

Measuring the Economic Effects of Political Events: War and the U.S. Defense Industry

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Abstract

The authors make use of the Cumulative Prediction Error (CPE) technique to examine the effects of political events in the stock market. The stock price behaviour of sixteen U.S. defense industry firms was examined before and after seventeen unforeseeable political events involving military force. The authors found that significantly positive effects on stock prices appear to occur as a result of military actions. The nature and use of the CPE technique is discussed.

Introduction

Anticipating political events, such as the military actions of foreign powers, is a difficult task at best. Given that the intelligence, diplomatic, and military agencies of governments are fooled with regularity, it stands to reason that individual investors are not in a position to forecast political events with any degree of accuracy. Ultimately, individuals are left with no other option than to be reactive. The effects of any anticipatory activity, in combination with any reactive activity, on the share prices of companies most likely to be affected by military actions of the U.S., former Soviet Union, or their clients is the primary focus of this research.

While military actions, and their effects on U.S. defense stocks have been chosen as the political events of interest here; it is important for the reader to remember that the basic method is of much wider use. The concepts and techniques applied here can be used to study effects of almost any type of event on any variable of interest. Thus, the method is of as much interest for persons interested in the effects of events as is the specific outcome of this study.

Background

The previous research on political events and stock market reaction includes the original work by Niederhofer (1971) who examined the period 1950-1966 using some 432 events. Niederhofer studied the percentage changes in the Dow Jones Industrial Average (DJIA) around (the term "around" is used in the sense of occurring during the time period before and after an event.) these events and concluded the market does adjust to

the informational content of those events and discriminates between good news and bad news. Niederhofer's study included events of all types, such as natural disasters, military actions, legislative acts, election results, and the deaths of prominent individuals. He reported a negative reaction to bad news followed by a positive movement in returns on the DJIA. This change in direction implies that the market overreacts to events which are perceived to be bad, and then must re-adjust in a positive direction.

Reilly and Drzycimski (1973), in their study of economic and political events, observed that much of the price adjustment occurred before the announcement date. They report that a number of the economic events may have been anticipated. They observed the percentage changes in several indices of the market for seven widely-known economic or political events. They reported indications of changes in the indices prior to the event in some cases. They noted that the larger percentage changes occurred during those events where advance information was least likely; i.e. the seizure of the USS Pueblo. Despite these findings they did not speculate as to why this might be the case.

Billingsley, Lamy and Thompson (1987) studied the effects of political events on defense industry stock returns and the market using standard event methodology. Their results showed statistically significant positive returns on defense industry stocks during such events. Concurrently, they observed a statistically negative reaction for the entire market. They reported neither any evidence of the events being anticipated nor that the market or the industry reactions discriminated

among events.

Method

Selection of firms:

The focus of this study is the U.S. defense industry. A sample of 16 firms in the defense industry was chosen. All of the firms in the sample had been listed as providers of military equipment to the Department of Defense during the time period surrounding the events in question. A second criterion was that all of these firms were on the Center for Research on Security Prices (CRSP) daily price tapes during the treatment period. Sample firms and events are listed in Appendix A.

Selection of events:

Seventeen events were chosen which intuitively presented a high likelihood of direct military action by the United States or the former Soviet Union and, thus, might affect returns of companies in the U.S. defense industry. Conditions for inclusion were either the immediate involvement of United States or forces of the former Soviet Union; or their allies in a situation where armed force was initiated. Sample firms and events are listed in Appendix A.

The CPE technique:

The cumulative prediction error (CPE) technique is used in this study. The CPE technique is derived from the cumulative average return method established by Fama, Fisher, Jensen and Roll in 1969 in their seminal article on stock splits. The market model is used to form a univariate estimating equation using 200 days of data before the event window. This equation is then used to generate estimated returns for a 181-day window centered around the event date(s) under examination. Days prior to the event date are given negative values and days following the event date have positive values. The event date proper has the value zero.

