Study on Diversification Benefits and Financial Market Integration

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(Abstract)

The objective of this study is to examine the diversification benefits in the integrated financial markets. This study employs Lambda in analyzing the degree of financial market integration. This study uses daily returns of stock market indexes for 10 countries across 3 different regions (i.e., Asia, Europe, and N. America) during May 2005 through April 2010. This period is chosen due to the global financial crisis in the US (2008), which had significant impacts on the financial markets around the world. This period is divided into 2 sub-periods, Before the US crisis (May 2005-June 2008) and After the crisis (July 2008-April 2010). The significant decrease of correlations suggests existence of diversification benefits to be exploited by US investors. European markets became less integrated with the US market after the crisis. In addition, decreased Lambdas after the crisis suggest existence of more diversification benefits around the world. As a whole, regional markets became less integrated but (a little bit) more integrated with the US market after the US market around the world. As a whole, regional markets became less integrated but (a little bit) more integrated with the US market after the US crisis. Thus, it is suggested to diversify across various financial markets to exploit more benefits after the US financial crisis.

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I. Introduction

The financial markets around the world became more integrated due to development of technologies and an increase of cross-border investments and foreign direct investments. Financial market integration and openness (e.g., liberalization and deregulation) may discipline domestic economic policies and financial sector to increase market efficiency and develop financial markets. The financial market reforms are followed by increased capitalization and more activities in domestic equity markets (Schmukler, Gozzi, and Torre 2007). The benefits of financial market integration lie in a more efficient way of allocating assets and sharing investment risks. Thus, it has long been debated how a shock due to major economic or financial events -- originated in one country -- affect other markets in the integrated financial markets.

The global financial crisis was triggered by subprime mortgage loans and a complex interplay of valuation and liquidity problems in the U.S. (2008). When the housing bubble busted, the values of securities tied to real estate fell sharply. Then, both financial markets and housing sector collapsed, resulting in the fall of major financial institutions and corporations. The increased bank insolvency and dwindling in credit availability had negative effects on consumer confidence and domestic economic activities with prolonged unemployment. This crisis had spread fast to other countries, affecting many multinational corporations and the lives of numerous investors. But this crisis ended in mid-2009 due to various stimulus policies by governments and central banks (e.g., QEs).

Empirical results show that the pair-wise correlation among securities is higher than between-market correlations, and thus, the foreign investment risk can be reduced by adding foreign securities. Heston and Rouwenhorst (1995) argue that investors need to pay more attention to the geographical rather than the industrial composition of their investments. Fooladi and Rumsey (2006) showed that geographical diversification might be more effective in reducing risk than industrial diversification. Eun and Resnick (1984) found that the average correlation between countries is below 0.30, much smaller than that (0.63) of stocks in one country during 1973-1982. Elton and Gruber (1995) showed that the average pair-wise correlations among market indexes of 18 countries (measured in US dollars) to be 0.4. Longin and Solnik (1995) note that international correlation has risen over time during 1960-1990. Solnik (1988) report that the average correlation of stock returns between countries is 0.35 during 1971-1986. Kaplanis and Schaefer (1991) provided empirical results with an average correlation of 0.32 during 1978-1987. Other studies showed that the correlations between stock markets increased when world market volatilities are high (Solnik, Boucrelle, and Fun (1996), Chesnay and Jondeau (2001)). In contrast, Longin and Solnik (2001) found that "correlation is not related to market volatility per se but to the market trend. Santis and Gerald (1997) showed that correlation increases in bear markets but not in bull market; the correlation between financial markets increased during the US market decline. As a result, US investors could have gained 2.1% additional return through global diversification, but this gain had not been significantly affected by the degree of financial market integration

Empirical studies, in general, indirectly measure the benefits of global diversification by making a general inference from pair-wise correlations between stock markets. In reality, correlation is only one of the elements in determining any portfolio risk. If foreign stocks are added to a diversified portfolio, the portfolio return might depend not only on the correlation

between domestic and foreign stocks but also on the total risk of foreign stocks. In empirical tests, we need to separate the impacts of exchange-rate movements from those of market returns. Thus, this study is to address these issues by 1) introducing a direct measure of diversification benefits and 2) separating the impacts of exchange-rate changes from stock market movements in local currencies. The objective of this study is to examine the integration and diversification benefits by using the Lambda (λ , Fooladi and Rumsey (2006)), which is different from the pair-wise correlations.

