

Structured note on differential payoff of two stock portfolios across US Presidential Cycles

1. Abstract

This paper investigates the impact of political risk on two stock portfolios to find out any differential performance during the US presidencies. We find that while over the last twenty years there is no material difference – in return or in Sharpe ratio between the portfolios, the Republican portfolio outperforms during the 10 months pre-election phase: Jan - Oct 2000/04/08/12/16; this trend reverses with respect to the top performers found through principal component analysis among the two portfolios in the election-to-inaugural period, ie. Nov-Jan 2001/05/09/13/17; whereas there is no actionable difference post that. Exploiting these findings, we construct a structured note to leverage above periods of differential performance, with a Chooser Option being offered to investors for the period when there is no clear direction between the two portfolios. Further, in order to hedge and price our position against the structured note – we use discrete Barrier options with varying contract specifications.

Keywords: Return, Chooser Option, Barrier Option, Principal Component Analysis

2. Introduction

There have been numerous studies on stock market returns and volatility around key periods of the US election. According to Alesina (1987), Republicans and Democrats differ in policies related to taxes, government spending, and social benefits. Frederico Belo, Vito D. Gala, Jun Li (2011) found significant variation in average returns, in the two years post-inauguration. John W. Goodell & Sami Vähämaa (2012) used monthly Iowa Electronic Market (IEM) data as a measure of changes in the probability of success of a candidate and its relation with volatility in the market.

There is very little difference in the risk/return characteristics of the two portfolios over the last 20 years. Republican portfolio had a higher return with high volatility at the same time.

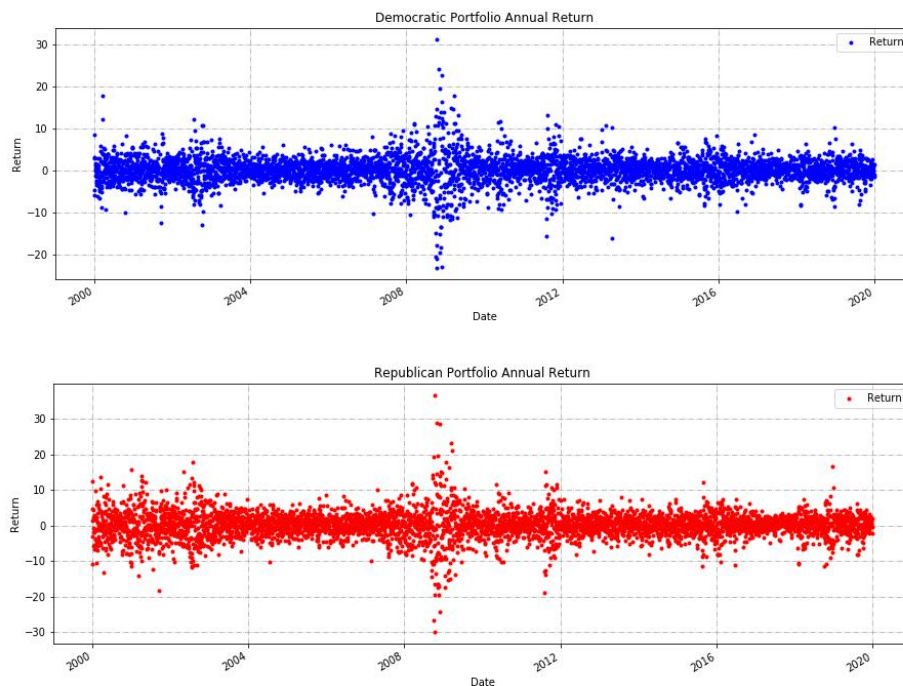
However, we do find differential performances between the two portfolios when we consider specific periods around the election dates. We study this in greater detail to identify potential trends and construct structured note that leverage this so that we can sell to investors as customized security. We define the following notations:

R/D = Republican/Democratic portfolio return; R-D = Republican-Democratic return
(R-D) = Long on Republic portfolio, Short on Democratic

3. Methodology

3.1 Performances in the past 20 Years

On doing a time series analysis of the two stock portfolios, we found some interesting observations. In the period from 1/3/2000 to 12/30/2019, these two portfolios did not have significant differences in returns and volatility. The mean annual return (daily returns multiply 252) of the Democratic portfolio is 15.89%. The mean annual return of the Republican portfolio is 17.89%. We rebalanced the portfolios on the following day of the listing of any stock in the portfolios (On 1/3/2000, there were 12 companies in Democratic portfolio and 10 companies in Republican portfolio).



