

Contracts Over Time Analysis

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June 2018

Abstract

This analysis was conducted using government-wide contract acquisition and spending data. An additional dataset was compiled identifying the timing of continuing resolutions and appropriations legislation enacted by Congress from fiscal year 2007 through the first quarter of fiscal year 2018. Contract spending data for all agencies was used for the same time period, 2007 through the first quarter of 2018.

Several models were estimated to determine if a relationship could be identified between Congressional budget actions and contract spending. These models were estimated to determine if historical data supports the theory that congressional actions, and the delay or lack of a full-year budget set by appropriations legislation, increases spending. The core model estimated was a semi-log linear model which was used to estimate the effect that continuing resolutions and appropriations legislation had on total contract spending aggregated at the weekly level. The model included several additional predictor variables including lagged values of total weekly contract spending and total yearly obligations government-wide which was used to proxy the trend in overall spending over time. Due to the nature of the data, certain corrections had to be implemented to ensure the integrity of the estimates and results -- this includes use of logged values for total spending and total obligations variables. Additionally, in the calculation of hypothesis test results, the Newey-West estimator was used to correct the predictor standard errors for heteroskedasticity and autocorrelation effects as needed. Additional models were also estimated to examine more closely subsets of the contracts spending data and determine if the effects of congressional budget actions differed among specific types of contract spending.

Scope

The purpose of this analysis was to use data to investigate the findings published by the Government Accountability Office (GAO) in their report *Continuing Resolutions and Other Budget Uncertainties Present Management Challenges*.¹ This report studied the effect of the legislative actions on agencies. In the last few years, Congress has increasingly enacted short-term continuing resolutions throughout the fiscal year, moving away from appropriations legislation that spans a full-year. Historically, appropriations legislation was passed prior to the start of the fiscal year allowing agencies to prepare their respective budgets with time, and work with Congress and the Executive Office to address their

¹ **Continuing Resolutions and Other Budget Uncertainties Present Management Challenges**
GAO-18-368T: Published: Feb 6, 2018. Publicly Released: Feb 6, 2018.

priorities and plan acquisitions efficiently. However, in the last few years the passage of comprehensive, full-fiscal year appropriations legislation has been rare. Instead, Congress has repeatedly enacted short-term continuing resolutions that allow agencies to maintain operations while appropriations legislation is negotiated.

This analysis uses detailed contracts data reported to Federal Procurement Data System - Next Generation (FPDS-NG) to evaluate the relationship between congressional actions and acquisitions. The analysis data includes all contracts reported by agencies and a compiled dataset of congressional budget actions, defined here as either passage of appropriations legislation or a continuing resolution. A series of models were estimated to examine whether the data showed a significant relationship between spending across government and the budget actions enacted by Congress.

In addition to evaluating the short-term effect of congressional budget actions on total contract spending, further research was conducted to determine if specific budget actions affected contracting. The analysis of the effect of congressional actions on overall contract spending is followed by a series of models that classify spending by contract types and the goods and services purchased. The goal of these models is to further disaggregate the relationship between budget actions and spending, evaluating how these actions affect the types of contracts agencies issue and the goods and services purchased. This analysis does not address the long-term impact of congressional actions on the overall rate of yearly purchasing or on total government expenditures. Further analysis should be pursued to address these questions.

Data Used

Contract spending data was collected from USAspending.gov. Congressional legislation data was compiled from appropriations and budget legislative history data available at Congress.gov.²

Historical contract spending data spans from fiscal year 2007 through the first quarter of fiscal year 2018, and includes all data labeled as a contract. This includes all new contracts issued in that time frame as well as the extension, modification, cancellation, or use of a option year on an existing contract. Any contract that was not reported as a modification of an existing contract was considered a new contract for the purposes of the new contract spending model. All other observations were considered contract modifications in this analysis.

Additionally, the contracts data used includes a label that identifies the Product and Service Code (PSC) for the contract issued. The PSCs are a comprehensive list of hundreds of codes that are used to categorize government contract purchases and acquisitions.³ In cases where there are more than one product or service is purchased, contracts are categorized according to the predominant product or service that is being purchased.⁴ These codes were further condensed into seven related categories to facilitate the interpretation

² See <https://www.congress.gov/resources/display/content/Appropriations+and+Budget>.

³ The complete list of product and service codes can be found here: https://www.acquisition.gov/PSC_Manual.

⁴ See Federal Procurement Data System: *Product and Service Codes Manual*, August 2015.

and processing of data. Related parent PSCs or Level 1 Categories⁵ were collapsed into the following parent categories for this analysis:

- Facilities, Equipment, and Construction;
- Information Technology and Electronics;
- Miscellaneous Supplies and Equipment, Clothing and Textiles;
- Professional Services, Education and Training;
- Research and Development;
- Transportation and Logistics Services; and
- Weapons and Ammunition.

