The Examination Of The Volkswagen Emission Scandal's Impact On The Stock Price Movements

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Abstract

In this study, the price movements of Volkswagen Company's shares traded in Deutscher Aktienindex (DAX) have been studied on the course of before, after and the emergence of the Volkswagen emission scandal. In addition to analysis of price movements of the Volkswagen company, Dogus Automotive's, makes Volkswagen Company's distributor in Turkey, shares traded in the Turkish National Index have been analyzed. In the study, the price movements of the Volkswagen and Dogus Automotive stocks have been examined by using case study methodology in the process of emission scandal. In the case study method, the event window consists of the pre-event and post-event 20 business days together with the event day. To estimate the ordinary returns of the Volkswagen's and Dogus Automotive's shares, the market model has been utilized. The data used in the market model consist of 5 years, from January 2010 to May 2015 when emission scandal obviously publicized, daily closing price. The significance of the differences between estimated returns and realized returns, in other words, abnormal returns have been tested by using t-statistics. As a result, the process of the Volkswagen emission scandal shows that investors reflect the bad news announcements, potential financial distress such as compensation obligations, in other words, developments that will put the company in trouble to stock prices.

Keywords: Finance, Financial Distress, Event Study Methodology, Emission Scandal

Introduction

The possible results of the legal process, faced by the companies, such as bankruptcy proceedings, claims for compensations in terms of litigant party and defendant party and within this context, the effects of such legal process on the stock prices have become a major issue attracting the researchers' attention in recent years. The reaction of the market to the legal

processes such as an action for damages, bankruptcy cases can lead to a significant effect on the firm value. Huge firm value losses can emerge from the decisions taken by the courts. However, prospects for a compromise between the parties can reverse this effect. Together with this situation, all the studies about the impact that the outcomes of this legal process is not yet sufficient.

Firm value varies depending on the present value of future expected cash flows. The value of the equity and the debt can also arise from the result of the allocation of a certain percentage of this cash flow. In this context, the unmarketable rights like bankruptcy costs and the compensations have the meaning of the transfer value from the marketable rights such as debt and equity. Within the framework of the value maximization's objectives, the executives keep these transferred rights at the lowest level and be involved in the activities that maximize the securities of the company. The pricing of securities representing the equity, the market value arises from expectations regarding the impact of the transfer of such rights. Various legal events such as litigation, court decisions provide an information to the market about future compensation obligations that court ruled or expected value of the payments which is reached an agreement on. When these payments are at a significant level for the company, the litigations affect the systematic risk of the firm thereby affect the company. If the lawsuit course is ended up unexpectedly, the market changes the expectations about the expected value of the payments and this changing process actualizes expeditiously (Fields, 1990;145-146).

There are various reasons giving rise to value loss experienced in the litigation process. The size of the legal fees related to litigation, transaction costs, conducting the lawsuit and the behavioral reasons can be counted among these reasons. The hypothesis of the transaction costs has an importance within these reasons. Businesses enter into many contracts that are both explicit and implicit. According to this hypothesis, the defendant company bears upon additional costs associated with the agency and auditing of the related case. Suppliers, customers, other companies involved in the company's distribution channel and employees less willing to act in tacit agreement and forced to make more costly agreements containing restrictive measures with respect to the defendant firm. In this situation, the company is losing its financial flexibility and the possibility of violating restrictive measures increases. This significantly reduces the likelihood to engage in profitable investment (Fields, 1990;145-147). In this case, that is also called short-term focusing, the company managers have to turn their attention to the short term. In addition to this, the Company may refrain from assessing long-term investment opportunities. In particular, a company facing the uncertainty in the legal process, large compensation payments and in parallel

with the financial distress risk that may occur, will be able to ignore the investment opportunities that can be taken into account in more normal times or in other words when the company is far away from the boredom conditions (Branch, 2002:50). If the court makes a decision on bankruptcy at the end of the legal process, limitations with regard to the activities are starting to emerge more clearly. For example, suppliers are becoming insist on cash payments (Fields, 1990;145-146). If suppliers begin to look their relations with the company as a short-term relationship, the bargaining process which is an appropriate period of time, price and after-sales service, can be reduced (Wruck, 437-438).

