

A Dynamic Interplay Between US and Asian Equity Markets

Fatollah Salimian, Salisbury University
Robert Winder, Christopher Newport University
Kashi Khazeh, Salisbury University
Herman Manakyan, Salisbury University

DETAILED ABSTRACT

The ongoing integration of the world's goods and financial markets has become a hallmark of the global economy in the 21st century. While this integration began decades ago, the pace of change continues to accelerate, as businesses, investors, and policy makers all struggle to adjust to a rapidly changing environment. Today, significant economic trends in one country often have consequences for the real sectors of its principal trading partners. For example, the recent slowdown in Chinese growth has led to fears of a slowdown in the real sectors of the U.S. and other industrial countries. As another example, the recent, unexpected collapse in the world price of oil is destabilizing the economies of both the oil exporting and importing countries.

Equally important, financial events in one country or region can be transmitted almost instantaneously to money and capital markets around the world. The recent sovereign debt crisis in Greece and its impact on currency markets, bond yields, and business confidence around the globe is a notable example. Similarly, an overnight pullback in equity markets in Japan (or another Asian stock market) can cause an immediate downturn in equity futures in the U.S. and Europe. Of course, the reverse is true, as well. With respect to policy making, perhaps the most convincing evidence of this new, shared economic reality is that the policy actions of one central bank can ramify in distant places, ultimately impacting central bank behavior in other countries.

The new economic reality described above, in combination with rapid technological change and the proliferation of stock market mutual funds and exchange traded funds in countries around the world, have fundamentally and permanently altered the landscape facing today's investors and expanded the range of feasible investment strategies. Specifically, improvements in information and computer technology have created opportunities for investors to diversify their portfolios on a global basis, and, as well, the potential to move funds rapidly and with little or no transactions costs to distant stock funds or indexes, and then back again. With respect to investment strategy, if there are predictable and dependable relationships between the prices of equity funds or equity indexes which are operational in different time zones, there is also the potential for investors to increase their investment return by taking advantage of these empirical relationships.

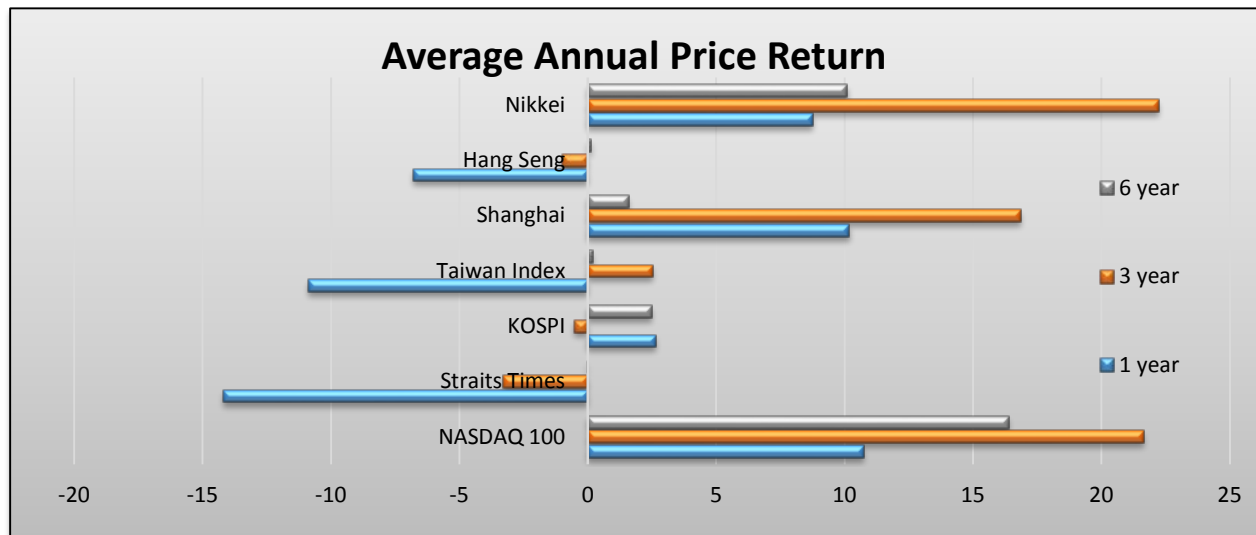
While the fundamental premise that investors are primarily motivated by wealth maximization has not changed over time, the range of potential strategies to accomplish this objective have recently expanded, as noted above. Moreover, because of lingering skittishness about investments in housing (i.e., in the aftermath of the housing collapse of 2007), and also due the continuing low interest rate environment resulting from extraordinary central bank ease in the U.S. and other countries, investors have looked increasingly to the equity markets as a preferred asset category. This heightened interest and emphasis in equities of the last several years makes it even more important to explore novel investment strategies involving worldwide stock markets, possible price correlations, and time zone differences.