The standard deviation of D_{annual} is 3.1332 while the standard deviation of R_{annual} is 3.6870. Republican portfolio has both higher return and higher volatility. However, Democratic portfolio's Sharpe ratio is 4.54% higher than Republican portfolio's.

	Annual Return	Volatility	Sharpe Ratio	VaR(% of portfolio value, at 95% C.I with 1 day holding period)	Expected Shortfall (CVAR)
Democratic	15.89%	3.1332	0.5070	2.08%	3.14%
Republican	17.89%	3.6870	0.4852	2.23%	3.38%

In conclusion, the two portfolios did not have any significant quantitative

differences in the past 20 years.

3.2 Pre-election phase: Jan – 31 Oct 2000/04/08/12/16

Trends/Observations:

1. Republican portfolio outperforms in all periods bar 2008 during the crisis.
2. $R-D > 20\%$, if current regime = republic.
3. $R-D < 15\%$, if current regime = democratic.



Implication for Structured Note Design

The structured note will payoff based on the differential return during this period, ie., based on R-D. The price of the structured note in this period will be equivalent to buy an up and in Barrier option with underlier being the (R-D) basket of securities.

3.3 Election -to -Inauguration: Nov 00/04/08/12/16 – 1 Jan 01/05/09/13/17

Trends/Observations:

1. The two portfolios as a whole show no discernible quantitative difference in 2012 and 2016 election season.
2. Democratic outperformed in 2004 & 2000. In 2008 both performed poorly, democratic relatively performed better.
3. In lieu of the above with there being no definite pattern, we decided to compare the top performers in each portfolio for the two month periods.
4. The top performers – the number of stock to be considered for each of the above period - is determined using a principal component analysis to identify hidden intrinsic dimensions of the dataset having largest variances by mapping a higher dimension dataset onto a smaller one (see figure).

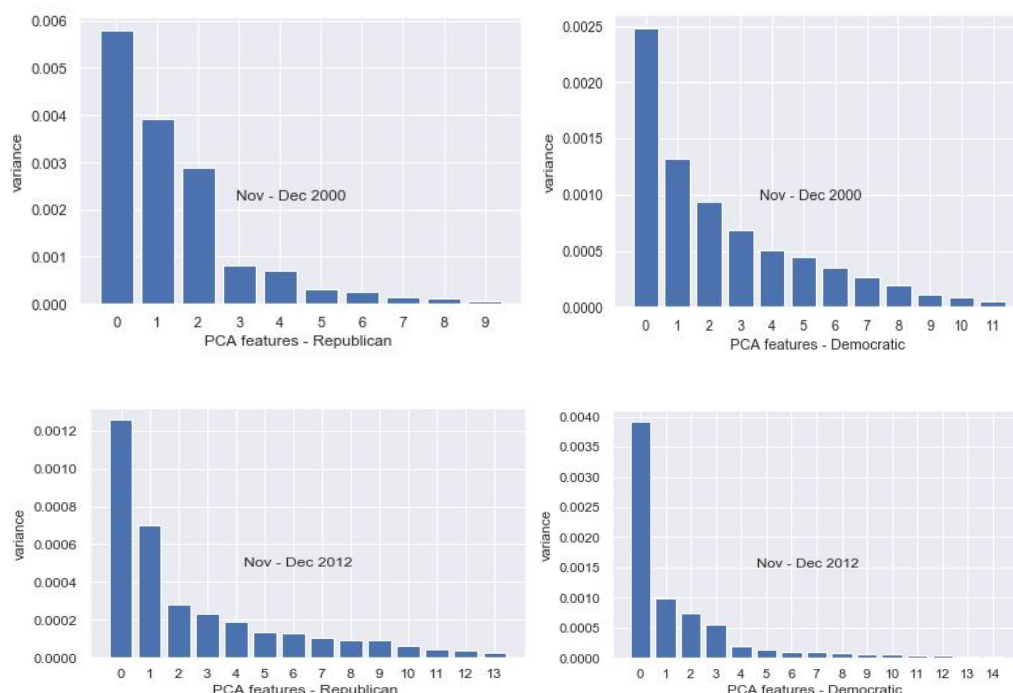


Figure – Top 3 & Top 2 performers selected in 2000 & 2012 using PCA

5. The top performers of the democratic convincingly outperform top performers of the republic across all periods (risk-adjusted) and outright in 4/5 presidential elections. One such period during 2012 is shown. In addition, we find VIX spiking and trending wildly around the election window in a separate event study around the election weeks: Nov1 - Nov 15 ; a straddle on VIX could be profitable

here.



