THE EFFECTS OF SHORT SELLING ON FINANCIAL MARKETS VOLATILITIES

Kwaku Boafo Baidoo[1]

[1] *Mendel University in Brno, Czech Republic*

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ABSTRACT

The paper investigates the relationship between short selling activities of stocks on the volatility of the US market and its sectors. We apply the multivariate DCC GARCH Model on the NYSE US 100 Index between November 2017 and October 2018. We find evidence that investments in some specific firms on the market reduce the market volatility and higher short selling activities reduce risk in the market. The study also finds that firms in the financial sector dominate the market and short selling activities in this sector has a greater impact on the market volatility. We also find portfolio managers to be better off investing in the market than creating portfolio within sectors.

KEY WORDS

short selling, market volatility, dynamic conditional correlation

JEL CODES

C58, G12, G15

1 INTRODUCTION

The activities of short sellers in financial markets were largely criticized and argued to be one of the factors which caused the financial crises of 2007/2008 as the practice aggravated market volatility and in extreme cases destabilised the market (Jain et al., 2013). Short sellers were also argued to be manipulators of stock prices during the crises (McGavin, 2010). This led to a ban on short selling that was later lifted in some markets and strict regulations were introduced in attempts to reduce volatility and strengthen the weakening market. This paper follows these literatures and investigates the effect of short selling on the financial markets after the crisis (Bohl et al., 2016; Deng and Gao, 2018; Sobacı et al., 2014).

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Short selling still remains a very risky and aggressive investment strategy used by traders in the financial markets. In cases when large number of traders and investors decide to short a particular stock, their actions impact on the stock prices. Several companies have blamed the activities of short selling for the price decline in their stock and also criticized as short seller profit only when companies are performing poorly (Desai et al., 2002). Angel and McCabe (2009) argues short selling creates incentives for illegal activities in the financial markets such as the spread of false information. Short selling remains controversial and regulators have enacted several bans on different occasions to regularize the practice to avert crises. However, the practice still continues to be a major contributing factor in any financial crises.

We follow Baklacı et al. (2016) by focusing on the effect of short selling on the various sector of the market (10 sectors of the US economy). Especially, we show that the financial sector dominates the market with more companies that affect the volatility. The results of the DCC-GARCH estimates indicates just about 15.97% of firms directly affects the volatility of the market. We find that investment in specific companies listed in the NYSE US 100 Index decrease the volatility of the market. Our results also show only two sectors; industry and consumer staples have some specific companies that increase the volatility of the market. On the contrarily, the financial, the financial, materials, health care, energy and consumer discretionary sectors consists of companies that reduce the market volatility.

The remainder of the paper is structured as follows. Section 2 gives analysis of existing literature on short selling activities. Section 3 provides the data and methodology. Section 4 provides the empirical results of the study and the section 5 concludes.

2 LITERATURE REVIEW

Short sellers borrow and sell shares in an anticipation of falling share prices. Short interest is derived from the short selling trading activity. It is expressed as a percentage of the short sale of shares to the shares outstanding. Short sellers were identified as one of the key triggers of the recent financial crises commencing in 2008 (McGavin, 2010).

The collapse of Lehmann Brothers in September, 2008 led to the emergency ban on short selling by the regulator; Securities and Exchange Commission (SEC) which caused a wider impact of falling stocks. Other countries such as Australia, Britain, Canada, Germany, Ireland, Portugal and Taiwan also imposed restrictions on short selling. These restrictions have been extensively studied in existing literature (Alves et al., 2016; Boehmer et al., 2013; Boehmer and Wu, 2013; Beber and Pagano, 2013). Imposing constraints on short selling activities can lead to overvaluation which makes it hard for securities prices to reflect on negative market information (Miller, 1977; Hong and Stein, 2003; Chen et al., 2002). The removal of these constraints can reduce stock crashes as argued by Hong and Stein (2003). Bris et al. (2007) conclude market returns are significantly negatively skewed when constraints are put on short selling while Beber and Pagano (2013) argues liquidity decreases and slows the price discovery process.

There are several literatures that focus on short interest and the activities short selling with opposing arguments. While some do find good and positives in this trading strategy by complicated investors, others have criticized their activities. Miller (1977) who was the originator of short selling argued on price discovery impairment as a result of negative information of the markets due to short sale constraints. Bianchi and Drew (2012) argue positively for short selling as it can be employed as a hedging tool.

