AN ECONOMETRIC ANALYSIS OF U.S. GDP - DEMOCRAT VS REPUBLICAN: WHO GETS YOUR VOTE?

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The American presidential elections, undoubtedly the most widely debated set of elections worldwide, could perhaps be described as a popularity contest as opposed to a battle of policy objectives. In this econometric analysis Nicola Dunne investigates the differing effects of Democrat or Republican leadership on US GDP by employing US fiscal spending and US labour force participation as explanatory variables. The results of her paper beg the question: if American citizens chose their Presidents purely on the basis of economic effectiveness, would the outcomes be different?

Introduction

> *'Economic policy can result from governmental inaction as well as governmental action.'*[1]

A link between politics and economics has been present in nations across the world for quite some time. In America, presidents have repeatedly emphasised the importance of improving their country's economy. In fact, the many efforts made by different presidents, including job creation and fiscal spending, tended to shape the country's economic performance. Jimmy Carter for instance:

> 'worked hard to combat the continuing economic woes of inflation and unemployment. By the end of his administration, he could claim an increase of nearly eight million jobs and a decrease in the budget deficit' (www.whitehouse.gov).

In the course of this report, a detailed analysis of the impact that

[1] President John F. Kennedy, New York: 12/10/1960

Democrat and Republican presidents have on U.S. GDP will be conducted. It will be of great interest to gain insight into this relationship as the U.S. presidential elections draw closer. This is particularly the case due to the state of the American economy at the present time, where fears of a recession being imminent are relayed more and more frequently. The analysis will initially involve an outline of the econometric approach adopted. This entails a description of the estimation technique, data set and regression model. Afterwards, the results obtained will be used to support or reject the hypothesis that the political affiliation of American presidents tends to have a distinctive impact on U.S. GDP. Finally, a set of investigative tests will be carried out to evaluate the strength of the model itself, from which, an overall conclusion of the success of this regression will be made.

Econometric Approach

Firstly, it is necessary to specify that this study utilises a time series data set and also the ordinary least squares (OLS) method of estimation. Through the *Microfit* programme, a set of population parameters will be estimated, from which a "line of best fit" will be derived.

Population Regression Model

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3D + u$$

Where:

Y =	Dependent Variable
X_s =	Explanatory or Independent Variables
b_s =	Regression Coefficients
D =	Dummy Variable
u =	Error or Disturbance Term

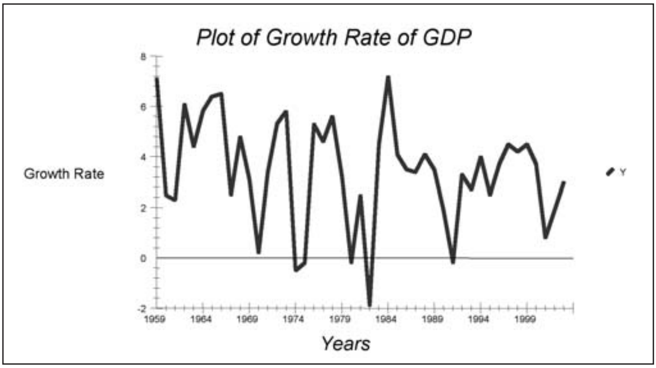
The regression is developed using annual figures from the time interval, 1959 to 2003, which should contain sufficient information as ten Presidents have been in office during this period. Twenty-five of these years have seen a Republican president in charge, leaving nineteen years having a president of Democrat affiliation. This provides quite an even basis for examination.

Specification of Variables

Dependent Variable *Y*

Y represents the dependent variable, which for the purpose of this report, is the growth rate in real U.S. GDP (2000 Prices) over the chosen period. The data for this variable was attained from the Economic Report of the President, 2006.

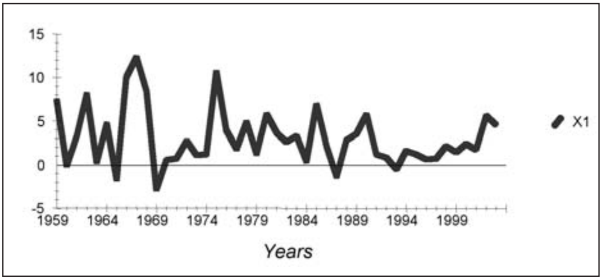
Figure 1. Plot of Growth Rate of GDP.