Implication for Structured Note Design

During this two month period, the structured note will switch to a payoff based on the top performers in the Democratic portfolio ($D_{tp} - R_{tp}$) where : D_{tp} / R_{tp} = portfolio of the top-performing republic/democratic 'N' stocks and N = determined using a principal component analysis.

3.4 Post election New Year (1 month): 1 Jan – 29 Jan 2001/05/09/13/17

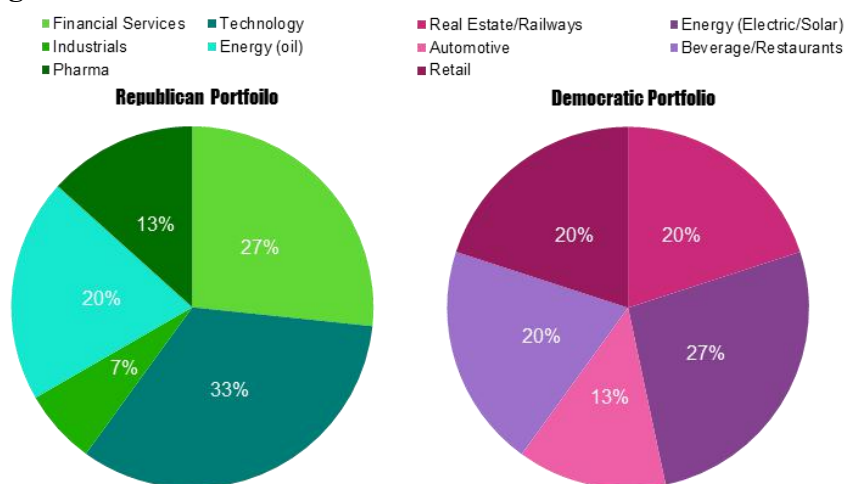
Trends/Observations:

1. No observable trend in return or Sharpe of the portfolios.
2. Since there appears to be no directional trend and high volatility, we will offer investors a chance to choose whether they want to be bullish(call) on (R-D) or switch to bearish.

Implication for Structured Note Design

To implement this, we will offer a Simple Chooser (same strike for call/put) as a part of the last 1 month of the structured note where the investors can “choose” a call or put option on the underlying (R-D) returns based on their view/outlook. The date to switch will be 1 Jan 2021.

3.5 Comparative performance of individual companies across different governments



- Trends have been looked at for companies over the periods covering democratic and republican governments.
- To compare the performance at a macro level, Adjusted Earnings before interest, taxes, depreciation, and amortization (EBITDA Adjusted), Earnings per share and other similar variables like gross profit are looked at for each company. The trend across one metric is reflected among all the other metrics. so, trends with EBITDA as a metric are only shown.
- If there is a trend for a particular company in Republican portfolio, then it corresponds to a positive performance/trend during the Republican period and a relative negative performance during Democratic period. Similarly for the companies in Democratic portfolio.

Democratic Portfolio			Republican Portfolio		
Company	Industry	Trend (Yes/No)	Company	Industry	Trend (Yes/No)
CSX Corp.	Real Estate/Rail Freight	No	Citigroup Inc.	Financial Services	No
Simon Property Group Inc.	Real Estate	No	American Express Co.	Financial Services	No

