Policy Uncertainty, Macroeconomic Dynamics, And US Unemployment Conditions

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ABSTRACT

This study provides empirical verification of the link between policy uncertainty[1], unemployment rate and other key US macroeconomic and performance indicators. A VAR augmented model (augmented by impulse responds function (IRF)) and Granger Causality test are employed in this study. Empirical results based on quarterly time series data (spanning the period 1960 to 2011) shows deficit induced policy uncertainty has significant negative impact on key US macroeconomic and performance indicators. This study also finds that one standard deviation policy uncertainty shock has immediate and significant negative impact on unemployment rate, GDP growth and other indicators tested. Concluding Granger causality test also shows deficit induced policy uncertainty granger cause variability in GDP and fixed private investment growth.

Keywords: Macroeconomic Indicators; Policy Uncertainty; US Unemployment rate; GDP Growth

1. INTRODUCTION

*T*he role of uncertainty in an investment decision making process, and its concomitant effect on other integral economic and performance indicators such as productivity, unemployment rate etc, has assumed relative importance in recent years for obvious socio-economic reasons. Prominent among these reasons, is the slower than expected economic recovery trend after the 2008 economic decline. Persistent subpar macroeconomic conditions coupled with historically weak growth in employment, has fuel the need to assess the role of policy uncertainty in present US macroeconomic environment. This need continues to grow as key macroeconomic indicators fail to exhibit semblance of pre-2008 growth conditions. In responds to this need, existing empirical literature presents extensive array of studies verifying the relationship between various uncertainty parameters and key macroeconomic indicators such as investments and GDP growth. A review of related studies suggests that growing interest in understanding the dynamics at play in these relationships (relationship between uncertainty and economic indicators) has been driven by perceived negative effects often attributed to uncertainty; which is projected to transcend immediate variables it impacts. The literature for instance, shows that system uncertainty does not only distort trends in investments growth, but also depress GDP growth in the long run; as well as other indicators which revolve around investment and GDP growth. Effect of uncertainty on investment growth for instance, has the potential to further perturb variables such as unemployment rate, consumption expenditure and in some instances, corporate profit growth all things being equal.

This study projects that policy uncertainty (defined as perceived failure or lack of capacity to enforce or sustain policies) will have constraining effect on unemployment conditions in the US economy via its impact on key macroeconomic indicators such as investments and GDP growth. This projection is based on verified empirical condition suggesting that uncertainty creates incentive to hold off on investment projects with the potential to positively impact variables such as unemployment rate and GDP growth. This study seeks to understand the extent to which present US unemployment rate and GDP growth trajectory could be explained by perceived policy uncertainty due to growing strained cooperation among policy makers in Washington. This study surmise that if

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[1] Measured in terms of Relative Political Capacity (RPC) formally introduced by Organski and Kugler (1980); and modified by Kugler and Arbetman (1997).

policy uncertainty is determined to have negative impact on investment growth, then there exists the likelihood that the condition will ultimately heighten prevailing unemployment rate all things being equal. Compared to existing studies focusing on effects of uncertainty on investment trends and GDP growth, this study augments existing literature by focusing primarily on how budget deficit induced policy uncertainty rather than macroeconomic uncertainty, influence prevailing unemployment rate and other key performance indicators in the US economy. This will be done using a modified version of policy uncertainty estimation framework which focuses primarily on relative capacity to maintain, enact or pursue policies critical to economic growth. The focus on the relationship between this form of policy uncertainty and unemployment rate, and other key economic indicators, has been influenced by ongoing divergent views on factors responsible for weak post-recession US economic conditions. For instance, some analysts suggests lack of clarity in government policies, and uncertainties surrounding trajectory of future fiscal policies from Washington, are particularly responsible for high unemployment conditions and slower than expected growth characterizing the US economy. This study seeks to verify this claim among others.

1.1   Present US Macroeconomic Conditions

According to US Bureau of Economic Analysis (BEA), quarterly leading economic indicators continue to show some improvement from post 2008 recession trends; these improvements however, has fail to have significant impact on key performance indicators such as unemployment rate. Published data from the Bureau of Labor Statistics (BLS) for instance, documents persistent downward stickiness in US unemployment rate after the 2008 recession despite mild improvements in key macroeconomic variables. BEA data further show that persistently low bank lending rates (a condition perceived as a necessary catalyst in investment growth) spurred by historically low federal fund rate, has so far also been unsuccessful in inducing expected growth in investments and GDP; further constraining efforts improving domestic job growth. These conditions, coupled with external factors such as persistent stock market fluctuations, uncertainties in global financial system, challenges in the euro market etc. continue to hold back efforts at reducing present US unemployment rate.

