Journal of Economics and Development, Vol.16, No.1, April 2014, pp. 74-89 ISSN 1859 0020

An Empirical Investigation of Factors Affecting Stock Prices in Vietnam

Vo Xuan Vinh
University of Economics, Ho Chi Minh City, Vietnam
Email: vinhvx@ueh.edu.vn

Abstract

This paper investigates factors affecting Vietnam's stock prices including US stock prices, foreign exchange rates, gold prices and crude oil prices. Using the daily data from 2005 to 2012, the results indicate that Vietnam's stock prices are influenced by crude oil prices. In addition, Vietnam's stock prices are also affected significantly by US stock prices, and foreign exchange rates over the period before the 2008 Global Financial Crisis. There is evidence that Vietnam's stock prices are highly correlated with US stock prices, foreign exchange rates and gold prices for the same period. Furthermore, Vietnam's stock prices were cointegrated with US stock prices both before and after the crisis, and with foreign exchange rates, gold prices and crude oil prices only during and after the crisis.

Keywords: Cointegration, Granger causality, stock prices, oil prices, foreign exchange rate.

1. Introduction

Stock prices are one of the economic indicators employed to proxy for the health as well as the growth of the economy. An examination of the impact of the main economic factors on stock indices has an important implication for both the government and investors. This paper investigates the long and short-run relationship between Vietnam's stock prices (VN-Index) and US stock prices (S&P 500 Index), the US Dollar - VN Dong exchange rates, gold prices, and crude oil prices covering a nearly 5-year time frame before and after the 2008 Global Financial Crisis.

The purpose of this study is to suggest answers to the following critical issues. Firstly, are there relationships between the pairs of the VN-Index and the other variables? Secondly, are there lead-lag relationships between the VN-Index and the other variables in pairwise analyses? To explore the short-run relationships among the variables, the techniques of correlations are utilized. The technique of Granger causality is applied to test whether movements in one variable appear to lead those of another. The technique of cointegration is employed to investigate the long-run relationships. The remainder of this study is structured as follows. Section 2 reviews the literature. Section 3 describes the methodology employed in the study. Section 4 presents the data descriptive statistics. Section 5 reports the empirical results. Section 6 concludes the study.

2. Literature review

Firstly, in terms of the integration of international equity markets, many studies have found stability of the correlation structure over time (Panton, Lessig and Joy, 1976; Watson, 1980), but the preponderance of the literature indicates that there is instability in the relationship (Fischer and Palasvirta, 1990; Kearney and Lucey, 2004; Longin and Solnik, 1995; Madura and Soenen, 1992; Makridakis and Wheelwright, 1974; Maldonado and Sounders, 1981; Meric and Meric, 1989; Wahab and Lashgari, 1993) and that this is determined primarily by real economic linkages between countries (Arshanapalli and Doukas, 1993; Bachman et al. 1996; Bodurtha, Cho and Senbet, 1989; Bracker and Koch, 1999; Campbell and Hamao, 1992; Roll, 1992). Employing the Engle–Granger cointegration methodology, Kasa (1992) examines the major equity markets over the 1974 -1990 period and finds a single cointegrating vector indicating a very low level of integration. Other studies also find similar results of low integration (Allen and MacDonald, 1995; Arshanapalli and Doukas, 1993; Chan, Gup and Pan, 1992; Chan, Gup and Pan, 1997; Gallagher, 1995). Kanas (1998) employs multivariate trace statistics, the Johansen method, and the Bierens nonparametric approach to test for pairwise cointegration between the US and each of the six largest European equity markets covering the period from 1983 to 1996, and finds that the US market is not pairwise cointegrated with any of the European markets. Vo and Daly (2005a, 2005b) analyse and test the 10-year period daily return data from 1994 to 2003 of Asian equity market indices and selected advanced nation's equity market indices by employing correlation, cointegration and the Granger causality test. They find a weak causal relationship between Asian equity markets and developed countries' equity markets. In addition, employing the same methodology,

Vo and Daly (2005a) also suggest that there are very low linkages among European equity markets. On the other hand, other authors state that the long-run covariances between markets are higher than in the short-run, and hence the benefits of international diversification are lower (Grubel and Fadner, 1971; Panton, Lessig and Joy, 1976; Taylor and Tonks, 1989). Employing the more sophisticated Johansen multivariate approach, other studies yield contrary results of strong integration (Chou, Ng and Pi, 1994; Gilmore and McManus, 2002; Hung and Cheung, 1995; Kearney, 1998; Manning, 2002; Ratanapakorn and Sharma, 2002).

Secondly, in terms of the relationship between stock prices and exchange rates, most studies show that a falling domestic currency value has a negative short-run and long-run effect on the aggregate domestic stock price. Domestic currency appreciations, on the contrary, often lead to higher stock prices. On the other hand, when the aggregate domestic stock price increases, domestic currency value drops in the short-term but goes up in the long-term (Ajayi and Mougoue, 1996; Dimitrova, 2005; Wang, Wang and Huang, 2010). Conflicting with the above authors, some researchers state that stock price reactions to changes in currency value are ambiguous (Granger, Huangb and Yangc, 2000).

