THE RELATIONSHIP BETWEEN THE UNITED STATES AND VIETNAM STOCK MARKETS

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ABSTRACT

This paper uses the Generalized Autoregressive Conditional Heteroscedasticity - Autogressive Moving Average (GARCH-ARMA) and the Exponentially General Autoregressive Conditional Heteroscedasticity-Autogressive Moving Average (EGARCH-ARMA) models to examine the relationship between United States and Vietnam stock markets. The paper analyzes 1,483 daily observations from 2003-2009. The study finds that the U.S. market has a positive and significant influence on the Vietnam market. Specifically, the S&P 500 Index has a positive and strong significant influence to the VN-Index return in recent years. However, there is no evidence of a volatility effect of the S&P 500 Index on the VN-Index. To support the initial findings, the study performs robustness tests to examine the effect of Dow Jones Index on the VN-Index return and shows similar results. Not only do these findings provide additional evidence that Vietnam is a viable market economy but also indicates that fund managers' should consider movement of the U.S. stock market before making Vietnam investment decisions.

JEL: E50, G1

KEYWORDS: Index, stock market, volatility effect.

INTRODUCTION

In recent years, financial markets in both developed and developing countries experienced liberalized capital movement, financial reform, and advances in information technologies. These changes have increased the interaction between domestic markets to other markets in the world. In particular, the linkage between stock markets has increased rapidly. Many studies have found that the U.S. stock market has strong influence on other stock markets. However, until now there is no official research to examine the influence of the U.S. stock market (like S&P 500 and Dow Jones Indices) on the Vietnam stock market (VN-Index). Market analysts frequently try to explain the movement of the Vietnam stock market (VN-Index) in the financial news in relation to movement in the U.S. stock market. Statements such as "*VN-Index declines…after the plunge by Wall Street*" and "*VN-Index is up…due to the soar of Dow*" are quite common. Those claims seem to suggest that the U.S. stock market transmits its influence to the stock market in Vietnam. There is a need to study this effect in order to answer the question: How does the U.S. stock market influence the Vietnam stock market?

This empirical study investigates the effect of a mature stock market on an infant stock market; specifically it examines the influence of the S&P 500 and Dow Jones Indices on VN-Index with special focus on political events between the U.S. and Vietnam governments. The GARCH-ARMA and EGARCH-ARMA models are utilized. The findings showthe U.S. stock market has a positive and significant influence on the Vietnam stock market. The influence of the S&P 500 Index on the VN-Index has become more significant and stronger after visits of top leaders from both countries in 2005. However, there is no volatility effect of the S&P 500 Index on the VN-Index. A robustness test is performed to support the initial findings by examining the effect of Dow Jones Index on the VN-Index return. Using the same method, number of observations and time period, the outcome shows similar results. That is, the U.S. stock market has an influence on the Vietnam stock market that is getting stronger. These findings could provide a basis for fund managers to develop investing strategies. The results provide evidence that Vietnam is a market economy. The Vietnam stock market, like other markets is influenced by the U.S. stock market. The remainder of the

article is organized as follows: A literature review is presented in the next section followed by a description of the GARCH-ARMA and EGARCH-ARMA models. A discussion of the data used in the analysis follows. The empirical results are presented and finally, the paper closes with some concluding comments.

LITERATURE REVIEW

There are two broad areas related to interdependence among international markets: interdependence in return (Errunza, 1985) and interdependence in volatility (Hamao et al., 1990; Theodossiou and Lee, 1997; Koutmos and Booth, 1995; Liu and Pan, 1997; Jang and Sul, 2002; Leong and Felminglam, 2003; Darrat and Benkato, 2003; Cifarell and Paladino, 2004; Hoti, 2005). Most studies have focused on developed markets, especially the interdependence among the U.S., Japanese and major European markets. Priyanka, Brajesh and Ajay (2009) find that there is greater regional influence among Asian markets in returns and volatilities than with European and U.S. markets. The Japanese market, which is first to open in daily trading, is affected by the U.S. and European markets only and affects most of the Asian Markets. Hamao et al. (1990) reveal that there are evidences of price volatility spillovers from New York to Tokyo, London to Tokyo, and New York to London. Tatsuyoshi (2003) examines the magnitude of return and volatility spillovers from Japan and the US to seven Asian equity markets and discovers that only the U.S. influences Asian market returns while the volatility of the Asian market is influenced more by the Japan than by the U.S.

Ming and Hsueh (1998) analyze the transmission of stock returns and volatility between the U.S. and Japanese stock markets using futures prices of the S&P 500 and Nikkei 225 stock indices and find that there are unidirectional contemporaneous return and volatility spillovers from the U.S. to Japan. The U.S.'s influence on Japan in returns is approximately four times as large as the influence of Japan to the U.S. and there is a significant lagged volatility spillover from the U.S. to Japan. Angela (2000) examines the magnitude and changing nature of volatility spillovers from Japan and the U.S. to the six Pacific–Basin equity markets by constructing a volatility spillover model which allows the unexpected return of any particular Pacific–Basin market be driven by a local idiosyncratic shock, a regional shock from Japan and a global shock from the US. The study reveals that there are significant spillovers from the region to many of the Pacific–Basin countries.

John et al. (1995) test the conventional wisdom that short-term volatility and price changes spillover from developed markets (New York, Tokyo, and London) to emerging markets (Taiwan and Hong Kong) and investigate how the degree of market openness affects return and volatility spillovers. They find that the Tokyo market has less influence than the New York market over the Taiwanese and Hong Kong markets; and the Taiwanese market is more sensitive than the Hong Kong market to the price and volatility behavior of advanced markets even though Taiwan is not as open as Hong Kong and the Taiwanese dollar is not linked to the U.S. dollar unlike the Hong Kong dollar. John et al. (1997) examine co-movement across international stock markets, particularly studying the spillover effects of volatility among the two developed markets and four emerging markets in the South China Growth Triangular (SCGT) using Chueng and Ng's causality-in-variance test. They discover that the Japanese stock market affects the US stock market and there is a feedback relationship between the Hong Kong and U.S. stock markets. Markets of the SCGT are contemporaneously correlated with the return volatility of the U.S. market; and geographic proximity and economic ties do not necessarily lead to a strong relationship in volatility across markets.