A key feature about present macroeconomic conditions is the seemingly unresponsive nature of prevailing unemployment rate to sustained growth in corporate profits, and modest gains in consumption expenditure. Most economists anticipated a boost in propensity to invest and job growth following recent periods of record corporate profits growth. However, a review of trend relationship between corporate profit and investment growth, suggest something to the contrary. Data from St Louis Fed (FRED) show that sustained growth in corporate profits in recent quarters has also failed to significantly impact unemployment conditions through investment growth. Trend analysis on the relationship between corporate profit growth and unemployment rate suggest that recent trend between the variables deviates from traditional view projecting inverse relationship between the two variables. Traditionally, corporate profits growth has been viewed as the press button which sets in motion further growth in investments; and generates additional employment opportunities in the process. This traditional view supporting inverse relationship is also supported by the theory of the firm which posits that sustained growth in profits increases propensity to embark on further investments among firms due to perceived higher returns on investments. Realization of such investments generates employment opportunities bringing about decline in prevailing unemployment rate. However recent performance trend between the variables defies this projection. Post-2008 recession unemployment rate has been persistently high according to BLS data; during the same period however, corporate profits have experienced significant growth according to BEA.

Recent dramatic growth in corporate profits is evidenced in the following BEA publication. According to BEA, corporate profit with inventory valuation and capital consumption adjustments increased by $61.2 billion just in the second quarter of 2011, compared to an increase of $19.0 billion in the first quarter of the same year. The publication further reports that current-production cash flow (net cash flow with inventory valuation adjustment) – that is, internal funds available to corporations for investments, also grew by $86.2 billion in the second quarter of 2011, compared to $21.1 billion in the first quarter. Additionally, the Bureau also documents that tax on corporate income over the same period decreased by $1.8 billion in the second quarter, in contrast to an increase of $17.6 billion in the first. These data points provides substantial evidence in support of the view that, most firms in recent times have access to substantial portion of operational revenue in the form of profits which could be channeled into additional investments. This record growth in corporate profits has barely had any measurable impact on prevailing unemployment rate. BLS quarterly tracking of unemployment rate for instance shows unemployment trend has been

persistently highly hovering over 8% throughout the period in question. This apparent deviation from traditionally perceived paradigm, further calls for the need to verify the possibility that conditions such as policy uncertainty, might be responsible for present US macroeconomic conditions.

The rest of this study is structured as follows: The next section reviews relationships between policy uncertainty and five key variables employed in this study. A model of policy uncertainty using a modified version of an existing policy uncertainty framework will then be introduced following these analyses. Policy uncertainty estimation methodology adopted in this study will be based on the concept of Relative Political Capacity (RPC) originally propounded by Organski and Kugler (1980), and later modified by Kugler and Arbetman (1997). This section will also discuss test variables and sources of data used in testing for the various relationships pursued in this study. Section four presents empirical model and auxiliary testing procedures critical in assessing various relationships of interest; the section also reports this study's findings. The study concludes with discussions of empirical results and potential policy implications.

2.   RELATIONSHIP BETWEEN POLICY UNCERTAINTY AND CORE VARIABLES

2.1   Policy Uncertainty and Investment Growth

The literature defines policy uncertainty as ambiguities generated by frequent changes in government policies or perceived brevity of existing government policies rather than changes in a political system or electoral uncertainty. This base definition is augmented in this study. Policy uncertainty parameter employed in this study, defines perceived lack of capacity or inability to enforce or implement growth augmenting policies due to resource constraints; it also encompass lack of predictability about future government policies due to stalemate among policy makers in Washington. This definition predicts that the less predictable government policies are, the higher would be the incentive to hold off on investments with significant financial outlay by potential investors and vice versa. Empirical evidence in this regard suggests that uncertainty (whether policy or macro economy induced) affects the value of waiting to invest, due to irreversibility of most fixed investment ventures. The literature further suggest that, in an uncertain environment, rational investors often seek to trade off returns from early commitment to invest, with the benefits of increased information which could be gained by delaying proposed investments projects. It is argued that additional information gained during this waiting period could help investors to make optimal investment decisions. Bernanke (1983) for instance, showed that uncertainty generate investment cycles which increases the incentive to wait for additional information before any investment commitment; this incentive to hold off on investments was found to be particularly pronounced during periods of persistent uncertainty. This condition ultimately depresses investment and GDP growth, as well as potential employment opportunities which could have been created. This view that uncertainty negatively impact investment growth is well documented by existing studies; however, the extent to which budget deficit induced policy uncertainty impacts investments and unemployment rate conditions in the US is yet to be explored.

Available studies largely support significant negative relationship between policy uncertainty or uncertainty in general and investment growth. For instance, in a study focusing on the policy uncertainty-investment nexus, Aizenman, J and Marion N. (1993), showed that, the magnitude of policy uncertainty and its persistence, jointly determine the pattern and growth rate of investment in an economy. In a panel study focusing on the relationship among developing economies, Aizenman, J and Marion N. further documented that policy uncertainty correlates negatively with both investments and economic growth. Rodrik, Dani (1989), further showed that policy uncertainty can significantly depress investment growth; and that, even ideal policy reforms might turn out to be detrimental to investment growth if it induces significant doubts with regards to its permanence. Pindyck, Robert S. (1988), additionally noted that investment trends significantly reflect the degree of predictability of prevailing policies with the potential to impact its outcome. Pindyck's work further showed that irreversibility feature associated with most investments, especially fixed investments with substantial capital outlay, makes investors extremely sensitive to perceived variability in prevailing and expected policies.