Thirdly, there has been a great deal of research on gold in the last number of years and most of the academic studies concentrate on the areas which are: gold as a diversifier, gold as a hedge against inflation or other assets, and the operation's efficiency of the gold market. This attractiveness comes from gold's characteristic low/negative correlation and high positive skewness. Baur and Lucey (2010) carry out an investigation of the relationship between U.S., U.K., and German stock and bond returns, and gold returns, and find that gold just acts as a hedge against stocks, and as a safe haven for stocks, but not for bonds, in any market. They further suggest that investors should not keep gold too long because the safe haven just exist for a limited period of time. In addition, analyzing whether gold and stocks having a negative correlation, in other words, the absence of co-movement between gold and stocks, many studies suggest the role and the proportion of gold in a portfolio in order to reduce risks and increase returns (Chua, Sick and Woodward, 1990; Klement and Longchamp, 2010; Scherer, 2009; Sherman, 1982).

Finally, referring to the impact of oil price changes on stock prices, there are conflicting views among researchers. Mussa (2000) indicates that when oil prices increase, although consumer and business confidence fall fairly strongly, stock prices drop. The decrease is much more caused by non-oil related factors. Some authors, on the contrary, indicate that there is a relationship between crude oil prices and equity values (Arouri, 2011; El-Sharifa et al., 2005; Filis, Degiannakisa and Floros, 2011) but they have different conclusions as to whether this relationship is positive or negative. Especially, the most notable study is the one carried out by Narayan and Narayan (2009). By adding the US Dollar - VN Dong exchange rate as an additional determinant of stock prices, and exploring daily data for the period 2000–2008, Narayan and Narayan (2009) find that there are relationships between Vietnam's stock prices and oil prices, nominal

exchange rates, and a rise in the oil price and exchange rate (Vietnamese currency's depreciation) which makes Vietnam's stock price increase significantly. In addition to investigating the relationship between the oil price and stock prices, there are some papers that explore the impact of oil price risk on stock returns (Basher and Sadorsky, 2006; Fayyad and Daly, 2011; Nandha and Faffa, 2008; Sadorsky, 1999) and find that oil price risk has a significant effect on stock returns. Nandha and Faffa (2008) performed an empirical investigation with 35 DataStream global industry indices for the period from April 1983 to September 2005 and find that a rise in oil price affects negatively on equity returns for all sectors except mining and the oil and gas industries, and suggest that the international portfolio investors should hedge oil price risk. By employing Vector Auto Regression (VAR) analysis with daily data from September 2005 to February 2010 relating to seven countries (Kuwait, Oman, UAE, Bahrain, Qatar, UK and USA), Fayyad and Daly (2011) indicate that a rise in oil prices brought about an increase in the predictive power of oil price on stock returns and the impulsive response of a shock to oil price raised during Global Financial Crisis periods.

3. Methodology

3.1. Correlation

The correlation coefficient is traditionally employed to measure the degree of integration between any two variables using historical data. Therefore, the correlations between the pairs of the VN-Index and the S&P 500 Index, the VN-Index and gold prices, the VN-Index and the US Dollar - VN Dong exchange rates, and the VN-Index and crude oil prices, are firstly examined to test if investors have potential gains by diversifying those products. However, the correlation coefficient only shows the short-run relationship, and using this parameter may yield false results because economic variables tend to diverge in the short terms but converge over longer terms. To avoid this major disadvantage, cointegration tests are utilized to spot any long-run combinations between couples of these economic variables.

3.2. Cointegration

Cointegration has been showing as an important technique to examine whether the economic and financial time series are cointegrated. Besides, there are many areas of finance where cointegration might be expected to hold. Therefore, the methodology of cointegration has been more and more widely used in empirical studies. The current article will employ the cointegration technique to investigate the linkages between the VN-Index and the S&P 500 Index, the US Dollar - VN Dong exchange rates, gold prices and crude oil prices pre- and post- the 2008 Global financial crisis. In addition, the analysis of these links has strong implication for diversification; especially investment with long-term horizons. Furthermore, knowledge about these links will help investors to forecast the movement of the VN-Index, basing themselves on information about the given changes of the S&P 500 Index, the US Dollar - VN Dong exchange rates, gold prices and crude oil prices. In order to test for cointegration, the first step is to check if each series (in levels) is integrated of the same order. It is common in financial market data that most of the macroeconomic and financial time series are integrated of order one, in other words, they

are following an I(1) process.

3.3. Unit root

A time series must be examined to determine if it is stationary because the use of non-stationary data can lead to spurious regressions. A time series is non-stationary when it contains a unit root (integrated of order one) and its first difference is stationary (integrated of order zero). For this reason, this article uses the Dickey–Fuller (DF) and Augmented Dickey-Fuller (ADF) methodologies to test for a unit root. An important factor which influences the results of these tests is choosing the appropriate lag length. It is normally a problem in determining the optimal number of lags of the dependent variable. As suggested by Brooks (Brooks, 2002), there are two ways to do this. Firstly, it could be decided based on the frequency of the data. However, as high frequency data (daily) are used, it is not an obvious choice in this case. Secondly, another option, which is more appropriate in this case, is to base the decision on the information criterion. There are three popular information criteria, Akaike's (1974) information criterion (AIC), Schwarz's (1978) Bayesian information criterion (SBIC) and the Hannan-Quinn criterion (HQIC). In this paper, we use SBIC to identify the optimal lag length as SBIC embodies a much stiffer penalty than AIC, while HQIC is somewhere in between.