Bekaert and Harvey (1997) examine the volatilities of emerging equity markets and find that in integrated markets global factors influence the volatility, whereas local factors affects the segmented markets. Jang and Sul (2002) analyze the co-movement of Asian stock markets in the past, during and after the Asian Financial Crisis. They conclude that co-movement among the Asian markets increased during the financial crisis period. Hahn (2004) investigates the international transmission mechanism of stock market movements via wavelet analysis by using daily stock indices data from the U.S. and Korean stock markets.

Strong evidence is found for price as well as volatility spillover effects from the developed stock market to the emerging market, but not vice versa.

Many researchers have applied multivariate GARCH models to estimate volatility spillover. In particular, Engle, Ito and Lin (1990) investigate the intraday volatility spillover between U.S. and Japanese foreign exchange markets. Bekaert and Harvey (1997), Ng (2000), Baele (2002), Christiansen (2003), and Worthington and Higgs (2004) used the same model for further application on various capital markets. Karolyi (1995) finds a short-run interdependence of return and volatility between Toronto and New York stock markets. Theodossiou et al. (1997) investigate stock market returns in the U.S., Japan and the UK during 1984 to 1994 and found some statistically significant volatility spillovers from the U.S. and Japan to the UK. Sang and John (1995) examine the repercussions of the relationship between the stock markets of Korea, Japan, and the U.S. and find out that the importance of "volatility spillovers" from Japan and the U.S. on the mean and variance of Korean returns have increased since the announced opening, with most of the effect on the opening prices of the Korean stock market. Hamao et al. (1990) use ARCH model and daily opening and closing prices of major stock indexes for the Tokyo, London, and New York stock markets to explore the short-run interdependence of prices and price volatility across three major international stock markets. Chen and Huang (2008) use the GARCH-ARMA and EGARCH-ARMA models to study the impact of spillover and leverage effects on returns and volatilities of stock index and Exchange Traded Funds for developed and emerging markets.

METHODOLOGY

This study analyzes the influence and level effect of the S&P 500 Index on the U.S. stock market on the VN-Index in the Vietnam stock market by using the GARCH-ARMA and EGARCH-ARMA models. The paper uses the logarithm of daily price index to measure returns. This is the difference between the logarithm of the index at time t and the logarithm of the index at time t-1. The GARCH-ARMA and EGARCH-ARMA models are as below:

The Stock index (S&P 500 Index) returns model:

$$R_{i,t}^{SP} = \alpha_0 + \sum_{i=1}^{g} \alpha_i R_{i,t-i}^{SP} + \varepsilon_{i,t}^{SP} + \sum_{i=1}^{s} \theta_i \varepsilon_{i,t-1}^{SP} \quad (1)$$

where

$R_{i,t}^{SP}$**:** stock index (S&P 500 Index) returns at period t,

$\varepsilon_{i,t}^{SP}$: stock index (S&P 500 Index) returns residual at period t,

θ_i**:** unknown parameter.

To the stock index (VN-Index) returns model:

$$R_{i,t}^{m} = \beta_0 + \sum_{i=1}^{g} \beta_i R_{i,t-i}^{m} + \varepsilon_{i,t}^{m} + \sum_{i=1}^{s} \gamma_i \varepsilon_{i,t-1}^{m} \quad (2)$$

$$h_{i,t}^{m} = b_0 + \sum_{i=1}^{q} b_i \varepsilon_{i,t-i}^{m^2} + \sum_{i=1}^{p} \zeta_i h_{i,t-i}^{m} \text{ , for GARCH} \quad (3)$$

$$Log\left(h_{i,t}^{m^2}\right) = b_0 + \sum_{i=1}^{q} \left(b_i \left| \frac{\varepsilon_{i,t-i}^{m}}{h_{i,t-i}^{m}} \right| + \delta_i \frac{\varepsilon_{i,t-i}^{m}}{h_{i,t-i}^{m}} \right) + \sum_{i=1}^{p} \zeta_i \log\left(h_{i,t-i}^{m^2}\right) \text{ , for EGARCH} \quad (4)$$

where

$R_{i,t}^{m}$**:** stock index (VN-Index) returns at period t,

$\varepsilon_{i,t}^{m}$: stock index (VN-Index) returns residual at period t,

$h_{i,t}^{m}$: conditional variance of stock index (VN-Index) returns at period t,

δ_i: the leverage term,

γ_i**:** unknown parameter.

The effects of returns (S&P 500 Index to VN-Index):

$$R_{i,t}^{m} = \beta_0 + \sum_{i=1}^{g} \beta_i R_{i,t-i}^{m} + dR_{i,t-1}^{SP} + \varepsilon_{i,t}^{m} + \sum_{i=1}^{s} \gamma_i \varepsilon_{i,t-1}^{m} \quad (5)$$

$$h_{i,t}^{m} = b_0 + \sum_{i=1}^{q} b_i \varepsilon_{i,t-i}^{m^2} + \sum_{i=1}^{p} \zeta_i h_{i,t-i}^{m}, \text{ for GARCH} \quad (6)$$

$$Log\left(h_{i,t}^{m^2}\right) = b_0 + \sum_{i=1}^{q} \left(b_i \left| \frac{\varepsilon_{i,t-i}^{m}}{h_{i,t-i}^{m}} \right| + \delta_i \frac{\varepsilon_{i,t-i}^{m}}{h_{i,t-i}^{m}} \right) + \sum_{i=1}^{p} \zeta_i \log\left(h_{i,t-i}^{m^2}\right), \text{ for EGARCH} \quad (7)$$

