Watson			1.925

Sources: International Financial Statistics, and Yahoo Finance

Further supporting the initial hypotheses, capital controls and pegged exchange rates still allow for large variances in market comovements, and as past literature has demonstrated, no market can ever be completely integrated in the presence of such controls. Given all this, however, perhaps it is at least safe to assume that these nations have made great headway in the integration of their capital markets. Still, as the adjusted R² value (0.419) suggests, there is still much to be accounted for in the variation of the dependent variable.

With this in mind, efforts were made not only to expand the time horizon for the analysis, but also to look at the more economically developed nations of the data sample. In the second test, China, Indonesia, Korea, and Thailand were left out of the sample, which allowed the analysis to span from January 1994 through December 1999. The three countries remaining are Hong Kong, Japan, and Singapore. Japan is the only industrialized

nation of the group, but Hong Kong and Singapore are still recognized as major international financial centers. The results are presented in the table below.

Table 5:
Dependent: (Hong Kong, Japan, Singapore) – U.S.

	TEST 2		
	Beta	t-stat	Sig.
DISCOUNT	-0.356	-3.112	0.002
CAPITAL	19.183	13.232	0.000
PEGGED	10.024	7.180	0.000
INFLATIO	-0.213	-5.418	0.000
OIL	-0.297	-8.747	0.000
EXCHANGE	-2.05E-02	-1.526	0.129
Adj. R²			0.955
Durbin-Watson			1.651

Sources: International Financial Statistics, and Yahoo Finance

The first notable difference between Test 1 and Test 2 is the dramatic rise in the adjusted R^2 value to 0.955 indicating that far more of the dependent variable's variation has been explained. All explanatory variable coefficient signs were as predicted and all were significant to the 0.05 level or better with the exception of EXCHANGE. The significance of DISCOUNT and the higher R^2 value seem to suggest these three nations as highly integrated, however, the insignificance of EXCHANGE, suggests otherwise. Recalling Karolyi and Stulz's findings concerning global and competitive shocks, it is hypothesized that integrated markets will be more influenced in their comovements by competitive shocks, while segmented markets are more subject to the influences of global shocks.

Of course the results from Test 2 leave much to be interpreted. The insignificance of exchange rate fluctuations as a competitive shock has many implications. It could very well be that the three markets in question are not integrated markets, however literature on the topic suggests otherwise, (see Korajczyk, 1996, and Theodore, 1996). In light of the expanded time horizon, the results might imply that exchange rate risk becomes less

important to long-term investors, or even that exchange rate risk is less of a factor among the more integrated markets (note that this would contradict the findings of Karolyi and Stulz, 1996). Yet another possible explanation is that through a longer time horizon, earlier periods of infancy in these markets are observed, and hence earlier periods where these markets may have in fact demonstrated characteristics indicative of segmented markets.

However, perhaps the most likely interpretation lies in that the Hong Kong dollar is pegged to the U.S. dollar. When only sampling three nations, Hong Kong's pegged exchange rate may have created a strong misrepresentation in the importance of exchange rate fluctuations. Despite the minor confusion as to the importance of exchange rate fluctuations within the model, the three nations in question have arguably exhibited greater responsiveness to the majority of explanatory variables as a whole. It is furthermore reasonable to assume that Hong Kong, Japan, and Singapore have shown themselves to be a relatively more integrated group of nations to the United States than the grouping of nations previously discussed in Test 1.

While Southeast Asia has been identified as a steadily integrated market, if not already highly integrated to the United States, the question remains as to whether a stronger relationship tends to exist among geographic neighbors in which there is greater possibility for cases of market contagion and/or integration. In test three, Japan replaces the United States as the benchmark nation for comparison to the other six remaining Asian stock indices. The results depicted in the table below seem to identify this group as fairly integrated, but raise many questions surrounding economic influences and arrangements among a more concentrated grouping of nations.

Table 6:
Dependent: (China, Hong Kong, Indonesia, Korea, Singapore, Thailand) – U.S.

	TEST 3		
	Beta	t-stat	Sig.
DISCOUNT	-4.09E-02	-2.404	0.017
CAPITAL	0.231	1.210	0.228
PEGGED	10.023	41.792	0.000
INFLATIO	-2.56E-02	-2.319	0.022
OIL	-0.104	-5.546	0.000
EXCHANGE	-1.18E-02	-3.985	0.000
Adj. R^2			0.945
Durbin-Watson			2.296

Sources: International Financial Statistics, and Yahoo Finance

Most noticeable is the extreme significance of the pegged exchange rate dummy variable. Recall that of the seven Southeast Asian markets used in this analysis, only Hong Kong still adheres to a stringent exchange rate policy in which the Hong Kong dollar is pegged to the U.S. dollar. The possibility that PEGGED is not necessarily a dummy for fixed exchange rates, but rather for idiosyncratic attributes of Hong Kong itself is not entirely out of the question. Furthermore, when considering the relative out-performance of Hong Kong's Hang Seng index in comparison to the other nations' stock indices over the past few years in light of the Asian Financial crisis, such a possibility becomes an even more realistic explanation.

Also distinctly different from the results of Test 1 and 2, is the decline in significance of the capital controls dummy variable. As previously discussed, often times nations within certain geographic groups strive to foster healthy business relations and economic growth through lax international economic policies. This can include certain trade agreements and joint ventures in manufacturer specialization. AFTA (Asian Free Trade Agreement) remains a primary example, and would suggest that capital controls pertaining to the United States and the western world may not necessarily apply to Japan

and other major Asian trading partners. Such policy decisions may lessen the impact of capital controls as they pertain to the empirical model.

