AN ANALYSIS OF NATIONAL SPENDING GROWTH RATES: CORRELATION OF POLITICAL POWER IN A MARKOV SWITCHING MODEL

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Abstract

This paper will examine the existence of high and low growth rate regimes within U.S. Federal spending. The focus will be on total spending and the following three components: defense, health care, and education spending. In order to study the possible high and low growth rates, a Markov switching model will be employed to allow for endogenous regime changes of national spending and its components. By allowing endogenous shifts of the data, the existence of any potential regimes can be identified and the timing of the regime changes can then be compared to the political landscape of the House, Senate, and Presidency to see which political party may be in power or assumed power at the time of the switch. Expectations should show that defense spending increases under times of Republican control while health care spending should increase under Democratic control. Total spending and education spending should remain relatively constant and help to identify potential unobserved variables which may change the regimes. While any number of outside variables could alter spending growth, the focus will be to see if regime changes align to expectations of political party platforms and political power.

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I. Introduction

National spending has hit record levels causing increased discussions about how to reign in government spending. Unfortunately, despite continual efforts to do so the government has been unsuccessful. The persistence of high spending levels may correlate to the difficulty of exiting the regime and entering into a lower spending level. While the focus of this paper may be on national spending, this paper will also incorporate the components of national spending: national defense, health care, and education. With the presence of business cycles, global issues, political elections, and a variety of other unobservable factors, there is a strong possibility of regimes existing regarding national spending levels. The purpose of this paper is not to overlook the possibility of outside influence but to instead try to understand the correlation of regime spending to the power of political parties. However, because politics do not operate in a vacuum, these outside variables may influence the existence of regimes, which is why the goal is to understand how regime changes may correlate to political power instead of examining how political power causes regime changes.

Through the use of a Markov switching model, an analysis of regime changes in national spending and its components can be studied to see what, if any, correlation to the power of political parties may exist. By allowing the model to switch endogenously instead of forcing changes, we can study the regime changes and see if they correlate to political expectations instead of looking at political power causing changes in spending. Further, while there can be a case made about studying multiple regimes because of political control of the House, Senate, and the Presidency, this paper will simply examine high and low spending growth and determine if the date of the regime change aligns to changes in political power. The questions being addressed are 1) Do high and low growth rates exist, and 2) if they do, do they correspond to the political party in power? By using the components of national spending we can understand how growth rates of certain programs, which are thought to be a focus of a political party, change when that party obtains power. The two primary political parties in the United States are the Democratic Party and Republican Party, and they often differ in their opinions of how government taxes should be spent. Democrats favor national health care programs such as Medicare and Medicaid, while Republicans often

favor private markets for health care instead of implementing a national program.[2] Regarding defense spending or national security, Republicans work to maintain a strong national defense and missile defense program, while Democrats favor limited defense spending.[3] Both parties show a desire to improve education, though through different means, which should serve as a standard to see where possible regime changes may occur outside of political control. Selecting national spending and these three components allows for a comparison of the regime changes, with a possibility of greater evidence of changes using the components, to understand the correlation of growth rates to political power.

In the wake of another political campaign cycle, primary elections, and an ever-looming election day, many Americans cast their vote, making a decision regarding the future of the government and how that government alters its spending. Political parties are partisan by definition, as are their budgets, and this is how government spending can differ, depending on the party in power. Does the political party in power push their agenda by using changes in spending growth? By using a Markov model as first introduced by James Hamilton we can hope to understand the possible correlation. Hamilton first introduced a Markov switching model in the field of economics by studying gross national product (GNP) to study the existence of business cycles. By employing this method to the national budget and its components we can see where, if any, regime changes may occur. By studying these regime changes and understanding when they occur we can see if they correlate to the political party in power. The goal of this paper is not to provide a detailed in-depth analysis of a particular model but to instead provide an overview of the Markov switching model and how it may correlate to our understanding of power of political parties.

The use of economics and changes in national spending based on political power is an issue that has been discussed by economists, politicians, newspapers, and almost anyone with an opinion, informed or uninformed. Previous literature has addressed questions on political budget cycles, fiscal inconsistencies[4] and the reputation of parties in the formation of policy. There is also a large amount of literature on Markov switching and this paper will work to bridge the gap, connecting the two discussions: Markov

[2] This point aligns to information gathered from www.democrats.org and www.gop.com. An excerpt taken from the GOP website states, “we oppose government-run health care...” while notes from the democrats show moves to strengthen government programs, showing a clear division between the two parties.

[3] Information provided by www.gop.com show a focus on increasing spending on national defense while www.democrats.org show favorability towards alliances to reduce the burden absorbed by the United States.

[4] Fiscal inconsistencies are fluctuations in spending levels outside the mean value or short term changes which may occur. There is also discussion on time-consistent policy which when differences occur represent inconsistencies.

switching models and political budget cycles. Section II will provide a detailed analysis of the literature and how it relates to the current work. The data, collected by the Congressional Budget Office (CBO), uses national spending and its components beginning from when it was reported in 1941, and will be discussed in detail in Section III. The Markov model is addressed in Section IV while the results of the model are addressed in Section V. Areas of further research and robustness checks will be provided in Section VI, allowing this discussion to be addressed further in the future. Section VII will summarize the results, discussion of the model, and my opinions of the work. References and the model coding are also provided.