The effects of volatility (S&P 500 Index to VN-Index):

$$R_{i,t}^{m} = \beta_0 + \sum_{i=1}^{g} \beta_i R_{i,t-i}^{m} + \varepsilon_{i,t}^{m} + \sum_{i=1}^{s} \gamma_i \varepsilon_{i,t-1}^{m} \quad (8)$$

$$h_{i,t}^{m} = b_0 + \sum_{i=1}^{q} b_i \varepsilon_{i,t-i}^{m^2} + \sum_{i=1}^{p} \zeta_i h_{i,t-i}^{m} + l\varepsilon_{i,t-i}^{SP^2}, \text{ for GARCH} \quad (9)$$

$$Log\left(h_{i,t}^{m^2}\right) = b_0 + \sum_{i=1}^{q} \left(b_i \left| \frac{\varepsilon_{i,t-i}^{m}}{h_{i,t-i}^{m}} \right| + \delta_i \frac{\varepsilon_{i,t-i}^{m}}{h_{i,t-i}^{m}} \right) + \sum_{i=1}^{p} \zeta_i \log\left(h_{i,t-i}^{m^2}\right) + l\varepsilon_{i,t-i}^{SP^2}, \text{ for EGARCH} \quad (10)$$

This paper also uses robustness test to examine the effect of Dow Jones Index to VN-Index. The models are the following:

The stock index (Dow Jones Index) returns model:

$$R_{i,t}^{d} = \alpha_0 + \sum_{i=1}^{g} \alpha_i R_{i,t-i}^{d} + \varepsilon_{i,t}^{d} + \sum_{i=1}^{s} \theta_i \varepsilon_{i,t-1}^{d} \quad (11)$$

where

$R_{i,t}^{d}$**:** stock index (Dow Jones Index) returns at period t,

$\varepsilon_{i,t}^{d}$: stock index (Dow Jones Index) returns residual at period t,

θ_i **:** unknown parameter.

The effects of returns (Dow Jones Index to VN-Index):

$$R_{i,t}^m = \beta_0 + \sum_{i=1}^{g} \beta_i R_{i,t-i}^m + dR_{i,t-1}^d + \varepsilon_{i,t}^m + \sum_{i=1}^{s} \gamma_i \varepsilon_{i,t-1}^m \quad (12)$$

$$h_{i,t}^m = b_0 + \sum_{i=1}^{q} b_i \varepsilon_{i,t-i}^{m^2} + \sum_{i=1}^{p} \zeta_i h_{i,t-i}^m \text{ , for GARCH} \quad (13)$$

$$Log\left(h_{i,t}^{m^2}\right) = b_0 + \sum_{i=1}^{q} \left(b_i \left| \frac{\varepsilon_{i,t-i}^m}{h_{i,t-i}^m} \right| + \delta_i \frac{\varepsilon_{i,t-i}^m}{h_{i,t-i}^m} \right) + \sum_{i=1}^{p} \zeta_i \log\left(h_{i,t-i}^{m^2}\right) \text{ , for EGARCH} \quad (14)$$

The effects of volatility (Dow Jones Index to VN-Index):

$$R_{i,t}^m = \beta_0 + \sum_{i=1}^{g} \beta_i R_{i,t-i}^m + \varepsilon_{i,t}^m + \sum_{i=1}^{s} \gamma_i \varepsilon_{i,t-1}^m \quad (15)$$

$$h_{i,t}^m = b_0 + \sum_{i=1}^{q} b_i \varepsilon_{i,t-i}^{m^2} + \sum_{i=1}^{p} \zeta_i h_{i,t-i}^m + l\varepsilon_{i,t-i}^{d^2} \text{ , for GARCH} \quad (16)$$

$$Log\left(h_{i,t}^{m^2}\right) = b_0 + \sum_{i=1}^{q} \left(b_i \left| \frac{\varepsilon_{i,t-i}^m}{h_{i,t-i}^m} \right| + \delta_i \frac{\varepsilon_{i,t-i}^m}{h_{i,t-i}^m} \right) + \sum_{i=1}^{p} \zeta_i \log\left(h_{i,t-i}^{m^2}\right) + l\varepsilon_{i,t-i}^{d^2} \text{ , for EGARCH} \quad (17)$$

DATA DESCRIPTION

There are two main reasons to select the U.S. stock market for this study: (1) the U.S. stock market is one of the leading stock markets in the world; and (2) the foreign direct investment (FDI) from the U.S. into the Vietnam economy has increased sharply in recent years (Table 1). In the first eight months of 2009, the U.S. was the largest foreign investor in Vietnam, occupying $3,956.1 million of registered capital.

Table 1: The Amount of Investment from the U.S. to Vietnam Market

	Until 27/12/2004	Until 31/12/2007	Until 19/12/2008	Until 31/08/2009
Number of projects	215	376	428	474
Registered capital (Million USD)	1,281.3	2,788.6	4,258.6	8,681.7
Rank	11	8	12	7
Number of countries investing into Vietnam	-	82	84	88