Quan V. Le (2004), also concluded that policy uncertainty characterized by variability in contract enforcement has significant impact on private investment. Le's study further showed that variability in government political capacity to enforce policies hinders private investment growth. Fend Yi (2001), additionally confirmed that

political uncertainty defined by variability in government capacity to pursue expected policies, adversely affect private investment growth. Furthermore, focusing on a specific policy, Van Wijnbergen (1992) also submitted that trade policy uncertainty distorts private investment growth and saving decisions which ultimately reduces economic efficiency and growth. Finally, Chen and Funke (2003), who modeled private investment decisions in the face of policy uncertainty among emerging markets, also concluded that rational investors tend to withhold investment until they are convinced about the prospects of future policies.

Following these conclusions, this study projects that investors will shelve investment projects with significant capital outlay if prevailing policies are perceived to be short lived, temporary or unsupportive; or if investors believe policy makers are unable or unwilling to implement expected or desired policies. To this end, this study also predicts significant negative relationship between budget deficits induced policy uncertainty and US investment growth.

2.2   Policy Uncertainty and Unemployment Rate

The relationship between policy uncertainty and unemployment rate in this study is considered to be derived; in that, the level of unemployment rate is projected to reflect how key macroeconomic indicators such as investments react to policy uncertainty. This study is of the view that since employment growth tend to lag growth in productivity, investments, GDP etc. effects of policy uncertainty on unemployment rate will be channeled through how such performance indicators respond to or perform in an uncertain environment. Consequently, this study projects that if policy uncertainty is verified to impact investment and GDP growth negatively, then the trend will ultimately exert significant negative impact on prevailing unemployment rate all things being equal. In other words, if policy uncertainty depresses investments and GDP growth, (due to conditions such as perceived heightened business risk, investment irreversibility, doubts about permanence of specific policies etc.), then employment opportunities which could have been generated as a result of such investments will also fail to materialize. In such condition, policy uncertainty would be perceived as a remote causal agent responsible for relatively high unemployment rate through its initial impact on investments and GDP growth.

2.3   Policy Uncertainty and GDP growth, Interest Rates and Consumer Sentiments

Effects of policy uncertainty on GDP growth has also been shown to revolve around the extent to which the condition impacts key components of GDP growth. For instance, if it is verified that Policy uncertainty has constraining effects on investment growth and consumption expenditure (as shown in previous discussions), then, policy uncertainty could further be shown to have depressing effects on GDP growth all things being equal. This projection stems from the fact that investment growth and consumption expenditures are key components of GDP growth according to basic GDP growth framework; $(GDP = C + I + G + NX)$. These two components accounts for about 12% and about 70% of GDP growth respectively according to US Bureau of Economic Analysis. Apart from this channeled impact, available literature further provides evidence in support of negative relationship between policy uncertainty and economic growth. Abdiweli M. Ali (2001) for instance, showed that policy uncertainty correlates negatively with economic growth. Negative effect of uncertainty on economic growth was also documented by Aizenman and Marion (1993) and Todd (1996) respectively. Robert Lensink, Hong Bo and Elmer Sterken (1999) further found robust evidence of negative relationship between uncertainty and economic growth. Using data from 93 countries, Antonio Fatas and Ilian Miho (2011) also documents that one-standard-deviation increase in policy volatility reduces long-term economic growth by about 0.74% in a panel regression; this outcome provide broad cross country evidence in support of the view that policy volatility exerts significant negative impact on economic growth.

The dynamic relationship between policy uncertainty and interest rates however, is not as clear cut as other variables employed in this study in reviewed literature. Empirical studies on how policy uncertainty ultimately impact interest are few and far between. However, sparse evidence of how specific source of policy uncertainty influences interest rate suggests that the likelihood of relatively high interest rate as a result of heightened policy uncertainty is more plausible than the reverse condition. For instance, Junko Koeda & Ryo Kato, (2010) finds that heightened monetary policy uncertainty raises both medium and long-term interest spread, which adversely affects investment growth in the process. This study projects that policy uncertainty could foster general economic

uncertainty forcing lenders to increase interest rate to compensate for perceived risk in the market place. In such condition, policy uncertainty will lead to interest rates hikes depending on how lenders interpret the condition. Additionally, this study further propose that all things being equal; policy uncertainty will dampen consumer sentiments and impact negatively on consumption expenditure which accounts for about 70% of US GDP growth according to BEA.

3. MODELING POLICY UNCERTAINTY

Policy Uncertainty, a reflection of cynicism associated with prevailing or expected government programs also captures perceived lack of permanence or variability in existing policies rather than expected changes in political regime or party. As stated in an earlier discussion, the dynamic relation between policy uncertainty and key macroeconomic indicators such private investment and economic growth has been studied extensively; and studies such as Rodrik (1991), Aizenman and Marion (1993), and Serven and Solimano (1993) have all addressed this relationship at different levels. Most of these studies however, modeled policy uncertainty using proxy parameters which hardly captures the essence of the variable. Proxies often employed in these studies ranged from exchange rate volatility, GDP growth volatility, and standard deviation of inflation, as found in Levine and Renelt (1992), and Pindyck and Solimano (1993) respectively. This study however, adopts a modified version of policy uncertainty based on variability in government relative political capacity to enact and enforce growth augmenting policies. Policy uncertainty modeled after this political capacity framework was originally introduced by Organski and Kugler (1980); and Kugler and Arbetman (1997) develop an alternative measure based on the same idea called Relative Political Capacity (RPC). Kugler and Arbetman (1997) measured RPC as a ratio of actual government revenue to predicted or projected government revenue. Using this measure of policy uncertainty, an economy with high RPC ratio is deemed to have strong government that is capable of extracting resources such as taxes to implement and sustain growth augmenting policies effectively- leading to lower perceived variability in policies. Conversely, economies characterized by low RPC ratio are perceived to be unable to extract resources (such as taxes etc.) to implement critical policies leading to perceived high degree of uncertainty among potential investors and consumers in general. Relative Political Capacity propounded by Organski and Kugler (1980), and modified by Kugler and Arbetman (1997) was modeled as follows:

$$\text{Relative Political Capacity }(\textit{Extraction}) = \frac{\text{Actual Government Revnenue}}{\text{Predicted Government Revenue}}$$

Following this framework, this study formulates a modified version of this *RPC* model. The version introduced in this study focuses on capturing and incorporating effects of growing US budget deficit problem into the measurement of policy uncertainty. Consequently, instead of the ratio of actual government revenue to projected government revenue, propounded by Organski and Kugler (1980); and modified by Kugler and Arbetman (1997) which could be highly subjective due to less predictable nature of projected government revenue, this study rather measures RPC as a ratio of actual government revenue to its total expenditure. This measure in our view has marked advantage over the original RPC formulation; in that, it is less subjective since it uses actual instead of projected expenditure and revenue values. In this modified framework, low RPC, which indicates extreme mismatch between government revenue and expenditure (growing deficits), is projected to better capture any weakness or lack of capacity on the part of the government to influence key domestic economic conditions than the traditional framework based on projected government revenue. This study projects that lack of political capacity due to growing budget deficits (low modified RPC ratio), will foster conditions which might be interpreted by current and potential investors as weakness on the part of the government to pursue policies or create enabling environment favorable for investments and economic growth. On the other hand, a high modified RPC ratio, which suggest significant government budget surplus, is expected to boost confidence in government's ability to pursue favorable economic policies thereby reducing uncertainty. This approach also models policy uncertainty (low modified RPC ratio) by taking into consideration the condition that expected policy might be shelved or existing policy might be reversed due to inadequate financial resources as a result of growing budget deficits. This approach to policy uncertainty in other words, captures weakening political will on the part of the government to implement growth augmenting policies due to constrained financial resource base. Modified RPC framework adopted in this study is thus modeled as follows:

$$Modified\ \text{RPC} = \frac{\text{Actual Government Revenue}}{\text{Actual Government Expenditure}}$$

In this modified model, RPC ratio greater than one reflects relatively high political capacity to implement and sustain current and future policies and contracts critical for economic growth and development. The condition also indicates the government is highly successful in extracting and managing resources such as taxes, to support its policies. Budget surplus in this case boost confidence in the government and its ability to promote growth augmenting policies, a condition which helps reduces uncertainty for current and potential investors. RPC ratio less than one however, generate anxiety about growing deficits and ability of the government to successfully implement expected policies. Persistently low RPC ratio is thus perceived as growing weakness on the part of the government to sustain ongoing programs or policies.

4.   DATA AND EMPIRICAL ESTIMATION

Effects of policy uncertainty on selected performance indicators in this study are estimated using time series data compiled from three US governmental institutions. Variables tested are sourced from the Bureau of Economic Analysis, the St. Louis Fed database (FRED) and Bureau of Labor Statistics. The data is made up of quarterly time series spanning the period 1960 and 2011. Data variables include GDP growth, interest rate (IR), fixed private investments (FPI), unemployment rate (Unemp), consumer sentiments (Con Sent) (as measured by Michigan Consumer Sentiment Index) and estimated policy uncertainty parameter (Polyun). This study employs Vector Autoregressive model (VAR) augmented by impulse response functions to verify effects of policy uncertainty on stated variables; and how policy uncertainty shocks impact trends associated with these variables. Granger causality test is finally conducted to further verify the presence and direction of causal relationship if any, between policy uncertainty and economic and performance indicators in the study.

4.1   VAR Model Estimation

A VAR model with Z variables specified as a linear function of its own lags and an exogenous variable is formulated. This formulation specifically determines the impact of policy uncertainty as measured by modified relative political capacity propounded by Organski and Kugler (1980) and Kugler and Arbetman (1997) on unemployment rate, GDP growth, prevailing interest rate, fixed private investment growth and consumer sentiments. Variables tested are modeled in logarithms of their first difference. Interactions between policy uncertainty and stated variables are investigated using the following augmented VAR equations.

