Norges Handelshøyskole

FIN11 Trading and Market Microstructure

FIN11 Term paper

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FIN11 – Trading and Market Microstructure

Prison Stocks - Capitalizing on Inflation, Crime and Political Uncertainty

NHH – Norwegian School of Economics



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Abstract

This paper investigates the potential benefits of investing in prison stocks in response to increased inflation, crime, and political uncertainty. The prison industry and a key player, GEO Group, are introduced, and the effects of inflation and crime on the industry are discussed. The impact of politics on the sustainability and the scale of operations in the prison industry are also examined with a corresponding event study on the impact of past presidential elections. To better understand how investors can capitalize on these factors, a model for predicting future stock prices is presented. In addition, a Discounted Cash Flow analysis is performed to assess the impact of changes in future revenues on stock prices. Furthermore, two strategies for capitalizing on increased crime and political uncertainty are discussed and a reverse iron butterfly spread. Finally, a conclusion is presented, offering different investment strategies.

Contents

1. Introduction **5**

1.1 Motivation *5*

1.2 Purpose *5*

1.3 Structure *5*

1.4 Background *6*

2. The Main Drivers of a Private Prison's Profits **9**

2.1 Inflation and Crime *9*

2.2 Illegal Immigration *11*

2.2.1 Summary of Inflation, Crime, and Illegal immigration 12

2.3 The impact of politics on scale of operation and operational sustainability *12*

2.4 Event Study of the Political Impact on Prison Stocks *13*

2.4.1 Summary of the Impact of Politics 15

3. Model for the Profit of a Prison Stock **16**

3.1 Logic *16*

3.2 A Simplified Prison Profit Predicator Model *16*

3.3 Assumptions in the model *17*

3.4 The number of contracts (X) *18*

3.5 Occupancy rate (Y) *18*

3.6 Summary of the model *19*

4. DCF **20**

4.1 Assumptions *20*

4.2 DCF Results *20*

4.3 Conclusion of DCF *21*

5. Strategies to Capitalize on Increased Crime and Political Uncertainty **21**

5.1 Strategy 1 - Long GEO Group stock and bet on Democratic win on election *21*

5.1.1 Scenario analysis of the Long GEO and Bet on Democratic Victory 24

5.1.2 Weaknesses of Strategy 1 24

5.2 Strategy 2 - The Reverse Iron Butterfly Spread *25*

5.2.1 Constructing the trade 26

5.2.2 Scenario analysis of the Reverse Iron Butterfly Spread on Election Outcomes 27

5.2.3 Weaknesses of Strategy 2 29

6. Limitations **30**

7. Conclusion **31**

8. Bibliography **32**

9. Appendix **36**

Profit Model-DCF Model（from Factors to Share Price） *36*

The Event Study *37*

The Market Model *38*

DCF-model *39*

1. Introduction

1.1 Motivation

"Winter coming", Michael Burry tweeted on the twelfth of August this year (Burry, 2022)Later that week, the investor sold all his stocks except the GEO Group (GEO) (Alaimo, 2022)a company that invests in private prisons and mental health sites. A few weeks later, Burry bets big on prison stocks amidst economic turmoil. In a bold move, the investor increased his position in GEO Group with an additional 1.5 million shares, as well as buying a $7.8 million stake in another "prison stock" CoreCivic (Mandel, 2022). In total, Burry has placed over $25 million in the two prison companies, making it over 60% of his invested portfolio. This paper will investigate why Burry bought these stocks at a time when he is predicting that a recession is coming.

1.2 Purpose

As rising inflation continues to decrease the value of our hard-earned money, more people are resorting to crime to make ends meet. It seems that the world is headed toward a bleak future. However, the situation might benefit some – perhaps private prisons. The thought of benefiting from the incarceration of others may be a frowned-upon endeavor. Nevertheless, it does present an opportunity to capitalize. In light of the above, this paper will attempt to answer the following question:

"How can one capitalize on inflation, crime, and political uncertainty with prison stocks?"

1.3 Structure

After outlining the background, the paper will explore various factors influencing the GEO stock. A proprietary model accounting for various socioeconomic factors will then be presented to predict the stock's future price. Ultimately, the model will be used on two strategies to elaborate on how one can capitalize on the socioeconomic

development in the U.S. Finally, the paper will conclude with a reflection on our findings.

1.4 Background

To understand how "prison stocks" can be attractive in an uncertain economic landscape, one needs to understand the prison industry. In contrast to most other countries, the U.S. prison industry is partly privatized. This entails that private prison companies enter into contractual agreements with governments that commit prisoners, paying the prisons a monthly rate per prisoner (Wikipedia, 2022). As of 2020, private prisons incarcerated ~ 100,000 American residents, representing twenty-six states and 8% of the total state and federal prison population (Buday & Nellis, 2022).

Furthermore, a study by Mukherjee (2014) found that the general cost of housing a prisoner in a public prison is $50,000 annually (Mukherjee, 2014). In comparison, it costs a private prison about $45,000, implying $5,000 in savings per year (Spohn, 2020). Given that the variable costs are the only relevant decision variables, one can assume that the government pays between $45,000-$50,000 annually for each inmate in private prisons. However, state prisons have become more overcrowded, potentially forcing governments to pay a higher fee to private prisons. Though, it is worth noting that the assumption ignores different factors, such as the specific state or jurisdiction and the quality of the services.

This paper will revolve around the *GEO Group, Inc.,* the leading provider of correctional, detention, and community reentry services in the U.S. The company is listed on the NYSE with a market capitalization of $1.3B as of 10.12.22. Furthermore, the company's primary revenue stream is contracts with the government. A quick overview of the revenue breakdown in the U.S. can be shown as follows:

U.S Secure Service	73%
Electronic Monitoring & Supervision	14%
Reentry Services	13%

Although the company's revenue does not solely come from the monthly fee per inmate, all income is linked to the prison industry in some way. Therefore, our paper will not adjust for alternative income streams but assume that all their income comes from their prison activities. GEO Group also has some international business, but we will disregard this to simplify.

Additionally, we can investigate the revenue and profits of the company. This will give insight into the industry, as we can look at the volatility and how stable the incomes are.

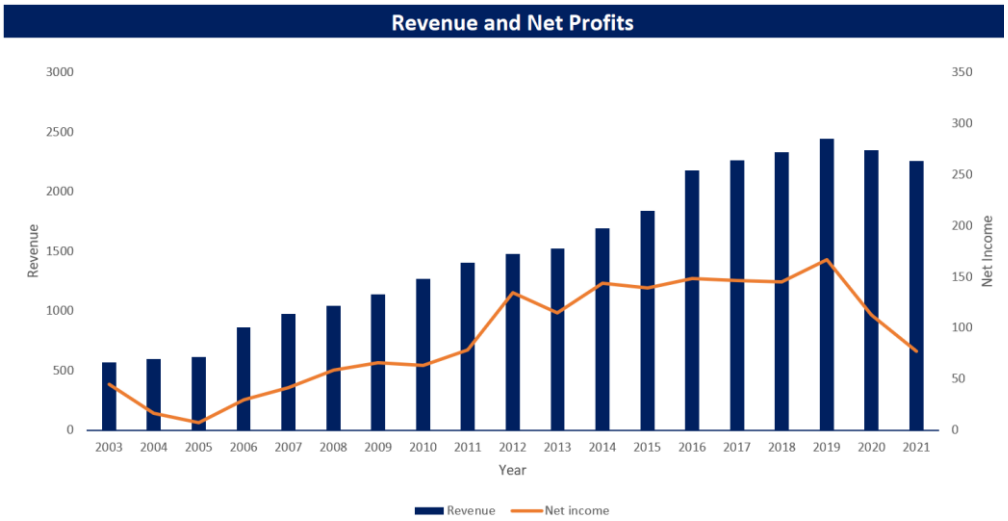


Figure 1: Revenue and Net income from 2003-2021 for GEO Group.