In all this framework the effect of the decisions taken in the legal process on the shareholders was investigated in studies carried out up until today. For instance Fields (1990), Cutler and Summers (1988) come to a conclusion that in terms of the defendant and litigant companies, the reaction of the market is asymmetric to the case process. The total loss of the defending party emerged in the legal process is more than litigant party. In this context, Cutler and Summers (1988) calculated the stressful situation emerged after Texaco and Penzoil's Getty Oil buying and the process of the reconstruction costs with the help of excessive increase/decrease in the value of both companies' securities in their case study. In this process, Penzoil was able to get only 682 million $ increase in value, while the decline of the Texaco's market value was 4.1 billion $. This loss represents 32% of the pre-trial value. After the agreement, a part of the total value loss disappeared. At the end of this process, the total value decrease of the right holder is approximately 2 billion $. Cutter and Summers mentioned that there can be two different explanations for the decline and stated that the first explanation is the direct costs paid by the company. But, Cutter and Summers also contended that these costs are very low when to compare the total value loss. As another reason the secondary type costs had an effect on Texaco's profitability was indicated in that study. These costs have increased uncertainty about Texaco's long-term financial capability, made difficult to find credit to firms and distracted the Texaco's executives from their principal occupation. In addition, the lawsuit process has caused to lose more than the amount needed to provide the Penzoil. Cutler and Summers stated that this financial dispute has a significant impact on the productivity of the companies and concluded that as an explanatory of the selection of the capital structure, the financial distress is costly. With respect to this effect, it was indicated in the document filed by Texaco in court for bankruptcy that some suppliers demanded cash payments before doing business or insisted assured (collateral) payments, while others temporarily suspended sending raw material or completely canceled. It was also stated at the end of the document that supplying and getting the funding source became difficult day

by day for Texaco, and this situation brought to a halt the Texaco's operations (Cutler and Summers, 1988;166-170).

Equity investors are adversely affected by the undesirable situation revealed by the process of the court case for the company. Because the defendant company to come to into a more risky situation leads to an effect of increasing the cost of equity. In particular, if the company had difficulty finding a fund, this effect could be greater (Fields, 1990;145-148). Therefore, this situation is reflected in the company's stock prices.

In our study, it has examined the effect of the legal process on the defendant company's and other companies', the official distributor of the related company, stock prices as unlike from the study that examines the price movements of the stock prices by Fields (1990), Cutler and Summers (1988) in terms of defending and litigant companies.

Research Method

In this part of our study, the Volkswagen company imposed sanctions by American and Canadian court and one of the firms that company's distribution company Dogus Automotive were analyzed by using the Event Study Methodology.

The Event Study Methodology was examined in the studies exercised by Boehmer et al. (1991), Strong (1992), Agrawal and Kamakura (1995 Binder (1998). The Event Study Methodology was clarified in detail, especially in the study that carried out by Strong (1992). This methodology examines the impact of the relevant event to company's market performance when an event which is important for the company arise (Benninga, 2008: 371). In addition, the methodology is on the basis of the present value of the discounted cash flow gained by the company (Duso et al., 2010:187). In this methodology, the stock price abnormal returns of the company emerged associated with that company is calculated and examined the abnormal returns and losses of the shareholders (Peterson, 1989: 36). With the help of calculating abnormal returns, the unexpected event that is specific to the company can be gauged (McWilliams and Siegel, 1997: 626). When we look at this aspect that is to say calculating the abnormal returns and employing the market model, the Event Study Methodology is the method that is used frequently in the field of finance and accounting (Peterson, 1989: 36, McWilliams and Siegel, 1997: 626). Especially in the context of the efficient market hypothesis, the unexpected events' impact which is specific to firm on the company's stock price is expected to be on the day and after. In other words, the abnormal returns that take place simultaneously with the relevant event are associated with that event(Im et al., 2001: 104).

Event Study Methodology has comprised three-time windows. These windows are event window, estimation window and post-event window

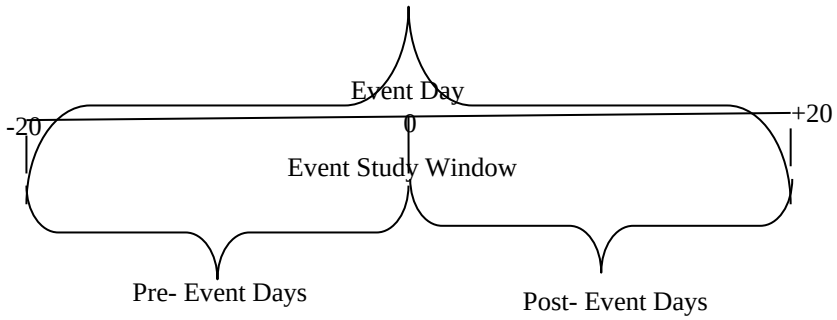
(Benninga, 2008: 371). After specifying the time windows, the Event Study Methodology is exercised in the form of three steps. These relevant steps indicated in the Strong's (1992) study are arrayed below.