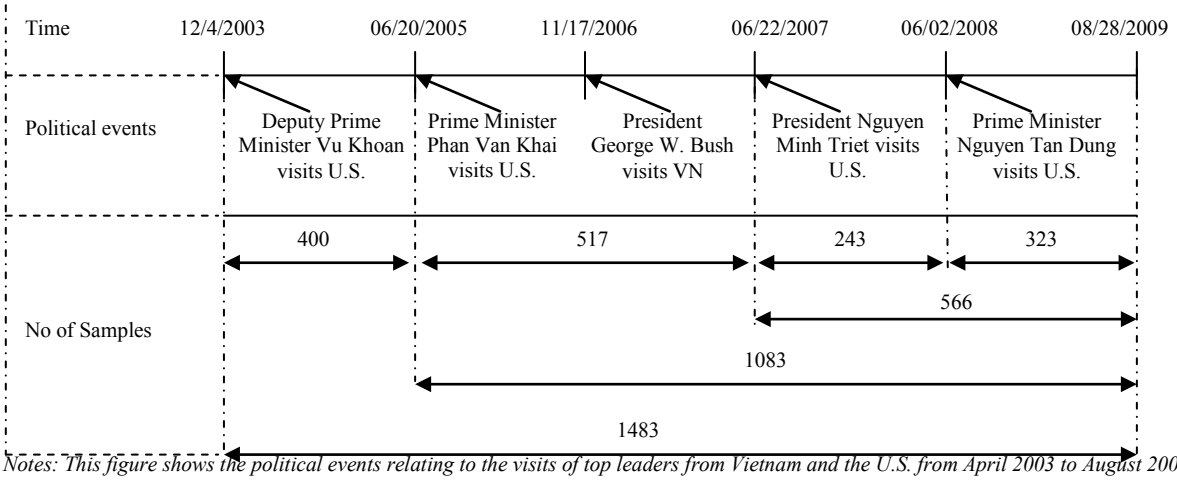
Source: Foreign Investment Agency, Ministry of Planning and Investment (2004, 2007, 2008, 2009)
Notes: This table shows number of projects, the ranking and registered capital from the U.S. to Vietnam market from 2004, 2007, 2008, 2009

The research uses the S&P 500 Index, as it is the most widely used index of large-cap firms in the U.S. stocks market and is the bellwether for the U.S. economy. On the Vietnamese public media, when the U.S. stock market is discussed, the discussion always mentions the S&P 500 Index and the Dow Jones Index. According to Vietnam Foreign Investment Agency, until 21/11/2008, 60% of projects invested in Vietnam from the U.S. focus on the fields of industrial and construction. Therefore, changes in the U.S. economy will greatly affect to the Vietnam economy and the stock market as well.

The data consists of daily prices from three indices over the period of December 04, 2003 to August 28, 2009. The S&P 500 and Dow Jones Indices and the VN-Index data sources extracted from the websites of Yahoo Finance and HoChiMinh Stock Exchange, respectively. Because the U.S. stock market closes at 3

AM (Vietnamese time) and the Vietnam Stock market opens at 8:30 AM, the data uses opening price for VN-Index and closing price for S&P 500 and Dow Jones Indices. The data includes 1483 observations divided into 4 periods based on special political events between the two countries as illustrated in figure 1.

Figure 1: Time, Political Events and Number of Samples



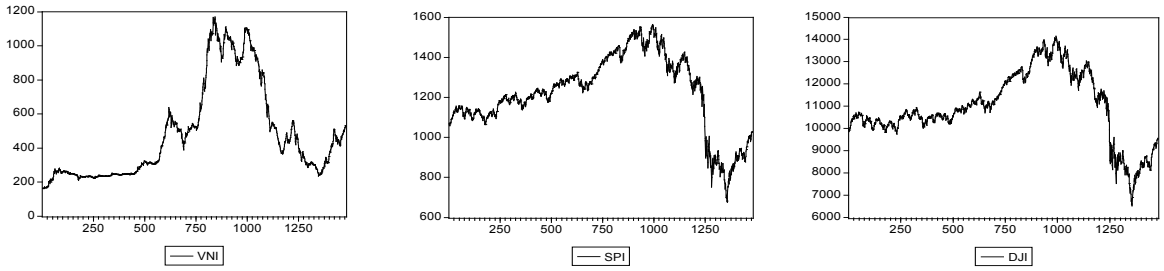
Notes: This figure shows the political events relating to the visits of top leaders from Vietnam and the U.S. from April 2003 to August 2009. The number of samples is divided into 4 sub-groups based on special political events between the two countries.

In each period, the relationship between Vietnam and the U.S. has developed in different ways. On December 04, 2003, Deputy Prime Minister Vu Khoan visited and signed an "Aviation Agreement" with the U.S., and on December 11, 2004, United Airlines of America opened the first direct flight between Vietnam and America. On June 19-26, 2005, Prime Minister Phan Van Khai made an official visit to the U.S. by invitation of President George W. Bush.

This visit strengthened the relationship between the two countries not only on political issues but also on economic and social issues. On November 17, 2006, President George W. Bush visited Vietnam and attended the APEC (Asia - Pacific Economic Corporation) forum in Hanoi. On June 22, 2007, President Nguyen Minh Triet visited Washington and encouraged American investors to invest in the Vietnam market in addition to discussing political relations issues concerning the two countries. As a result, in 2007, investments from the U.S. reached the eighth position. It jumped to the seventh position in the first eight months of 2009 (Table 1) after the visit of Prime Minister Nguyen Tan Dung to the U.S. on June 26, 2008. In short, visits of top leaders from both countries made the relationship tighter and resulted in the influx of investments from the U.S. greatly affecting development of the Vietnam economy and the stock market as well. Figure 2 gives the general pictures of the prices of the three indices from December 04, 2003 to August 28, 2009.

From Table 2, indices are positive and right skewed. The Jarque-Bera statistic for residual normality is not equal to zero indicating that the distribution of the residual is normal distribution. Figure 3 shows the daily returns of VN, S&P 500 and Dow Jones Indices in each period time. The VN-Index is more volatile than S&P 500 and Dow Jones Indices.

Figure 2: Price of VN-Index (VNI), S&P 500 Index (SPI) and Dow Jones Index (DJI) (12/4/03-08/28/09)



Note: These figures show the price of each index in the whole observation period.

