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FORECASTING NAVY RESERVE SELECTED RESERVE ANNUAL TRAINING EXECUTION RATE

December 2017

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The Navy Reserve budgets for the annual training of officers and enlisted in the Selected Reserve, tracking end strength for both throughout the fiscal year. At the end of each year, it determines how many enlisted and officers completed their annual training. The Navy Reserve Forces Command then determines a "participation rate" for both based on the dollars expended, and calculates the average dollar rate for each annual training, per person. This project explores a model that tracks end strength fluctuations at the end of each month throughout the fiscal year and compares the fluctuations with annual training dollars executed at the same point in time to determine what the projected Selected Reserve participation rate should be at the end of the year. Projecting training costs throughout the year is critical because these budget decisions impact other aspects of the Navy Reserve's personnel budget.

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FORECASTING NAVY RESERVE SELECTED RESERVE ANNUAL TRAINING EXECUTION RATE

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ABSTRACT

The Navy Reserve budgets for the annual training of officers and enlisted in the Selected Reserve, tracking end strength for both throughout the fiscal year. At the end of each year, it determines how many enlisted and officers completed their annual training. The Navy Reserve Forces Command then determines a "participation rate" for both based on the dollars expended, and calculates the average dollar rate for each annual training, per person. This project explores a model that tracks end strength fluctuations at the end of each month throughout the fiscal year and compares the fluctuations with annual training dollars executed at the same point in time. Projecting training costs throughout the year is critical because these budget decisions impact other aspects of the Navy Reserve's personnel budget.

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LIST OF ACRONYMS AND ABBREVIATIONS

AC	Active Component
AD	Active Duty
ADSW	Active Duty for Special Work
ADT	Active Duty for Training
ASP	Active Status Pool
AT	Annual Training
BCA	Budget Control Act
CNR	Chief of Navy Reserve
COMNAVAIRRESFOR	Commander, Naval Air Reserve Force
COMNAVRESFOR	Commander, Navy Reserve Force
COMNAVRESFORCOM	Commander, Navy Reserve Forces Command
CR	Continuing Resolution
DCOS	Deputy Chief of Staff
DJMS-RC	Defense Joint Military Pay System – Reserve Component
DOD	Department of Defense
ES	Exponential Smoothing
FTS	Full-Time Support
FY	Fiscal Year
IDT	Inactive Duty Training
IDTT	Inactive Duty Training Travel
IMA	Individual Mobilization Augmentee
IRR	Inactive Ready Reserve
MA	Moving Average
MAD	Mean Absolute Deviation
MAPE	Mean Absolute Percent Error
MOB	Mobilization
MSE	Mean Squared Error
N8	Financial Management
NOSC	Navy Operational Support Center
NROWS	Navy Reserve Order Writing System

RC	Reserve Component
RPA	Retired Pay Accrual
S-1	Standby Reserve Active
S-2	Standby Reserve Inactive
SELRES	Selected Reserve or Selected Reservist
STARS-FL	Standard Accounting and Reporting System – Field Level
USN	United States Navy
USNR	United States Navy Reserve
VTU	Voluntary Training Unit
WMA	Weighted Moving Average

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I. INTRODUCTION

The deputy chief of staff (DCOS) for financial management (N8) at Commander, Navy Reserve Forces Command (COMNAVRESFORCOM) has expressed interest in exploring a model that tracks end strength fluctuations at the end of each month throughout the fiscal year (FY) and compares them with annual training (AT) dollars expended at the same point in time. Per Title 10, a selected reservist (SELRES) must perform 12 to 14 days of AT per FY.

The DCOS for N8 at COMNAVRESFORCOM is confronted with establishing the impact to the Navy Reserve's budget as it correlates to AT for the SELRES. COMNAVRESFORCOM is concerned about the level of any variations to AT participation rates possibly attributed to budgetary changes.

A. OBJECTIVE

The aim of this MBA project is to develop a model to accurately forecast SELRES participation rates in order to better predict the cost of AT requirements.

B. SCOPE AND METHODOLOGY

The AT budget rate is derived from execution and orders data provided by COMNAVRESFORCOM. Deliverables include forecast models and an analysis with supportive data as it pertains to financial effects on AT execution rates. This research will provide the DCOS for N8 at COMNAVRESFORCOM with useful information for planning and budgeting.

C. ORGANIZATION OF THE PROJECT

This report is arranged into five chapters with supplementary appendices, structured as follows. Chapter I establishes the research question, discusses the importance of AT participation rates, and delineates the subsequent MBA project chapters. Chapter II describes the mission and organization of the Navy Reserve. Next, it describes the roles and responsibilities of the key players in the Navy Reserve. Finally, it

discusses personnel policy that impacts AT participation rates. Chapter III describes the data and the different techniques that can be utilized to forecast AT participation rates. Chapter IV describes the forecast models and presents the graphs and related forecasting results. Finally, Chapter V closes with a summation of the findings and highlights potential shortcomings with the prediction.

II. THE NAVY RESERVE

A. GENERAL

The Navy Reserve's mission is "to deliver strategic depth and operational capability to the Navy, Marine Corps, and Joint Forces" (Department of the Navy [DON], 2011, p. 1). Its mission is further established by section 262 of Title 10, U.S. Code, which asserts that it is "to provide units and qualified persons available for active duty (AD) in the armed forces, in time of war or national emergency and at such other times as the national security requires." The Navy Reserve supports AD forces deployed all over the globe, and it is a vital component of most mission areas of the Navy. Currently, there are approximately 104,649 sailors in the Ready Reserve (America's Navy, n.d.).

B. THE STRUCTURE OF THE NAVY RESERVE

The Navy Reserve encompasses the Ready Reserve, the Standby Reserve, and the Retired Reserve (DON, 2007). This project focuses primarily on the drilling reservists in the Ready Reserve; however, an understanding of the requirements, structure, and employment of the Navy Reserve will help explain why accurately forecasting AT is essential. Figure 1 further describes the Ready Reserve, the Standby Reserve, and the Retired Reserve.

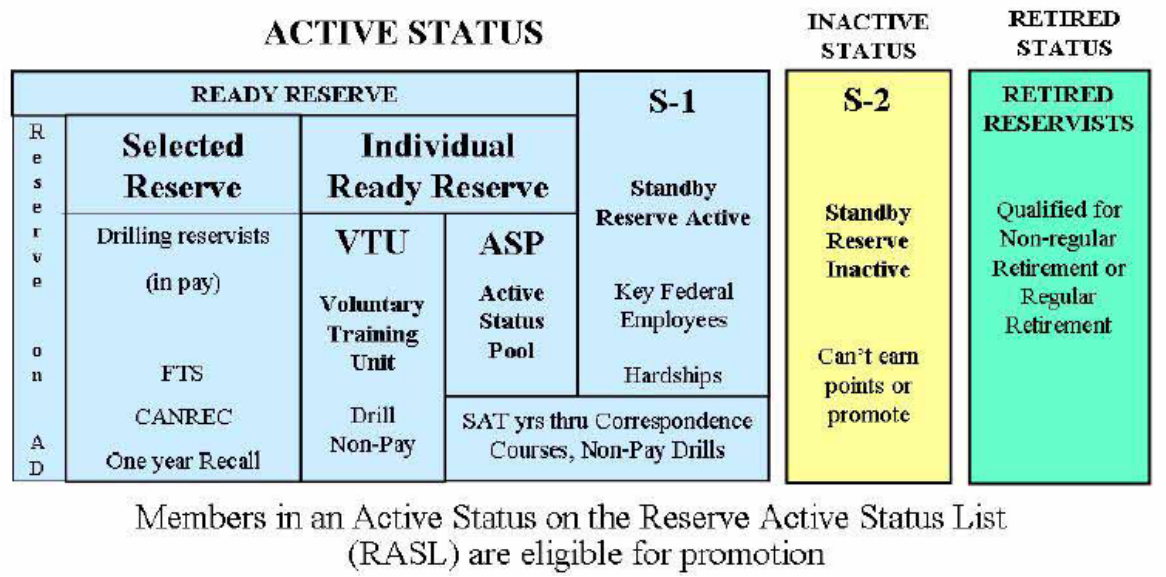

Figure 1. Status Classifications in the Navy Reserve. Source: DON (2007).

1. Ready Reserve

The Ready Reserve comprises the SELRES and the Individual Ready Reserve (IRR; DON, 2007). Both are subject to recall in time of war or emergency and are required to maintain their health and fitness during their contractual obligation in preparation for a possible recall (Reserve Components, 2011).

a. Selected Reserve

The Selected Reserve (SELRES) is comprised of reserve sailors in active status, including drilling reservists and full-time support (FTS) personnel (DON, 2007). They are the main supply of direct mobilization (MOB) manpower for the Active Component (AC) of the Navy. There are 57,824 sailors in the SELRES (America's Navy, n.d.). The president may direct sailors of the SELRES to AD for peacetime operational missions by exercising the call-up authority prescribed in Title 10. With the exception of FTS personnel, sailors in the SELRES are the standard "one weekend per month, two weeks per year" drilling reservists (Department of Defense [DOD], 2015). This project focuses on drilling reservists.

(1) Full-Time Support

Although they are technically part of the SELRES, FTS sailors are on permanent AD and are responsible for the training and administration of the Navy Reserves (DON, 2007). There are 10,051 FTS sailors in the Navy Reserve, roughly 2% of the Navy's total force (DON, 2017). They are important to the success of the Navy Reserve. They are mostly assigned to Navy Operational Support Centers (NOSCs) in various locations throughout the United States where reservists drill. They carry out many of the everyday administrative, logistical, retention, recruiting, and operational obligations of Reserve units. This allows drilling reservists to devote maximum time to training and other preparations for MOB. Additionally, some FTS personnel are assigned to AC commands to act as liaisons between the Reserve Component (RC) and the AC.

(2) Individual Mobilization Augmentees

Individual mobilization augmentees (IMAs) are pre-trained individuals who augment AC commands and certain federal agencies. Upon MOB, they are integrated into their assigned organization or agency. They enable these federal agencies and AC commands to meet the obligations of contingencies or major war. They also offer advanced technical expertise from prior military and civilian experience.

b. Individual Ready Reserve

The IRR comprises reserve sailors who are not in the SELRES. They are qualified personnel that previously served in the AC or SELRES. There are 46,825 sailors in the IRR (America's Navy, n.d.). Sailors in IRR status are either in the Voluntary Training Unit (VTU) or Active Status Pool (ASP; DON, 2007). Sailors in the VTU report to drill in a non-pay status mainly to earn points towards retirements. Sailors assigned to the ASP usually have a remaining military service obligation from their initial contract and are serving out the remainder of it in the IRR. ASP sailors do not get paid and are not required to commit "one weekend per month, two weeks per year." However, they are responsible for MOB and, in very limited cases, for involuntary active duty for training (ADT). They may drill of their own accord for retirement points and promotion, with or without pay.

2. Standby Reserve

The Standby Reserve contains personnel who have transferred from the Ready Reserve upon satisfying specific obligations set by law (DON, 2012). Standby Reserve active (S-1) personnel are usually key federal employees or they have temporary disability or hardship (DON, 2007). They are not obligated to drill and are not assigned to units. These individuals could be mobilized to satisfy specific manpower needs if there were not sufficient reservists available in the Ready Reserve. Standby Reserve inactive (S-2) personnel are not compelled by regulation to stay active but maintain their reserve membership in a non-participating status (DON, 2007).

3. Retired Reserve

The Retired Reserve contains personnel receiving retired wages or those who are eligible to collect retired pay upon reaching the age of 60 (DON, 2007). These individuals may be directed to AD by the secretary of the Navy in accordance with Title 10. Additionally, the Retired Reserve includes the Fleet Reserve, which contains former enlisted sailors that have completed a minimum of 20 years AD service or 30 years of total service. These individuals provide the AC Navy with a pool of personnel immediately available during an emergency or time of conflict without additional training.

C. ROLES AND RESPONSIBILITIES OF KEY PLAYERS

1. Chief of Navy Reserve

The chief of Navy Reserve (CNR) is usually a drilling reservist at the rank of vice admiral. The CNR acts as principal advisor on Navy Reserve matters to the chief of naval operations and is commander, Navy Reserve Forces. The CNR is responsible for preparation, justification, and execution of the Reserve personnel, reserve operation and maintenance, and reserve military construction appropriations.

2. Commander, Navy Reserve Forces Command

The commander, Navy Reserve Forces Command (COMNAVRESFORCOM) is headed by an FTS officer at the rank of rear admiral (upper half). COMNAVRESFORCOM is responsible for the training and administration of the Navy Reserve. He or she is ultimately responsible for ensuring drilling reservists are meeting their requirements.

3. Commander, Naval Air Forces Reserve

The commander, Naval Air Forces Reserve (COMNAVAIRFORRES) is headed by a drilling reservist at the rank of rear admiral (lower half). COMNAVIRFORRES is responsible to COMNAVRESFOR for the training of SELRES aviators and maintenance personnel and the operation and maintenance of naval aircraft that is overseen by the Navy and the Marine Corps Reserve.

D. RESERVE PARTICIPATION REQUIREMENTS

1. Introduction

Under Title 10, there are three thresholds for SELRES participation:

- maintaining active status,
- completing a qualifying year towards retirement, and
- upholding minimum participation standards.

Points are accrued via various activities, mainly AT, ADT, active duty for special work (ADSW), inactive duty training (IDT), or inactive duty training with travel (IDTT).

a. Annual Training

Annual training (AT) is generally the most important training opportunity for a drilling reservist and can be used to perform individual training, unit level training, or AC missions. Drilling reservists must perform 12 to 14 days of AT per year to satisfy their AD requirements (Reserve Components, 2011).

b. Active Duty for Training

"Active duty for training (ADT) is a period of AD that is intended to support a specific training requirement and assist a command that has ADT funding available" (DON, 2007, section 1571-010, pg. 2). ADT is generally used to deliver training to individual sailors or units but can also be used to reinforce AC missions (DON, 2012). Additionally, ADT can be merged with AT for SELRES to meet requirements for 12 to 14 days of AT (DON, 2007).

c. Active Duty for Special Work

"The ADSW Program supports Navy mission requirements for which no permanent duty billet or position is programmed, and where active duty personnel with the required skills(s) are not reasonably available" (DON, 2008). ADSW is not intended to fill gapped AC billets and is issued for a duration of 30 days or more in length, not to exceed 365 days (DON, 2007).

d. Inactive Duty for Training

Inactive duty for training (IDT) is authorized routine training executed by reservists not on AD and performed at their NOSCs (DON, 2007). IDT is also commonly referred to as drills.

e. Inactive Duty for Training Travel

Inactive duty for training travel (IDTT) authorizes the travel of individuals to training sites away from their NOSCs to perform drills for routine training (DON, 2007).

2. Basic Criteria

All drilling reservists are required to meet or exceed certain thresholds to participate in the Ready Reserve. Fifty points are required for a qualifying year towards retirement (Reserve Components, 2011). Twenty-seven points are required to remain in active status. Selected Reservists (SELRES) automatically receive 15 points per year for being in the reserves. Participation standards require 12 to 14 days of AT and 40 to 48 IDT/IDTT periods which are awarded points in accordance with Table 1 (DOD, 2012).

Any combination of 12 to 14 days of AD, AT, ADT, or ADSW may be substituted for the AT requirement (DON, 2007). Sixty-seven points are awarded if SELRES meet minimum participation requirements. SELRES that fail to meet requirements for a qualifying year towards retirement for two consecutive years are administratively separated or transferred to the IRR (DON, 2016).

Table 1. Crediting of Retirement Points. Source: DON (2007).

AD, AT, ADT, or ADSW	1 point for each day of AD, AT, ADT, or ADSW
IDT, IDTT	1 point for each drill period of a minimum 4 hours duration with a maximum of 2 points in any 1 calendar day

E. FISCAL ISSUES

1. Continuing Resolution

In recent years, Congress has not successfully passed a full budget, which has hampered the Navy's ability to properly plan and fund training. Congress employs an annual appropriations process to finance the standard activities of most federal agencies. This process anticipates the completion of 12 regular appropriations bills to support these routine actions before the beginning of the FY. The timing of congressional action on standard appropriations bills has differed significantly, but ratification after the start of the FY has been a regular problem. Until regular appropriations for a FY are ratified, continuing appropriations acts (also known as continuing resolutions [CRs]) can be utilized to deliver funding for a definite period of time (Saturno & Tollestrup, 2016).

CRs have six key parts. First, CRs deliver funding for specific activities, which are usually identified with reference to the prior FY's appropriations acts. Second, CRs give budget authority for a stipulated period of time. This period may be as brief as a single day or as lengthy as the rest of the FY. Third, CRs usually afford funds based on an overall funding level. Fourth, the use of budget authority stipulated in the CR is normally barred for new undertakings not funded in the previous FY. Fifth, the period

and sum of money in the CR, and reasons for which they may be expended for identified activities, may be changed through anomalies. Sixth, legislative provisions—which create, amend, or extend other laws—have been integrated in some cases (Saturno & Tollestrup, 2016).

For FY2009 through FY2016, Congress enacted a total of 31 CRs (Saturno & Tollestrup, 2016). While these CRs prevent government shutdowns, they also set spending levels at or below those of the previous year's budget. CRs produce ambiguity for government agencies about both when they will get their final appropriation and what rate of funding ultimately will be available, because they only deliver funding until settlement is attained on final appropriations. Impacts of CRs on federal agencies vary based on the period and quantity of CRs and may differ by agency and program. CRs contain provisions that bar agencies from starting new activities and projects and order agencies to take only limited funding actions. Congress can offer flexibility for particular programs and projects through the usage of legislative anomalies, which afford funding and powers different from the normal CR provisions (Government Accountability Office, 2013).

2. Sequestration

Budget restrictions imposed by the Budget Control Act of 2011 (BCA) have made it difficult to fund training to increase readiness. The BCA was ratified into law on August 2, 2011. The BCA established limits on discretionary spending for FY2012 through FY2021 and formed the Joint Select Committee on Deficit Reduction (commonly called the Super Committee). The BCA established the FY2013 spending ceiling at $1.047 trillion, $4 billion more than the FY2012 spending ceiling. The BCA ordered the Super Committee to create propositions that would save $1.5 trillion over ten years. It required that if the Super Committee fails to put forward at least $1.2 trillion in savings, over ten years, automatic spending cuts, called sequestration, will occur (NCSHA, 2012).

The caps were amended by the American Taxpayer Relief Act of 2012 for the 2013 and 2014 budgets after the breakdown of the Super Committee to develop the

required proposals. The 2014 and 2015 budgets were further amended by the Bipartisan Budget Act of 2013. Finally, the 2016 and 2017 limits were raised by the Bipartisan Budget Act of 2015 (Office of Management and Budget, 2017). Despite these actions taken by Congress, the budget is taking across the board cuts to defense and non-defense appropriations spending. If Congress cannot reduce the budget to below the budget caps, then across the board cuts will happen, affecting everything instead of areas that could be more effectively reduced.

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III. DATA AND METHODOLOGY

This chapter provides a summary of the data used in the forecast models and the methodology used to forecast participation rates. Analysis of the data may reveal a more accurate means of forecasting participation rates.

A. DATA

For this research the retired pay accrual (RPA) execution data for FY2009 through FY2017 was obtained from N8 at COMNAVRESFROM via the Defense Joint Military Pay System–Reserve Component (DJMS-RC) pay execution data, Navy Reserve Order Writing System (NROWS) orders execution data, and Standard Accounting and Reporting System–Field Level (STARS-FL). DJMS-RC captured payroll data and STARS-FL captured data not in DJMS-RC payrolls to determine total annual and monthly cost of AT for the Navy Reserve. NROWS is used to determine total man-days executed annually and monthly based on NROWS data.

B. DESCRIPTIVE STATISTICS

The descriptive statistics for the entire data set are shown in Table 2. The descriptive statistics by month from FY2009 to FY2017 are shown in Table 3 and Table 4. The mean for the entire data set is $3,867.92. However, monthly data for the mean ranges from $1863.33 to $6545.25. Although certain months have smaller standard deviations than the longitudinal data, there is significant variability in the monthly data as shown in Tables 2 through 4 with standard deviations ranging from a low of $519.46 to a high of $1952.51. Additionally, each month had only 9 observations. The high degree of randomness indicated by the varying standard deviations indicates more observations are needed to produce accurate forecast models. The results from the longitudinal data set were slightly more desirable due to a less volatile standard deviation and greater number of observed values at 104 observations. The standard deviation for the longitudinal data was $1651.10 which is still very high. This could indicate that the models we develop later in this project will not be very accurate.

Table 2. Descriptive Statistics for AT Budget Rate FY2009–FY2017 (Dollars)

Mean	3867.9
Median	3667.5
Standard Deviation	1651.1
Sample Variance	2726115.2
Kurtosis	0.18760481
Skewness	0.622726514

Table 3. Monthly Descriptive Statistics October–March, FY2009–FY2017 (Dollars)

	OCT	NOV	DEC	JAN	FEB	MAR
Mean	2862.1	2728.9	1863.3	3299.7	3010.6	4113.4
Median	3011	2893	1850	3392	3196	3998
Std Dev	756.9	826.9	522.1	519.5	618.8	673.7
Sample Variance	572899.6	683777.4	272571.3	269833.8	382926.3	453847.0
Kurtosis	-1.6	0.8	0.0	-1.8	-1.2	-1.1
Skewness	0.0	-0.6	-0.1	-0.2	-0.6	-0.4

Table 4. Monthly Descriptive Statistics April–September, FY2009–FY2017 (Dollars)

	APR	MAY	JUN	JUL	AUG	SEP
Mean	4113.4	4528.4	5689.4	6545.3	5213.5	2432.5
Median	4191	4589	6192	6369	4423	2281
Std Dev	662.2	781.7	1741.6	928.6	1952.5	1312.1
Sample Variance	438461.5	611072.5	3033199.3	862263.6	3812311.7	1721639.7
Kurtosis	-0.6	0.3	7.9	0.1	0.9	0.3
Skewness	-0.1	-0.9	-2.7	0.4	1.3	0.8

C. METHODOLOGY

The data is provided in the form of a budget execution rate in dollars. The total cost of AT is determined by capturing and accumulating cost data from DJMS-RC and STARS-FL. A daily rate is then established by dividing the total cost of AT by the total man-days as captured from NROWS. Finally, the budget rate is determined by multiplying the budget rate by 15 days of AT execution as shown in Figure 2. The budget rate data for FY2009 through FY2017 were determined monthly, as shown in Appendix A, and entered into moving average (MA), weighted moving average (WMA), exponential smoothing (ES), regression, and seasonal forecast models.

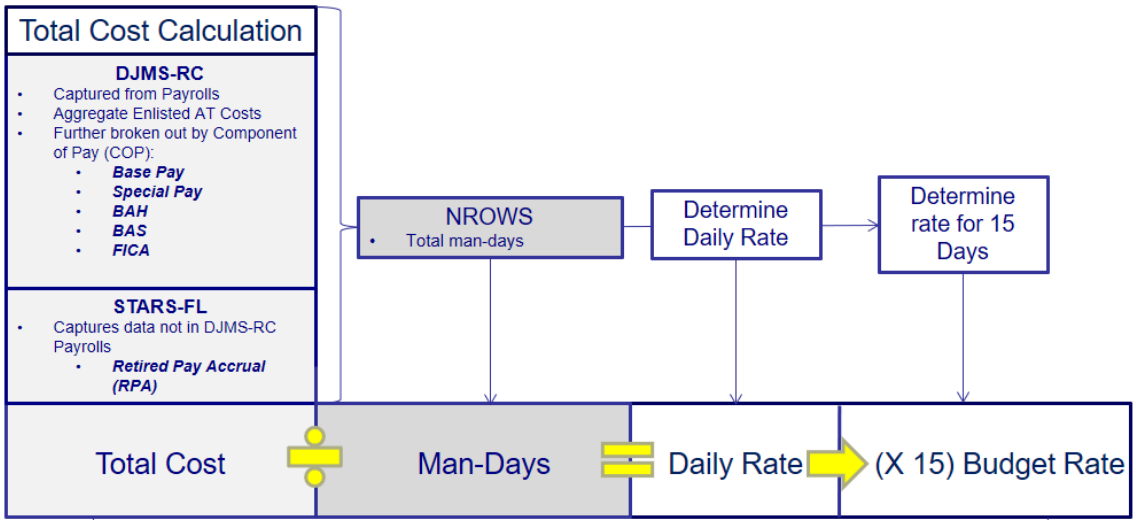

Figure 2. Budget Rate Calculation

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IV. MODEL ESTIMATIONS

The goal of this chapter is to offer a synopsis of the various forecast models. For this project, we investigated the best way to formulate a predictive model for funding each month and the entire continuous data set. Continuous and discrete time series data is used in the models that forecast AT budget rates.

A. MOVING AVERAGE MODEL

The moving average (MA) is a calculation to examine data points by generating a series of averages of different data subsets of the full data set. All data points are assumed to be of equal significance, and the MA model is a simple average of the number of observations calculated. MA models are beneficial if we can presume that the data we are trying to forecast will remain relatively stable over time (Balakrishnan, Render, & Stair, 2014). We used Microsoft Excel to calculate the MA for the data.

B. WEIGHTED MOVING AVERAGE MODEL

The weighted moving average (WMA) compares a set of data points, assigning a weight to each data point according to the priority or importance of that data point. The weighting factors must add to one: "This is especially true if there is a trend or pattern in the data. In such cases, we can use weights to place more emphasis on some periods and less emphasis on others" (Balakrishnan et al., 2014). We used Microsoft Excel to calculate the WMA for the data. Additionally, we used the solver function in Excel to determine optimal weights for the WMA.

C. EXPONENTIAL SMOOTHING MODEL

Exponential smoothing (ES) model is a forecasting model that is a combination of the last forecast and the preceding actual value. A smoothing constant delineated as alpha is determined and applied to the previous data point and the current observation to forecast the next period (Balakrishnan et al., 2014). The smoothing constant should be between zero and one with smoothing constants close to one having less of a smoothing effect than smoothing constants closer to zero (Balakrishnan et al., 2014). ES is very

similar to WMA with the declining weights placed on the previous observations. We used Microsoft Excel to calculate the ES model. Additionally, we used the solver function to determine optimal smoothing constants for the data.

D. LINEAR TREND ANALYSIS MODEL

The linear trend analysis technique is used to impose a linear trend line to the time series data points (Balakrishnan et al., 2014). The slope of that linear trend line is translated as the average change in Y for a unit increase in the value of time (Balakrishnan et al., 2014). A linear trend analysis is useful when there is an increasing or decreasing linear constant pattern with the data points (Balakrishnan et al., 2014). We used Microsoft Excel to calculate the linear trend forecasts for the data. Additionally, we used the data analysis function within Excel to perform a regression analysis.

E. SEASONALITY ANALYSIS MODEL

A seasonality analysis is conducted when the data set corresponds to a pattern in the data that recurs at steady intervals (Balakrishnan et al., 2014). We computed a sample mean of the entire data set divided each observation by the sample mean to calculate a seasonality factor for each. We averaged the factors for like seasons to determine a forecasted demand. We used Microsoft Excel to calculate seasonality analysis forecast for the data.

F. FORECASTING ACCURACY

There are several approaches to measuring the accuracy of forecast models. The forecast errors help determine which model is the best and establish a benchmark for future forecasts.

1. Mean Absolute Percentage Error

The mean absolute percentage error (MAPE) is a measure of the prediction accuracy of a forecasting model. We computed the MAPE by obtaining the absolute value of the difference between the forecasted observation and the actual observation and dividing that result by the actual value. We then measured the result in percentage terms

by multiplying that number by 100. We determined the MAPE for the entire model by averaging the MAPEs from each observation. The lower the MAPE, the more accurate the model.

2. Mean Absolute Deviation

The mean absolute deviation (MAD) is another measure of the prediction accuracy of a forecasting model. We calculated MAD by taking the absolute value of the difference between the forecasted observation and the actual observation. We then measured the error in the units of the observation. We computed the MAD for the entire model by averaging the MADs from each individual observation. Similar to MAPE, the lower the MAD, the better the predictive model.

3. Mean Squared Error

The final measure of the prediction accuracy used for the forecasting models is mean squared error (MSE). We calculated the MSE by taking the absolute value of the difference between the forecasted observation and the actual observation and squaring the result. We computed the MSE for the entire data set by averaging the MSEs from each individual observation. The MSE accentuates large deviations, therefore it is better utilized if the deviations are expected to be small (Balakrishnan et al., 2014). The closer to 0 the value is, the better the forecast model (Balakrishnan et al., 2014).

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V. RESULTS

For this project, we investigated the best way to formulate a predictive model for monthly AT budget rates. In addition to seasonality, we investigated each month individually using MA, WMA, ES, and linear trend analysis models. We determined the MAPE to be the most accurate way to compare and contrast the data, since the percentage would provide a stable comparison, as opposed to the MSE or MAD, which would be difficult to compare month to month due to the differing amounts spent each month. For the WMA and ES models, we used the solver function in Microsoft Excel to determine optimal weights and smoothing constants. For the linear trend analysis models, the regression function found within the data analysis tool in Microsoft Excel was used to determine the linear equation The overall results from the data for each model and each month showed a significant amount of variation in the data, which led to difficulty in creating models. We discuss our theories on the reasons for the massive data variation from month to month and year to year later.

A. DISCUSSION

1. Entire Data Set Forecast Results

We performed MA, WMA, ES, linear trend analysis, and seasonality analysis models on the entire data set of 104 data points to discover the best model to use, by comparing the MAD, MAPE and MSE for each model. For the MA, we evaluated models with periods ranging from 3 to 90. Six of the 87 MA models we tested are included in Appendix B with periods 3, 4, 5, 6, 8, and 48. As displayed in Table 5, 48 periods were required to achieve the lowest forecast error with a MAD of $1,099.1, a MAPE of 37.0%, and an MSE of $1,828,662.9. Using this data, we predict a FY2018 June expenditure of $3,759.60 per person.

Table 5. MA Forecast Model Comparison for Entire Data Set (Dollars)

Periods (n)	MAPE (%)	June FY2018 Forecast
3	49.30	3567.70
4	54.90	3300.50
5	59.00	3427.60
6	60.40	3147.20
8	57.90	3181.50
48	37.00	3759.60

For WMA, we tested the same number of data points and evaluated models with periods ranging from 3 to 90. Optimal weights for the various periods are displayed in Table 6. Five of the 87 models we tested are included in Appendix C with periods of 3, 4, 5, 6, and 7. As displayed in Table 7, the lowest forecast error required four observations with a MAD of $1,196.1, a MAPE of 40.5%, and an MSE of $2,260,854.9. Using this data, we predict a FY2018 June expenditure of $3,015.90 per person.

Table 6. Weights from WMA Models

n=3	**weights**	**n=4**	**weights**	**n=5**	**weights**	**n=6**	**weights**	**n=7**	**weights**
0.0000	w1	0.0000	w1	0.0604	w1	0.0104	w1	0.0000	w1
0.0334	w2	0.0000	w2	0.0000	w2	0.0608	w2	0.0000	w2
0.9666	w3	0.0332	w3	0.0000	w3	0.0000	w3	0.0000	w3
		0.9668	w4	0.0000	w4	0.0000	w4	0.0000	w4
				0.9396	w5	0.0000	w5	0.0000	w5
						0.9288	w6	0.0000	w6
								1.0000	w7

Table 7. WMA Forecast Model Comparisons for Entire Data Set (Dollars)

Periods (n)	MAPE (%)	June FY2018 Forecast
3	40.70	3016.00
4	40.50	3015.90
5	40.60	3049.00
6	40.60	3036.50
7	41.10	2993.00

We also used ES to model the data and make predictions for future spending which is included in Appendix D. An optimal smoothing constant of 0.8798 provided the lowest forecast error, with a MAD of $1,168.5, a MAPE of 40.5%, and an MSE of $2,205,629.8. Using this data, we predict a FY2018 June expenditure of $3,080.50 per person.