Independent Variables

X_1: The first independent variable is the growth rate of Annual Fiscal Spending (2000 Prices) by the U.S. government. The data for this variable was constructed through calculations using the U.S. Government's Budget figures, containing Historical Tables for the fiscal year 2007.

Figure 2. Plot of Growth Rate in Fiscal Outlays



X_2: The second explanatory variable chosen is the growth rate in the annual Labour Force Participation Rate in the U.S. economy. Again, the data for the variable was composed through calculations using the Economic Report of the President, 2006.

Figure 3. Plot of Growth Rate in Labour Force Participation

Dummy Variable

D: To conduct this analysis, it is necessary to introduce a Dummy Variable 'as a device to classify data into mutually exclusive categories' (Gujarati, 2003: 298). In this case, Democrats are arbitrarily chosen as the benchmark category (0) and therefore Republicans become the alternative category (1). The information regarding the years when the various Presidents were in power and the political parties, of which each of these Presidents were members, is taken from web-based sources.[2]

Error Term

u; Due to the wide array of possible variables that may influence the level of GDP in a country, such as literacy levels or entrepreneurial spirit, it is necessary to incorporate an error term which represents all the omitted variables from the regression.

> 'No matter how many explanatory variables we include in our model, there will always be factors we cannot include, and these are collectively contained in u' (Wooldridge: 2006: 76).

[2] www.whitehouse.gov

Expectations

We would expect there to be a positive relationship between fiscal spending and GDP and also between the labour force participation rate and GDP as both are important stimulants for productivity, output and growth in an economy. One would also anticipate a negative relationship between the dummy variable and GDP due to the conservative aspect of the Republican Party. It can be argued that this conservative element would limit the party's ability to make strong economic improvements, relative to the Democrat Party. In addition, as this is a time series model, heteroskedasticity is not expected to be present in the analysis. However, due to the correlation patterns that tend to exist between some of the independent variables, we do expect to find some degree of multicollinearity.

Primary Results

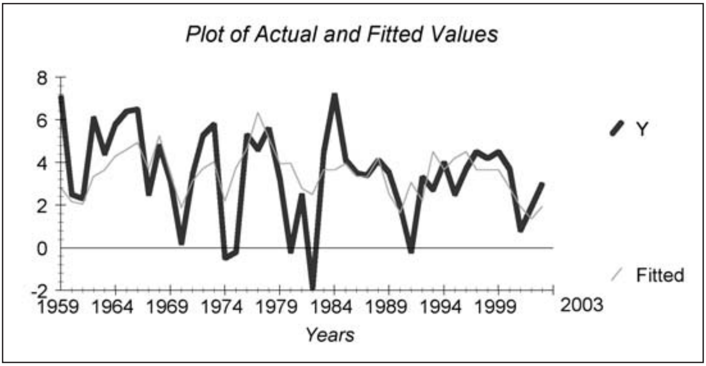
The results that the *Microfit* programme returned allowed us to construct the following line of best fit:

$$\boldsymbol{Y = 3.6507 + 0.0017043X_1 + 1.8851X_2 - 1.1671D}$$

Table 1: Results

Explanatory Variables	Coefficients	T-Statistic	Standard Error	P-Value
C	*-3.6057*	*6.8457*	*0.53329*	*0*
X1	*0.001704*	*0.019625*	*0.086842*	*0.984*
X2	*1.8851*	*3.1417*	*0.60004*	*0.003*
D	*-1.1671*	*-2.0455*	*0.57055*	*0.047*

Figure 4. Plot of Actual and Fitted Values



Expectations versus Results

Table 2 demonstrates that the expected relationships between the dependent and independent variables in this model have been verified by the actual results. It is interesting to note that the dummy variable has a negative relationship with GDP, as predicted. This shows that, relatively speaking, Republicans are less successful at generating GDP growth, i.e. the average growth rate is 2.48% compared to 3.65% for the Democrat Party.

Table 2: Expectations and Results

Variables	Expected Relationship	Results
Y and X_1	Positive	Positive
Y and X_2	Positive	Positive
Y and D	Negative	Negative

Analysis of the Model

Now that the initial results have been reported, it is necessary to perform a number of different tests to examine this model more thoroughly.