Source: (GEO Group, 2022)

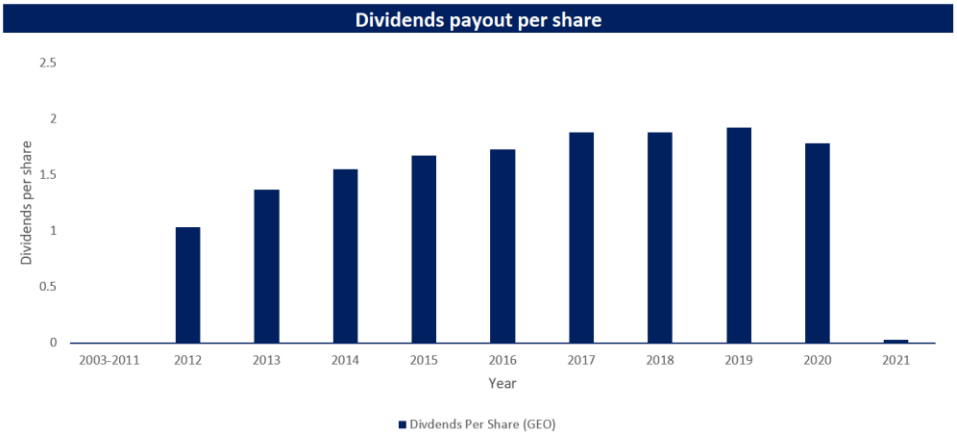


Figure 2: Dividends paid by GEO Group from 2012-2021.

Source: (GEO Group, 2022)

As one can see from Figure 1, the income and profits have been growing steadily. A Cumulative Average Growth Rate (CAGR) of 8% from 2003 shows that there has been some solid growth while still having positive net income every single year. The company has also paid dividends every year since 2012, which makes the growth even more impressive (Figure 2). From Figure 1, it is also visible that the company achieved positive profits and growth during the recession.



The GEO Group Stock Beta

90 days	180 days	2 years	3 years	5 years
0.75	0.8	0.17	0.75	0.66

Figure 3: Development in the stock price of GEO Group from 2000 to 10.12.2022.

Source: Yahoo Finance

Figure 3 above shows a positive correlation between GEO and the S&P 500. This remains true even during significant events such as the financial crises and Covid-19. This entails that Burry's decision to buy the stock was not solely based on hedging against an upcoming recession:

2. The Main Drivers of a Private Prison's Profits

Predicting the future of a private prison stock's profitability is certainly no easy feat. With a wide range of factors to consider, including crime rates, inflation, illegal immigration, and an ever-changing political landscape, the task can be rather intricate. For this reason, the paper will use a self-constructed model that considers these factors to predict the future value of a GEO Group stock.

2.1 Inflation and Crime

Recent studies have indicated that there is a link between inflation and crime. An analysis of 17 cities in the United States found that as inflation increased, so did the rates of homicide, particularly in economically disadvantaged areas (Rosenfeld, Vogel, & McCuddy, 2019). Furthermore, another study using 30 years of cross-country data confirmed this relationship, finding that higher inflation rates also significantly impacted robbery and burglary rates in the United States and several European countries (Rosenfeld C. R., 2014).

As can be observed from the graph below, the U.S. inflation spikes and remains very high between 2021 and 2022, which would indicate crime rates to climb as well. Moreover, because inflation has a lagged effect on crime, today's high inflation levels indicate that future crime rates will increase. Though this is not good for the world, private prison companies may benefit from this situation.

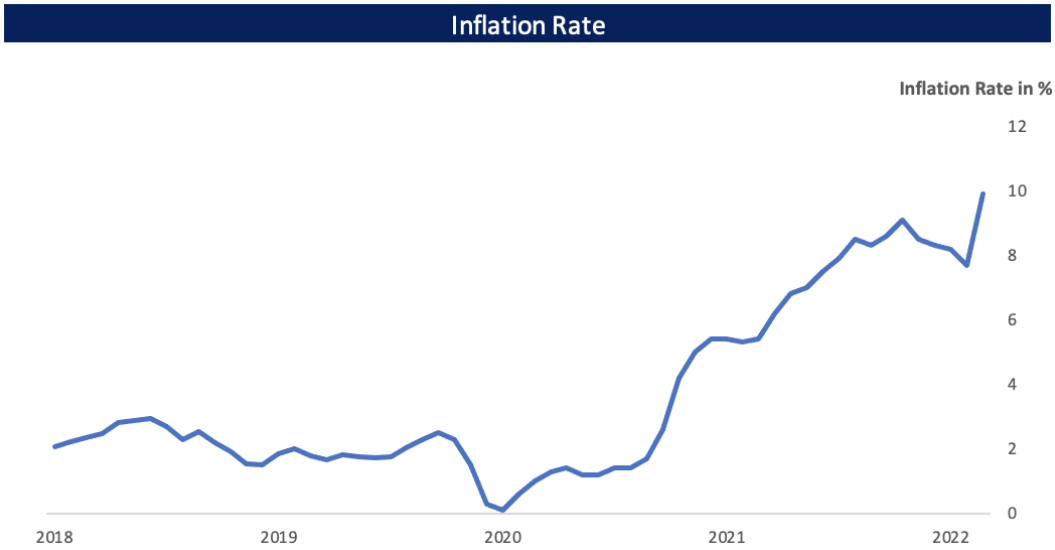


Figure 2: Montly Inflation Rate in the U.S from 2018 to November 2022.

Source: (Statista, 2022)

The inflationary impact on crimes seems to have affected the crime rates already. A recent survey of the U.S. found that overall violent crime rates in major U.S. cities increased by 4.2 percent from January 1st to June 30th, 2022, compared to the same period in 2021 (Contreras, 2022). This included a significant rise in robberies, with an increase of nearly 12 percent, and a 3 percent increase in aggravated assaults (Contreras, 2022).

2.2 Illegal Immigration

The number of undocumented immigrants in the United States has grown in the last year. This can be overserved in Figure below. This increase is partly due to the Democratic Party's relaxation of border controls and dismantling of the border wall (Oliphant & Cerda, 2022). More than a year into the Democratic administration, more than 2.3 million undocumented immigrants entered the United States in the fiscal year from October 2021 to September 2022: the highest number in U.S. history (Miroff, 2022). That is just the number of undocumented people caught by the Border Patrol; many more likely crossed the border undetected.

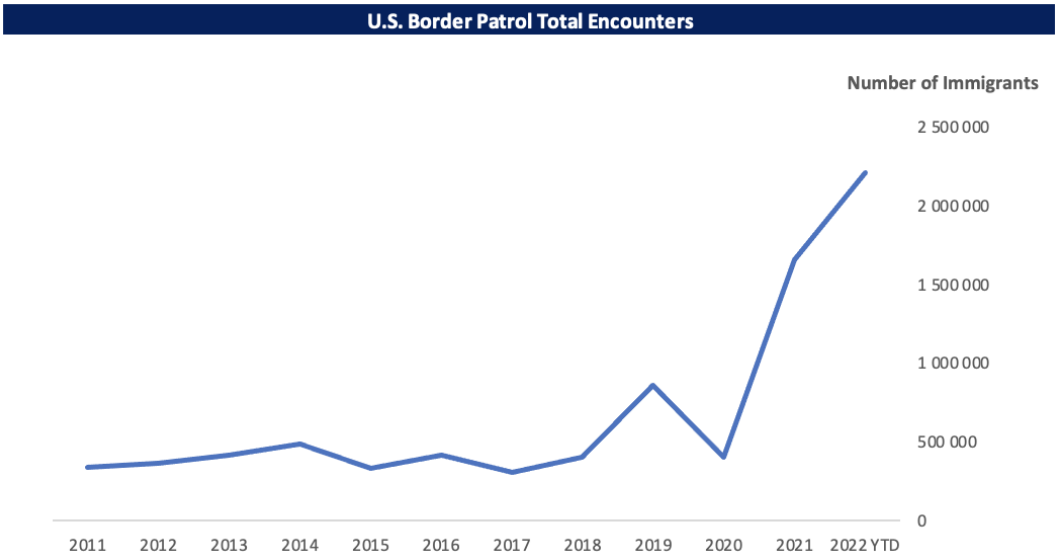


Figure 3: U.S total border patrol encounters from 2011 - YTD 2022.
(U.S. Border Patrol, 2022)

Private prisons have seen significant increases in profits due to the rise in the number of undocumented immigrants. 36 percent of GEO Group's revenues came from Immigration and Customs Enforcement (ICE) in 2021 (GEO Group, 2022). This trend is expected to continue for the duration of their contract with the Department of Justice, and ICE is not included in Biden's executive order to end the federal government's use of private prisons (The White House, 2022).