$$y_t = a_1 y_{t-1} + a_1 m_{t-1} + a_1 \lambda_{t-1} + a_1 \psi_{t-1} + a_1 \delta_{t-1} + a_1 \mu_{t-1} + e_t^y \tag{1a}$$

$$m_t = a_1 y_{t-1} + a_1 m_{t-1} + a_1 \lambda_{t-1} + a_1 \psi_{t-1} + a_1 \delta_{t-1} + a_1 \mu_{t-1} + e_t^y \tag{1b}$$

$$\lambda_t = a_1 y_{t-1} + a_1 m_{t-1} + a_1 \lambda_{t-1} + a_1 \psi_{t-1} + a_1 \delta_{t-1} + a_1 \mu_{t-1} + e_t^y \tag{1c}$$

$$\psi_t = a_1 y_{t-1} + a_1 m_{t-1} + a_1 \lambda_{t-1} + a_1 \psi_{t-1} + a_1 \delta_{t-1} + a_1 \mu_{t-1} + e_t^y \tag{1d}$$

$$\delta_t = a_1 y_{t-1} + a_1 m_{t-1} + a_1 \lambda_{t-1} + a_1 \psi_{t-1} + a_1 \delta_{t-1} + a_1 \mu_{t-1} + e_t^y \tag{1e}$$

Where, y represents GDP growth, m, unemployment rate, λ, fixed private investments, ψ, interest rates and δ, consumer sentiments respectively. Standard VARs modeled in equations 1a to 1e are augmented by lagged policy uncertainty parameter $a_1 u_{t-1}$, as the key explanatory (exogenous) variable. Results from these VAR equations are presented in Table 3 after optimal lag order selection procedure and unit root test for stationary conditions of the variables in Tables 1 and 2 respectively. Table 4 on the other hand tests VAR residuals for the presence of autocorrelation.

Test results reported in Table 1 show that optimal lag order selection methods differ on the choice of lag order to be adopted. This study follows optimal lag order selected by the Akaike Information Criterion method (AIC); a lag order of 3.

Table 1: Optimal Number of Lags for VAR

Lag	LL	LR	P	FPE	AIC	HQIC	SBIC
0	505.907			2.70E-13	-11.903	-11.833	-11.729
1	569.776	127.74	0.000	1.40E-13	-12.566	-12.078*	-11.351
2	606.656	73.761	0.000	1.40E-13	-12.587	-11.679	-10.329
3	654.871	96.43	0.000	1.10E-13*	-12.878*	-11.552	-9.5789
4	682.725	55.708	0.019	1.40E-13	-12.684	-10.939	-8.3431

Stationary conditions of individual variables employed in this study are verified using Augmented Dicky-fuller unit root test and lag order according to AIC. Table 2 report results of log first difference stationarity tests. Results supports stationary conditions for the various variables at the stated lag order selected by AIC.

Table 2: Unit Root Tests
Augment Dicky-Fuller Unit Root Test

Variables	Description	lags	ADF (Test Statistic)
*In*Polyun	Policy Uncertainty	3	-6.201
*In*Unemp	Unemployment Rate	3	-6.541
*In*FPI	Fixed Private Investment	3	-6.104
*In*GDP	Gross Domestic Growth	3	-9.260
*ln*IR	Interest Rate	3	-5.402
*ln*Con Sent	Consumer Sentiments	3	-6.597

Stationary condition based on calculated **Critical Value of: -3.476** at 1% significant level
Test Statistic are based on log first difference of individual variables

Table 3 as noted earlier presents result of Standard Vector Autoregression test based on equations (1a) to (1e). Results features coefficients estimates illustrating relationships between key US economic and performance indicators and modeled policy uncertainty parameter.

Table 3. Results from VAR
Impact of Policy Uncertainty on key Variables

Dependent Variable (Policy Uncertainty)	Lags	Coefficient	Standard Error
*In*Unemp	1	-0.1649398*	0.0849555
*In*Unemp	2	-0.0701754	0.0843397
*In*Unemp	3	0.0210209	0.0876032
*In*FPI	1	-0.0027832	0.0038735
*In*FPI	2	-0.0003738	0.0041983
*In*FPI	3	-0.0070549*	0.0035848
*In*GDP	1	-0.0189200**	0.0070434
*In*GDP	2	-0.0113564	0.0079947
*In*GDP	3	-0.0166573*	0.0069939
*ln*IR	1	-0.0227289	0.0406122
*ln*IR	2	0.0243007	0.0346133
*ln*IR	3	-0.134808***	0.0332677
*ln*Con Sent	1	-0.1262921	0.0505966
*ln*Con Sent	2	-0.0288587	0.0554220
*ln*Con Sent	3	0.1402102**	0.0476932
AIC			-12.659
HQIC			-11.42809
SBIC			-9.613834
Log Likelihood			721.6319
Sample			206

* p<.10, ** p<.05, *** p<.0

Using optimal lag range chosen by HQIC and AIC, (i.e. lag order between 1 and 3 according to Table 1), this study finds that policy uncertainty has direct significant impact on all performance indicators or variables tested. Policy uncertainty is found to have significant impact on unemployment rate only with optimal lag order of 1 (chosen by HQIC instead of AIC adopted in this study). Coefficients estimates reported in Table 3 show that policy uncertainty has significant negative effects on fixed private investments growth, GDP growth and prevailing interest rates. This outcome to some degree reflects present US macroeconomic trends since economic slowdown brought about by the 2008 recession. With the exception of interest rates, which has remain relatively low in post-recession US economic environment, performance of other test variables have been well below expectations; a condition which some analysts have attributed to growing policy uncertainty generated lack of predictable policies and political will to implement expected policies by stakeholders in Washington. These results, thus, suggest that deficit induced policy uncertainty has significant constraining effects on key performance indicators in the US economy.