Additionally, we used a linear trend analysis model to examine the 104 data points, which is included in Appendix E. We predicted an execution rate of $3,751.0 in FY2018 June. Overall, the MAD was $1,288.9, the MAPE was 45.4%, and the MSE was $2,695,435.4.

Finally, based on the behavior of the AT execution data as shown in Figure 3, we detected a level of seasonality in the data. We used a seasonality analysis model to examine the entire data set. Using the same 104 data points, we calculated the budget rate for each fiscal year and measured the ratios and seasonal index for each month which can be found in Appendix F. Based on our calculations, we predicted an execution rate of $6,236.00 in FY2018 June. Overall, the MAD was $596, the MAPE was 20.0%, and the MSE was $2,650,672.8.

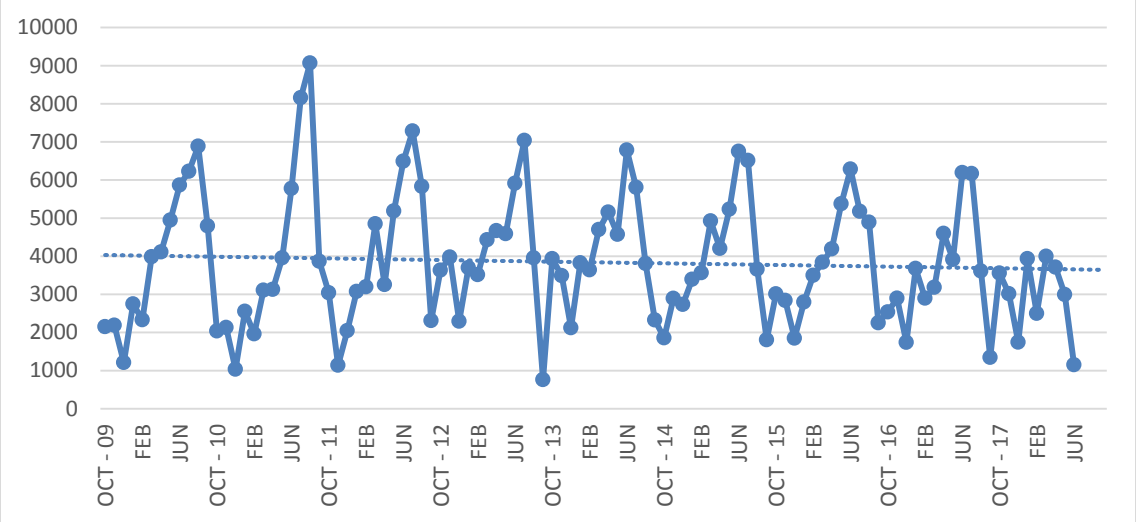


Figure 3. AT Budget Rate Chart FY2009–FY2017 (Dollars)

2. Monthly Data Set

We investigated each month individually and ran a series of MA, WMA, ES, and linear trend analysis models to discover the best model to use, by comparing the MAD, MAPE and MSE for each weight. Each monthly forecast model can be viewed in detail in Appendices G through Q. With a database of only nine years, we tried models that investigated the previous three, four, five, six, and seven years' worth of data for each month to arrive at the best prediction for 2018. The data changed month to month on how many data points to use for the best model. For each month, we looked at the range of number of months we wished to use as the best possible predictor model and compared the MAD, MAPE, and MSE for each.

a. October Monthly Forecast Results

For the month of October data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of October. For the MA model, we found that a predictive model using the previous six months of data provided the best predictive model for the MAD, MAPE and MSE as shown in Table 8. All three measures had the smallest amount of error, with a MAD of $389.50, a MAPE of 12.8% and an MSE of $168,493.14. Using this data, we can predict an FY2018 October expenditure of $3,088.50 per person.

Table 8. MA Forecast Model Comparisons for October (Dollars)

Periods (n)	MAPE (%)	October FY2018 Forecast
3	33.50	3034.70
4	29.50	2740.50
5	25.20	2979.60
6	12.80	3088.50
7	16.30	2951.00

For the WMA model, we tested the same number of data points. Optimal weights for the various periods are displayed in Table 9. Similar to the MA model, using data from the previous six Octobers in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 10. Six

months of data provides a MAD of $190.10, MAPE of 5.5% and MSE of $73,155.11. Using this data, we can predict an FY2018 October expenditure of $2,761.70 per person.

Table 9. Weights from WMA Models for October

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	Weights
0.0870	w1	0.6743	w1	0.0648	w1	0.0104	w1	0.0000	w1
0.4806	w2	0.0000	w2	0.8959	w2	0.0615	w2	0.0000	w2
0.4325	w3	0.1571	w3	0.0000	w3	0.1815	w3	0.0000	w3
		0.1686	w4	0.0393	w4	0.0000	w4	0.0000	w4
				0.0000	w5	0.5010	w5	0.0000	w5
						0.2456	w6	0.3375	w6
								0.6625	w7

Table 10. WMA Forecast Model Comparisons for October (Dollars)

Periods (n)	MAPE (%)	Oct FY2018 Forecast
3	29.00	3018.90
4	21.00	2250.90
5	15.30	2019.40
6	5.50	2761.70
7	21.70	4412.30

We also used ES to model the data and make predictions for future spending. For October 2017, we predicted spending $2,538 compared to an actual expenditure of $3,555.00. The optimal smoothing constant was 0.1086. This is a MAPE of 28.6% for that year and an overall MAPE of 21.9%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY17 of $3,214.60 versus actual spending of $3,555.00, a MAPE for the year of 9.6%. The overall MAPE for the data set was 22.1% using linear trend analysis model.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the WMA model provides the best forecast for the month of October, with a MAPE of 5.5%.

b. November Monthly Forecast Results

For the month of November data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of November. For the MA, we found that a predictive model using the previous five months of data provided the best predictive model for the MAD, MAPE and MSE as displayed in Table 11. All three measures had the smallest amount of error, with a MAD of $164.00, a MAPE of 5.6% and an MSE of $37,768.95. Using this data, we can predict an FY2018 November expenditure of $3,025.80 per person.

Table 11. MA Forecast Model Comparison for October (Dollars)

Periods (n)	MAPE (%)	November FY2018 Forecast
3	19.72	2916.00
4	11.07	2910.25
5	5.61	3025.80
6	5.70	3184.50
7	9.32	2796.63

For the WMA model, we tested the same number of data points. Similar to the MA model, using data from the previous seven Novembers in the data set provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 13. Optimal weights for the various periods are displayed in Table 12. Seven months of data provides a MAD of $0.003, MAPE of 0.0001% and MSE of 0.00002. Using this data, we can predict an FY2018 November expenditure of $3,124.00 per person.

Table 12. Weights from November WMA Models

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.2416	w1	0.1260	w1	0.0684	w1	0.0120	w1	0.0032	w1
0.0151	w2	0.1531	w2	0.1136	w2	0.0729	w2	0.0029	w2
0.7432	w3	0.0000	w3	0.1584	w3	0.1455	w3	0.0228	w3
		0.7209	w4	0.0421	w4	0.0001	w4	0.0032	w4
				0.6175	w5	0.4445	w5	0.0000	w5
						0.3251	w6	0.0018	w6
								0.9661	w7

Table 13. WMA Forecast Model Comparisons for November (Dollars)

Periods (n)	MAPE (%)	November FY2018$ Forecast
3	14.12	2969.69
4	2.12	2971.81
5	0.69	2999.81
6	0.00	2990.08
7	0.00	3124.03

We also used ES to model the data and make predictions for future spending. We predicted spending of $2,881.50 compared to an actual expenditure of $3,014.00. An optimal smoothing constant of 0.3521 gave the lowest forecast error. This is a MAPE of 4.4% for that year and an overall MAPE of 20.1%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY17 of $3,257.40 versus actual spending of $3,014.00, a MAPE for FY2017 of 8.1%. The overall MAPE for the data set was 22.9% using linear trend analysis model.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the WMA model provides the best model for the month of November, with a MAPE of 0.0001%.

c. December Monthly Forecast Results

For the month of December data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of December. For the MA, we found that a predictive model using the previous seven months of data provided the best predictive model for the MAD, MAPE and MSE as displayed in Table 14. All three measures had the smallest amount of error, with a MAD of $147.2, a MAPE of 8.5% and an MSE of $21,867.67. Using this data, we can predict an FY2018 December expenditure of $1,944.80 per person.

Table 14. MA Forecast Model Comparisons for December (Dollars)

Periods (n)	MAPE (%)	December FY2018 Forecast
3	25.40	1777.33
4	25.67	2016.50
5	24.25	2037.00
6	13.65	2079.33
7	8.46	1944.75

For the WMA model, we tested the same number of data points. Similar to the MA model, using data from the previous seven Decembers in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 16. Optimal weights for the various periods are displayed in Table 15. Seven months of data provides a MAD of $58.80, MAPE of 3.4% and MSE of $6,907.50. Using this data, we can predict an FY2018 December expenditure of $1,753.80 per person.

Table 15. Weights from December WMA Models

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.0080	w1	0.0000	w1	0.5203	w1	0.1864	w1	0.0000	w1
0.0000	w2	0.0565	w2	0.0000	w2	0.1976	w2	0.0034	w2
0.9920	w3	0.4138	w3	0.0000	w3	0.0000	w3	0.0000	w3
		0.5296	w4	0.0000	w4	0.0000	w4	0.0000	w4
				0.4797	w5	0.0000	w5	0.0000	w5
						0.6160	w6	0.0000	w6
								0.9966	w7

Table 16. WMA Forecast Model Comparisons for December

Periods (n)	MAPE (%)	December FY2018 Forecast
3	15.89	1745.84
4	17.32	1747.63
5	17.06	1939.59
6	7.81	1920.68
7	3.38	1753.83

We also used ES to model the data and make predictions for future spending. We predicted spending of $1,737.0 compared to an actual expenditure of $1,745.00. A smoothing constant of 1.00 provided the lowest forecast error. This is a MAPE of 0.5% for that year and an overall MAPE of 18.1%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY2017 of $2,149.10 versus actual spending of $1,745.00, a MAPE for the year of 23.2%. Overall MAPE for the data set was 24.4% using linear trend analysis.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the ES model provides the best model, with a MAPE of 0.5%.

d. January Monthly Forecast Results

For the month of January data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of January. For the MA, we found that a predictive model using the previous five months of data provided the best predictive model for the MAD, MAPE and MSE as displayed in Table 17. All three measures had the smallest amount of error, with a MAD of $376.30, a MAPE of 11.2% and an MSE of $155,291.99. Using this data, we can predict an FY2018 January expenditure of $3,525.2 per person.

Table 17. MA Forecast Model Comparisons for January (Dollars)

Periods (n)	MAPE (%)	January FY2018 Forecast
3	17.20	3470.00
4	13.82	3450.50
5	11.25	3525.20
6	13.57	3554.17
7	16.21	3369.00

For the WMA model, we tested the same number of data points. Similar to the MA model, using data from the previous six Januarys in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 19. The optimal weights for the various periods are displayed in Table 18. Six months of data provides a MAD of $125.00, MAPE of 4.1% and MSE of $26,805.44. Using this data, we can predict an FY2018 January expenditure of $3406.50 per person.

Table 18. Weights from January WMA Models

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.0000	w1	0.3404	w1	0.5338	w1	0.0000	w1	0.0080	w1
0.0000	w2	0.0000	w2	0.4662	w2	0.0335	w2	0.0000	w2
1.0000	w3	0.0000	w3	0.0000	w3	0.9665	w3	0.0000	w3
		0.6596	w4	0.0000	w4	0.0000	w4	0.0000	w4
				0.0000	w5	0.0000	w5	0.0257	w5
						0.0000	w6	0.2244	w6
								0.7419	w7

Table 19. WMA Forecast Model Comparisons for January (Dollars)

Periods (n)	MAPE (%)	January FY2018 Forecast
3	14.13	3936.00
4	10.02	3750.81
5	8.69	3622.62
6	4.07	3406.47
7	6.07	4858.35

We also used ES to model the data and make predictions for future spending. We predicted spending of $3,358.40 compared to an actual expenditure of $3,936.00. A smoothing constant of 0.3662 provided the lowest forecast error. This is a MAPE of 14.7% for FY2017 and an overall MAPE of 12.4%.

Additionally, we used linear trend analysis to examine the data. We predicted a monthly expenditure in FY17 of $3,784.60 versus actual spending of $3,936.00, a MAPE for the year of 3.8%. The overall MAPE for the data set was 8.6% using linear trend analysis.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the linear trend analysis model provides the best model, with a MAPE of 3.8%.

e. February Monthly Forecast Results

For the month of February data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of February. For the MA, we found that a predictive model using the previous seven months of data provided the best predictive model for the MAD, MAPE and MSE as displayed in Table 20. All three measures had the smallest amount of error, with a MAD of $389.80, a MAPE of 15.0% and an MSE of $186,408.13. Using this data, when can predict an FY2018 February expenditure of $3,095.80 per person.

Table 20. MA Forecast Model Comparisons for February (Dollars)

Periods (n)	MAPE (%)	February FY2018 Forecast
3	18.47	2964.00
4	19.46	3113.75
5	21.05	3218.80
6	20.05	3268.00
7	15.04	3095.75

For the WMA model, we tested the same number of data points. Similar to the MA model, using data from the previous four Februarys in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 22. Optimal weights for the various periods are displayed in Table 21. Four months of data provides a MAD of $253.0, MAPE of 8.8% and MSE of $108,913.48. Using this data, when can predict an FY2018 February expenditure of $3,095.80 per person.

Table 21. Weights from February WMA Forecast Models

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.0000	w1	0.0000	w1	0.0442	w1	0.0130	w1	0.0000	w1
0.0000	w2	0.0000	w2	0.0080	w2	0.0312	w2	0.0000	w2
1.0000	w3	0.0000	w3	0.0000	w3	0.0000	w3	0.0000	w3
		1.0000	w4	0.0384	w4	0.0000	w4	0.0000	w4
				0.9094	w5	0.0000	w5	0.0000	w5
						0.9558	w6	0.0000	w6
								1.0000	w7

Table 22. WMA Forecast Model Comparisons for February (Dollars)

Periods (n)	MAPE (%)	February FY2018 Forecast
3	8.86	2499.00
4	8.82	2499.00
5	9.66	2573.07
6	12.18	2547.77
7	18.36	2500.00

We also used ES to model the data and make predictions for future spending. We predicted spending of $2,329.0 compared to an actual expenditure of $2,499.00. A smoothing constant of 0.00 provided the lowest forecast error. This is a MAPE of 6.8% for FY2017 and an overall MAPE of 23.3%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY17 of $3,286.10 versus actual spending of $2,499.00, a MAPE for the year of 31.5%. Overall MAPE for the data set was 18.9% using linear trend analysis.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the ES model provides the best model, with a MAPE of 6.8%.

f. March Monthly Forecast Results

For the month of March data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of March. For the MA, we found that a predictive model using the previous three months of data provided the best predictive model for the MAD, MAPE, and MSE as displayed in Table 23. All three measures had the smallest amount of error, with a MAD of $575.20, a MAPE of 15.2% and an MSE of $502,667.39. Using this data, we can predict an FY2018 March expenditure of $3,674.00 per person.

Table 23. MA Forecast Model Comparisons for March (Dollars)

Periods (n)	MAPE (%)	March FY2018 Forecast
3	15.17	3674.00
4	18.78	3987.00
5	19.36	4129.60
6	18.76	4179.83
7	18.56	4129.63

For the WMA model, we tested the same number of data points. Similar to the MA model, using data from the previous three Marches in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 25. Optimal weights for the various periods are displayed in Table 24. Three months of data provides a MAD of $493.40, MAPE of 13.0% and MSE of $437,647.60. Using this data, we can predict an FY2018 March expenditure of $3,912.80 per person.

Table 24. Weights from March WMA Forecast Models

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.4492	w1	0.0000	w1	0.0993	w1	0.0136	w1	0.0000	w1
0.0175	w2	0.4673	w2	0.0000	w2	0.1249	w2	0.1676	w2
0.5333	w3	0.0000	w3	0.3962	w3	0.0837	w3	0.0000	w3
		0.5327	w4	0.0000	w4	0.2920	w4	0.0000	w4
				0.5045	w5	0.0000	w5	0.0000	w5
						0.4858	w6	0.0000	w6
								0.8324	w7

Table 25. WMA Forecast Model Comparisons for March (Dollars)

Periods (n)	MAPE (%)	March FY2018 Forecast
3	12.96	3912.78
4	15.50	3924.17
5	14.44	4005.10
6	17.27	4123.10
7	18.49	4741.59

We also used ES to model the data and make predictions for future spending. We predicted spending of $3,984.00 compared to an actual expenditure of $3,998.00. A smoothing constant of 0.00 provided the lowest forecast error. This is a MAPE of 0.4% for FY2017 and an overall MAPE of 13.3%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY17 of $4,030.80 versus actual spending of $3,998.00, a MAPE for the year of 0.8%. Overall MAPE for the data set was 13.8% using linear trend analysis.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the ES model provides the best model, with a MAPE of 0.4%.

g. April Monthly Forecast Results

For the month of April data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of November. For the MA model, we found that a predictive model using the previous five months of data provided the best predictive model for the MAD, MAPE and MSE as displayed in Table 26. All three measures had the smallest amount of error, with a MAD of $350.60, a MAPE of 8.9% and an MSE of $211,369.02. Using this data, we can predict an FY2018 November expenditure of $4,372.00 per person.

Table 26. MA Forecast Model Comparisons for April (Dollars)

Periods (n)	MAPE (%)	April FY2018 Forecast
3	14.54	4167.00
4	11.26	4176.25
5	8.86	4372.00
6	10.11	4421.17
7	11.46	4113.75

For the WMA model, we tested the same number of data points. Similar to the MA model, using data from the previous five Aprils in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 28. The optimal weights for the various periods are displayed in Table as displayed in Table 27. Five months of data provides a MAD of $228.20, MAPE of 6.0% and MSE of $129.679.79. Using this data, we can predict an FY2018 November expenditure of $4,058.30 per person.

Table 27. Weights for April WMA Forecast Models

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.5005	w1	0.1691	w1	0.0643	w1	0.0104	w1	0.0985	w1
0.0000	w2	0.3185	w2	0.0000	w2	0.0623	w2	0.0000	w2
0.4995	w3	0.0000	w3	0.4550	w3	0.1938	w3	0.0000	w3
		0.5125	w4	0.0397	w4	0.3964	w4	0.0000	w4
				0.4410	w5	0.0823	w5	0.0000	w5
						0.2548	w6	0.0000	w6
								0.9015	w7

Table 28. WMA Forecast Model Comparisons for April (Dollars)

Periods (n)	MAPE (%)	April FY2018 Forecast
3	11.92	3952.25
4	8.85	3948.24
5	5.96	4058.33
6	7.30	4170.20
7	16.07	4034.65

We also used ES to model the data and make predictions for future spending. We predicted spending of $4,111.00 compared to an actual expenditure of $3,713.00. A smoothing constant of 0.00 provided the lowest forecast error. This is a MAPE of 10.7% for FY2017 and an overall MAPE of 12.8%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY2017 of $4,395.00 versus actual spending of $3,713.00, a MAPE for FY2017 of 18.4%. Overall MAPE for the MAPE for the data set was 12.6% using linear trend analysis.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the WMA model provides the best model, with a MAPE of 6.0%.

h. May Monthly Forecast Results

For the month of May data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of May. For the MA model, we found that a predictive model using the previous three months of data provided the best predictive model for the MAD, MAPE and MSE as displayed in Table 29. All three measures had the smallest amount of error, with a MAD of $688.20, a MAPE of 18.8% and an MSE of $879,049.67. Using this data, we can predict an FY2018 November expenditure of $4,092.30 per person.

Table 29. MA Forecast Model Comparisons for May (Dollars)

Periods (n)	MAPE (%)	May FY2018 Forecast
3	18.79	4092.33
4	21.88	4377.50
5	27.35	4416.60
6	31.87	4445.33
7	40.70	4476.50

For the WMA model, we tested the same number of data points. Similar to the MA model, using data from the previous three Mays in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 31. The optimal weights for the various periods are displayed in Table 30. Three months of data provides a MAD of $632.20, MAPE of 16.1% and MSE of %631,932.15. Using this data, when can predict an FY2018 May expenditure of $2,992.00 per person.

Table 30. Weights for WMA Models for May

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.0000	w1	0.4081	w1	0.0000	w1	0.0000	w1	0.0000	w1
0.0000	w2	0.2538	w2	0.0000	w2	0.0000	w2	0.0000	w2
1.0000	w3	0.0000	w3	0.0000	w3	0.0000	w3	0.0000	w3
		0.3381	w4	0.0000	w4	0.0000	w4	0.0000	w4
				1.0000	w5	0.0000	w5	0.0000	w5
						1.0000	w6	0.0000	w6
								1.0000	w7

Table 31. WMA Forecast Model Comparisons for May (Dollars)

Periods (n)	MAPE (%)	May FY2018 Forecast
3	16.11	2992.00
4	19.08	4510.75
5	20.83	2992.00
6	23.57	2992.00
7	34.08	2993.00

We also used ES to model the data and make predictions for future spending. We predicted spending of $4,767.70 compared to an actual expenditure of $2,992.00. A smoothing constant of 0.1580 provided the lowest forecast error. This is a MAPE of 59.3% for that year and an overall MAPE of 16.4%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY2017 of $4,067.30 versus actual spending of $2,992.00, a MAPE for FY2017 of 35.9%. Overall MAPE for the data set was 12.6% using linear trend analysis.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the WMA model provides the best model, with a MAPE of 16.1%.

i. June Monthly Forecast Results

For the month of June data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of June. For the MA model, we found that a predictive model using the previous seven months of data provided the best predictive model for all the MAD, MAPE and MSE as displayed in Table 32. All three measures had the smallest amount of error, with a MAD of $74.10, a MAPE of 1.2% and an MSE of $5,497.16. Using this data, we can predict an FY2018 June expenditure of $6,256.90 per person.

Table 32. MA Forecast Model Comparisons for June (Dollars)

Periods (n)	MAPE (%)	June FY2017 Forecast
3	5.61	6408.67
4	6.50	6502.50
5	4.55	6384.00
6	1.30	6401.83
7	1.20	6256.88

For the WMA, we tested the same number of data points. Similar to the MA model, using data from the previous seven Junes in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 34. Optimal weights for the various periods are displayed in Table 33. Seven months of data provides a MAD of $114.00, MAPE of 6.6% and MSE of 12,996.0. Using this data, we can predict an FY2018 June expenditure of $1,738.00 per person.

Table 33. Weights for WMA Models for June

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.1369	w1	0.0000	w1	0.3511	w1	0.0302	w1	0.0000	w1
0.0000	w2	0.1369	w2	0.0000	w2	0.4180	w2	0.0000	w2
0.8631	w3	0.0000	w3	0.6489	w3	0.1860	w3	0.0000	w3
		0.8631	w4	0.0000	w4	0.0001	w4	0.0000	w4
				0.0000	w5	0.0000	w5	0.0000	w5
						0.3656	w6	0.0000	w6
								1.0000	w7

Table 34. WMA Forecast Model Comparisons for June (Dollars)

Periods (n)	MAPE (%)	June FY2017 Forecast
3	18.33	1873.53
4	19.00	1873.53
5	18.80	2578.46
6	7.28	2049.14
7	6.56	1738.00

We also used ES to model the data and make predictions for future spending. We predicted spending of $6,284.00 compared to an actual expenditure of $6,192.00. A smoothing constant of 0.2214 provided the lowest forecast error. This is a MAPE of 1.5% for FY2017 and an overall MAPE of 4.4%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY17 of $6,526.2 versus actual spending of $6,192.00 and a MAPE for FY2017 of 5.4%. The overall MAPE for the data set was 4.8% using linear trend analysis.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the MA model provides the best model, with a MAPE of 1.2%.

j. July Monthly Forecast Results

For the month of July data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of July. For the MA, we found that a predictive model using the previous seven months of data provided the best predictive model for the MAD, MAPE and MSE as displayed in Table 35. All three measures had the smallest amount of error, with a MAD of $431.10, a MAPE of 7.0% and an MSE of $185,884.16. Using this data, when can predict an FY2018 November expenditure of $6,545.3 per person.

Table 35. MA Forecast Model Comparisons for July (Dollars)

Periods (n)	MAPE (%)	July FY2017 Forecast
3	12.95	5952.00
4	15.33	5915.75
5	14.52	6139.60
6	20.02	6330.00
7	6.99	6545.25

For the WMA model, we tested the same number of data points. Similar to the MA model, using data from the previous six Julys in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 37. The optimal weights for the various periods are displayed in Table 36. Six months of data provides a MAD of $411.60, MAPE of 8.0% and MSE of $338,901.53. Using this data, we can predict an FY2018 November expenditure of $5,463.50 per person.

Table 36. Weights from July WMA Forecast Models

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.0000	w1	0.0000	w1	0.0655	w1	0.0095	w1	0.0000	w1
0.5736	w2	0.0000	w2	0.2669	w2	0.0000	w2	0.0001	w2
0.4264	w3	0.7429	w3	0.0000	w3	0.0000	w3	0.0001	w3
		0.2571	w4	0.0406	w4	0.0000	w4	0.0001	w4
				0.6270	w5	0.7216	w5	0.0001	w5
						0.2689	w6	0.1518	w6
								0.8480	w7

Table 37. WMA Forecast Model Comparisons for July (Dollars)

Periods (n)	MAPE (%)	July FY2017 Forecast
3	11.17	5599.56
4	10.79	5431.81
5	12.06	6088.20
6	7.95	5463.52
7	0.00	6956.49

We also used ES to model the data and make predictions for future spending. We predicted spending of $6,083.70 compared to an actual expenditure of $6,168.00. A smoothing constant 0.3501 provided the lowest forecast error. This is a MAPE of 1.4% for FY2017 and an overall MAPE of 10.0%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY2017 of $5,760.10 versus actual spending of $6,168.00 and a MAPE for FY2017 of 6.6%. The overall MAPE for the data set was 9.9% using linear trend analysis.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the ES model provides the best model, with a MAPE of 1.4%.

k. August Monthly Forecast Results

For the month of August data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of August. For the MA, we found that a predictive model using the previous six months of data provided the best predictive model for the MAD, MAPE and MSE as displayed in Table 38. All three measures had the smallest amount of error, with a MAD of $1,115.3, a MAPE of 28.5% and an MSE of $1,468,170.69. Using this data, when can predict an FY2018 Augusts expenditure of $4,292.50 per person.

Table 38. MA Forecast Model Comparisons for August (Dollars)

Periods (n)	MAPE (%)	August FY2017 Forecast
3	41.76	4054.00
4	37.15	3992.50
5	30.58	3984.80
6	28.55	4292.50
7	50.63	5213.50

For the WMA model, we tested the same number of data points. Similar to the MA model, using data from the previous six Augusts in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 40. Optimal weights for the various periods are displayed in Table 39. Six months of data provides a MAD of $101.60, MAPE of 2.8% and MSE of $20,633.70. Using this data, when can predict an FY2018 August expenditure of $4,311.2 per person.

Table 39. Weights from August WMA Forecast Models

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.0000	w1	0.0000	w1	0.0000	w1	0.0000	w1	0.0000	w1
0.0000	w2	0.0000	w2	0.0000	w2	0.0000	w2	0.0000	w2
1.0000	w3	0.0000	w3	0.0000	w3	0.5358	w3	0.0000	w3
		1.0000	w4	1.0000	w4	0.0000	w4	0.0000	w4
				0.0000	w5	0.4642	w5	0.0000	w5
						0.0000	w6	0.0000	w6
								1.0000	w7

Table 40. WMA Forecast Model Comparisons for August (Dollars)

Periods (n)	MAPE (%)	August FY2017 Forecast
3	23.22	3613.00
4	17.15	3613.00
5	10.50	4892.00
6	2.81	4311.15
7	35.43	3614.00

We also used ES to model the data and make predictions for future spending. We predicted spending of $4,892.0 compared to an actual expenditure of $3,613.00. A smoothing constant of 1.00 provided the lowest forecast error. This is a MAPE of 35.4% for FY2017 and an overall MAPE of 24.5%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY17 of $3,111.40 versus actual spending of $3,613.00, a MAPE for FY2017 of 13.9%. The overall MAPE for the data set was 20.2% using linear trend analysis.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the WMA model provides the best model, with a MAPE of 2.8%.

l. September Monthly Forecast Results

For the month of September data set, we explored predictive models using the most recent 3, 4, 5, 6 and 7 months of September. For the MA model, we found that a predictive model using the previous four months of data provided the best predictive model for the MAD, MAPE and MSE as displayed in Table 41. All three measures had the smallest amount of error, with a MAD of $501.60, a MAPE of 26.8% and an MSE of $255,834.22. Using this data, when can predict an FY2018 September expenditure of $1,932.80 per person.

Table 41. MA Forecast Model Comparisons for September (Dollars)

Periods (n)	MAPE (%)	September FY2017 Forecast
3	93.50	1801.33
4	26.76	1932.75
5	32.64	1698.40
6	41.31	1800.33
7	92.56	2432.50

For the WMA model, we tested the same number of data points. Similar to the MA model, using data from the previous six Septembers in the dataset provided the most accurate model with the MAD, MAPE and MSE all having the smallest error as displayed in Table 43. Optimal weights for the various periods are displayed in Table 42. Six months of data provides a MAD of $64.70, MAPE of 4.8% and MSE of $8,374.67. Using this data, we can predict an FY2018 September expenditure of $2,022.50 per person.

Table 42. Weights from September WMA Forecast Models

n=3	weights	n=4	weights	n=5	weights	n=6	weights	n=7	weights
0.0000	w1	0.1895	w1	0.0637	w1	0.0079	w1	0.0000	w1
0.3314	w2	0.0000	w2	0.6006	w2	0.0298	w2	0.0000	w2
0.6686	w3	0.5176	w3	0.0058	w3	0.4534	w3	0.0000	w3
		0.2929	w4	0.0375	w4	0.0054	w4	0.0000	w4
				0.2925	w5	0.2643	w5	0.0000	w5
						0.2392	w6	0.0000	w6
								1.0000	w7

Table 43. WMA Forecast Model Comparisons for September (Dollars)

Periods (n)	MAPE (%)	September FY2017 Forecast
3	77.04	1644.92
4	8.25	2000.30
5	28.44	1934.01
6	4.81	2022.50
7	67.63	1345.00

We also used ES to model the data and make predictions for future spending. We predicted spending of $2,252.00 compared to an actual expenditure of $1,344.00. A smoothing constant of 1.00 provided the lowest forecast error. This is a MAPE of 67.6% for FY2017 and an overall MAPE of 59.8%.

Additionally, we used a linear trend analysis to examine the data. We predicted a monthly expenditure in FY2017 of $1,093.00 versus actual spending of $1,344.00, a MAPE for FY2017 of 18.7%. The overall MAPE for the data set was 46.0% using linear trend analysis.

Doing a comparison of the predictive models using MA, WMA, ES and linear trend analysis, we find that the WMA model provides the best model, with a MAPE of 4.8%.

B. FINDINGS

A preliminary observation of the data indicated the existence of seasonal fluctuations. After comparing the MA, WMA, ES, linear trend analysis, and seasonality analysis models, we concluded that the seasonality analysis model was the most suitable model for the entire data set. However, with a MAPE of 20.0%, there is significant variation between actual execution rate and the forecasted execution rate.