2.2.1 Summary of Inflation, Crime, and Illegal immigration

Inflation and border deregulation are both currently happening, and it will take time before this is reflected in higher rates. Therefore, though an increase in the number of inmates can be beneficial for private prisons, the impact of rising crime rates on prison profits can also take some time to be realized.

2.3 The impact of politics on scale of operation and operational sustainability

The Biden administration has called for eliminating of all federal government contracts with private prisons. However, Deputy Attorney General Yates has stated that the Department of Justice may adopt a "voluntary termination of existing contracts when they expire" (Zapotosky, 2016). Thus, private prisons will continue to take on large numbers of offenders and profit from them until their contracts with the Department of Justice end. On the other side, since federal contracts with private prisons usually last from three to ten years (GEO Group, 2022), several contracts will expire during Bidens presidential period.

Barack Obama was the first president to take a clear standing against private prisons with his executive order to stop renewing federal contracts at the end of 2015. However, two months later, President Donald Trump won the election and reversed the executive order. As a result, political influence has become an essential factor in the "Prison Stocks", especially in the last two elections. The Democrats want to phase out government contracts with private prisons, while the Republicans support private prisons. If the Republicans win back the U.S. presidency in 2024, it may significantly affect prison stocks. On the other hand, if the Democrats continue to be elected, the sustainability of private prison operations will be at an all-time low.

The graph below reveals some insights about the relationship between presidential elections and the GEO stock. For one, it is clear that the recent elections in 2016 and 2020 had a much more significant impact on the stock than in prior years. Additionally, the stock reacted differently depending on the party that won the election. When the Republicans won in 2016, with Trump in office, the stock price rose, while the Democratic victory in 2020, with Biden, had the opposite effect. These findings shed light on the complex relationship between the GEO Group stock and political events.

2.4 Event Study of the Political Impact on Prison Stocks

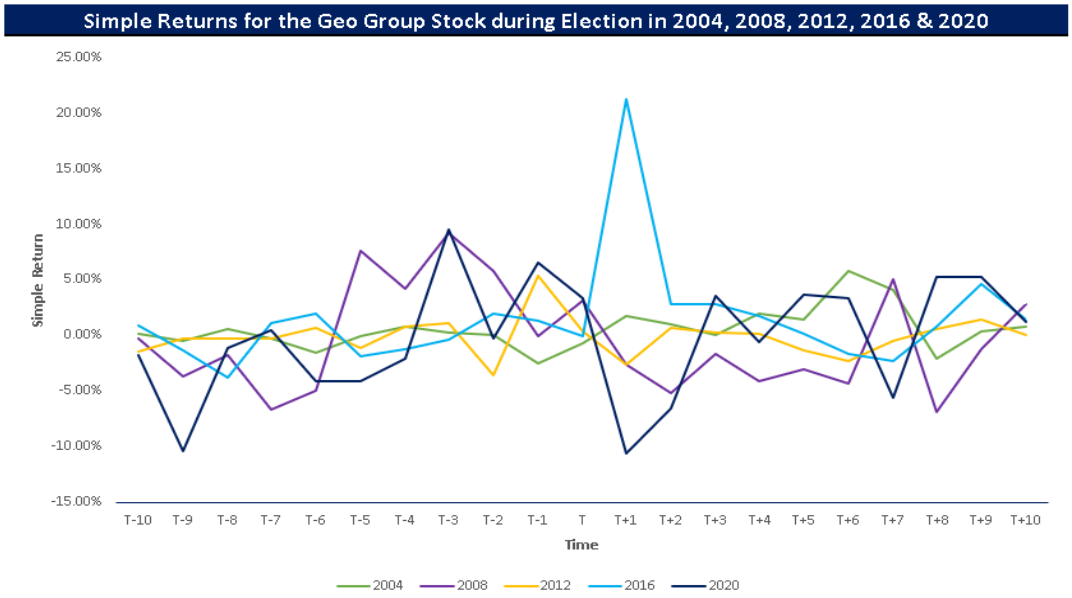


Figure 4: Simple Returns for GEO Group compared to elections in 2004, 2008, 2012, 2016 & 2020.
Source: Yahoo Finance

The following Event Study will measure the political impact of the past five U.S. presidential elections. For this analysis, we have gathered daily stock prices for the S&P 500 and The GEO Group from 2002 to 08-12-2022. To conduct an event study, it is necessary to separate calendar-time and fit it into a so-called event-time. The event-time is made up of three phases: pre-event, event, and post-event. In this analysis, the announcement dates were set to observation 0, and the pre- and post-observations as negative and positive, respectively.

Furthermore, abnormal returns using the market-/index model were calculated. These calculations were used to calculate average abnormal returns (AAR), cumulative abnormal returns (CAR), and cumulative average abnormal returns (CAAR) – to provide more depth to the analysis. Finally, a t-test is conducted to assess the significance of the abnormal returns that have been calculated.

