Spring 5-1-2024

Examining the Relationship Between Politics and the Economy

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HONORS THESIS
Certificate of Approval

Examining the Relationship Between Politics and the Economy

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May, 2024

Approved to fulfill the
requirements of HON 437

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Approved to fulfill the
Honors Thesis requirement
of the Murray State Honors
Diploma

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Examination Approval Page

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Project Title: Examining the Relationship Between Politics and the Economy

Department: Economics

Date of Defense:

Approval by Examining Committee:

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Examining the Relationship Between Politics and the Economy

Submitted in partial fulfillment
of the requirements
for the Murray State University Honors Diploma

Evan Pals
May, 2024

Abstract

The purpose of this project is to quantify the relationship between the US political environment and the American economy. First, impacts of U.S. presidential elections on the American economy are analyzed. The project will analyze the time effects of elections on multiple economic indicators. Average returns on the following investments will be observed: Dow Jones Industrial Average, S&P 500, gold, and silver. Additionally, the price of crude oil and the consumer price index will be studied. Time dummy variables will then be incorporated to show whether an election took place within the given time period, splitting the data into two groups: election year and non-election year. Average economic changes for these two groups will be compared to determine whether any statistically significant differences are present between groups. Additionally, using the same data, the effect of economic changes on the president's approval rating will be observed. This analysis will highlight trends in the U.S. economy relative to shifts in the political environment, ultimately providing insight into ideal investing habits, determining how these habits should change as political changes occur.

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Introduction

Between 1913 and 2020, the average annual rate of inflation in the United States has been roughly 3.1% (McMahon, 2020). This number may sound rather low, but what does it actually mean? Using an inflation rate of 3.1% per year, goods and services today cost more than double what they did in 2000. In fact, at a constant rate of 3.1%, every dollar an individual saves at the age of twenty-five would only have about $0.29 worth of purchasing power by the time that individual retires, assuming that retirement begins at age sixty-five. This means that keeping large sums of money in cash does not benefit consumers. In order to keep up with inflation, that money needs to be invested in a way that will earn a positive rate of return.

These days, many savings accounts offer interest rates that are just a fraction of a percent. Although savings accounts are a very safe option for money, these low rates are still far below the 3.1% annual inflation rate. This means that consumers are losing purchasing power when they leave their money in a savings account, even if the nominal value of the account increases over time. Therefore, investing is practically a necessity for those who wish to reach a state of financial security.

While assets such as stocks and precious metals have had generally positive returns over time, any form of investment comes with a certain degree of risk. Therefore, it is important to consider all possible factors that may affect the returns of these investments. Understanding the cyclic trends of different asset types plays a crucial role in the overall success of an investment portfolio. Although each type of asset has its own type of risk, these risks are all affected by the same thing: uncertainty. One of the leading causes of uncertainty is political change. The goal of this paper is to determine the nature of the relationship between politics and the economy. By building an understanding of this relationship, this uncertainty can be minimized, which can allow investors to maximize the overall return on their investments.

Since several variables are being observed, there are multiple hypotheses that inspire this paper. The null hypothesis would state that any changes to the observed variables in election years should be roughly equal to changes during non-election years. Prior to performing any type of data analysis, the alternative hypotheses will state the following:

The first hypothesis states that stock market returns will be lower during election years than during non-election years. Although the stock market boasts higher returns than many other types of investments, it also comes with a higher level of risk. During times of uncertainty, investors may try to take extra steps to minimize this risk. It is hypothesized that the uncertainty of an election year will cause investors to seek alternative investments to the stock market, therefore lowering the values of stock indices such as the Dow Jones Industrial Average and the S&P 500.

The next hypothesis states that precious metals will see a relatively higher return on investment in election years when compared to non-election years. The value of precious metals is generally assumed to be counter-cyclical to the stock market, meaning that precious metals see a higher return on investment when the value of the stock market decreases. Considering that the first hypothesis states that stock market returns will decrease, the logical effect would be an increase in the value of precious metals like gold and silver. Gold and silver are generally considered to be safe investments which hold a physical store of value. Therefore, as political uncertainty increases, the alternative hypothesis states that gold and silver prices will rise.

The third hypothesis that will be tested in this study relates to CPI and oil prices. Both of these variables have the potential to influence election outcomes. If consumers are unhappy with the prices of the goods and services available to them, it is very possible that an incumbent president may lose their place in office. Therefore, it is in the best interest of the incumbent president to devote extra focus toward lowering prices on gasoline and other goods as an election nears; this will theoretically allow the incumbent president to gain extra votes that are needed in order to win reelection. Based upon this assumption, the third alternative hypothesis states that changes in CPI and in oil prices will be lower during election years than during non-election years.

Overall, the hypotheses at the center of this paper would suggest that an ideal investing strategy would focus on investment in the stock market during non-election years, but would also include a switch to precious metals like gold and silver during an election year. This paper will aim to determine whether or not the empirical evidence would support this theory.

Literature Review

The relationship between politics and the economy has certainly been examined many times in the past, though results have varied over the years. Prior to performing any kind of data analysis, the hypothesis that inspires this paper is that the economy slows during election years as a result of political uncertainty. This implies that stock market returns will be, on average, the lowest during election years. Some evidence may support this hypothesis; however, some previous works have actually found the exact opposite.

For example, one paper (Foerseter, Schmitz, 1997) examined 18 different countries from 1957 to 1996. For this project, the authors split the data into four categories based upon the four years of the election cycle, with year 1 beginning on November 1 of an election year. For all 18 countries, these researchers found that markets had the lowest average returns in year 2 of the election cycle. In this study, higher returns were found in year 3 and year 4 than in either of the first two years. Another paper (Anspach, 2022) found that years 3 and 4 had the highest returns; however, this paper found that the lowest average return actually happened in year 1 of the election cycle. Contrary to the hypothesis of this paper, both of these past works have found that stocks and other investments perform the best in the later years of a president's term, including during election years.

There is a third paper that shares similarities to the works mentioned above. In this paper (Brown, Pugliese, 2016), the authors found that certain economic indicators such as real consumer spending, real personal income growth, real GDP, business fixed investment, and industrial production all increase during election years. However, the evidence found in the project did suggest that other indicators such as government spending and employment growth were not significantly different during election years.

While this project focuses on variables such as stocks, precious metals, and consumer costs, past literature has found that many other economic variables differ during election years. In many cases, these economic indicators would suggest that the economy slows down during election years. GDP has been found to be lower in election years than non-election years (Greenland et al, 2019). Data from past literature shows lower investment rates (Julio, Yook, 2012; Baker et al, 2018; Amore, Minichilli, 2018), lower interest rates (Bretscher et al, 2018), and higher stock option prices (Kelly et al, 2016) immediately before an election. All of these would suggest that political uncertainty does slow the economy, consistent with the main hypothesis of this project.

Finally, these results were found to differ based upon other factors that were not observed in this paper, such as the political party of presidential election winners (Niederhoffer et al, 1970), recency of a recession (MAI Capital Management, 2023), asset redeployability (Kim, Kung, 2017), or the specific industry being observed (Boutchkova, 2012). Significant differences were also found when comparing years with gubernatorial elections to years without (Çolak et al, 2017), specifically with regard to IPOs. The findings of this paper suggested that IPOs were often delayed until after the political uncertainty of the election had passed. The authors also found that IPOs during the election year had a lower price relative to fair value than IPOs in non-election years.

Overall, the past literature over this topic has provided a large amount of evidence to explain the behavior of the economy during election years, but a consensus has yet to be reached regarding the exact relationship. While this consensus may never be reached, it is important to continuously analyze the issue. With presidential elections only taking place once every four years, sample size is a major constraint. Therefore, it is important to constantly re-study the issue using the most up-to-date available information.