Table 44. Forecast Model Comparisons for the Entire Data Set (Dollars)

Model	MAPE (%)	MAD	MSE	June FY2018 Forecast
MA	37.00	1099.10	1828662.90	3759.60
WMA	40.50	1196.10	2260854.90	3015.90
ES	40.50	1168.50	2205629.80	3080.50
Linear	45.40	1288.90	2695435.40	3751.00
Seasonality	20.00	596.00	2650672.80	6236.00

After compiling the data, we determined the best predictive model fit for each month, as shown in Tables 44 and 45. The data show that the vast majority of the predictions were most accurate when using the WMA or ES predictive models. Only one month, January, was most accurate using a linear trend analysis model. No month had the most accurate model using MA. We concluded that the WMA model was slightly better than the ES Model. However, the number of periods required to achieve the lowest MAPES varied for the months that had the best forecasts using the WMA model.

Table 45. Monthly MA and WMA Forecast Comparison

Month	AT Rate	MA		WMA	
		Forecast	MAPE	Forecast	MAPE
Oct	3,555.00	3,002.80	12.80	3,101.30	5.50
Nov	3,014.00	3,218.60	5.60	3,014.00	0.00
Dec	1,745.00	1,878.10	8.50	1,745.00	3.40
Jan	3,936.00	3,477.80	11.20	3,819.80	4.10
Feb	2,499.00	2,896.00	8.80	3,074.50	15.00
Mar	3,998.00	3,983.30	0.40	3,978.00	0.50
Apr	3,713.00	4,562.80	8.90	4,406.60	6.00
May	2,992.00	4,839.30	18.80	3,912.00	16.10
Jun	1,737.00	6,266.10	1.20	1,851.00	6.60
Jul	6,168.00	6,599.10	7.00	6,168.00	8.00
Aug	3,613.00	5,201.80	28.50	3,826.10	2.80
Sep	1,334.00	1,787.00	26.80	1,473.40	4.80

Table 46. Monthly ES and Linear Trend Analysis Forecast Comparison

Month	AT Rate	ES		Trend	
		Prediction	MAPE	Prediction	MAPE
Oct	3,555.00	2,538.00	21.90	3,214.60	22.10
Nov	3,014.00	2,881.50	4.40	3,257.40	8.10
Dec	1,745.00	1,737.00	0.50	2,149.10	23.20
Jan	3,936.00	3,358.40	14.70	3,784.60	3.80
Feb	2,499.00	2,329.00	6.80	3,286.10	31.50
Mar	3,998.00	3,984.00	0.40	4,030.80	0.80
Apr	3,713.00	4,111.00	10.70	4,395.00	18.40
May	2,992.00	4,767.70	59.30	4,067.30	35.90
Jun	1,737.00	6,284.00	1.00	6,526.20	5.40
Jul	6,168.00	6,083.70	1.40	5,760.10	6.60
Aug	3,613.00	4,892.00	35.40	3,111.40	13.90
Sep	1,334.00	2,252.00	67.60	1,093.00	18.70

C. RECOMMENDATIONS AND CONCLUSIONS

Overall, we concluded that the seasonality analysis forecast model was the best predictive model to project AT execution rates. The cyclic nature of the data was immediately evident from our initial observation. The monthly data forecast models indicated that the WMA model most often gave the best prediction and lowest forecast errors and in many instances had lower MAPES than the seasonality analysis model. However, the small number of data points for each month makes it difficult to determine if the model is actually accurate and causes less confidence in the forecasts.

D. AREAS FOR FURTHER RESEARCH

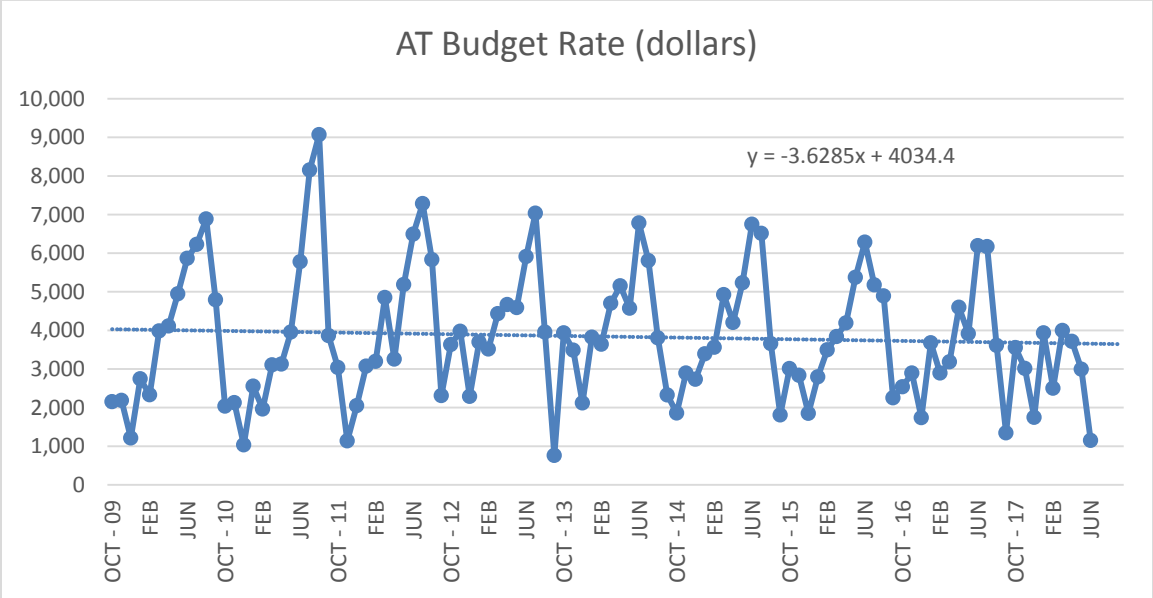
Based on our findings, the MA, WMA, ES, linear trend analysis, and seasonality analysis forecast models had varied and high forecast errors that make them unreliable for use. We considered several factors that might have caused such high deviations in the execution rate from a given month in a series of years. Without delving more intensively into the data, it is difficult to say what caused the MAPES definitively, but we propose a number of possible factors. The U.S. budget and political landscape have been in turmoil for much of the last decade. Sequestration and CRs have been the cause of much chaos in regards to the federal budget. Shrinking budget funds and freezes on government spending were possibly the cause of much of the deviation in funds spent in a given month. Sequestration has led to fiscal uncertainty and decreased budgets. CRs create doubt as to the level of funding that will be available, as well as anxiety from the potential for decreased funding when it does become available.

We recommend obtaining more data and exploring a causal forecast model. It seems possible that AT participation rates could statistically correlate with a number of external factors, if identified, could help develop a more accurate and reliable forecast. Factors such as unit training schedules, major exercises, various contingency operations, sequestration, and CRs definitely impact when AT is conducted. A causal forecast could help determine what type of impact these variables have but would require more in-depth historical data.

APPENDIX A. AT PARTICIPATION DATA FOR FY2009–FY2017 (DOLLARS)

	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17
OCT	2,151	2,036	3,041	3,633	3,936	1,858	3,011	2,538	3,555
NOV	2,187	2,128	1,138	3,978	3,488	2,893	2,838	2,896	3,014
DEC	1,212	1,035	2,047	2,291	2,119	2,734	1,850	1,737	1,745
JAN	2,745	2,555	3,072	3,699	3,824	3,392	2,796	3,678	3,936
FEB	2,329	1,962	3,196	3,514	3,639	3,563	3,497	2,896	2,499
MAR	3,984	3,107	4,851	4,431	4,700	4,926	3,840	3,184	3,998
APR	4,111	3,128	3,255	4,667	5,155	4,204	4,191	4,597	3,713
MAY	4,944	3,955	5,185	4,589	4,573	5,233	5,373	3,912	2,992
JUN	5,866	5,778	6,491	5,910	6,784	6,750	6,284	6,192	*
JUL	6,227	8,155	7,282	7,035	5,807	6,511	5,177	6,168	*
AUG	6,884	9,069	5,831	3,954	3,808	3,657	4,892	3,613	*
SEP	4,793	3,865	2,310	761	2,327	1,808	2,252	1,344	*

*Data unavailable at the time



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APPENDIX B. MOVING AVERAGE MODELS FOR ENTIRE DATA SET (DOLLARS)

Time	Period	AT Executed	n=3	Error	% Error	$Error^2$
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745	1850.0	895.0	32.6	801025.0
FEB	5	2329	2048.0	281.0	12.1	78961.0
MAR	6	3984	2095.3	1888.7	47.4	3567061.8
APR	7	4111	3019.3	1091.7	26.6	1191736.1
MAY	8	4944	3474.7	1469.3	29.7	2158940.4
JUN	9	5866	4346.3	1519.7	25.9	2309386.8
JUL	10	6227	4973.7	1253.3	20.1	1570844.4
AUG	11	6884	5679.0	1205.0	17.5	1452025.0
SEP	12	4793	6325.7	1532.7	32.0	2349067.1
OCT - 10	13	2036	5968.0	3932.0	193.1	15460624.0
NOV	14	2128	4571.0	2443.0	114.8	5968249.0
DEC	15	1035	2985.7	1950.7	188.5	3805100.4
JAN	16	2555	1733.0	822.0	32.2	675684.0
FEB	17	1962	1906.0	56.0	2.9	3136.0
MAR	18	3107	1850.7	1256.3	40.4	1578373.4
APR	19	3128	2541.3	586.7	18.8	344177.8
MAY	20	3955	2732.3	1222.7	30.9	1494913.8
JUN	21	5778	3396.7	2381.3	41.2	5670748.4
JUL	22	8155	4287.0	3868.0	47.4	14961424.0
AUG	23	9069	5962.7	3106.3	34.3	9649306.8
SEP	24	3865	7667.3	3802.3	98.4	14457738.8
OCT - 11	25	3041	7029.7	3988.7	131.2	15909461.8
NOV	26	1138	5325.0	4187.0	367.9	17530969.0
DEC	27	2047	2681.3	634.3	31.0	402378.8
JAN	28	3072	2075.3	996.7	32.4	993344.4
FEB	29	3196	2085.7	1110.3	34.7	1232840.1
MAR	30	4851	2771.7	2079.3	42.9	4323627.1
APR	31	3255	3706.3	451.3	13.9	203701.8
MAY	32	5185	3767.3	1417.7	27.3	2009778.8
JUN	33	6491	4430.3	2060.7	31.7	4246347.1
JUL	34	7282	4977.0	2305.0	31.7	5313025.0
AUG	35	5831	6319.3	488.3	8.4	238469.4

Time	Period	AT Executed	n=3	Error	% Error	Error^2
SEP	36	2310	6534.7	4224.7	182.9	17847808.4
OCT - 12	37	3633	5141.0	1508.0	41.5	2274064.0
NOV	38	3978	3924.7	53.3	1.3	2844.4
DEC	39	2291	3307.0	1016.0	44.3	1032256.0
JAN	40	3699	3300.7	398.3	10.8	158669.4
FEB	41	3514	3322.7	191.3	5.4	36608.4
MAR	42	4431	3168.0	1263.0	28.5	1595169.0
APR	43	4667	3881.3	785.7	16.8	617272.1
MAY	44	4589	4204.0	385.0	8.4	148225.0
JUN	45	5910	4562.3	1347.7	22.8	1816205.4
JUL	46	7035	5055.3	1979.7	28.1	3919080.1
AUG	47	3954	5844.7	1890.7	47.8	3574620.4
SEP	48	761	5633.0	4872.0	640.2	23736384.0
OCT - 13	49	3936	3916.7	19.3	0.5	373.8
NOV	50	3488	2883.7	604.3	17.3	365218.8
DEC	51	2119	2728.3	609.3	28.8	371287.1
JAN	52	3824	3181.0	643.0	16.8	413449.0
FEB	53	3639	3143.7	495.3	13.6	245355.1
MAR	54	4700	3194.0	1506.0	32.0	2268036.0
APR	55	5155	4054.3	1100.7	21.4	1211467.1
MAY	56	4573	4498.0	75.0	1.6	5625.0
JUN	57	6784	4809.3	1974.7	29.1	3899308.4
JUL	58	5807	5504.0	303.0	5.2	91809.0
AUG	59	3808	5721.3	1913.3	50.2	3660844.4
SEP	60	2327	5466.3	3139.3	134.9	9855413.8
OCT - 14	61	1858	3980.7	2122.7	114.2	4505713.8
NOV	62	2893	2664.3	228.7	7.9	52288.4
DEC	63	2734	2359.3	374.7	13.7	140375.1
JAN	64	3392	2495.0	897.0	26.4	804609.0
FEB	65	3563	3006.3	556.7	15.6	309877.8
MAR	66	4926	3229.7	1696.3	34.4	2877546.8
APR	67	4204	3960.3	243.7	5.8	59373.4
MAY	68	5233	4231.0	1002.0	19.1	1004004.0
JUN	69	6750	4787.7	1962.3	29.1	3850752.1
JUL	70	6511	5395.7	1115.3	17.1	1243968.4
AUG	71	3657	6164.7	2507.7	68.6	6288392.1
SEP	72	1808	5639.3	3831.3	211.9	14679115.1
OCT - 15	73	3011	3992.0	981.0	32.6	962361.0
NOV	74	2838	2825.3	12.7	0.4	160.4

Time	Period	AT Executed	n=3	Error	% Error	$Error^2$
DEC	75	1850	2552.3	702.3	38.0	493272.1
JAN	76	2796	2566.3	229.7	8.2	52746.8
FEB	77	3497	2494.7	1002.3	28.7	1004672.1
MAR	78	3840	2714.3	1125.7	29.3	1267125.4
APR	79	4191	3377.7	813.3	19.4	661511.1
MAY	80	5373	3842.7	1530.3	28.5	2341920.1
JUN	81	6284	4468.0	1816.0	28.9	3297856.0
JUL	82	5177	5282.7	105.7	2.0	11165.4
AUG	83	4892	5611.3	719.3	14.7	517440.4
SEP	84	2252	5451.0	3199.0	142.1	10233601.0
OCT - 16	85	2538	4107.0	1569.0	61.8	2461761.0
NOV	86	2896	3227.3	331.3	11.4	109781.8
DEC	87	1737	2562.0	825.0	47.5	680625.0
JAN	88	3678	2390.3	1287.7	35.0	1658085.4
FEB	89	2896	2770.3	125.7	4.3	15792.1
MAR	90	3184	2770.3	413.7	13.0	171120.1
APR	91	4597	3252.7	1344.3	29.2	1807232.1
MAY	92	3912	3559.0	353.0	9.0	124609.0
JUN	93	6192	3897.7	2294.3	37.1	5263965.4
JUL	94	6168	4900.3	1267.7	20.6	1606978.8
AUG	95	3613	5424.0	1811.0	50.1	3279721.0
SEP	96	1344	5324.3	3980.3	296.2	15843053.4
OCT - 17	97	3555	3708.3	153.3	4.3	23511.1
NOV	98	3014	2837.3	176.7	5.9	31211.1
DEC	99	1745	2637.7	892.7	51.2	796853.8
JAN	100	3936	2771.3	1164.7	29.6	1356448.4
FEB	101	2499	2898.3	399.3	16.0	159467.1
MAR	102	3998	2726.7	1271.3	31.8	1616288.4
APR	103	3713	3477.7	235.3	6.3	55381.8
MAY	104	2992	3403.3	411.3	13.7	169195.1
JUN	105		3567.7			
MAD				1363.0		
MAPE					49.3	
MSE						3118720.7

Time	Period	AT Executed	n=4	Error	% Error	$Error^2$
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745				
FEB	5	2329	2073.8	255.3	11.0	65152.6
MAR	6	3984	2118.3	1865.8	46.8	3481023.1
APR	7	4111	2567.5	1543.5	37.5	2382392.3
MAY	8	4944	3292.3	1651.8	33.4	2728278.1
JUN	9	5866	3842.0	2024.0	34.5	4096576.0
JUL	10	6227	4726.3	1500.8	24.1	2252250.6
AUG	11	6884	5287.0	1597.0	23.2	2550409.0
SEP	12	4793	5980.3	1187.3	24.8	1409562.6
OCT - 10	13	2036	5942.5	3906.5	191.9	15260742.3
NOV	14	2128	4985.0	2857.0	134.3	8162449.0
DEC	15	1035	3960.3	2925.3	282.6	8557087.6
JAN	16	2555	2498.0	57.0	2.2	3249.0
FEB	17	1962	1938.5	23.5	1.2	552.3
MAR	18	3107	1920.0	1187.0	38.2	1408969.0
APR	19	3128	2164.8	963.3	30.8	927850.6
MAY	20	3955	2688.0	1267.0	32.0	1605289.0
JUN	21	5778	3038.0	2740.0	47.4	7507600.0
JUL	22	8155	3992.0	4163.0	51.0	17330569.0
AUG	23	9069	5254.0	3815.0	42.1	14554225.0
SEP	24	3865	6739.3	2874.3	74.4	8261313.1
OCT - 11	25	3041	6716.8	3675.8	120.9	13511138.1
NOV	26	1138	6032.5	4894.5	430.1	23956130.3
DEC	27	2047	4278.3	2231.3	109.0	4978476.6
JAN	28	3072	2522.8	549.3	17.9	301675.6
FEB	29	3196	2324.5	871.5	27.3	759512.3
MAR	30	4851	2363.3	2487.8	51.3	6188900.1
APR	31	3255	3291.5	36.5	1.1	1332.3
MAY	32	5185	3593.5	1591.5	30.7	2532872.3
JUN	33	6491	4121.8	2369.3	36.5	5613345.6
JUL	34	7282	4945.5	2336.5	32.1	5459232.3
AUG	35	5831	5553.3	277.8	4.8	77145.1
SEP	36	2310	6197.3	3887.3	168.3	15110712.6
OCT - 12	37	3633	5478.5	1845.5	50.8	3405870.3
NOV	38	3978	4764.0	786.0	19.8	617796.0
DEC	39	2291	3938.0	1647.0	71.9	2712609.0

Time	Period	AT Executed	n=4	Error	% Error	$Error^2$
JAN	40	3699	3053.0	646.0	17.5	417316.0
FEB	41	3514	3400.3	113.8	3.2	12939.1
MAR	42	4431	3370.5	1060.5	23.9	1124660.3
APR	43	4667	3483.8	1183.3	25.4	1400080.6
MAY	44	4589	4077.8	511.3	11.1	261376.6
JUN	45	5910	4300.3	1609.8	27.2	2591295.1
JUL	46	7035	4899.3	2135.8	30.4	4561428.1
AUG	47	3954	5550.3	1596.3	40.4	2548014.1
SEP	48	761	5372.0	4611.0	605.9	21261321.0
OCT - 13	49	3936	4415.0	479.0	12.2	229441.0
NOV	50	3488	3921.5	433.5	12.4	187922.3
DEC	51	2119	3034.8	915.8	43.2	838598.1
JAN	52	3824	2576.0	1248.0	32.6	1557504.0
FEB	53	3639	3341.8	297.3	8.2	88357.6
MAR	54	4700	3267.5	1432.5	30.5	2052056.3
APR	55	5155	3570.5	1584.5	30.7	2510640.3
MAY	56	4573	4329.5	243.5	5.3	59292.3
JUN	57	6784	4516.8	2267.3	33.4	5140422.6
JUL	58	5807	5303.0	504.0	8.7	254016.0
AUG	59	3808	5579.8	1771.8	46.5	3139098.1
SEP	60	2327	5243.0	2916.0	125.3	8503056.0
OCT - 14	61	1858	4681.5	2823.5	152.0	7972152.3
NOV	62	2893	3450.0	557.0	19.3	310249.0
DEC	63	2734	2721.5	12.5	0.5	156.3
JAN	64	3392	2453.0	939.0	27.7	881721.0
FEB	65	3563	2719.3	843.8	23.7	711914.1
MAR	66	4926	3145.5	1780.5	36.1	3170180.3
APR	67	4204	3653.8	550.3	13.1	302775.1
MAY	68	5233	4021.3	1211.8	23.2	1468338.1
JUN	69	6750	4481.5	2268.5	33.6	5146092.3
JUL	70	6511	5278.3	1232.8	18.9	1519672.6
AUG	71	3657	5674.5	2017.5	55.2	4070306.3
SEP	72	1808	5537.8	3729.8	206.3	13911035.1
OCT - 15	73	3011	4681.5	1670.5	55.5	2790570.3
NOV	74	2838	3746.8	908.8	32.0	825826.6
DEC	75	1850	2828.5	978.5	52.9	957462.3
JAN	76	2796	2376.8	419.3	15.0	175770.6
FEB	77	3497	2623.8	873.3	25.0	762565.6
MAR	78	3840	2745.3	1094.8	28.5	1198477.6

Time	Period	AT Executed	n=4	Error	% Error	$Error^2$
APR	79	4191	2995.8	1195.3	28.5	1428622.6
MAY	80	5373	3581.0	1792.0	33.4	3211264.0
JUN	81	6284	4225.3	2058.8	32.8	4238451.6
JUL	82	5177	4922.0	255.0	4.9	65025.0
AUG	83	4892	5256.3	364.3	7.4	132678.1
SEP	84	2252	5431.5	3179.5	141.2	10109220.3
OCT - 16	85	2538	4651.3	2113.3	83.3	4465825.6
NOV	86	2896	3714.8	818.8	28.3	670351.6
DEC	87	1737	3144.5	1407.5	81.0	1981056.3
JAN	88	3678	2355.8	1322.3	36.0	1748345.1
FEB	89	2896	2712.3	183.8	6.3	33764.1
MAR	90	3184	2801.8	382.3	12.0	146115.1
APR	91	4597	2873.8	1723.3	37.5	2969590.6
MAY	92	3912	3588.8	323.3	8.3	104490.6
JUN	93	6192	3647.3	2544.8	41.1	6475752.6
JUL	94	6168	4471.3	1696.8	27.5	2878960.6
AUG	95	3613	5217.3	1604.3	44.4	2573618.1
SEP	96	1344	4971.3	3627.3	269.9	13156942.6
OCT - 17	97	3555	4329.3	774.3	21.8	599463.1
NOV	98	3014	3670.0	656.0	21.8	430336.0
DEC	99	1745	2881.5	1136.5	65.1	1291632.3
JAN	100	3936	2414.5	1521.5	38.7	2314962.3
FEB	101	2499	3062.5	563.5	22.5	317532.3
MAR	102	3998	2798.5	1199.5	30.0	1438800.3
APR	103	3713	3044.5	668.5	18.0	446892.3
MAY	104	2992	3536.5	544.5	18.2	296480.3
JUN	105		3300.5			
MAD				1530.2		
MAPE					54.9	
MSE						3562125.6

Time	Period	AT Executed	n=5	Error	% Error	$Error^2$
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745				
FEB	5	2329				
MAR	6	3984	2124.8	1859.2	46.7	3456624.6
APR	7	4111	2491.4	1619.6	39.4	2623104.2
MAY	8	4944	2876.2	2067.8	41.8	4275796.8
JUN	9	5866	3622.6	2243.4	38.2	5032843.6
JUL	10	6227	4246.8	1980.2	31.8	3921192.0
AUG	11	6884	5026.4	1857.6	27.0	3450677.8
SEP	12	4793	5606.4	813.4	17.0	661619.6
OCT - 10	13	2036	5742.8	3706.8	182.1	13740366.2
NOV	14	2128	5161.2	3033.2	142.5	9200302.2
DEC	15	1035	4413.6	3378.6	326.4	11414938.0
JAN	16	2555	3375.2	820.2	32.1	672728.0
FEB	17	1962	2509.4	547.4	27.9	299646.8
MAR	18	3107	1943.2	1163.8	37.5	1354430.4
APR	19	3128	2157.4	970.6	31.0	942064.4
MAY	20	3955	2357.4	1597.6	40.4	2552325.8
JUN	21	5778	2941.4	2836.6	49.1	8046299.6
JUL	22	8155	3586.0	4569.0	56.0	20875761.0
AUG	23	9069	4824.6	4244.4	46.8	18014931.4
SEP	24	3865	6017.0	2152.0	55.7	4631104.0
OCT - 11	25	3041	6164.4	3123.4	102.7	9755627.6
NOV	26	1138	5981.6	4843.6	425.6	23460461.0
DEC	27	2047	5053.6	3006.6	146.9	9039643.6
JAN	28	3072	3832.0	760.0	24.7	577600.0
FEB	29	3196	2632.6	563.4	17.6	317419.6
MAR	30	4851	2498.8	2352.2	48.5	5532844.8
APR	31	3255	2860.8	394.2	12.1	155393.6
MAY	32	5185	3284.2	1900.8	36.7	3613040.6
JUN	33	6491	3911.8	2579.2	39.7	6652272.6
JUL	34	7282	4595.6	2686.4	36.9	7216745.0
AUG	35	5831	5412.8	418.2	7.2	174891.2
SEP	36	2310	5608.8	3298.8	142.8	10882081.4
OCT - 12	37	3633	5419.8	1786.8	49.2	3192654.2
NOV	38	3978	5109.4	1131.4	28.4	1280066.0
DEC	39	2291	4606.8	2315.8	101.1	5362929.6

Time	Period	AT Executed	n=5	Error	% Error	$Error^2$
JAN	40	3699	3608.6	90.4	2.4	8172.2
FEB	41	3514	3182.2	331.8	9.4	110091.2
MAR	42	4431	3423.0	1008.0	22.7	1016064.0
APR	43	4667	3582.6	1084.4	23.2	1175923.4
MAY	44	4589	3720.4	868.6	18.9	754466.0
JUN	45	5910	4180.0	1730.0	29.3	2992900.0
JUL	46	7035	4622.2	2412.8	34.3	5821603.8
AUG	47	3954	5326.4	1372.4	34.7	1883481.8
SEP	48	761	5231.0	4470.0	587.4	19980900.0
OCT - 13	49	3936	4449.8	513.8	13.1	263990.4
NOV	50	3488	4319.2	831.2	23.8	690893.4
DEC	51	2119	3834.8	1715.8	81.0	2943969.6
JAN	52	3824	2851.6	972.4	25.4	945561.8
FEB	53	3639	2825.6	813.4	22.4	661619.6
MAR	54	4700	3401.2	1298.8	27.6	1686881.4
APR	55	5155	3554.0	1601.0	31.1	2563201.0
MAY	56	4573	3887.4	685.6	15.0	470047.4
JUN	57	6784	4378.2	2405.8	35.5	5787873.6
JUL	58	5807	4970.2	836.8	14.4	700234.2
AUG	59	3808	5403.8	1595.8	41.9	2546577.6
SEP	60	2327	5225.4	2898.4	124.6	8400722.6
OCT - 14	61	1858	4659.8	2801.8	150.8	7850083.2
NOV	62	2893	4116.8	1223.8	42.3	1497686.4
DEC	63	2734	3338.6	604.6	22.1	365541.2
JAN	64	3392	2724.0	668.0	19.7	446224.0
FEB	65	3563	2640.8	922.2	25.9	850452.8
MAR	66	4926	2888.0	2038.0	41.4	4153444.0
APR	67	4204	3501.6	702.4	16.7	493365.8
MAY	68	5233	3763.8	1469.2	28.1	2158548.6
JUN	69	6750	4263.6	2486.4	36.8	6182185.0
JUL	70	6511	4935.2	1575.8	24.2	2483145.6
AUG	71	3657	5524.8	1867.8	51.1	3488676.8
SEP	72	1808	5271.0	3463.0	191.5	11992369.0
OCT - 15	73	3011	4791.8	1780.8	59.1	3171248.6
NOV	74	2838	4347.4	1509.4	53.2	2278288.4
DEC	75	1850	3565.0	1715.0	92.7	2941225.0
JAN	76	2796	2632.8	163.2	5.8	26634.2
FEB	77	3497	2460.6	1036.4	29.6	1074125.0
MAR	78	3840	2798.4	1041.6	27.1	1084930.6

Time	Period	AT Executed	n=5	Error	% Error	$Error^2$
APR	79	4191	2964.2	1226.8	29.3	1505038.2
MAY	80	5373	3234.8	2138.2	39.8	4571899.2
JUN	81	6284	3939.4	2344.6	37.3	5497149.2
JUL	82	5177	4637.0	540.0	10.4	291600.0
AUG	83	4892	4973.0	81.0	1.7	6561.0
SEP	84	2252	5183.4	2931.4	130.2	8593106.0
OCT - 16	85	2538	4795.6	2257.6	89.0	5096757.8
NOV	86	2896	4228.6	1332.6	46.0	1775822.8
DEC	87	1737	3551.0	1814.0	104.4	3290596.0
JAN	88	3678	2863.0	815.0	22.2	664225.0
FEB	89	2896	2620.2	275.8	9.5	76065.6
MAR	90	3184	2749.0	435.0	13.7	189225.0
APR	91	4597	2878.2	1718.8	37.4	2954273.4
MAY	92	3912	3218.4	693.6	17.7	481081.0
JUN	93	6192	3653.4	2538.6	41.0	6444490.0
JUL	94	6168	4156.2	2011.8	32.6	4047339.2
AUG	95	3613	4810.6	1197.6	33.1	1434245.8
SEP	96	1344	4896.4	3552.4	264.3	12619545.8
OCT - 17	97	3555	4245.8	690.8	19.4	477204.6
NOV	98	3014	4174.4	1160.4	38.5	1346528.2
DEC	99	1745	3538.8	1793.8	102.8	3217718.4
JAN	100	3936	2654.2	1281.8	32.6	1643011.2
FEB	101	2499	2718.8	219.8	8.8	48312.0
MAR	102	3998	2949.8	1048.2	26.2	1098723.2
APR	103	3713	3038.4	674.6	18.2	455085.2
MAY	104	2992	3178.2	186.2	6.2	34670.4
JUN	105		3427.6			
MAD				1658.5		
MAPE					59.0	
MSE						3880647.0

Time	Period	AT Executed	n=6	Error	% Error	$Error^2$
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745				
FEB	5	2329				
MAR	6	3984				
APR	7	4111	2434.7	1676.3	40.8	2810093.4
MAY	8	4944	2761.3	2182.7	44.1	4764033.8
JUN	9	5866	3220.8	2645.2	45.1	6996906.7
JUL	10	6227	3996.5	2230.5	35.8	4975130.3
AUG	11	6884	4576.8	2307.2	33.5	5323018.0
SEP	12	4793	5336.0	543.0	11.3	294849.0
OCT - 10	13	2036	5470.8	3434.8	168.7	11798080.0
NOV	14	2128	5125.0	2997.0	140.8	8982009.0
DEC	15	1035	4655.7	3620.7	349.8	13109227.1
JAN	16	2555	3850.5	1295.5	50.7	1678320.3
FEB	17	1962	3238.5	1276.5	65.1	1629452.3
MAR	18	3107	2418.2	688.8	22.2	474491.4
APR	19	3128	2137.2	990.8	31.7	981750.7
MAY	20	3955	2319.2	1635.8	41.4	2675950.7
JUN	21	5778	2623.7	3154.3	54.6	9949818.8
JUL	22	8155	3414.2	4740.8	58.1	22475500.7
AUG	23	9069	4347.5	4721.5	52.1	22292562.3
SEP	24	3865	5532.0	1667.0	43.1	2778889.0
OCT - 11	25	3041	5658.3	2617.3	86.1	6850433.8
NOV	26	1138	5643.8	4505.8	395.9	20302534.0
DEC	27	2047	5174.3	3127.3	152.8	9780213.8
JAN	28	3072	4552.5	1480.5	48.2	2191880.3
FEB	29	3196	3705.3	509.3	15.9	259420.4
MAR	30	4851	2726.5	2124.5	43.8	4513500.3
APR	31	3255	2890.8	364.2	11.2	132617.4
MAY	32	5185	2926.5	2258.5	43.6	5100822.3
JUN	33	6491	3601.0	2890.0	44.5	8352100.0
JUL	34	7282	4341.7	2940.3	40.4	8645560.1
AUG	35	5831	5043.3	787.7	13.5	620418.8
SEP	36	2310	5482.5	3172.5	137.3	10064756.3
OCT - 12	37	3633	5059.0	1426.0	39.3	2033476.0
NOV	38	3978	5122.0	1144.0	28.8	1308736.0
DEC	39	2291	4920.8	2629.8	114.8	6916023.4