3.4. Granger causality

The Granger causality method seeks to determine how much of a current variable, y, can be explained by past values of y and whether adding lagged values of another variable, x, can improve the explanation. Then, y is said to be "Granger-caused" by x if x helps to predict y. In other words, one looks at the coefficients on the lagged x's to see if they are statistically significant based on an F-test.

This method runs the bivariate regression of the form:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_1 y_{t-1} + \beta_1 x_{t-1} + \ldots + \beta_1 x_{t-1} + \varepsilon_t$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \ldots + \alpha_1 x_{t-1} + \beta_1 y_{t-1} + \ldots + \beta_1 y_{t-1} + u_t$$

for all possible pairs of (x, y) series in the group. The reported F-statistics are the Wald statistics for the joint hypothesis:

$$\beta_1 = \beta_2 = \ldots = \beta_1 = 0$$

for each equation. The null hypothesis is that x does not Granger-cause y in the first regression and that y does not Granger-cause x in the second regression.

4. Data

4.1. Data descriptive statistics

The VN-Index data are downloaded from Ho Chi Minh City stock exchange websites and the S&P 500 Index is extracted from Bloomberg. The US Dollar - VN Dong exchange rates are the inter-bank average rate of VN Dong versus US Dollar supplied by the State Bank of Vietnam. The gold prices are London Afternoon (PM) Gold Prices, extracted from the USA Gold website. The oil price data are the WTI crude oil spot prices and extracted from the United States Department of Energy via Wikiposit website. All data are daily closing prices over the period from 4 January 2005 to 31 December 2012 and are divided into two sub-periods. The first sub-period runs from the beginning of the data set to 28 December 2007. The second sub-period is from 2 January 2008 to the end of the data set. The rationale for this division is to avoid the excessive fluctuations during the financial crisis and to uncover the differences in linkages before and during the

2008 Global Financial Crisis.

4.2. Time differences

Karolyi and Stulz (1996) and Alaganar and Bhar (2001) suggest that as there are different time zones in international markets and markets are not open and closed at the same time, therefore, it is important to consider the time differences between markets. Another important factor is that national holidays also differ between countries. To deal with this, the closing prices from the previous days for non-trading days are used. The trading time in the Vietnam market is eleven hours ahead of New York time (US market), six hours ahead of London time (UK market). Given that the US closing stock price, oil price and London afternoon gold price of a day (t-1) before Vietnam stock market opening price, what follows is that if Vietnam stock prices are sensitive to the US stock price, oil price and UK gold price changes, and the market is efficient, the US stock price, oil price and UK gold price information in day (t-1) should be reflected in the opening price on day t of the Vietnam stocks. If the Vietnam stock market is partly efficient, only part of the information will be reflected in the Vietnam opening price of day t, with the remaining changes spilling over during the course of the day.

5. Empirical results

5.1. Descriptive statistics

Table 1 displays the results of the preliminary data analysis for the returns of the VN-Index, the S&P 500 Index, the US Dollar - VN Dong exchange rate, and gold and crude oil.

In the whole period, gold has the highest return but has the second lowest risk, oil has the highest risk but has the second highest return, the VN-Index has the third highest return but has the second highest risk and the S&P 500 Index has the lowest return but has the third highest risk. Besides, the data sets of the VN-Index return, the S&P 500 Index return and the return for gold are skewed left, while the US Dollar's return and oil's return are skewed right. Furthermore, all the data sets have kurtosis coefficients higher than 3. Especially, the US Dollar return is very high. This indicates that all of the data sets are leptokurtic distributions.

In the first sub-period (before the Global Financial Crisis), the mean return of the VN-Index is highest (0.001827), and, following in descending order, the mean returns of oil, gold, the S&P 500 Index and the US Dollar. The standard deviation of the oil return is the highest (0.019721), next are the return of the VN-Index, the gold, the S&P 500 Index, and the US Dollar respectively. Moreover, only the skewness coefficient of the VN-Index return is positive, indicating a right-skewed data set, the others are left-skewed data sets. All kurtosis coefficients continue to be higher than 3, showing that return values are leptokurtic distributions.

In the second sub-period (2/1/2008-31/12/2012), all the mean returns are negative except that of gold and the US Dollar. In addition, the mean return of gold is highest (0.000710). Although the mean return of oil is lowest, the standard deviation of oil is highest (0.032232). Furthermore, only skewness coefficients of the US Dollar return and the oil return are positive, indicating a right-skewed data set, the others are left-skewed data sets. Moreover, only the kurtosis coefficient of the VN-Index return is lower than 3, indicating a platykurtic distribution; the others are leptokur-