Table 2: The Time Span of Datasets and Summary Statistics of the Daily Return of VN, S&P 500 and Dow Jones Indices from December 04, 2003 to August 28, 2009

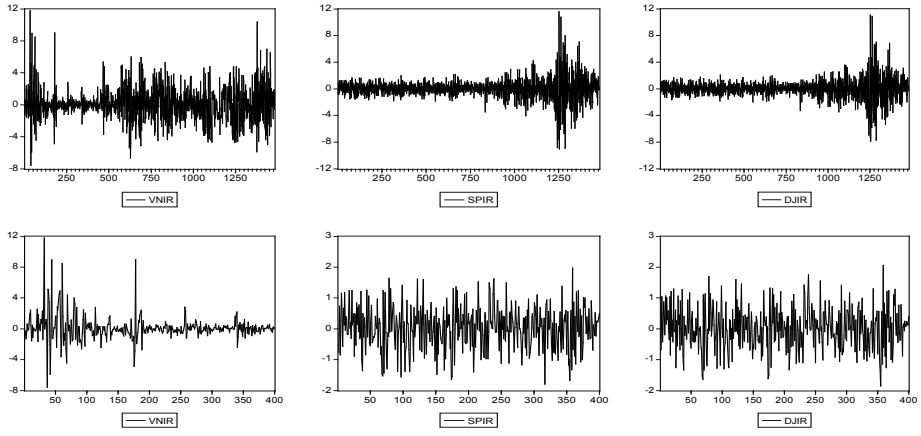
Time	Index	Obs.	Mean	SD	Skewness	Kurtosis	Jarque-Bera
	VNI	1482	0.0985	1.9495	0.4356	5.6442	478.63
12/04/03–08/28/09	S&P 500	1482	0.008	1.4553	0.0482	14.5383	8221.47
	DJI	1482	0.0062	1.3357	0.3175	14.8753	8733.04
	VNI	399	0.1143	1.5829	2.0410	18.4211	4230.62
12/04/03 – 06/17/05	S&P 500	399	0.0347	0.6898	-0.1206	2.8657	1.26
	DJI	399	0.0192	0.6752	0.0414	2.8897	0.32
	VNI	517	0.2959	1.9058	0.0021	3.9050	17.64
06/20/05 - 06/21/07	S&P 500	517	0.0454	0.6474	-0.2868	5.0281	95.70
	DJI	517	0.0490	0.6234	0.3905	4.9221	92.72
	VNI	243	-0.3602	1.7816	0.0830	3.5850	3.74
06/22/07–05/30/08	S&P 500	243	-0.0256	1.3263	0.0561	3.6374	4.24
	DJI	243	-0.0212	1.2150	0.0262	3.4345	1.94
	VNI	323	0.1081	2.4402	0.2790	3.3407	5.7524
06/02/08 – 08/28/09	S&P 500	323	-0.0597	2.6740	0.1163	5.6799	97.38
	DJI	323	-0.0576	2.4295	0.3281	6.0801	133.49
	VNI	566	-0.0930	2.1925	0.3286	3.7178	22.34
06/22/07 – 08/28/09	S&P 500	566	-0.0451	2.1975	0.1119	7.2919	435.61
	DJI	566	-0.0419	1.9991	0.3231	7.7387	539.42
	VNI	1083	0.09266	2.0688	0.1664	3.7654	31.44
06/20/05 – 08/28/09	S&P 500	1083	-0.0019	1.6503	0.0633	12.0057	3660.52
	DJI	1083	0.00145	1.5080	0.3082	12.4946	4085.04

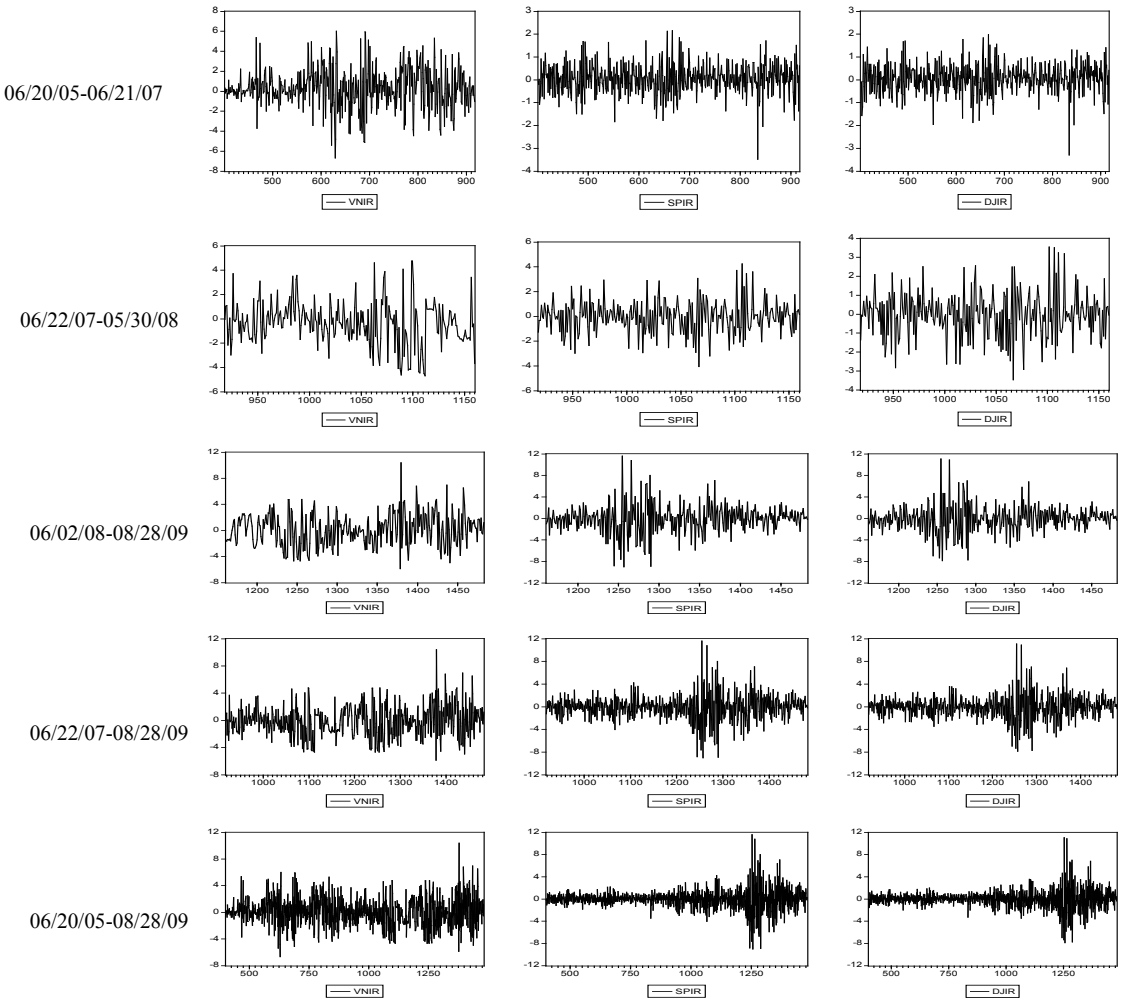
Notes: Obs.: Number of Observations; SD: Standard Deviation; Skewness is a measure of the asymmetry of the probability distribution;
Kurtosis is a measure of whether the data are peaked or flat relative to a normal distribution;
Jarque–Bera test is a goodness-of-fit measure of departure from normality.