Lambda (λ) is calculated as a ratio of the standard deviation (STD) of returns of an equally weighted global portfolio to the average STD of all market indexes, included in the portfolio. The Lambda is used to measure diversification benefits by separating the impacts of exchangerate changes from market index returns (in local currency) without requiring any prior correlation inference. In this study, Lambda is calculated for a portfolio of equity returns, measured in the investor's home currency. After all the market indexes are scaled to have the same value (I₀) in the base year, Lambda is calculated in two steps. The first step is to form a portfolio of equally-weighted market indices (in local currency). The second step is to compute Lambda as a ratio of STD of an equal-weight global portfolio to the STD average of all market indexes (Eq. (2), p. 228, Fooladi and Rumsey (2006)):

$$\lambda_{\rm SD,T} = S^2_{\rm p,t} / \dot{S}_{\rm T} \tag{1}$$

where $S_{p,t}^2$ is the sample variance of the portfolio, and \dot{S}_T is the average of STDs of the m market indexes for a period from T to T+n.

If financial markets become more integrated, Lambda (λ) increases up to 1. If all markets are perfectly correlated, the equal-weight portfolio STD becomes the average STD of these indexes, and Lambda equals to one. If these markets are less than perfectly correlated, Lambda decreases to below one. The diversification benefits are measured by the extent how small the Lambda (λ) becomes. The values of Lambda ($0 < \lambda < 1$) are inversely related to the benefits of financial markets diversification. The third step is to examine changes of λ s to analyze the diversification benefits. In empirical tests, it is much easier and powerful to use one ratio, Lambda (λ), rather than many correlations (i.e., N(N-1)/2).

II. Empirical Results

This study uses daily returns of stock market indexes for the 10 countries for a period of May 2005 through June 2010. The market indexes are from 3 different regions, N. America (Canada, Mexico, and the US), Europe (France, Germany, and the UK), and Asia (Hong Kong, Japan, Korea, and Singapore). This period is chosen due to the global financial crisis in the US (2008), which had significant impacts on the financial markets around the world and the lives of numerous people around the world. To better account for the impacts of the crisis, this period is divided into 2 sub-periods, Period 1 (Before the US crisis: May 2005-June 2008) and Period 2 (After the crisis: July 2008-April 2010).

Table 1 provides descriptive statistics of daily returns and standard deviations (STD). Before the crisis, Mexico had the highest return (40.35%), followed by Korea (25.43%) and Hong Kong

(24.45%). On the other hand, the UK (6.67%) and France (6.76%) had the lowest returns. In terms of the relative volatility measurement (i.e.., coefficient of variation (CV), France had the highest CV (57.18), followed by the UK (53.93) and the US (43.32). The average CV for Europe is 44.85, much higher than those of N. America (23.5) and Asia (25.4). The results suggest that European markets had carried much more volatile in relation to other markets.

	Before	Crisis		After	Crisis	
	Mean	STD	CV	Mean	STD	CV
US	0.0731	3.1690	43.32	0.0183	7.9321	434.64
CANADA	0.2070	3.1505	15.22	-0.0544	7.4179	-136.28
MEXICO	0.4035	4.8289	11.97	0.1592	7.1443	44.88
FRANCE	0.0676	3.8637	57.18	0.0183	7.7000	421.92
UK	0.0667	3.5963	53.93	0.1095	6.8636	62.68
GERMANY	0.1634	3.8295	23.44	0.0756	7.5140	99.33
HONG KONG	0.2445	5.2538	21.49	0.0837	9.1354	109.19
JAPAN	0.1167	4.5285	38.81	-0.0690	7.9778	-115.61
KOREA	0.2543	4.5117	17.74	0.1358	7.3180	53.90
SINGAPORE	0.1634	3.8497	23.56	0.0647	6.7209	103.84
Average	<mark>0.1760</mark>	<mark>4.0582</mark>	<mark>30.67</mark>	<mark>0.0542</mark>	<mark>7.5724</mark>	<mark>158.23</mark>

Table 1: Descriptive Statistics for Stock Index Returns

(Note) The mean is the average of annualized returns. CV: Coefficient of variation (STD / Mean). Period 1 (Before the US crisis; May 2005–June 2008); Period 2 (After the crisis; July 2008–April 2008).

After the crisis, Mexico had the highest return (15.92%), followed by Korea (13.58%) and the UK (10.95%). Japan (-6.9%) and Canada (-5.54%) had the lowest returns. The CVs show that the US (434.64) and France (421.92) had the highest value, followed by Hong Kong (109.19) and Singapore (103.84). The average CVs for N. America (205.77) and Europe (194.64) are much higher than that of Asia (95.64). The post-crisis results show that both N. American and European markets had much more volatility in comparison to Asian markets. This result was expected because the global financial crisis originated in the US.