Data

A total of seven datasets were used for this research. The first dataset (Shiller et al, 2024) contains the monthly values of the Dow Jones Industrial Average, beginning on January 1, 1915, and ending on February 1, 2024. The second dataset (Shiller, S&P, 2024) contains the monthly values of the S&P 500, beginning on December 1, 1927, and ending on February 1, 2024. The third dataset (LBMA, BLS, 2024a) contains values for gold price per ounce, beginning on January 1, 1915, and ending on February 1, 2024. The fourth dataset (LBMA, BLS, 2024b) contains values for silver price per ounce, beginning on January 1, 1915, and ending on February 1, 2024. The fifth dataset (EIA, BLS, 2024) contains values for the price of one barrel of crude oil, beginning on January 1, 1946, and ending on February 1, 2024. For each of these five datasets, both nominal and real values are included, though only the nominal values were used for the purpose of this project. This is because consumer price index (CPI) data was also included, meaning that changes in purchasing power had already been accounted for. If real values had been used instead of nominal values, the effect of inflation would have been factored into the equation twice. In order to account for inflation, a CPI dataset was gathered (BLS, 2024). This dataset shows the monthly price of a given basket of goods and services from January 1, 1947 to December 1, 2023. Finally, presidential approval rating data was obtained (Woolley, Peters, 2024). Unlike the other datasets used for this project, this approval rating data was not strictly provided monthly. In order to ensure an equal number of observations for each variable, only the first data point for any given month was kept.

Each of these variables was chosen very deliberately. Like many pieces of literature (Schmitz, Foerster, 1997; Brown, Pugliese, 2016; Anspach, 2022), stock market returns will be evaluated. There are many types of investment to choose from; however, none is as representative of the state of the American economy as the stock market. Since the Dow Jones Industrial Average and the S&P 500 are two of the largest stock market indices, both are included in the model. Next, gold and silver prices were included. Precious metal returns are known to behave in the opposite manner to the stock market. Additionally, these metals represent a physical commodity that investors can buy, unlike stocks or bonds. Therefore, gold and silver would be the most different substitutes for the stock market. For these reasons, it felt appropriate that gold and silver prices should be added. Finally, CPI and oil prices were included in the model. While different investment types are important, it is also important to include outside factors which affect these investments. In order to invest in the stock market or precious metals, investors need to have income to invest. After all, if consumers have no income to invest, it hardly matters which type of investment is best. If the prices of necessary goods and services are too high, these investors will not have disposable income to invest, meaning that values of all investment types should decrease.

One of the first steps taken to understand the trends found in each variable was to plot each variable over time. Plots were created to show the month-over-month percentage change in the value of each commodity. A visual inspection of each plot can help to identify any clear trends in the data, such as seasonality within the election cycle.

Figure 1

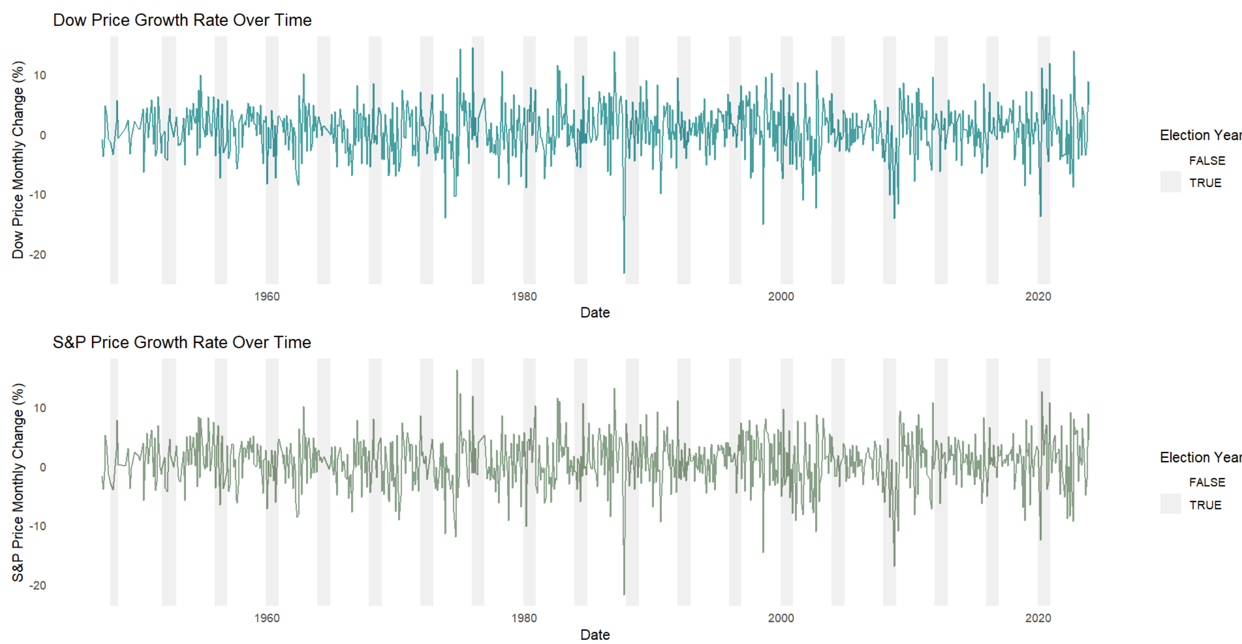


Figure 1 shows the month-over-month percentage change in the values of the stock variables. Simply looking at these plots, there are no obvious trends in the data. These variables appear to be stationary, meaning that both the mean and variance remain constant throughout. While there are no obvious differences in average returns when looking at election years vs. non-election years, it does appear that the points with the highest variance occur proportionally more often during election years than non-election years. Although this trend does appear to be true, the difference is minor at best, meaning that these plots are not enough evidence to suggest any election-based trends when it comes to the month-over-month percentage returns in the stock market.

Figure 2

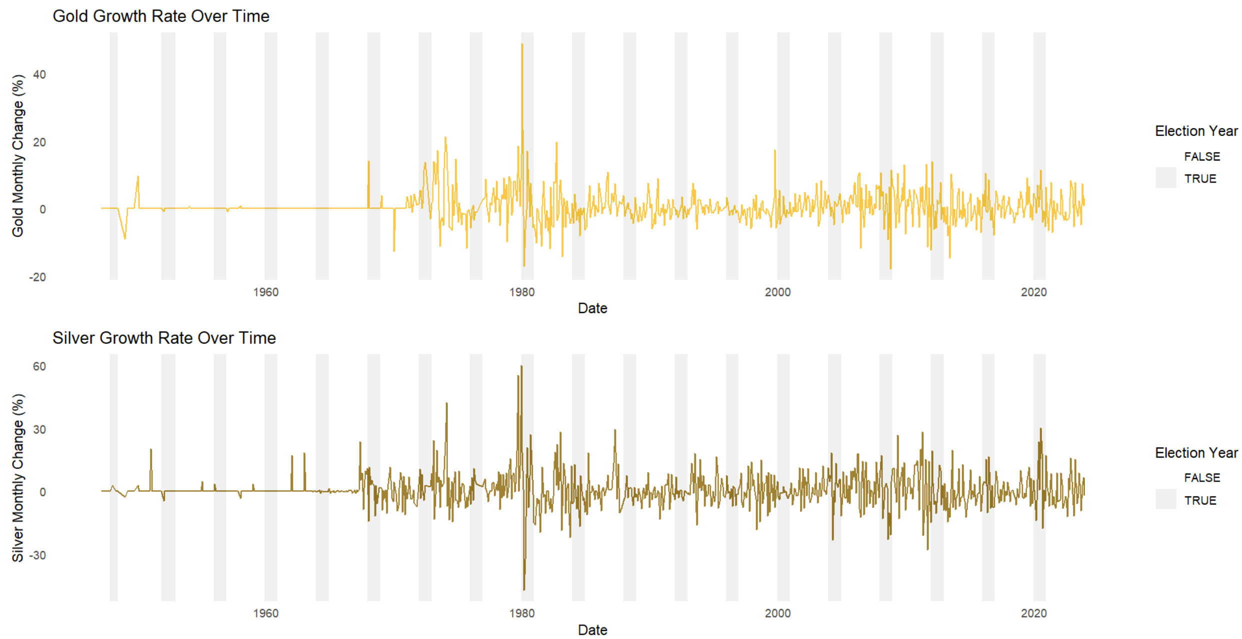


Figure 2 shows the month-over-month percentage change in the values of the precious metal variables. Unlike the values of the stock variables, these variables are not stationary. While the mean remains constant, the variance is not constant. Prior to 1970, the variance was very low. Aside from a few occasional spikes, there were very few changes in the value of these commodities. However, beginning around 1970, the variance increased drastically, reaching its peak around 1980. While the highest and lowest returns for each of these commodities comes during an election year, there is no other compelling evidence within these plots to suggest any election-based difference in returns.