Time	Period	AT Executed	n=6	Error	% Error	Error^2
JAN	40	3699	4220.8	521.8	14.1	272310.0
FEB	41	3514	3623.7	109.7	3.1	12026.8
MAR	42	4431	3237.5	1193.5	26.9	1424442.3
APR	43	4667	3591.0	1076.0	23.1	1157776.0
MAY	44	4589	3763.3	825.7	18.0	681725.4
JUN	45	5910	3865.2	2044.8	34.6	4181343.4
JUL	46	7035	4468.3	2566.7	36.5	6587777.8
AUG	47	3954	5024.3	1070.3	27.1	1145613.4
SEP	48	761	5097.7	4336.7	569.9	18806677.8
OCT - 13	49	3936	4486.0	550.0	14.0	302500.0
NOV	50	3488	4364.2	876.2	25.1	767668.0
DEC	51	2119	4180.7	2061.7	97.3	4250469.4
JAN	52	3824	3548.8	275.2	7.2	75716.7
FEB	53	3639	3013.7	625.3	17.2	391041.8
MAR	54	4700	2961.2	1738.8	37.0	3023541.4
APR	55	5155	3617.7	1537.3	29.8	2363393.8
MAY	56	4573	3820.8	752.2	16.4	565754.7
JUN	57	6784	4001.7	2782.3	41.0	7741378.8
JUL	58	5807	4779.2	1027.8	17.7	1056441.4
AUG	59	3808	5109.7	1301.7	34.2	1694336.1
SEP	60	2327	5137.8	2810.8	120.8	7900784.0
OCT - 14	61	1858	4742.3	2884.3	155.2	8319378.8
NOV	62	2893	4192.8	1299.8	44.9	1689566.7
DEC	63	2734	3912.8	1178.8	43.1	1389648.0
JAN	64	3392	3237.8	154.2	4.5	23767.4
FEB	65	3563	2835.3	727.7	20.4	529498.8
MAR	66	4926	2794.5	2131.5	43.3	4543292.3
APR	67	4204	3227.7	976.3	23.2	953226.8
MAY	68	5233	3618.7	1614.3	30.8	2606072.1
JUN	69	6750	4008.7	2741.3	40.6	7514908.4
JUL	70	6511	4678.0	1833.0	28.2	3359889.0
AUG	71	3657	5197.8	1540.8	42.1	2374167.4
SEP	72	1808	5213.5	3405.5	188.4	11597430.3
OCT - 15	73	3011	4693.8	1682.8	55.9	2831928.0
NOV	74	2838	4495.0	1657.0	58.4	2745649.0
DEC	75	1850	4095.8	2245.8	121.4	5043767.4
JAN	76	2796	3279.2	483.2	17.3	233450.0
FEB	77	3497	2660.0	837.0	23.9	700569.0
MAR	78	3840	2633.3	1206.7	31.4	1456044.4

Time	Period	AT Executed	n=6	Error	% Error	$Error^2$
APR	79	4191	2972.0	1219.0	29.1	1485961.0
MAY	80	5373	3168.7	2204.3	41.0	4859085.4
JUN	81	6284	3591.2	2692.8	42.9	7251351.4
JUL	82	5177	4330.2	846.8	16.4	717126.7
AUG	83	4892	4727.0	165.0	3.4	27225.0
SEP	84	2252	4959.5	2707.5	120.2	7330556.3
OCT - 16	85	2538	4694.8	2156.8	85.0	4651930.0
NOV	86	2896	4419.3	1523.3	52.6	2320544.4
DEC	87	1737	4006.5	2269.5	130.7	5150630.3
JAN	88	3678	3248.7	429.3	11.7	184327.1
FEB	89	2896	2998.8	102.8	3.6	10574.7
MAR	90	3184	2666.2	517.8	16.3	268151.4
APR	91	4597	2821.5	1775.5	38.6	3152400.3
MAY	92	3912	3164.7	747.3	19.1	558507.1
JUN	93	6192	3334.0	2858.0	46.2	8168164.0
JUL	94	6168	4076.5	2091.5	33.9	4374372.3
AUG	95	3613	4491.5	878.5	24.3	771762.3
SEP	96	1344	4611.0	3267.0	243.1	10673289.0
OCT - 17	97	3555	4304.3	749.3	21.1	561500.4
NOV	98	3014	4130.7	1116.7	37.0	1246944.4
DEC	99	1745	3981.0	2236.0	128.1	4999696.0
JAN	100	3936	3239.8	696.2	17.7	484648.0
FEB	101	2499	2867.8	368.8	14.8	136038.0
MAR	102	3998	2682.2	1315.8	32.9	1731417.4
APR	103	3713	3124.5	588.5	15.8	346332.3
MAY	104	2992	3150.8	158.8	5.3	25228.0
JUN	105		3147.2			
MAD				1715.9		
MAPE					60.4	
MSE						4131278.7

Time	Period	AT Executed	n=8	Error	% Error	$Error^2$
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745				
FEB	5	2329				
MAR	6	3984				
APR	7	4111				
MAY	8	4944				
JUN	9	5866	2957.9	2908.1	49.6	8457191.0
JUL	10	6227	3422.3	2804.8	45.0	7866622.6
AUG	11	6884	3927.3	2956.8	43.0	8742370.6
SEP	12	4793	4636.3	156.8	3.3	24570.6
OCT - 10	13	2036	4892.3	2856.3	140.3	8158164.1
NOV	14	2128	4855.6	2727.6	128.2	7439938.1
DEC	15	1035	4623.6	3588.6	346.7	12878229.4
JAN	16	2555	4239.1	1684.1	65.9	2836277.0
FEB	17	1962	3940.5	1978.5	100.8	3914462.3
MAR	18	3107	3452.5	345.5	11.1	119370.3
APR	19	3128	3062.5	65.5	2.1	4290.3
MAY	20	3955	2593.0	1362.0	34.4	1855044.0
JUN	21	5778	2488.3	3289.8	56.9	10822455.1
JUL	22	8155	2956.0	5199.0	63.8	27029601.0
AUG	23	9069	3709.4	5359.6	59.1	28725580.1
SEP	24	3865	4713.6	848.6	22.0	720164.4
OCT - 11	25	3041	4877.4	1836.4	60.4	3372273.1
NOV	26	1138	5012.3	3874.3	340.4	15009813.1
DEC	27	2047	4766.1	2719.1	132.8	7393640.8
JAN	28	3072	4631.0	1559.0	50.7	2430481.0
FEB	29	3196	4520.6	1324.6	41.4	1754631.4
MAR	30	4851	4197.9	653.1	13.5	426572.3
APR	31	3255	3784.9	529.9	16.3	280767.5
MAY	32	5185	3058.1	2126.9	41.0	4523597.3
JUN	33	6491	3223.1	3267.9	50.3	10679007.0
JUL	34	7282	3654.4	3627.6	49.8	13159663.1
AUG	35	5831	4422.4	1408.6	24.2	1984224.4
SEP	36	2310	4895.4	2585.4	111.9	6684163.9
OCT - 12	37	3633	4800.1	1167.1	32.1	1362180.8
NOV	38	3978	4854.8	876.8	22.0	768690.6
DEC	39	2291	4745.6	2454.6	107.1	6025183.9

Time	Period	AT Executed	n=8	Error	% Error	$Error^2$
JAN	40	3699	4625.1	926.1	25.0	857707.5
FEB	41	3514	4439.4	925.4	26.3	856318.9
MAR	42	4431	4067.3	363.8	8.2	132314.1
APR	43	4667	3710.9	956.1	20.5	914175.0
MAY	44	4589	3565.4	1023.6	22.3	1047808.1
JUN	45	5910	3850.3	2059.8	34.9	4242570.1
JUL	46	7035	4134.9	2900.1	41.2	8410725.0
AUG	47	3954	4517.0	563.0	14.2	316969.0
SEP	48	761	4724.9	3963.9	520.9	15712305.0
OCT - 13	49	3936	4357.6	421.6	10.7	177767.6
NOV	50	3488	4410.4	922.4	26.4	850775.6
DEC	51	2119	4292.5	2173.5	102.6	4724102.3
JAN	52	3824	3974.0	150.0	3.9	22500.0
FEB	53	3639	3878.4	239.4	6.6	57300.4
MAR	54	4700	3594.5	1105.5	23.5	1222130.3
APR	55	5155	3302.6	1852.4	35.9	3431293.1
MAY	56	4573	3452.8	1120.3	24.5	1254960.1
JUN	57	6784	3929.3	2854.8	42.1	8149597.6
JUL	58	5807	4285.3	1521.8	26.2	2315723.1
AUG	59	3808	4575.1	767.1	20.1	588480.8
SEP	60	2327	4786.3	2459.3	105.7	6047910.6
OCT - 14	61	1858	4599.1	2741.1	147.5	7513766.3
NOV	62	2893	4376.5	1483.5	51.3	2200772.3
DEC	63	2734	4150.6	1416.6	51.8	2006826.4
JAN	64	3392	3848.0	456.0	13.4	207936.0
FEB	65	3563	3700.4	137.4	3.9	18871.9
MAR	66	4926	3297.8	1628.3	33.1	2651198.1
APR	67	4204	3187.6	1016.4	24.2	1033018.1
MAY	68	5233	3237.1	1995.9	38.1	3983517.0
JUN	69	6750	3600.4	3149.6	46.7	9920137.6
JUL	70	6511	4211.9	2299.1	35.3	5285975.8
AUG	71	3657	4664.1	1007.1	27.5	1014300.8
SEP	72	1808	4779.5	2971.5	164.4	8829812.3
OCT - 15	73	3011	4581.5	1570.5	52.2	2466470.3
NOV	74	2838	4512.5	1674.5	59.0	2803950.3
DEC	75	1850	4251.5	2401.5	129.8	5767202.3
JAN	76	2796	3957.3	1161.3	41.5	1348501.6
FEB	77	3497	3652.6	155.6	4.5	24219.1
MAR	78	3840	3246.0	594.0	15.5	352836.0

Time	Period	AT Executed	n=8	Error	% Error	$Error^2$
APR	79	4191	2912.1	1278.9	30.5	1635521.3
MAY	80	5373	2978.9	2394.1	44.6	5731834.5
JUN	81	6284	3424.5	2859.5	45.5	8176740.3
JUL	82	5177	3833.6	1343.4	25.9	1804656.4
AUG	83	4892	4126.0	766.0	15.7	586756.0
SEP	84	2252	4506.3	2254.3	100.1	5081643.1
OCT - 16	85	2538	4438.3	1900.3	74.9	3610950.1
NOV	86	2896	4318.4	1422.4	49.1	2023150.6
DEC	87	1737	4200.4	2463.4	141.8	6068216.4
JAN	88	3678	3893.6	215.6	5.9	46494.1
FEB	89	2896	3681.8	785.8	27.1	617403.1
MAR	90	3184	3258.3	74.3	2.3	5513.1
APR	91	4597	3009.1	1587.9	34.5	2521347.0
MAY	92	3912	2972.3	939.8	24.0	883130.1
JUN	93	6192	3179.8	3012.3	48.6	9073650.1
JUL	94	6168	3636.5	2531.5	41.0	6408492.3
AUG	95	3613	4045.5	432.5	12.0	187056.3
SEP	96	1344	4280.0	2936.0	218.5	8620096.0
OCT - 17	97	3555	3988.3	433.3	12.2	187705.6
NOV	98	3014	4070.6	1056.6	35.1	1116456.4
DEC	99	1745	4049.4	2304.4	132.1	5310144.1
JAN	100	3936	3692.9	243.1	6.2	59109.8
FEB	101	2499	3695.9	1196.9	47.9	1432509.8
MAR	102	3998	3234.3	763.8	19.1	583314.1
APR	103	3713	2963.0	750.0	20.2	562500.0
MAY	104	2992	2975.5	16.5	0.6	272.3
JUN	105		3181.5			
MAD				1679.5		
MAPE					57.9	
MSE						4130694.1

Time	Period	AT Executed	n=48	Error	% Error	Error^2
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745				
FEB	5	2329				
MAR	6	3984				
APR	7	4111				
MAY	8	4944				
JUN	9	5866				
JUL	10	6227				
AUG	11	6884				
SEP	12	4793				
OCT - 10	13	2036				
NOV	14	2128				
DEC	15	1035				
JAN	16	2555				
FEB	17	1962				
MAR	18	3107				
APR	19	3128				
MAY	20	3955				
JUN	21	5778				
JUL	22	8155				
AUG	23	9069				
SEP	24	3865				
OCT - 11	25	3041				
NOV	26	1138				
DEC	27	2047				
JAN	28	3072				
FEB	29	3196				
MAR	30	4851				
APR	31	3255				
MAY	32	5185				
JUN	33	6491				
JUL	34	7282				
AUG	35	5831				
SEP	36	2310				
OCT - 12	37	3633				
NOV	38	3978				
DEC	39	2291				

Time	Period	AT Executed	n=48	Error	% Error	$Error^2$
JAN	40	3699				
FEB	41	3514				
MAR	42	4431				
APR	43	4667				
MAY	44	4589				
JUN	45	5910				
JUL	46	7035				
AUG	47	3954				
SEP	48	761				
OCT - 13	49	3936	3966.0	30.0	0.8	898.8
NOV	50	3488	4003.2	515.2	14.8	265396.7
DEC	51	2119	4030.3	1911.3	90.2	3652956.2
JAN	52	3824	4049.2	225.2	5.9	50700.0
FEB	53	3639	4071.6	432.6	11.9	187182.4
MAR	54	4700	4098.9	601.1	12.8	361276.1
APR	55	5155	4113.9	1041.1	20.2	1083984.6
MAY	56	4573	4135.6	437.4	9.6	191315.1
JUN	57	6784	4127.9	2656.1	39.2	7055000.0
JUL	58	5807	4147.0	1660.0	28.6	2755600.0
AUG	59	3808	4138.3	330.3	8.7	109065.1
SEP	60	2327	4074.2	1747.2	75.1	3052591.4
OCT - 14	61	1858	4022.8	2164.8	116.5	4686323.0
NOV	62	2893	4019.1	1126.1	38.9	1268063.7
DEC	63	2734	4035.0	1301.0	47.6	1692655.2
JAN	64	3392	4070.4	678.4	20.0	460249.2
FEB	65	3563	4087.9	524.9	14.7	275471.9
MAR	66	4926	4121.2	804.8	16.3	647689.6
APR	67	4204	4159.1	44.9	1.1	2015.6
MAY	68	5233	4181.5	1051.5	20.1	1105608.4
JUN	69	6750	4208.1	2541.9	37.7	6461022.6
JUL	70	6511	4228.4	2282.6	35.1	5210281.8
AUG	71	3657	4194.1	537.1	14.7	288525.6
SEP	72	1808	4081.4	2273.4	125.7	5168328.6
OCT - 15	73	3011	4038.5	1027.5	34.1	1055841.9
NOV	74	2838	4037.9	1199.9	42.3	1439800.0
DEC	75	1850	4073.3	2223.3	120.2	4943211.1
JAN	76	2796	4069.2	1273.2	45.5	1621112.5
FEB	77	3497	4063.5	566.5	16.2	320898.6
MAR	78	3840	4069.8	229.8	6.0	52785.1

Time	Period	AT Executed	n=48	Error	% Error	$Error^2$
APR	79	4191	4048.7	142.3	3.4	20252.8
MAY	80	5373	4068.2	1304.8	24.3	1702535.7
JUN	81	6284	4072.1	2211.9	35.2	4892483.2
JUL	82	5177	4067.8	1109.2	21.4	1230343.1
AUG	83	4892	4023.9	868.1	17.7	753532.5
SEP	84	2252	4004.4	1752.4	77.8	3070818.1
OCT - 16	85	2538	4003.2	1465.2	57.7	2146713.4
NOV	86	2896	3980.4	1084.4	37.4	1175824.0
DEC	87	1737	3957.8	2220.8	127.9	4932008.2
JAN	88	3678	3946.3	268.3	7.3	71969.2
FEB	89	2896	3945.8	1049.8	36.3	1102150.0
MAR	90	3184	3933.0	749.0	23.5	560938.6
APR	91	4597	3907.0	690.0	15.0	476128.8
MAY	92	3912	3905.5	6.5	0.2	42.0
JUN	93	6192	3891.4	2300.6	37.2	5292683.7
JUL	94	6168	3897.3	2270.7	36.8	5156116.3
AUG	95	3613	3879.2	266.2	7.4	70878.0
SEP	96	1344	3872.1	2528.1	188.1	6391416.0
OCT - 17	97	3555	3884.3	329.3	9.3	108419.3
NOV	98	3014	3876.3	862.3	28.6	743618.8
DEC	99	1745	3866.5	2121.5	121.6	4500585.5
JAN	100	3936	3858.7	77.3	2.0	5980.4
FEB	101	2499	3861.0	1362.0	54.5	1855044.0
MAR	102	3998	3837.3	160.8	4.0	25840.6
APR	103	3713	3822.6	109.6	3.0	12017.6
MAY	104	2992	3792.6	800.6	26.8	640933.7
JUN	105		3759.6			
MAD				1099.1		
MAPE					37.0	
MSE						1828662.9

MA n=48	
Mean	4011.932
Standard Error	14.8096
Median	4035.021
Mode	4003.167
Standard Deviation	111.81
Sample Variance	12501.48
Kurtosis	-0.66427
Skewness	-0.26198
Range	468.75
Minimum	3759.646
Maximum	4228.396
Sum	228680.1
Count	57

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APPENDIX C. WEIGHTED MOVING AVERAGE MODELS FOR ENTIRE DATA SET (DOLLARS)

Weights	n=3
w1	0.0000
w2	0.0334
w3	0.9666
Sum	1.00

Time	Period	AT Executed	n=3	Error	% Error	Error^2
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745	1244.5	1500.5	54.7	2251445.5
FEB	5	2329	2693.9	364.9	15.7	133131.1
MAR	6	3984	2342.9	1641.1	41.2	2693293.1
APR	7	4111	3928.8	182.2	4.4	33196.0
MAY	8	4944	4106.8	837.2	16.9	700963.6
JUN	9	5866	4916.2	949.8	16.2	902086.3
JUL	10	6227	5835.2	391.8	6.3	153468.5
AUG	11	6884	6215.0	669.0	9.7	447614.6
SEP	12	4793	6862.1	2069.1	43.2	4281123.9
OCT - 10	13	2036	4862.7	2826.7	138.8	7990454.2
NOV	14	2128	2128.0	0.0	0.0	0.0
DEC	15	1035	2124.9	1089.9	105.3	1187950.9
JAN	16	2555	1071.5	1483.5	58.1	2200909.3
FEB	17	1962	2504.3	542.3	27.6	294094.6
MAR	18	3107	1981.8	1125.2	36.2	1266125.1
APR	19	3128	3068.8	59.2	1.9	3503.2
MAY	20	3955	3127.3	827.7	20.9	685087.9
JUN	21	5778	3927.4	1850.6	32.0	3424654.3
JUL	22	8155	5717.2	2437.8	29.9	5942872.7
AUG	23	9069	8075.7	993.3	11.0	986600.9
SEP	24	3865	9038.5	5173.5	133.9	26765270.1
OCT - 11	25	3041	4038.6	997.6	32.8	995134.1
NOV	26	1138	3068.5	1930.5	169.6	3726761.1
DEC	27	2047	1201.5	845.5	41.3	714922.7
JAN	28	3072	2016.7	1055.3	34.4	1113694.0

Time	Period	AT Executed	n=3	Error	% Error	$Error^2$
FEB	29	3196	3037.8	158.2	4.9	25022.8
MAR	30	4851	3191.9	1659.1	34.2	2752731.1
APR	31	3255	4795.8	1540.8	47.3	2374071.9
MAY	32	5185	3308.2	1876.8	36.2	3522266.1
JUN	33	6491	5120.6	1370.4	21.1	1877912.5
JUL	34	7282	6447.4	834.6	11.5	696486.7
AUG	35	5831	7255.6	1424.6	24.4	2029537.9
SEP	36	2310	5879.4	3569.4	154.5	12740572.3
OCT - 12	37	3633	2427.4	1205.6	33.2	1453392.8
NOV	38	3978	3588.9	389.1	9.8	151418.1
DEC	39	2291	3966.5	1675.5	73.1	2807278.6
JAN	40	3699	2347.3	1351.7	36.5	1827187.7
FEB	41	3514	3652.0	138.0	3.9	19055.1
MAR	42	4431	3520.2	910.8	20.6	829611.1
APR	43	4667	4400.4	266.6	5.7	71066.9
MAY	44	4589	4659.1	70.1	1.5	4918.1
JUN	45	5910	4591.6	1318.4	22.3	1738174.7
JUL	46	7035	5865.9	1169.1	16.6	1366696.8
AUG	47	3954	6997.5	3043.5	77.0	9262764.0
SEP	48	761	4056.8	3295.8	433.1	10862018.7
OCT - 13	49	3936	867.5	3068.5	78.0	9415734.5
NOV	50	3488	3830.1	342.1	9.8	117037.4
DEC	51	2119	3502.9	1383.9	65.3	1915294.7
JAN	52	3824	2164.7	1659.3	43.4	2753412.7
FEB	53	3639	3767.1	128.1	3.5	16418.5
MAR	54	4700	3645.2	1054.8	22.4	1112666.1
APR	55	5155	4664.6	490.4	9.5	240478.9
MAY	56	4573	5139.8	566.8	12.4	321290.4
JUN	57	6784	4592.4	2191.6	32.3	4803062.8
JUL	58	5807	6710.3	903.3	15.6	815876.1
AUG	59	3808	5839.6	2031.6	53.4	4127337.4
SEP	60	2327	3874.7	1547.7	66.5	2395284.8
OCT - 14	61	1858	2376.4	518.4	27.9	268732.7
NOV	62	2893	1873.6	1019.4	35.2	1039090.5
DEC	63	2734	2858.5	124.5	4.6	15495.4
JAN	64	3392	2739.3	652.7	19.2	426013.4
FEB	65	3563	3370.1	192.9	5.4	37228.0
MAR	66	4926	3557.3	1368.7	27.8	1873348.5
APR	67	4204	4880.5	676.5	16.1	457707.9

Time	Period	AT Executed	n=3	Error	% Error	Error^2
MAY	68	5233	4228.1	1004.9	19.2	1009863.8
JUN	69	6750	5198.7	1551.3	23.0	2406591.5
JUL	70	6511	6699.4	188.4	2.9	35496.4
AUG	71	3657	6519.0	2862.0	78.3	8190878.8
SEP	72	1808	3752.2	1944.2	107.5	3779862.2
OCT - 15	73	3011	1869.7	1141.3	37.9	1302638.8
NOV	74	2838	2970.9	132.9	4.7	17656.4
DEC	75	1850	2843.8	993.8	53.7	987578.6
JAN	76	2796	1883.0	913.0	32.7	833657.0
FEB	77	3497	2764.4	732.6	20.9	536631.0
MAR	78	3840	3473.6	366.4	9.5	134234.2
APR	79	4191	3828.6	362.4	8.6	131362.6
MAY	80	5373	4179.3	1193.7	22.2	1424935.4
JUN	81	6284	5333.6	950.4	15.1	903302.2
JUL	82	5177	6253.6	1076.6	20.8	1159102.6
AUG	83	4892	5213.9	321.9	6.6	103633.0
SEP	84	2252	4901.5	2649.5	117.7	7019878.5
OCT - 16	85	2538	2340.0	198.0	7.8	39184.4
NOV	86	2896	2528.5	367.5	12.7	135084.7
DEC	87	1737	2884.1	1147.1	66.0	1315746.6
JAN	88	3678	1775.7	1902.3	51.7	3618916.4
FEB	89	2896	3613.3	717.3	24.8	514467.2
MAR	90	3184	2922.1	261.9	8.2	68601.4
APR	91	4597	3174.4	1422.6	30.9	2023806.1
MAY	92	3912	4549.9	637.9	16.3	406882.7
JUN	93	6192	3934.8	2257.2	36.5	5094743.5
JUL	94	6168	6116.0	52.0	0.8	2708.4
AUG	95	3613	6168.8	2555.8	70.7	6532115.9
SEP	96	1344	3698.2	2354.2	175.2	5542325.9
OCT - 17	97	3555	1419.7	2135.3	60.1	4559609.4
NOV	98	3014	3481.3	467.3	15.5	218330.6
DEC	99	1745	3032.0	1287.0	73.8	1656480.9
JAN	100	3936	1787.3	2148.7	54.6	4616809.6
FEB	101	2499	3862.9	1363.9	54.6	1860293.2
MAR	102	3998	2546.9	1451.1	36.3	2105613.1
APR	103	3713	3948.0	235.0	6.3	55227.5
MAY	104	2992	3722.5	730.5	24.4	533638.0

Time	Period	AT Executed	N=3	Error	% Error	Error^2
JUN	105		3016.0			
MAD				1199.1		
MAPE					40.7	
MSE						2260751.9

Weights	n=4
w1	0.0000
w2	0.0000
w3	0.0332
w4	0.9668
Sum	1.00

Time	Period	AT Executed	n=4	Error	% Error	$Error^2$
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745				
FEB	5	2329	2694.2	365.2	15.7	133339.7
MAR	6	3984	2342.8	1641.2	41.2	2693547.4
APR	7	4111	3929.1	181.9	4.4	33083.6
MAY	8	4944	4106.8	837.2	16.9	700923.9
JUN	9	5866	4916.4	949.6	16.2	901791.3
JUL	10	6227	5835.4	391.6	6.3	153333.8
AUG	11	6884	6215.0	669.0	9.7	447524.5
SEP	12	4793	6862.2	2069.2	43.2	4281631.2
OCT - 10	13	2036	4862.3	2826.3	138.8	7988251.5
NOV	14	2128	2127.4	0.6	0.0	0.3
DEC	15	1035	2124.9	1089.9	105.3	1187988.4
JAN	16	2555	1071.3	1483.7	58.1	2201513.8
FEB	17	1962	2504.6	542.6	27.7	294402.0
MAR	18	3107	1981.7	1125.3	36.2	1266373.7
APR	19	3128	3069.0	59.0	1.9	3478.0
MAY	20	3955	3127.3	827.7	20.9	685081.4
JUN	21	5778	3927.6	1850.4	32.0	3424083.5
JUL	22	8155	5717.5	2437.5	29.9	5941215.6
AUG	23	9069	8076.2	992.8	10.9	985720.6
SEP	24	3865	9038.7	5173.7	133.9	26767034.6
OCT - 11	25	3041	4037.6	996.6	32.8	993200.0
NOV	26	1138	3068.3	1930.3	169.6	3726168.4
DEC	27	2047	1201.1	845.9	41.3	715522.7
JAN	28	3072	2016.9	1055.1	34.3	1113336.4
FEB	29	3196	3038.0	158.0	4.9	24962.3
MAR	30	4851	3191.9	1659.1	34.2	2752654.2
APR	31	3255	4796.1	1541.1	47.3	2375022.9

Time	Period	AT Executed	n=4	Error	% Error	$Error^2$
MAY	32	5185	3307.9	1877.1	36.2	3523382.6
JUN	33	6491	5121.0	1370.0	21.1	1876926.4
JUL	34	7282	6447.7	834.3	11.5	696080.2
AUG	35	5831	7255.8	1424.8	24.4	2029958.4
SEP	36	2310	5879.1	3569.1	154.5	12738642.5
OCT - 12	37	3633	2426.8	1206.2	33.2	1454975.5
NOV	38	3978	3589.1	388.9	9.8	151226.2
DEC	39	2291	3966.6	1675.6	73.1	2807494.3
JAN	40	3699	2347.0	1352.0	36.6	1828037.8
FEB	41	3514	3652.3	138.3	3.9	19127.7
MAR	42	4431	3520.1	910.9	20.6	829673.7
APR	43	4667	4400.6	266.4	5.7	70975.8
MAY	44	4589	4659.2	70.2	1.5	4924.2
JUN	45	5910	4591.6	1318.4	22.3	1738212.8
JUL	46	7035	5866.2	1168.8	16.6	1366120.9
AUG	47	3954	6997.7	3043.7	77.0	9264041.3
SEP	48	761	4056.2	3295.2	433.0	10858234.2
OCT - 13	49	3936	866.9	3069.1	78.0	9419387.2
NOV	50	3488	3830.7	342.7	9.8	117442.7
DEC	51	2119	3502.9	1383.9	65.3	1915063.7
JAN	52	3824	2164.4	1659.6	43.4	2754259.4
FEB	53	3639	3767.5	128.5	3.5	16500.1
MAR	54	4700	3645.1	1054.9	22.4	1112738.7
APR	55	5155	4664.8	490.2	9.5	240284.9
MAY	56	4573	5139.9	566.9	12.4	321386.6
JUN	57	6784	4592.3	2191.7	32.3	4803537.9
JUL	58	5807	6710.7	903.7	15.6	816621.0
AUG	59	3808	5839.4	2031.4	53.3	4126598.0
SEP	60	2327	3874.3	1547.3	66.5	2394131.8
OCT - 14	61	1858	2376.1	518.1	27.9	268446.7
NOV	62	2893	1873.6	1019.4	35.2	1039268.7
DEC	63	2734	2858.7	124.7	4.6	15543.5
JAN	64	3392	2739.3	652.7	19.2	426052.0
FEB	65	3563	3370.2	192.8	5.4	37180.7
MAR	66	4926	3557.3	1368.7	27.8	1873261.0
APR	67	4204	4880.8	676.8	16.1	458051.9
MAY	68	5233	4227.9	1005.1	19.2	1010134.2
JUN	69	6750	5198.9	1551.1	23.0	2405996.1
JUL	70	6511	6699.7	188.7	2.9	35603.1

Time	Period	AT Executed	n=4	Error	% Error	Error^2
AUG	71	3657	6518.9	2861.9	78.3	8190624.5
SEP	72	1808	3751.7	1943.7	107.5	3777794.3
OCT - 15	73	3011	1869.3	1141.7	37.9	1303425.6
NOV	74	2838	2971.1	133.1	4.7	17716.1
DEC	75	1850	2843.7	993.7	53.7	987514.6
JAN	76	2796	1882.8	913.2	32.7	833993.2
FEB	77	3497	2764.6	732.4	20.9	536372.7
MAR	78	3840	3473.8	366.2	9.5	134138.4
APR	79	4191	3828.6	362.4	8.6	131316.2
MAY	80	5373	4179.4	1193.6	22.2	1424779.0
JUN	81	6284	5333.8	950.2	15.1	902883.3
JUL	82	5177	6253.8	1076.8	20.8	1159468.5
AUG	83	4892	5213.7	321.7	6.6	103500.2
SEP	84	2252	4901.5	2649.5	117.6	7019597.5
OCT - 16	85	2538	2339.6	198.4	7.8	39379.5
NOV	86	2896	2528.5	367.5	12.7	135045.5
DEC	87	1737	2884.1	1147.1	66.0	1315899.8
JAN	88	3678	1775.4	1902.6	51.7	3619738.2
FEB	89	2896	3613.6	717.6	24.8	514986.4
MAR	90	3184	2921.9	262.1	8.2	68677.7
APR	91	4597	3174.4	1422.6	30.9	2023653.2
MAY	92	3912	4550.1	638.1	16.3	407218.8
JUN	93	6192	3934.7	2257.3	36.5	5095319.5
JUL	94	6168	6116.4	51.6	0.8	2664.4
AUG	95	3613	6168.8	2555.8	70.7	6532093.7
SEP	96	1344	3697.7	2353.7	175.1	5540084.2
OCT - 17	97	3555	1419.3	2135.7	60.1	4561415.6
NOV	98	3014	3481.7	467.7	15.5	218716.0
DEC	99	1745	3031.9	1286.9	73.8	1656221.5
JAN	100	3936	1787.1	2148.9	54.6	4617826.0
FEB	101	2499	3863.3	1364.3	54.6	1861407.5
MAR	102	3998	2546.7	1451.3	36.3	2106390.4
APR	103	3713	3948.3	235.3	6.3	55358.9
MAY	104	2992	3722.5	730.5	24.4	533560.5
JUN	105		3015.9			
MAD				1196.1		
MAPE					40.5	
MSE						2260854.9