Woolridge and Dickinson (1994) show short sellers enhance market liquidity by buying back the shares when prices fell. Warren Buffet a well know Wall Street tycoon also believes short

selling help in identifying fraudulent corporate activities and is very key in forensic accounting (Bianchi and Drew, 2012).

The aftermath of the financial crises resulted in several literature criticizing the short selling strategy with tighten laws by the Securities and Exchange Commission to check the activities of short selling. Their argument was that short selling could artificially depress prices and weaken market efficiency. Several researchers have considered short selling as a market manipulative activity. Short sellers negatively affect the financial market by increasing volatility and instability while beneficial by increasing efficiency and price discovery (Henry et al., 2015; Feng and Chan, 2016). Henry and McKenzie (2006) find market display greater volatility after a period of short selling while Cáceres et al. (2015) conclude volatility can be reduced by imposing constraints on short selling activities.

Literature on short selling suggests short sales contributes to efficiency in the stock markets (Boehmer et al., 2008; Chang et al., 2014; Boehmer and Wu, 2013; Cohen, 2010; Saffi and Sigurdsson, 2011; Chen and Rhee, 2010; Zhao et al., 2014) as it corrects the mis-pricing in stock. However, the constraints placed on short selling activities have been concluded by several researchers to decrease market liquidity resulting and in higher volatility and poor market quality (Boehmer et al., 2013; Sobacı et al., 2014; Wang et al., 2013; Lee and Piqueira, 2017).

This paper contributes to the existing literature on short selling and focus on the impact of short selling activities on the various sector of the US economy and the individual listed stocks on the market volatility. To our best of knowledge, no literature has focus on the sector impact of short selling activities on the market volatility.

3 METHODOLOGY AND DATA

We build a daily frequency time series data comprising of short selling volumes, listed stock prices and prices for the market represented by the stock index. The short selling data are mainly retrieved from the Financial Industry Regulatory Authority (FINRA) website. The study uses 95 listed firms in the NYSE US 100 Index. The firms are categorized into 10 sectors of the US economy; Communication, Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industries, Materials, Technology and Utilities. The data of the NYSE US 100 Index and prices of all the companies are retrieved from the NYSE website which are published daily. The dataset consists daily log returns in the period November, 2017 – October, 2018 (23,562 obsevations)

The daily log returns for the firm i on dat t is given as

$$r_{it} = \ln \frac{p_{it}}{p_{it-1}}, \tag{1}$$

where p_{it} and p_{it-1} are the closing prices of the firms and index for days t and $t-1$, respectively.

To identify the impact of short selling on the volatility of the market, we employ the multivariate Dynamic Conditional Correlation (DCC) Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model that identifies stock markets volatility spillovers across different markets proposed by Engle (2002). The model has the flexibility of the univariate GARCH models coupled with parsimonious parametric models for the correlations (Engle, 2002).

The conditional correlation matrix of the DCC GARCH as proposed by Engle (2002) expressed as

$$H_t = D_t R_t D_t, \tag{2}$$

where D_t is the diagonal matrix of conditional variances defined, R_t is the $n \times n$ correlation matrix defined as

$$R_t = \text{diag}\,(Q_t)^{-\frac{1}{2}}\, Q_t\, \text{diag}\,(Q_t)^{-\frac{1}{2}}, \tag{3}$$

where diag (A) denotes a matrix with diagonal equal to the diagonal of A.

$$Q_t = \hat{Q}(1-\alpha-\beta) + \alpha\varepsilon_{t-1}\varepsilon'_{t-1} + \beta Q_{t-1}, \tag{4}$$

where ε_t is the vector of standardized returns, $\varepsilon_{it} = \frac{r_{it}}{\sigma_{it}}$, α and β are scaler, $\hat{Q} = \frac{1}{T}\sum_{t=1}^{T} \varepsilon_t \varepsilon_t'$ with $\alpha, \beta > 0$ and $\alpha + \beta < 1$. $\hat{Q}$ represent the $n \times n$ unconditional matrix for the short selling volumes of the firms i and Q_t represent the conditional volatility of the NYSE US 100 Index.