The PSC data was used to estimate a series of models to determine if congressional actions had significant effects on the types of products and services purchased by the government.

Methodology

Total Contract Spending Model

The hypothesis tested in this analysis is whether the passage of continuing resolutions as opposed to the traditional full-year appropriations legislation causes spending to rise or the type of spending to change in the short-term, as a result of the budget uncertainty caused by short-term congressional budget actions. To test this hypothesis we developed a model that tested whether the issuance of continuing resolutions caused an increase on contract spending in the short-term. The models developed included a variable used to estimate the impact of appropriations legislation, to control for the expected impact of congressional actions on spending. Additionally, in order to account for the changes in spending over time, the models included data for total obligations over each fiscal year. This variable is used as a proxy for overall government spending changes over time.

The core model developed was a semi-log linear model, specified as follows:

$$\log(y_t) = \alpha + \beta cr_t + \beta budgetl_t + \beta lags_{t-x} + \log(obligations) + \varepsilon$$

Where:

y_t is equal to contract dollars for a given week;

cr_t is equal to binary variable, 1 denoting passage of a continuing resolution in that week, and zero otherwise;

$budgetl_t$ is equal to a binary variable, 1 denoting the passage of appropriations legislation in that week and zero otherwise;

$lags_{t-x}$ is a vector of lagged values of $\log(y_t)$; and

$obligations$ is equal to the total value of government spending obligated in a given fiscal year.

Following the estimation of each model, residuals were tested for stationarity, heteroskedasticity, and autocorrelation. According to the results of these tests, standard

⁵ These categories were based on the Level 1 Categories provided by General Services Administration, found at acquisition.gov Federal Procurement Data System: *Final PSC Category Alignment*, March 2018.

errors and hypothesis test statistics were evaluated using White-Huber (robust) standard errors, or using the Newey-West correction.

Additional Models

A series of additional models were estimated. These models focused on estimation of specific subsets of contract spending, including models for which y_t was equal to new contract spending by week, contract modifications by week, as well as models estimating spending by the category of product and services acquired. The variable definitions are discussed in more detail in the corresponding model analysis sections. Following the estimation of each model, residuals were tested for stationarity, heteroskedasticity, and autocorrelation following the methodology of the total spending model.

Analysis

Total Weekly Contract Spending Model

The following model was used to estimate whether there is a statistically significant relationship between the passage of appropriations legislation and continuing resolutions on government-wide contract spending. Total contract spending was calculated as a total of all contracts obligated by week across all agencies reporting data via the Data Act.

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-6.74144363	5.22721022	-1.2896829	0.19771082
budgetl	-0.12907938	0.11130931	-1.1596458	0.24670364
cr	0.13369169	0.06892319	1.9397198	0.05293220
L(log(weekSpend), 1)	0.41100461	0.04093297	10.0409184	0.00000000
L(log(weekSpend), 4)	0.20049288	0.04097434	4.8931332	0.00000131
L(log(weekSpend), 7)	0.06961596	0.06218193	1.1195528	0.26340025
L(log(weekSpend), 9)	0.14225618	0.04044062	3.5176562	0.00047191
L(log(weekSpend), 10)	-0.14754700	0.03576807	-4.1251037	0.00004288
L(log(weekSpend), 40)	0.11555879	0.04038354	2.8615321	0.00437882
L(log(weekSpend), 44)	-0.06543577	0.02749805	-2.3796516	0.01767403
L(log(weekSpend), 50)	-0.09890571	0.04267750	-2.3175138	0.02084734
L(log(weekSpend), 53)	0.42011899	0.05350763	7.8515718	0.00000000
log(obligation)	0.19670152	0.15172568	1.2964286	0.19537955

R_Squared	Adjusted_R_Squared	P_Value	Degrees_Freedom	LogLikelihood
0.52226774	0.51169064	0	13	-284.09537

The model developed shows that there is a statistically significant relationship between continuing resolutions and an increase in spending. Total contract spending is estimated to rise by 14 percent in the short-term if Congress passes a continuing resolution, all else held equal.

Appropriations legislation does not have a statistically significant relationship with total contract spending. However, there is an notable inverse relationship between this type of legislation and overall contract spending. This suggests that appropriations legislation is related to lower levels of spending in the short-term. Hypothesis testing was conducted using the Newey-west correction, to correct for the remaining effect of serial correlation, which is typical of this type of time series data and heteroskedasticity in the distribution of spending data which was not captured entirely in the use of logged values of total spending and total obligations.

New Contracts and Contract Modifications Models

Models were estimated for two subsets of contracts data. The first model estimated the effect of appropriations legislation versus continuing resolutions on government spending on total spending on new contracts. The second model estimated the effects of the same predictors - appropriations legislation and continuing resolutions passage - on contract modification spending, including contract modifications, extensions, and spending for the engagement during option years exercised. Contract spending values are aggregated by week across all government agencies reporting Data Act data.