While previous studies have endeavored to estimate stock price correlations between various stock indexes around the world, there are few studies which clearly demonstrate the potential gains from employing a worldwide strategy which takes advantage of stock price correlations and time zone differences. Moreover, there are few studies which provide specific, actionable information about these relationships that may inform or guide investors in their efforts to increase investment returns. To fill this void in the literature, the current study estimates the daily price correlations between seven major world equity markets (i.e., one in the U.S. and six in Asia) for the most recent six-year period and, subsequently, measures the potential gains from employing various investment strategies specifically designed to take advantage of these price correlations and time zone differences.

Specifically, this study employs stock price data for the Nasdaq 100 index along with the Asian stock market indexes Nikkei 225, STI, KX11, TWII, SSE, and HSI for the period January 1, 2010 through December 31, 2015. Various statistical analyses between the daily price indexes are conducted to determine which exchanges influence the other(s), with the ultimate goal of achieving improved investment returns by taking advantage of intertemporal correlations. The daily values for these global equity market indexes were obtained from the Yahoo Finance website. This total period covers 6 years or 2,191 days. For the individual indexes, it includes 1510 days of reported values for the NDX 100; 1486 days of reported values for the Nikkei 225; 1504 days of reported values for HSI; 1468 days of reported values for the SSE; 1486 days of reported values for the TWII; 1488 reported values of KS11; and 1522 days of reported values for the STI. Overall, it includes 1259 days during which all the indexes reported values.

The 1-year, 3-year, and 6-year average annual returns (i.e., capital gains yields) to each of these indexes are shown in Figure 1, below. As can be seen, these average annual returns displayed significant variability over the various time periods, to say the least.

**Figure 1 (January 2010-December 2015)
Nasdaq and Individual Asian Equity Market Indexes Annual Price Returns**



In addition, this study computed and evaluated the intertemporal correlation coefficients between the daily returns on these stock market indexes for both the “next day” and the “previous day.” To illustrate the nature of the analysis, the data (see Table 1, below) reveal that changes in the value of the NDX 100 had the most significant influence on the performance of the daily next day returns on Nikkei 225 index (with $r = 0.35$). By contrast, changes in the value of NDX 100 had the least significant influence on the performance of the next day SSE (with $r = .14$). The daily correlation coefficients between the NDX 100 and the six Asian equity market indexes, for both the “next day” and the “previous day,” are shown in Table 1 and Table 2, below (respectively).

**Table 1 (2010-2015)
Daily Correlation Coefficients between the NDX 100 Index and the Next Day Values of the Asian Equity Market Indexes**

	NDX	STI +1	KS11 +1	TWII +1	SSE +1	HSI +1	Nikkei +1
NDX	1						
STI +1	0.303687	1					
KS11 +1	0.344229	0.602723	1				
TWII +1	0.340061	0.614465	0.726027	1			
SSE +1	0.144206	0.322539	0.280762	0.307428	1		
HSI +1	0.341718	0.691007	0.637125	0.640586	0.534873	1	
Nikkei +1	0.353311	0.504977	0.534853	0.521221	0.264847	0.501521	1

Table 2 (2010-2015)
Daily Correlation Coefficients between the NDX 100 Index and Previous Day Values of the Asian Equity Market Indexes

	NDX	STI -1	KS11 -1	TWII -1	SSE-1	HSI -1	Nikkei -1
NDX	1						
STI -1	0.019065	1					
KS11 -1	0.005157	0.602229	1				
TWII -1	0.045721	0.614718	0.726191	1			
SSE -1	0.038312	0.322785	0.280508	0.307773	1		
HSI -1	0.040204	0.691291	0.636018	0.640254	0.535096	1	
Nikkei -1	0.029697	0.504807	0.534799	0.521556	0.264762	0.501119	1

Figures 2 and 3, below, show exactly how the U.S. equity market (as represented by the NDX 100) influences, and is influenced by, the six selected Asian equity markets. More specifically, Figure 2 shows the correlation coefficients between the closing prices for the NDX 100 and the “same day” closing prices of the Nikkei, STI, KS11, TWII, SSE and HSI indexes. The data suggest that the closing prices of the Asian equity markets have relatively little impact on the (same day) performance of U.S. equity market. By contrast, the closing prices for the NDX 100 have a moderate impact on the Asian markets.