Figure 3

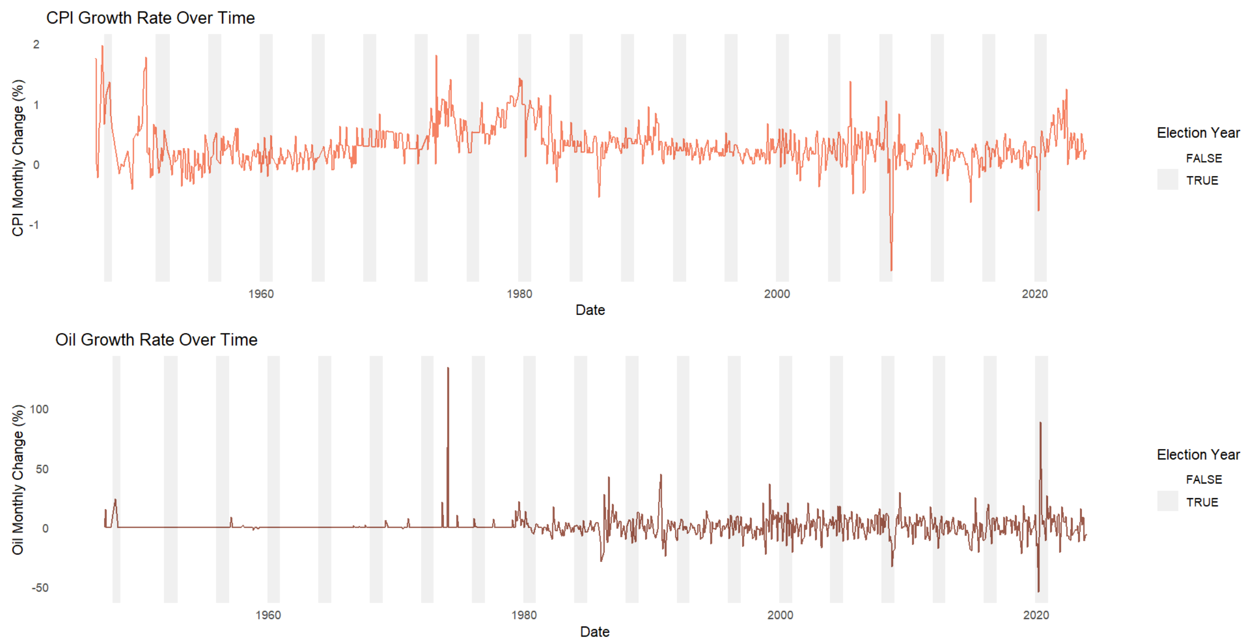


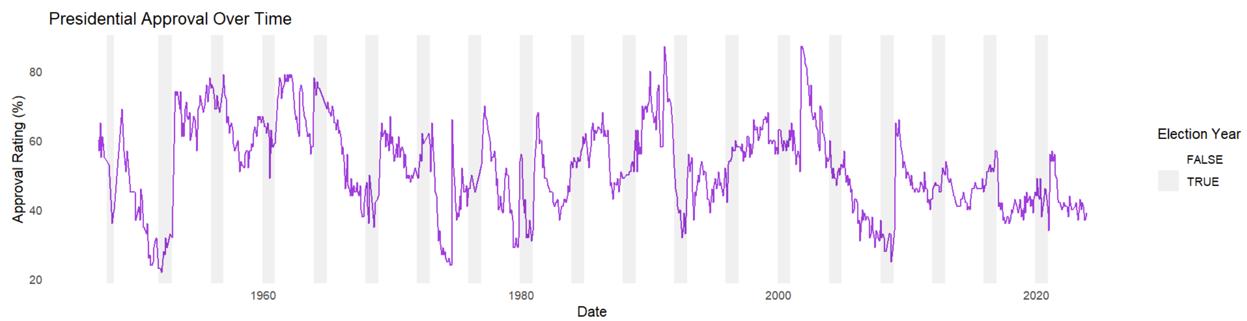
Figure 3 shows the percentage change in the CPI and in the price of a barrel of oil. Unlike the other variables previously discussed, higher values in these variables would be viewed negatively by the average consumer. This is because these variables generally represent costs of disposable goods, not investments. Increases in CPI or oil prices reduce the amount of disposable income that consumers have available for investment. Therefore, increases in CPI or in oil prices would be signs of poor economic conditions.

As the first plot would suggest, the growth rate of CPI is roughly stationary. While the plot does show deviations from the mean, the mean appears to stay generally constant throughout the plot. Additionally, the variance of the plot remains constant. Therefore, since neither mean nor variance are time-dependent, the growth rate of CPI could be called stationary.

On the other hand, the growth rate of the price of oil is not stationary. Like the plots for gold and silver, the plot for oil shows non-constant variance, despite having a constant mean. Overall, the plot for oil growth shares a resemblance to the plots of gold and silver growth rates.

Although there had been previous spikes in price growth rates prior to 1980, the average variance increased significantly around this time. This means that the growth rate of oil is non-stationary. Overall, neither the plot of CPI nor the plot of oil price growth seems to show evidence of an election cycle effect.

Figure 4



Finally, Figure 4 shows the presidential approval rating over time. As the plot shows, the presidential approval rating is not stationary. Since elections occur every four years, often putting a new president in office, the mean approval rating can change drastically in a very short amount of time. While approval ratings do not appear to trend in a certain direction during election years, it does appear that the variance may be slightly lower during election years, compared to non-election years. Most of the major shifts in presidential approval rates seem to occur during non-election years, often shortly after a new president has taken office. In order to determine whether or not the data is actually stationary, the standard deviation of both the original data and the difference are taken. Generally speaking, when data is stationary, the standard deviation of its difference should be no less than half the standard deviation of the raw data. Since the standard deviation of the differenced data, 5.16, is less than half of the standard deviation of the original data, 12.69, the original data might be non-stationary. Using the difference of the data rather than the raw data can help to prevent spurious results. As a precautionary measure to avoid skewed results, the percentage change in approval rating is used, where 100% is equal to the approval rating of the previous month. For example, if the approval rating jumped 5% from 50% to 55%, that value will be expressed as a ratio of the net change to the previous value rather than as a proportion of the total population; in this case the value is 5/50, or 10%. The plot of this percentage change in approval rating is pictured below.

Figure 5

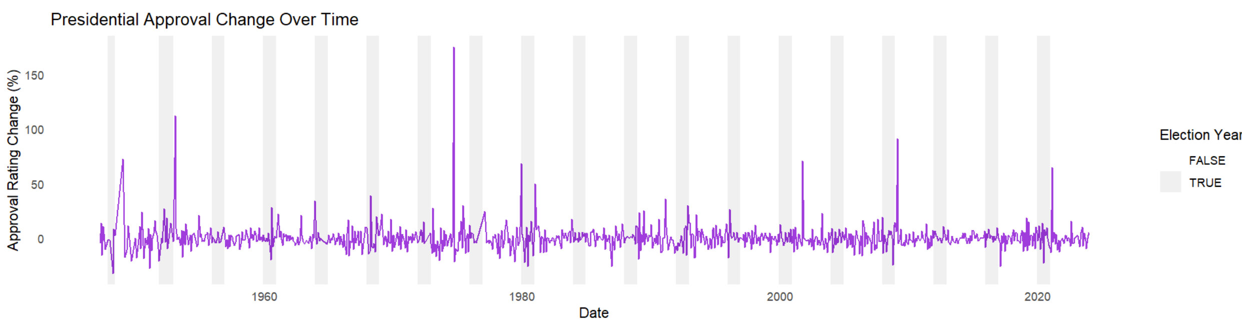


Figure 5 shows the percentage change in presidential approval rating over time. Unlike the original data on approval rating, this plot shows stationarity. The mean is constant over time, and the variance appears to be generally constant as well. Using the same test of standard deviations, this data would be stationary.