The Geo Group Simple Returns and Abnormal Returns											
	The Geo Group Simple Stock Returns					Abnormal Returns (AR)					AAR
Election	**2004**	**2008**	**2012**	**2016**	**2020**	**2004**	**2008**	**2012**	**2016**	**2020**	
T+10	0.80%	2.81%	0.07%	1.42%	1.17%	0.70%	3.03%	-0.22%	1.33%	1.31%	1.23%
T+9	0.40%	-1.18%	1.43%	4.66%	5.25%	0.17%	-0.82%	1.00%	4.35%	3.34%	1.61%
T+8	-2.10%	-6.86%	0.55%	0.80%	5.29%	-2.12%	-6.50%	0.38%	1.04%	6.35%	-0.17%
T+7	4.05%	5.03%	-0.44%	-2.28%	-5.56%	3.72%	4.43%	-0.61%	-2.60%	-5.35%	-0.08%
T+6	5.77%	-4.29%	-2.27%	-1.63%	3.33%	5.53%	-3.68%	-2.28%	-0.72%	1.86%	0.14%
T+5	1.46%	-3.03%	-1.35%	0.19%	3.69%	1.24%	-2.04%	-1.58%	-0.23%	5.30%	0.54%
T+4	1.99%	-4.06%	0.18%	1.76%	-0.59%	2.28%	-4.78%	0.00%	2.17%	0.75%	0.08%
T+3	0.00%	-1.67%	0.29%	2.79%	3.55%	0.03%	-1.78%	0.32%	4.40%	4.33%	1.46%
T+2	1.00%	-5.19%	0.65%	2.80%	-6.53%	1.15%	-4.09%	0.36%	3.02%	-6.74%	-1.26%
T+1	1.74%	-2.64%	-2.62%	21.27%	-10.55%	1.55%	-3.17%	-4.53%	20.88%	-12.22%	0.50%
T	**-0.71%**	**3.17%**	**0.35%**	**-0.08%**	**3.39%**	**-0.66%**	**2.55%**	**-0.07%**	**-0.08%**	**2.37%**	**0.82%**
T-1	-2.47%	-0.11%	5.40%	1.36%	6.55%	-2.50%	0.23%	5.26%	0.96%	6.53%	2.10%
T-2	0.00%	5.81%	-3.57%	1.95%	-0.23%	-0.02%	5.84%	-3.77%	2.63%	-0.34%	0.87%
T-3	0.30%	9.23%	1.15%	-0.43%	9.49%	0.24%	8.83%	0.64%	0.08%	10.14%	3.99%
T-4	0.75%	4.23%	0.84%	-1.23%	-2.05%	0.75%	3.81%	0.59%	-1.07%	-0.55%	0.70%
T-5	-0.10%	7.56%	-1.15%	-1.84%	-4.06%	0.00%	7.33%	-1.35%	-1.39%	-4.79%	-0.04%
T-6	-1.57%	-4.95%	0.69%	1.96%	-4.11%	-1.53%	-3.92%	0.67%	1.91%	-3.10%	-1.19%
T-7	-0.25%	-6.64%	-0.32%	1.07%	0.45%	-0.27%	-5.05%	-0.61%	1.19%	-0.32%	-1.01%
T-8	0.59%	-1.73%	-0.25%	-3.77%	-1.10%	1.06%	-1.24%	-0.07%	-3.13%	-0.65%	-0.81%
T-9	-0.49%	-3.64%	-0.32%	-1.31%	-10.39%	-0.78%	-3.42%	-0.40%	-0.83%	-9.13%	-2.91%
T-10	0.20%	-0.31%	-1.45%	0.91%	-1.75%	0.54%	-0.27%	-1.80%	1.42%	-2.01%	-0.43%
CAR(1, 52)	31.51%	0.65%	0.28%	63.33%	0.99%	(Cumulative abnormal returns (T+1, T+52))					
CAR(1, 13)	13.01%	-1.81%	-6.41%	37.14%	-0.32%	(Cumulative abnormal returns (T+1, T+13))					
CAR(14, 52)	18.50%	2.45%	6.69%	26.19%	1.31%	(Cumulative abnormal returns (T+14, T+52))					
T-test of AR	**1.21**										

Figure 5: Simple Returns and Abnormal Returns for GEO Grope.

While presidential elections may impact the GEO stock, it is not significant. The average abnormal returns have been tested with both 11-day- and 7-day intervals and compared with the past 246 and 248 observations. In both cases, the absolute value of the T-value is less than the critical value at a 95% confidence interval ($\alpha = 5\%$). Thus, there is not enough evidence to infer that the presidential elections had significant impacts on the stock returns of GEO stock.

t-Test: Two-Sample Assuming Unequal Variances				
	Election	Pre	Election	Pre
Intervals (T,T)	*(-5,5)*	*(-252,-6)*	(-3-3)	(-252,-4)
Mean	0.89%	-0.04%	1.21%	-0.03%
Variance	0.000178375	0.001359436	0.000257	0.000191
Observations	11	247	7	249
Hypothesized Mean Difference	0		0	
df	18		6	
t Stat	**1.999129752**		**2.021182275**	
P(T<=t) one-tail	0.030461657		0.044876654	
t Critical one-tail	1.734063607		1.943180281	
P(T<=t) two-tail	0.060923314		0.089753308	
t Critical two-tail	**2.10092204**		**2.446911851**	

Figure 6: Conducted t-test on the returns on GEO Grope and elections.

It is worth noting that the event study was based on historical evidence. One needs to determine how long this evidence will remain relevant in forecasting similar events. Though the Event Study concludes that there are no significant abnormal returns in light of the election outcomes, the last two elections trigger strong reactions to the stock returns of GEO. This might be due to the Democratic Party's firm stand against Private Prisons in 2015. Lastly, there are not enough observations of election outcomes and GEO stock prices to conduct a complete Event Study without compromising its validity.

2.4.1 Summary of the Impact of Politics

The Biden administration has called for the end of federal contracts with private prisons. This decision may have implications for the revenues of private prisons. Lastly, the Event Study concluded that the elections did not significantly impact the GEO stock price over the last five elections. However, data indicates that the prior two elections have impacted GEO stock, and one should therefore consider this in light of the presidential election in 2024.

3. Model for the Profit of a Prison Stock

3.1 Logic

This paper investigates how to capitalize on increasing inflation, crime, and political uncertainty affecting GEO Group. The paper will develop a model that can predict the future stock price based on changes in these factors.

The first part of the model forms a profit equation, giving us the expected profit for GEO Group based on the mentioned socioeconomic factors. Changes in these factors, for instance, the election result, will give us different estimates for future profits.

The second part of our model is a Discounted Cash Flow analysis (DCF). This gives us an estimated share price based on the company's future profits. By combining these two models, one can estimate the future stock price of GEO based on changes in different factors. This will allow us to use the stock in various investment strategies, including hedging out political risk.

3.2 A Simplified Prison Profit Predicator Model

The market price of a stock is the sum of the intrinsic value of the stock and market noise. Consequently, the intrinsic value of the prison stock depends on its profitability and operational sustainability. Therefore, considering determining the stock price of the prison stocks, a model with a profitability function has been constructed.

$$Profitability = P = X \cdot (mY + gY) \cdot C \cdot UP \cdot Z - C \cdot Y \cdot UVC - FC$$

$X = Number\ of\ contracts$

$Y = Occupancy\ rate$

$mY = Minimum\ Occupancy\ rate$

$gY = Growth\ rate\ of\ Occupancy$

$C = Capacity\ of\ prison$

$UP = Unit\ Price$

$Z = Daily\ rates$

$VC = Variable\ cost$

$UVC = Unit\ Variable\ Cost$

$FC = Fixed\ cost$

To simplify the model, all costs can be gathered into one post, and the projected costs from Bloomberg can be considered as given. The simplified model can then be expressed as:

$$Profitability = P = X \cdot (mY + gY) \cdot C \cdot UP \cdot Z - Cost$$

Where:

X and **gY** are the endogenous variables and **mY**, **C**, **UP**, **Z** and **Cost** are exogenous variables.

3.3 Assumptions in the model

Private prison contracts often feature "minimum occupancy clauses" to guarantee, in many cases, payment for 90 percent occupancy for their facilities (Leacock, 2017). For this reason, the *Occupancy rate* (mY) and the *Daily rates* (Z) can be considered constants (Leacock, 2017). The *Capacity of a prison* (C) facility does not vary with the number of contracts and occupancy rate but by the structural and security-related limitations. Furthermore, *Unit Prices* (UP) can be considered constant as they are given in the contracts and stay constant throughout the contract's duration.

The model above can be deconstructed further to separate the different components of the growth rate of the occupancy rate:

$$P = X \cdot (mY + \delta gC \cdot d) \cdot C \cdot UP \cdot Z - Cost$$

From the equation above, one can see that the growth rate of occupancy, gY, can be

deconstructed to the growth rate of crime multiplied by the degree of the crime committed, implying that the number of crimes and the degree of crimes has a positive correlation with occupancy rates.

3.4 The number of contracts (X)

The number of contracts with the federal and state governments is directly related to the profitability and sustainability of private prison operations. Moreover, the number of contracts is directly related to which party holds the power of the federal and state governments.

The number of contracts can be derived from this equation:

$$X = X_0(1-\lambda)\cdot p(D) + X_0(1-\lambda+\beta)\cdot(1-p(D))$$

$X_0 = \ Contracts\ at\ present$

$\beta = New\ contracts\ signed\ Speed(Yearly)$

$\lambda = Old\ Contracts\ expired\ speed\ (Yearly)$

The final independent variable of X is P(D).