Model_Predictors	Log New Contract Spending				Log Contract Modification Spending			
	Estimates	StandardError	T-Statistic	P-Value	Estimates	StandardError	T-Statistic	P-Value
(Intercept)	-8.48	5.54	-1.53	0.13	-5.13	5.33	-0.96	0.34
budgetl	0.04	0.09	0.48	0.63	-0.19	0.14	-1.29	0.20
cr	0.18	0.08	2.20	0.03	0.10	0.07	1.39	0.16
L(log(contractdollars), 1)	0.44	0.05	8.92	0.00	0.31	0.04	8.85	0.00
L(log(contractdollars), 10)	-0.10	0.04	-2.56	0.01	-0.13	0.04	-3.05	0.00
L(log(contractdollars), 4)	0.17	0.04	4.01	0.00	0.15	0.05	3.09	0.00
L(log(contractdollars), 40)	0.10	0.04	2.67	0.01	NA	NA	NA	NA
L(log(contractdollars), 50)	NA	NA	NA	NA	-0.09	0.04	-2.37	0.02
L(log(contractdollars), 53)	0.43	0.06	7.27	0.00	0.36	0.07	4.93	0.00
L(log(contractdollars), 7)	NA	NA	NA	NA	0.10	0.05	1.86	0.06
L(log(contractdollars), 9)	0.13	0.03	5.04	0.00	0.13	0.05	2.39	0.02
log(obligation)	0.18	0.16	1.12	0.26	0.32	0.19	1.68	0.09

Model_Names	R_Squared	Adjusted_R_Squared	P_Value	Degrees_Freedom
New Contract Spending Model	0.59	0.59	0	10
Contract Modification Model	0.32	0.30	0	11

The model for new contract spending showed that there is a statistically significant relationship between the passage of a continuing resolution and short-term spending increases. The model estimates that a continuing resolution will increase spending on new contracts by **19 percent**, all else held equal.

The model estimated for spending on contract modifications did not show a statistically significant relationship, though there was a positive relationship between continuing resolutions and increased spending on contract modifications.

Across both models the passage of appropriations legislation did not have a statistically significant effect on spending. The estimates suggest that the passage of appropriations legislation is related with a decrease in spending.

Contract Spending by Product and Services Purchased

To better understand whether the types of products and services purchased across government are affected by budget uncertainty, we separated contract spending into seven distinct categories of products and services. Government contracts identify the primary purpose for the purchase using a Product and Service Code. Using these PSCs, contract spending was separated into seven categories which grouped together related PSCs, as follows:

- Facilities, Equipment, and Construction;
- Information Technology and Electronics;
- Professional Services, Education and Training;
- Miscellaneous Supplies and Equipment, Clothing and Textiles;
- Research and Development;
- Transportation and Logistics Services; and
- Weapons and Ammunition.

By estimating models for each of these specific subsets, we are able to see in more detail how congressional budget actions, defined here as either passage of appropriations legislation or a continuing resolution, may affect the types of products and services that are purchased. The product and service category models followed the same structure of the core model, using a log-semi log model to estimate the effect that the passage of appropriations legislation and continuing resolutions had on the volume of contract spending for each group.

Overall the models indicated a similar relationship between continuing resolutions, budget appropriations, and the given product and service category. Of the seven models estimated, five showed a statistically significant relationship between continuing resolutions and spending by category. Two models did not show a significant relationship between congressional action and spending for the category. The Research and Development and the Weapons and Ammunition models did not show a statistically significant relationship between either type of congressional budget action and spending in these categories.

The results for each model estimated are discussed in more detail below.

[Insert model output tables here]

Facilities, Equipment, and Construction

This model included all contracts identified with the purchasing of facilities, equipment, construction, maintenance, utilities, leases, and rentals. This also includes professional services required for maintenance and operation of facilities such as engineering, housekeeping, and architecture. The model estimated that facilities, equipment, and construction contract spending rose by 22 percent in the short-term when Congress issued a continuing resolution, all else held equal. In contrast to the rise in spending estimated for continuing resolutions, the passage of appropriations legislation did not have a statistically significant impact on spending.

Information Technology and Electronics

The model used to estimate the relationship between congressional actions and information technology spending included all contracts identified as telecommunications, electronics, and maintenance, installation, and professional services related to these goods. The Information Technology and Electronic model estimated that the issuance of a continuing resolution increased spending by 19 percent, all else held equal. The passage of appropriations legislation did not have a statistically significant impact. However, unlike most models, appropriations legislation was positively correlated with Information Technology and Electronics spending.