Given all of these factors, it would appear that this select group of Southeast Asian nations remains highly integrated in regards to their capital markets, if not more so than the nations examined in Test 2, particularly in light of the findings surrounding CAPITAL. The discount rate differential remains an important determinant in integration levels and its significance value supports such a hypothesis. The impact of both OIL and EXCHANGE remains high, again suggesting the importance of both global and competitive shocks to the comovements of national stock indices. As already discussed, this research is not prepared to label Southeast Asia as only somewhat integrated given the relative significance of global shocks. Rather, this research questions the original hypotheses set out by Karolyi and Stulz who posit that global shocks are only significant to relatively less integrated or emerging capital markets. Clearly it has been demonstrated that these nations remain highly integrated despite certain limitations pertaining to capital controls and pegged exchange rates.

VI. CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

As has been established by the evidence in Table 1 and the various works of other researchers, certain conditions exist in every economy preventing the perfect integration of capital markets, regardless of the financial market's maturity or governmental efforts. Time and distance, among other reasons, will impede informational and capital flows. However, even given these assumptions, the market integration hypothesis has often failed to account for uncharacteristic changes in stock comovement correlation. Table 4 indicates that much

of the variation in stock comovements is still left unexplained by a relatively low value of R^2 .

Perhaps in this instance there remain specific factors within the international economy that the model has ignored. Recalling that July 1997 marks the beginnings of the Asian financial crisis (and the beginning of the analysis for Test 1), it is important to note that both Indonesia and Thailand underwent significant changes in economic policy. These changes included the floating of their exchange rates and the abolishment of all capital controls. It does not require extensive contemplation to understand the drastic effects such policy changes may have on financial markets; specifically, the dramatic increase in speculation in their currencies, securities, and bonds markets. The result of this speculation is significant downward pressure on these initially overvalued and transparent capital markets. Such factors are not accounted for in the empirical model, and cannot be systematically anticipated by the international investor.

By expanding the time horizon for the analysis however, and by ignoring those nations which have undergone such extensive liberalization of economic policy, it is observed through Table 5 (Test 2) that a much greater amount of variance in the dependent variable has now been explained through a significantly higher R^2 value. These findings confirm the hypotheses behind market integration barring significant and unexpected disturbances to these nations' economies. Ideally another regression should be run for the nations previously excluded in Test 2 using a longer time horizon. Then perhaps more definitive conclusions could be made concerning their degree of market correlation. Yet another alternative would be analyzing the Southeast Asian market during the several years prior to July 1997, coupled with a second analysis for the months following. This would

allow a direct comparison of the two distinctly different time periods. In addition, such a study might be better served through the use of other explanatory variables including political and institutional variables that might account for the extensive policy changes that took place.

Despite these few concerns, noteworthy is the consistent importance of a few explanatory variables. Throughout the duration of testing, those variables that yielded the most consistent results were the discount rate differential, oil price fluctuations as a global shock, and the dummy variable representative of currency exchange controls. DISCOUNT remains a significant variable throughout the regression analysis of tests one through three confirming Kasa and other researchers' previous findings. Furthermore, OIL implicates the similar effects oil price fluctuations may have on capital markets as a whole, more specifically supporting Karolyi and Stulz's hypotheses concerning global shocks.

However, questions remain as to the exact impact of pegged exchange rates. Given that Hong Kong is the only nation tested still enforcing a strict fixed rate (to the U.S. dollar), there is a strong possibility that PEGGED may have been capturing characteristics purely indicative of Hong Kong's unique financial structure, and not necessarily those of a pegged exchange rate. Perhaps the simplest solution to this concern is the testing of other nations' capital markets that also utilize pegged exchange rates helping to single out the exact effect a fixed exchange rate system. Furthermore, the analysis might simply be better served through a broader scope of nations not only throughout Southeast Asia, but rather throughout the developing world. Such an analysis would help determine exactly how integrated these Southeast Asian markets are in comparison to the capital markets of other developing nations.

In addition, it is necessary to address the significant role capital-flow barriers play in the integration of capital markets. In both tests one and two, it was observed that capital controls have an apparent adverse effect on the integration of capital markets, as was seen both by the positive coefficient and its high significance level. However questions remain as to the role capital barriers may play in a more concentrated region as was observed in test three. Clearly the effect of capital controls when using Japan in place of the United States as a benchmark for comparing stock comovements is clouded at best. Again, a broader scope of nations for such an analysis, including other geographic groupings such as Latin America, may help to further understand the full effect of these restrictions.

Lastly is the surprising significance inflation has as it pertains to the empirical model despite its intended use as a pure control variable. Perhaps its inclusion in a similar model, but in conjunction with real discount and exchange rates as opposed to the currently used nominal measurements, might better implicate the importance of inflationary concerns in developing markets.

Overall, the results of study are highly encouraging and warrant continued research in the area of capital market integration. An extended time horizon and a broader base of nations for comparison would appear to be areas of concern if research in this area is to be continued. Regardless of any alterations to the empirical model, however, the consistent results yielded by DISCOUNT and OIL on capital markets comovements should be kept in mind. Clearly the discount rate differential among Southeast Asian nations and the United States should be a primary factor in any international investor's decision, as well as the anticipation of possible oil price fluctuations across the globe.

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