Figure 2 (2010-2015)
Daily Correlation Coefficients between NDX 100 and the Same Day Values of Asian Equity Markets Indexes

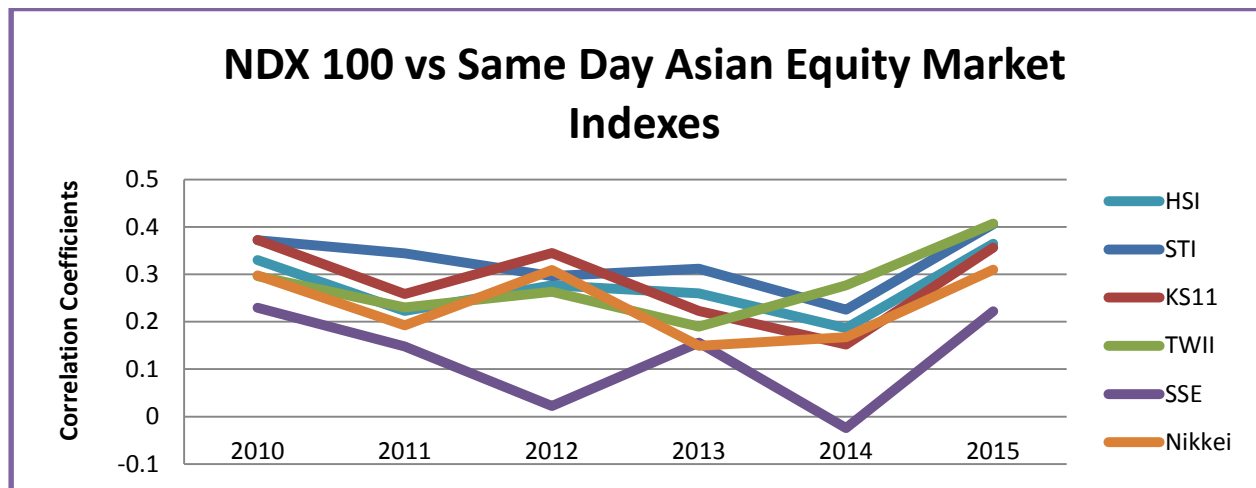
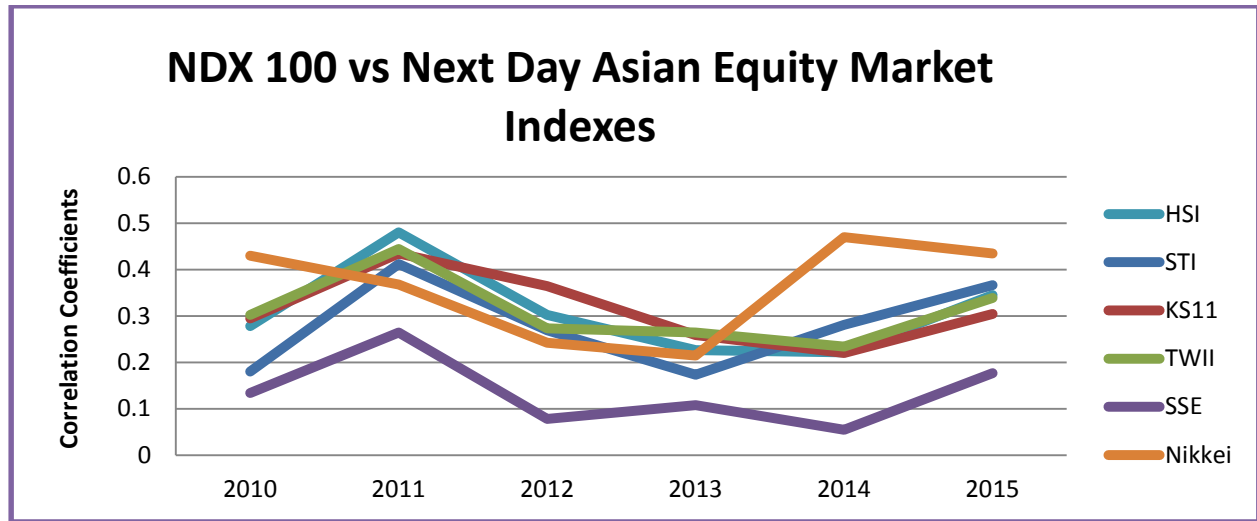