Table 1: Descriptive statistics of daily returns

	RVN-Index	RSP500	RUSD/VND	RGold	Roil
Panel (a): Whole period (4/1/2005 – 31/12/2012)					
Mean	0.000480	0.000031	0.000124	0.000787	0.000510
Median	0.000335	0.000601	0.000000	0.000575	0.000000
Maximum	0.047348	0.109572	0.052991	0.068414	0.229156
Minimum	-0.049714	-0.094695	-0.030049	-0.079719	-0.128267
Std. Dev.	0.018223	0.014909	0.002244	0.013561	0.026709
Skewness	-0.053854	-0.216534	13.36337	-0.219078	0.368341
Kurtosis	3.396942	13.47955	310.1559	6.739788	10.07636
Jarque-Bera	10.50229	6829.689	5901585	880.2171	3142.508
Panel (b): First sub-period (4/1/2005 – 28/12/2007)					
Mean	0.001827	0.000275	0.000031	0.000863	0.001112
Median	0.000537	0.000695	0.000062	0.000632	0.000847
Maximum	0.047348	0.082436	0.002169	0.040330	0.084090
Minimum	-0.049714	-0.084795	-0.002231	-0.062474	-0.123901
Std. Dev.	0.015973	0.008921	0.000332	0.011515	0.019721
Skewness	0.071239	-0.349460	-0.296316	-0.485087	-0.147076
Kurtosis	4.063755	23.85560	8.460569	6.010013	5.393692
Jarque-Bera	35.80411	13535.06	937.7538	310.8772	180.7896
Panel (c): Second sub-period (2/1/2008 – 31/12/2012)					
Mean	-0.000872	-0.000215	0.000217	0.000710	-0.000098
Median	0.000169	0.000524	0.000000	0.000484	0.000000
Maximum	0.046468	0.109572	0.052991	0.068414	0.229156
Minimum	-0.048384	-0.094695	-0.030049	-0.079719	-0.128267
Std. Dev.	0.020150	0.019119	0.003157	0.015349	0.032232
Skewness	-0.040628	-0.140072	9.538333	-0.090981	0.489225
Kurtosis	2.883509	8.855023	157.7431	6.329231	8.805961
Jarque-Bera	0.625347	1065.153	753589.7	344.6235	1074.663

Note: Return = log(Price$_t$/Price$_{t-1}$)

tic distributions.

5.2. Correlation

Table 2 represents the correlation coefficients between the VN-Index, the S&P 500 Index, the US Dollar - VN Dong exchange rates, gold prices, and crude oil prices, before and after the 2008 Global Financial Crisis. It's clearly seen that the VN-Index is strongly correlated with the S&P 500 Index in all periods. In the first sub-period, the VN-Index is highly correlated with the rest (all the correlation coefficients are over 0.5), especially with the S&P 500 Index (0.941), the US Dollar - VN Dong exchange rates (0.938) and gold prices (0.867). In the second sub-period, the correlation coefficient between the VN-Index and the S&P 500 Index is still rather high (0.668). The correlation between the VN-Index and the rest are lower than 0.5, especially the correlation coefficient between the VN-Index and the US Dollar - VN Dong exchange rates which be-

Table 2: Correlation coefficients amongst examined daily price variables

	VN-Index	S&P 500	USD/VND	Gold price	Oil price
Panel (a): Whole period (4/1/2005 – 31/12/2012)					
VN-Index	1	0.675	-0.097	0.061	0.221
S&P 500		1	-0.412	-0.339	0.349
USD/VND			1	0.899	0.149
Gold price				1	0.406
Oil price					1
Panel (b): First sub-period (4/1/2005 – 28/12/2007)					
VN-Index	1	0.941	0.938	0.867	0.536
S&P 500		1	0.948	0.861	0.565
USD/VND			1	0.902	0.606
Gold price				1	0.778
Oil price					1
Panel (c): Second sub-period (2/1/2008 – 31/12/2012)					
VN-Index	1	0.668	-0.048	0.168	0.439
S&P 500		1	-0.057	0.195	0.877
USD/VND			1	0.895	-0.218
Gold price				1	0.007
Oil price					1

Table 3: Correlation coefficients amongst the daily return variables

	RVN-Index	RSP500	RUSD/VND	RGold	Roil
Panel (a): Whole period (4/1/2005 – 31/12/2012)					
RVN-Index	1	0.266	-0.035	0.076	0.179
RSP500		1	0.023	-0.003	0.296*
RUSD/VND			1	0.007	0.042
RGold				1	0.208
Roil					1
Panel (b): First sub-period (4/1/2005 – 28/12/2007)					
RVN-Index	1	0.072	0.067	0.141	-0.046
RSP500		1	0.031	0.039	-0.041
RUSD/VND			1	0.022	-0.040
RGold				1	0.183
Roil					1
Panel (c): Second sub-period (2/1/2008 – 31/12/2012)					
RVN-Index	1	0.348	-0.047	0.036	0.288
RSP500		1	0.025	-0.019	0.395
RUSD/VND			1	0.007	0.053
RGold				1	0.221
Roil					1

Note: Return = log(Price$_t$/Price$_{t-1}$)

Table 4: Unit root tests for the daily price

	Level ADF/DF test statistic	First difference ADF/DF test statistic
Whole period (4/1/2005 – 31/12/2012)		
VN-INDEX	-1.490	-16.044*
SP500	-1.269	-32.086*
USD/VND	0.983	-43.128*
Gold price	0.145	-38.227*
Oil price	-1.871	-42.356*
First sub-period (4/1/2005 – 28/12/2007)		
VN-INDEX	-0.724	-11.531*
SP500	-1.108	-33.386*
USD/VND	-1.279	-31.223*
Gold price	0.037	-26.488*
Oil price	-0.962	-29.229*
Second sub-period (2/1/2008 – 31/12/2012)		
VN-INDEX	0.073	-9.756*
SP500	-2.048	-31.787*
USD/VND	-0.276	-30.522*
Gold price	-0.363	-27.138*
Oil price	-1.290	-30.140*

*Note: * denotes rejection of the hypothesis at the 0.01 level.*

comes negative (-0.048).