Figure 3: The Daily Returns of VN, S&P 500 and Dow Jones Indices in Each Period Time

12/04/03-08/28/09

12/04/03-06/17/05





Note: These figures show the daily returns of VN, S&P 500 and Dow Jones Indices in each time period.

EMPIRICAL RESULTS

Findings in Table 3 accept the alternative hypothesis of no unit roots (ADF test) in each sample, which support a stationary time series data. The author uses the SBC (Schwarz Criterion) by selecting its minimum value in choosing suitable models of ARMA, GARCH-ARMA and EGARCH-ARMA. The results of LM tests show that there is no serial correlation in each model.

The paper estimates GARCH-ARMA and EGARCH-ARMA models to examine the effects of the S&P 500 and VN indices return. As shown in Tables 4 and 5, the estimation value of $\boldsymbol{\zeta_1}$ is far larger than $\mathbf{b_1}$ means that the lagged conditional variance has a higher explanatory power than the lagged innovation. Moreover, all positive and significant coefficients of b_1 and ζ_1 indicate that the lagged conditional variance of stock returns has a positive impact on current conditional variance.

Table 3: Summary Statistics of Unit-Root, LM and ARCH-LM Tests for VN, S&P 500, Dow Jones Indices

Time period	Type	ADF	ARMA	SBC	LM	ARCH-LM	GARCH	SBC	ARCH-LM	EGARCH	SBC	ARCH-LM
12/04/03	VNI	-17.49 ***	(3,1)	3.74	1.93	11.49 ***	(1,1)	2.73	0.429	(1,1)	2.76	0.075
–	S&P 500	-20.94***	(1,1)	2.11	0.38	0.90						
06/17/05	DJI	-20.97 ***	(2,2)	2.10	0.02	0.26						
06/20/05	VNI	-16.34 ***	(2,2)	4.09	0.11	42.29 ***	(1,3)	3.85	0.029	(1,1)	3.85	0.889
–	S&P 500	-24.04***	(1,1)	1.99	1.12	0.15						
06/21/07	DJI	-23.19 ***	(1,1)	1.92	0.89	0.15						
06/22/07	VNI	-11.99 ***	(0,1)	3.98	1.37	42.07 ***	(1,1)	3.84	0.241	(1,1)	3.86	0.024
–	S&P 500	-19.54***	(0,1)	3.37	0.82	0.01						
05/30/08	DJI	-19.11 ***	(0,1)	3.21	1.04	0.21						
06/02/08	VNI	-14.27 ***	(0,1)	4.58	0.11	28.73 ***	(1,1)	4.49	0.971	(1,1)	4.51	2.960
–	S&P 500	-22.30***	(2,0)	4.78	0.24	9.29***						
08/28/09	DJI	-15.92 ***	(2,0)	4.58	0.58	10.05 ***						
06/22/07	VNI	-18.57 ***	(1,2)	4.37	0.12	63.72 ***	(1,1)	4.20	0.003	(1,1)	4.20	0.854
–	S&P 500	-29.61***	(0,1)	4.37	0.83	21.38***						
08/28/09	DJI	-20.63 ***	(2,0)	4.19	0.99	24.31 ***						
06/20/05	VNI	-25.67 ***	(0,5)	4.23	1.04	119.75 ***	(1,1)	4.01	0.623	(1,1)	4.01	0.649
–	S&P 500	-28.24***	(0,1)	3.80	1.93	64.82***						
08/28/09	DJI	-28.16 ***	(2,3)	3.63	0.02	68.98 ***						

*ADF is the statistics for the Augemented Dickey Fller test with an intercept and trend at the level. SBC is Schwarz Criterion (select minimum value). LM is Breusch-Godfrey Serial Correlation LM test. *** denote significance at α=1% or less.*

Table 4: GARCH-ARMA Result for VN -Index Returns

Time period	Model	Mean equation						Conditional variance equation				
		β_1	β_2	β_3	γ_1	γ_2	γ_5	b_0	b_1	ζ_1	ζ_2	ζ_3
12/04/03 –	GARCH(1,1)-	-0.0797		-0.1310	0.9237			0.0662	0.6621	0.4874		
06/17/05	ARMA(3,1)	***		***	***			***	***	***		
06/20/05 –	GARCH(1,3)-		-0.4444		0.1935	0.3518		0.0557	0.2580	0.8251	-0.6975	0.6292
06/21/07	ARMA(2,2)		***		***	**		***	***	***	***	***
06/22/07 –	GARCH(1,1)-				0.2379			0.2731	0.2717	0.6523		
05/30/08	ARMA(0,1)				***			*	***	***		
06/02/08 –	GARCH(1,1)-				0.3028			0.1443	0.1883	0.8011		
08/28/09	ARMA(0,1)				***				***	***		
06/22/07 –	GARCH(1,1)-	0.9760			-0.7171	-0.2297		0.1799	0.2428	0.7341		
08/28/09	ARMA(1,2)	***			***	***		**	***	***		
06/20/05 –	GARCH(1,1)-				0.2455		0.0706	0.0811	0.1779	0.8154		
08/28/09	ARMA(0,5)				***		**	***	***	***		