Table 1

	Mean	SD	Min	Median	Max
CPI	0.290	0.344	-1.771	0.248	1.964
Dow	0.669	4.144	-23.216	0.893	14.414
SnP	0.714	4.192	-21.763	0.951	16.305
Gold	0.534	4.459	-17.755	0	48.704
Silver	0.669	7.966	-47.277	0	60.079
Oil	0.774	9.104	-54.245	0	134.571
Date	1985.5	22.288	1947	1985.5	2024

Table 1 displays descriptive statistics for each of the continuous variables used in this research. As this table shows, the S&P 500 has the highest average monthly return of any of the four investment types, with a monthly average return of about 0.714%. The Dow Jones and silver follow closely behind with an average return of 0.669% per month. Silver is generally the most volatile; its standard deviation of 7.966% is nearly twice that of any of the alternative investments. With a minimum monthly return of -47% and a maximum monthly return of 60%, the data would suggest that silver prices can change rather quickly. Even though silver has shown one of the highest historical return percentages, gold has the lowest average rate of return of any of the four investment types with a mean monthly return of 0.534%. Despite having a lower average return than the stock market, the minimum monthly return rate for gold is moderately higher than either of the stock variables, and the maximum monthly return is about three times that of the S&P 500. Overall, gold has a lower average rate of return than silver, although gold does appear to be a slightly less risky investment.

The Dow Jones Industrial Average and the S&P 500 follow generally very similar trends to one another. Since both have prices determined by a set of successful, often blue-chip stocks, both market indexes develop extremely similar patterns. Despite their similarities, Table 1 would suggest that the S&P 500 slightly outperforms the Dow Jones Industrial Average. The S&P 500 returns an average of about 0.714%, compared to about 0.669% from the Dow Jones Industrial Average. While this 0.045% difference may seem too miniscule to be relevant, even a small difference in return rate can be significant due to the effect of compounding.

For example, if $1 were to be invested and left in an account with a 0.714% monthly return, that $1 would be worth $12.95 after 30 years. If that same $1 were to be invested in an account with a 0.669% monthly return, that $1 would be worth only $11.03. With an advantage of just 0.045% per month, the $1 invested with the slightly higher rate of return would be worth a whopping 17.4% more than the $1 invested at the slightly lower rate of return, assuming that the original investment was left in each account for 30 years. Therefore, even a small difference in monthly return can make a considerable difference over time. For both the Dow Jones and the S&P 500, the absolute value of the minimum historical return is higher than the absolute value of the maximum historical return. Additionally, the median return for both the Dow Jones and the S&P 500 are higher than the average. This matches the findings of a previous paper (Pastor, Veronesi, 2012), which found that negative returns from unfortunate political news were generally more severe than the positive returns that came from good political news.

Finally, looking at the mean change for each variable, it can be seen one can see that all investment types grow faster than the CPI, on average. This means that over time, an investment in either stock index and/or either precious metal would allow an investor to keep up with inflation while still gaining purchasing power. However, on average, the price of oil grows at a faster rate than any of the four investment types used for this experiment. This means that none of the four investments earns a high enough rate of return to account for changes in oil prices, meaning that purchasing power regarding gasoline is likely to decrease over time regardless of which investment type is chosen.

Methods

i) Election vs. Non-Election Results

After the final dataset was formed, the first analysis technique was to create a table to show how results differ between election years and non-election years. Average growth rates for each variable were calculated by taking the difference in the real value of the variable from one time period to the next, then dividing by the value in the earlier time period. These values were then multiplied by 100, meaning that all values in the dataset are expressed as a month-over-month percentage return. In order to determine whether there is truly a statistically significant difference between election years and non-election years, a dummy variable was created. This variable tells whether a U.S. presidential election occurs in any given year. Based upon the value of the dummy variable, two separate columns were formed. The first column represents average growth rates during election years, while the other represents average growth rates during non-election years. There is also a third column. This column uses a Welch's two sample t-test to determine whether there is a statistically significant difference between the election year and non-election year values.

ii) Vector Autoregressive Model

One important part of this project was determining the relationship between economic indicators and presidential approval rating. In order to determine the nature of this relationship, a vector autoregressive (VAR) model was used. Vector autoregression is a statistical time series model used to estimate the correlation between simultaneous time series equations. While a vector autoregressive model can account for exogenous variables, VAR models are a great option when variables are suspected to be endogenous. In a VAR model, each variable is regressed upon its own lags as well as the lags of the other endogenous and/or exogenous variables. In a first order VAR model, only one lag of each variable is included. Such a model would follow the format below:

$$Y_{1,t} = \beta_0 + \beta_1 Y_{1,t-1} + \beta_2 Y_{2,t-1} + \beta_3 Y_{3,t-1} + \beta_4 Y_{4,t-1} + \ldots + \varepsilon_{1,t}$$

$$Y_{2,t} = \lambda_0 + \lambda_1 Y_{2,t-1} + \lambda_2 Y_{1,t-1} + \lambda_3 Y_{3,t-1} + \lambda_4 Y_{4,t-1} + \ldots + \varepsilon_{2,t}$$

$$Y_{3,t} = \psi_0 + \psi_1 Y_{3,t-1} + \psi_2 Y_{1,t-1} + \psi_3 Y_{2,t-1} + \psi_3 Y_{4,t-1} + \ldots + \varepsilon_{3,t}$$

A vector autoregressive model could also be of the second order, meaning that two lags of each variable would be included. A second order VAR model would follow the format below:

$$Y_{1,t} = \beta_0 + \beta_1 Y_{1,t-1} + \beta_2 Y_{1,t-2} + \beta_3 Y_{2,t-1} + \beta_4 Y_{2,t-2} + \beta_5 Y_{3,t-1} + \beta_6 Y_{3,t-2} + \ldots + \varepsilon_{1,t}$$

$$Y_{2,t} = \lambda_0 + \lambda_1 Y_{2,t-1} + \lambda_2 Y_{2,t-2} + \lambda_3 Y_{1,t-1} + \lambda_4 Y_{1,t-1} + \lambda_5 Y_{3,t-1} + \lambda_6 Y_{3,t-2} + \ldots + \varepsilon_{2,t}$$

$$Y_{3,t} = \psi_0 + \psi_1 Y_{3,t-1} + \psi_2 Y_{3,t-2} + \psi_3 Y_{1,t-1} + \psi_4 Y_{1,t-1} + \psi_5 Y_{2,t-1} + \psi_6 Y_{2,t-2} + \ldots + \varepsilon_{3,t}$$

A VAR model can also use more than two lags of each variable; in this case the equation will be adjusted accordingly to match the number of lags included to the order of the VAR model. It is also possible to expand the model beyond a linear model, such as adding quadratic terms for each of the variables. In fact, it is likely that a truly correct model would include some non-linear terms. However, interpreting the results of a VAR model is already difficult; the addition of any non-linear terms would make the interpretation of the model even more difficult. For the sake of simplicity, linearity was assumed for this project. Although this model may not be perfect, it is a starting point that should still be useful in showing the overall effects.

With a vector autoregressive model, one can observe how all variables will change when one of the variables experiences a shock. In a classic linear regression model, coefficients explain effects on a dependent variable due to a one-unit change in a given independent variable.