Table 3 reports the correlation coefficients between the returns of the VN-Index, the S&P500 Index, the US Dollar, gold and crude oil. It is shown that the magnitude of these correlation coefficients is very small, even negative. In addition, the correlation coefficients between the VN-Index return and the S&P 500 Index return in all periods are highest, from 0.266 to 0.348, except for the first period when the correlation coefficient between the VN-Index return and the gold return is highest (0.141). The low correlation coefficients suggest that there are diversification benefits from investing in these financial instruments.

5.3. Unit root test

The results of unit root tests are reported in Table 4. DF and ADF unit root tests indicate that the whole period series for the VN-Index, the S&P 500 Index, the US Dollar - VN Dong exchange rates, gold prices and crude oil prices in level terms, contain a unit root (integrated of order one), but it appears that there is no unit root in the first differences (integrated of order zero). Therefore, we can conclude that they are non-stationary time series.

5.4 .Cointegration test

5.4.1. Bivariate cointegration test

Table 5 represents the results for the trace and max-eigen statistics of the bivariate cointergration tests, that is, the VN-Index, with the prices of the rest. In the Table 5, the second column presents the ordered eigenvalues, the third column the trace test and the fourth the max-eigen test at the 0.05 level. If the test statistic exceeds the critical value, the null hypothesis of

Table 5: Bivariate cointegration test results

Group Name	Eigenvalue	Trace statistic 0.05		Max-eigen statistic 0.05	
		Statistic	Critical value	Statistic	Critical value
Whole period (4/1/2005 – 31/12/2012)					
VN-Index & SP500 Index					
None	0.004066	7.361222	15.49471	6.070350	14.26460
At most 1	0.000866	1.290872	3.841466	1.290872	3.841466
VN-Index & USD/VND					
None	0.001524	2.738604	15.49471	2.271908	14.26460
At most 1	0.000313	0.466696	3.841466	0.466696	3.841466
VN-Index & Gold price					
None	0.003434	5.275919	15.49471	5.125717	14.26460
At most 1	0.000101	0.150202	3.841466	0.150202	3.841466
VN-Index & Oil price					
None	0.009667	16.67407*	15.49471	14.47393*	14.26460
At most 1	0.001476	2.200142	3.841466	2.200142	3.841466
First sub-period (4/1/2005 – 28/12/2007)					
VN-Index & SP500 Index					
None	0.030403	23.34019*	15.49471	23.03237*	14.26460
At most 1	0.000413	0.307819	3.841466	0.307819	3.841466
VN-Index & USD/VND					
None	0.011847	10.47432	15.49471	8.890407	14.26460
At most 1	0.002121	1.583916	3.841466	1.583916	3.841466
VN-Index & Gold price					
None	0.002359	1.930859	15.49471	1.761634	14.26460
At most 1	0.000227	0.169224	3.841466	0.169224	3.841466
VN-Index & Oil price					
None	0.010998	9.408914	15.49471	8.249697	14.26460
At most 1	0.001553	1.159217	3.841466	1.159217	3.841466
Second sub-period (2/1/2008 - 31/12/2012)					
VN-Index & SP500 Index					
None	0.027025	24.78363*	15.49471	20.38363*	14.26460
At most 1	0.005897	4.399994*	3.841466	4.399994*	3.841466
VN-Index & USD/VND					
None	0.034346	26.39219*	15.49471	26.00260*	14.26460
At most 1	0.000524	0.389593	3.841466	0.389593	3.841466
VN-Index & Gold price					
None	0.033385	25.28367*	15.49471	25.26287*	14.26460
At most 1	2.80E-05	0.020809	3.841466	0.020809	3.841466
VN-Index & Oil price					
None	0.028919	24.52413*	15.49471	21.83274*	14.26460
At most 1	0.003611	2.691394	3.841466	2.691394	3.841466

*Note: * denotes rejection of the hypothesis at the 0.05 level.*

Table 6: Multivariate cointegration test results

Hypothesized No. of CE(s)	Eigenvalue	Trace statistic 0.05		Max-eigen statistic 0.05	
		Statistic	Critical value	Statistic	Critical value
Whole period (5/1/2005 – 31/12/2012)					
None	0.020838	65.61774	69.81889	31.37681	33.87687
At most 1	0.015798	34.24093	47.85613	23.72621	27.58434
At most 2	0.004177	10.51472	29.79707	6.236076	21.13162
At most 3	0.002189	4.278642	15.49471	3.265138	14.26460
At most 4	0.000680	1.013504	3.841466	1.013504	3.841466
First sub-period (5/1/2005 – 28/12/2007)					
None	0.058937	94.63081*	69.81889	45.31605*	33.87687
At most 1	0.036358	49.31475*	47.85613	27.62850*	27.58434
At most 2	0.020852	21.68625	29.79707	15.71987	21.13162
At most 3	0.005329	5.966383	15.49471	3.986323	14.26460
At most 4	0.002651	1.980059	3.841466	1.980059	3.841466
Second sub-period (2/1/2008 – 31/12/2012)					
None	0.061162	85.98960*	69.81889	46.95521*	33.87687
At most 1	0.024324	39.03438	47.85613	18.32061	27.58434
At most 2	0.020318	20.71377	29.79707	15.27206	21.13162
At most 3	0.007165	5.441708	15.49471	5.349679	14.26460
At most 4	0.000124	0.092029	3.841466	0.092029	3.841466

*Note: * denotes rejection of the hypothesis at the 0.05 level of significance.*

no cointegrating vectors is rejected. In general, to consider the whole period, all the tests indicate there is only one pair of VN-Index and crude oil prices which is cointegrated at the 0.05 level. However, when conducting the bivariate cointegration tests in every sub-period, the results indicate that the long-run relationships change significantly after the 2008 Global Financial Crisis. In the first sub-period, the VN-Index and the S&P 500 Index are cointegrated. In the second sub-period, there are two cointegrating vectors between the VN-Index and the S&P 500 Index, one cointegrating vector between the pairs of VN-Index and US Dollar - VN Dong exchange rates, VN-Index and gold prices, VN-Index and crude oil prices.