❖ Selection of the pre-event and post-event days.

❖ Identification of the model estimating the normal returns and calculation of the abnormal returns and the cumulative abnormal returns with the help of this model.

❖ Measurement the test statistics of the abnormal returns calculated by the market model.

In our study, firstly we specified the event day, pre-event day, post-event day and control period to use for the estimation model calculating the expected, i.e., normal returns. The date when the commission created jointly by the United State and Canada announced that the Volkswagen Group is found guilty is determined as the event day. As the event window, previous and next twenty business days were examined according to the event day. Finally, estimation window was created from January 2010 to May 2015 in the form of daily data. The event window analyzed the pre-event and post-event period together with the event day is shown as below.



After specifying the estimation window, the normal returns, i.e., expected returns were calculated by employing the market model created with the help of daily stock price data covered approximately 5 years. Furthermore, the market model studied by Beaver et al. (1979) was employed in the calculation of the abnormal returns that is the difference between the realized return and expected return. The market model is the regression model that is on the assumption that there is a linear relationship between the related firm and its market index Benninga, 2008: 373, MacKinlay, 1997: 15). For any *i* firm, the market model can be shown below as a mathematical form(Beaver, 1979: 18).

$$\tilde{R}_{it} = \alpha_i + \beta_i \tilde{R}_{mt} + \tilde{\varepsilon}_{it}$$

$\tilde{R}_{it}$ = The calculated return of the stock *i* at time t by utilizing the market model, that is to say, the expected return of the i stock.

$\widetilde{R}_{mt}$ = The return of the index or market used for the calculation of the return of the stock *i* at time t.

α_i = The constant of the model that is used for the calculation of the return of the stock *i*.

β_i = The slope of the model that is used for the calculation of the return of the stock *i*.

$\widetilde{\varepsilon}_{it}$ = The abnormal returns, i.e., the unsystematic return of stock *i*.

It is possible that the abnormal returns calculated for the event window are shown as below (Mackinlay, 1997: 15).

$$AR_{it} = R_{it} - E(R_{it} / X_t)$$

The figures that have taken part above AR_{it}, R_{it}, $E(R_{it} / X_t)$ is abnormal, realized and expected returns of the stock i. In the calculating stage, the returns that are realized returns of the relevant firm before the event day, in other words, the estimation window was utilized. The cumulative abnormal returns were calculated in an attempt to examine the total effect over the course of the event, after calculating the abnormal returns. The cumulative abnormal returns were also calculated for the pre-event days so as to examine whether there is any information leakage about Volkswagen Group before the event -the economic sanction- in the context of Efficient Market Hypothesis. The cumulative abnormal returns were also calculated for the pre-event and post-event period by using a formula that is shown below.

$$CAR_{i,-20,20} = \sum_{\tau=-20}^{\tau=20} AR_{i,\tau}$$

CAR_t = The cumulative abnormal return of the stock i in any day of the event window.

$AR_{i,\tau}$ = The abnormal return of the stock i in any day of the event window.

In conclusion, after calculating the cumulative abnormal returns, the average abnormal returns that are in the related event window were testing with the statistical aspect. Starting on the basis that is the abnormal returns of the stock prices of the both companies that are Volkswagen Group and Dogus Automotive are normally distributed were analyzed the statistical significance of each average abnormal returns of the companies in the event window by employing t-test just like in the studies exercised by Beaver et al. (1979), Binder (1998), Duso et al. (2010) Babacan and Ozer (2013). The statistical significance of the average abnormal returns of the both companies in the event window was shown in the next section.

Outputs Of The Study

Firstly, we utilized the market model in order to calculate abnormal and cumulative abnormal returns of the Volkswagen Group's and Dogus Automotive's stocks in the event window. In the composing of the market model, the daily returns of both companies in the event window were not included. The daily returns for using market model has covered the period starting from January 2010 to May 2015. The market model is on the basis that is the stock prices and its stock market is in the relationship linearly as we explained before in the previous section.

