Testing the Effect of the Conflict in Georgia in 2008 on Energy Market.

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Abstract

This paper focuses on providing empirical evidence that the conflict in Georgia 08/08/08 had an effect on the worldwide energy market. The idea was inspired by the popular event studies, testing the effects of the conflicts in oil and gas rich countries, where they found out significant aftermath on the stock market.

Using the Event Study approach to detect the influence of the conflict, we failed to support these claims. We compared the returns on energy industry before the event and after the event, made statistical tests on them, but did not find any evidence of our hypothesis to be true.

Contents

Introduction

After the Collapse of the Soviet Union in 1991, 15 countries received the independence, which are Kazakhstan, Lithuania, Latvia, Estonia, Ukraine, Belarus, Moldova, Armenia, Azerbaijan, Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan, Russia and Georgia. It is a well-known fact that Georgia is a strategic region for the supply of energy resources from East to West. Due to good geopolitical position of South Caucasus, it became interesting for international investors all over the world, as it is one of the oldest and richest Oil and Gas producing areas worldwide. Azerbaijan, Georgia and Turkey established the Baku-Tbilisi-Ceyhan Pipeline Company, on first of August 2002 in London. Fuel pumping began on 10 May 2005 and reached Turkey at twenty eights of May 2006. The first delivery took place on fourth of June 2006 with about 600,000 barrels (95,000 m^3) of crude oil. In addition, two other pipelines lie on the territory of Georgia; they are Baku-Supsa Oil pipeline and Baku-Tbilisi-Erzurum Gas pipeline. (Kornely K. Kakachia, 2011)

Figure 1: Map of Oil and Natural Gas pipelines lying in Georgia

Source : downloaded from Wikipedia.org

For the past ten years, Georgia became valuable for energy resources transportation to Europe. Active influence of EU and USA in the Caspian Region has driven to the decrease of the control of Russia in energy industry in the region, by investing in construction of the pipelines bypassing it. This trend caused a loss in benefits for Russians, as Russia has enormous Oil and Gas fields and the fact that Europe is a huge consumer of energy resources from it. Russian "Gazprom" is one of the main suppliers of energy to Europe; Russia exported oil to twenty-one European Countries including Turkey, Germany and United Kingdom.

On Eights of August of 2008, the conflict between Russia and Georgia took place, as Russian military forces invaded the territory of Georgia; it changed the economic situation for 5 days. During the fight in the country, Russian forces destroyed the railway bridge that was important for transportation of the Oil and Gas resources from Azerbaijan. It was a strike on the reputation of Georgia, for being a safe transporter of energy. In addition, the Standard and Poor's agency immediately decreased the rank of Georgia from B+ to B, as well as Fitch

Rating rated Georgia from BB- to BB+, which means that Georgia decreased its position from “positive” to “stable” (European Journal of Economic and Political Studies, Gursoy & Chitadze). This strike gave bad imagination to the international investors.

It is important to know how the regional conflicts in the countries involved into the transit of oil and natural gas affect the situation on the energy prices in terms of the international market. The clash in the Region is an example of the fuel related conflict, and the purpose of this Event Study project is to check the market reaction on the conflict…

Literature Review

During the past century the majority of countries have experienced whether international or internal conflicts, what caused the rise of interest in political and economic studies concerning the issue of economic studies concerning the issue of economic effect of civil conflicts. Christopher Blattman and Edward Miguel (March 2009) conducted an empirical paper researching the influence of regional conflicts on economy of countries and the link of industrial directivity of the country to the origin of the instable situation in particular regions. In addition, one of the important features of their study is that they mentioned the fact that energy is one of the main reasons for the increase of violence in specific regions that are reach in natural resources. Some scientists study the relationship between the factors that lead to the onset of the conflict and its length over time. (Montalvo & Reynal-Querol, 2005). Other writers used event studies of the regions such as Middle East, Venezuela and Yugoslav in different periods for constructing models of the influence of conflict situations on international investments, and found positive reactions between national stock markets and set up of conflicts. Nevertheless, the common feature of these studies is that authors construct the regressions on example of several event studies from different regions, where they use dummy variables that are dependable from the level of economic growth, investment rates, climate and availability of natural resources. Furthermore, it was found that usually the rise of the tensions in places involved in production and transit of oil and gas resources are beneficial for international stockholders, as effect on market is usually positive (David J. Ramberg, 2010).