The logarithm of the likelihood function of the DCC GARCH model is

$$\ln L = -\frac{1}{2}\sum \left(T \ln(2\pi) + 2|D_t| + \right.$$
$$\left. + \ln |R_t| + \varepsilon' t R_t^{-1} \varepsilon_t \right). \quad (5)$$

Thus, positive conditional volatility provides empirical evidence of volatility persistence in the market.

4 RESULTS

In order to investigate the relationship between the Volatility of the NYSE US 100 Index and short selling volumes of the equities, we evaluate the estimates of DCC GARCH for all 95 companies. Out of the 95, only 19 companies showed significant impact on the volatility of the index as shown in the Annex. These 19 companies are re-evaluated to show the actual impact of short selling trades on the conditional volatility. The estimates in Tab. 2 indicate 15 companies have impact at 5% and 10% levels of significance on the volatility of the index.

The estimates also indicate just about 15.97% of the firms significantly affects the conditional volatility of the index. We proceed to perform the sector analysis of the effect of short selling on the market. The initial results reveal short selling activities of companies in the technology and communication sectors on the NYSE US 100 has no impact of market volatility and the respective sectors. The utilities sector in the index consist of three companies. The Southern Company (SO) with coefficient of (0.0002) has little or no significant impact at of the market volatility. Hence, we conclude short selling activities has no effect on the market volatility.

The material sectors consist of 7 companies. Two companies Alcoa Corporation (AA) and Freeport-McMoRan Inc (FCX) with coefficients -0.0006 and -0.0007 are both significantly at 5% and 10% respectively. These companies have negative relation to the market volatility; thus, they reduce the market volatility. Alcoa Corporation in additional also reduce the volatility of the sector. We conclude the materials sector on the NYSE US 100 index reduce the market volatility.

The health sector consists of 12 companies representing 12.60% of the market. Danaher Corporation (DHR) is the only significant companies in the health sector with coefficient 0.0002. This indicates a positive relationship between the sector and the market implying the sector increase the volatility of the market. No company however significantly affects the volatility of the sector.

The market is dominated by the financial sector which represent 22.10% consisting of 21 companies. Berkshire Hathaway Inc. (BRK-B), Mastercard Incorporated (MA), Prudential Financial Inc. (PRU), Simon Property Group Inc. (SPG) and U.S. Bancorp (USB) are all companies that affect the volatility of the market. The coefficients -0.0015, 0.0008, -0.0005, -0.0002 and -0.0005 respectively are all significant at 5% and 10% levels. Mastercard Incorporated (MA) increase the volatility of the market while the remaining companies significantly reduce market volatility.

The energy sector consisting of 13 companies has just Devon Energy Corporation (DVN) with coefficient -0.0004 significant affecting the volatility of the market. It reduces the market volatility while increasing that of the energy sector. The consumer discretionary sector also consists of 8 companies with Ford Motor Company (F) and Las Vegas Sands Corporation (LVS) with coefficients -0.0016 and 0.0010 at 5% and 10% significant levels respectively affect the volatility of the market. Ford Motor

Tab. 1: DCC-GARCH Estimates

Comp.	NYSE US 100 Index	Utilities	Materials	Industries	Health Care	Financials	Energy	Consumer Discretionary	Consumer Staples
SO	0.0002	0.0002							
	(0.0003)	(0.0004)							
AA	−0.0006*		−0.0008*						
	(0.0002)		(0.0003)						
FCX	−0.0007**		−0.0008						
	(0.0003)		(0.0004)						
UNP	0.0003**			0.0001					
	(0.0001)			(0.0010)					
DHR	0.0002**				−0.0004				
	(0.0001)				(0.0002)				
MDT	−0.0003				−0.0001				
	(0.0002)				(0.0002)				
ALL	0.0001					0.0001			
	(0.0001)					(0.0001)			
BRK-B	−0.0015**					−0.0016*			
	(0.0007)					(0.0008)			
MA	0.0008**					0.0008**			
	(0.0005)					(0.0005)			
PNC	−0.0006					−0.0004*			
	(0.0002)					(0.0002)			
PRU	−0.0005*					0.0003**			
	(0.0002)					(0.0002)			
SPG	−0.0002*					−0.0002*			
	(0.0001)					(0.0001)			
USB	−0.0005**					−0.0003			
	(0.0002)					(0.0003)			
V	0.0015*					0.0008			
	(0.0006)					(0.0007)			
DVN	−0.0004**						0.0004**		
	(0.0002)						(0.0002)		
MRO	0.0005						0.0001		
	(0.0003)						−0.0004		
F	−0.0016*							−0.0019*	
	(0.0006)							(0.0006)	
LVS	0.0010**							0.0007**	
	(0.0003)							(0.0004)	
WBA	0.0003**								0.0000
	(0.0001)								(0.0001)
α	0.0013*	0.0001	0.0008	0.0006	0.0007	0.0002*	0.0002	0.0010	0.0005
	(0.0006)	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
β	0.0000*	0.0001*	0.0001*	0.0001*	0.0001*	0.0001*	0.0001*	0.0001*	0.0001*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	228	228	228	228	228	228	228	228	228
Number of Companies in Sector	95	3	7	13	12	21	13	8	11