In our study, we carried out a regression analysis between stock returns and market returns so as to calculate the normal and abnormal returns of the Volkswagen Group's and Dogus Automotive's stocks. Prior to regress, the stock returns with the market returns, we employed unit root test both companies' stock returns and their market returns. The aim of employing the unit root test just before the regression analysis is to test the stationeries of both stocks and market indexes. The meaning of the stationary is that the time series's variance and the average are zero, in other words, the time series have a mean - reversion tendency (Bahar, 2006: 142). In the condition that the time series is not stationary, the estimation model for the event window would not unbiased and efficient and the fake regression problem would arise. We used Dickey and Fuller's (1979) and Phillips and Perron's (1988) tests as unit root tests. The unit root tests of the Volkswagen's Group and Dogus Automotive's stock returns and both stock's indexes is shown in the table as below.

Table 1:The Unit Root Tests Of The Volkswagen Group.

Volkswagen Group'un Birim Kök Testleri									
AUGMENTED DİCKEY FULLER					**PHILLIPS-PERRON**				
	Sabit		**Sabit ve Trend**			**Sabit**		**Sabit ve Trend**	
	t-stat	**p-value**	**t-stat**	**p-value**		**t-stat**	**p-value**	**t-stat**	**p-value**
LEVEL					**LEVEL**				
DAX	-34.71642	0.0000	-34.71262	0.0000	**DAX**	-34.67946	0.0000	-34.67731	0.0000
VW	-34.70583	0.0000	-34.69348	0.0000	**VW**	-34.6763	0.0000	-34.66375	0.0000

Table 2:The Unit Root Tests Of The Dogus Automotive and Bist100.

Dogus Otomotiv									
AUGMENTED DİCKEY FULLER					**PHILLIPS-PERRON**				
	Sabit		**Sabit ve Trend**			**Sabit**		**Sabit ve Trend**	
	t-stat	**p-value**	**t-stat**	**p-value**		**t-stat**	**p-value**	**t-stat**	**p-value**
LEVEL					**LEVEL**				
BIST100	-37.80158	0.0000	-37.78756	0.0000	**BIST100**	-37.80512	0.0000	-37.79105	0.0000
DOGUS	-33.64515	0.0000	-33.63398	0.0000	**DOGUS**	-33.63583	0.0000	-33.6246	0.0000

After employing the unit root tests the statistics and probability values were shown in table 1 and table 2. When we look at the statistical

significance of the related statistics, we reject the null hypothesis that there is a unit root in level for both stocks and indexes. In other words, we can say that the Volkswagen Group, Dax, Dogus Automotive and Bist100 series are stationary.

After testing the stationary of both companies and indexes, the output of the regression models created for both stocks is displayed below in table 3 and table 4.

Table 3: The Regression Model Output of The Volkswagen Group.

Volkswagen							
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**Std. Error**	**R-Squared**	**Adj. R-Squared**
DAX	1.05113	0.028167	37.31722	0.0000	0.013083	0.507022	0.506658
C	0.000426	0.000356	1.198177	0.2311			

When we look at the model in table 3 the slope of the regression model that is the coefficient of the Dax is significant at %1 confidence level. The constant of the model is also not significant for all %10, %5 and %1 confidence levels. The explanatory power of the Dax index returns is %50. For this reason, we can say that the explanatory power of the market model is sufficient for the analysis. According to the model that is shown in the above section, the mathematical form of the market model of the Volkswagen Group is taking place below with model's output figures.

$$\tilde{R}_{VW} = 0.000426 + 1.05113 \cdot \tilde{R}_{DAX}$$

Table 4: The Regression Model Output of The Dogus Automotive.

Dogus							
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**Std. Error**	**R-Squared**	**Adj. R-Squared**
BIST100	1.048226	0.037388	28.03643	0.0000	0.020434	0.369895	0.369424
C	0.001098	0.000558	1.966694	0.0494			

When we also look at table 4 the Bist 100 index returns are significant at %1 significance level. In addition to the significance of the coefficient of the Bist 100, when we look at the constant of the model, we can say that the model constant is significant at %10 and %5 significance level but not significant at %1 significance level. We can finally say that for the model the explanatory power is %36. Then we can also say that the explanatory power is enough for the event study analysis. Moreover, the expected return for the Dogus Automotive's stocks is shown as below with model's output figures.