Norfolk Southern Corp.	Railways	No	Visa Inc.	Financial Services	No
Exelon Corp.	Energy (Electric)	No	PayPal Holdings Inc.	Financial Services	No
SunPower Corp.	Energy (Solar)	Yes	Honeywell International Inc.	Conglomerate	No
NextEra Energy Inc.	Energy (Electric)	No	Alphabet Inc.	Technology	No
First Solar Inc.	Energy (Solar)	Yes	Salesforce.com Inc.	Technology	Yes
Ford Motor Co.	Automotive	No	Qualcomm Inc.	Technology	No
Aptiv PLC	Tech. Automotive	Yes	Amazon.com Inc	Technology	No
Constellation Brands Inc.	Beverage	No	Facebook Inc.	Technology	No
Coca-Cola Co.	Beverage	No	ConocoPhillips	Energy (Crude Oil)	Yes
McDonald's Corp.	Restaurants	No	Marathon Oil Corp.	Energy (Crude Oil)	Yes
Estee Lauder Cos.	Retail (fashion)	No	Chevron Corp.	Energy (Crude Oil)	Yes
Walmart Inc.	Retail	No	Gilead Sciences Inc.	Biotech/Pharma.	No
Home Depot Inc.	Retail (Home)	No	Merck & Co.	Pharma.	No

- Companies like Alphabet, Amazon, and Facebook did not show any differential trend pertaining to a government, as they are big companies, which are affected very little by Government policies & regulations.
- Major performers during Republican governments are Crude Oil companies and it can be qualitatively supported by the recent developments - Republicans' policies reflect their denial of climate change or lack of response to adverse effects of climate change. This same argument can be extended in support of clean energy (solar, electric) companies that have a differential performance during Democratic governments.
- Regarding the Pharmaceutical (Big Pharma) industry, we did not see any differential trend during Republican Governments. This can be supported qualitatively by the fact that lobbying is done based on the

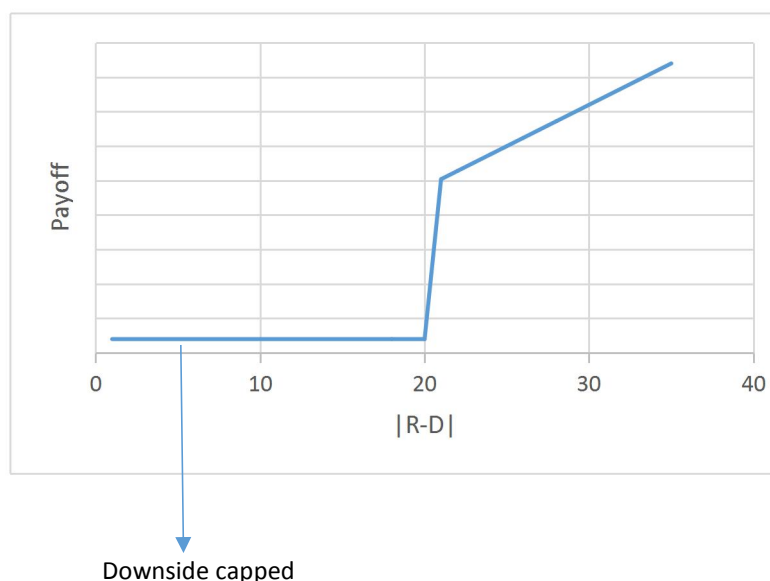
representative/congressman from a state (in which Big Pharma. presence is there), irrespective of the party allegiance.

- Other retail and financial services companies have similar trends during both the Democratic & Republican governments, as these are consumer-driven and the USA being a consumer dependent economy, we would never see any visible policy by any government, that would impact consumer spending negatively.

4. Structured Note

4.1 Structured Note Design and Payoff Profile

For the first 11 months – the payoff is a linear function of $|R-D|$. For the last month, when the chooser is exercised, the payoff is similar to a straddle (long volatility); but costs cheaper since the direction on the underlier has been already determined by the investor. Downside protection is given in the case our bet on $|R-D|$ does not pay off. A sample payoff profile of the structured note is given below.