Alternatively, in a VAR model, the variable is not increased directly, but rather the shock is applied to the error term. When all other values remain the same, this one-unit increase in the error term effectively acts as a one-unit increase to the left-side variable.

Unlike a classic regression, the effect of a one-unit change cannot be expressed by the value of any one coefficient from any of the equations. This is true because some or all variables are assumed to be endogenous, meaning that there are both direct and indirect effects. This can be seen upon reviewing the first set of equations. Looking at the first equation, a one-unit increase in $\varepsilon_{1,t}$ leads to a one-unit increase in $Y_{1,t}$. In the second equation, Y_2 is dependent upon Y_1. Therefore, a one-unit increase in $\varepsilon_{1,t}$ leads to a λ_2 increase in $Y_{2,t}$. However, the effect of the shock does not end there. In the third equation, Y_3 is dependent upon Y_1 and Y_2. This means that $Y_{3,t}$ will increase by $\psi_2 + \lambda_2\psi_3$. Plugging these increases in Y_2 and Y_3 back into the first equation, a $\lambda_2\beta_2 + \lambda_2\psi_3\beta_3$ increase will be observed in $Y_{1,t}$. As this pattern continues, the true effect of the shock can be very difficult to interpret.

In order to visualize the effect of the shock over time, impulse response functions are created. The first step of this process was to create a functional VAR model. Since this model requires there to be no missing values, only complete observations were included. Next, this dataset was converted into the format of a time series. This time series was used to create a VAR model. Using this VAR model, impulse response functions were created, showing the impact on each variable when one variable is shocked. Finally, these impulse response functions were plotted along with 68%, 90%, and 99% confidence bands.

Like most regressions, this model works with the null hypothesis that the effect of any given shock would be 0 for all other variables. In other words, the null hypothesis states that a shock to one variable has no statistically significant impact on any of the other variables. To determine whether or not the null hypothesis may be rejected, one should go to the plots of the impulse response functions. Since the null hypothesis assumes an effect of size 0, this hypothesis may only be rejected when the value 0 falls outside of the confidence interval. For this project, 68%, 90%, and 99% confidence intervals were calculated. If 0 falls within all three of these confidence bands, the conclusion would be a failure to reject the null hypothesis; however, if a confidence band does not contain 0, then the null hypothesis may be rejected for that given confidence level. Since a 68% confidence interval would be the narrowest of the three levels used, rejecting the null hypothesis at the 68% significance level would be far easier than rejecting it at the 90% significance level.

iii) Endogenous vs Exogenous Variables

To understand a vector autoregressive model, it is important to understand the difference between endogenous and exogenous variables. Exogenous variables are variables that are unrelated to one another. While they may be used as independent variables in the same model, they are not considered to be dependent upon one another. For example, the square footage of a house and its proximity to the nearest airport may both be used to predict house prices. While they may both reasonably be included as predictors in the same model, house size is very unlikely to have an effect on airport proximity, and vice versa. Endogenous variables are assumed to be influenced by the other variables within the model. For example, gold prices and S&P 500 prices would be considered endogenous variables when put into a model. Since both represent different investment alternatives, the values of one should in some way depend upon the other. The law of demand states that quantity demanded for a given good increases when the price of a substitute good increases. Therefore, if the price of the S&P 500 changes, gold prices will likely be affected as a result, and vice versa.

Results

i) Election vs. Non-Election Results

Table 2

Characteristic	**Election**, N = 228[1]	**Non-Election**, N = 698[1]	**p-value**[2]
CPI	0.26 (0.36)	0.30 (0.34)	0.2
Dow	0.42 (4.05)	0.75 (4.17)	0.3
SnP	0.55 (4.12)	0.77 (4.22)	0.5
Gold	0.46 (5.29)	0.56 (4.16)	0.8
Silver	0.12 (8.47)	0.85 (7.79)	0.3
Oil	0.65 (9.93)	0.81 (8.82)	0.8

[1] Mean (SD)

[2] Welch Two Sample t-test

Table 2 shows the mean and standard deviation for each variable during an election year, as well as during a non-election year. Each is expressed as a month-over-month percentage return. The far-right column contains p-values. These p-values use a Welch's two sample t-test to determine whether there is a statistically significant difference between election year returns and non-election year returns. Using an alpha level of 10%, the p-values would suggest that there is insufficient evidence to reject the null hypothesis for any of the observed variables. Therefore, the conclusion must be drawn that election year returns are not statistically different from non-election year returns for any of the included variables.

Despite a lack of statistical significance, the differences found in the point estimates may be of some use. For example, during non-election years both the Dow Jones and the S&P 500 have a growth rate of approximately 0.75% per month. However, during election years, past data would suggest that the Dow Jones and the S&P 500 have growth rates of about 0.42% and 0.55% per month, respectively. Even though these values do not provide sufficient evidence to claim that this trend will happen in the future, these point estimates are worth considering when making an investment decision. Similarly, the point estimates of silver would suggest that silver has the highest growth rate of any investment type during non-election years; yet during an election year, silver has the lowest growth rate of any investment. Looking at the results found in Table 2, it would appear that an optimal investing strategy could include investing in silver during non-election years, then shifting focus to the S&P 500 during election years. This strategy directly contradicts the original hypothesis of this paper.

Overall, the results of the Table 2 show several large differences between election year averages and non-election year averages. This begs the question: why are these results statistically insignificant? This is likely due to the volatility of the investment types that are included. As previously mentioned, these p-values are found using a Welch's t-test. Statistical significance using a Welch's t-test is determined based upon the mean and the standard error of each group. Take the S&P 500 for example. During an election year, the average return on investment is about 0.55% per month, yet the standard deviation is a whopping 4.12%, a value several times the mean. This relatively high standard deviation leads to a low t-value, ultimately leading to a high p-value and a failure to reject the null hypothesis. Therefore, an extreme difference between groups would be required to actually achieve statistically significant results.

ii) Vector Autoregressive Model

In order to quantify the effect of economic changes on presidential approval rating, a vector autoregressive (VAR) model was used. For this project, a third order VAR model was used. This means that three lags were used for each variable. Since the VAR model was only able to run when the dataset was complete, any missing values were removed. This means that any data points which occurred prior to January 1, 1947 were omitted, and all of the following models were run with the remaining data. First, a full model was run, meaning that all of the relevant variables were included. One at a time, each commodity experienced a hypothetical shock. Impulse response functions were then plotted to visualize the effect of each shock on the approval rating of the incumbent president. The following plot displays the effect of each shock, as well as a 68%, 90%, and 99% confidence interval. The lightest-shaded area represents the 99% confidence interval, while the darkest shading represents the 68% confidence interval, with the 90% confidence interval being in the middle.

It is difficult to determine where the first shock should occur in this model. The strongest argument can be made that the original shock should occur on the price of oil. As oil prices increase, consumers have less disposable income that they are able to invest in stocks or precious metals. This will affect both stock and commodity prices, likely in a negative way. Additionally, an increase in oil prices will cause the cost of transportation to increase. When the cost to get products to stores rises, the prices of those goods will likely rise as well in the form of a CPI increase. Finally, a shock to the price of oil should affect presidential approval rating. Consumers see signs of gasoline prices nearly every time they leave their homes. With gasoline being a necessity, consumers become unhappy when prices rise, especially when gas station signs make the change obvious. Therefore, a shock to the price of oil should cause the presidential approval rating to decrease.