II. Model

In order to check for the existence of regime changes between high and low spending growth in national spending and its components, a Markov switching autoregressive model AR(4) is employed. The model is based upon James Hamilton's 1989 paper and Jeremy Piger's 2007 paper, which looks at models of regime changes. Some differences between the model used here and Hamilton's model are that this paper's model only uses a lag to calculate predicted values, while Hamilton also incorporates a moving average. A moving average was not incorporated here because while it is important to understand the budget values of the past, there is no reason to consider that a moving average is necessary because of the possibility of political turnover preventing a budget value to be maintained to previous years. In addition to removing a moving average, a trend variable is added to the model. This variable is incorporated to account for certain time-growth-dependent variables that may influence levels in the budget and its growth. The steady increase of both costs and wages should force spending levels to increase over time. The increase in prices tied to continual increase in population growth will cause the growth of each variable to increase over time. Also, by looking at the value of the trend we can see how the government is playing a long term role regarding each variable. Further, as mentioned above there is a dummy variable incorporated to denote the change in fiscal timing and a dummy variable for defense spending during WWII. This yields the following model:

$$y_t = a_0 + a_1 \cdot s_t + trend + \boldsymbol{\beta} \cdot \boldsymbol{X} + z_t$$

$$z_t = \phi_1 \cdot y_{t-1} + \phi_2 \cdot y_{t-2} + \phi_3 \cdot y_{t-3} + \phi_4 \cdot y_{t-4} + \varepsilon$$

Where $\alpha_1 + \alpha_0 > \alpha_0$, or $\alpha_1 > 0$.

Here y_t is defined as the log difference of our spending level, measuring the percent growth between fiscal years and z_t is a notation of the lags incorporated to calculate the current growth rate. "X" is defined as the collection of dummy variables within our model. Our constant, which is also the growth in the low state, is defined as "a_0" while the high state value, "$a_0 + a_1$", is incorporated when $s_t = 1$. As discussed, the trend variable is incorporated to try to measure the price and quantity changes that the growth of spending variables may experience.

A threshold model, although considered, was not used because the goal is to study correlation, not causation, of the data. The comprehensive nature of the political process may not allow regime changes to align to expectations. This is important when working through the identification strategy of high- and low-spending growth levels. Because the values of the states can switch endogenously, the values are defined as:

$$P(S_t = 1 \mid S_{t-1} = 1) = p$$

$$P(S_t = 0 \mid S_{t-1} = 1) = 1 - p$$

$$P(S_t = 0 \mid S_{t-1} = 0) = q$$

$$P(S_t = 1 \mid S_{t-1} = 0) = 1 - q$$

The goals are then to identify when these regime changes occur, allowing the model to alternate between high- and low-growth regimes, and to understand how persistent each regime is. The persistence of each regime is important to understand because of continuous high levels of spending by the U.S. government, despite growing resistance to lower government spending. Once the regime changes are identified, they can be compared to the composition of the political landscape throughout all branches of the government. There is also the possibility of other cultural, economic, or global events that may influence the regime changes. World War II is an example of an outside factor that caused high levels of defense spending growth during 1941-1945, regardless of the political party in power.

The initial assumption is that the time spent in each regime will be based on when each party was in complete power. When Democrats take complete control, the assumption would be that health care

spending would increase and when they lost control the high levels of growth would decline. When Republicans take control, the expectation will be that defense spending increases and then falls when the control is lost. Because the analysis is only using two states in order to gain a simple understanding, low growth would occur when the party favoring higher spending growth falls out of power or the opposing party gains power. Although there is evidence that three regimes may exist when each party obtains power and when the government is divided, the goal is provide a simple analysis. There are also eight unique possibilities of government control by total or divided control of the House, Senate, and the Presidency. While a question may be if accounting for all these regime possibilities is necessary or what it may add in addition to the model, this paper looks at a simpler example.

The model will use a random starting value while trying to determine the strongest level of convergence. By using a random starting value, as opposed to no starting value, several possible convergences can be calculated until the highest maximum likelihood estimator is determined, providing the best possible analysis of the regime changes and results. In addition, ergodic probabilities are used when calculating the initial starting value of the regime as opposed to a uniform probability. Ergodic probabilities were also used by Hamilton in his 1989 paper. By applying this method, the regime changes can alternate more fluidly during the existence of a longer-lasting regime. Although the model is based on Hamilton's 1989 analysis, there are some changes incorporated to allow for a political comparison. The results of this model may help provide further understanding to the expectation individuals have regarding how their vote may correlate to changes in spending. Do political changes lead to actual regime changes in spending growth, or does spending simply vary from a predefined value leading to fiscal inconsistencies?