Table 4 verifies the presence of serial autocorrelation in test variables using Lagrange Multiplier test for serial autocorrelation. This procedure utilizes residuals from VAR test variables. Results show that the null hypotheses of no serial autocorrelation in residuals cannot be rejected.

Table 4: Test for Autocorrelation

Lagrange Multiplier Test

Policy Uncertainty	lag	Chi-sq(X^2)	df	Prob> chi-Sq(X^2)
*In*Unemp	1	2.8301	4	0.58659
*In*FPI	1	2.7286	4	0.60422
*In*GDP	1	3.9568	4	0.41189
*In*IR	1	2.1674	4	0.70500
*In*Con Sent	1	6.0093	4	0.19846

5.   IMPULSE RESPONSE FUNCTIONS FOR VAR

Impulse Response Function (IRF) in this section ascertains how endogenous variable react to simulated shocks. The section focuses on effects of policy uncertainty shocks or how a standard deviation shock to policy uncertainty perturbs key indicators such as prevailing unemployment rate, GDP growth, interest rates, fixed investment growth and consumer sentiments. Four separate figures of conditional impulse respond functions are generated to track how employed variables respond to policy uncertainty shock.

Figure 1 tracks effects of policy uncertainty shock on unemployment rate. IRF trend reported in Figure 1 show that a standard deviation policy uncertainty shock (either due to sudden policy failure etc) has adverse impact on unemployment rate. Policy uncertainty shock according to Figure 1; readily increases unemployment rate in the first quarter after the shock. This initial increase in unemployment rate dips mildly through time, but then continues to rise and remain persistently high several quarters after the initial shock. This outcome to some degree lends support to the view that growing perception of policy uncertainty has contribute to persistently high US unemployment rate. Figure 1, charts unemployment rate's responds to one standard deviation shock to policy uncertainty.
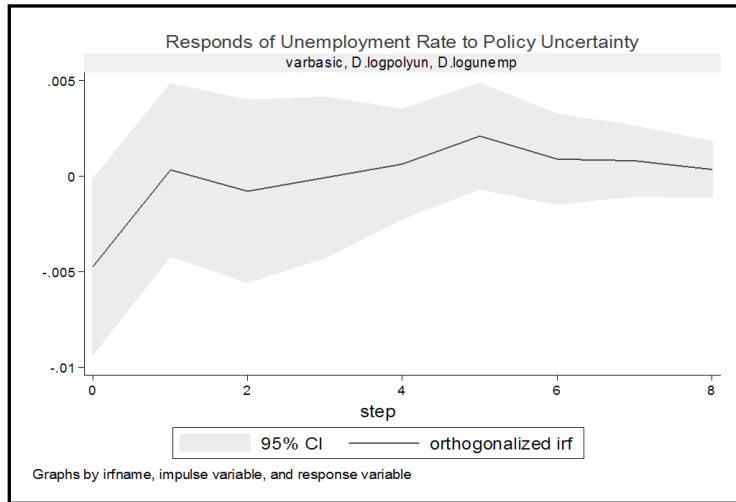
Figure 1: Effects of Policy Uncertainty Shock on Unemployment Rate

As projected, Figure 2 demonstrates that policy uncertainty shock has significant negative impact on GDP growth. Impulse responds outcome indicates a standard deviation policy uncertainty shock causes GDP growth to decline sharply during the first two quarters after the shock. Although, GDP growth trend is restored temporarily after the second quarter; effects of the initial shock continue to negatively influence GDP growth several quarters after the initial shock. This result further supports VAR estimates in Table 3 on the relationship between budget deficits induced policy uncertainty and GDP growth.
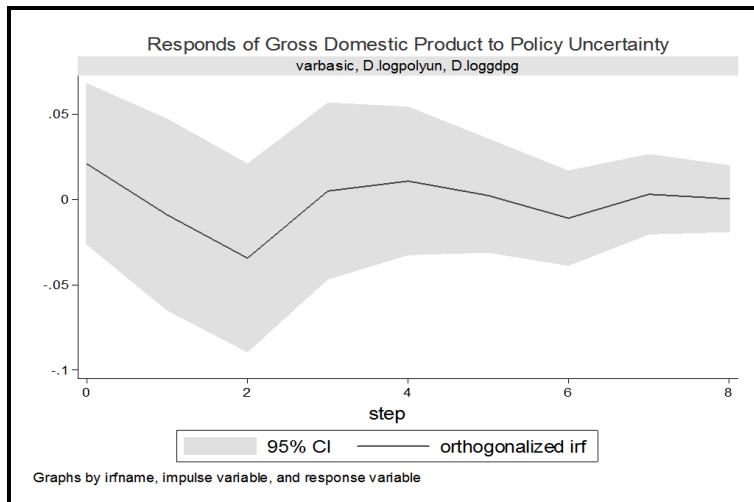