4.2 Pricing and Hedging

Price of the Structured Note = Cost to set up a hedge portfolio + Fees by Julius Baer

Cost to set up = Barrier Option price on R-D securities (with 9 month maturity from 21 Jan – 31 Oct 2020) + Barrier Option price on D-R securities (with 2 month maturity from 1 Nov – 31 Dec 2020) + Chooser option price on R-D with 1 month maturity (from 1 Jan – 29 Jan 2021) + Cost of Risk free on-the-run treasury securities

Where R-D securities: going long republic portfolio & shorting democratic

Because the payoff is discontinuous and differentiated we are having to use different securities to hedge. A detailed analysis of the pricing securities and equations is given below in the table:

4.3 Pricing Table and Equations

Underlier : R-D	Payoff	How to Price?	Pricing Eqn	Comments
If R-D > 20%	1.2*(R-D)	Discrete Barrier Option price with barrier at (R-D)*1.2 = P1	$P1 = c_{ud} = SN(x_1) - Xe^{-rT}N(x_1 - \sigma\sqrt{T}) - S\left(\frac{H}{S}\right)^{2\lambda} (N(-y) - N(-y_1)) + Xe^{-rT}\left(\frac{H}{S}\right)^{2\lambda-2} (N(-y + \sigma\sqrt{T}) - N(-y_1 + \sigma\sqrt{T}))$ $S = R-D, X = \text{strike}, H = \text{barrier price} = (R-D)*1.2$	Up & in call option on (R-D) portfolio, ie long R and short D
Any other condition	risk free rate	Price of most liquid on the run treasury like strips = P2	$P2 = FV * e^{-rT}$	Downside protection
(D _{tp} - R _{tp}) > 0, where tp = top performers, not the whole portfolio	1.1*(D _{tp} - R _{tp})	Discrete Barrier Option price with barrier at (D _{tp} - R _{tp})*1.1 = P3	$P3 = c_{ud} = SN(x_1) - Xe^{-rT}N(x_1 - \sigma\sqrt{T}) - S\left(\frac{H}{S}\right)^{2\lambda} (N(-y) - N(-y_1)) + Xe^{-rT}\left(\frac{H}{S}\right)^{2\lambda-2} (N(-y + \sigma\sqrt{T}) - N(-y_1 + \sigma\sqrt{T}))$ $S = R-D, X = \text{strike}, H = \text{barrier price} = (R-D)*1.1$	Up & in call option on (D _{tp} - R _{tp}) portfolio, ie long D _{tp} and short R _{tp}
Any other condition	risk free rate	Price of most liquid on the run treasury like strips = P4	$P4 = FV * e^{-rT}$	Downside protection
Price of a chooser option on (R-D) portfolio	Max(Call, put) on (R-D)	P5	$P5 = \max(c, c + Ke^{-r(T2-T1)} - Se^{-q(T2-T1)}) = c + e^{-q(T2-T1)} * \max(0, Ke^{-r(T2-T1)} - S), \text{ where: } c = \text{Call option with strike } K \text{ and maturity } T2, e^{-q(T2-T1)} = \text{number of put options, } \max(0, Ke^{-r(T2-T1)} - S) = \text{Put with strike } Ke^{-r(T2-T1)} - S \text{ and maturity } T1$ $T2 = 1 \text{ year}, T1 = 1 \text{ month (when call/put decision made)}$	European Chooser Option with chooser date 1 Jan 2021
Price of the Struct Note		P1+P2+P3+P4+P5		

4.4 Advantages to Investors of such a structured note

- Investors are allowed to take a directional position and receive a highly levered return for the first 11 months.
- Downside protection in case our (Julius Baer) statistical time series analysis is wrong above.

- Option to switch and receive returns for the final 1 month of the structured note based on their (investors, not Julius Baer) belief which portfolio will perform better.

5. Conclusions

We find out that when we dig deeper and around different time periods there is a significant difference between the portfolios. While we primarily focused on risk/return differences between the portfolios, further studies could be conducted analyzing the tails of the return distributions of the two portfolios using measures like kurtosis and EVT. Our study dated back to 2000 because we wanted to create a good sample of historical performance. This allowed us to investigate combinations like the Republic regime followed by another Republic/Democratic and vice versa. Taking advantage of this, we created a customized security that allowed investors to take part in significant upside potential and also allow them to defer directional risk until the last month of the structured note.

This customized security could be made more complicated by allowing investors two separate strikes for call and put switching – a complex chooser. Further, we used a barrier option to hedge our position instead of simple calls/puts because they are cheaper and private banks like Julius Baer can easily get into such OTC contracts with other counterparties. An extension of this hedging scheme could be a computationally more efficient way to price the Barrier option instead of the closed-form solutions used above - as suggested by Baldi, Carmellini and Iovino using a probability measure to compute the number of times barrier is breached in a certain duration and between specific asset price ranges.

6. References

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