III. Results

As previously mentioned, the goal is to understand the presence of the high- and low-spending growth regime changes and how they may correlate to the political party in power. Based on Harrington's 1992 paper, a party's platform is deemed credible so when a party assumes power, spending growth may differ. Total, defense, health care, and education spending growth will be discussed below, providing a clear understanding of the results of each model and the possible correlation to political power before

discussing the next model. Although the four variables are indeed connected through the budget process, each variable will discussed individually of the other three so that a clear, but separate, understanding of each can be shown.

a. Total Spending Growth

The analysis will begin by understanding how the model generates potential regime changes of the data. From Table III we can see where the regime changes occur for total spending growth rates. Not surprisingly given current the current deficits and the expanding levels of government debt, the economy has been in a state of high spending growth since 1952. In fact, since our analysis from 1945, there are only two years where spending growth has been negative, in the low state. This low state occurred from 1950 to 1951, shortly after Democrat Harry Truman took office in 1949 and the Democrats gained complete control of the legislative branch as well. This time period was unique because, surprisingly, there were no major economic events that took place. Although the NBER defined this period as a time of economic expansion, current history has taught us that it is still rare to see national spending levels to be reduced, even during an expansion. At this time, even the influence of WWII dissipated, allowing the economy to stabilize through the early 1950s. A budget proposed by President Truman may have reduced spending to any number of programs and could pass without opposition. Although having total control by one political party is not unique, the analysis shows that Democrats have had complete control for 26 years since 1941, compared to the Republicans four years. However, a low growth regime was only able to occur in 1950 to 1951 when the Democrats had total control and not in any other times when they also had control. For this reason, this period may reveal more about the stable economy than about political power, however it is still worth noting.

Table I: Regime Switches of Total Spending

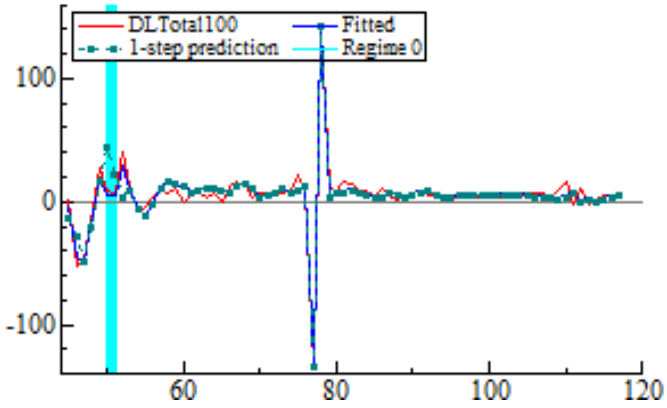
DLTotal100: Regime classification based on smoothed probabilities

Regime 0		years	avg.prob.
	1950 – 1951	2	1.000

Total: 2 years (2.74%) with average duration of 2.00 years.

Regime 1		years	avg.prob.
	1945 – 1949	5	1.000
	1952 – 2016	66	1.000

Total: 71 years (97.26%) with average duration of 35.50 years.



From the regression analysis results displayed in Table IV we can see that in the low state the growth rate is actually negative, showing a clear decline in spending growth rate during 1950 and 1951, and although the high state increases the growth rate, it still remains negative. The values represented below are percentage points, and over time the spending growth rate has declined, though gradually at (-5.1055) percentage points each year. Also, the dummy variable accounting for the transition quarter and the year following it are significant, preventing these periods from generating unwarranted regime changes in the data. The time trend, while significant, is negative, which aligns to the analysis that spending has decreased over the years. Although Figure I shows that there is no clear time trend, it is incorporated to allow for the data to be stationary and to allow for greater separation of the high- and low-growth states. The final key point to examine is the transition probability table incorporated in Table IV. We can see the persistence of the high growth regime; once you enter it there is a 97.27% probability you will remain

there. The persistence of this regime could help to explain why national spending is continually so high because trying to exit this regime appears to be very difficult and unlikely.

Table II: Coefficients of Total Spending

The estimation sample is: 41 - 117

	Coefficient	Std.Error	t-value	t-prob
AR-1	0.369371	0.1154	3.20	0.002
AR-2	0.0127714	0.1197	0.107	0.915
AR-3	-0.221216	0.1160	-1.91	0.061
AR-4	-0.246742	0.08874	-2.78	0.007
Trend	-0.121838	0.02935	-4.15	0.000
Dummy TQ	-143.980	5.167	-27.9	0.000
Dummy TQ+1	138.897	4.861	28.6	0.000
Constant(0)	-22.9463	3.721	-6.17	0.000
Constant(1)	17.8408	2.512	7.10	0.000
Sigma	5.04990	0.4235	11.9	0.000
p_{0|0}	0.596481	0.2201	2.71	0.009
p_{0|1}	0.0272995	0.01907	1.43	0.157

log-likelihood	-234.073265		
no. of observations	73	no. of parameters	12
AIC.T	492.146531	AIC	6.7417333
mean(DLTotal100)	7.99576	var(DLTotal100)	819.984

Linearity LR-test Chi^2(3) = 66.330 [0.0000]** approximate upperbound: [0.0000]**

Transition probabilities p_{i|j} = P(Regime i at t+1 | Regime j at t)

	Regime 0,t	Regime 1,t
Regime 0,t+1	0.59648	0.027299
Regime 1,t+1	0.40352	0.97270