Weights	n=5
w1	0.0604
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.9396
Sum	1.00

Time	Period	AT Executed	n=5	Error	% Error	Error^2
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745				
FEB	5	2329				
MAR	6	3984	2318.3	1665.7	41.8	2774718.6
APR	7	4111	3875.5	235.5	5.7	55466.6
MAY	8	4944	3935.9	1008.1	20.4	1016182.5
JUN	9	5866	4811.2	1054.8	18.0	1112579.0
JUL	10	6227	5652.4	574.6	9.2	330147.9
AUG	11	6884	6091.6	792.4	11.5	627970.0
SEP	12	4793	6716.5	1923.5	40.1	3700044.1
OCT - 10	13	2036	4802.1	2766.1	135.9	7651410.7
NOV	14	2128	2267.3	139.3	6.5	19398.4
DEC	15	1035	2375.5	1340.5	129.5	1796999.3
JAN	16	2555	1388.2	1166.8	45.7	1361428.3
FEB	17	1962	2690.1	728.1	37.1	530193.4
MAR	18	3107	1966.5	1140.5	36.7	1300811.9
APR	19	3128	3047.9	80.1	2.6	6418.9
MAY	20	3955	3001.6	953.4	24.1	908948.2
JUN	21	5778	3870.5	1907.5	33.0	3638709.9
JUL	22	8155	5547.6	2607.4	32.0	6798705.2
AUG	23	9069	7850.2	1218.8	13.4	1485542.0
SEP	24	3865	8710.2	4845.2	125.4	23476420.9
OCT - 11	25	3041	3870.4	829.4	27.3	687962.1
NOV	26	1138	3206.3	2068.3	181.7	4277767.1
DEC	27	2047	1561.7	485.3	23.7	235488.7
JAN	28	3072	2471.0	601.0	19.6	361164.8
FEB	29	3196	3119.9	76.1	2.4	5793.3
MAR	30	4851	3186.6	1664.4	34.3	2770093.5

Time	Period	AT Executed	n=5	Error	% Error	$Error^2$
APR	31	3255	4626.8	1371.8	42.1	1881799.7
MAY	32	5185	3182.1	2002.9	38.6	4011793.4
JUN	33	6491	5057.4	1433.6	22.1	2055195.8
JUL	34	7282	6292.0	990.0	13.6	980043.7
AUG	35	5831	7135.2	1304.2	22.4	1700942.5
SEP	36	2310	5675.4	3365.4	145.7	11326226.1
OCT - 12	37	3633	2483.6	1149.4	31.6	1321098.3
NOV	38	3978	3805.6	172.4	4.3	29727.6
DEC	39	2291	4177.5	1886.5	82.3	3558939.6
JAN	40	3699	2504.8	1194.2	32.3	1426194.2
FEB	41	3514	3615.1	101.1	2.9	10226.1
MAR	42	4431	3521.2	909.8	20.5	827761.6
APR	43	4667	4403.6	263.4	5.6	69355.7
MAY	44	4589	4523.5	65.5	1.4	4287.2
JUN	45	5910	4535.3	1374.7	23.3	1889919.5
JUL	46	7035	5765.3	1269.7	18.0	1612099.1
AUG	47	3954	6877.8	2923.8	73.9	8548343.9
SEP	48	761	3997.1	3236.1	425.2	10472053.5
OCT - 13	49	3936	992.2	2943.8	74.8	8666209.3
NOV	50	3488	4055.2	567.2	16.3	321718.0
DEC	51	2119	3702.2	1583.2	74.7	2506487.4
JAN	52	3824	2229.8	1594.2	41.7	2541447.4
FEB	53	3639	3639.0	0.0	0.0	0.0
MAR	54	4700	3656.9	1043.1	22.2	1087985.3
APR	55	5155	4626.8	528.2	10.2	278982.2
MAY	56	4573	4971.7	398.7	8.7	158936.5
JUN	57	6784	4527.8	2256.2	33.3	5090569.3
JUL	58	5807	6594.1	787.1	13.6	619504.9
AUG	59	3808	5740.2	1932.2	50.7	3733214.6
SEP	60	2327	3889.3	1562.3	67.1	2440906.0
OCT - 14	61	1858	2462.6	604.6	32.5	365573.6
NOV	62	2893	2155.5	737.5	25.5	543963.5
DEC	63	2734	3069.0	335.0	12.3	112201.3
JAN	64	3392	2798.9	593.1	17.5	351821.5
FEB	65	3563	3327.7	235.3	6.6	55371.3
MAR	66	4926	3460.0	1466.0	29.8	2149032.8
APR	67	4204	4803.2	599.2	14.3	359083.1
MAY	68	5233	4115.2	1117.8	21.4	1249403.7
JUN	69	6750	5121.8	1628.2	24.1	2650939.0

Time	Period	AT Executed	n=5	Error	% Error	$Error^2$
JUL	70	6511	6557.6	46.6	0.7	2166.9
AUG	71	3657	6415.3	2758.3	75.4	7608154.8
SEP	72	1808	3690.0	1882.0	104.1	3542041.3
OCT - 15	73	3011	2014.8	996.2	33.1	992370.8
NOV	74	2838	3236.8	398.8	14.1	159027.9
DEC	75	1850	3059.8	1209.8	65.4	1463610.3
JAN	76	2796	1959.1	836.9	29.9	700372.4
FEB	77	3497	2736.3	760.7	21.8	578605.6
MAR	78	3840	3467.7	372.3	9.7	138642.7
APR	79	4191	3779.5	411.5	9.8	169337.7
MAY	80	5373	4049.6	1323.4	24.6	1751290.8
JUN	81	6284	5217.4	1066.6	17.0	1137666.5
JUL	82	5177	6115.7	938.7	18.1	881166.1
AUG	83	4892	5096.3	204.3	4.2	41723.8
SEP	84	2252	4849.7	2597.7	115.3	6747887.0
OCT - 16	85	2538	2440.5	97.5	3.8	9513.2
NOV	86	2896	2764.2	131.8	4.6	17369.7
DEC	87	1737	3033.7	1296.7	74.7	1681535.6
JAN	88	3678	1927.5	1750.5	47.6	3064188.4
FEB	89	2896	3591.9	695.9	24.0	484262.5
MAR	90	3184	2874.4	309.6	9.7	95863.4
APR	91	4597	3166.6	1430.4	31.1	2046018.7
MAY	92	3912	4424.3	512.3	13.1	262447.5
JUN	93	6192	3897.9	2294.1	37.0	5263033.6
JUL	94	6168	5993.0	175.0	2.8	30636.2
AUG	95	3613	5987.8	2374.8	65.7	5639715.1
SEP	96	1344	3672.4	2328.4	173.2	5421538.9
OCT - 17	97	3555	1499.1	2055.9	57.8	4226843.6
NOV	98	3014	3714.2	700.2	23.2	490333.0
DEC	99	1745	3204.5	1459.5	83.6	2130015.6
JAN	100	3936	1857.8	2078.2	52.8	4318911.2
FEB	101	2499	3779.5	1280.5	51.2	1639628.2
MAR	102	3998	2562.8	1435.2	35.9	2059892.1
APR	103	3713	3938.6	225.6	6.1	50886.5
MAY	104	2992	3594.2	602.2	20.1	362597.3
JUN	105		3049.0			
MAD				1196.3		
MAPE					40.6	
MSE						2213626.4

Weights	n=6
w1	0.0104
w2	0.0608
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.9288
Sum	1.00

Time	Period	AT Executed	n=6	Error	% Error	$Error^2$
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745				
FEB	5	2329				
MAR	6	3984				
APR	7	4111	3855.7	255.3	6.2	65192.1
MAY	8	4944	3914.7	1029.3	20.8	1059464.2
JUN	9	5866	4771.5	1094.5	18.7	1197900.7
JUL	10	6227	5618.5	608.5	9.8	370311.2
AUG	11	6884	6050.1	833.9	12.1	695365.1
SEP	12	4793	6685.2	1892.2	39.5	3580546.0
OCT - 10	13	2036	4795.1	2759.1	135.5	7612674.4
NOV	14	2128	2299.1	171.1	8.0	29290.3
DEC	15	1035	2416.1	1381.1	133.4	1907491.7
JAN	16	2555	1444.7	1110.3	43.5	1232865.4
FEB	17	1962	2736.1	774.1	39.5	599160.1
MAR	18	3107	1995.9	1111.1	35.8	1234587.9
APR	19	3128	3036.3	91.7	2.9	8402.2
MAY	20	3955	2990.3	964.7	24.4	930622.3
JUN	21	5778	3839.5	1938.5	33.5	3757625.2
JUL	22	8155	5512.4	2642.6	32.4	6983129.3
AUG	23	9069	7783.7	1285.3	14.2	1652049.2
SEP	24	3865	8645.8	4780.8	123.7	22855650.0
OCT - 11	25	3041	3862.8	821.8	27.0	675398.5
NOV	26	1138	3217.0	2079.0	182.7	4322107.0
DEC	27	2047	1613.0	434.0	21.2	188379.9
JAN	28	3072	2537.5	534.5	17.4	285678.7
FEB	29	3196	3182.5	13.5	0.4	183.1
MAR	30	4851	3193.5	1657.5	34.2	2747258.2

Time	Period	AT Executed	n=6	Error	% Error	Error^2
APR	31	3255	4606.4	1351.4	41.5	1826193.8
MAY	32	5185	3159.6	2025.4	39.1	4102438.3
JUN	33	6491	5023.9	1467.1	22.6	2152356.6
JUL	34	7282	6255.1	1026.9	14.1	1054532.6
AUG	35	5831	7091.7	1260.7	21.6	1589435.4
SEP	36	2310	5664.1	3354.1	145.2	11250259.6
OCT - 12	37	3633	2494.7	1138.3	31.3	1295764.3
NOV	38	3978	3822.9	155.1	3.9	24040.9
DEC	39	2291	4205.1	1914.1	83.5	3663587.9
JAN	40	3699	2558.1	1140.9	30.8	1301605.8
FEB	41	3514	3636.6	122.6	3.5	15039.7
MAR	42	4431	3508.7	922.3	20.8	850556.1
APR	43	4667	4395.2	271.8	5.8	73894.6
MAY	44	4589	4515.3	73.7	1.6	5427.9
JUN	45	5910	4511.0	1399.0	23.7	1957153.6
JUL	46	7035	5741.3	1293.7	18.4	1673621.4
AUG	47	3954	6840.1	2886.1	73.0	8329390.7
SEP	48	761	4002.3	3241.3	425.9	10506152.8
OCT - 13	49	3936	1034.4	2901.6	73.7	8419404.0
NOV	50	3488	4062.8	574.8	16.5	330450.8
DEC	51	2119	3728.9	1609.9	76.0	2591735.1
JAN	52	3824	2281.6	1542.4	40.3	2378896.7
FEB	53	3639	3639.0	0.0	0.0	0.0
MAR	54	4700	3627.2	1072.8	22.8	1150901.5
APR	55	5155	4618.3	536.7	10.4	287993.5
MAY	56	4573	4953.0	380.0	8.3	144423.6
JUN	57	6784	4502.0	2282.0	33.6	5207639.9
JUL	58	5807	6562.0	755.0	13.0	569999.2
AUG	59	3808	5717.2	1909.2	50.1	3644917.3
SEP	60	2327	3899.2	1572.2	67.6	2471782.6
OCT - 14	61	1858	2493.0	635.0	34.2	403179.7
NOV	62	2893	2185.8	707.2	24.4	500121.6
DEC	63	2734	3110.6	376.6	13.8	141848.5
JAN	64	3392	2831.2	560.8	16.5	314476.5
FEB	65	3563	3331.5	231.5	6.5	53575.3
MAR	66	4926	3446.5	1479.5	30.0	2189026.7
APR	67	4204	4770.5	566.5	13.5	320923.8
MAY	68	5233	4101.0	1132.0	21.6	1281469.3
JUN	69	6750	5095.1	1654.9	24.5	2738744.1

Time	Period	AT Executed	n=6	Error	% Error	$Error^2$
JUL	70	6511	6521.3	10.3	0.2	106.0
AUG	71	3657	6384.0	2727.0	74.6	7436513.0
SEP	72	1808	3703.4	1895.4	104.8	3592697.9
OCT - 15	73	3011	2041.2	969.8	32.2	940519.9
NOV	74	2838	3261.5	423.5	14.9	179343.7
DEC	75	1850	3102.0	1252.0	67.7	1567537.2
JAN	76	2796	2008.3	787.7	28.2	620497.5
FEB	77	3497	2744.8	752.2	21.5	565747.2
MAR	78	3840	3449.9	390.1	10.2	152169.6
APR	79	4191	3770.4	420.6	10.0	176863.3
MAY	80	5373	4034.6	1338.4	24.9	1791410.7
JUN	81	6284	5179.7	1104.3	17.6	1219500.8
JUL	82	5177	6078.3	901.3	17.4	812304.8
AUG	83	4892	5078.2	186.2	3.8	34685.6
SEP	84	2252	4838.4	2586.4	114.9	6689690.1
OCT - 16	85	2538	2462.0	76.0	3.0	5781.8
NOV	86	2896	2795.3	100.7	3.5	10145.1
DEC	87	1737	3069.9	1332.9	76.7	1776634.9
JAN	88	3678	1964.6	1713.4	46.6	2935716.2
FEB	89	2896	3603.9	707.9	24.4	501065.1
MAR	90	3184	2867.5	316.5	9.9	100146.3
APR	91	4597	3159.8	1437.2	31.3	2065606.6
MAY	92	3912	4405.4	493.4	12.6	243427.5
JUN	93	6192	3875.2	2316.8	37.4	5367582.4
JUL	94	6168	5965.4	202.6	3.3	41036.1
AUG	95	3613	5952.5	2339.5	64.8	5473439.0
SEP	96	1344	3668.4	2324.4	172.9	5402843.0
OCT - 17	97	3555	1534.0	2021.0	56.9	4084598.9
NOV	98	3014	3719.1	705.1	23.4	497172.9
DEC	99	1745	3238.8	1493.8	85.6	2231519.5
JAN	100	3936	1904.5	2031.5	51.6	4126895.1
FEB	101	2499	3775.0	1276.0	51.1	1628138.7
MAR	102	3998	2551.2	1446.8	36.2	2093094.0
APR	103	3713	3933.5	220.5	5.9	48642.0
MAY	104	2992	3586.0	594.0	19.9	352882.7
JUN	105		3036.5			
MAD				1190.7		
MAPE					40.6	
MSE						2199696.4

Weights	n=7
w1	0.0000
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.0000
W7	1.0000
Sum	1.00

Time	Period	AT Executed	n=7	Error	% Error	$Error^2$
OCT - 09	1	2151				
NOV	2	2187				
DEC	3	1212				
JAN	4	2745				
FEB	5	2329				
MAR	6	3984				
APR	7	4111				
MAY	8	4944	4112.0	832.0	16.8	692224.0
JUN	9	5866	4945.0	921.0	15.7	848241.0
JUL	10	6227	5867.0	360.0	5.8	129600.0
AUG	11	6884	6228.0	656.0	9.5	430336.0
SEP	12	4793	6885.0	2092.0	43.6	4376464.0
OCT - 10	13	2036	4794.0	2758.0	135.5	7606564.0
NOV	14	2128	2037.0	91.0	4.3	8281.0
DEC	15	1035	2129.0	1094.0	105.7	1196836.0
JAN	16	2555	1036.0	1519.0	59.5	2307361.0
FEB	17	1962	2556.0	594.0	30.3	352836.0
MAR	18	3107	1963.0	1144.0	36.8	1308736.0
APR	19	3128	3108.0	20.0	0.6	400.0
MAY	20	3955	3129.0	826.0	20.9	682276.0
JUN	21	5778	3956.0	1822.0	31.5	3319684.0
JUL	22	8155	5779.0	2376.0	29.1	5645376.0
AUG	23	9069	8156.0	913.0	10.1	833569.0
SEP	24	3865	9070.0	5205.0	134.7	27092025.0
OCT - 11	25	3041	3866.0	825.0	27.1	680625.0
NOV	26	1138	3042.0	1904.0	167.3	3625216.0
DEC	27	2047	1139.0	908.0	44.4	824464.0

Time	Period	AT Executed	n=7	Error	% Error	$Error^2$
JAN	28	3072	2048.0	1024.0	33.3	1048576.0
FEB	29	3196	3073.0	123.0	3.8	15129.0
MAR	30	4851	3197.0	1654.0	34.1	2735716.0
APR	31	3255	4852.0	1597.0	49.1	2550409.0
MAY	32	5185	3256.0	1929.0	37.2	3721041.0
JUN	33	6491	5186.0	1305.0	20.1	1703025.0
JUL	34	7282	6492.0	790.0	10.8	624100.0
AUG	35	5831	7283.0	1452.0	24.9	2108304.0
SEP	36	2310	5832.0	3522.0	152.5	12404484.0
OCT - 12	37	3633	2311.0	1322.0	36.4	1747684.0
NOV	38	3978	3634.0	344.0	8.6	118336.0
DEC	39	2291	3979.0	1688.0	73.7	2849344.0
JAN	40	3699	2292.0	1407.0	38.0	1979649.0
FEB	41	3514	3700.0	186.0	5.3	34596.0
MAR	42	4431	3515.0	916.0	20.7	839056.0
APR	43	4667	4432.0	235.0	5.0	55225.0
MAY	44	4589	4668.0	79.0	1.7	6241.0
JUN	45	5910	4590.0	1320.0	22.3	1742400.0
JUL	46	7035	5911.0	1124.0	16.0	1263376.0
AUG	47	3954	7036.0	3082.0	77.9	9498724.0
SEP	48	761	3955.0	3194.0	419.7	10201636.0
OCT - 13	49	3936	762.0	3174.0	80.6	10074276.0
NOV	50	3488	3937.0	449.0	12.9	201601.0
DEC	51	2119	3489.0	1370.0	64.7	1876900.0
JAN	52	3824	2120.0	1704.0	44.6	2903616.0
FEB	53	3639	3825.0	186.0	5.1	34596.0
MAR	54	4700	3640.0	1060.0	22.6	1123600.0
APR	55	5155	4701.0	454.0	8.8	206116.0
MAY	56	4573	5156.0	583.0	12.7	339889.0
JUN	57	6784	4574.0	2210.0	32.6	4884100.0
JUL	58	5807	6785.0	978.0	16.8	956484.0
AUG	59	3808	5808.0	2000.0	52.5	4000000.0
SEP	60	2327	3809.0	1482.0	63.7	2196324.0
OCT - 14	61	1858	2328.0	470.0	25.3	220900.0
NOV	62	2893	1859.0	1034.0	35.7	1069156.0
DEC	63	2734	2894.0	160.0	5.9	25600.0
JAN	64	3392	2735.0	657.0	19.4	431649.0
FEB	65	3563	3393.0	170.0	4.8	28900.0
MAR	66	4926	3564.0	1362.0	27.6	1855044.0

Time	Period	AT Executed	n=7	Error	% Error	$Error^2$
APR	67	4204	4927.0	723.0	17.2	522729.0
MAY	68	5233	4205.0	1028.0	19.6	1056784.0
JUN	69	6750	5234.0	1516.0	22.5	2298256.0
JUL	70	6511	6751.0	240.0	3.7	57600.0
AUG	71	3657	6512.0	2855.0	78.1	8151025.0
SEP	72	1808	3658.0	1850.0	102.3	3422500.0
OCT - 15	73	3011	1809.0	1202.0	39.9	1444804.0
NOV	74	2838	3012.0	174.0	6.1	30276.0
DEC	75	1850	2839.0	989.0	53.5	978121.0
JAN	76	2796	1851.0	945.0	33.8	893025.0
FEB	77	3497	2797.0	700.0	20.0	490000.0
MAR	78	3840	3498.0	342.0	8.9	116964.0
APR	79	4191	3841.0	350.0	8.4	122500.0
MAY	80	5373	4192.0	1181.0	22.0	1394761.0
JUN	81	6284	5374.0	910.0	14.5	828100.0
JUL	82	5177	6285.0	1108.0	21.4	1227664.0
AUG	83	4892	5178.0	286.0	5.8	81796.0
SEP	84	2252	4893.0	2641.0	117.3	6974881.0
OCT - 16	85	2538	2253.0	285.0	11.2	81225.0
NOV	86	2896	2539.0	357.0	12.3	127449.0
DEC	87	1737	2897.0	1160.0	66.8	1345600.0
JAN	88	3678	1738.0	1940.0	52.7	3763600.0
FEB	89	2896	3679.0	783.0	27.0	613089.0
MAR	90	3184	2897.0	287.0	9.0	82369.0
APR	91	4597	3185.0	1412.0	30.7	1993744.0
MAY	92	3912	4598.0	686.0	17.5	470596.0
JUN	93	6192	3913.0	2279.0	36.8	5193841.0
JUL	94	6168	6193.0	25.0	0.4	625.0
AUG	95	3613	6169.0	2556.0	70.7	6533136.0
SEP	96	1344	3614.0	2270.0	168.9	5152900.0
OCT - 17	97	3555	1345.0	2210.0	62.2	4884100.0
NOV	98	3014	3556.0	542.0	18.0	293764.0
DEC	99	1745	3015.0	1270.0	72.8	1612900.0
JAN	100	3936	1746.0	2190.0	55.6	4796100.0
FEB	101	2499	3937.0	1438.0	57.5	2067844.0
MAR	102	3998	2500.0	1498.0	37.5	2244004.0
APR	103	3713	3999.0	286.0	7.7	81796.0
MAY	104	2992	3714.0	722.0	24.1	521284.0
JUN	105		2993.0			

Time	Period	AT Executed	n=7	Error	% Error	$Error^2$
MAD				1215.4		
MAPE					41.1	
MSE						2305037.8

WMA n=4	
Mean	3927.277
Standard Error	160.59192
Median	3722.4523
Mode	#N/A
Standard Deviation	1613.9288
Sample Variance	2604766.1
Kurtosis	0.2242954
Skewness	0.6326945
Range	8171.7888
Minimum	866.89798
Maximum	9038.6868
Sum	396654.97
Count	101

APPENDIX D. EXPONENTIAL SMOOTHING MODEL FOR ENTIRE DATA SET (DOLLARS)

Alpha	0.8798

Time	Period	AT Executed	ES	Error	% Error	Error^2
OCT - 09	1	2151	2,151.0	0.0	0.0	0.0
NOV	2	2187	2,151.0	36.0	1.6	1296.0
DEC	3	1212	2,182.7	970.7	80.1	942203.5
JAN	4	2745	1,328.7	1416.3	51.6	2005891.5
FEB	5	2329	2,574.7	245.7	10.6	60376.9
MAR	6	3984	2,358.5	1625.5	40.8	2642110.9
APR	7	4111	3,788.6	322.4	7.8	103961.5
MAY	8	4944	4,072.2	871.8	17.6	759976.3
JUN	9	5866	4,839.2	1026.8	17.5	1054345.9
JUL	10	6227	5,742.5	484.5	7.8	234696.7
AUG	11	6884	6,168.8	715.2	10.4	511577.7
SEP	12	4793	6,798.0	2005.0	41.8	4020045.3
OCT - 10	13	2036	5,034.1	2998.1	147.3	8988388.6
NOV	14	2128	2,396.5	268.5	12.6	72071.2
DEC	15	1035	2,160.3	1125.3	108.7	1266249.1
JAN	16	2555	1,170.3	1384.7	54.2	1917412.3
FEB	17	1962	2,388.5	426.5	21.7	181915.1
MAR	18	3107	2,013.3	1093.7	35.2	1196222.5
APR	19	3128	2,975.5	152.5	4.9	23256.0
MAY	20	3955	3,109.7	845.3	21.4	714591.5
JUN	21	5778	3,853.4	1924.6	33.3	3704222.4
JUL	22	8155	5,546.6	2608.4	32.0	6803757.0
AUG	23	9069	7,841.4	1227.6	13.5	1507029.2
SEP	24	3865	8,921.4	5056.4	130.8	25567209.8
OCT - 11	25	3041	4,472.9	1431.9	47.1	2050444.5
NOV	26	1138	3,213.2	2075.2	182.4	4306303.7
DEC	27	2047	1,387.5	659.5	32.2	434941.1
JAN	28	3072	1,967.7	1104.3	35.9	1219462.0
FEB	29	3196	2,939.2	256.8	8.0	65931.0
MAR	30	4851	3,165.1	1685.9	34.8	2842163.8
APR	31	3255	4,648.3	1393.3	42.8	1941300.6
MAY	32	5185	3,422.5	1762.5	34.0	3106340.0
JUN	33	6491	4,973.1	1517.9	23.4	2304036.2

Time	Period	AT Executed	ES	Error	% Error	$Error^2$
JUL	34	7282	6,308.5	973.5	13.4	947701.4
AUG	35	5831	7,165.0	1334.0	22.9	1779435.9
SEP	36	2310	5,991.4	3681.4	159.4	13552580.7
OCT - 12	37	3633	2,752.6	880.4	24.2	775074.1
NOV	38	3978	3,527.2	450.8	11.3	203265.3
DEC	39	2291	3,923.8	1632.8	71.3	2666015.7
JAN	40	3699	2,487.3	1211.7	32.8	1468186.0
FEB	41	3514	3,553.3	39.3	1.1	1545.9
MAR	42	4431	3,518.7	912.3	20.6	832241.7
APR	43	4667	4,321.3	345.7	7.4	119497.2
MAY	44	4589	4,625.4	36.4	0.8	1327.7
JUN	45	5910	4,593.4	1316.6	22.3	1733485.6
JUL	46	7035	5,751.7	1283.3	18.2	1646855.5
AUG	47	3954	6,880.7	2926.7	74.0	8565616.7
SEP	48	761	4,305.9	3544.9	465.8	12566185.0
OCT - 13	49	3936	1,187.2	2748.8	69.8	7555872.2
NOV	50	3488	3,605.5	117.5	3.4	13808.4
DEC	51	2119	3,502.1	1383.1	65.3	1913043.8
JAN	52	3824	2,285.3	1538.7	40.2	2367612.6
FEB	53	3639	3,639.0	0.0	0.0	0.0
MAR	54	4700	3,639.0	1061.0	22.6	1125721.1
APR	55	5155	4,572.4	582.6	11.3	339382.3
MAY	56	4573	5,085.0	512.0	11.2	262100.5
JUN	57	6784	4,634.6	2149.4	31.7	4620121.3
JUL	58	5807	6,525.6	718.6	12.4	516342.1
AUG	59	3808	5,893.4	2085.4	54.8	4348870.1
SEP	60	2327	4,058.7	1731.7	74.4	2998886.9
OCT - 14	61	1858	2,535.2	677.2	36.4	458610.5
NOV	62	2893	1,939.4	953.6	33.0	909311.9
DEC	63	2734	2,778.4	44.4	1.6	1966.9
JAN	64	3392	2,739.3	652.7	19.2	425975.2
FEB	65	3563	3,313.5	249.5	7.0	62235.8
MAR	66	4926	3,533.0	1393.0	28.3	1940432.8
APR	67	4204	4,758.5	554.5	13.2	307490.9
MAY	68	5233	4,270.7	962.3	18.4	926078.2
JUN	69	6750	5,117.3	1632.7	24.2	2665715.9
JUL	70	6511	6,553.7	42.7	0.7	1823.1
AUG	71	3657	6,516.1	2859.1	78.2	8174645.3
SEP	72	1808	4,000.8	2192.8	121.3	4808183.4

Time	Period	AT Executed	ES	Error	% Error	$Error^2$
OCT - 15	73	3011	2,071.6	939.4	31.2	882401.4
NOV	74	2838	2,898.1	60.1	2.1	3607.1
DEC	75	1850	2,845.2	995.2	53.8	990464.9
JAN	76	2796	1,969.7	826.3	29.6	682843.4
FEB	77	3497	2,696.6	800.4	22.9	640563.7
MAR	78	3840	3,400.8	439.2	11.4	192920.6
APR	79	4191	3,787.2	403.8	9.6	163061.6
MAY	80	5373	4,142.4	1230.6	22.9	1514254.3
JUN	81	6284	5,225.0	1059.0	16.9	1121376.2
JUL	82	5177	6,156.7	979.7	18.9	959775.1
AUG	83	4892	5,294.8	402.8	8.2	162238.4
SEP	84	2252	4,940.4	2688.4	119.4	7227643.5
OCT - 16	85	2538	2,575.2	37.2	1.5	1386.3
NOV	86	2896	2,542.5	353.5	12.2	124978.8
DEC	87	1737	2,853.5	1116.5	64.3	1246562.1
JAN	88	3678	1,871.2	1806.8	49.1	3264390.5
FEB	89	2896	3,460.8	564.8	19.5	318966.1
MAR	90	3184	2,963.9	220.1	6.9	48442.7
APR	91	4597	3,157.5	1439.5	31.3	2072052.3
MAY	92	3912	4,423.9	511.9	13.1	262074.1
JUN	93	6192	3,973.6	2218.4	35.8	4921519.7
JUL	94	6168	5,925.3	242.7	3.9	58916.3
AUG	95	3613	6,138.8	2525.8	69.9	6379749.8
SEP	96	1344	3,916.7	2572.7	191.4	6618692.3
OCT - 17	97	3555	1,653.3	1901.7	53.5	3616399.7
NOV	98	3014	3,326.4	312.4	10.4	97567.7
DEC	99	1745	3,051.6	1306.6	74.9	1707086.5
JAN	100	3936	1,902.1	2033.9	51.7	4136795.2
FEB	101	2499	3,691.5	1192.5	47.7	1421961.9
MAR	102	3998	2,642.4	1355.6	33.9	1837730.2
APR	103	3713	3,835.0	122.0	3.3	14886.7
MAY	104	2992	3,727.7	735.7	24.6	541209.7
JUN	105		3,080.5			
MAD				1168.5		
MAPE					40.5	
MSE						2205629.8

ES Descriptive Statistics	
Mean	3850.361707
Standard Error	153.2445584
Median	3605.509151
Mode	2151
Standard Deviation	1570.289445
Sample Variance	2465808.942
Kurtosis	0.192749563
Skewness	0.687540833
Range	7751.109417
Minimum	1170.293434
Maximum	8921.40285
Sum	404287.9792
Count	105

APPENDIX E. LINEAR TREND ANALYSIS MODEL FOR ENTIRE DATA SET (DOLLARS)