3.5 Occupancy rate (Y)

Occupancy rates consist of minimum occupancy rates and growth in occupancy rates:

$$Y = mY + gY = 90\% + gY\ ,\ 0 < \text{gY} < 10\%$$

$gY\ = \ \Delta\ gI, \Delta > \ 0\ and\ \Delta\ is\ constant$

$gI\ = \ Level\ of\ sentencing \cdot \ Growth\ of\ crime\ rate\ (gC)$

$gY\ = \ Growth\ of\ occupancy\ rate$

$gI\ = \ Growth\ of\ incarceration\ rate$

The final independent variable of Y is **gC**.

The contract establishes a minimum occupancy rate (mY), which averages 90%

(Leacock, 2017). As a result, the federal and state governments, to avoid paying for empty beds, will first meet the demand for incarceration in private prisons and give priority to supplying private prisons with offenders who have prison sentences (McDonald & Pattern, 2004). In addition, because the government does not want to pay too much for non-citizens to be incarcerated, non-citizen offenders, such as illegal immigrants, are also given priority in supplying private prisons (McDonald & Pattern, 2004).

The sentencing level is related to federal courts, state courts, and specific judges and is considered constant for now, given the complexity of the study. However, it is worth noting that this is related to political factors.

3.6 Summary of the model

The model ends up with only two independent variables: gC and P(D). With the latter being the most important variable, as the growth of crime rate (gC) is limited due to the minimum occupancy clause.

4. DCF

4.1 Assumptions

The paper presents a constructed Discounted Cash Flow model (DCF) (see Appendix), which helps to convert changes in future earnings to changes in stock price. To make the DCF, there consequently had to be made many assumptions. In the base case, which is a standard valuation case of the GEO stock, historical numbers are used to estimate future profits. This implies taking the historic data from 2014-2021 (Bloomberg) and using the average over these years to estimate key figures like EBIT margin.

In the DCF, it is assumed a 1% growth rate in perpetuity as well as a discount rate of 8%. The tax rate to be used is 22%. In the base case, a 4% revenue growth is used instead of the 6% average from the historical data. This is because the last two years have been significantly worse for the company, and as the Biden Administration has the power, future revenue does not look to promising.

4.2 DCF Results

The Base case of the DCF model can be shown as follow:

Projecttions								
Revenues	2 257	2 347	2 441	2 538	2 640	2 746	2 855	2 970
COGS		-1 931	-2 008	-2 088	-2 172	-2 259	-2 349	-2 443
EBITDA		416	433	450	468	487	506	526
Depreciation and amortization		-131	-136	-142	-147	-153	-159	-166
EBIT		285	296	308	321	333	347	361
DCF - Simplified								
EBIT		285	296	308	321	333	347	361
Tax		-63	-65	-68	-71	-73	-76	-79
Depreciation and amortization		131	136	142	147	153	159	100
dNWC (assumed to be zero)		0	0	0	0	0	0	0
CAPEX		-65	-100	-100	-100	-100	-100	-100
Free cash flow to the firm		288	267	282	297	313	330	281
Year			1	2	3	4	5	
Discount factor			0,93	0,86	0,79	0,74	0,68	
Present value of free cash flow to the firm		1 181	248	242	236	230	225	4 018
Present value of terminal period		2 735						
Sum NPV		3 915						
Net debt		2021						
Equity value		1 895						
Share price (as of 31.12.2022)		15,64						

Figure 7: Discounted Cash Flow for GEO Group with a FMV share price of 15.64 as of 31.12.2022.

Stock as of 09.12.2022 is USD 11.03.

4.3 Conclusion of DCF

The GEO Group is undervalued based on the Base Case Scenario analysis. However, minor adjustments in some of the inputs make significant differences, especially in the growth rate and discount rate, and therefore **we** cannot make any conclusions based on this.

5. Strategies to Capitalize on Increased Crime and Political Uncertainty

Based on the analysis of the profit drivers of prison stocks and the profit model, two different investing strategies will be explored in detail in the following. One revolves around reducing political influence, while the other profits from large political interventions in the private prison sector.

5.1 Strategy 1 - Long GEO Group stock and bet on Democratic win on election

This strategy consists of going long on The GEO Group stock, while simultaneously bet on a Democratic victory in the coming presidential election on a betting platform. Based on our profit model and the analysis above, the GEO Group stock is driven by two factors, an increase in criminals due to inflation and political elections. The former being less influential on the prison stock price than the latter. However, risk and reward go hand in hand, and since political elections have more uncertainty relative to inflation, this strategy will aim to hedge out political risk.

Political betting involves placing bets on the outcome of political events or elections. As discussed earlier, there are various factors influencing the odds. Therefore, the bookmaker has to continuously adjust the odds based on thorough analysis of the probability of an event. Gamblers will lock in the odds on when the order is placed.

The strategy can be achieved by the following steps:

1. Buy GEO Group stock at the lowest possible price.
2. Place an order on the betting platform (US Presidential Election 2024 - Winning Party) at a time when the Democratic Party odds are high (i.e., the Democratic Party win rate is low) whenever possible and bet on a Democratic victory to hedge political risk. (No fee cost, pro-rata draw).

For the strategy, the timing and volume of purchases in these two asset classes are critical. However, since the strategy is event-driven and there is a relative lack of available historical data, event-related data is taken to adjust the ratio between the timing of purchases and the volume.

	Before	After	Price Growth	Average Price Growth
Republican victory 11/00 - 01/01	1.472	1.639	11.35%	Republican victory 30.865%
Democratic victory 11/08 - 01/09	12.867	12.160	-0.05%	Democratic victory -0.45%
Republican victory 11/16 - 01/17	16.033	24.127	50.48%	
Democratic victory 11/20 - 01/21	9.45	8.94	-0.04%	

From the table above, one can observe that the stock price increased following the past four elections. When the Republicans won the election, the stock price increased by 30.865% on average. Thus, this can be used as the stock price growth assumption for this scenario. Conversely, if the Democrats win, the growth assumption of the stock price is -0.45% based on the average of the past two Democratic victories.

Further relevant information to construct the strategy:

1. GEO stock: The stock price on 09/12/22 was $11.03; Commission is $0.005/share.
2. Betting site: Order unit price: $10; On 10/12/22, the odds of betting on a Democratic win were +2.25 (5/4), which means the betting site assumed a probability of about 44.44% for a Democratic win.

To achieve equal net payout in both electoral outcomes, one needs to determine the ratio between the amount of stocks to invest in GEO and amount to place on the Political bet. The ratio is therefore weighted for an equal return in both scenarios. More formally the Ratio can be written as:

$$Total\ amount\ of\ stocks\ invested\ /\ Total\ amount\ of\ bets\ placed.$$

Based on these known values and profit-based formulas above, we construct a strategy return model for two outcomes; (1) Buy 1000 shares at the $11.03 and (2) Place a bet at the odds 2.25. As we want to find an order size which equals the payout in each scenario, the order would be $\$11.03 \cdot 1000/(100 \cdot Ratio)$.

Long on GEO Group Stock and Bet on Democratic Victory on the Presidential Election											
	The GEO Group Stock					Bet on the Democratic Victory					
	Share	Price	Growth rate	Commission	Income	Volume	Price	Odds	Income	Ratio	Net Income
Republican victory	1000	$11.03	30.865%	$5	$3 399.41	15	$100	0	-$1 535.13	7.18505483	$1 864.28
Democratic victory	1000	$11.03	-0.450%	$5	-$54.64	15	$100	2.25	$1 918.91		$1 864.28
										Difference	$0.00

Figure 8: Example of Strategy 1 - Long on stock price and bet on Democratic win in election.

Assuming that our calculations for the two scenarios are correct, the model determines a ratio between shares and bets of 7.18. With the conditions above remaining unchanged, is betting strategy is equal to approximately 15 bets of $100. Consequently, the net returns of the two scenarios are equal, implying that the returns of the strategy are independent of political risk, regardless of which party that takes Office.