5.4.2. Multivariate cointegration test

The results for the λ_{trace} and λ_{max} statistics of the multivariate cointegration test are exhibited in Table 6. Overall, the results show no cointegrating vector in the whole period. There are two cointegrating equations in the first sub-period, one cointegrating equation in the second sub-period at the 0.05 level.

5.5. Granger causality

The Granger causality test is employed to further examine the causality relationship between the VN-Index and the S&P 500 Index, the US Dollar - VN Dong exchange rates, gold prices, and crude oil prices. The results of the Granger causality tests are represented in Table 7. In the whole period, only crude oil prices affect the VN-Index at the 0.05 level. In the first sub-period, the S&P 500 Index and the

Table 7: Granger causality test results

Null Hypothesis	F-statistic		
	Whole period	First sub-period	Second sub-period
VN-Index does not Granger Cause S&P 500	0.48518	9.10210**	0.19866
S&P 500 does not Granger Cause VN-Index	1.04893	10.1539**	0.32815
VN-Index does not Granger Cause USD/VND	0.93236	0.02137	1.04715
USD/VND does not Granger Cause VN-Index	0.20041	8.22734**	1.78912
VN-Index does not Granger Cause Gold price	0.20153	1.44975	0.33275
Gold price does not Granger Cause VN-Index	0.97192	0.00337	1.42186
VN-Index does not Granger Cause Oil price	1.82438	3.04353	4.80186**
Oil price does not Granger Cause VN-Index	3.08231*	4.82355*	0.06973

*Note: * and ** denote rejection of the hypothesis at the 5% and 1% level respectively.*

VN-Index affect each other significantly at the 0.01 level. Besides, the US Dollar - VN Dong exchange rates also affect the VN-Index at the 0.01 level and crude oil prices affect the VN-Index at the 0.05 level. In the second sub-period, there is only one direction of Granger causality running from the VN-Index to crude oil prices at the 0.01 level. This result can be explained by the existence of another variable affecting crude oil prices through the VN-Index because the VN-Index cannot influence crude oil prices by itself.

6. Conclusion

This article investigates the impacts of the fluctuations in the S&P 500 Index, the US Dollar - VN Dong exchange rates, gold prices and crude oil prices on the VN-Index by examining the interdependence among these variables over a considerable time span.

Firstly, the correlation test shows that the correlation between the VN-Index and the S&P 500 Index was very high before the Global Financial crisis of 2008, and relatively high during and after the crisis. In addition, the results of the correlation test also indicate that the VN-Index is highly correlated with gold prices and the US Dollar - VN Dong exchange rates in the first sub-period (1/4/2005 – 12/28/2007).

Secondly, the empirical results of bivariate cointegration tests indicate a very low degree of integration between the VN-Index and the prices of the others for the period 2005-2012. There is only one cointegrating equilibrium at the 5% level between the VN-Index and crude oil prices. The results are consistent with (Narayan and Narayan, 2009). Therefore, it can be concluded that the VN-Index and crude oil prices are cointegrated for the whole period. Moreover, there is one cointegrating equilibrium at 0.05 level before the crisis and two cointegrating equilibriums at 0.05 level during and after the crisis between the VN-Index and the S&P 500 Index. Furthermore, the analysis also shows that the VN-Index is cointegrated with the US Dollar - VN Dong exchange rates, gold prices and oil prices during and after the crisis. In addition, the multivariate cointegration tests show two cointegrating equations at the 0.05 level in the first sub-period and one

cointegrating equation at the 0.05 level in the second sub-period.

Finally, the bivariate Granger causality tests reveal causality running from crude oil prices to the VN-Index in the whole period and in the first sub-period. Conversely, in the second sub-period, the VN-Index affects crude oil prices. In addition, in the first-sub period, the S&P 500 Index and the VN-Index affect each other significantly; the US Dollar - VN Dong exchange rates have a significant impact on the VN-Index. The above findings are meaningful for the governments' decisions about monetary and fiscal policy because the exchange rate in Vietnam is not determined by the market, but mainly controlled by the government.

The empirical analysis results provide implications for investors who contemplate investing in Vietnam's stock market. The paper indicates a high level of correlation and cointegration tie between the VN-Index and the crude oil price. In addition, in the short-term, investors can get more reference information by monitoring the price movement of the S&P 500 Index and the US Dollar - VN Dong exchange rates. Moreover, in the long-run, the low level of cointegration between the VN-Index and gold prices indicate diversification benefits for those investing in both Vietnam's stock and gold markets.

Understanding the relationship between key financial variables is also important for other stakeholders including academic, financial practitioners and policy makers. This paper focuses on a number of variables that potentially affect Vietnamese stock prices. Further research should focus on the relationship at the firm level.