Time	Period	AT Executed	Trend	Error	% Error	Error^2
OCT - 09	1	2151	3982.6	1831.6	85.2	3354686.1
NOV	2	2187	3980.4	1793.4	82.0	3216118.1
DEC	3	1212	3978.1	2766.1	228.2	7651461.4
JAN	4	2745	3975.9	1230.9	44.8	1515117.7
FEB	5	2329	3973.7	1644.7	70.6	2704955.2
MAR	6	3984	3971.4	12.6	0.3	157.5
APR	7	4111	3969.2	141.8	3.4	20101.0
MAY	8	4944	3967.0	977.0	19.8	954537.3
JUN	9	5866	3964.8	1901.2	32.4	3614677.8
JUL	10	6227	3962.5	2264.5	36.4	5127765.3
AUG	11	6884	3960.3	2923.7	42.5	8547924.1
SEP	12	4793	3958.1	834.9	17.4	697074.1
OCT - 10	13	2036	3955.9	1919.9	94.3	3685877.7
NOV	14	2128	3953.6	1825.6	85.8	3332952.8
DEC	15	1035	3951.4	2916.4	281.8	8505454.8
JAN	16	2555	3949.2	1394.2	54.6	1943751.6
FEB	17	1962	3947.0	1985.0	101.2	3940060.6
MAR	18	3107	3944.7	837.7	27.0	701795.3
APR	19	3128	3942.5	814.5	26.0	663419.8
MAY	20	3955	3940.3	14.7	0.4	216.7
JUN	21	5778	3938.1	1839.9	31.8	3385404.3
JUL	22	8155	3935.8	4219.2	51.7	17801422.3
AUG	23	9069	3933.6	5135.4	56.6	26372328.3
SEP	24	3865	3931.4	66.4	1.7	4405.5
OCT - 11	25	3041	3929.1	888.1	29.2	788806.5
NOV	26	1138	3926.9	2788.9	245.1	7778082.6
DEC	27	2047	3924.7	1877.7	91.7	3525738.7
JAN	28	3072	3922.5	850.5	27.7	723297.0
FEB	29	3196	3920.2	724.2	22.7	524527.0
MAR	30	4851	3918.0	933.0	19.2	870459.1
APR	31	3255	3915.8	660.8	20.3	436643.0
MAY	32	5185	3913.6	1271.4	24.5	1616551.3
JUN	33	6491	3911.3	2579.7	39.7	6654661.5
JUL	34	7282	3909.1	3372.9	46.3	11376382.9
AUG	35	5831	3906.9	1924.1	33.0	3702221.5

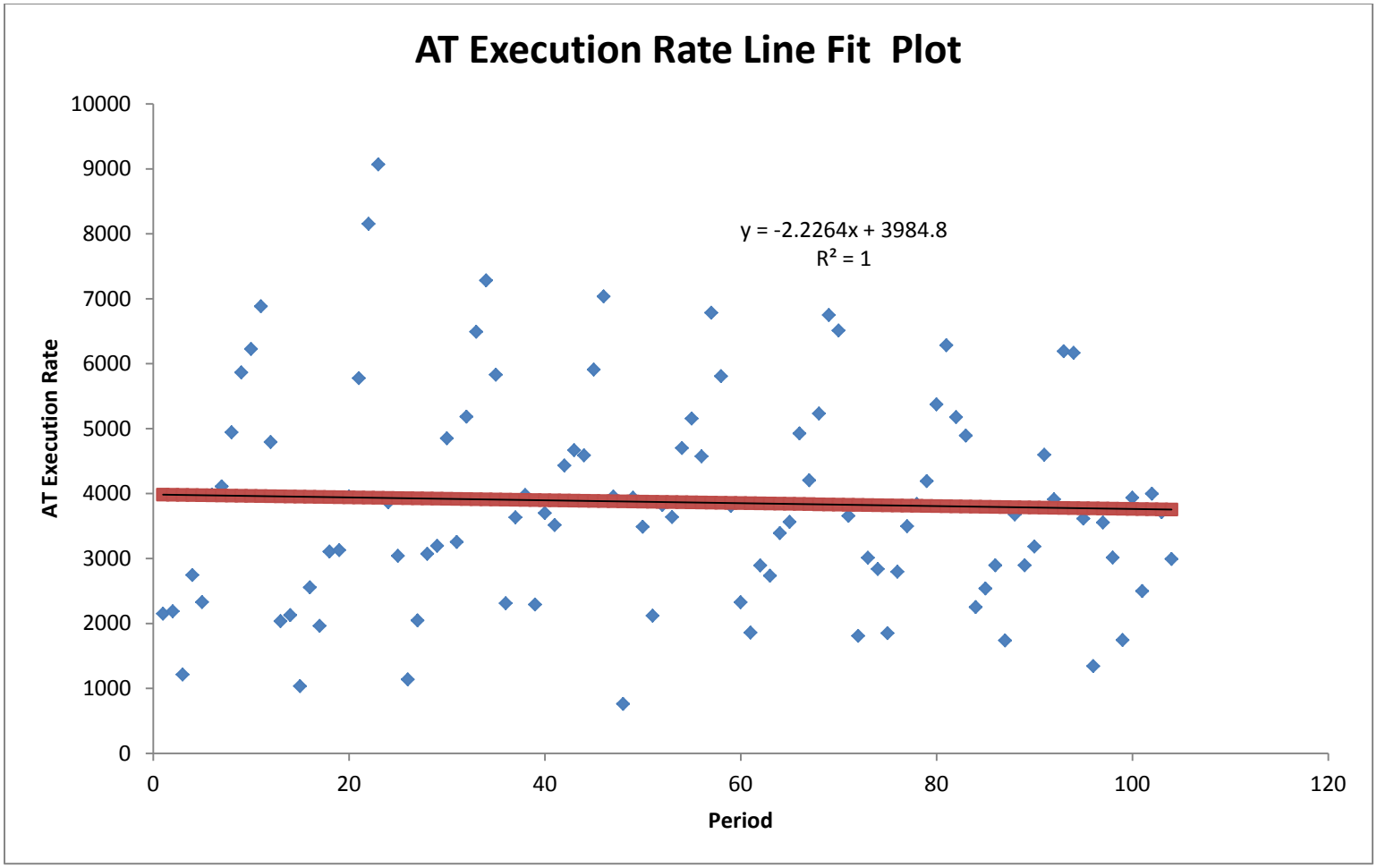
Time	Period	AT Executed	Trend	Error	% Error	$Error^2$
SEP	36	2310	3904.7	1594.7	69.0	2542933.8
OCT - 12	37	3633	3902.4	269.4	7.4	72593.4
NOV	38	3978	3900.2	77.8	2.0	6052.0
DEC	39	2291	3898.0	1607.0	70.1	2582381.0
JAN	40	3699	3895.8	196.8	5.3	38711.5
FEB	41	3514	3893.5	379.5	10.8	144040.1
MAR	42	4431	3891.3	539.7	12.2	291276.3
APR	43	4667	3889.1	777.9	16.7	605169.8
MAY	44	4589	3886.8	702.2	15.3	493018.7
JUN	45	5910	3884.6	2025.4	34.3	4102161.2
JUL	46	7035	3882.4	3152.6	44.8	9938922.3
AUG	47	3954	3880.2	73.8	1.9	5451.2
SEP	48	761	3877.9	3116.9	409.6	9715325.3
OCT - 13	49	3936	3875.7	60.3	1.5	3634.2
NOV	50	3488	3873.5	385.5	11.1	148601.7
DEC	51	2119	3871.3	1752.3	82.7	3070424.2
JAN	52	3824	3869.0	45.0	1.2	2028.3
FEB	53	3639	3866.8	227.8	6.3	51897.4
MAR	54	4700	3864.6	835.4	17.8	697920.6
APR	55	5155	3862.4	1292.6	25.1	1670925.4
MAY	56	4573	3860.1	712.9	15.6	508182.4
JUN	57	6784	3857.9	2926.1	43.1	8562034.9
JUL	58	5807	3855.7	1951.3	33.6	3807657.0
AUG	59	3808	3853.5	45.5	1.2	2065.9
SEP	60	2327	3851.2	1524.2	65.5	2323263.2
OCT - 14	61	1858	3849.0	1991.0	107.2	3964077.3
NOV	62	2893	3846.8	953.8	33.0	909682.4
DEC	63	2734	3844.5	1110.5	40.6	1233313.3
JAN	64	3392	3842.3	450.3	13.3	202788.1
FEB	65	3563	3840.1	277.1	7.8	76780.9
MAR	66	4926	3837.9	1088.1	22.1	1184032.7
APR	67	4204	3835.6	368.4	8.8	135688.4
MAY	68	5233	3833.4	1399.6	26.7	1958839.2
JUN	69	6750	3831.2	2918.8	43.2	8519461.9
JUL	70	6511	3829.0	2682.0	41.2	7193328.3
AUG	71	3657	3826.7	169.7	4.6	28810.2
SEP	72	1808	3824.5	2016.5	111.5	4066309.4
OCT - 15	73	3011	3822.3	811.3	26.9	658179.9
NOV	74	2838	3820.1	982.1	34.6	964435.0

Time	Period	AT Executed	Trend	Error	% Error	$Error^2$
DEC	75	1850	3817.8	1967.8	106.4	3872355.5
JAN	76	2796	3815.6	1019.6	36.5	1039591.9
FEB	77	3497	3813.4	316.4	9.0	100094.7
MAR	78	3840	3811.2	28.8	0.8	832.3
APR	79	4191	3808.9	382.1	9.1	145981.5
MAY	80	5373	3806.7	1566.3	29.2	2453300.7
JUN	81	6284	3804.5	2479.5	39.5	6148058.9
JUL	82	5177	3802.2	1374.8	26.6	1889949.4
AUG	83	4892	3800.0	1092.0	22.3	1192421.8
SEP	84	2252	3797.8	1545.8	68.6	2389475.9
OCT - 16	85	2538	3795.6	1257.6	49.5	1581473.8
NOV	86	2896	3793.3	897.3	31.0	805219.6
DEC	87	1737	3791.1	2054.1	118.3	4219384.0
JAN	88	3678	3788.9	110.9	3.0	12296.1
FEB	89	2896	3786.7	890.7	30.8	793277.4
MAR	90	3184	3784.4	600.4	18.9	360522.0
APR	91	4597	3782.2	814.8	17.7	663885.2
MAY	92	3912	3780.0	132.0	3.4	17428.7
JUN	93	6192	3777.8	2414.2	39.0	5828575.0
JUL	94	6168	3775.5	2392.5	38.8	5723915.3
AUG	95	3613	3773.3	160.3	4.4	25697.1
SEP	96	1344	3771.1	2427.1	180.6	5890701.6
OCT - 17	97	3555	3768.9	213.9	6.0	45732.0
NOV	98	3014	3766.6	752.6	25.0	566443.0
DEC	99	1745	3764.4	2019.4	115.7	4077967.1
JAN	100	3936	3762.2	173.8	4.4	30216.4
FEB	101	2499	3759.9	1260.9	50.5	1589982.3
MAR	102	3998	3757.7	240.3	6.0	57735.1
APR	103	3713	3755.5	42.5	1.1	1805.6
MAY	104	2992	3753.3	761.3	25.4	579525.8
JUN	105		3751.0			
MAD				1288.9		
MAPE					45.4	
MSE						2695435.4

Regression Statistics	
Multiple R	0.04068
R Square	0.00165
Adjusted R Square	-0.00813
Standard Error	1657.79585
Observations	104

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	464586.2902	464586.2902	0.1690	0.6818
Residual	102	280325281.1	2748287.07		
Total	103	280789867.4			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	3984.8066	327.4793	12.1681	0.0000	3335.2529	4634.3603	3335.2529	4634.3603
X Variable 1	-2.2264	5.4149	-0.4112	0.6818	-12.9668	8.5141	-12.9668	8.5141


AT Execution Rate Line Fit Plot
y = -2.2264x + 3984.8
R² = 1
AT Execution Rate
Period
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0
20
40
60
80
100
120

Trend Descriptive Statistics	
Mean	3866.809901
Standard Error	6.616924753
Median	3866.809901
Mode	#N/A
Standard Deviation	67.80330217
Sample Variance	4597.287785
Kurtosis	-1.2
Skewness	4.15973E-14
Range	231.540638
Minimum	3751.039582
Maximum	3982.58022
Sum	406015.0396
Count	105

APPENDIX F. SEASONALITY ANALYSIS MODEL FOR ENTIRE DATA SET (DOLLARS)

Month	AT Execution Rate	AT Budget Rate	Ratio	Seasonal Index	Expected Demand	Error	% Error	Error^2
OCT - 09	2,151	3,925	0.5480	0.5333				
NOV	2,187	3,925	0.5572	0.5496				
DEC	1,212	3,925	0.3088	0.2862				
JAN	2,745	3,925	0.6993	0.6751				
FEB	2,329	3,925	0.5933	0.5466				
MAR	3,984	3,925	1.0150	0.9033				
APR	4,111	3,925	1.0473	0.9221				
MAY	4,944	3,925	1.2595	1.1336				
JUN	5,866	3,925	1.4944	1.4832				
JUL	6,227	3,925	1.5864	1.8320				
AUG	6,884	3,925	1.7538	2.0321				
SEP	4,793	3,925	1.2211	1.1029				
OCT - 10	2,036	3,925	0.5187	0.6127	2094	58	2.8	3355308.1
NOV	2,128	3,925	0.5421	0.4627	2158	30	1.4	3124940.1
DEC	1,035	3,925	0.2637	0.3639	1124	89	8.6	7849803.1
JAN	2,555	3,925	0.6509	0.7099	2650	95	3.7	1626262.6
FEB	1,962	3,925	0.4998	0.6347	2146	184	9.4	3167510.1
MAR	3,107	3,925	0.7915	1.0124	3546	439	14.1	144210.1
APR	3,128	3,925	0.7969	0.8900	3620	492	15.7	93483.1
MAY	3,955	3,925	1.0076	1.1942	4450	495	12.5	274838.1
JUN	5,778	3,925	1.4720	1.5377	5822	44	0.8	3597660.6
JUL	8,155	3,925	2.0776	1.8371	7191	964	11.8	10665123.1
AUG	9,069	3,925	2.3104	1.8478	7977	1093	12.0	16412626.6

Month	AT Execution Rate	AT Budget Rate	Ratio	Seasonal Index	Expected Demand	Error	% Error	$Error^2$
SEP	3,865	3,925	0.9847	0.9306	4329	464	12.0	163014.1
OCT - 11	3,041	3,942	0.7715	0.6885	2415	626	20.6	2330463.9
NOV	1,138	3,942	0.2887	0.5978	1824	686	60.3	4486230.8
DEC	2,047	3,942	0.5193	0.4174	1434	613	29.9	6286619.3
JAN	3,072	3,942	0.7793	0.7656	2798	274	8.9	1308021.3
FEB	3,196	3,942	0.8108	0.6975	2502	694	21.7	2073905.8
MAR	4,851	3,942	1.2307	1.0386	3991	860	17.7	2384.4
APR	3,255	3,942	0.8258	0.9617	3508	253	7.8	188033.4
MAY	5,185	3,942	1.3154	1.1849	4707	478	9.2	585794.7
JUN	6,491	3,942	1.6467	1.5258	6061	430	6.6	4492554.8
JUL	7,282	3,942	1.8474	1.8213	7242	40	0.6	10888333.3
AUG	5,831	3,942	1.4793	1.6351	7284	1453	24.9	11168670.8
SEP	2,310	3,942	0.5860	0.7459	3668	1358	58.8	74875.2
OCT - 12	3,633	3,966	0.9160	0.7472	2731	902	24.8	1525732.8
NOV	3,978	3,966	1.0030	0.6522	2371	1607	40.4	2544953.7
DEC	2,291	3,966	0.5777	0.4396	1655	636	27.8	5339620.9
JAN	3,699	3,966	0.9327	0.8032	3036	663	17.9	864473.8
FEB	3,514	3,966	0.8860	0.7396	2766	748	21.3	1439275.6
MAR	4,431	3,966	1.1173	1.0654	4119	312	7.0	23440.4
APR	4,667	3,966	1.1768	1.0265	3814	853	18.3	23092.0
MAY	4,589	3,966	1.1571	1.1761	4699	110	2.4	537735.8
JUN	5,910	3,966	1.4902	1.5591	6051	141	2.4	4349008.5
JUL	7,035	3,966	1.7738	1.7468	7223	188	2.7	10609631.3
AUG	3,954	3,966	0.9970	1.4981	6485	2531	64.0	6344572.7
SEP	761	3,966	0.1919	0.7128	2958	2197	288.7	1015516.3
OCT - 13	3,936	4,009	0.9818	0.7001	2995	941	23.9	1026951.6

Month	AT Execution Rate	AT Budget Rate	Ratio	Seasonal Index	Expected Demand	Error	% Error	$Error^2$
NOV	3,488	4,009	0.8701	0.6640	2615	873	25.0	1943692.5
DEC	2,119	4,009	0.5286	0.4802	1762	357	16.8	5046843.0
JAN	3,824	4,009	0.9539	0.8107	3220	604	15.8	622207.4
FEB	3,639	4,009	0.9078	0.7647	2965	674	18.5	1090089.9
MAR	4,700	4,009	1.1724	1.0930	4271	429	9.1	68668.8
APR	5,155	4,009	1.2859	1.0306	4115	1040	20.2	11313.1
MAY	4,573	4,009	1.1407	1.1981	4715	142	3.1	498179.9
JUN	6,784	4,009	1.6923	1.5805	6250	534	7.9	5023836.3
JUL	5,807	4,009	1.4486	1.7269	7002	1195	20.6	8961410.8
AUG	3,808	4,009	0.9499	1.4007	6005	2197	57.7	3986677.2
SEP	2,327	4,009	0.5805	0.6693	2858	531	22.8	1325354.2
OCT - 14	1,858	4,001	0.4644	0.7082	2801	943	50.7	1439836.1
NOV	2,893	4,001	0.7231	0.6711	2657	236	8.2	1806638.7
DEC	2,734	4,001	0.6834	0.4781	1921	813	29.7	4324276.0
JAN	3,392	4,001	0.8478	0.7953	3243	149	4.4	573783.0
FEB	3,563	4,001	0.8906	0.7811	3059	504	14.1	886020.9
MAR	4,926	4,001	1.2313	1.0748	4373	553	11.2	138488.5
APR	4,204	4,001	1.0508	1.0339	4123	81	1.9	14964.4
MAY	5,233	4,001	1.3080	1.2199	4793	440	8.4	627862.8
JUN	6,750	4,001	1.6872	1.5804	6323	427	6.3	5393077.2
JUL	6,511	4,001	1.6274	1.6661	6909	398	6.1	8456599.0
AUG	3,657	4,001	0.9141	1.3764	5604	1947	53.2	2570473.7
SEP	1,808	4,001	0.4519	0.6546	2678	870	48.1	1750101.5
OCT - 15	3,011	3,977	0.7571	0.7223	2817	194	6.5	1346406.9
NOV	2,838	3,977	0.7136	0.6969	2669	169	6.0	1710621.1
DEC	1,850	3,977	0.4652	0.4972	1901	51	2.8	4308140.7

Month	AT Execution Rate	AT Budget Rate	Ratio	Seasonal Index	Expected Demand	Error	% Error	$Error^2$
JAN	2,796	3,977	0.7031	0.8293	3163	367	13.1	662739.4
FEB	3,497	3,977	0.8793	0.8017	3106	391	11.2	757854.6
MAR	3,840	3,977	0.9656	1.0457	4274	434	11.3	88517.3
APR	4,191	3,977	1.0538	1.0516	4112	79	1.9	18175.6
MAY	5,373	3,977	1.3511	1.1824	4851	522	9.7	764872.0
JUN	6,284	3,977	1.5801	1.5923	6285	1	0.0	5327960.1
JUL	5,177	3,977	1.3018	1.6640	6626	1449	28.0	7017957.7
AUG	4,892	3,977	1.2301	1.2573	5474	582	11.9	2240265.7
SEP	2,252	3,977	0.5663	0.5291	2603	351	15.6	1886666.5
OCT - 16	2,538	3,925	0.6466	0.7795	2835	297	11.7	1188001.2
NOV	2,896	3,925	0.7378	0.7308	2736	160	5.5	1415133.8
DEC	1,737	3,925	0.4425	0.5240	1952	215	12.4	3895074.7
JAN	3,678	3,925	0.9370	0.8816	3255	423	11.5	449164.7
FEB	2,896	3,925	0.7378	0.8226	3147	251	8.7	605612.3
MAR	3,184	3,925	0.8112	1.0803	4105	921	28.9	32177.1
APR	4,597	3,925	1.1712	1.0749	4128	469	10.2	41010.4
MAY	3,912	3,925	0.9967	1.1489	4641	729	18.6	512347.1
JUN	6,192	3,925	1.5775	1.6123	6250	58	0.9	5404706.7
JUL	6,168	3,925	1.5714	1.5951	6531	363	5.9	6792663.7
AUG	3,613	3,925	0.9205	1.0818	4935	1322	36.6	1020145.9
SEP	1,344	3,925	0.3424	0.4532	2077	733	54.5	3416510.7
OCT - 17	3,555	3,868	0.9191	0.7248	3015	540	15.2	727306.4
NOV	3,014	3,868	0.7792	0.7091	2827	187	6.2	1084194.2
DEC	1,745	3,868	0.4511	0.4578	2027	282	16.1	3390181.9
JAN	3,936	3,868	1.0176	0.8357	3410	526	13.4	209593.8
FEB	2,499	3,868	0.6461	0.7451	3182	683	27.3	470681.2

Month	AT Execution Rate	AT Budget Rate	Ratio	Seasonal Index	Expected Demand	Error	% Error	$Error^2$
MAR	3,998	3,868	1.0336	1.0409	4178	180	4.5	96431.2
APR	3,713	3,868	0.9599	1.0409	4158	445	12.0	83900.9
MAY	2,992	3,868	0.7735	1.1455	4444	1452	48.5	331814.2
JUN		3,868		1.5801	6236			
JUL		3,868		1.6543	6170			
AUG		3,868		1.3194	4184			
SEP		3,868		0.6226	1753			
OCT - 18		3,868		0.7248	2804			
MAD						596		
MAPE							20.0	
MSE								2650672.8

Seasonality Descriptive Statistics	
Mean	3943.946236
Standard Error	167.46151
Median	3545.5
Mode	#N/A
Standard Deviation	1649.304599
Sample Variance	2720205.662
Kurtosis	-0.613490183
Skewness	0.599178924
Range	6853
Minimum	1123.5
Maximum	7976.5
Sum	382562.7849
Count	97

APPENDIX G. OCTOBER FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

OCT	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	2,151				
FY10	2	2,036				
FY11	3	3,041				
FY12	4	3,633	2409.3	1223.7	33.7	1497360.1
FY13	5	3,936	2903.3	1032.7	26.2	1066400.4
FY14	6	1,858	3536.7	1678.7	90.3	2817921.8
FY15	7	3,011	3142.3	131.3	4.4	17248.4
FY16	8	2,538	2935.0	397.0	15.6	157609.0
FY17	9	3,555	2469.0	1086.0	30.5	1179396.0
FY18*	10		3034.7			
MAD				924.9		
MAPE					33.5	
MSE						1,122,655.96

OCT	Period	AT Executed	n=4	Error	% Error	$Error^2$
FY09	1	2,151				
FY10	2	2,036				
FY11	3	3,041				
FY12	4	3,633				
FY13	5	3,936	2715.3	1220.8	31.0	1490230.6
FY14	6	1,858	3161.5	1303.5	70.2	1699112.3
FY15	7	3,011	3117.0	106.0	3.5	11236.0
FY16	8	2,538	3109.5	571.5	22.5	326612.3
FY17	9	3,555	2835.8	719.3	20.2	517320.6
FY18*	10		2740.5			
MAD				784.2		
MAPE					29.5	
MSE						808,902.33

OCT	Period	AT Executed	n=5	Error	% Error	$Error^2$
FY09	1	2,151				
FY10	2	2,036				
FY11	3	3,041				
FY12	4	3,633				
FY13	5	3,936				
FY14	6	1,858	2959.4	1101.4	59.3	1213082.0
FY15	7	3,011	2900.8	110.2	3.7	12144.0
FY16	8	2,538	3095.8	557.8	22.0	311140.8
FY17	9	3,555	2995.2	559.8	15.7	313376.0
FY18*	10		2979.6			
MAD				582.3		
MAPE					25.2	
MSE						462,435.72

OCT	Period	AT Executed	n=6	Error	% Error	$Error^2$
FY09	1	2,151				
FY10	2	2,036				
FY11	3	3,041				
FY12	4	3,633				
FY13	5	3,936				
FY14	6	1,858				
FY15	7	3,011	2775.8	235.2	7.8	55303.4
FY16	8	2,538	2919.2	381.2	15.0	145288.0
FY17	9	3,555	3002.8	552.2	15.5	304888.0
FY18*	10		3088.5			
MAD				389.5		
MAPE					12.8	
MSE						168,493.14

OCT	Period	AT Executed	n=7	Error	% Error	$Error^2$
FY09	1	2,151				
FY10	2	2,036				
FY11	3	3,041				
FY12	4	3,633				
FY13	5	3,936				
FY14	6	1,858				
FY15	7	3,011				
FY16	8	2,538	2809.4	271.4	10.7	73673.5
FY17	9	3,555	2775.5	779.5	21.9	607620.3
FY18*	10		2951.0			
MAD				525.5		
MAPE					16.3	
MSE						340,646.86

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.0870
w2	0.4806
w3	0.4325
Sum	1.00

OCT	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	2,151				
FY10	2	2,036				
FY11	3	3,041				
FY12	4	3,633	2480.6	1152.4	31.7	1327973.8
FY13	5	3,936	3209.6	726.4	18.5	527627.7
FY14	6	1,858	3712.6	1854.6	99.8	3439371.5
FY15	7	3,011	3011.0	0.0	0.0	0.0
FY16	8	2,538	2537.3	0.7	0.0	0.4
FY17	9	3,555	2706.2	848.8	23.9	720494.9
FY18*	10		3018.9			
MAD				763.8		
MAPE					29.0	
MSE						1,002,578.06

Weights	n=4
w1	0.6743
w2	0.0000
w3	0.1571
w4	0.1686
Sum	1.00

OCT	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	2,151				
FY10	2	2,036				
FY11	3	3,041				
FY12	4	3,633				
FY13	5	3,936	2540.7	1395.3	35.5	1946972.6
FY14	6	1,858	2607.2	749.2	40.3	561315.5
FY15	7	3,011	2982.2	28.8	1.0	828.8
FY16	8	2,538	3249.3	711.3	28.0	505879.8
FY17	9	3,555	3555.0	0.0	0.0	0.0
FY18*	10		2250.9			
MAD				576.9		
MAPE					21.0	
MSE						602,999.34

Weights	n=5
w1	0.0648
w2	0.8959
w3	0.0000
w4	0.0393
w5	0.0000
Sum	1.00

OCT	Period	AT Execution Rate	n=5	Error	% Error	Error^2
FY09	1	2,151				
FY10	2	2,036				
FY11	3	3,041				
FY12	4	3,633				
FY13	5	3,936				
FY14	6	1,858	2106.2	248.2	13.4	61593.3
FY15	7	3,011	3011.0	0.0	0.0	0.0
FY16	8	2,538	3524.9	986.9	38.9	973983.0
FY17	9	3,555	3880.0	325.0	9.1	105642.0
FY18*	10		2019.4			
MAD				390.0		
MAPE					15.3	
MSE						285,304.58

Weights	n=6
w1	0.0104
w2	0.0615
w3	0.1815
w4	0.0000
w5	0.5010
w6	0.2456
Sum	1.00

OCT	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	2,151				
FY10	2	2,036				
FY11	3	3,041				
FY12	4	3,633				
FY13	5	3,936				
FY14	6	1,858				
FY15	7	3,011	3127.7	116.7	3.9	13624.3
FY16	8	2,538	2538.0	0.0	0.0	0.0
FY17	9	3,555	3101.3	453.7	12.8	205841.0
FY18*	10		2761.7			
MAD				190.1		
MAPE					5.5	
MSE						73,155.11

Weights	n=7
w1	0.0000
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.3375
W7	0.6625
Sum	1.00

OCT	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	2,151				
FY10	2	2,036				
FY11	3	3,041				
FY12	4	3,633				
FY13	5	3,936				
FY14	6	1,858				
FY15	7	3,011				
FY16	8	2,538	3638.8	1100.8	43.4	1211790.7
FY17	9	3,555	3555.0	0.0	0.0	0.0
FY18*	10		4412.3			
MAD				550.4		
MAPE					21.7	
MSE						605,895.37

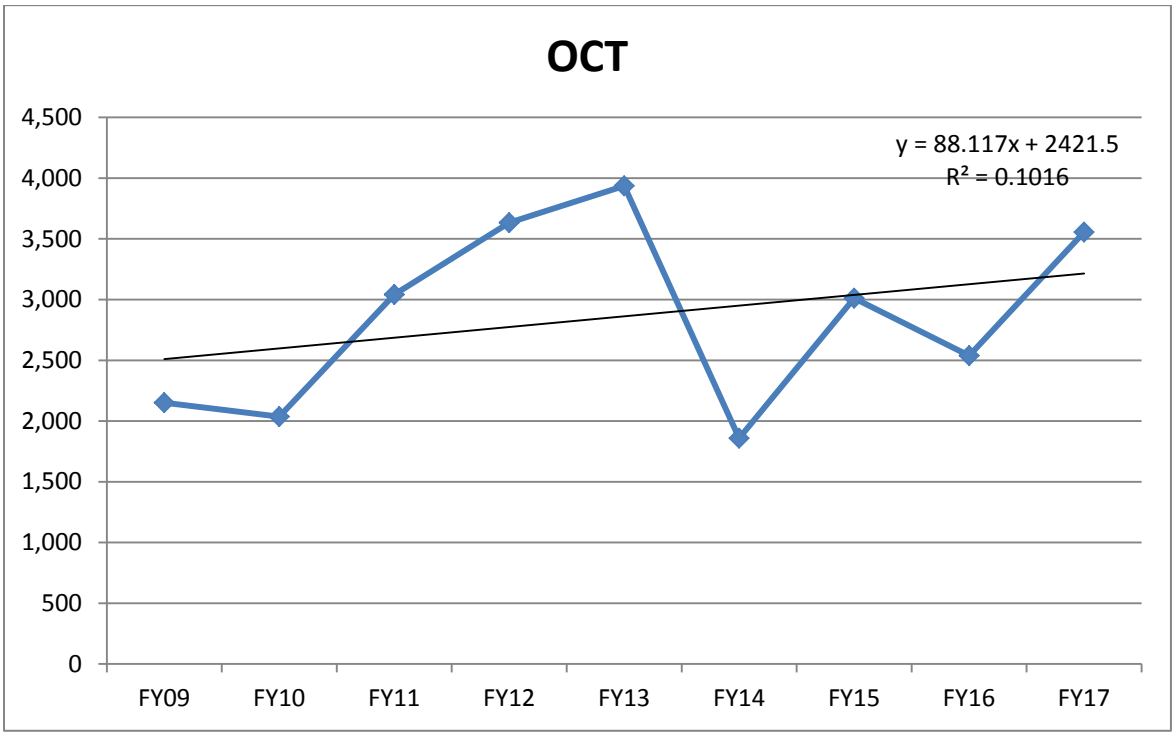
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	0.1086

OCT	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	2,151	2,151	0.0	0.0	0.0
FY10	2	2,036	2,151.0	115.0	5.6	13225.0
FY11	3	3,041	2,138.5	902.5	29.7	814481.8
FY12	4	3,633	2,236.5	1396.5	38.4	1950202.6
FY13	5	3,936	2,388.1	1547.9	39.3	2395895.9
FY14	6	1,858	2,556.2	698.2	37.6	487477.4
FY15	7	3,011	2,480.4	530.6	17.6	281549.8
FY16	8	2,538	2,538.0	0.0	0.0	0.0
FY17	9	3,555	2,538.0	1017.0	28.6	1034289.0
FY18*	10		2,648.4			
MAD				689.7		
MAPE					21.9	
MSE						775235.7

D. LINEAR TREND ANALYSIS FORECAST MODEL

OCT	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	2,151	2509.6	358.6	16.7	128625.8
FY10	2	2,036	2597.8	561.8	27.6	315575.5
FY11	3	3,041	2685.9	355.1	11.7	126111.8
FY12	4	3,633	2774.0	859.0	23.6	737890.5
FY13	5	3,936	2862.1	1073.9	27.3	1153237.3
FY14	6	1,858	2950.2	1092.2	58.8	1192961.5
FY15	7	3,011	3038.3	27.3	0.9	747.7
FY16	8	2,538	3126.5	588.5	23.2	346286.5
FY17	9	3,555	3214.6	340.4	9.6	115887.3
FY18*	10		3302.7			
MAD				584.1		
MAPE					22.1	
MSE						457480.5