$$\tilde{R}_{Dogus} = 0.001098 + 1.048226 \cdot \tilde{R}_{BIST100}$$

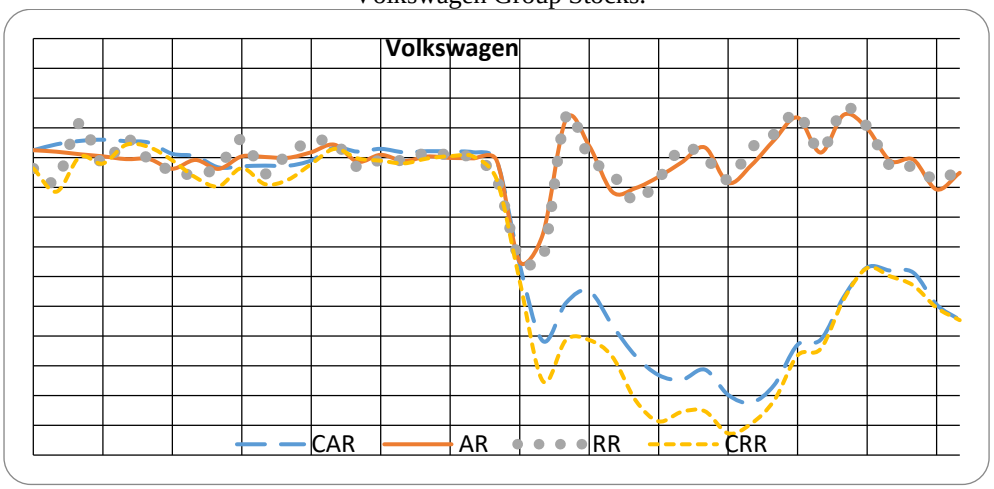
Following the regression model created in order to calculate the abnormal returns of the companies and test this abnormal returns with a statistical aspect, for each event, pre-event and post-event days that is in the event study window the normal returns of the stocks were calculated.

Subsequent to this we subtracted the abnormal returns estimated by employing the market model from actual returns and then calculated the abnormal returns. In addition, we analyzed the statistical significance of the average abnormal returns and cumulative average abnormal returns. The statistical significance of both average abnormal returns and cumulative average abnormal returns were tested by t-test statistics. Also, we use the cumulative abnormal statistics for the reason that we can exhibit the total effect of the Volkswagen emission scandal. Volkswagen and Dogus companies' expected, realized, abnormal and cumulative abnormal returns in the event study window are demonstrated below as tables and graphs.

Table 5: The Abnormal Returns and Statistical Significance Of The Volkswagen Group.