References

Ajayi, R.A. and Mougoue, M. (1996), 'On the Dynamic Relation between Stock Prices and Exchange Rates', *Journal of Financial Research*, Vol. 19, No. 2 (Summer), pp. 193-207.

Alaganar, V.T. and Bhar, R. (2001), 'Diversification gains from American depositary receipts and foreign equities: evidence from Australian stocks', *Journal of International Financial Markets, Institutions and Money*, Vol. 11, No.1, pp. 97-113.

Allen, D.E. and MacDonald, G. (1995), 'The long run gains from international diversification: Australian evidence from cointegration tests', *Applied Financial Economics*, Vol. 5, No. 1, pp. 33-42.

Arouri, M.E.H. (2011), 'Does crude oil move stock markets in Europe? A sector investigation', *Economic Modelling*, Vol. 28, No.4, pp. 1716-1725.

Arshanapalli, B. and Doukas, J. (1993), 'International stock linkages: Evidence from the pre- and post-October 1987 period', *Journal of Banking and Finance*, Vol. 17, No.1, pp. 193-208.

Bachman, D., Choi, J.J., Jeon, B.N. and Kopecky, K.J. (1996), 'Common factors in international Stock prices: Evidence from a cointegration study', *International Review of Financial Analysis*, Vol. 5, No.1, pp. 39-53.

Basher, S.A. and Sadorsky, P. (2006), 'Oil price risk and emerging stock markets', *Global Finance Journal*, Vol. 17, No.2, pp. 224-251.

Baur, D.G. and Lucey, B.M. (2010), 'Is Gold a Hedge or a Safe Haven? An Analysis of Stocks, Bonds and Gold', *Financial Review*, Vol. 45, No. 2, pp. 217-29.

Bodurtha, J., James N., Cho, D.C. and Senbet, L.W. (1989), 'Economic forces and the stock market: An international perspective', *Global Finance Journal*, Vol. 1, No.1, pp. 21-46.

Bracker, K. and Koch, P.D. (1999), 'Economic determinants of the correlation structure across international equity markets', *Journal of Economics and Business*, Vol. 51, No.6, pp. 443-471.

Brooks, C.(2002), *Introductory Econometrics for Finance*, Cambridge University Press, Cambridge.

Campbell, J.Y. and Hamao, Y. (1992), 'Predictable Returns in the United States and Japan: A Study of Long-Term Capital Market Integration', *Journal of Finance*, Vol. 47, No.1, pp. 43-69.

Chan, C.K., Gup, B.E. and Pan, M.S. (1992), 'An Empirical Analysis of Stock Prices in Major Asian Markets and the United States', *The Financial Review*, Vol. 27, No.2, pp. 289-307.

Chan, K.C., Gup, B.E. and Pan, M.-S. (1997), 'International Stock Market Efficiency and Integration: A Study of Eighteen Nations', *Journal of Business Finance and Accounting*, Vol. 24, No.6, pp. 803-813.

Chou, R.Y., Ng, V.K. and Pi, L.K. (1994), 'Cointegration of International Stock Market Indices', *IMF Working Paper*, No. 94/94.

Chua, J.H., Sick, G. and Woodward, R.S. (1990), 'Diversifying with Gold Stocks', *Financial Analysts Journal*, Vol. 46, No.4, pp. 76-79.

Dimitrova, D. (2005), 'The Relationship between Exchange Rates and Stock Prices: Studied in a Multivariate Model', *Political Economy*, Vol. 14.

El-Sharifa, I., Browna, D., Burtona, B., Nixona, B. and Russellb, A. (2005), 'Evidence on the nature and extent of the relationship between oil prices and equity values in the UK', *Energy Economics*, Vol. 27, No. 6, pp. 819-830.

Fayyad, A. and Daly, K. (2011), 'The impact of oil price shocks on stock market returns: Comparing GCC countries with the UK and USA ', *Emerging Markets Review*, Vol. 12, No.1, pp. 61-78.

Filis, G., Degiannakisa, S. and Floros, C. (2011), 'Dynamic correlation between stock market and oil prices: The case of oil-importing and oil-exporting countries', *International Review of Financial Analysis*, Vol. 20, No.3, pp. 152-164.

Fischer, K.P. and Palasvirta, A.P. (1990), 'High road to a global marketplace: the international transmission of stock market fluctuations', *The Financial Review*, Vol. 25, No.3, pp. 371-394.

Gallagher, L. (1995), 'Interdependencies among the Irish, British and German Stock Markets', *The Economic and Social Review*, Vol. 26, No.2, pp. 131-147.

Gilmore, C.G. and McManus, G.M. (2002), 'International portfolio diversification: US and Central European equity markets', *Emerging Markets Review*, Vol. 3, No.1, pp. 69-83.

Granger, C.W.J., Huangb, B.-N. and Yangc, C.-W. (2000), 'A bivariate causality between stock prices and exchange rates: evidence from recent Asianflu', *The Quarterly Review of Economics and Finance*, Vol. 40, No.3, pp. 337-354.

Grubel, H.G. and Fadner, K. (1971), 'The Independence of International Equity Markets', *Journal of Finance*, Vol. 26, No.1, pp. 89-94.

Hung, B.W.-S. and Cheung, Y.-L. (1995), 'Interdependence of Asian emerging equity markets', *Journal of Business Finance and Accounting*, Vol. 22, No.2, pp. 281-288.