Three statistics are generated from the error terms resulting from differencing estimated and actual returns. A cumulative Z-score and cumulative t-score allow for observation of statistically significant changes in returns during the entire 181-day window or portions thereof. Daily t-scores are also generated for examining any statistically significant changes in returns each day during the window and, particularly, around and on the event date. Parametric tests were first suggested by Brown and Warner (1985). A confirmation of the choice of parametric statistics over nonparametric statistics has been reported by Berry, Gallinger, and Henderson (1990). Similar results and observations on cross-sectional clustering were reported by Chandra, Moriarty and Willinger (1990). Typically, the window is parti-

tioned into shorter time spans to observe for evidence of anticipatory actions by investors prior to the event date, or reactions following a particular event.

Reducing the effects of cross-sectional clustering:

Cross-sectional clustering is to be expected in this study as all of the firms in the sample are within one industry. Three variations were used to examine the effect of clustering, as discussed in Brown and Warner (1980, 1985), and the sensitivity of results. The variants are the market model, the mean adjusted return model, and the index adjusted model, as shown in Appendix B. There are two forms of clustering which may be present in an event study. Cross-sectional clustering occurs when firms of like type or industry are used. Event-date clustering is important when different events are closely spaced chronologically. Either form of clustering may cloud the results. Cross-sectional clustering may confound results due to the high correlation of returns within a given industry. Event-date clustering may cloud results because of autocorrelation of closely spaced events.

An analysis for cross-sectional clustering was undertaken for each event individually, using each of the three variants of the CPE method. While the market model and the index model were consistent across all windows, the mean adjusted model tended to give statistically significant results more often, and tended to exhibit greater magnitude. This is, as Brown and Warner (1985) point out, evidence that cross-sectional clustering may be present. As suggested by Jain (1985), a pooled sample method was employed to circumvent possible confounding of the results due to the presence of cross-sectional clustering because the entire sample was from a single industry.

Due to the use of pooled results, the impact of a particular military action is lost. However, confidence in the results concerning the overall effects of military actions is increased. Thus, our results are a general statement as to the effects of military actions on defense stock prices rather than an examination of the effects of a particular action.

Results

There are statistically significant positive results for the defense industry. That is, stock prices for defense firms tend to rise, overall, as a result of military actions. The events, on the whole, appear not to have been anticipated, which was expected. Overall non-anticipation is indicated by the fact that the significant increases appear to occur on or after the date of the event, rather than before. Anticipation may also be indicated by a significantly negative adjustment following the event without a significant positive adjustment in prior

periods; which may indicate an anticipation over time which was too gradual to detect. While there was a negative adjustment following the event date, it is not statistically significant. These results are indicated by the data in the "overall" column of Table 1.

Results are most readily observed by partitioning the event window into smaller segments. In this study the periods of interest were the twenty-one day period surrounding the event, the ten day period prior to the event, the three day period during and immediately following the event, and the nine day period commencing on the second day after the event. These time periods are shown in Table 1 in the column labeled "window." When the events are further partitioned on the basis of direct involvement by the United States, as shown in Table 1 in the "USA" column, or the former Soviet Union as shown in the "USSR" column, further analysis becomes possible.

The most prominent effect on U.S. defense industry stocks was observed for those events involving the former Soviet Union, as shown in the "USSR" column. Actions undertaken by the U.S.S.R. were accompanied by dramatic reactions among U.S. defense industry stocks and entailed significant movements. A very significant positive reaction in returns was observed at the event date. A negative movement of returns followed in the period after the event date. This period of readjustment tends to substantiate the notion that investors may overreact during some types of crises. The results of this study indicate that this is especially true when the former Soviet Union used force.

participant, the results were not statistically significant at the event date with a CPE of 0.0189 and a cumulative Z-score of 0.897. It would appear that the effect is driven by super power participation.

Implications and Conclusions

Confirmation of previous observations:

From a methodological standpoint it would appear that managers and researchers should be mindful of Brown and Warners' cautionary note regarding the use of the adjusted mean return method, as our results confirm that the effects of clustering may well distort the results. However, this variant, used in conjunction with the other models, can be a useful diagnostic tool in detecting otherwise unobservable clustering. While researchers should not rely on the results obtained from the adjusted mean return model, it should continued to be used as a means of detection for clustering.

Billingsley, Lamy and Thompson's (1987) findings with regard to positive significant effects on U.S. defense stocks are confirmed. However, their findings of non-anticipation of such events, while apparently true in the aggregate, do not appear to hold where the U.S. is the main country involved.