Figure 3 (below) shows the correlation coefficients between the NDX 100 closing prices and the “next day” closing prices of the Nikkei, STI, HSI, SSE, KR11, and TWII indexes. The data reveal that the closing prices of the NDX 100 index have a moderate influence on the

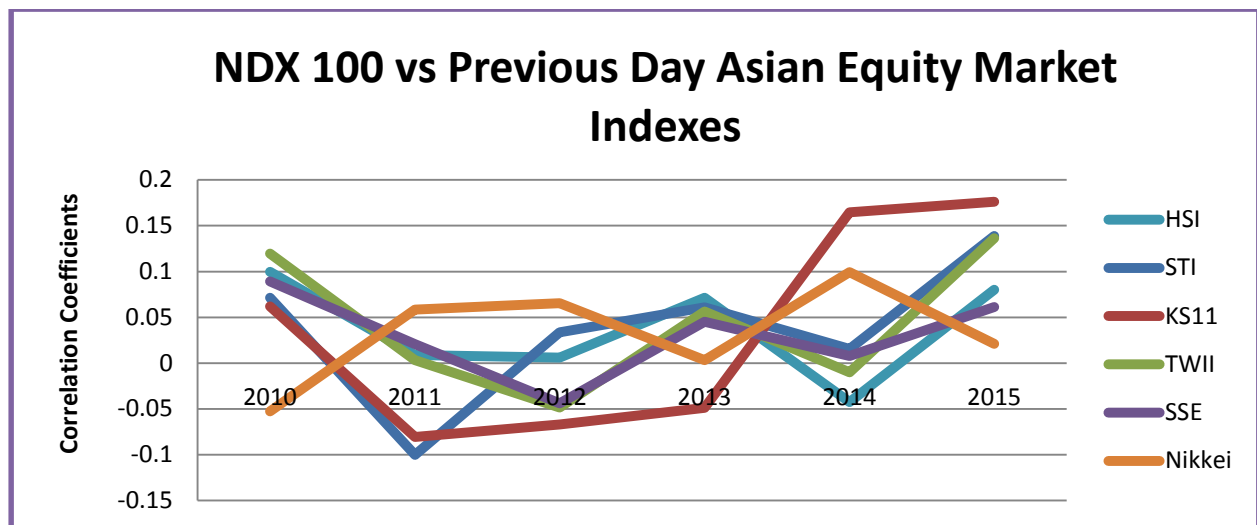
performance of Nikkei 225 and HIS indexes. By contrast, the closing prices of the NDX 100 have a weak, but positive, influence on the next day Shanghai equity market.

Figure 3 (2010-2015)
Daily Correlation Coefficients between the NDX 100 and the Next Day Values of the Asian Equity Markets



Lastly, Figure 4 (below) indicates the correlation coefficients between the NDX 100 closing prices with the “previous day” closing prices of the Nikkei, STI, HSI, SSE, KR11, and TWII stock market indexes. In this case, the correlation values reveal that the closing prices of the NDX 100 are not influenced by the Asian Equity markets’ previous day closing prices.

Figure 4 (2010-2015)
Daily Correlation Coefficients between the NDX 100 and the Previous Day Values of the Asian Equity Markets Indexes