R-Squared

R^2 is defined as 'the basic measure of goodness of fit in regression analysis'. In this regression, R^2 is found to be a low *0.25399* or 25.4%, meaning that just over 25% of the data is explained by the independent variables. This perhaps suggests that some of the variables omitted from the regression may have been more significant. Therefore, they should have been included.in order to obtain a greater level of fit in the analysis. At the same time, according to Achen, 'R^2 measures directly neither causal strength nor goodness of fit' (Achen, 1982: 64). Furthermore, it should not be strictly assumed that regressions are 'less satisfactory or less powerful if their R^2 is lower' (Achen, 1982: 59). Thus it is important to pay attention to the statistical significance of the explanatory variables and in particular to 'the underlying theoretical expectations about the model in terms of a priori signs of the coefficients entering the model' (Gujarati, 2003: 232).

T-Statistic

In this model, X_2 and D both have statistically significant partial effects on Y at the 5% level. Thus one can reject that the poplation parameters of these two variables have a true value equal to zero. However, X_1 has a very high p-value of *0.984*. As a result, it can be stated that this variable does not hold much significance.

F-Statistic

'In multiple regression models, the F-test is used to test the overall significance of the regression' (Brown, 1991: 108). The F-statistic, in this model, has been calculated as *4.6529*. Since the corresponding p-value is just *0.007*, I can reject the null hypothesis of all slope coefficients being simultaneously zero and thus assert that at least one of the explanatory variables has a significant effect on Y.

Autocorrelation

Autocorrelation can be detected through the use of numerous different tests such as the Durbin-Watson test. The DW statistic we obtain for this model is *1.6892*. Using a 5% significance level, given that there are 45 observations, with 3 explanatory variables, the upper and lower critical values are:

$$d_U = 1.615 \text{ and } d_L = 1.383 \text{ respectively.}$$

We fail to reject the null hypothesis of no autocorrelation when:

$$d_U < d < 4 - d_U$$

Therefore, since:

$$1.615 < 1.6892 < 2.3108,$$

the null hypothesis cannot be rejected and it can be concluded that no autocorrelation is present in this model. Therefore, the OLS estimators may still, at this point, be described as BLUE (Best, Linear and Unbiased Estimator). As a result, the Classical Normal Linear Regression Model (CNLRM) assumptions are not affected at this stage.

Functional Form

According to Gujarati, one of the assumptions under the CNLRM is that 'the regression model is correctly specified' (Gujarati, 2003: 73). This in part refers to the use of the correct functional form in the model, which can be analysed using a test known as Ramsey's Regression Specification Errors Test (RESET). The null hypothesis, stated as, correct model specification, should not be rejected if the F-statistic is significant at the 5% level. In this model, the F value is quite low at *0.69745* while the p-value of *0.404* is greater than *0.05*. This indicates that the model does not appear to be mis-specified.

Normality Test

The normality assumption tends to be employed as it results in the residual terms being normally distributed and in the case of small finite samples (such as this model) 'it enables us to use the t, F, and c2 statistical tests for regression models' (Gujarati, 2003: 110). The presence of normality can be examined using the Jarque-Bera test. The calculated statistic obtained in this test was *2.1766* with a p-value of *0.337*. According to Gujarati;

> 'if the computed p value of the JB statistic in an application is sufficiently low … one can reject the hypothesis that the residuals are normally distributed' (Gujarati, 2003: 148).

Due to the high p-value found, it is verified that the residuals are normally distributed and all of the benefits of this as highlighted above, can be exploited.

The histogram of residuals below seems to support this result. In addition, the plot of residuals within two standard error bands confirms that some residuals are positive while others are negative. This implies that the distribution of residuals is not skewed.

Figure 5. Histogram of Residuals and the Normal Density

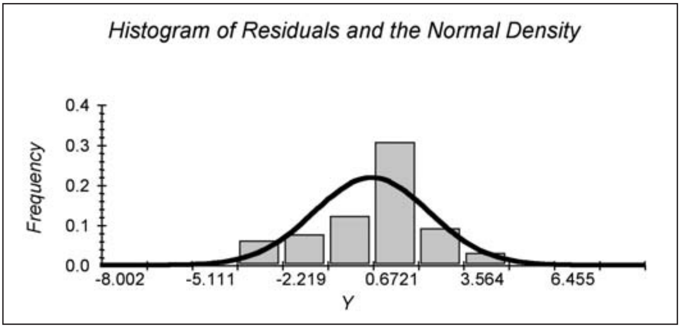
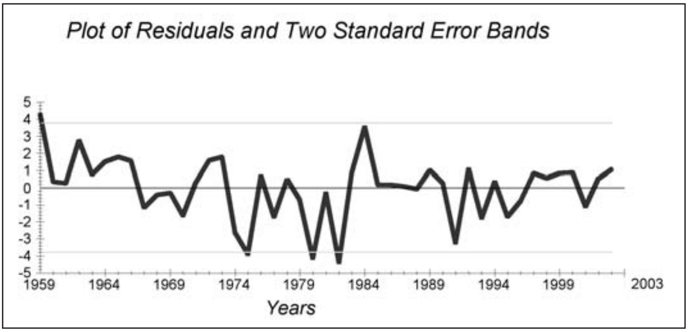