Figure 2: Effects of Policy Uncertainty Shock on GDP Growth Rate

This study further finds that one standard deviation policy uncertainty shock all things being equal, increases prevailing interest rates in the short run; that is, in the first two quarters after the shock. Initial effect of such shock however dissipates over time. Decline in interest rate in the first two quarters after the shock however, does not fully restore interest rates to its pre-shock levels. A new diminishing rate relatively higher than pre-shock interest rate, tend to be established for at least 4 quarters after the initial peak rate brought about by policy uncertainty shock. Figure 3 illustrates how prevailing interest rates respond to a standard deviation shock to policy uncertainty.
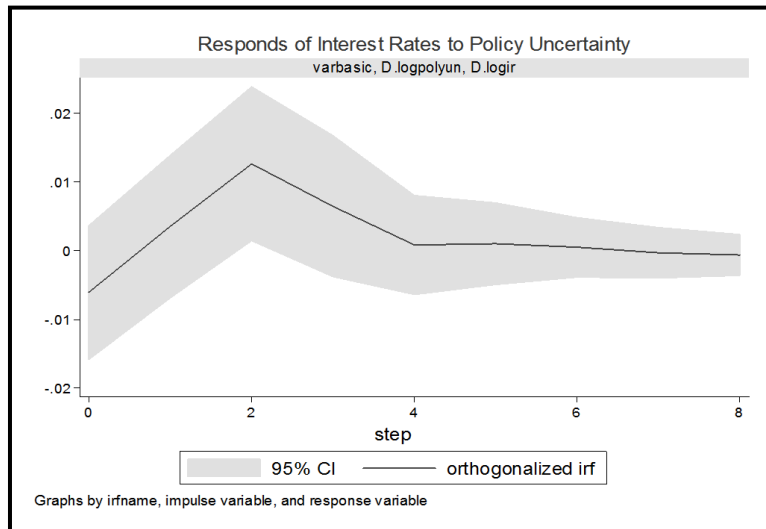
Figure 3: Effects of Policy Uncertainty Shock on Interest Rate

Figure 4 further illustrates how consumer sentiments respond to policy uncertainty shock. One standard deviation shock to policy uncertainty negatively impacts consumer sentiments. Consumer sentiment is shown to decline sharply from the effect of the shock; the trend however, reaches a minimum point and resurges again in subsequent quarters. Figure 4 also show a surge in consumer sentiments after the shock tends to be relatively lower than pre-shock levels; an indication that effects of policy uncertainty on consumer sentiments tend to persist for a longer period.
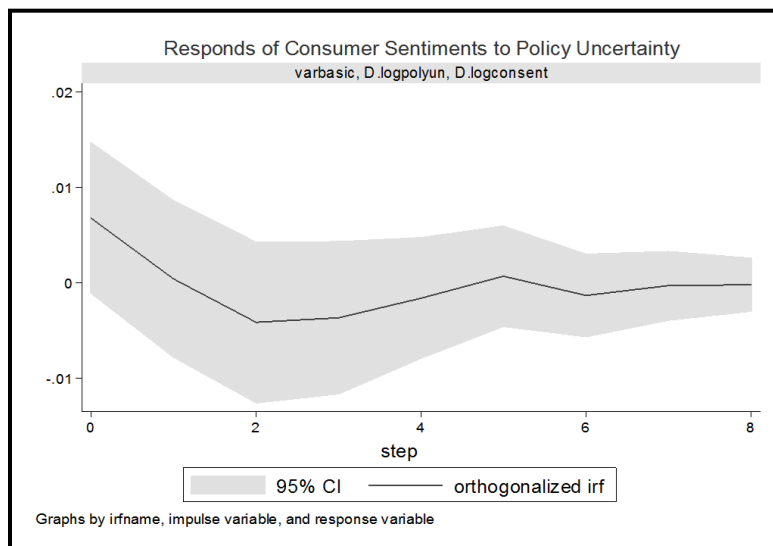

Figure 4: Effects of Policy Uncertainty Shock on Consumer Sentiments

Finally, Figure 5 tracks how policy uncertainty shock generates swings in private investment growth. One standard deviation policy uncertainty shock in this case causes fixed private investment to decline abruptly just in the first quarter after the shock. The sharp decline is quickly reversed towards growth trajectory prior to the shock; however, effect of the initial shock continue to cause reverberations in fixed private investment growth for a much longer period before the trend stabilizes at a lower level several quarters after the initial shock.
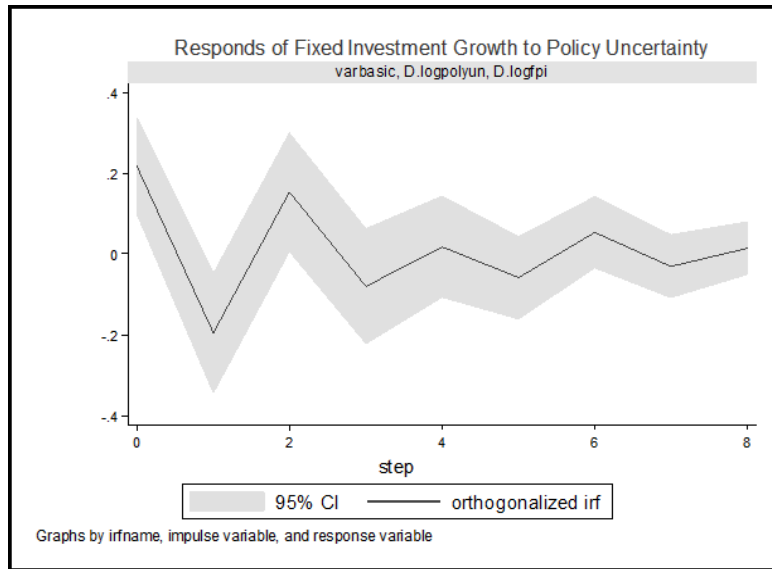
Figure 5: Effects of Policy Uncertainty Shock on Fixed Private Investment