This article will try to develop the same idea; however, it is pursuing the aim to make the economic aftermath of the conflicts narrower for the analysis, to make the model that will show the influence of war, on example of Georgia on August 2008, on investors' behaviour by analysing the energy portfolio in terms of the world market. The American Stock market (NASDAQ, AMEX, NYSE) show highest correspondence to conflicts, the evidence was found that abnormal returns show positive results, in correspondence of 12 % in the conflicts that were taken into the model (Massimo Guidolin, 2010).
Gerald Schneider and Vera E. Troeger (2006) made a time-series event study analysis. They made a model, which included three different conflicts: Palestine and Israel in GAZA, Iraqi war and wars in Yugoslavia in period from 1990 to 2000. They researched the impact that these wars had on financial market, as they used the daily data from FTSE (London), Dow Jones (New York) and CAC (Paris). Although, they divided the parts of their empirical research on 4 hypothesis:

1) Financial market reacts negatively on conflict if it strongly damages the economy of the country;
2) War rallies when participants of the conflict are obvious;
3) Conflicts influence on increase of volatility of the market;
4) Events linked to conflict have more impact on the stock markets than cooperative events.

The model that they used for their study is – generalized Autoregressive conditional heteroskedasticity (GARCH), not ordinary least square (OLS), because the data that they used in the paper is daily and is high frequent, also the major point is that its variance is time dependent. Their event study model showed that mostly the reaction of the stock market on their chosen conflicts was negative. Conflicts affected stocks volatility more than cooperative events. GARCH and ARCH are efficient for the study, because present results in the model depend on past information and variance of the error varies over time. However, in their study, they used the data from different time-series and the volatility comes in cluster, while in our paper we are analysing only one time series for the event. Apart from that, the war always has some kind of surprise, for example unexpected terrorist attacks, GARCH model is also more efficient than ARCH here, as it allows to test the asymmetric information in the model using T-GARCH and E-GARCH models which they implemented in the research. It helps to improve the accuracy of the results.

Capital Asset pricing model (CAPM), as a tool for financial analysis is one of the most popular models. However, in 1996, Fama and French made a research and proved that CAPM is no longer the efficient model for stock prices analysis. Jeong-Ryeol Kim in 2002 used the same data as Fama and French did, and concluded that CAPM using Markowitz rule of variance of returns and expected returns could still explain the variation of cross-sectional average returns. To check the paper for common trends in prices, they used prices of 30 companies and tested each asset price and integration with DAX (Deutscher Aktieindex). For the normality of the data, they used the Dickey/Fuller test, which means non-stationary under the null, and KPSS test is stationary. Nevertheless, their purpose of the study was to test the possible upgrade of the conventional CAPM model, and conducted that long-run information can be estimated by stable long-run CAPM. They proved empirically that long-run CAPM improves the result of normal CAPM, which followed the rule of Markowitz. This author concluded that CAPM is still useful model for financial data analysis (Kim, 2002).

Data and methodology

This papers data is on the daily stock prices on energy market from NASDAQ, NYSE and AMEX, which daily stock prices are assigned to industry portfolio, based on its Standard Industrial Classification(SIC) (1200-1399-2900-2999 which are Oil, Gas, Coal and their products). The data is downloaded from Kenneth R. French website database, and the period taken for the research is from 01/04/2008 to 19/03/2009. However, as the conflict started on 08/08/2008 and lasted until 13/08/2008, only four days were included into portfolio as 09/08/2008 and 10/08/2008 were not working days. The important point is that we included 150 days before the event, and 150 days after the conflict happened. The software used for analysing the data are "Microsoft Excel".