Regression Statistics									
Multiple R	0.3188								
R Square	0.1016								
Adjusted R Square	-0.0267								
Standard Error	766.9349								
Observations	9								
ANOVA									
	df	*SS*	*MS*	*F*	*Significance F*				
Regression	1	465872.8167	465872.817	0.7920	0.4030				
Residual	7	4117324.0722	588189.153						
Total	8	4583196.8889							
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*	
Intercept	2421.527778	557.1653	4.3462	0.0034	1104.0412	3739.0143	1104.0412	3739.0143	
Period	88.11666667	99.0109	0.8900	0.4030	-146.0068	322.2402	-146.0068	322.2402	

E. OCTOBER DESCRIPTIVE STATISTICS

OCT	
Mean	2862.111111
Standard Error	252.3004406
Median	3011
Mode	#N/A
Standard Deviation	756.9013219
Sample Variance	572899.6111
Kurtosis	-1.581085805
Skewness	0.025361856
Range	2078
Minimum	1858
Maximum	3936
Sum	25759
Count	9

APPENDIX H. NOVEMBER FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

NOV	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	2,187				
FY10	2	2,128				
FY11	3	1,138				
FY12	4	3,978	1817.7	2160.3	54.3	4667040.1
FY13	5	3,488	2414.7	1073.3	30.8	1152044.4
FY14	6	2,893	2868.0	25.0	0.9	625.0
FY15	7	2,838	3453.0	615.0	21.7	378225.0
FY16	8	2,896	3073.0	177.0	6.1	31329.0
FY17	9	3,014	2875.7	138.3	4.6	19136.1
FY18*	10		2916.0			
MAD				698.2		
MAPE					19.7	
MSE						1,041,399.94

NOV	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	2,187				
FY10	2	2,128				
FY11	3	1,138				
FY12	4	3,978				
FY13	5	3,488	2357.8	1130.3	32.4	1277465.1
FY14	6	2,893	2683.0	210.0	7.3	44100.0
FY15	7	2,838	2874.3	36.3	1.3	1314.1
FY16	8	2,896	3299.3	403.3	13.9	162610.6
FY17	9	3,014	3028.8	14.8	0.5	217.6
FY18*	10		2910.3			
MAD				358.9		
MAPE					11.1	
MSE						297,141.45

NOV	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	2,187				
FY10	2	2,128				
FY11	3	1,138				
FY12	4	3,978				
FY13	5	3,488				
FY14	6	2,893	2583.8	309.2	10.7	95604.6
FY15	7	2,838	2725.0	113.0	4.0	12769.0
FY16	8	2,896	2867.0	29.0	1.0	841.0
FY17	9	3,014	3218.6	204.6	6.8	41861.2
FY18*	10		3025.8			
MAD				164.0		
MAPE					5.6	
MSE						37768.95

NOV	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	2,187				
FY10	2	2,128				
FY11	3	1,138				
FY12	4	3,978				
FY13	5	3,488				
FY14	6	2,893				
FY15	7	2,838	2635.3	202.7	7.1	41073.8
FY16	8	2,896	2743.8	152.2	5.3	23154.7
FY17	9	3,014	2871.8	142.2	4.7	20211.4
FY18*	10		3184.5			
MAD				165.7		
MAPE					5.7	
MSE						28,146.61

NOV	Period	AT Execution Rate	n=7	Error	% Error	Error^2
FY09	1	2,187				
FY10	2	2,128				
FY11	3	1,138				
FY12	4	3,978				
FY13	5	3,488				
FY14	6	2,893				
FY15	7	2,838				
FY16	8	2,896	2664.3	231.7	8.0	53691.5
FY17	9	3,014	2693.3	320.8	10.6	102880.6
FY18*	10		2796.6			
MAD				276.2		
MAPE					9.3	
MSE						78,286.04

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.2416
w2	0.0151
w3	0.7432
Sum	1.00

NOV	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	2,187				
FY10	2	2,128				
FY11	3	1,138				
FY12	4	3,978	1406.5	2571.5	64.6	6612812.2
FY13	5	3,488	3488.0	0.0	0.0	0.0
FY14	6	2,893	2927.5	34.5	1.2	1192.9
FY15	7	2,838	3164.2	326.2	11.5	106397.7
FY16	8	2,896	2995.9	99.9	3.4	9980.6
FY17	9	3,014	2894.4	119.6	4.0	14304.7
FY18*	10		2969.7			
MAD				525.3		
MAPE					14.1	
MSE						1,124,114.67

Weights	n=4
w1	0.1260
w2	0.1531
w3	0.0000
w4	0.7209
Sum	1.00

NOV	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	2,187				
FY10	2	2,128				
FY11	3	1,138				
FY12	4	3,978				
FY13	5	3,488	3469.2	18.8	0.5	354.8
FY14	6	2,893	2956.9	63.9	2.2	4085.8
FY15	7	2,838	2838.0	0.0	0.0	0.0
FY16	8	2,896	3081.1	185.1	6.4	34270.2
FY17	9	3,014	2970.1	43.9	1.5	1925.3
FY18*	10		2971.8			
MAD				62.4		
MAPE					2.1	
MSE						8,127.23

Weights	n=5
w1	0.0684
w2	0.1136
w3	0.1584
w4	0.0421
w5	0.6175
Sum	1.00

NOV	Period	AT Execution Rate	n=5	Error	% Error	Error^2
FY09	1	2,187				
FY10	2	2,128				
FY11	3	1,138				
FY12	4	3,978				
FY13	5	3,488				
FY14	6	2,893	2893.0	0.0	0.0	0.0
FY15	7	2,838	2838.2	0.2	0.0	0.0
FY16	8	2,896	2956.6	60.6	2.1	3670.7
FY17	9	3,014	3034.3	20.3	0.7	412.8
FY18*	10		2999.8			
MAD				20.3		
MAPE					0.7	
MSE						1,020.88

Weights	n=6
w1	0.0120
w2	0.0729
w3	0.1455
w4	0.0001
w5	0.4445
w6	0.3251
Sum	1.00

NOV	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	2,187				
FY10	2	2,128				
FY11	3	1,138				
FY12	4	3,978				
FY13	5	3,488				
FY14	6	2,893				
FY15	7	2,838	2838.0	0.0	0.0	0.0
FY16	8	2,896	2895.9	0.1	0.0	0.0
FY17	9	3,014	3014.0	0.0	0.0	0.0
FY18*	10		2990.1			
MAD				0.0		
MAPE					0.0	
MSE						0.00

Weights	n=7
w1	0.0032
w2	0.0029
w3	0.0228
w4	0.0032
w5	0.0000
w6	0.0018
W7	0.9661
Sum	1.00

NOV	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	2,187				
FY10	2	2,128				
FY11	3	1,138				
FY12	4	3,978				
FY13	5	3,488				
FY14	6	2,893				
FY15	7	2,838				
FY16	8	2,896	2896.0	0.0	0.0	0.0
FY17	9	3,014	3014.0	0.0	0.0	0.0
FY18*	10		3124.0			
MAD				0.0		
MAPE					0.0	
MSE						0.00

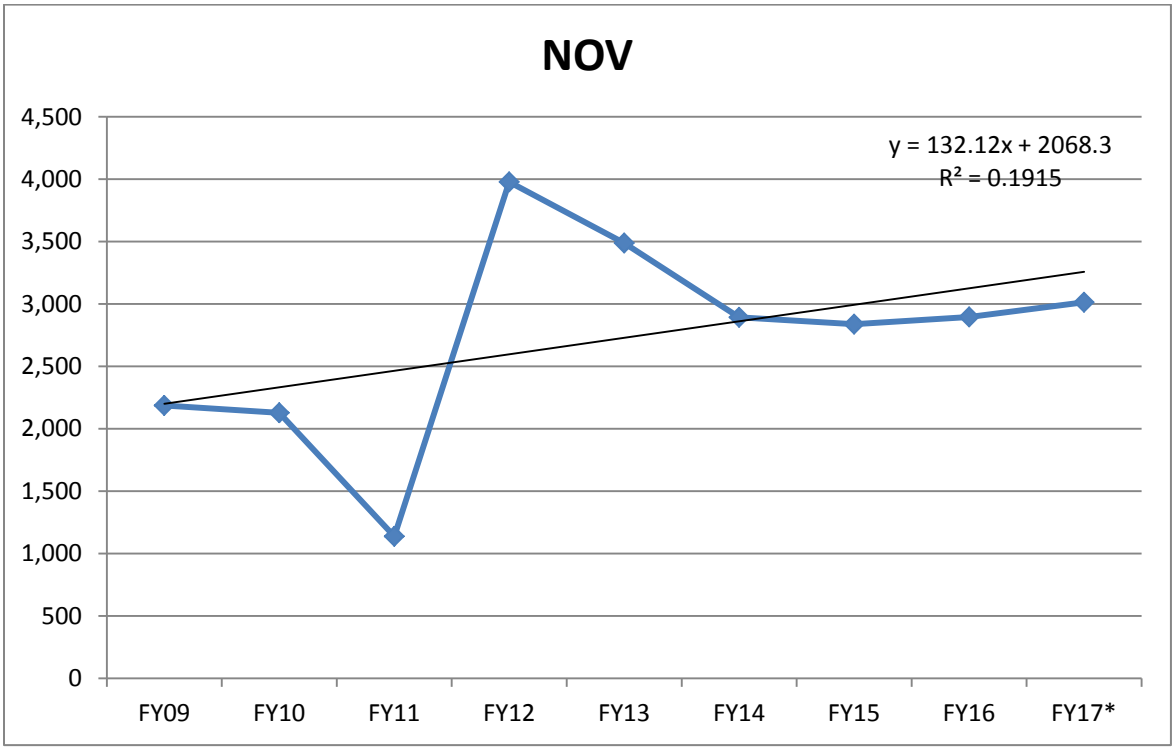
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	0.3521

NOV	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	2,187	2,187	0.0	0.0	0.0
FY10	2	2,128	2,187.0	59.0	2.8	3481.0
FY11	3	1,138	2,166.2	1028.2	90.4	1057246.3
FY12	4	3,978	1,804.2	2173.8	54.6	4725558.1
FY13	5	3,488	2,569.6	918.4	26.3	843424.8
FY14	6	2,893	2,893.0	0.0	0.0	0.0
FY15	7	2,838	2,893.0	55.0	1.9	3025.0
FY16	8	2,896	2,873.6	22.4	0.8	500.3
FY17	9	3,014	2,881.5	132.5	4.4	17553.8
FY18*	10		2,928.2			
MAD				487.7		
MAPE					20.1	
MSE						738976.6

D. LINEAR TREND ANALYSIS FORECAST MODEL

NOV	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	2,187	2200.4	13.4	0.6	180.1560494
FY10	2	2,128	2332.5	204.5	9.6	41836.15707
FY11	3	1,138	2464.7	1326.7	116.6	1760014.963
FY12	4	3,978	2596.8	1381.2	34.7	1907790.174
FY13	5	3,488	2728.9	759.1	21.8	576249.679
FY14	6	2,893	2861.0	32.0	1.1	1023.644475
FY15	7	2,838	2993.1	155.1	5.5	24062.90383
FY16	8	2,896	3125.2	229.2	7.9	52550.46818
FY17	9	3,014	3257.4	243.4	8.1	59221.92642
FY18*	10		3389.5			
MAD				482.7		
MAPE					22.9	
MSE						491436.6747



Regression Statistics	
Multiple R	0.437553
R Square	0.191453
Adjusted R Square	0.075946
Standard Error	794.8881
Observations	9

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1047288.817	1047288.8	1.657503	0.23887
Residual	7	4422930.072	631847.15		
Total	8	5470218.889			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	2068.306	577.4728447	3.5816499	0.008956	702.7993	3433.811849	702.7992623	3433.812
Period	132.1167	102.6196175	1.2874406	0.23887	-110.54	374.7735028	-110.5401695	374.7735

E. NOVEMBER DESCRIPTIVE STATISTICS

NOV	
Mean	2728.888889
Standard Error	275.6361049
Median	2893
Mode	#N/A
Standard Deviation	826.9083148
Sample Variance	683777.3611
Kurtosis	0.812037654
Skewness	-0.563515616
Range	2840
Minimum	1138
Maximum	3978
Sum	24560
Count	9

APPENDIX I. DECEMBER FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

DEC	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291	1431.3	859.7	37.5	739026.8
FY13	5	2,119	1791.0	328.0	15.5	107584.0
FY14	6	2,734	2152.3	581.7	21.3	338336.1
FY15	7	1,850	2381.3	531.3	28.7	282315.1
FY16	8	1,737	2234.3	497.3	28.6	247340.4
FY17	9	1,745	2107.0	362.0	20.7	131044.0
FY18	10		1777.3			
MAD				526.7		
MAPE					25.4	
MSE						307,607.74

DEC	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119	1646.3	472.8	22.3	223492.6
FY14	6	2,734	1873.0	861.0	31.5	741321.0
FY15	7	1,850	2297.8	447.8	24.2	200480.1
FY16	8	1,737	2248.5	511.5	29.4	261632.3
FY17	9	1,745	2110.0	365.0	20.9	133225.0
FY18	10		2016.5			
MAD				531.6		
MAPE					25.7	
MSE						312,030.18

DEC	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119				
FY14	6	2,734	1740.8	993.2	36.3	986446.2
FY15	7	1,850	2045.2	195.2	10.6	38103.0
FY16	8	1,737	2208.2	471.2	27.1	222029.4
FY17	9	1,745	2146.2	401.2	23.0	160961.4
FY18	10		2037.0			
MAD				515.2		
MAPE					24.2	
MSE						351,885.04

DEC	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119				
FY14	6	2,734				
FY15	7	1,850	1906.3	56.3	3.0	3173.4
FY16	8	1,737	2012.7	275.7	15.9	75992.1
FY17	9	1,745	2129.7	384.7	22.0	147968.4
FY18	10		2079.3			
MAD				238.9		
MAPE					13.7	
MSE						75,711.33

DEC	Period	AT Execution Rate	n=7	Error	% Error	Error^2
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119				
FY14	6	2,734				
FY15	7	1,850				
FY16	8	1,737	1898.3	161.3	9.3	26013.1
FY17	9	1,745	1878.1	133.1	7.6	17722.3
FY18	10		1944.8			
MAD				147.2		
MAPE					8.5	
MSE						21,867.67

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.0080
w2	0.0000
w3	0.9920
Sum	1.00

DEC	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291	2040.3	250.7	10.9	62850.6
FY13	5	2,119	2280.9	161.9	7.6	26218.6
FY14	6	2,734	2118.4	615.6	22.5	378936.0
FY15	7	1,850	2730.4	880.4	47.6	775183.9
FY16	8	1,737	1852.2	115.2	6.6	13261.5
FY17	9	1,745	1745.0	0.0	0.0	0.0
FY18*	10		1745.8			
MAD				337.3		
MAPE					15.9	
MSE						209,408.42

Weights	n=4
w1	0.0000
w2	0.0565
w3	0.4138
w4	0.5296
Sum	1.00

DEC	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119	2119.0	0.0	0.0	0.0
FY14	6	2,734	2186.1	547.9	20.0	300183.0
FY15	7	1,850	2454.4	604.4	32.7	365341.7
FY16	8	1,737	2231.1	494.1	28.4	244086.3
FY17	9	1,745	1840.1	95.1	5.5	9051.7
FY18*	10		1747.6			
MAD				348.3		
MAPE					17.3	
MSE						183,732.54

Weights	n=5
w1	0.5203
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.4797
Sum	1.00

DEC	Period	AT Execution Rate	n=5	Error	% Error	Error^2
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119				
FY14	6	2,734	1647.1	1086.9	39.8	1181385.0
FY15	7	1,850	1850.0	0.0	0.0	0.0
FY16	8	1,737	1952.5	215.5	12.4	46440.1
FY17	9	1,745	2025.2	280.2	16.1	78539.0
FY18*	10		1939.6			
MAD				395.7		
MAPE					17.1	
MSE						326,591.03

Weights	n=6
w1	0.1864
w2	0.1976
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.6160
Sum	1.00

DEC	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119				
FY14	6	2,734				
FY15	7	1,850	2114.6	264.6	14.3	70001.4
FY16	8	1,737	1737.0	0.0	0.0	0.0
FY17	9	1,745	1904.3	159.3	9.1	25361.2
FY18*	10		1920.7			
MAD				141.3		
MAPE					7.8	
MSE						31,787.54

Weights	n=7
w1	0.0000
w2	0.0034
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.0000
W7	0.9966
Sum	1.00

DEC	Period	AT Execution Rate	n=7	Error	% Error	Error^2
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119				
FY14	6	2,734				
FY15	7	1,850				
FY16	8	1,737	1854.5	117.5	6.8	13815.0
FY17	9	1,745	1745.0	0.0	0.0	0.0
FY18*	10		1753.8			
MAD				58.8		
MAPE					3.4	
MSE						6,907.50

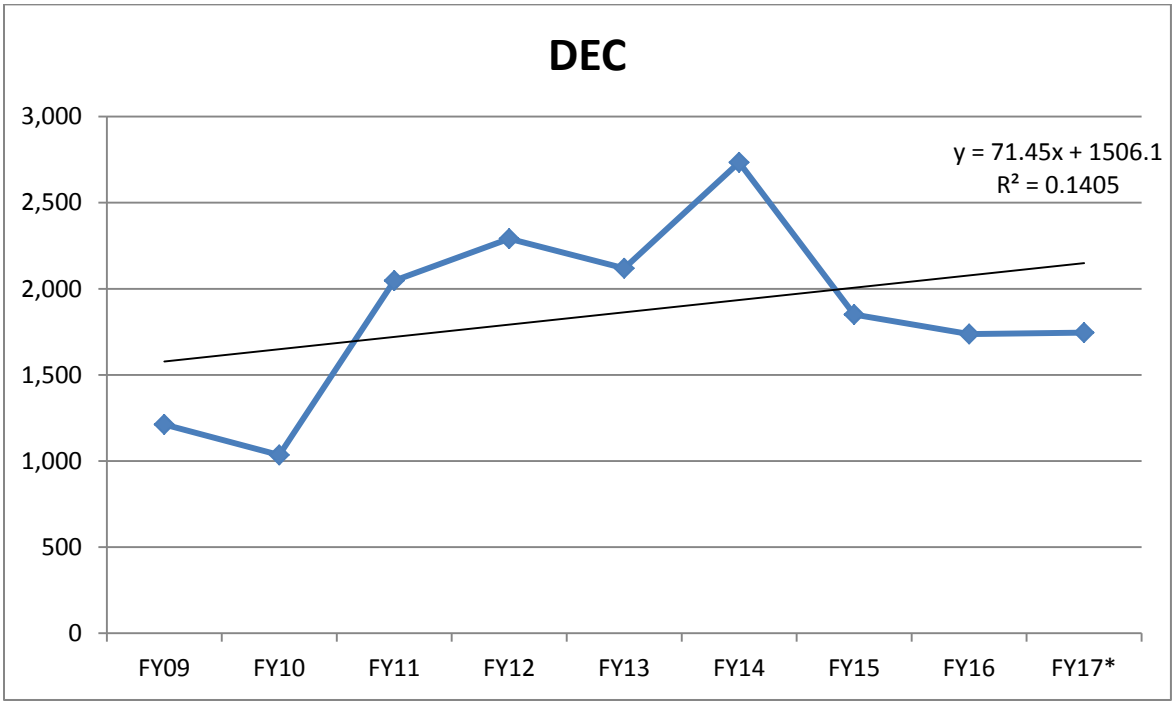
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	1.0000

DEC	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	1,212	1,212	0.0	0.0	0.0
FY10	2	1,035	1,212.0	177.0	17.1	31329.0
FY11	3	2,047	1,035.0	1012.0	49.4	1024144.0
FY12	4	2,291	2,047.0	244.0	10.7	59536.0
FY13	5	2,119	2,291.0	172.0	8.1	29584.0
FY14	6	2,734	2,119.0	615.0	22.5	378225.0
FY15	7	1,850	2,734.0	884.0	47.8	781456.0
FY16	8	1,737	1,850.0	113.0	6.5	12769.0
FY17	9	1,745	1,737.0	8.0	0.5	64.0
FY18	10		1,745.0			
MAD				358.3		
MAPE					18.1	
MSE						257456.3

D. LINEAR TREND ANALYSIS FORECAST MODEL

DEC	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	1,212	1577.5	365.5	30.2	133614.6
FY10	2	1,035	1649.0	614.0	59.3	376975.5
FY11	3	2,047	1720.4	326.6	16.0	106645.8
FY12	4	2,291	1791.9	499.1	21.8	249117.4
FY13	5	2,119	1863.3	255.7	12.1	65365.4
FY14	6	2,734	1934.8	799.2	29.2	638747.3
FY15	7	1,850	2006.2	156.2	8.4	24408.9
FY16	8	1,737	2077.7	340.7	19.6	116065.1
FY17	9	1,745	2149.1	404.1	23.2	163323.8
FY18	10		2220.6			
MAD				417.9		
MAPE					24.4	
MSE						208251.5



Regression Statistics									
Multiple R	0.374794183								
R Square	0.14047068								
Adjusted R Square	0.017680777								
Standard Error	517.4475612								
Observations	9								
ANOVA									
	df	*SS*	*MS*	*F*	*Significance F*				
Regression	1	306306.15	306306.15	1.143992107	0.320299004				
Residual	7	1874263.85	267751.9786						
Total	8	2180570							
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*	
Intercept	1506.083333	375.916938	4.006425838	0.005147651	617.1810252	2394.985641	617.1810252	2394.985641	
Period	71.45	66.8021929	1.069575667	0.320299004	-86.51208539	229.4120854	-86.51208539	229.4120854	

E. DECEMBER DESCRIPTIVE STATISTICS

DEC	
Mean	1863.333333
Standard Error	174.0278554
Median	1850
Mode	#N/A
Standard Deviation	522.0835661
Sample Variance	272571.25
Kurtosis	-0.011689364
Skewness	-0.098478836
Range	1699
Minimum	1035
Maximum	2734
Sum	16770
Count	9

APPENDIX J. JANUARY FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

JAN	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	2,745				
FY10	2	2,555				
FY11	3	3,072				
FY12	4	3,699	2790.7	908.3	24.6	825069.4
FY13	5	3,824	3108.7	715.3	18.7	511701.8
FY14	6	3,392	3531.7	139.7	4.1	19506.8
FY15	7	2,796	3638.3	842.3	30.1	709525.4
FY16	8	3,678	3337.3	340.7	9.3	116053.8
FY17	9	3,936	3288.7	647.3	16.4	419040.4
FY18*	10		3470.0			
MAD				598.9		
MAPE					17.2	
MSE						433,482.94

JAN	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	2,745				
FY10	2	2,555				
FY11	3	3,072				
FY12	4	3,699				
FY13	5	3,824	3017.8	806.3	21.1	650039.1
FY14	6	3,392	3287.5	104.5	3.1	10920.3
FY15	7	2,796	3496.8	700.8	25.1	491050.6
FY16	8	3,678	3427.8	250.3	6.8	62625.1
FY17	9	3,936	3422.5	513.5	13.0	263682.3
FY18*	10		3450.5			
MAD				475.1		
MAPE					13.8	
MSE						295,663.44

JAN	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	2,745				
FY10	2	2,555				
FY11	3	3,072				
FY12	4	3,699				
FY13	5	3,824				
FY14	6	3,392	3179.0	213.0	6.3	45369.0
FY15	7	2,796	3308.4	512.4	18.3	262553.8
FY16	8	3,678	3356.6	321.4	8.7	103298.0
FY17	9	3,936	3477.8	458.2	11.6	209947.2
FY18*	10		3525.2			
MAD				376.3		
MAPE					11.2	
MSE						155,291.99

JAN	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	2,745				
FY10	2	2,555				
FY11	3	3,072				
FY12	4	3,699				
FY13	5	3,824				
FY14	6	3,392				
FY15	7	2,796	3214.5	418.5	15.0	175142.3
FY16	8	3,678	3223.0	455.0	12.4	207025.0
FY17	9	3,936	3410.2	525.8	13.4	276500.7
FY18*	10		3554.2			
MAD				466.4		
MAPE					13.6	
MSE						219,555.98

JAN	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	2,745				
FY10	2	2,555				
FY11	3	3,072				
FY12	4	3,699				
FY13	5	3,824				
FY14	6	3,392				
FY15	7	2,796				
FY16	8	3,678	3154.7	523.3	14.2	273827.9
FY17	9	3,936	3220.1	715.9	18.2	512477.0
FY18*	10		3369.0			
MAD				619.6		
MAPE					16.2	
MSE						393152.5

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.0000
w2	0.0000
w3	1.0000
Sum	1.00

JAN	Period	AT Execution Rate	n=3	Error	% Error	Error^2
FY09	1	2,745				
FY10	2	2,555				
FY11	3	3,072				
FY12	4	3,699	3072.0	627.0	17.0	393129.0
FY13	5	3,824	3699.0	125.0	3.3	15625.0
FY14	6	3,392	3824.0	432.0	12.7	186624.0
FY15	7	2,796	3392.0	596.0	21.3	355216.0
FY16	8	3,678	2796.0	882.0	24.0	777924.0
FY17	9	3,936	3678.0	258.0	6.6	66564.0
FY18*	10		3936.0			
MAD				486.7		
MAPE					14.1	
MSE						299,180.34

Weights	n=4
w1	0.3404
w2	0.0000
w3	0.0000
w4	0.6596
Sum	1.00

JAN	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	2,745				
FY10	2	2,555				
FY11	3	3,072				
FY12	4	3,699				
FY13	5	3,824	3374.2	449.8	11.8	202290.4
FY14	6	3,392	3392.0	0.0	0.0	0.0
FY15	7	2,796	3283.1	487.1	17.4	237230.9
FY16	8	3,678	3103.4	574.6	15.6	330158.8
FY17	9	3,936	3727.7	208.3	5.3	43387.9
FY18*	10		3750.8			
MAD				343.9		
MAPE					10.0	
MSE						162,613.59

Weights	n=5
w1	0.5338
w2	0.4662
w3	0.0000
w4	0.0000
w5	0.0000
Sum	1.00

JAN	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	2,745				
FY10	2	2,555				
FY11	3	3,072				
FY12	4	3,699				
FY13	5	3,824				
FY14	6	3,392	2656.4	735.6	21.7	541061.3
FY15	7	2,796	2796.0	0.0	0.0	0.0
FY16	8	3,678	3364.3	313.7	8.5	98422.4
FY17	9	3,936	3757.3	178.7	4.5	31944.8
FY18*	10		3622.6			
MAD				307.0		
MAPE					8.7	
MSE						167,857.12

Weights	n=6
w1	0.0000
w2	0.0335
w3	0.9665
w4	0.0000
w5	0.0000
w6	0.0000
Sum	1.00

JAN	Period	AT Execution Rate	n=6	Error	% Error	Error^2
FY09	1	2,745				
FY10	2	2,555				
FY11	3	3,072				
FY12	4	3,699				
FY13	5	3,824				
FY14	6	3,392				
FY15	7	2,796	3054.7	258.7	9.3	66916.9
FY16	8	3,678	3678.0	0.0	0.0	0.0
FY17	9	3,936	3819.8	116.2	3.0	13499.4
FY18*	10		3406.5			
MAD				125.0		
MAPE					4.1	
MSE						26,805.44

Weights	n=7
w1	0.0080
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.0257
w6	0.2244
W7	0.7419
Sum	1.00

JAN	Period	AT Execution Rate	n=7	Error	% Error	Error^2
FY09	1	2,745				
FY10	2	2,555				
FY11	3	3,072				
FY12	4	3,699				
FY13	5	3,824				
FY14	6	3,392				
FY15	7	2,796				
FY16	8	3,678	3678.0	0.0	0.0	0.0
FY17	9	3,936	4413.7	477.7	12.1	228155.4
FY18*	10		4858.4			
MAD				238.8		
MAPE					6.1	
MSE						114,077.68

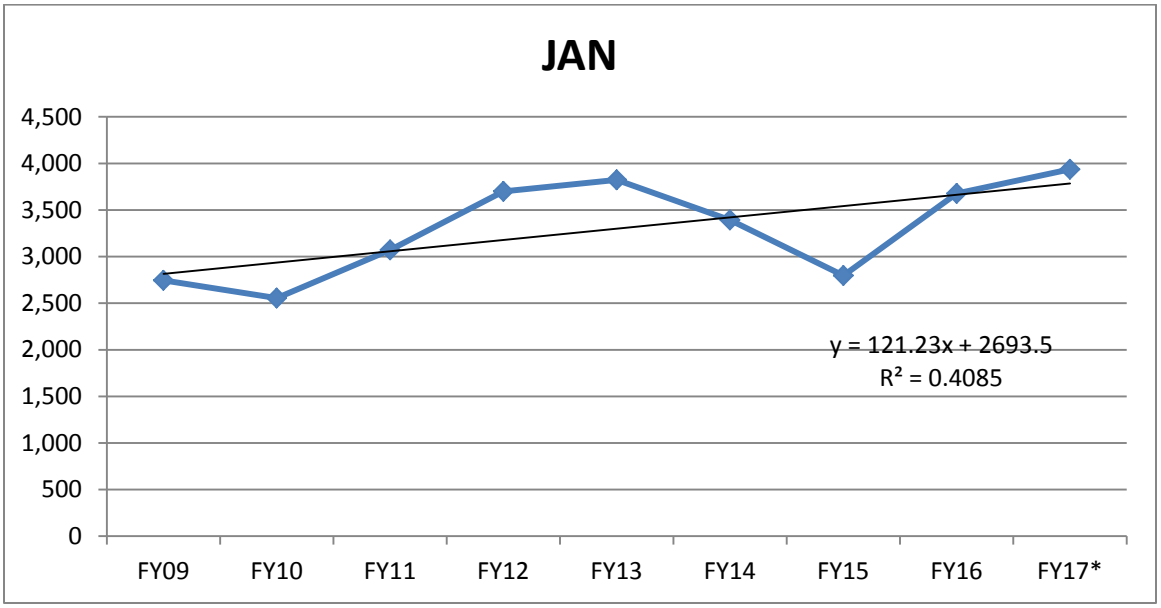
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	0.3662

JAN	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	2,745	2,745	0.0	0.0	0.0
FY10	2	2,555	2,745.0	190.0	7.4	36100.0
FY11	3	3,072	2,675.4	396.6	12.9	157280.9
FY12	4	3,699	2,820.7	878.3	23.7	771478.9
FY13	5	3,824	3,142.3	681.7	17.8	464648.9
FY14	6	3,392	3,392.0	0.0	0.0	0.0
FY15	7	2,796	3,392.0	596.0	21.3	355215.9
FY16	8	3,678	3,173.7	504.3	13.7	254300.4
FY17	9	3,936	3,358.4	577.6	14.7	333611.7
FY18*	10		3,569.9			
MAD				424.9		
MAPE					12.4	
MSE						263626.3

D. LINEAR TREND ANALYSIS FORECAST MODEL

JAN	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	2,745	2814.7	69.7	2.5	4862.7
FY10	2	2,555	2936.0	381.0	14.9	145135.6
FY11	3	3,072	3057.2	14.8	0.5	219.0
FY12	4	3,699	3178.4	520.6	14.1	270989.7
FY13	5	3,824	3299.7	524.3	13.7	274925.4
FY14	6	3,392	3420.9	28.9	0.9	835.2
FY15	7	2,796	3542.1	746.1	26.7	556715.0
FY16	8	3,678	3663.4	14.6	0.4	214.1
FY17	9	3,936	3784.6	151.4	3.8	22922.0
FY18*	10		3905.8			
MAD				272.4		
MAPE					8.6	
MSE						141868.7