Figure 6

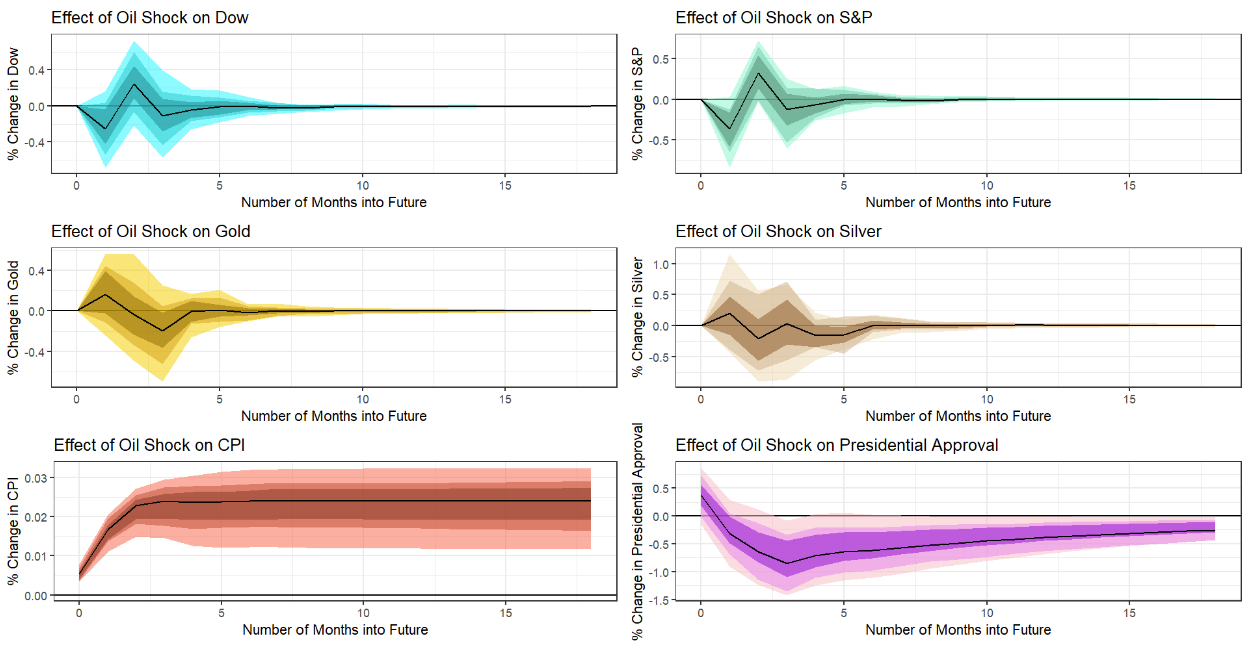


Figure 6 shows the effect of an oil shock on all other variables. The effects on asset prices appear to be statistically insignificant; although there is a significant effect on CPI, which is small but positive. There is also a significant effect on presidential approval rating which is both negative and moderately large.

While a couple of variables were significant in this model, multiple variables were insignificant, despite presenting a strong logical reason to be significant. One cause for this could be multicollinearity. Multicollinearity is an issue that arises when two or more variables are too closely related. Table 3 shows the correlation coefficients for each pair of predictors.

Table 3

	Dow	SnP	Gold	Silver	Oil	CPI
Dow	1					
SnP	0.953334	1				
Gold	0.001844	0.016269	1			
Silver	0.167847	0.183534	0.535713	1		
Oil	0.133596	0.149328	0.084836	0.22271	1	
CPI	-0.0277	-0.01792	0.040033	0.0667	0.214029	1

With a correlation coefficient of more than 0.95, multicollinearity is likely present between the two variables related to stocks. Although the Dow Jones and the S&P 500 are separate market indices, these two variables have extremely similar trends. Both indices are made up of several high-cap stocks. When the stock market as a whole goes up, the Dow Jones and the S&P generally go up, often at very comparable rates. This means that the model may assign effects to the S&P that are actually caused by the Dow, and vice versa. Therefore, including just one of these variables in the model should be sufficient to capture the effects. Similarly, gold and silver could present an issue regarding multicollinearity. Gold and silver are two precious metal options that follow very similar trends over time; the two assets are also frequently purchased together. With a correlation coefficient of about 0.54, it would appear that only one of these variables should be included. Finally, CPI and oil prices may be causing some multicollinearity. Their correlation coefficient is only about 0.21, much lower than either of the previously mentioned pairs. However, both of these variables represent price changes in goods that are necessary for consumers. As either one increases, presidential approval ratings should be expected to fall, and asset values should fall. Since they are both a measure of consumer costs and have the same expected effect, removing one is likely the best course of action. Oil seems to be the more relevant variable, so CPI was removed from the model to avoid multicollinearity with oil prices.

Therefore, in order to estimate the effects of an oil shock while still controlling for multicollinearity, a smaller model was created. In this model, an oil shock is simulated where gold price, S&P price, and presidential approval rating are all included as endogenous variables. This model can be represented by the following set of four equations:

1) $Oil_t = \beta_0 + \beta_1 Oil_{t-1} + \beta_2 Oil_{t-2} + \beta_3 Oil_{t-3} + \beta_4 SnP_{t-1} + \beta_5 SnP_{t-2} + \beta_6 SnP_{t-3} + \beta_7 Gold_{t-1} + \beta_8 Gold_{t-2} + \beta_9 Gold_{t-3} + \beta_{10} Approval_{t-1} + \beta_{11} Approval_{t-2} + \beta_{12} Approval_{t-3} + \varepsilon_{1,t}$
2) $SnP_t = \lambda_0 + \lambda_1 SnP_{t-1} + \lambda_2 SnP_{t-2} + \lambda_3 SnP_{t-3} + \lambda_4 Oil_{t-1} + \lambda_5 Oil_{t-2} + \lambda_6 Oil_{t-3} + \lambda_7 Gold_{t-1} + \lambda_8 Gold_{t-2} + \lambda_9 Gold_{t-3} + \lambda_{10} Approval_{t-1} + \lambda_{11} Approval_{t-2} + \lambda_{12} Approval_{t-3} + \varepsilon_{2,t}$
3) $Gold_t = \psi_0 + \psi_1 Gold_{t-1}\ \psi_2 Gold_{t-2}\ \psi_3 Gold_{t-3} + \psi_4 Oil_{t-1} + \psi_5 Oil_{t-2} + \psi_6 Oil_{t-3} + \psi_7 SnP_{t-1} + \psi_8 SnP_{t-2} + \psi_9 SnP_{t-3} + \psi_{10} Approval_{t-1} + \psi_{11} Approval_{t-2} + \psi_{12} Approval_{t-3} + \varepsilon_{3,t}$
4) $Approval_t = \psi_0 + \psi_1 Approval_{t-1} + \psi_2 Approval_{t-2} + \psi_3 Approval_{t-3} + \psi_4 Oil_{t-1} + \psi_5 Oil_{t-2} + \psi_6 Oil_{t-3} + \psi_7 SnP_{t-1} + \psi_8 SnP_{t-2} + \psi_9 SnP_{t-3} + \psi_{10} Gold_{t-1} + \psi_{11} Gold_{t-2} + \psi_{12} Gold_{t-3} + \varepsilon_{4,t}$

As these equations would show, interpreting the true effects of the shock can be extremely difficult and time-consuming. Instead, the impulse response functions provide a much better understanding of the impacts.