In the data found, we had a choice between analysing value-weighted returns and equal weighted returns on energy portfolio. In equal weighted performance, each asset counts the same weight with respect to the value of the fund. Equal weighted returns are useful for statistic calculations, but generally, in the most indexes, analysis of value-weighted returns appears more often, the reason is that it also includes the sizes of the properties. The larger volumes in terms of the value have greater impact on the index than small portfolio.

For this paper, we use the Event Study methodology proposed by Chris Brooks in his book Econometrics for Finance (2014). We specified the "event window", it includes four days during which the event occurred: eights, ninth, eleventh, twelfth and thirteenth of August 2008, also we included ten days before the event happened; and 10 days after that (t = -10,-9 …-1, 0, 1… 9, 10, where t=0 is the date of the event).

There is a number of ways to calculate the expected return $E(R_t)$, but for our model we will calculate it by using a sample data before the "event window" so the event itself does not influence the accuracy of estimation of a portfolio over the estimation window$(\overline{R})$. Chris Brooks (2014) found that this approach outperforms some other complicated ways.

We will use the following approaches to conduct the Event Study. The important feature is that we need to see the impact of the event, to separate the aftermath of the conflict from other not needed fluctuations in prices. That is why we need to estimate abnormal returns (AR_t), where we subtract an expected return from the actual return.

$$AR_t = R_t - E(R_t)$$

The hypothesis testing method is based on examining the null hypothesis, meaning that the conflict in Georgia in 2008 did not have any effect on the stock price. We are constructing test statistics of standardized abnormal returns of the energy portfolio during the "event window". These test statistics is normally distributed asymptotically.

$$AR_t \sim N(0, \delta^2(AR_t))$$

($\delta^2(AR_t)$is the variance of abnormal returns)

The variance of $\sigma^2(AR_t)$ we calculate the variance of the residuals from the market

$$\delta^2(\mathrm{AR}_t) = \frac{1}{T-2}\sum_{t=2}^{T} \widehat{U}^2{}_t$$

After that, we calculate test statistic by taking the abnormal return and dividing it by standard error, which is normally distributed asymptotically, because we estimate the variance, and it follows that test statistic is normally distributed as well. Standardized abnormal returns means test statistic.

$$S\hat{A}R_t = \frac{\hat{A}R_t}{\left[\widehat{\delta}(\mathrm{AR}_t)\right]^{1/2}} \sim N(0,1)$$

The next step of our paper will be calculating the cumulative average return, as calculating the test statistic returns it is still hard to see the trend.

$$C\hat{A}R(T_1, T_2) = \sum_{t=T_1}^{T_2} \hat{A}\ R_t$$

Where T_2 and T_1 is a just a sub-set of the "event window", and the variance of it is given by the number of observations in the "event window" plus one, and then multiplied by the daily abnormal return variance

$$\hat{\delta}^2\left(C\hat{A}R(T_1, T_2)\right) = (T_2 - T_2 + 1)\widehat{\sigma}^2(\mathrm{AR}_t)$$

After that, we can calculate a test statistic for the cumulative abnormal return in the same way, which is following asymptotically normal distribution.

$$SC\hat{A}R(T_1, T_2) = \frac{C\hat{A}R(T_1, T_2)}{\left[\hat{\delta}^2\left(C\hat{A}R(T_1, T_2)\right)\right]^{1/2}} \sim N(0,1)$$

It is important for us to test a pre-event and post-event window to know whether there any result of the event. Now we add together the daily returns of the portfolio separately for days from -10 to -1, and from t+1 to t+10, with the date of the event t.