Implications:

For the individual events where military force, or the threat thereof, are employed seem to be, on the whole, unforeseeable. This result should surprise no one since

Table 1
Pooled Sample Results

Window (Days)	Overall		USA		USSR	
	CPE	Cum t	CPE	Cum t	CPE	Cum t
-10 to +10	0.1	0.247	-0.8	-0.872	0.0	0.035
-10 to -1	0.4	0.777	0.1	0.195	-1.1	-1.141
0 to +2	0.8	3.055*	0.2	0.592	3.4	6.422*
+2 to +10	-0.4	-0.842	-1.2	-2.105**	-2.9	-3.135*

* indicates significance at the .01 level and ** indicates significance at the .05 level

One very interesting result is observable in the "USA" column of Table 1. While there appear to be no significant changes in U.S. defense industry stocks leading up to or during the event, there is a negative adjustment in prices after the event which is significant at the .05 level. This may indicate a prior anticipation of events where the U.S. is likely to take military action.

For those events where neither super power was a

it is unlikely that individual investors would be privy to the inner workings of general staffs or the Kremlin, much less the now independent former Soviet republics.

Since such political events do come to pass with unfortunate frequency, individuals must take prudent precautionary measures by diversifying into or out of these defense industry stocks so that portfolios will not be adversely affected to a great degree by macro-event

shocks. Perhaps a group of stocks which tend to react contra-cyclically could be found.


Individuals appear to discriminate rapidly concerning military events. Events which have the potential for confrontation or conflict involving either the U.S. or former Soviet military forces tend to be associated with significant positive and negative returns during the crisis.

Suggestions for Future Research

It will be interesting to see if possible conflicts between Russia, and other former Soviet republics, and other countries continue to have the same effects in the future. Another aspect of great interest will also be the effects of any conflicts which might occur between the former Soviet republics.

The recent dramatic changes in the balance of power may affect the way investors perceive political events. There was considerable activity in world financial markets as news of the coup against President Gorbachev broke. The failure of the coup resulted in more activity. While not examined as a part of this research, this reaction appears to have followed the pattern of previous events. If we are on the brink of a unipolar world with a single superpower, the United States, then political events may become less important to investors. On the other hand, in the absence of the great ideological conflict, regional events may achieve greater importance in the eyes of market participants as the possibility of superpower conflict continues to diminish.

Events within and between the several republics which formerly comprised the Soviet Union will be interesting to examine in the future. Presently, the distant events concerning a distant folk do not appear to cause undue concern in the financial markets. The extent to which such events are perceived by individuals to affect the outside world is likely to be the crucial factor in determining market effects.

Further research is needed in all of the above instances. It will be interesting, in the future, to determine if changes in the world's political structure will alter the effects noted herein. 

References

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Appendix A

<i>Sample Firms</i>	<i>Events</i>
Boeing Company	Cuban Missile Crisis
Colt Industries	Gulf of Tonkin Incident
FMC	Raids on Hanoi
General Dynamics	Six-Day War
Grumman Corp.	Pueblo Incident
Litton Industries	Tet Offensive
Lockheed	Czechoslovakia Invasion
Martin Marietta	Mayaguez Incident
McDonnell-Douglas	Embassy Seizure Teheran
Northrop Corp.	Afghanistan Invasion
Olin Corp.	US Rescue Attempt in Iran
Raytheon	South Atlantic War
Rockwell International	Car Bomb US Embassy in Beirut
Sanders Associates	Shoot Down of KAL007
Sunstrand Corp.	Bombing of Marine Barracks in Beirut
Todd Shipyards	Grenada Liberation
	Punitive Action in Libya

Appendix B

The three CPE techniques employed generate excess returns ($e_{j,t}$) in the following manner:

$$\text{Adjusted Mean } e_{j,t} = R_{j,t} - R$$

where:

$R_{j,t}$ is the daily return on security j at day t .

R is the daily average return over the estimation period (-90 to +90).

$$\text{Index Method } e_{j,t} = R_{j,t} - I_t$$

where:

$R_{j,t}$ is the daily return on security j at day t .

I_t is the CRSP equally weighted index for day t .

$$\text{Market Model } e_{j,t} = R_{j,t} - a_j - B_j R_{m,t}$$

where:

$R_{j,t}$ is the daily return on security j at day t .

a and B are the ordinary least squares values.

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