Figure 6. Plot of Residuals and Two Standard Error Bands



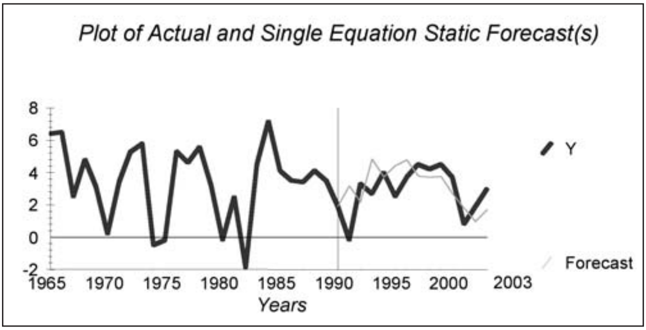
Heteroskedasticity

Microfit applies the Koenker-Basset test for heteroskedasticity. The null hypothesis of this test states that homoskedasticity is present. The computed F value in this model is found to be *0.26130* with a corresponding p-value of *0.612*. Due to the high p-value obtained, it is concluded that the null hypothesis should not be rejected. As expected, heteroskedasticity is not a problem that is faced by this model. Therefore, the residuals appearing in this regression are, 'homoscedastic; that is, they all have the same variance' (Gujarati, 2003: 387). As a result, this model's estimators maintain BLUE status.

Multicollinearity
Multicollinearity, defined as, 'high (but not perfect) correlation between two or more independent variables' (Wooldridge, 2006: 102) is tested by regressing the different explanatory variables on each other, and checking the resulting R^2 that is found (Wooldridge, 2006: 102). In this model, a high level of multicollinearity exists between X_1 and X_2, where R^2 equals *0.91884*. This result was expected due to a common trend in the two variables i.e. both tend to increase over time. Although the OLS estimators will still be BLUE in the presence of multicollinearity, their variances will be effected. Large variances result in 'the t-ratio of one or more coefficients … [being] statistically insignificant' (Gujarati, 2003: 350). However, little correlation is found between either X_1 and D, or X_2 and D, as R^2 is found to be *0.024847* and *0.015410*, respectively.

Forecasting
The final point of reference, which is very important, is the forecasting ability of this model. According to Koutsoyiannis; 'Forecasting is one of the prime aims of econometric research' (Koutsoyiannis, 1977: 28). By eliminating 13 years from the original regression, it is possible to use the data collected to forecast the GDP growth rates for the eliminated years. As the following graph demonstrates, while the forecast is not perfect, it does provide a satisfactory estimation of the trends to be expected in GDP. This supports the significance of the variables used in this regression.

Figure 7. Plot of Actual and Single Equation Static Forecast(s)



Conclusion

This report provides a useful insight into the impact that Democrat and Republican presidents have on U.S. GDP. Given the onslaught of negative shocks to the American economy in recent times, namely the sub-prime mortgage crisis, the consequent credit crunch and the significant decline in the housing market, a considered view of the economic effectiveness of Democrat and Republican presidents is all the more relevant as we now approach elections in November of this year. The results of this investigation reveal that Democrat presidents have created a 3.65% average GDP growth rate, compared to a 2.48% average growth rate generated by Republican presidents. An important and statistically significant explanation for this difference may be the presidents' ability to create jobs in the economy, a variable that has a positive impact on GDP growth. However, the growth rate of fiscal outlays was proven to be statistically insignificant.

While some weaknesses such as a low R^2 and high multicollinearity are evident in this model, the data is strong in terms of autocorrelation, functional form and normality. Therefore, the result that Democrat presidents have created higher GDP growth levels, relative to their Republican counterparts, should not be disregarded. Consequently, a reasonable prediction, should a Democrat be elected president next term, is that an increase in GDP growth will occur. As a result, perhaps for the sake of the U.S. economy alone, the most useful outcome in November would be the arrival of a Democrat politician to the White House. It will be exciting to witness events unfold and to see if this will in fact come to pass.

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