To test with non-normality we will use the non-parametric test. We text the null hypothesis that the proportion of positive abnormal returns are not affected by conflict, with the use of the test statistic (Z_p)

$$Z_p = \frac{[p - p^*]}{[p^*(1 - p^*)/N]^{1/2}}$$

Where p - is the proportion of negative abnormal returns during the event window and p^* - is the expected proportion of negative abnormal returns. It follows a binomial distribution, which can be approximated by the standard normal distribution.

$$SC\hat{A}R(T_1, T_2) = \frac{C\hat{A}R(T_1, T_2)}{\left[\hat{\delta}^2\left(C\hat{A}R(T_1, T_2)\right)\right]^{1/2}} \sim N(0,1)$$

The purpose of our model is to obtain the p-value - a function of observed sample results, to test our hypothesis, that the war affected the energy market. Significance level for our test is

5%. The null hypothesis (H_0) of our test is that the conflict did not affect the prices for stocks, If the p-value happens to be equal or smaller than the significance level, it means that the null hypothesis is not true, and suggests that the H_0 has to be rejected. This leads to assumption that another hypothesis (H_1) is true, which suggests that the conflict had an influence on energy market. Another option of the sequence is that the null hypothesis is true, which means that the result exceeds 5%. It means the reverse situation.

Empirical analysis of the data

Abnormal returns

We start our analysis with calculating expected returns $E(R_t)$ using the returns before the event window (for days from T-150 to T-11), and calculating its $\overline{R}$, which is equal to -0,03964.

Returns are given from for days from -150 to +150. Using expected returns we calculate Abnormal Returns, Using Formulas

$$AR_t = R_t - E(R_t)$$

The estimation period is from day -150 to -10 (150 days), while the event periods examined are (T-10, T-1), 4 days of event T=0, (T+1, T=10) and (T+1, T+250).

The first window gives us an opportunity to examine whether there was any kind of asymmetric information that could influence stocks before the conflict occurred. Immediate effect on the day of the event depends on whether the conflict was a surprise for the market or not. If there was insider information on event to happen on days T=0, then the impact of the war on the market could be erased as it already have affected the prices.

Summary Statistics

After calculating all the abnormal returns for the whole range of time, we find CAR's, using abnormal returns for each day

$$C\hat{A}R(T_1, T_2) = \sum_{t=T_1}^{T_2} \hat{A}\ R_t$$

Next step of our empirical analysis is calculating the variances of abnormal returns, using cumulative abnormal returns that we found in previous step. We do it using the formula for multi-day event windows, the variance of each days abnormal return is multiplied by the number of days in the window, separately for (T-10, T-1), four days T=0, (T+1, T+10), (T+1, T+150)

$$\hat{\delta}^2\left(C\hat{A}R(T_1, T_2)\right) = (T_2 - T_1 + 1)\hat{\sigma}^2(AR_t)$$

$\hat{\delta}^2(Ar_t)$	3,557737

T-10,T-1		T(0)		T+1, T+10		T+1,T+150	
$C\hat{A}R$	-1,52357	$C\hat{A}R$	2,338571	$C\hat{A}R$	4,266429	$C\hat{A}R$	-20,9136
$\hat{\delta}^2(C\hat{A}R)$	39,13511	$\hat{\delta}^2(C\hat{A}R)$	17,78869	$\hat{\delta}^2(C\hat{A}R)$	39,13511	$\hat{\delta}^2(C\hat{A}R)$	537,2183

Now as we know cumulative abnormal returns and their variances for the Energy industry, We need to calculate Test statistics by dividing CAR by its standard deviation

T-10,T-1		T(0)		T+1, T+10		T+1,T+150	
$SC\hat{A}R$	-0,24355	$SC\hat{A}R$	0,554471	$SC\hat{A}R$	0,681995	$SC\hat{A}R$	-0,9023

Eventually, we need to know approximate value of normal distribution, that's why we calculate p-values for our model using the chi-squared test, by implementing TDIST function in Excel, a two-sided test with a large number of degrees of Freedom (for example 10000). For this test, we need to use values of success, which are standardized abnormal returns in this case and total amount of degrees of freedom, which is 10000. We calculated the following result