Date	Event Day	Real Return	Expected Return	AR	CRR	CAR
21.08.2015	-20	-0.01814936	-0.030574314	0.011343	-0.01814936	0.012424954
24.08.2015	-19	-0.039090909	-0.049001774	0.007933	-0.057240269	0.022335818
25.08.2015	-18	0.058341217	0.052684922	0.008624	0.001100948	0.027992114
26.08.2015	-17	-0.01102503	-0.013137443	0.001879	-0.009924082	0.030104527
27.08.2015	-16	0.031334739	0.033880503	-0.00049	0.021410657	0.027558763
28.08.2015	-15	-0.003797838	-0.001315419	-0.00214	0.017612819	0.025076343
31.08.2015	-14	-0.02228739	-0.00356172	-0.01849	-0.004674571	0.006350673
01.09.2015	-13	-0.028494301	-0.024561679	-0.00472	-0.033168872	0.002418051
02.09.2015	-12	-0.015128126	0.003834763	-0.01837	-0.048296998	-0.016544838
03.09.2015	-11	0.030721003	0.028648826	0.003871	-0.017575995	-0.01447266
04.09.2015	-10	-0.027068127	-0.028078626	5E-05	-0.044644121	-0.01346216
07.09.2015	-9	0.007502344	0.007815714	0.000472	-0.037141777	-0.01377553
08.09.2015	-8	0.026372944	0.017349336	0.010273	-0.010768832	-0.004751922
09.09.2015	-7	0.025392987	0.003676192	0.022301	0.014624154	0.016964873
10.09.2015	-6	-0.015919811	-0.009029265	-0.00692	-0.001295657	0.010074327
11.09.2015	-5	-0.003894548	-0.008518	0.004614	-0.005190205	0.014697779
14.09.2015	-4	-0.004511278	0.00127533	-0.00532	-0.009701483	0.008911171
15.09.2015	-3	0.0081571	0.006276251	0.002591	-0.001544383	0.01079202
16.09.2015	-2	0.003895715	0.004457963	5.99E-05	0.002351332	0.010229772
17.09.2015	-1	-0.000597015	0.000669583	-0.00083	0.001754317	0.008963173
18.09.2015	0	-0.03614098	-0.031779151	-0.0055	-0.03614098	-0.004361829
21.09.2015	1	-0.171366594	0.003855156	-0.17463	-0.207507574	-0.179583579
22.09.2015	2	-0.16828721	-0.039496508	-0.13031	-0.375794784	-0.308374281
23.09.2015	3	0.069244604	0.005034398	0.06486	-0.30655018	-0.244164075
24.09.2015	4	0	-0.019801371	0.019243	-0.30655018	-0.224362705
25.09.2015	5	-0.028174937	0.0295138	-0.05585	-0.334725117	-0.282051441
28.09.2015	6	-0.073128516	-0.021812733	-0.05197	-0.407853633	-0.333367225
29.09.2015	7	-0.035480859	-0.003248253	-0.03199	-0.443334492	-0.365599831
30.09.2015	8	0.015972894	0.023787905	-0.00625	-0.427361597	-0.373414841
01.10.2015	9	0.000952835	-0.016024632	0.016603	-0.426408762	-0.356437375
02.10.2015	10	-0.037125178	0.005269759	-0.04173	-0.463533941	-0.398832312
05.10.2015	11	0.016312407	0.029223208	-0.01108	-0.447221534	-0.411743113
06.10.2015	12	0.039883268	0.009854779	0.030913	-0.407338265	-0.381714623
07.10.2015	13	0.074836296	0.007598177	0.068013	-0.33250197	-0.314476505
08.10.2015	14	0.011314186	0.002815986	0.00904	-0.321187783	-0.305978305
09.10.2015	15	0.083476764	0.011315896	0.073117	-0.237711019	-0.233817436
12.10.2015	16	0.052025417	0.002844413	0.049725	-0.185685602	-0.184636432
13.10.2015	17	-0.013967535	-0.008611585	-0.00537	-0.199653137	-0.189992383
14.10.2015	18	-0.015313936	-0.011828847	-0.00366	-0.214967073	-0.193477471
15.10.2015	19	-0.037325039	0.01621545	-0.05235	-0.252292112	-0.24701796
16.10.2015	20	-0.021001616	0.004564809	-0.02494	-0.273293727	-0.272584384

Graph 1: The Abnormal, Actual, Cumulative Abnormal, Cumulative Actual Returns Of The Volkswagen Group Stocks.