Figure 7

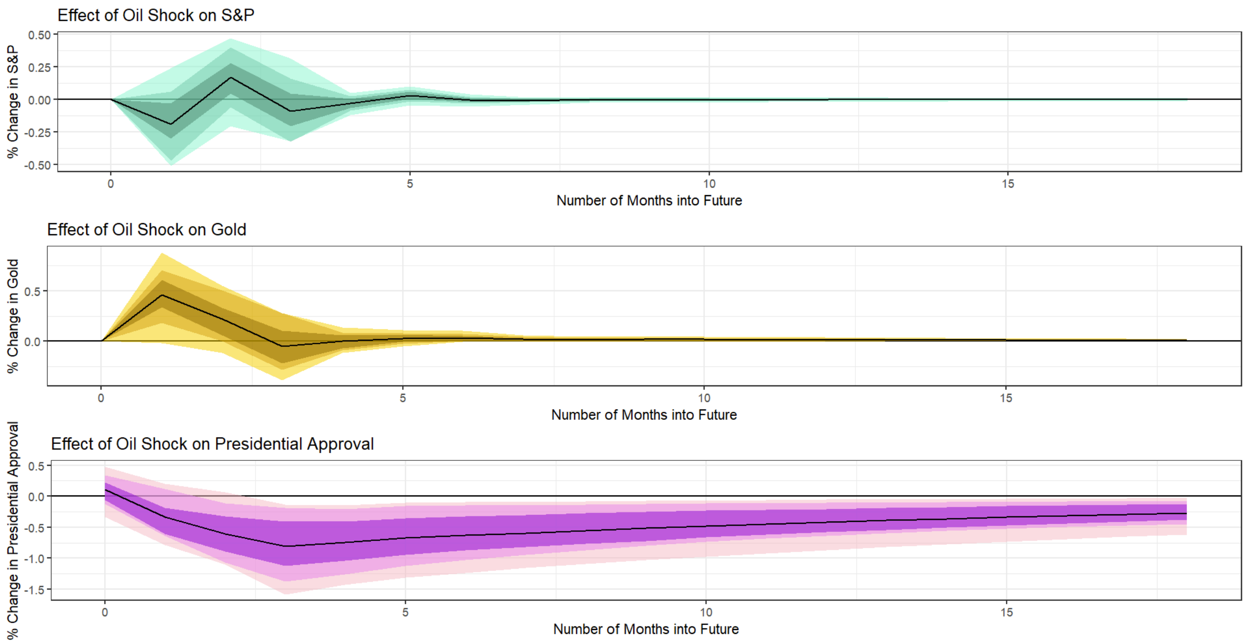


Figure 7 shows the impulse response functions of S&P, gold prices, and presidential approval rating if there is a shock on the price of oil. Overall, there looks to be little effect on the stock market, with results being insignificant throughout the entirety of the plot. There appears to be little impact on the price of gold, though it would seem that gold prices rise for about two months after an oil shock. These results are significant at a 90% confidence level. While a 2 month stint of significance may be due to type I error, these results would be logical. As oil prices rise, consumers become uncertain of the future. Gold is a popular asset during times of uncertainty, so the results are consistent with understood economic theory. Finally, there is a significant, negative effect on presidential approval rating. When consumers are unhappy with gas prices, approval rating drops; these effects can be long-lasting, being significant even 18 months after the occurrence of the shock.

Although multicollinearity should no longer be an issue in this model, it is important to remember the behavior of each of the variables included in the model. Both oil prices and gold prices were non-stationary due to non-constant variance. In order to ensure that the above model is not providing spurious results, a robustness check is performed by running an identical model where only stationary data is included. As previously discussed, prior to about 1980 –1982 to be exact-- variance in oil prices was very low. Beginning in 1982, the variance increased and became much more constant. By only including data from 1982 and later, this model can help to determine whether the results are skewed by non-stationarity. Since all data prior to 1982 is removed, this should resolve the same issue regarding gold prices. If the results are accurate, the new impulse response functions should look very similar.

Figure 8

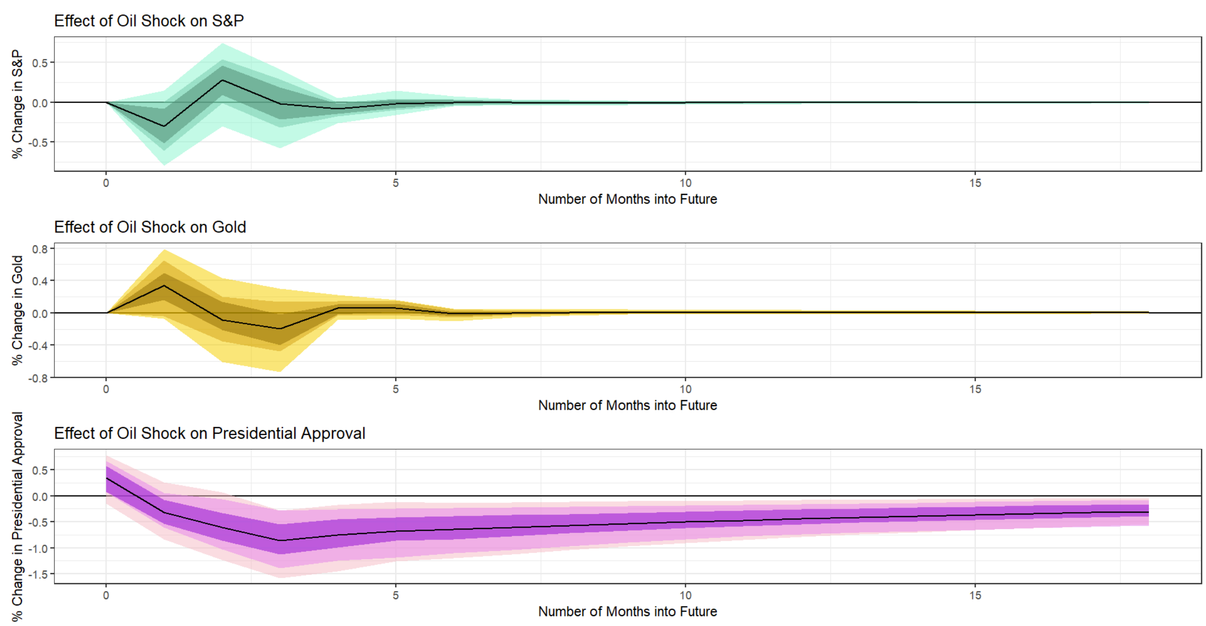
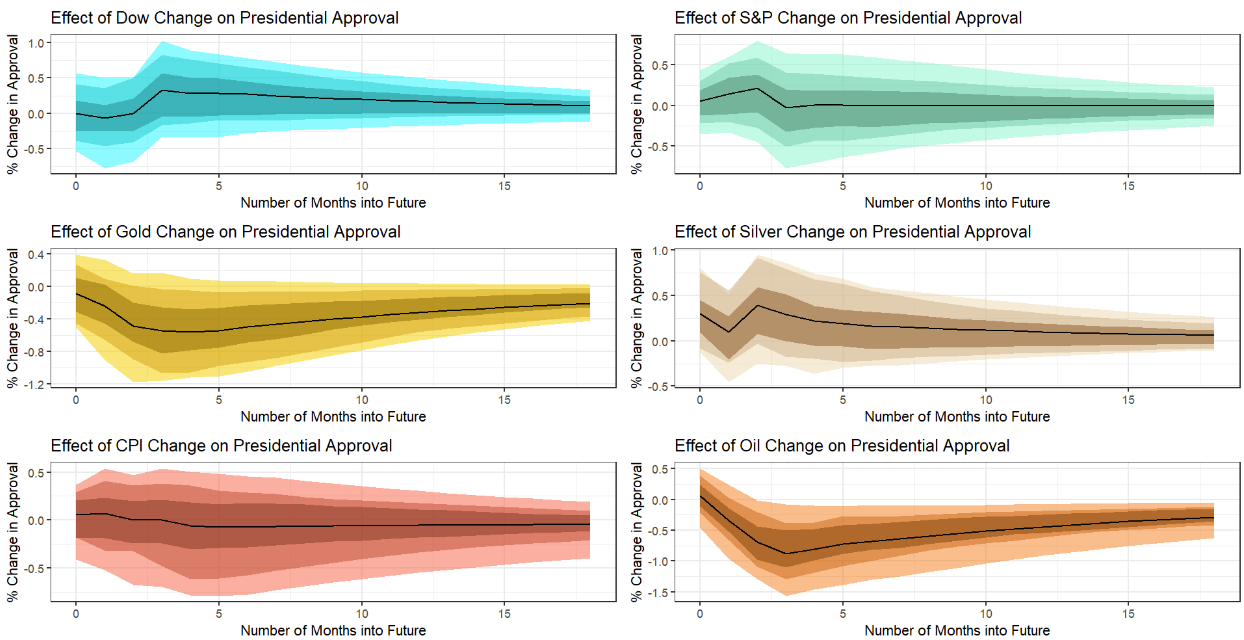


Figure 8 shows the new model that uses only stationary data from 1982 and later. Since this data is remarkably similar to the previous model, it would appear that non-stationarity in the data is not an issue to worry about.