REFERENCES

- Allai, A. and Oueslati, A., "Detection of Information Flow in Major International Financial Markets by Interactivity Network Analysis," *Asia-Pacific Markets*, Vol. 18, 2011, pp. 319-344.
- Chiou, I., "The Volatility Transmission of Stock Returns across Asia, Europe, and North America," *Managerial Finance*, Vol. 37, No. 5, 2011, pp. 442-450.
- Chittedi, K., "Global Financial Crisis and Contagion: Evidence for the BRIC Economies," *The Journal of Developing Areas*, Vol. 48, No. 4, 2014, pp. 243-252.
- Floros, C., "Price Linkages between the U.S., Japan and U.K. Stock Markets," *Financial Markets and Portfolio Management*, Vol. 19, No. 2, 2005, pp. 169-178.
- Goh, K., Wong, Y. and Kok, K., "Financial Crisis and Intertemporal Linkages across ASEAN-5 Stock Markets," *Review of Quantitative Finance and Accounting*, Vol. 24, 2005, pp. 359-377.
- Hamao, R., Masulis, R. and Ng, V., "Correlations in Price Changes and Volatility across International Stock Markets," *The Review of Financial Studies*, Vol. 3, No. 2, 1990, pp. 281-307.
- Huang, C., "Influence of External Factors on the Taiwan Stock Exchange," *The International Journal of Business and Finance Research*, Vol. 8, No. 4, 2014, pp. 109-120.
- Huang, Y. and Bacon, F., "Can the U.S. Stock Market Be Shangaied?: Evidence of the Impact of China's Emerging Stock Market," *Management Research News*, Vol. 32, No. 5, pp. 469-476.
- Islam, R., "Comparing Financial Contagion and Volatility Spill Over and Structural Break within Major Asian Economies Pre and Post Global Recession to That of Asian Crisis," *The Journal of Applied Business and Economics*, Vol. 16, No. 4, 2014, pp. 92-111.
- Kahya, E., "Correlation of Returns in Non-Contemporaneous Markets," *Multinational Finance Journal*, Vol. 1, No. 2, 1997, pp. 123-135.
- Koopman, S. J. and Uspensky, E. H., "The Stochastic Volatility in Mean Model: Empirical Evidence from International Stock Markets," *Journal of Applied Econometrics*, Vol 17, No. 6, 2002, pp. 667-689.
- Lee, C., Tsong, C. and Lee, C., "Testing for the Efficient Market Hypothesis in Stock Prices: International Evidence from Nonlinear Heterogeneous Panels," *Macroeconomic Dynamics*, Vol. 18, No. 4, 2014, pp. 943-958.
- Linn, W., Engle, R. and Ito, T., "Do Bulls and Bears Move across Borders? International Transmission of Stock Returns and Volatility," *The Review of Financial Studies*, Vol. 7, No. 3, 1994, pp. 507-538.

Liu, Y. and Pan, M., "Mean and Volatility Spillover Effects in the U.S. and Pacific-Basin Stock Markets," *Multinational Finance Journal*, Vol. 1, No. 1, 1997, pp. 47-62.

Lyosca, S. and Baumohl, E., "Risk-Return Convergence in CEE Stock Markets: Structural Breaks and Market Volatility," *Journal of Economics and Finance*, Vol. 64, No. 5, 2014, pp. 352-356.

Meric, G., Lentz, C., Smeltz, W. and Meric, I., "International Evidence on Market Linkages after the 2008 Stock Market Crash," *The International Journal of Business and Finance Research*, Vol. 6, No. 4, 2012, pp. 45-57.

Peng, Y. and Ng, W., "Analyzing financial Contagion and Asymmetric Market Dependence with Volatility Indices via Copulas," *Ann Finance*, Vol. 8, 2012, pp. 49-74.

Salimian, F., Winder, R., and Khazeh, K., "Taking Advantage of Time Zone Differences Between Global Stock Markets to Deliver Improved Return," *Academy of Taiwan Business Management Review*, Vol. 11, No. 3, 2015, pp. 22-28.

Sakthivel, P., Bodkhe, N. and Kamaiah, B., "Correlation and Volatility Transmission across International Stock Markets: A Bivariate Garch Analysis," *International Journal of Economics and Finance*, Vol 4, No. 3, 2012, pp. 253-264.

Yahoo Finance, (2016, Feb. 21), Asia Pacific Market Indexes Historical Prices, Retrieved from: <http://finance.yahoo.com/q/hp?s=%5ENDX+Historical+Prices>

Worthington, A. and Higgs, H., "Transmission of Equity Returns and Volatility in Asian Developed and Emerging Markets: A Multivariate GARCH Analysis," *International Journal of Finance and Economics*, Vol. 9, No. 1, 2004, pp. 71-80

Fatollah Salimian is an Associate Professor of Information Systems at the Perdue School of Business, Salisbury University. His academic interests include statistical theories and risk analysis.

Robert Winder is a professor of Economics in the Department of Economics, Christopher Newport University. His research interests include financial institutions, monetary policy and strategy, and international finance.

Kashi Khazeh is a Professor of Finance at the Perdue School of Business, Salisbury University. He has published numerous articles in the field of international financial management.

Herman Manakyan is a Professor of Finance at the Perdue School of Business, Salisbury University. He has published numerous articles in the field of financial theories and practice.

SA16014