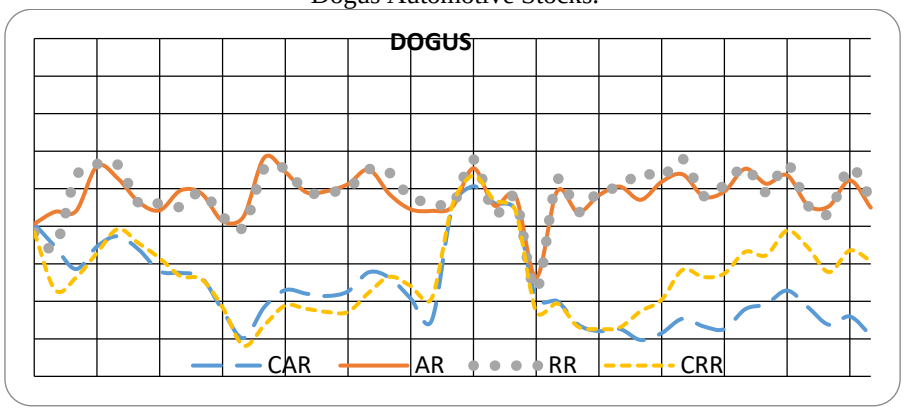


We demonstrated the actual, abnormal, cumulative actual (real) and cumulative abnormal returns of the Volkswagen Group stocks in table 5. In addition to this data, we mentioned previous sentence the statistical significance and t statistics of the average abnormal returns and the cumulative average abnormal returns also takes place. When we look at the datum shown in table 5, we can say that there is no significant decrease prior to the event days in the Volkswagen stock prices, but when we give attention to the post-event days the significant decrease can be observed in that stock. We can clearly see the capital loss of the Volkswagen Group. The Volkswagen Group stocks were not on the significant decline of the event day that is 18th September 2015. The reason why Volkswagen Group stock prices were not on the significant decline on the commission's decision date is the time difference between The United States and Germany. The German National Index (Dax) were not opened When the commission reached a decision for the Volkswagen Group. The first business day after the court decision, the Volkswagen Group stocks sharply decreased up to approximately %17 and the business day after this day the stocks diminished again up to about %9,8. The total amount of the decrease of the Volkswagen shares is about to %23 in two days after the event. In addition to this, Volkswagen shares were not decreased so much before the event days. We can conclude from this situation, there is no information leakage about the court decision. Eventually, we can say that the total decrease of the Volkswagen stock prices reached up to %44,7.

Table 6: The Abnormal Returns and Statistical Significance Of The Volkswagen Group.

Date	Event Day	Real Return	Expected Return	AR	CRR	CAR
21/8/2015	-20	-0.057971014	-0.011310708	-0.046660306	-0.057971014	-0.046660306
24/8/2015	-19	-0.076923077	-0.04622913	-0.030693947	-0.134894091	-0.077354254
25/8/2015	-18	0.016666667	0.046377891	-0.029711224	-0.118227425	-0.107065478
26/8/2015	-17	0.032786885	0.00261238	0.030174506	-0.08544054	-0.076890972
27/8/2015	-16	0.031746032	0.018150347	0.013595685	-0.053694508	-0.063295287
28/8/2015	-15	-0.019230769	-0.001310244	-0.017920526	-0.072925277	-0.081215813
31/8/2015	-14	-0.019607843	0.009085496	-0.028693339	-0.09253312	-0.109909152
1/9/2015	-13	-0.024	-0.021768991	-0.002231009	-0.11653312	-0.112140161
2/9/2015	-12	-0.004098361	0.002329889	-0.006428249	-0.120631481	-0.11856841
3/9/2015	-11	-0.037037037	0.006050652	-0.043087689	-0.157668518	-0.161656099
4/9/2015	-10	-0.051282051	-0.013831588	-0.037450463	-0.208950569	-0.199106562
7/9/2015	-9	0.027027027	-0.01448225	0.041509277	-0.181923542	-0.157597285
8/9/2015	-8	0.026315789	0.003810536	0.022505254	-0.155607753	-0.135092031
9/9/2015	-7	-0.004273504	0.000393138	-0.004666643	-0.159881257	-0.139758674
10/9/2015	-6	-0.004291845	-0.001184989	-0.003106857	-0.164173102	-0.14286553
11/9/2015	-5	0	-0.006133432	0.006133432	-0.164173102	-0.136732099
14/9/2015	-4	0.025862069	0.000342287	0.025519781	-0.138311033	-0.111212317
15/9/2015	-3	0.021008403	0.028647893	-0.00763949	-0.11730263	-0.118851807
16/9/2015	-2	-0.012345679	0.015081013	-0.027426692	-0.129648309	-0.146278498
17/9/2015	-1	-0.016666667	0.012846981	-0.029513648	-0.146314976	-0.175792146
18/9/2015	0	-0.021186441	0.002754207	-0.023940648	-0.021186441	-0.023940648
21/9/2015	1	0.038961039	0.011729326	0.027231713	0.017774598	0.003291065
22/9/2015	2	-0.033333333	-0.010881872	-0.022451462	-0.015558735	-0.019160397
23/9/2015	3	-0.012931034	-0.004262518	-0.008668516	-0.02848977	-0.027828913
28/9/2015	4	-0.135371179	-0.017098879	-0.1182723	-0.163860949	-0.146101213
29/9/2015	5	0.011111111	0.014575745	-0.003464634	-0.152749837	-0.149565846
30/9/2015	6	-0.030969031	0.000361424	-0.031330455	-0.183718868	-0.180896301
1/10/2015	7	-0.003092784	0.00569587	-0.008788653	-0.186811652	-0.189684954
2/10/2015	8	0.002068252	-0.000790977	0.002859229	-0.1847434	-0.186825725
5/10/2015	9	0.021671827	0.036405222	-0.014733396	-0.163071573	-0.201559121
6/10/2015	10	0.015151515	0.005951167	0.009200348	-0.147920058	-0.192358773
7/10/2015	11	0.039800995	0.020629876	0.019171119	-0.108119063	-0.173187653
8/10/2015	12	-0.009569378	0.000603311	-0.010172689	-0.117688441	-0.183360342
9/10/2015	13	0.004830918	0.008479195	-0.003648277	-0.112857523	-0.187008619
12/10/2015	14	0.028846154	0.002224895	0.026621259	-0.084011369	-0.160387361
13/10/2015	15	-0.004672897	-0.011346927	0.00667403	-0.088684266	-0.153713331
14/10/2015	16	0.03286385	0.014764643	0.018099207	-0.055820417	-0.135614124
15/10/2015	17	-0.022727273	-0.000446736	-0.022280537	-0.078547689	-0.157894661
16/10/2015	18	-0.03255814	-0.009213364	-0.023344776	-0.111105829	-0.181239437
19/10/2015	19	0.028846154	0.017806218	0.011039936	-0.082259675	-0.170199501
20/10/2015	20	-0.014018692	0.011114805	-0.025133496	-0.096278367	-0.195332997