Note: * and ** denotes statistical significance at 5% and 10% levels, respectively.

Company has a reducing impact while LVS increase the volatility. Both companies have similar effect within the volatility of the sector.

The results of the estimates show significance evidence that the market volatility is impacted by some specific companies. Most of these companies significantly reduce the volatility. We interpret these results as higher short selling activities reduce the uncertainties in the market.

Tab. 2: DCC GARCH Estimates for the Holiday Effect on the Market Volatility

Companies	**NYSE US 100 Index**	**from 01.11.2017 to 23.12.2007**	**from 02.01.2018 to 25.05.2018**	**from 29.05.2018 to 03.07.2018**	**from 05.07.2018 to 28.09.2018**
SO	0.0002	0.0009*	0.0012	−0.0022	0.0001
	(0.0003)	(0.0004)	(0.0011)	(0.0024)	(0.0003)
AA	−0.0006*	−0.0003	−0.0005**	0.0024*	−0.0005*
	(0.0002)	(0.0004)	(0.0005)	(0.0011)	(0.0002)
FCX	−0.0007**	0.0004	−0.0007*	−0.0049*	−0.0006**
	(0.0003)	(0.0006)	(0.0005)	(0.0019)	(0.0005)
UNP	0.0003**	0.0002*	−0.0003	0.0017	0.0002
	(0.0001)	(0.0001)	(0.0003)	(0.0013)	(0.0003)
DHR	0.0002**	−0.0001	0.0002*	0.0012**	0.0000
	(0.0001)	(0.0002)	(0.0001)	(0.0008)	(0.0005)
MDT	−0.0003	−0.0002	−0.0006	−0.0013	0.0002
	(0.0002)	(0.0002)	(0.0003)	(0.0010)	(0.0003)
ALL	0.0001	0.0002**	−0.0010	0.0006*	0.0004*
	(0.0001)	(0.0001)	(0.0003)	(0.0003)	(0.0001)
BRK−B	−0.0015**	0.0021*	−0.0030*	0.0010	0.0010**
	(0.0007)	(0.0008)	(0.0016)	(0.0020)	(0.0006)
MA	0.0008**	−0.0008	0.0035*	0.0005	0.0014**
	(0.0005)	(0.0005)	(0.0012)	(0.0011)	(0.0006)
PNC	−0.0006	−0.0015*	−0.0002*	0.0011	−0.0002*
	(0.0002)	(0.0003)	(0.0006)	(0.0012)	(0.0003)
PRU	−0.0005*	0.0003*	−0.0003*	0.0003	0.0000
	(0.0002)	(0.0001)	(0.0003)	(0.0007)	(0.0004)
SPG	−0.0002*	−0.0001	−0.0001*	−0.0001*	−0.0011*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0006)
USB	−0.0005**	−0.0002	−0.0009**	0.0004	0.0005
	(0.0002)	(0.0002)	(0.0006)	(0.0004)	(0.0007)
V	0.0015*	−0.0004	0.0008	0.0023	−0.0002
	(0.0006)	(0.0007)	(0.0010)	(0.0019)	(0.0008)
DVN	−0.0004**	−0.0021*	−0.0004**	0.0004	0.0000
	(0.0002)	(0.0005)	(0.0003)	(0.0011)	(0.0004)
MRO	0.0005	−0.0001	0.0005	0.0019	0.0009
	(0.0003)	(0.0003)	(0.0005)	(0.0020)	(0.0006)
F	−0.0016*	0.0003	−0.0014*	−0.0128*	−0.0010*
	(0.0006)	(0.0009)	(0.0009)	(0.0039)	(0.0006)
LVS	0.0010**	0.0007**	0.0020*	−0.0015	0.0000
	(0.0003)	(0.0004)	(0.0006)	(0.0015)	(0.0003)
WBA	0.0003**	0.0007**	0.0000	0.0005**	0.0011**
	(0.0001)	(0.0002)	(0.0002)	(0.0002)	(0.00003)
α	0.0013*	0.0011*	0.0019**	−0.0015	0.0003
	(0.0006)	(0.0005)	(0.0012)	(0.0015)	(0.0006)
β	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	228	40	91	26	60