Kanas, A. (1998), 'Linkages between the US and European equity markets: further evidence from cointegration tests', *Applied Financial Economics*, Vol. 8, No. 6, pp. 607-614.

Karolyi, G.A. and Stulz, R.M. (1996), 'Why do markets move together? An investigation of U.S.-Japan stock return comovements', *Journal of Finance*, Vol. 51, No.3, pp. 951-986.

Kasa, K. (1992), 'Common stochastic trends in international stock markets', *Journal of Monetary Economics*, Vol. 29, No.1, pp. 95-124.

Kearney, C. (1998), 'The Causes of Volatility in a Small, Internationally Integrated Stock Market: Ireland, July 1975-June 1994', *Journal of Financial Research*, Vol. 21, No.1, pp. 85-104.

Kearney, C. and Lucey, B.M. (2004), 'International equity market integration: Theory, evidence and

implications', *International Review of Financial Analysis*, Vol. 13, No.5, pp. 571-583.

Klement, J. and Longchamp, Y. (2010), 'Managing currency risks for global families.', *Journal of Wealth Management*, Vol. 13, No.2, pp. 76-87.

Longin, F. and Solnik, B. (1995), 'Is the correlation in international equity returns constant: 1960-1990?', *Journal of International Money and Finance*, Vol. 14, No.1, pp. 3-26.

Madura, J. and Soenen, L. (1992), 'Benefits from International Diversification: Across Time and Country Perspectives', *Managerial Finance*, Vol. 18, No.2, pp.1-14.

Makridakis, S.G. and Wheelwright, S.C. (1974), 'An Analysis of the Interrelationships Among the Major World Stock Exchanges', *Journal of Business Finance and Accounting*, Vol. 1, No.2, pp.195-215.

Maldonado, R. and Sounders, A. (1981), 'International Portfolio Diversification and the Inter-Temporal Stability of International Stock Market Relationships, 1957-78.', *Financial Management*, Vol. 10, No.3, pp. 54-63.

Manning, N. (2002), 'Common trends and convergence? South East Asian equity markets, 1988-1999', *Journal of International Money and Finance*, Vol. 21, No.2, pp.183-202.

Meric, I. and Meric, G. (1989), 'Potential Gains from International Portfolio Diversification and intertemporal stability and seasonality in international stock market relationships', *Journal of Banking and Finance*, Vol. 13, No.4-5, pp. 627-640.

Mussa, M. (2000), 'The Impact of Higher Oil Prices on the Global Economy', IMF Working paper, Available at http://www.imf.org/external/pubs/ft/oil/2000/

Nandha, M. and Faffa, R. (2008), 'Does oil move equity prices? A global view ', *Energy Economics*, Vol. 30, No. 3, pp. 986-997.

Narayan, P.K. and Narayan, S. (2009), 'Modelling the impact of oil prices on Vietnam's stock prices', *Applied Energy*, Vol. 87, No. 1, pp. 356-361.

Panton, D.B., Lessig, V.P. and Joy, O.M. (1976), 'Co-movement of International Equity Markets: A Taxonomic Approach', *Journal of Financial and Quantitative Analysis*, Vol. 11, No. 3, pp. 415-432.

Ratanapakorn, O. and Sharma, S.C. (2002), 'Interrelationships among regional stock indices', *Review of Financial Economics*, Vol. 11, No. 2, pp. 91-108.

Roll, R. (1992), 'Industrial Structure and the Competitive behaviour of international stock market indices', *Journal of Finance*, Vol. 47, No. 1, pp. 3-42.

Sadorsky, P. (1999), 'Oil price shocks and stock market activity ', *Energy Economics*, Vol. 21, No. 5, pp. 449-469.

Scherer, B. (2009), 'A note on portfolio choice for sovereign wealth funds.', *Financial Markets and Portfolio Management*, Vol. 23, No. 3, pp. 315-327.

Sherman, E. (1982), 'Gold: A Conservative, Prudent Diversifier', *Journal of Portfolio Management* Vol. 8, No. 3, pp. 21-27.

Taylor, M.P. and Tonks, I. (1989), 'The Internationalisation of Stock Markets and the Abolition of UK Exchange Controls', *Review of Economics and Statistics*, Vol. 71, No. 2, pp. 332-336.

Vo, X.V. and Daly, K.J. (2005a), 'European Equity Market Integration - Implication for US Investors', *Journal of Research in International Business and Finance*, Vol. 19, No. 1, pp. 155-170.

Vo, X.V. and Daly, K.J. (2005b), 'International Financial Integration: an Empirical Investigation into Asian equity markets pre and post 1997 Asian Financial Crisis', in T.A. Fetherston and J.A. Batten (eds), *Asian Pacific Financial Markets in Comparative Perspective: Issues and Implications for the 21st Century*, Vol. 87, Elsevier Science, Amsterdam Netherlands.

Wahab, M. and Lashgari, M. (1993), 'Covariance stationarity of international equity markets returns: Recent evidence', *The Financial Review*, Vol. 28, No. 2, pp. 239-260.

Wang, M.-L., Wang, C.-P. and Huang, T.-Y. (2010), 'Relationships among Oil Price, Gold Price, Exchange Rate and International Stock Markets', *International Research Journal of Finance and Economics*, Issue. 47.

Watson, J. (1980), 'The Stationarity of Inter-Country Correlation Coefficients: A Note', *Journal of Business Finance and Accounting*, Vol. 7, No. 2, pp. 297-303.