5.1.1 Scenario analysis of the Long GEO and Bet on Democratic Victory

1. The historical data shows that the impact of the Republican Party on GEO stock is not only reflected in the short term. During Trump's presidency, GEO's share price rose to an all-time high of 33.32 per share and stayed up for almost 1,5 years (Yahoo Finance). Therefore, if the Republicans are elected, it could be a strategy to hold GEO stock after the election until the trend turns down.
2. If the Democrats are elected, then the strategy will liquidate its position in GEO stock after the election results while cashing in its betting orders. At this point, we only expect the revenues for private prisons to decrease due to the Democratic stand against private prisons.

In addition, if the strategy user has his own political opinion and has a high-risk appetite and is willing to take political risk, then the user can do so by adjusting the ratio and reconfiguring the order quantity on both sides.

5.1.2 Weaknesses of Strategy 1

This strategy suffers from the assumption that the biggest risk to prison stocks comes from elections. This might not hold in the future, and as shown in the Event Study elections are not necessarily predictive of future performance. Furthermore, factors such as criminal justice policies or economic conditions could also have a considerable impact on the performance of prison stocks.

The strategy uses US stock trading and European betting sites but does not take into account interest rate differences; the revenue growth assumptions are not supported by

sufficient historical data and are not effectively supported by the profit model due to lack of data. Market risk was not hedged out.

5.2 Strategy 2 - The Reverse Iron Butterfly Spread

Instead of betting on the election's outcome, one can bet on the fact that the election will cause the GEO stock to be volatile. The Event Study above concluded that there were no significant abnormal returns, the analysis showed that the past two elections had caused major changes in the stock price of GEO. For this reason, one can invest in the volatility of the stock instead of the direction it is heading. To achieve this, one can apply a strategy called The Reverse Iron Butterfly Spread.

This type of options trading strategy revolves around profiting from volatility in the underlying asset - in the case of The GEO Group stock. Before elaborating on the composition of the trading strategy, we find it necessary to explain some key concepts.

Firstly, this strategy is based upon using *options*, more specifically, *call options,* and *put options*. The former, also referred to as a *call*, gives the holder the right, but not the obligation, to buy a specified quantity of an underlying asset at the strike price within a certain time frame (Scott, 2022). Conversely a put option, *put*, is the opposite.

Furthermore, an option with value is referred to as *in the money* (ITM), while an option without value is called *out of the money* (OTM). When the option’s strike price is the same as the underlying security price, it is *at the money* (ATM).

Moreover, one can write call and put options. Unlike buying options, the writer of a call option has an obligation to sell to the holder within the expiration date. Likewise, a writer of a put option has an obligation to buy to the holder within the expiration date (Smith, 2021). Underneath the paper, provides a table that shows the development of payoff depending on the underlying price, when selling and buying call- and put options.

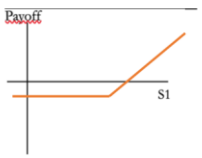
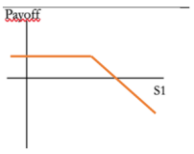
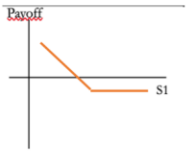
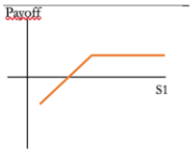
Calls		Puts	
Buy Call	**Write Call**	**Buy Put**	**Write Put**
Pay premium Profit on rise in share price Worthless if share price falls	Receive premium Lose on rise in share price Expires without execution if share price rises	Pay premium Profit on fall in share price Worthless if share price rises	Receive premium Lose on fall in share price Expires without execution if share price rises
			

Figure 9: Outcomes from buying or selling call and put options.

This trading profile can be achieved by four steps; (1) writing an OTM call, (2) buying an ATM call, (3) writing a OTM put, and (4) buying an ATM put. The highest possible profit will be achieved if the underlying asset price goes above or below the higher or lower strike prices.

5.2.1 Constructing the trade

The stock price as of 10.12.22 is $11.03. However, there are no options for this stock with a strike price of $11, which the strategy is based on. To simplify, we assume that the stock will at least fall to its last support-level of $10 dollars, following its recent bull rally. In addition, the options chosen below are American, allowing the investor to exercise the option right at any time before and including the expiration day (Chen, 2022). The expiration day for these particular options is in January 2025 – two months after the election. Lastly, the strategy will be based on contracts of 100 options based on the last traded price.

The GEO Group (GEO)			
Calls		Puts	
Buy Call	**Write Call**	**Buy Put**	**Write Put**
Premium: $3.23 **Strike:** $10.00	**Premium:** $1.75 **Strike:** $15.00	**Premium:** $1.60 **Strike:** $10.00	**Premium:** $0.35 **Strike:** $5.00

Figure 10: Example Strategy 2.

The strategy can be executed by purchasing the following trades (prices as of 09.12.22):

1. Write one contract of 100 OTM calls for a strike price of $15. The cost is $1.75 per option, so the total credit is $175.
2. Buy one contract of 100 ATM calls for a strike price of $10. The cost is $3.23 per option, so the total cost is $323.
3. Write one contract of 100 OTM puts for a strike price of $5. The cost is $0.35 per option, so the total credit is $35.
4. Buy one contract of 100 ATM puts for a strike price of $10. The cost is $1.60 per option, so the total cost is $160.

In summary, the strategy spends a total of $483 on buying options, while receiving a credit of $210. Thus, the total debit spread, and loss potential is $273.

5.2.2 Scenario analysis of the Reverse Iron Butterfly Spread on Election Outcomes

As mentioned in the model, the profit of private prisons is highly dependent on government contracts. Furthermore, the model assumes that the number of contracts is highly related to which party holds the power of the federal and state governments. Moreover, the DCF considers the contracts when valuing the GEO stock price.

Therefore, the strategy is highly dependent on an electoral outcome in which the elected party changes the number of contracts (X) significantly, such that the revenue from government contracts either increases or decreases enough to cause a significant reaction on the GEO stock. In the following, the paper will elaborate on the different outcomes.

Number of contracts (X) remains stable, and GEO Group stock remains unchanged

The worst possible outcome using this strategy is if the number of contracts stays unchanged after the election, resulting in the stock price of GEO Group being stable.

Then the investor can potentially lose the net debit spread of $273.

Minimum Increase in Contracts - Upper Breakeven Point (X = Price of GEO)

$$(X - Long\ Call\ Strike) \cdot 100 = Net\ Debit$$

$$(X - \$10) \cdot 100 = \$273$$

$$X = \$12.73$$

The upper Breakeven Point is when the GEO stock reaches $12.73.

To reach the upper Breakeven Point, the electoral outcome needs to increase the number of contracts such that the revenue increases enough so that the GEO stock price reaches $12.73.

Minimum Decrease in Contracts - Lower Breakeven Point (X= Price of GEO)

$$(Long\ Put\ Strike - X) \cdot 100 = Net\ Debit$$

$$(\$10 - X) \cdot 100 = \$273$$

$$X = \$7.27$$

The lower Breakeven Point is when the GEO stock reaches $7.27.

Thus, the brief analysis above indicates that the strategy will yield profits if the GEO stock is above $12.73 or below $7.27 at the expiry time.

To reach the lower Breakeven Point, the electoral outcome needs to decrease the number of contracts, such that the revenue decreases enough so that the GEO stock price falls to $7.27.