Note: * and ** denotes statistical signifincance at 5% and 10% respectively.

4.1 Robustness Analysis

We run a robustness analysis to confirm the effect of short selling activities of the various sectors of the market. We divide our data in 4 distinct time periods (Period 1: 01/11/2017–23/12/2017; Period 2: 02/01/2018–25/05/2018; Period 3: 29/05/2018–03/07/2018; Period 4:

05/07/2018–28/09/2018). These periods are selected based on 3 important market holidays where the NYSE is closed for activities. The dates; 01/01/2018, 28/05/2018 and 04/07/2018 represent the New Year's Day, Memorial Day and Independence Day. The holiday effect has widely studied in literature with many researchers concluding of investors achieve significant abnormal returns on day prior to the holiday and around the holiday (Gama and Vieira, 2013; Casado et al., 2013).

The estimates for the various periods are consistent with our results that some specific firms affect the volatility of the market. While the firms in Period 1 indicate the increase in market volatility, firms in periods 2, 3 and 4 show a significant effect of short selling activities decreasing volatility. We interpret these results as short selling reducing the risk of investors during holiday periods which can results in abnormal returns on investments.

5 DISCUSSION AND CONCLUSIONS

This paper investigates the impact of short selling activities of stocks on a single index (NYSE US 100 Index) in the US market using DCC GARCH model proposed by Engle (2002) and focuses on the impact of the various sectors. The results of the DCC-GARCH estimates indicates just about 15.97% of firms directly affect the volatility of the market which is dominated by the financial sector. We find evidence that investments in specific companies listed on the NYSE US 100 Index decrease the volatility of the market. The sector analysis shows the technology and communication sector have no effects on the market, while the utility sector has an insignificant impact.

The industry and consumer staples sectors estimate show weak positive impact on the market by increasing the volatility. The financial, materials, health care, energy and consumer discretionary sectors estimates show a strong significant negative impact of the market. Short selling activities of these sectors reduce the market volatility. These results are consistent with literature (Sobacı et al., 2014; Cáceres et al., 2015) who conclude short selling activities is associated with decreased market volatility These results show short selling reduces the risk on investments which can lead to higher returns.

The sector analysis also indicates portfolio managers may achieve higher returns by investing in the market rather than creating portfolio within sectors. The implication of our results is that investors can use short selling as a hedging tool to reduce their risk exposure (Bianchi and Drew, 2012). Portfolio managers can also increase their short positions in the identified specific firms that reduce market volatility in their portfolios. In so doing, the investors are expected to achieve higher returns with minimal risk.

The findings of this paper include implications for the regulatory bodies. The results show the need for closer monitoring of short selling activities on sector to sector basis. This will give the regulators informed knowledge of how the activities of short selling in the sectors affect the market volatility. This may lead to specific regulations on short selling on the sectors.