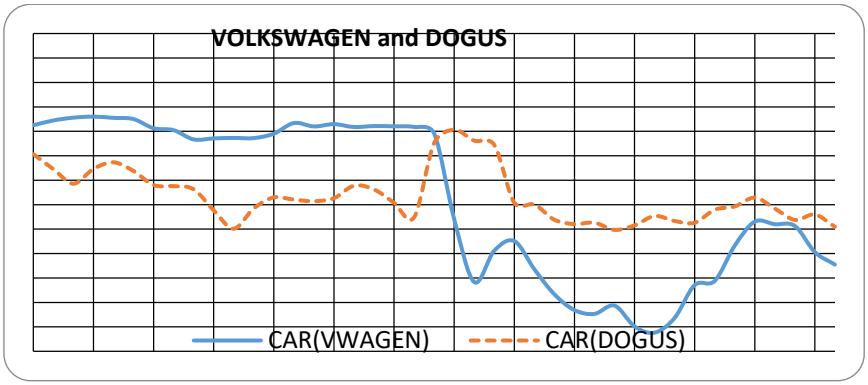
Graph 2: The Abnormal, Actual, Cumulative Abnormal, Cumulative Actual Returns Of The Dogus Automotive Stocks.



When we also look at table 6 we can see the Dogus Automotive's actual, abnormal, cumulative actual and cumulative abnormal returns over the course of the event window. In addition to this, when we analyze the table 6 and the graph 2, we can say that the Dogus Automotive's stocks do not decrease in value. As a matter of fact, the stock prices increase in value, unlike the Volkswagen shares. But the Dogus Automotive stocks decreased in significant value up to the event day. In other words, the Dogus Automotive shares response partially in advance to the event. In addition to this information, the total loss of the Dogus Automotive shares reached up to approximately %18,7. Finally, when we look at this scandal with another point of view, the investors of the Dogus Automotive started to price out the shares previous to Volkswagen investors and this pricing out likely stem from possible supply and future sale problems of the company.

Subsequent to the emergence of the Volkswagen emission scandal, the cumulative abnormal returns exhibiting the total value loss that is observed for both companies is shown as below on the Graph 3.

Graph 3: The Cumulative Abnormal Returns Of The Volkswagen Group and Dogus Automotive.



As it is seen in the Graph 3 the Volkswagen emission scandal was priced out differently by German and Turkish security investors. The Dogus Automotive's stock prices were not a loss in significant value after the event when Volkswagen stock was. Because the Dogus Automotives' investors already priced out of the event as demonstrated in the before graph and table. The total value loss of the Dogus Automotive's stock prices was approximately %18,7 when the total value loss of the Volkswagen Group was %44,7 throughout the event days.

Conclusion

In our study, we observed major losses for both companies. After the publicizing the economic sanctions, the Volkswagen stock investors sold their shares with the thought that the company can be in the financial distress in the near future. Also, the Dogus Automotive investors reflected the possibility of the car supply and the sale problem to related stocks. In addition to outputs and results obtained from this study, the Volkswagen emission scandal can be analyzed and examined with another point of view. The event day and event period can be differently exercised or the expected returns can be estimated by employing another model apart from market model. In this way, the abnormal and cumulative abnormal returns can be calculated more accurately and then the effect of the event can be measured more effectively.

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