Professional Services, Education, and Training

Professional services, education, and training contract spending includes contracts identified as special studies, specialized research and training, administrative, medical, and social services contracts. The professional services contract spending model estimated that the issuance of a continuing resolution increased spending by 26 percent, all else held equal. The passage of appropriations legislation did not have a statistically significant impact on professional services, but was negatively correlated with professional services spending.

Miscellaneous Supplies and Equipment

Miscellaneous supplies and equipment includes clothing and textiles, subsistence supplies, and purchase of various types of equipment such as books, hardware, engine parts and accessories. Miscellaneous supplies and equipment spending had a large and statistically significant relationship with continuing resolutions. Issuance of a continuing resolution generated a 41 percent increase in miscellaneous supplies and equipment spending, all else held equal. The passage of appropriations legislation did not have a statistically significant impact on miscellaneous contract spending.

Transportation and Logistics Services

Transportation and logistics service contracts includes contracts related to the purchase, maintenance, and operation of vehicles such as aircraft, ground vehicles, and submarines as well as freight services and relocation contracts. Transportation and logistic services contract spending has a large and statistically significant relationship with the issuance of a continuing resolution. Issuance of a continuing resolutions increased transportation and logistics contract spending by 35 percent, all else held equal. The issuance of appropriations legislation did not have a statistically significant effect but did have an estimated large positive relationship with transportation and logistics services spending.

Transportation and logistics services contracts included data that included relatively small negative values - three observations - which were dropped from the analysis to allow for the estimate of the modeling using a log of total spending to account for the exponential distribution of the known population. The transformation of the data allows the model to maintain consistency with the overall analysis and due to the small and marginal changes, should not affect the integrity of the model estimates.

Research and Development

Research and development contract spending includes energy, economic development, and medical research and development contracts. The research and development model did not estimate a statistically significant relationship with either congressional action. Both variables showed that congressional actions were only marginally correlated with this type of contract spending. This could be due to many factors including the potential spending stability of research and development spending over time; longer-term contracts such as these may not be as reactive to yearly budget actions.

Weapons and Ammunition

Weapons and ammunitions contract spending includes weapons and accessories including nuclear weapons and guidance systems. Weapons and ammunitions contract spending did not have statistically significant relationship with congressional budget actions. This could be due to the unique nature of these contracts and the overall declining trend in these purchases.

Conclusion

The purpose of this analysis was to use data to investigate the findings published by the GAO regarding the effect that legislative actions and potential budget uncertainty have on government spending. There are several theories about how congressional actions may impact government spending. One theory is that as agencies administer their responsibilities, if a full-year of obligation authority has not been issued, there may be accruing demand or outstanding contractual needs that can not be filled until Congress issues a continuing resolution. Once a continuing resolution is issued, federal agencies may be under pressure to execute contracts quickly to address existing needs and ensure contracts are in effect prior to the conclusion of short-term budget actions. This flurry may cause the uptick in spending immediately after a continuing resolution is issued. This would be in contrast to a full-year appropriation where the horizon for issuing contracts is much longer and affords agencies more time to plan and execute contracts.

Another theory is that, due to the short-term nature of continuing resolutions, spending may rise because funds are not available to agencies for the issuance of new long-term contracts. This could require agencies to extend existing contracts and pay more for ad-hoc services rather than negotiating long-term or more efficient contracts. Continuing resolutions often have limited budgets and therefore could make negotiation of larger contracts impossible without the budget authority provided in full-year appropriations.

The series of models estimated in this analysis are used to estimate whether the data showed a significant relationship between spending across government and the budget actions enacted by Congress. Specifically, the models measure how the issuance of a continuing resolution or appropriation legislation impacts the volume of contractual spending obligated in a week. The models estimate that total spending does increase in response to continuing resolutions, but not in response to appropriations legislation. This is consistent with the theory that spending rises due to the short window of time available to issue

contracts prior to the conclusion of the continuing resolution, as well as the uncertainty about whether there will be funds available and time to issue the contracts needed. Further analysis would be required to validate the theory that continuing resolutions result in pent-up demand. As a preliminary look into this theory, this analysis suggests that this may not be accurate since the demand theory would suggest that the issuance of either type of legislation would result in a temporary increase in spending.

Although the passage of appropriations legislation in this analysis did not have a statistically significant effect on the volume of contract spending in most cases, the passage of appropriations legislation was correlated with spending in interesting ways. Notably, appropriations legislation had inverse effects on total spending on new contracts and the total value of modifications issued, all else held equal. This suggests that appropriations legislation allows the government to delay contract acquisitions and may provide more time to engage in long-term budgeting and planning, facilitating the implementation of forward-looking spending decisions.

Further Research

This analysis does not address the long-term impact of congressional actions on the overall rate of yearly purchasing or on total government expenditures. Additional analysis into the types, quantity, and pricing of contracted goods and services would need to be conducted to measure how budget uncertainty affects efficiency in government spending and is beyond the scope of this analysis.