Above IRF analysis supports initial projections suggesting that policy uncertainty will have significant negative impact on on key economic and performance indicators in the US economy. The results further suggests that reducing percieve uncertainty surrounding commitments to support growth augmenting policies is enssential in improving present economic conditions. Well defined long term policies geared towards enhancing economic growth for instance, could have positive impact on investments decisions among current and potential investors.

6.   GRANGER CAUSALITY ANALYSIS

To augment relationships already verified, Granger causality analysis in this section further test for causal relationships between Policy uncertainty and key performance indicators employed in this study. Granger causality tests are modeled using the following restricted and unrestricted equations.

Unrestricted equation is formulated as follows:

$$\Delta y_t = \delta_1 + \sum_{i=1}^{n} \beta_{1t}\, \Delta y_{t-1} + \sum_{i=1}^{n} \gamma_{1t} x_{t-1} + u_1 \qquad (2a)$$

$$\Delta x_t = \delta_2 + \sum_{i=1}^{n} \beta_{2t}\, \Delta x_{t-1} + \sum_{i=1}^{n} \gamma_{2t} y_{t-1} + u_2 \qquad (2b)$$

With resticted equation formulated as,

$$\Delta y_t = \delta_1 + \sum_{i=1}^{n} \beta_{1t}\Delta y_{t-1} + u_1 \qquad (3a)$$

$$\Delta y_t = \delta_2 + \sum_{i=1}^{n} \beta_{2t}\Delta x_{t-1} + u_2 \qquad (3b)$$

Where Δy_t and Δx_t are log difference of policy uncertainty and other variables employed; δ, β, γ are modeled coefficients of various parameters tested and u_1, u_2 are the error terms. The lag order n, is the optimum lag order

chosen by Akaike information criteria. From equations (2a) and (2b), if γ_1 is found to be statistically significant, and γ_2 is not, then, it could be concluded that variability in variable x Granger causes changes in y and vice versa. If both coefficients are statistically significant, then bi-directional causal relationship exists between the two specified variables featured in the test. On the other hand, if both γ_1 and γ_2 are statistically insignificant then changes in y or x have no effect on the other variable or the variables are deemed unrelated.

Table 5 report bivariate Granger causality test results using variables in log difference form. Results support bi-directional causal relationship between deficit induced policy uncertainty and GDP growth. An indication that policy uncertainty impact variability in GDP growth and verse versa. The test however, failed to verify significant causal relationship between policy uncertainty and unemployment rate. Causality results further documents uni-directional causal relationship between policy uncertainty and interest rate; with direction of causality running from interest rate contrary to prior projections. Additionally, policy uncertainty is also found to Granger cause changes in fixed private investment growth in the US economy with no significant feedback effect. Finally, results also support significant uni-directional causal relationship between policy uncertainty and consumer sentiments.

Table 5 Granger Causality Results

Equation	Variables	Prob> chi-Sq(X^2)	Direction of Causality
Policy Uncertainty	GDP growth	[(0.021*) - (0.061*)]	Bi-directional
"	Unemployment rate	[(0.115) - (0.534)]	Insignificant
"	Interest Rate	[(0.001**) - (0.292)]	Uni-directional
"	Fixed Private Investment	[(0.112) - (0.071*)]	Uni-directional
"	Consumer Sentiments	[(0.001**) - (0.525)]	Uni-directional

7. CONCLUSION

Using a modified measure of policy uncertainty based on Relative Political Capacity (RPC) concept originally propounded by Organski and Kugler (1980) and later modified by Kugler and Arbetman (1997), this study verified effects of deficit induced policy uncertainty on key US economic and performance indicators. This study finds that policy uncertainty negatively impacts GDP growth, interest rates and fixed private investments. Further analysis of how individual variables employed in this study respond to policy uncertainty shocks show that, all things being equal, one standard deviation policy uncertainty shock increases unemployment rate; with the effect persisting for several quarters after the initial shock. Policy uncertainty shock is also found to decrease GDP growth, increases interest rate, depress consumer sentiments and generate significant decline in fixed private investment growth. With the exception of fixed private investments growth which fluctuates significantly over a long period after policy uncertainty shock, I find that most of the variables tested regains some pre-shock trend a number of quarters after the initial shock. Finally, Granger Causality test further supported bi-directional causal relationship between budget deficit induced policy uncertainty and GDP growth. Policy uncertainty was also found to Granger cause fluctuations in fixed private investment growth with no feedback effect. Granger causality verification of the relationship between policy uncertainty and unemployment rate was however insignificant.

This study has shown that activities of political players in Washington and how they are perceived by potential investors can have significant impact on key economic and performance indicators.

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