Maximum profit

The maximum profit is reached under two conditions:

1. The price of a GEO stock falls beneath the strike price of the short puts
2. The price of a GEO stock rises above the strike price of the long calls

Maximum profit GEO stock rise:

$$Maximum\ profit = 100 \cdot (\$15 - \$10 + \$1.75 - \$3.23 + \$0.35 - \$1.60) = \$\mathbf{227}$$

Maximum profit GEO stock fall:

$$Maximum\ profit = 100 \cdot (\$10 - \$5 + \$1.75 - \$3.23 + \$0.35 - \$1.60) = \$\mathbf{227}$$

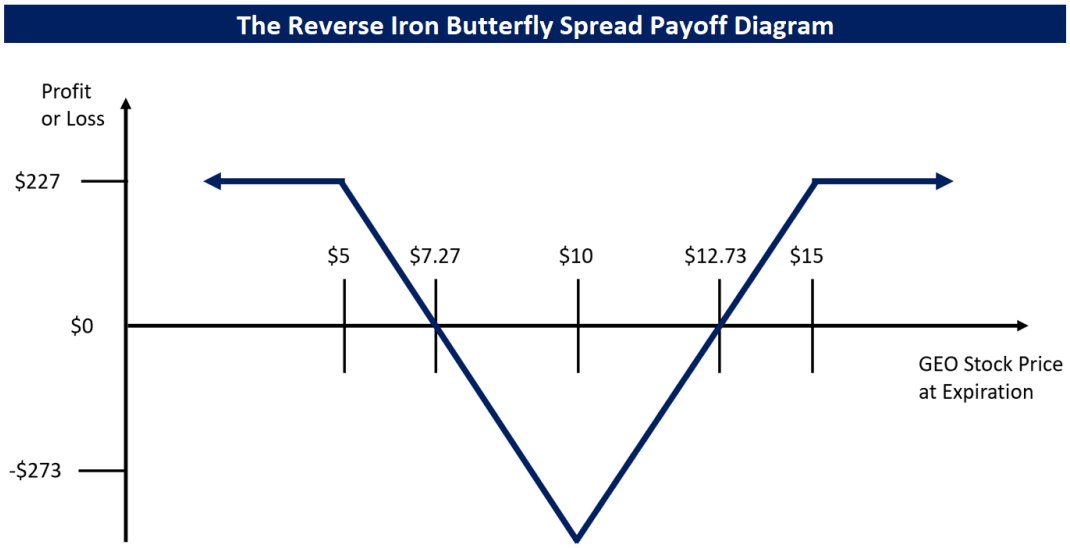


Figure 11: Example of strategy 1 presented visually.

5.2.3 Weaknesses of Strategy 2

A major weakness of this strategy is its dependence on an electoral outcome which results in a change in the number of contracts, all else equal, further resulting in a significant increase or decrease in GEO profits which ultimately must be reflected in the stock price. Thus, the strategy assumes many correlated events to be causal. Furthermore, the strategy assumes that the *Efficient Market Hypothesis* holds.

Given that the assumptions hold, there are still inherent weaknesses in the trading strategy. Firstly, the strategy is complex and heavily reliant on volatility in the GEO stock. Secondly, the profit potential is limited to the net premium received when the trade is initiated. Therefore, even if the stock experiences a significantly increase or decreases in price, the trader's potential profit is capped.

6. Limitations

Firstly, this paper does not consider ethical perspectives surrounding the operations of private prisons. Furthermore, our models may not accurately reflect the reality of the situation as they oversimplify world's complexities. Another deficiency in this analysis is that it focuses on a single company.

Additionally, the paper has only accounted for a few selected factors, neglecting a wide range of factors that impact the socioeconomic state of the U.S. and the price of GEO stock. Stock price movements are disturbed by many factors and cannot be analyzed independently, especially the general market fluctuations and dividends.

Furthermore, apart from the small sample size in the event study, it does not consider the impact of broad market volatility on the analysis. This will likely interfere with the accuracy of the results, as changes in the overall market can significantly impact stock prices. On top of this, the paper posit that several correlated events are causally related, which might not be the case.

Moreover, the analysis is primarily based on historical data to predict future outcomes, which is inherently uncertain and may not be reliable. In addition, the second strategy relies on efficient markets for the stock price to reflect the profits - an assumption that is challenged today.

7. Conclusion

In this paper, we have examined why investor Michael Burry chose to invest heavily in prison stocks while predicting an economic downturn. We sought to answer the question: "How can one capitalize on inflation, crime, and political uncertainty with prison stocks?". Observations of the correlation between GEO stock and the S&P 500 showed that the two securities were positively correlated, deeming GEO stock less suitable for hedging against recessions. By analyzing various factors affecting the industry and applying these to the model we constructed, we have identified two potential strategies for achieving this goal.

The first strategy revolves around hedging the political risk by betting on the U.S. election, which determined a ratio of shares and bets of 7.18. The second strategy is based upon profiting from increased volatility in the GEO stock, where profit is achieved by GEO stock rising above $12.73 or falling below $7.27. As a result, the maximum profit and loss on the trade are $227 and $273, respectively.

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9. Appendix

Profit Model-DCF Model（from Factors to Share Price）

$$P = X * Y * CUPZ - COST$$

$$X = X0\ (1-\lambda) * p\ (D) + X0\ (1-\lambda+\beta) * (1-p\ (D))$$

$$Y = mY + \delta * gC * D = 90\% + \delta * gC * D\ (Y <= 100\%)$$

$$CUPZ = C * UP * Z$$

$$COST = FC + Y * C * UC$$

Which gives us:

$Revenue = X * Y * CUPZ$, Revenue Growth can by calculate by the Revenue year by year; Then put Revenue Growth into a DCF model to obtain the Share Price.

The model ends up with only two independent variables: gC and P(D). In order to test the effectiveness of the strategy, different independent variables can be set according to different scenarios.

(This shows the data convert process)

The Event Study

4	Organizing the Adjusted Close Prices and Caluclating the Simple Returns					
5			The GEO Group		S&P	
6	Date	Observation number	Close	Simple	Close	Simple
7	07-12-22	1	11.34	-4.30%	10 930.00	-1.58%
8	06-12-22	2	11.85	0.00%	11 105.00	-2.07%
9	05-12-22	3	11.85	3.67%	11 340.00	-1.22%
4957	09-05-02	4951	3.39	-4.09%	499.15	0.54%
4958	02-05-02	4952	3.53	5.86%	496.46	1.32%
4959	01-05-02	4953	3.34	0.00%	490.00	0.00%

In the Event Study we have used the daily **Simple Return** to measure the performance of the GEO Group stock and the S&P 500. The Simple Returns is given by

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}$$

5	Simple Returns for the Geo Group and the S&P 500 Centered on the Time of Elections										
6		The Geo Group					S&P 500				
7	Election dates	02-11-04	04-11-08	06-11-12	08-11-16	03-11-20	02-11-04	04-11-08	06-11-12	08-11-16	03-11-20
8	Obs. Nr.	4466	3481	2494	1502	515	4466	3481	2494	1502	515
9	52	-2.70%	-2.61%	-0.03%	1.47%	-0.69%	1.04%	3.30%	1.30%	-0.25%	0.99%
10	51	-1.30%	5.58%	-0.31%	-1.28%	-4.07%	-0.07%	-0.82%	1.36%	1.52%	1.58%
58	3	0.00%	-1.67%	0.29%	2.79%	3.55%	-0.25%	1.23%	-1.07%	-3.82%	-0.76%
59	2	1.00%	-5.19%	0.65%	2.80%	-6.53%	-0.83%	-4.37%	0.47%	-0.27%	0.63%
60	1	1.74%	-2.64%	-2.62%	21.27%	-10.55%	0.84%	3.17%	8.03%	1.29%	2.69%
61	0	-0.71%	3.17%	0.35%	-0.08%	3.39%	-0.33%	3.60%	1.07%	0.28%	1.77%
62	-1	-2.47%	-0.11%	5.40%	1.36%	6.55%	0.00%	-0.88%	-0.25%	1.29%	0.35%
63	-2	0.00%	5.81%	-3.57%	1.95%	-0.23%	0.00%	0.57%	0.05%	-1.46%	0.49%
64	-3	0.30%	9.23%	1.15%	-0.43%	9.49%	0.17%	2.51%	1.50%	-1.01%	-0.58%
311	-250	-0.59%	0.96%	-0.68%	2.99%	-1.10%	1.46%	0.19%	0.98%	-0.10%	-0.50%
312	-251	-1.12%	-0.35%	4.11%	-1.31%	-1.22%	0.92%	-0.37%	2.21%	1.01%	1.92%
313	-252	-4.47%	1.58%	1.90%	-0.99%	0.26%	-0.18%	0.84%	2.21%	0.42%	0.19%

The first column to the left, indicates the days pre-event (negative) and the days post-event (positive). T = 0 is the day of the election.