These models may certainly prove to be very useful, but there is one big question that is left unanswered: how would presidential approval rating be affected if a shock were to occur on a different variable rather than on oil prices?

Figure 9



As Figure 9 shows, changes in some economic indicators seem to affect approval rating, and some seem to have no effect. Just like the last model, a shock was applied to one variable at a time. While it is possible to see the effects on all other variables, presidential approval rating is the variable of interest in this model. Therefore, only the total effect on presidential approval rating was included for each shock. The first variable to experience a shock was CPI. One might expect that a rise in the price of necessary goods might upset consumers, lowering the approval rating of the president. However, there is no evidence of this within the plot. Any changes to the line of estimation are very miniscule, and 0 is well within even the 68% confidence band. Therefore, the null hypothesis cannot be rejected regarding CPI, and there is not enough evidence to suggest that the impact of CPI changes on presidential approval rating is not equal to 0.

The next variables to experience shocks were the Dow Jones and the S&P 500. For each of these variables, the effect of the shock on presidential approval rating was insignificant at the 90% confidence level. The positive effect of the Dow Jones shock was statistically significant at the 68% level from about three months after the shock until 18 months after the shock; however, this confidence level still leaves an extremely large amount of room for error.

The next shock to be observed was a shock in the price of gold. Looking at the plot, a shock to the price of gold does appear to have a statistically significant effect on presidential approval rating. Roughly two months after the shock, there is a negative effect on approval rating which is statistically significant using a 90% confidence interval. This effect is significantly negative even 18 months after the shock, though the absolute value of the effect is constantly decreasing from about four months onward.

When the price of oil experienced a shock, the effect on presidential approval rating was statistically significant even at the 99% confidence level. Within just a couple of months after a shock on the price of oil, approval rating falls. After peaking around 3 months after the shock, the negative effect begins to move toward 0, but it remains significantly negative for at least 18 months after the shock. The long-lasting effects on oil and gold match the findings of a previous paper (Gulen, Ion, 2016), which found that recovery time for losses that stem from political uncertainty may reach two to three years.

Finally, the price of silver experienced a shock. Like most other variables, the effect of the shock on presidential approval rating was insignificant for all time points when looking at the

90% confidence band. Unlike shocks on gold, shocks on silver have positive effects on presidential approval rating, though the evidence of this is extremely statistically insignificant.

The evidence presented in this model would suggest that these economic indicators have some type of effect on presidential approval ratings, but it could also be the case that the direction of this relationship is the opposite. For example, the previous model suggests that an increase in gold returns leads to a decrease in presidential approval ratings. This relationship does not seem to make logical sense; after all, investors should be happy that their investment is earning them a higher return. Perhaps this is an incorrect or unexpected result. But it may also be the case that lower presidential approval ratings lead to an increase in gold prices, presenting the issue of reverse causation. Gold is generally a rather safe investment, so it may be the political uncertainty of a drop in approval ratings that leads to an increase in prices, which would still explain the negative correlation. In order to test whether this is the case, another VAR model was used. In this new model, a shock on presidential approval rating was simulated. The effects on the S&P 500, gold, and oil were then observed.

Figure 10

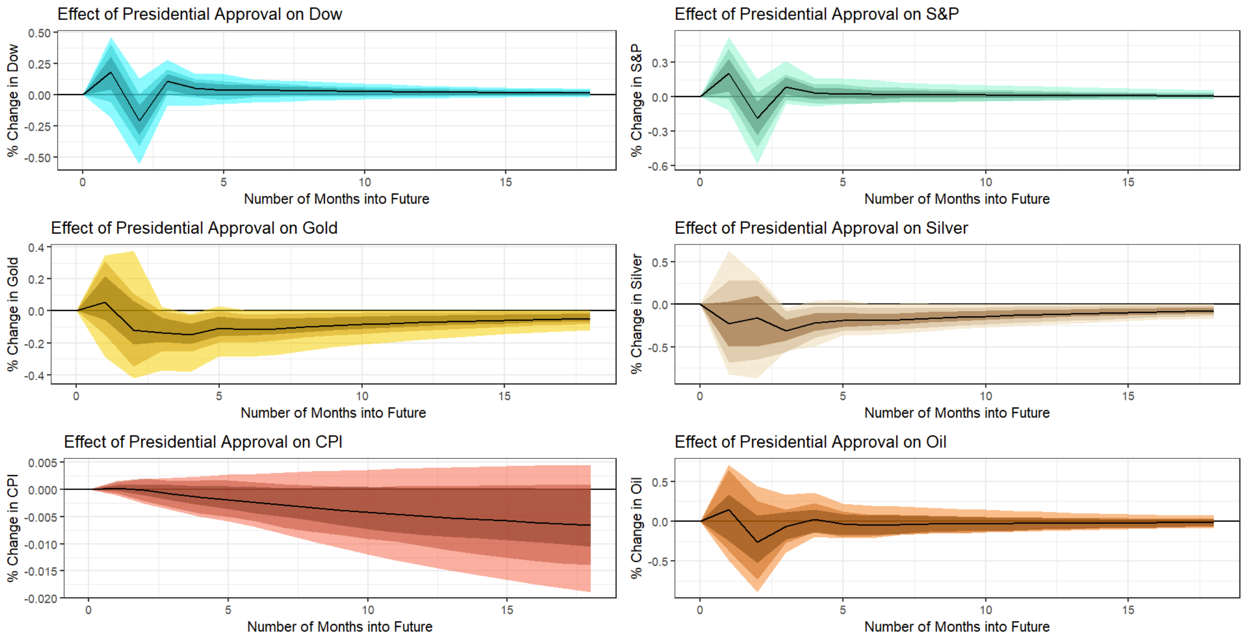


Figure 10 shows the results of the VAR model using an approval rating shock. In this case, effects of an approval shock on all variables appear to be statistically insignificant. Based on this model, the effect of the economy on presidential approval ratings appears to be larger and more significant than the effect of presidential approval ratings on the economy, meaning that reverse causality should not be a cause for concern.

Conclusion

When observing the impact of an election year on investment returns and cost variables, there does appear to be some type of effect, even if not significant. Although the high variance-mean ratio present within the variables leads the results to be statistically insignificant, the point estimates can still be useful. The evidence would suggest that an optimal investing strategy would include a focus on silver during non-election years, then a switch to the S&P 500 during election years. While this strategy may provide the highest average return, the evidence does also show that silver is a very volatile investment, with monthly returns ranging from -47%

to 60%. Therefore, this strategy may not be optimal for risk-averse investors. The S&P 500, on the other hand, has had historical monthly returns ranging from -22% to 16%. Due to the more consistent returns from the S&P 500, an S&P 500 focused investment plan may be more optimal for those investors who wish to limit their risk.

Additionally, at least some of the economic indicators that were used for this project do appear to have an effect on presidential approval rating. Increases in the prices of oil or gold are generally followed by a decrease in presidential approval ratings. Increases in the value of the S&P 500 are generally followed by increases in presidential approval ratings. The logic behind this evidence is valid, though its significance is questionable. Finally, increases in the value of silver are generally followed by increases in presidential approval rating; however, this result was very statistically insignificant. On the other hand, shocks to presidential approval ratings seem to have no significant impact on any of the economic indicators examined in this paper.

Overall, the results of this project would suggest that there is some type of significant relationship between politics and the economy, though some results are more significant than others. Generally speaking, the conclusions drawn from the evidence presented in this experiment are logically sound. By considering these results when making investing decisions, it may be possible to make slight improvements in investing behavior.

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