*Notes: This table shows the result of GARCH-ARMA model to VN-Index returns through specific time period; *, ** and *** indicate significance at 10, 5 and 1% levels, respectively.*

Table 5: EGARCH-ARMA Result for VN - Index Returns

Time period	Model	Mean equation						Conditional variance equation			
		β_1	β_2	β_3	γ_1	γ_2	γ_5	b_0	b_1	ζ_1	δ
12/04/03 –	EGARCH(1,1)	-0.7692		-0.1483	0.9091			-0.4343	0.6065	0.9332	0.0217
06/17/05	-ARMA(3,1)	***		***	***			***	***	***	
06/20/05 -	EGARCH(1,1)		-0.4660		0.1986	0.3871		-0.1704	0.2847	0.9532	0.0221
06/21/07	-ARMA(2,2)		***		***	***		***	***	***	
06/22/07 –	EGARCH(1,1)				0.2400			-0.2147	0.3851	0.8878	-0.0818
05/30/08	-ARMA(0,1)				***			**	***	***	
06/02/08 –	EGARCH(1,1)				0.3275			-0.1920	0.3835	0.9266	-0.0773
08/28/09	-ARMA(0,1)				***			**	***	***	*
06/22/07 –	EGARCH(1,1)	0.9230			-0.6367	-0.2046		-0.2302	0.3860	0.9349	-0.0706
08/28/09	-ARMA(1,2)	***			***	***		***	***	***	**
06/20/05 –	EGARCH(1,1)				0.2507		0.0654	-0.1865	0.3276	0.9427	-0.0222
08/28/09	-ARMA(0,5)				***		**	***	***	***	

*Notes: This table shows the result of EGARCH-ARMA model to VN-Index returns through specific time period; *, ** and *** indicate significance at 10, 5 and 1% levels, respectively.*

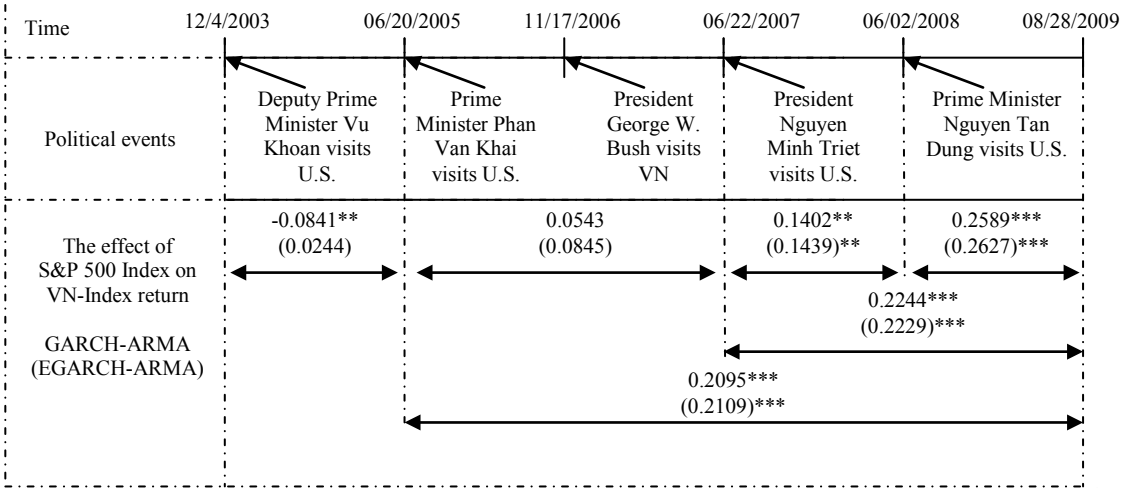
Table 6: The Effect of S&P 500 Index to VN-Index Return through Each Period

Time period	The effect of Returns		The effect of Volatility	
	GARCH-ARMA	EGARCH-ARMA	GARCH-ARMA	EGARCH-ARMA
12/04/03 – 06/17/05	-0.0841**	0.0244	-0.2072	0.0056
06/20/05 – 06/21/07	0.0543	0.0845	0.1020	-0.0022
06/22/07 – 05/30/08	0.1402**	0.1439**	0.0863	-0.0044
06/02/08 – 08/28/09	0.2589***	0.2627***	0.0076	0.0007
06/22/07 – 08/28/09	0.2244***	0.2229***	0.0215	0.0021
06/20/05 –08/28/09	0.2095***	0.2109***	0.0117	0.0014

*Notes: This table shows the effect (returns and volatility) of S&P 500 Index to VN-Index returns through each period by using GARCH-ARMA and EGARCH-ARMA model; *, ** and *** indicate significance at 10, 5 and 1% levels, respectively.*

The multiple GARCH-ARMA and EGARCH-ARMA models are also used to determine whether S&P 500 Index has an effect on VN-Index in terms of returns and variance as illustrated in Table 6. The results show that the lagged S&P 500 Index return has positive and strong effect (0.21) on the VN-Index return after the visits of Prime Minister Phan Van Khai to the U.S. on June 20, 2005 and August 28, 2009. The influence of S&P 500 Index on VN-Index return has jumped from 0.14 in the period June 2007 to June 2008 (after the visiting of President Nguyen Minh Triet to the U.S.) to 0.26 in the period June 2008 to August 2009 (after the visiting of Prime Minister Nguyen Tan Dung to the U.S.). From June 2007 to August 2009, the effect of the S&P 500 Index on VN-Index return is 0.22. In short, the effect of S&P 500 Index on VN-Index return is positive and getting stronger in recent years. It means that through the special political events and visiting of top leaders from the U.S. and Vietnam, the U.S. stock market has influenced the Vietnam stock market. However, there is no volatility effect of S&P 500 Index on VN-Index. Figure 4 illustrates the results.