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8 ANNEX

Tab. 3: Descriptive Statistics

Company	Ticker	Observ.	Mean	Standard Deviation	Skweness	Kurtosis
NYSE US 100 Index	NYSE US 100	228	0.0004	0.0080	−1.5701	7.0167
Alcoa Corporation	AA	228	0.5369	1.9180	4.6398	30.6408
Abbott Laboratories	ABT	228	0.3889	1.4158	4.1058	26.7986
Allergen Plc	AGN	228	0.8846	7.0292	14.1107	209.6982
American Int. Group Inc	AIG	228	0.9734	3.7736	8.0074	87.0814
The Allsate Corporation	ALL	228	1.3515	4.5443	5.3011	37.3938
Apache Corporation	APA	228	0.6245	2.2598	4.4820	27.0461
American Express Company	AXP	228	0.6846	2.7965	6.5989	58.2335
The Boeing Company	BA	228	0.2325	0.8862	2.2958	8.2884
Bank of America Corporation	BAC	228	0.1391	0.7173	4.6903	35.9234
Baxter Int. Inc.	BAX	228	1.1379	4.0505	5.3619	36.3035
Franklin Resources Inc.	BEN	228	1.4121	4.4205	5.1403	34.7487
Baker Hughes, a GE Comp.	BHGE	228	2.1770	6.8890	4.8149	29.2364
Bank of New York Mellon Corp.	BK	228	1.1482	4.4860	8.8064	103.0218
Bristol-Myers Squibb Comp.	BMY	228	0.9431	3.5654	6.7857	63.7279
Berkshire Hathaway Inc.	BRK-B	228	0.1775	0.7284	1.7689	4.1321
Citigroup Inc.	C	228	0.1774	0.7135	1.8681	6.4646
Caterpillar Inc.	CAT	228	0.2926	1.2894	5.2704	41.1698
Carnival Corp. and Plc	CCL	228	1.5068	5.1807	5.4310	37.5457
Colgate-Palmolive Comp.	CL	228	0.6071	2.6332	8.4144	94.4828
ConocoPhillips Comp.	COP	228	0.4247	1.4258	3.7604	24.2763
CVS Health Corporation	CVS	228	0.4750	1.9699	4.9242	31.6639
Chevron Corporation	CVX	228	0.2587	0.9566	2.5798	11.4795
Dominion Energy Inc	D	228	0.6042	2.5280	5.2735	35.0977
Deere & Company	DE	228	0.5817	2.0292	4.8663	33.6324
Danaher Corporation	DHR	228	1.2928	7.0014	12.2490	171.0975
The Walt Disney Company	DIS	228	0.4764	1.6033	2.9833	10.7316
Devon Energy Corporation	DVN	228	0.5446	2.2615	7.4144	78.9532
DowDuPont Inc	DWDP	228	0.3272	1.4622	5.5482	40.4393

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Company	Ticker	Observ.	Mean	Standard Deviation	Skweness	Kurtosis
Emerson Electric Co.	EMR	228	0.4803	1.4509	2.5175	9.0955
Exelon Corporation	EXC	228	0.6346	2.3332	6.6071	65.1775
Ford Motor Company	F	228	0.2027	0.8076	2.2358	7.9205
Freeport-McMoRan Inc.	FCX	228	0.3370	1.3267	4.6997	35.6298
FedEx Corporation	FDX	228	0.3590	1.1608	2.1338	5.7998
General Dynamics Corp.	GD	228	0.7499	2.5196	3.8844	18.8370
General Electric Company	GE	228	0.2056	0.9147	3.4481	17.6822
General Mills Inc.	GIS	228	1.0489	6.5228	10.7920	133.7067
Corning Incoporated	GLW	228	0.7764	2.5720	4.1948	23.2962
The Goldman Sachs Gp. Inc.	GS	228	0.2942	1.1780	3.1931	13.1642
Halliburton Company	HAL	228	0.5320	1.8499	3.6611	17.0124
The Home Depot Inc	HD	228	0.2546	0.9474	2.3399	8.2559
The Hartford Financial Serv. Gp. Inc	HIG	228	4.9213	30.0093	12.7951	181.1323
Honeywell Int. Inc.	HON	228	0.4577	1.6132	3.5479	16.1143
HP Inc.	HPQ	228	0.6467	2.7417	7.6981	81.1854
International Business Machines Inc.	IBM	228	0.4355	1.9897	6.1912	47.4994
Illinois Tool Works Inc.	ITW	228	0.7481	2.3411	3.2708	13.5643
Johnson & Johnson	JNJ	228	0.3163	1.6948	8.2404	87.0857
JPMorgan Chase & Co.	JPM	228	0.1793	0.8054	4.1604	33.5679
Kimberly-Clark Corp.	KMB	228	1.0067	4.4536	10.1645	128.6628
The Coca-Cola Comp.	KO	228	0.3528	2.0394	11.0653	148.5944
Eli Lilly & Company	LLY	228	1.4756	7.9620	10.4659	128.3707
Lockhead Martin Corp.	LMT	228	0.5486	2.1227	6.4006	61.0188
Lowe's Companies Inc.	LOW	228	1.0057	5.5972	11.8312	162.2424
Las Vegas Sands Corp.	LVS	228	0.4280	1.4578	3.2543	14.6972
Mastercard Incorporated	MA	228	0.2637	1.0827	3.2435	14.0641
McDonald's Corporation	MCD	228	0.3733	1.3201	3.2586	16.5784
Medtronic Plc	MDT	228	0.6816	2.3666	4.1833	23.3725
Metlife Inc.	MET	228	0.6079	2.3375	5.1764	34.1693
3M Company	MMM	228	0.5496	2.4588	6.7302	55.7211
Altria Group Inc.	MO	228	0.4795	1.6395	3.4215	15.0424
Merck & Co. Inc.	MRK	228	0.4262	1.5699	3.7837	19.2646
Marathon Oil Corporation	MRO	228	0.4664	1.5105	3.1944	14.0376
Newmont Goldcorp Corp.	NEM	228	0.3833	1.3325	3.2491	15.3863
Morgan Stanley	MS	228	0.6023	2.5606	6.8809	61.9066
NIKE Inc.	NKE	228	0.4904	1.9572	6.7376	68.7425
National Oilwell Varco Inc.	NOV	228	1.7107	5.6369	4.9545	31.4586
Occidental Petroleum Corp.	OXY	228	0.6639	2.0228	3.1094	12.3648
PepsiCo Inc	PEP	228	0.4746	1.7568	5.7040	51.8705
Pfizer Inc.	PFE	228	0.2658	0.9673	2.2473	7.0353
The Procter & Gamble Comp.	PG	228	0.2107	0.9664	4.0460	25.9584
Phillip Morris Int. Inc	PM	228	0.8479	4.2294	9.7834	118.6667
The PNC Financial Serv. Gp. Inc.	PNC	228	0.8002	2.6910	6.1058	55.5829