Table 2 provides correlations between stock markets. The correlations increased in 20 cases, supporting more integration between financial markets. In contrast, the decrease of correlations in 23 cases suggests lower degree of integration. The results as a whole are not consistent on the degree of integration between stock markets of interest.

Other interesting results are: 1) stock markets in Europe and N. America became much less integrated, suggesting more diversification benefits; 2) Asian markets have not been affected by the US financial crisis because of no big changes in the correlations; and 3) there is a negative correlation (-0.0415) between Korea and the US after the crisis. This result suggests the existence of diversification benefits to be exploited by US investors between Korean and the US markets. In addition, stock markets in Canada, Mexico, and France became more integrated with those in Germany, Hong Kong, Japan, and Korea, resulting in smaller benefits. Table 2.A Correlations among Stock Markets before the US crisis (May 2005 – June 2008)

	US	CAN	MEX	FRA	UK	GER	НКМ	JAP	KOR	SIN
US	1.0000									
CAN	0.8736	1.0000								
MEX	0.9027	0.9678	1.0000							
FRA	0.9185	0.7439	0.7582	1.0000						
UK	0.9315	0.8470	0.8436	0.9650	1.0000					
GER	0.9563	0.9083	0.9423	0.8656	0.9090	1.0000				
HKN	0.8067	0.8663	0.8900	0.5984	0.7065	0.8626	1.0000			
JAP	0.6738	0.5261	0.4909	0.8630	0.8150	0.6050	0.2512	1.0000		
KOR	0.8429	0.9163	0.9137	0.6786	0.7816	0.9014	0.9290	0.4255	1.0000	
SIN	0.9627	0.9070	0.9431	0.8312	0.8724	0.9660	0.8906	0.5316	0.9002	1.0000

Table 2.B Correlations among Stock Markets after the U.S. crisis (July 2008 – April 2010)

	l	US	CAN	MEX	FRA	UK	GER	НКМ	JAP	KOR	SIN
US	1.0	0000									
CAN	0.1	L155	1.0000								
MEX	0.1	L604	0.9481	1.0000							
FRA	0.7	7236	0.7208	0.7641	1.0000						
υк	0.0)277	0.9597	0.8931	0.6362	1.0000					
GER	0.4	152	0.9235	0.8985	0.8818	0.8713	1.0000				
НКМ	0.2	2651	0.9286	0.9429	0.8266	0.8732	0.9228	1.0000			
JAP	0.4	1761	0.8265	0.8879	0.9167	0.7597	0.8889	0.8912	1.0000		
KOR	-0.0)415	0.9181	0.9483	0.6124	0.8789	0.8051	0.8821	0.7899	1.0000	
SIN	0.7	7014	0.6134	0.7217	0.9165	0.5174	0.7491	0.7555	0.8856	0.5754	1.0000

Table 3 provides empirical results of Lambda tests. Lambda (λ) is calculated for each of the four scenarios. **Scenario 1** is to invest in all 10 markets; **Scenario 2** only in N. American markets; **Scenario 3** only in European markets; and **Scenario 4** only in Asian markets. The results show that the overall Lambda decreased by 32% (0.5446 to 0.3706) after the US crisis (**Scenario 1**), supporting the existence of much bigger diversification benefits across stock markets after the US crisis. Lambda decreased by 27% in Asia (**Scenario 4**), 20% in Europe (**Scenario 3**), and only 9% in N. America (**Scenario 2**).

Table 3 Changes in the Value of Lambda before and after the US crisis

	Period 1	Period 2	Changes
λ (10 markets)	0.5446	0.3706	0.1586 (32%↓)
λ (US, Canada, Mexico)	0.6591	0.6000	0.1472 (9%↓)
λ (France, Germany, UK)	0.6995	0.5625	0.1444 (20%↓)
λ (HKN, Japan, Korea, Singapore)	0.7915	0.5774	0.1390 (27%↓)

(Note) Period 1(Before the crisis: May 2005 – June 2008); Period 2(After the crisis: July 2008 – April 2010



Figure 1 The Trend of Lambda Values for various scenarios

III.Summary and Conclusion

This study examined diversification benefits of portfolio investments in the integrated financial markets, using the Lambda as the direct measurement of stock market integration. The correlation results support the existence of diversification benefits to be exploited by US investors around the world. European markets became more integrated but less integrated with the US market after the crisis. Smaller Lambdas in all scenarios provide empirical evidences for the existence of diversification benefits across stock markets in various regions. In short, regional markets became less integrated but more integrated with the US market after the US crisis. Thus, it is suggested to diversify across stock markets for more benefits after the US crisis.

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