T-10,T-1		T(0)		T+1, T+10		T+1, T+150	
p-value	0,807633	p-value	0,579381	p-value	0,4954	p-value	0,367113

It is clear now that there is no significant effect on the market before the event from T-10 to T-1 as cumulative abnormal return ($C\hat{A}R$) is at -1,422 % with test statistic equal to -0,218247885. In addition, there are no significant returns for this period. In the period of the war in Georgia no significant returns showed up as well, and the cumulative abnormal returns raised comparing to the short-term window before the event but is still insignificant being equal to 2,3792 % with higher t-statistic 0,541617563. In the post-event window, we see some action, as $C\hat{A}R$ has raised to 4,368 %, and 1,063868879. However in the long-term post-event window we see the fall of the $C\hat{A}R$ and t-statistic.
The null hypothesis here is that the cumulative abnormal return is zero. The reaction of the event on energy market before, after and in the time of the event happened is not visible.

Non-parametric test.
After all, we need to conduct the non-parametric test, Z_p. Nevertheless, before it we need to find the value of p^*- expected proportion of negative abnormal returns, to calculate it we use function "COUNTIF" giving it the range from (T-150, T-11) and setting "<0" to separate negative abnormal returns from positive. In the end, we divide the sum by 140 to find the average. To find p – which is an actual proportion of negative abnormal returns during the event window, we do the same procedure but for the different set of days, we check (T-10, T-1), (T+1, T+10) and (T+1, T+150).

p^*	0,478571

T-10,T-1		T+1, T+10		T+1, T+150	
p	0,6	p	0,5	p	0,513333

The expected proportion of negative returns p^* is equal to 0,478571, while the actual proportion of negative abnormal returns p for the pre-event "window" equal to 0,6, which means that there were negative returns for six out of ten days before the event. While in the post-event "window" negative returns came to the same expected proportion of negative abnormal returns, which is five days out of ten showed abnormal returns. It is obvious that the difference is not significant.
For the non-parametric test Z_p, we use the following formula

$$Z_p = \frac{[p - p^*]}{[p^*(1 - p^*)/N]^{1/2}}$$

T-10,T-1		T+1, T+10		T+1, T+150	
Z_p	0,24308	Z_p	0,042897	Z_p	0,069588

In this section, we need to calculate the p–value using the same function TDIST in Excel, a two-sided test with 10000 degrees of freedom.

T-10,T-1		T+1, T+10		T+1, T+150	
p-value	0,807948	p-value	0,966	p-value	0,945

The purpose of our non-parametric test was to obtain the p-value - a function of observed sample results, to test our hypothesis, that the war affected the energy market. Significance level for our test is 5%. The p-values of our test for the pre-event window, short-run event window and for the long-run event window are significantly bigger than 5%, as p-value for the period (T-10, T-1) is equal to 80,79%, the p-value for (T+1, T+10) is equal to 96,6 % and p-value for the period from (T+1, T+150) is equal to 94,5%. It leads us to conclude that we reject H_1 , which assumes that the war had an effect on the energy market. The result is that the null hypothesis H_0 cannot be rejected, and the conflict in Georgia did not have an effect on the global energy market.

Conclusion

As we mentioned before, Georgia is one of the countries involved in the production and the transit of Gas and Oil from the Caspian Sea to Europe. Supplies of energy resources have stopped for 4 days during August 2008, due to the conflict with Russia. Using the Event Study approach, proposed by Chris Brooks, we tried to investigate the effect of this disruption in energy supply on the world Energy Market. From the Literature Review we found out that conflicts generally have response from the market. While our results show that the parameters of the tests that we have conducted were not significant. This might be attributed to the fact that the amount of supply being channelled through the country was only a small fraction of the amount of oil that was being supplied to Europe at that time. Also, and most importantly, stock markets were on the verge of collapsing during that period and oil prices were already stumbling.

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