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Company	Ticker	Observ.	Mean	Standard Deviation	Skweness	Kurtosis
Prudential Financial Inc.	PRU	228	0.8393	3.3744	7.0599	64.8173
Parxair Inc	PX	228	1.5967	7.7090	10.6377	135.3735
Transocean Ltd	RIG	228	0.4539	1.6658	3.8882	19.6857
Southern Copper Corp.	SCCO	228	7.7544	89.4463	14.8863	225.6449
Schlumberger Limited	SLB	228	0.3963	2.3047	11.0576	147.2325
The Southern Company	SO	228	0.3508	1.4947	6.6216	67.4193
Simon Property Gp. Inc.	SPG	228	1.5911	6.5436	6.3743	47.6210
AT&T Inc.	T	228	0.2440	1.1947	5.1862	38.6297
Target Corporation	TGT	228	1.1136	7.4573	13.4661	196.1881
The Travelers Companies Inc.	TRV	228	14.5316	206.4652	14.9941	227.8767
Texas Instruments Incorporated	TXN	228	0.5456	2.0935	4.8437	31.9162
UnitedHealth Group Incorporated	UNH	228	0.3475	1.4912	5.0394	34.1646
Union Pacific Corporation	UNP	228	0.9456	3.6617	6.8243	59.2131
United Parcel Services Inc.	UPS	228	0.4944	1.9285	5.2898	40.7156
U. S. Bancorp	USB	228	0.5314	2.0446	5.2454	38.8063
United Technologies Corp.	UTX	228	0.6025	2.1980	4.0998	21.7327
Visa Inc.	V	228	0.2111	0.8914	3.0551	15.1551
Valero Energy Corp.	VLO	228	0.3965	1.4635	3.4111	16.8235
Verizon Communications Inc.	VZ	228	0.2101	1.0384	5.6211	48.6167
Walgreens Boots Alliance Inc.	WBA	228	0.9621	3.6803	5.3788	34.6242
Well Fargo & Company	WFC	228	0.5124	1.9614	4.1591	20.4456
Walmart Inc.	WMT	228	0.4184	1.9514	5.8811	44.7787
Exxon Mobil Corporation	XOM	228	0.2159	0.9073	3.2684	15.6107
YUM Brands Inc.	YUM	228	1.8752	7.8740	7.0996	61.6398

AUTHOR'S ADDRESS

Kwaku Boafo Baidoo, Department of Finance, Faculty of Business and Economics, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic, e-mail: xbaidoo@mendelu.cz