The Market Model

The GEO Group stock return using the market model is given by

$$R_{GEO,t} = \alpha_{GEO} + \beta_{GEO} \cdot R_{M,t} + \epsilon_{GEO,t}$$

where $R_{M,t}$ is the Returns of the S&P 500 at time t.

The abnormal return is defined as

$$AR_{i,t} = R_{i,t} - \alpha_i - \beta_i R_{M,t}$$

where α_i and β_i are estimated over the pre-event windows, $[t_1, t_2] = [-252\,, 1]$.

Furthermore, we have aggregated the abnormal return across the five elections dates to give the **Average Abnormal Return** (**AAR**) at time t, which is defined by

$$AAR_t = \frac{1}{N} \cdot \sum_{i=1}^{N} AR_{i,t}$$

Lastly, we have aggregated the abnormal returns over time to also give a **Cumulative Abnormal Return** (**CAR**). The CAR for each election, between the times t_1 and t_2 is given by

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{i,t}$$

Underneath is an overview of different metrics for the abnormal returns:

Date	02-11-04	04-11-08	06-11-12	08-11-16	03-11-20
Obs. Nr.	4466	3481	2494	1502	515
Intercept	0.000200846	-0.00152321	0.001902555	-0.00113	-0.00235558
Slope	0.202780635	0.217046777	0.214212222	0.391685	0.708686976
CAR(1, 52)	0.32	0.01	0.00	0.63	0.01
CAR(1, 13)	0.13	-0.02	-0.06	0.37	0.00
CAR(14, 52)	18.50%	2.45%	6.69%	26.19%	1.31%

DCF-model

Analysis											
Growth and margins		2014	2015	2016	2017	2018	2019	2020	2021	Avg.	Cmnts
Revenue growth			8,97%	18,24%	3,85%	3,00%	6,29%	-5,16%	-3,98%	6,02%	
Gross profit margin		26,36%	26,01%	24,28%	24,87%	24,69%	24,91%	24,33%	27,81%	25,41%	
EBITDA-margin		19,56%	18,58%	17,46%	16,46%	16,78%	16,67%	17,25%	19,06%	17,73%	
EBIT-margin		13,88%	12,79%	12,19%	10,97%	11,35%	11,39%	11,52%	13,07%	12,14%	
CAPEX as % of revenues		0,77%	18,00%	0,00%	15,62%	0,00%	0,00%	0,00%	0,00%	4,30%	
CAPEX growth			2448,46%	-100,00%	#DIV/0!	-100,00%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Depreciation as % of fixed assets							8,77%	8,85%	9,31%	8,98%	
Common-size analysis		2014	2015	2016	2017	2018	2019	2020	2021	Avg.	
Profit and loss statement											
Total revenue		100%	100%	100%	100%	100%	100%	100%	100%	100%	
Cost of goods sold		74%	74%	76%	75%	75%	75%	76%	72%	75%	
Employee benefits expense		7%	7%	7%	8%	8%	8%	8%	9%	8%	
Other operating expenses		0%	0%	0%	0%	0%	1%	-1%	0%	0%	
Depreciation and amortisation		6%	6%	5%	5%	5%	5%	6%	6%	6%	
Net financial income (+) / expense (-)		5%	5%	5%	4%	5%	5%	5%	4%	5%	
Balance sheet - Assets											
Intangible assets		22%	24%	22%	24%	24%	23%	21%	20%	23%	
Property, plant and equipment		66%	63%	60%	62%	62%	65%	63%	59%	62%	
Inventories		1%	2%	2%	2%	1%	1%	6%	11%	3%	
Trade receivables		9%	9%	15%	10%	11%	10%	8%	8%	10%	
Other receivables		1%	1%	1%	1%	1%	1%	1%	1%	1%	
Derivative financial instruments		1%	1%	0%	1%	1%	1%	1%	0%	1%	
Tax		2014	2015	2016	2017	2018	2019	2020	2021	Avg.	
Effective tax rate		9,26%	5,23%	4,78%	5,51%	9,25%	10,23%	12,77%	59,85%	14,61%	
Dividends		2014	2015	2016	2017	2018	2019	2020	2021	Avg.	
Dividends		26	8	25	14	5	14	3	12		
Payout ratio				15,9 %	9,5 %	3,5 %	9,6 %	2,0 %	14,2 %	9,1 %	
EPS and BPS		2014	2015	2016	2017	2018	2019	2020	2021	Avg.	Cmnts
Earnings per share	121,1	1,14	1,10	1,30	1,19	1,12	1,21	1,15	0,68	1,11	
Book value per share	121,1	8,63	8,31	8,05	9,90	8,59	8,23	7,54	8,06	8,41	

Multiple valuation									
EPS and BPS	(Number of shares)	2014	2015	2016	2017	2018	2019	2020	2021
Earnings per share	121,1	1,14	1,10	1,30	1,19	1,12	1,21	1,15	0,68
Book value per share	121,1	8,63	8,31	8,05	9,90	8,59	8,23	7,54	8,06

DCF assumptions	Unit	Assumptions	2022e	2023e	2024e	2025e	2026e	2027e	2028e
General									
Valuation date		31/12/2022							
Growth		1,0 %							
Discount rate		8,0 %							
Tax rate		22,0 %							
Value drivers									
Revenue growth			4,0 %	4,0 %	4,0 %	4,0 %	4,0 %	4,0 %	4,0 %
EBITDA-margin			17,7 %	17,7 %	17,7 %	17,7 %	17,7 %	17,7 %	17,7 %
EBIT-margin			12,1 %	12,1 %	12,1 %	12,1 %	12,1 %	12,1 %	12,1 %

Discounted cash flow analysis								
Projecttions								
Revenues	2 257	2 347	2 441	2 538	2 640	2 746	2 855	2 970
COGS		-1 931	-2 008	-2 088	-2 172	-2 259	-2 349	-2 443
EBITDA		416	433	450	468	487	506	526
Depreciation and amortization		-131	-136	-142	-147	-153	-159	-166
EBIT		285	296	308	321	333	347	361
DCF - Simplified								
EBIT		285	296	308	321	333	347	361
Tax		-63	-65	-68	-71	-73	-76	-79
Depreciation and amortization		131	136	142	147	153	159	100
dNWC (assumed to be zero)		0	0	0	0	0	0	0
CAPEX		-65	-100	-100	-100	-100	-100	-100
Free cash flow to the firm		288	267	282	297	313	330	281
Year			1	2	3	4	5	
Discount factor			0,93	0,86	0,79	0,74	0,68	
Present value of free cash flow to the firm		1 181	248	242	236	230	225	4 018
Present value of terminal period		2 735						
Sum NPV		3 915						
Net debt		2021						
Equity value		1 895						
Share price (as of 31.12.2022)		15,64						

As shown in the upper picture, our DCF model has taken the basis of historical data from 2014 (data from Bloomberg). These numbers have given the basis of the yellow cells in the DCF Assumption section. These numbers can be substituted according to our model so that we can look at stock prices in different scenarios.

Applying the numbers in a normal DCF analysis, gives us a base case valuation of $15,64 per share.