Figure 4: Time Period, Political Events and Effect of S&P 500 Index on VN-Index Return



, ** and * indicate significance at 10, 5 and 1% levels, respectively. The values in parenthesis are the effects of S&P 500 Index on VN-Index return using EGARCH-ARMA model; the remainder values are the effects of S&P 500 Index on VN-Index Return using GARCH-ARMA model.*

ROBUSTNESS TEST: AN ANALYSIS OF THE EFFECT OF DOW JONES INDEX ON VN-INDEX RETURN

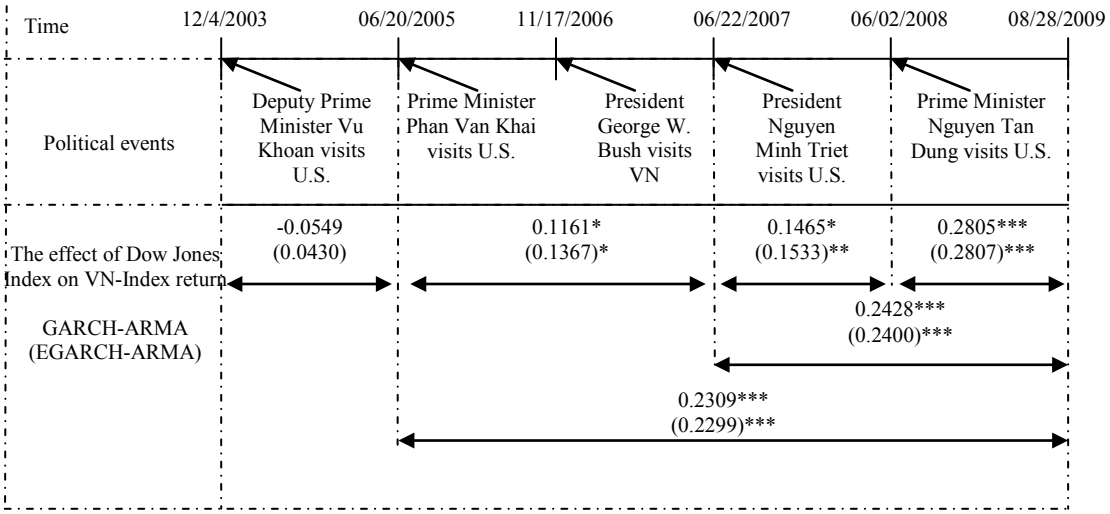
Table 7: The Effect of Dow Jones Index to VN-Index Return from Each Period

	The effect of Returns		The effect of Volatility	
	GARCH-ARMA	EGARCH-ARMA	GARCH-ARMA	EGARCH-ARMA
12/04/03 – 06/17/05	-0.0549	0.0430	0.0659*	0.0166
06/20/05 – 06/21/07	0.1161*	0.1367*	0.0837	0.0516
06/22/07 – 05/30/08	0.1465*	0.1533**	0.1160	-0.0011
06/02/08 – 08/28/09	0.2805***	0.2807***	0.0137	0.0013
06/22/07 – 08/28/09	0.2428***	0.2400***	0.0374	0.0029
06/20/05 –08/28/09	0.2309***	0.2299***	0.0186	0.0020

*This table shows the effect (returns and volatility) of Dow Jones Index to VN-Index returns through each period by using GARCH-ARMA and EGARCH-ARMA model; *, ** and *** indicate significance at 10, 5 and 1% levels, respectively.*

The paper performs robustness tests to examine and analyze the influence and level effect of the Dow Jones Index on VN-Index by using the GARCH-ARMA and EGARCH-ARMA and the same related procedures. The results show that the lagged Dow Jones Index return has positive and strong effect to the VN-Index return in recent years; however, there is no volatility of Dow Jones Index on the VN-Index returns (see Table 7 and Figure 5). By comparing the effect of S&P 500 and Dow Jones Index to the VN-Index returns in each period time, the Dow Jones Index has a stronger effect than S&P 500 Index (see Figures 4 and 5).

Figure 5: Time, Political Events and Effect of Dow Jones Index on VN-Index Return



, ** and * indicate significance at 10, 5 and 1% levels, respectively. The values in parenthesis are the effects of Dow Jones Index on VN-Index Return using EGARCH-ARMA model; the remainder values are the effects of Dow Jones Index on VN-Index Return using GARCH-ARMA model.*

CONCLUSION

This research examines the relationship between the U.S. and Vietnam stock markets. The paper utilizes the multiple GARCH-ARMA and EGARCH-ARMA models in analyzing 1,438 daily observations from 2003-2009 to examine the effects of returns and volatilities of the S&P 500 Index on the VN-Index return. The result shows that there are strong and positive effects of returns of the S&P 500 Index on the VN-Index

returns. The paper indicates that the U.S. stock market has an increasing influence on the Vietnam stock market in recent years after the visits of top leaders from both countries. However, there is no volatility effect of the S&P 500 Index on VN-Index. The results of robustness tests using the Dow Jones Index to affect the VN-Index yield similar results. This research is limited as it only considers the S&P 500 and Dow Jones indices that represent to the U.S. stock market. It does not consider other factors that can influence the Vietnam stock market such as oil prices, exchange rates between the U.S. dollar and Vietnam Dong. Future research can examine these issues to further specify the influence of the U.S. to the Vietnam stock market.

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