Regression Statistics	
Multiple R	0.639153
R Square	0.408516
Adjusted R Square	0.324018
Standard Error	427.0863
Observations	9

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	881851.2667	881851.27	4.83464	0.063846
Residual	7	1276818.733	182402.68		
Total	8	2158670			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	2693.5	310.2709769	8.6811213	5.39E-05	1959.826	3427.174277	1959.825723	3427.174
Period	121.2333	55.13659949	2.1987815	0.063846	-9.14401	251.6106736	-9.144006968	251.6107

E. JANUARY DESCRIPTIVE STATISTICS

JAN	
Mean	3299.667
Standard Error	173.1517
Median	3392
Mode	#N/A
Standard Deviation	519.4552
Sample Variance	269833.8
Kurtosis	-1.79491
Skewness	-0.23244
Range	1381
Minimum	2555
Maximum	3936
Sum	29697
Count	9

APPENDIX K. FEBRUARY FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

FEB	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	2,329				
FY10	2	1,962				
FY11	3	3,196				
FY12	4	3,514	2495.7	1018.3	29.0	1037002.8
FY13	5	3,639	2890.7	748.3	20.6	560002.8
FY14	6	3,563	3449.7	113.3	3.2	12844.4
FY15	7	3,497	3572.0	75.0	2.1	5625.0
FY16	8	2,896	3566.3	670.3	23.1	449346.8
FY17	9	2,499	3318.7	819.7	32.8	671853.4
FY18*	10		2964.0			
MAD				574.2		
MAPE					18.5	
MSE						456,112.54

FEB	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	2,329				
FY10	2	1,962				
FY11	3	3,196				
FY12	4	3,514				
FY13	5	3,639	2750.3	888.8	24.4	789876.6
FY14	6	3,563	3077.8	485.3	13.6	235467.6
FY15	7	3,497	3478.0	19.0	0.5	361.0
FY16	8	2,896	3553.3	657.3	22.7	431977.6
FY17	9	2,499	3398.8	899.8	36.0	809550.1
FY18*	10		3113.8			
MAD				590.0		
MAPE					19.5	
MSE						453,446.55

FEB	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	2,329				
FY10	2	1,962				
FY11	3	3,196				
FY12	4	3,514				
FY13	5	3,639				
FY14	6	3,563	2928.0	635.0	17.8	403225.0
FY15	7	3,497	3174.8	322.2	9.2	103812.8
FY16	8	2,896	3481.8	585.8	20.2	343161.6
FY17	9	2,499	3421.8	922.8	36.9	851559.8
FY18*	10		3218.8			
MAD				616.5		
MAPE					21.0	
MSE						425,439.83

FEB	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	2,329				
FY10	2	1,962				
FY11	3	3,196				
FY12	4	3,514				
FY13	5	3,639				
FY14	6	3,563				
FY15	7	3,497	3033.8	463.2	13.2	214523.4
FY16	8	2,896	3228.5	332.5	11.5	110556.3
FY17	9	2,499	3384.2	885.2	35.4	783520.0
FY18*	10		3268.0			
MAD				560.3		
MAPE					20.0	
MSE						369,533.21

FEB	Period	AT Execution Rate	n=7	Error	% Error	Error^2
FY09	1	2,329				
FY10	2	1,962				
FY11	3	3,196				
FY12	4	3,514				
FY13	5	3,639				
FY14	6	3,563				
FY15	7	3,497				
FY16	8	2,896	3100.0	204.0	7.0	41616.0
FY17	9	2,499	3074.5	575.5	23.0	331200.3
FY18*	10		3095.8			
MAD				389.8		
MAPE					15.0	
MSE						186,408.13

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.0000
w2	0.0000
w3	1.0000
Sum	1.00

FEB	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	2,329				
FY10	2	1,962				
FY11	3	3,196				
FY12	4	3,514	3196.0	318.0	9.0	101124.0
FY13	5	3,639	3514.0	125.0	3.4	15625.0
FY14	6	3,563	3639.0	76.0	2.1	5776.0
FY15	7	3,497	3563.0	66.0	1.9	4356.0
FY16	8	2,896	3497.0	601.0	20.8	361201.0
FY17	9	2,499	2896.0	397.0	15.9	157609.0
FY18*	10		2499.0			
MAD				263.8		
MAPE					8.9	
MSE						107,615.17

Weights	n=4
w1	0.0000
w2	0.0000
w3	0.0000
w4	1.0000
Sum	1.00

FEB	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	2,329				
FY10	2	1,962				
FY11	3	3,196				
FY12	4	3,514				
FY13	5	3,639	3514.0	125.0	3.4	15624.9
FY14	6	3,563	3639.0	76.0	2.1	5776.0
FY15	7	3,497	3563.0	66.0	1.9	4356.0
FY16	8	2,896	3497.0	601.0	20.8	361201.3
FY17	9	2,499	2896.0	397.0	15.9	157609.1
FY18*	10		2499.0			
MAD				253.0		
MAPE					8.8	
MSE						108,913.48

Weights	n=5
w1	0.0442
w2	0.0080
w3	0.0000
w4	0.0384
w5	0.9094
Sum	1.00

FEB	Period	AT Execution Rate	n=5	Error	% Error	Error^2
FY09	1	2,329				
FY10	2	1,962				
FY11	3	3,196				
FY12	4	3,514				
FY13	5	3,639				
FY14	6	3,563	3563.0	0.0	0.0	0.0
FY15	7	3,497	3492.3	4.7	0.1	22.0
FY16	8	2,896	3486.4	590.4	20.4	348551.1
FY17	9	2,499	2952.3	453.3	18.1	205485.4
FY18*	10		2573.1			
MAD				262.1		
MAPE					9.7	
MSE						138,514.60

Weights	n=6
w1	0.0130
w2	0.0312
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.9558
Sum	1.00

FEB	Period	AT Execution Rate	n=6	Error	% Error	Error^2
FY09	1	2,329				
FY10	2	1,962				
FY11	3	3,196				
FY12	4	3,514				
FY13	5	3,639				
FY14	6	3,563				
FY15	7	3,497	3497.0	0.0	0.0	0.0
FY16	8	2,896	3467.7	571.7	19.7	326816.7
FY17	9	2,499	2919.2	420.2	16.8	176558.0
FY18*	10		2547.8			
MAD				330.6		
MAPE					12.2	
MSE						167,791.56

Weights	n=7
w1	0.0000
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.0000
W7	1.0000
Sum	1.00

FEB	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	2,329				
FY10	2	1,962				
FY11	3	3,196				
FY12	4	3,514				
FY13	5	3,639				
FY14	6	3,563				
FY15	7	3,497				
FY16	8	2,896	3498.0	602.0	20.8	362404.0
FY17	9	2,499	2897.0	398.0	15.9	158404.0
FY18*	10		2500.0			
MAD				500.0		
MAPE					18.4	
MSE						260,404.00

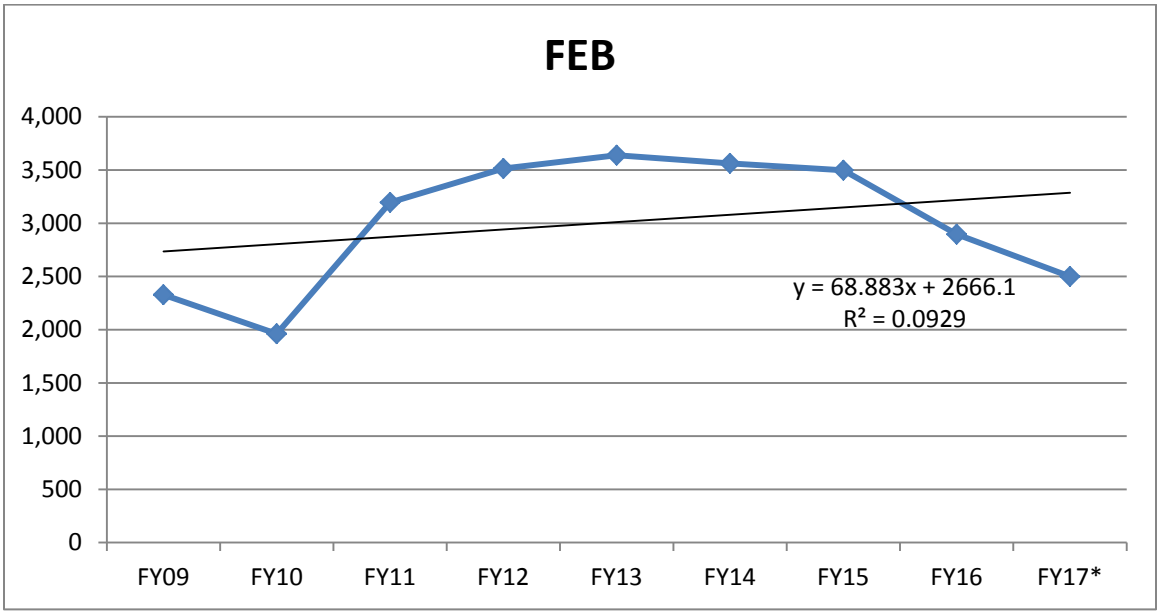
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	0.0000

FEB	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	2,329	2,329	0.0	0.0	0.0
FY10	2	1,962	2,329.0	367.0	18.7	134689.0
FY11	3	3,196	2,329.0	867.0	27.1	751689.0
FY12	4	3,514	2,329.0	1185.0	33.7	1404225.0
FY13	5	3,639	2,329.0	1310.0	36.0	1716100.0
FY14	6	3,563	2,329.0	1234.0	34.6	1522756.0
FY15	7	3,497	2,329.0	1168.0	33.4	1364224.0
FY16	8	2,896	2,329.0	567.0	19.6	321489.0
FY17	9	2,499	2,329.0	170.0	6.8	28900.0
FY18*	10		2,329.0			
MAD				763.1		
MAPE					23.3	
MSE						804896.9

D. LINEAR TREND ANALYSIS FORECAST MODEL

FEB	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	2,329	2735.0	406.0	17.4	164854.0
FY10	2	1,962	2803.9	841.9	42.9	708805.0
FY11	3	3,196	2872.8	323.2	10.1	104465.4
FY12	4	3,514	2941.7	572.3	16.3	327559.1
FY13	5	3,639	3010.6	628.4	17.3	394942.4
FY14	6	3,563	3079.4	483.6	13.6	233831.3
FY15	7	3,497	3148.3	348.7	10.0	121576.2
FY16	8	2,896	3217.2	321.2	11.1	103173.0
FY17	9	2,499	3286.1	787.1	31.5	619508.9
FY18*	10		3355.0			
MAD				523.6		
MAPE					18.9	
MSE						308746.2



Regression Statistics	
Multiple R	0.304851
R Square	0.092934
Adjusted R Square	-0.03665
Standard Error	630.0471
Observations	9

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	284694.8167	284694.82	0.717189	0.42507
Residual	7	2778715.406	396959.34		
Total	8	3063410.222			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	2666.139	457.7186038	5.8248427	0.000647	1583.806	3748.4714	1583.806378	3748.471
Period	68.88333	81.33873039	0.84687	0.42507	-123.452	261.2188678	-123.4522011	261.2189

E. FEBRUARY DESCRIPTIVE STATISTICS

FEB	
Mean	3010.556
Standard Error	206.2701
Median	3196
Mode	#N/A
Standard Deviation	618.8104
Sample Variance	382926.3
Kurtosis	-1.16678
Skewness	-0.63682
Range	1677
Minimum	1962
Maximum	3639
Sum	27095
Count	9

APPENDIX L. MARCH FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

MAR	Period	AT Execution Rate	n=3	Error	% Error	Error^2
FY09	1	3,984				
FY10	2	3,107				
FY11	3	4,851				
FY12	4	4,431	3980.7	450.3	10.2	202800.1
FY13	5	4,700	4129.7	570.3	12.1	325280.1
FY14	6	4,926	4660.7	265.3	5.4	70401.8
FY15	7	3,840	4685.7	845.7	22.0	715152.1
FY16	8	3,184	4488.7	1304.7	41.0	1702155.1
FY17	9	3,998	3983.3	14.7	0.4	215.1
FY18*	10		3674.0			
MAD				575.2		
MAPE					15.2	
MSE						502,667.39

MAR	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	3,984				
FY10	2	3,107				
FY11	3	4,851				
FY12	4	4,431				
FY13	5	4,700	4093.3	606.8	12.9	368145.6
FY14	6	4,926	4272.3	653.8	13.3	427389.1
FY15	7	3,840	4727.0	887.0	23.1	786769.0
FY16	8	3,184	4474.3	1290.3	40.5	1664745.1
FY17	9	3,998	4162.5	164.5	4.1	27060.3
FY18*	10		3987.0			
MAD				720.5		
MAPE					18.8	
MSE						654,821.79

MAR	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	3,984				
FY10	2	3,107				
FY11	3	4,851				
FY12	4	4,431				
FY13	5	4,700				
FY14	6	4,926	4214.6	711.4	14.4	506090.0
FY15	7	3,840	4403.0	563.0	14.7	316969.0
FY16	8	3,184	4549.6	1365.6	42.9	1864863.4
FY17	9	3,998	4216.2	218.2	5.5	47611.2
FY18*	10		4129.6			
MAD				714.6		
MAPE					19.4	
MSE						683,883.39

MAR	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	3,984				
FY10	2	3,107				
FY11	3	4,851				
FY12	4	4,431				
FY13	5	4,700				
FY14	6	4,926				
FY15	7	3,840	4333.2	493.2	12.8	243213.4
FY16	8	3,184	4309.2	1125.2	35.3	1266000.0
FY17	9	3,998	4322.0	324.0	8.1	104976.0
FY18*	10		4179.8			
MAD				647.4		
MAPE					18.8	
MSE						538,063.13

MAR	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	3,984				
FY10	2	3,107				
FY11	3	4,851				
FY12	4	4,431				
FY13	5	4,700				
FY14	6	4,926				
FY15	7	3,840				
FY16	8	3,184	4262.7	1078.7	33.9	1163624.5
FY17	9	3,998	4127.9	129.9	3.2	16867.5
FY18*	10		4129.6			
MAD				604.3		
MAPE					18.6	
MSE						590,246.01

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.4492
w2	0.0175
w3	0.5333
Sum	1.00

MAR	Period	AT Execution Rate	n=3	Error	% Error	Error^2
FY09	1	3,984				
FY10	2	3,107				
FY11	3	4,851				
FY12	4	4,431	4431.0	0.0	0.0	0.0
FY13	5	4,700	3843.6	856.4	18.2	733469.9
FY14	6	4,926	4763.1	162.9	3.3	26527.9
FY15	7	3,840	4699.7	859.7	22.4	739044.6
FY16	8	3,184	4245.3	1061.3	33.3	1126444.6
FY17	9	3,998	3978.0	20.0	0.5	398.6
FY18*	10		3912.8			
MAD				493.4		
MAPE					13.0	
MSE						437,647.60

Weights	n=4
w1	0.0000
w2	0.4673
w3	0.0000
w4	0.5327
Sum	1.00

MAR	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	3,984				
FY10	2	3,107				
FY11	3	4,851				
FY12	4	4,431				
FY13	5	4,700	3812.3	887.7	18.9	787966.4
FY14	6	4,926	4770.6	155.4	3.2	24161.9
FY15	7	3,840	4694.7	854.7	22.3	730508.6
FY16	8	3,184	4241.9	1057.9	33.2	1119064.3
FY17	9	3,998	3998.0	0.0	0.0	0.0
FY18*	10		3924.2			
MAD				591.1		
MAPE					15.5	
MSE						532,340.24

Weights	n=5
w1	0.0993
w2	0.0000
w3	0.3962
w4	0.0000
w5	0.5045
Sum	1.00

MAR	Period	AT Execution Rate	n=5	Error	% Error	Error^2
FY09	1	3,984				
FY10	2	3,107				
FY11	3	4,851				
FY12	4	4,431				
FY13	5	4,700				
FY14	6	4,926	4688.7	237.3	4.8	56294.7
FY15	7	3,840	4549.3	709.3	18.5	503065.7
FY16	8	3,184	4281.1	1097.1	34.5	1203664.5
FY17	9	3,998	3998.0	0.0	0.0	0.0
FY18*	10		4005.1			
MAD				510.9		
MAPE					14.4	
MSE						440,756.22

Weights	n=6
w1	0.0136
w2	0.1249
w3	0.0837
w4	0.2920
w5	0.0000
w6	0.4858
Sum	1.00

MAR	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	3,984				
FY10	2	3,107				
FY11	3	4,851				
FY12	4	4,431				
FY13	5	4,700				
FY14	6	4,926				
FY15	7	3,840	4535.3	695.3	18.1	483393.6
FY16	8	3,184	4256.9	1072.9	33.7	1151118.9
FY17	9	3,998	3998.0	0.0	0.0	0.0
FY18*	10		4123.1			
MAD				589.4		
MAPE					17.3	
MSE						544,837.50

Weights	n=7
w1	0.0000
w2	0.1676
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.0000
W7	0.8324
Sum	1.00

MAR	Period	AT Execution Rate	n=7	Error	% Error	Error^2
FY09	1	3,984				
FY10	2	3,107				
FY11	3	4,851				
FY12	4	4,431				
FY13	5	4,700				
FY14	6	4,926				
FY15	7	3,840				
FY16	8	3,184	4361.7	1177.7	37.0	1386866.5
FY17	9	3,998	3998.0	0.0	0.0	0.0
FY18*	10		4741.6			
MAD				588.8		
MAPE					18.5	
MSE						693,433.24

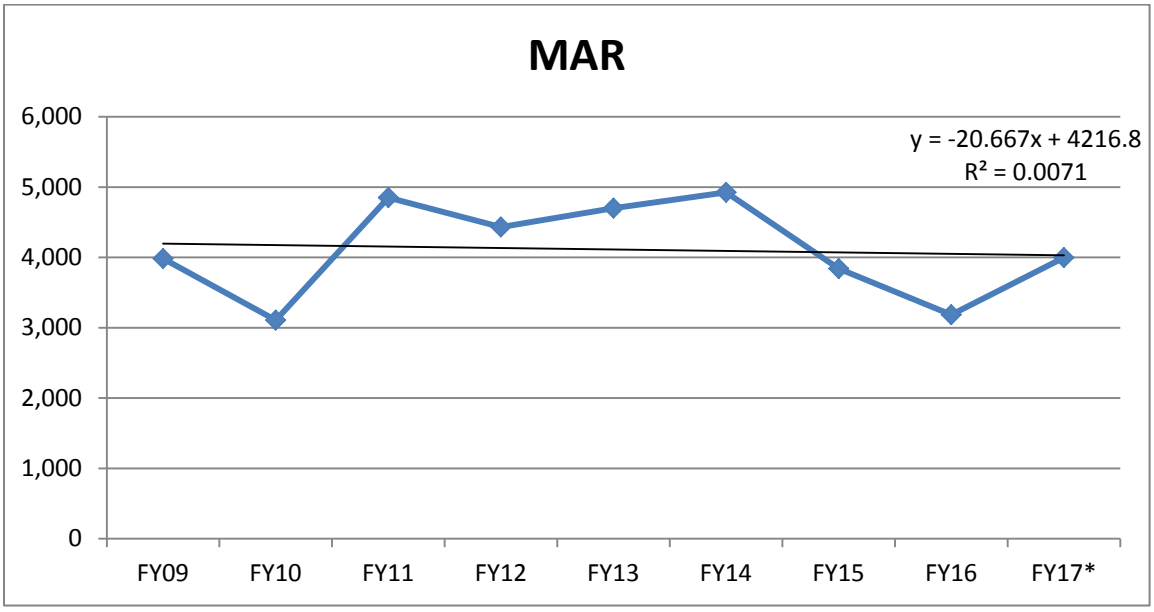
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	0.0000

MAR	Period	AT Executed	ES	Error	% Error	Error^2
FY09	1	3,984	3,984	0.0	0.0	0.0
FY10	2	3,107	3,984.0	877.0	28.2	769129.0
FY11	3	4,851	3,984.0	867.0	17.9	751689.0
FY12	4	4,431	3,984.0	447.0	10.1	199809.0
FY13	5	4,700	3,984.0	716.0	15.2	512656.0
FY14	6	4,926	3,984.0	942.0	19.1	887364.0
FY15	7	3,840	3,984.0	144.0	3.8	20736.0
FY16	8	3,184	3,984.0	800.0	25.1	640000.0
FY17	9	3,998	3,984.0	14.0	0.4	196.0
FY18*	10		3,984.0			
MAD				534.1		
MAPE					13.3	
MSE						420175.4

D. LINEAR TREND ANALYSIS FORECAST MODEL

MAR	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	3,984	4196.1	212.1	5.3	44991.1
FY10	2	3,107	4175.4	1068.4	34.4	1141573.5
FY11	3	4,851	4154.8	696.2	14.4	484725.4
FY12	4	4,431	4134.1	296.9	6.7	88143.0
FY13	5	4,700	4113.4	586.6	12.5	344047.4
FY14	6	4,926	4092.8	833.2	16.9	694259.3
FY15	7	3,840	4072.1	232.1	6.0	53875.6
FY16	8	3,184	4051.4	867.4	27.2	752459.9
FY17	9	3,998	4030.8	32.8	0.8	1074.4
FY18*	10		4010.1			
MAD				536.2		
MAPE					13.8	
MSE						400572.2



Regression Statistics	
Multiple R	0.084013
R Square	0.007058
Adjusted R Square	-0.13479
Standard Error	717.6499
Observations	9

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	25626.66667	25626.667	0.049758	0.829854
Residual	7	3605149.556	515021.37		
Total	8	3630776.222			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	4216.778	521.3605581	8.0880261	8.5E-05	2983.956	5449.599597	2983.956	5449.6
Period	-20.6667	92.64820245	-0.223066	0.829854	-239.745	198.4115197	-239.745	198.4115

E. MARCH DESCRIPTIVE STATISTICS

MAR	
Mean	4113.444
Standard Error	224.5606
Median	3998
Mode	#N/A
Standard Deviation	673.6817
Sample Variance	453847
Kurtosis	-1.13997
Skewness	-0.35481
Range	1819
Minimum	3107
Maximum	4926
Sum	37021
Count	9

APPENDIX M. APRIL FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

APR	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	4,111				
FY10	2	3,128				
FY11	3	3,255				
FY12	4	4,667	3498.0	1169.0	25.0	1366561.0
FY13	5	5,155	3683.3	1471.7	28.5	2165802.8
FY14	6	4,204	4359.0	155.0	3.7	24025.0
FY15	7	4,191	4675.3	484.3	11.6	234578.8
FY16	8	4,597	4516.7	80.3	1.7	6453.4
FY17	9	3,713	4330.7	617.7	16.6	381512.1
FY18*	10		4167.0			
MAD				663.0		
MAPE					14.5	
MSE						696,488.85

APR	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	4,111				
FY10	2	3,128				
FY11	3	3,255				
FY12	4	4,667				
FY13	5	5,155	3790.3	1364.8	26.5	1862542.6
FY14	6	4,204	4051.3	152.8	3.6	23332.6
FY15	7	4,191	4320.3	129.3	3.1	16705.6
FY16	8	4,597	4554.3	42.8	0.9	1827.6
FY17	9	3,713	4536.8	823.8	22.2	678564.1
FY18*	10		4176.3			
MAD				502.7		
MAPE					11.3	
MSE						516,594.46

APR	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	4,111				
FY10	2	3,128				
FY11	3	3,255				
FY12	4	4,667				
FY13	5	5,155				
FY14	6	4,204	4063.2	140.8	3.3	19824.6
FY15	7	4,191	4081.8	109.2	2.6	11924.6
FY16	8	4,597	4294.4	302.6	6.6	91566.8
FY17	9	3,713	4562.8	849.8	22.9	722160.0
FY18*	10		4372.0			
MAD				350.6		
MAPE					8.9	
MSE						211,369.02

APR	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	4,111				
FY10	2	3,128				
FY11	3	3,255				
FY12	4	4,667				
FY13	5	5,155				
FY14	6	4,204				
FY15	7	4,191	4086.7	104.3	2.5	10885.4
FY16	8	4,597	4100.0	497.0	10.8	247009.0
FY17	9	3,713	4344.8	631.8	17.0	399213.4
FY18*	10		4421.2			
MAD				411.1		
MAPE					10.1	
MSE						219,035.94

APR	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	4,111				
FY10	2	3,128				
FY11	3	3,255				
FY12	4	4,667				
FY13	5	5,155				
FY14	6	4,204				
FY15	7	4,191				
FY16	8	4,597	4101.6	495.4	10.8	245449.5
FY17	9	3,713	4163.5	450.5	12.1	202950.3
FY18*	10		4113.8			
MAD				473.0		
MAPE					11.5	
MSE						224,199.86

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.5005
w2	0.0000
w3	0.4995
Sum	1.00

APR	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	4,111				
FY10	2	3,128				
FY11	3	3,255				
FY12	4	4,667	3683.5	983.5	21.1	967369.7
FY13	5	5,155	3896.7	1258.3	24.4	1583344.1
FY14	6	4,204	4204.0	0.0	0.0	0.0
FY15	7	4,191	4435.7	244.7	5.8	59899.5
FY16	8	4,597	4673.5	76.5	1.7	5853.4
FY17	9	3,713	4400.3	687.3	18.5	472371.9
FY18*	10		3952.3			
MAD				541.7		
MAPE					11.9	
MSE						514,806.40

Weights	n=4
w1	0.1691
w2	0.3185
w3	0.0000
w4	0.5125
Sum	1.00

APR	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	4,111				
FY10	2	3,128				
FY11	3	3,255				
FY12	4	4,667				
FY13	5	5,155	4082.9	1072.1	20.8	1149420.5
FY14	6	4,204	4207.2	3.2	0.1	10.4
FY15	7	4,191	4191.0	0.0	0.0	0.0
FY16	8	4,597	4578.5	18.5	0.4	343.3
FY17	9	3,713	4566.2	853.2	23.0	727926.2
FY18*	10		3948.2			
MAD				389.4		
MAPE					8.9	
MSE						375,540.09

Weights	n=5
w1	0.0643
w2	0.0000
w3	0.4550
w4	0.0397
w5	0.4410
Sum	1.00

APR	Period	AT Execution Rate	n=5	Error	% Error	Error^2
FY09	1	4,111				
FY10	2	3,128				
FY11	3	3,255				
FY12	4	4,667				
FY13	5	5,155				
FY14	6	4,204	4204.0	0.0	0.0	0.0
FY15	7	4,191	4383.2	192.2	4.6	36958.0
FY16	8	4,597	4569.9	27.1	0.6	732.6
FY17	9	3,713	4406.6	693.6	18.7	481028.5
FY18*	10		4058.3			
MAD				228.2		
MAPE					6.0	
MSE						129,679.79

Weights	n=6
w1	0.0104
w2	0.0623
w3	0.1938
w4	0.3964
w5	0.0823
w6	0.2548
Sum	1.00

APR	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	4,111				
FY10	2	3,128				
FY11	3	3,255				
FY12	4	4,667				
FY13	5	5,155				
FY14	6	4,204				
FY15	7	4,191	4213.9	22.9	0.5	524.2
FY16	8	4,597	4597.0	0.0	0.0	0.0
FY17	9	3,713	4506.3	793.3	21.4	629293.9
FY18*	10		4170.2			
MAD				272.1		
MAPE					7.3	
MSE						209,939.37

Weights	n=7
w1	0.0985
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.0000
W7	0.9015
Sum	1.00

APR	Period	AT Execution Rate	n=7	Error	% Error	Error^2
FY09	1	4,111				
FY10	2	3,128				
FY11	3	3,255				
FY12	4	4,667				
FY13	5	5,155				
FY14	6	4,204				
FY15	7	4,191				
FY16	8	4,597	4597.0	0.0	0.0	0.0
FY17	9	3,713	4906.1	1193.1	32.1	1423568.2
FY18*	10		4034.6			
MAD				596.6		
MAPE					16.1	
MSE						711,784.11

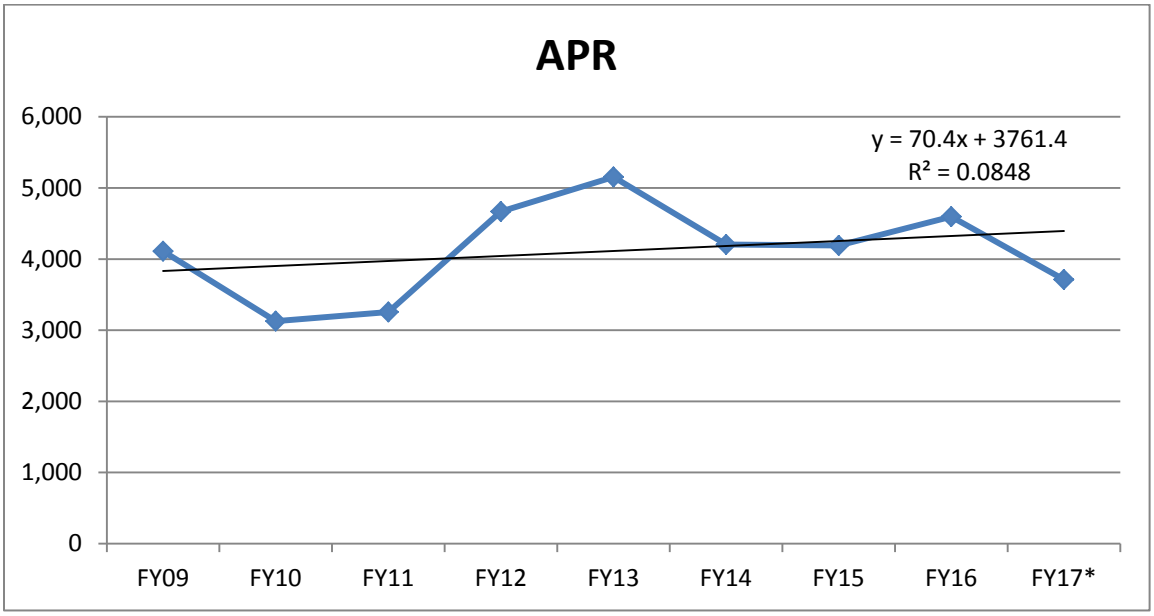
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	0.0000

APR	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	4,111	4,111.0	0.0	0.0	0.0
FY10	2	3,128	4,111.0	983.0	31.4	966289.0
FY11	3	3,255	4,111.0	856.0	26.3	732736.0
FY12	4	4,667	4,111.0	556.0	11.9	309136.0
FY13	5	5,155	4,111.0	1044.0	20.3	1089936.0
FY14	6	4,204	4,111.0	93.0	2.2	8649.0
FY15	7	4,191	4,111.0	80.0	1.9	6400.0
FY16	8	4,597	4,111.0	486.0	10.6	236196.0
FY17	9	3,713	4,111.0	398.0	10.7	158404.0
FY18*	10		4,111.0			
MAD				499.6		
MAPE					12.8	
MSE						389749.6

D. LINEAR TREND ANALYSIS FORECAST MODEL

APR	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	4,111	3831.8	279.2	6.8	77927.8242
FY10	2	3,128	3902.2	774.2	24.8	599454.4598
FY11	3	3,255	3972.6	717.6	22.0	515013.5486
FY12	4	4,667	4043.0	624.0	13.4	389320.5353
FY13	5	5,155	4113.4	1041.6	20.2	1084837.975
FY14	6	4,204	4183.8	20.2	0.5	406.2464198
FY15	7	4,191	4254.2	63.2	1.5	3999.859753
FY16	8	4,597	4324.6	272.4	5.9	74177.54864
FY17	9	3,713	4395.0	682.0	18.4	465184.6242
FY18*	10		4465.4			
MAD				497.2		
MAPE					12.6	
MSE						356702.5136



Regression Statistics	
Multiple R	0.291164
R Square	0.084776
Adjusted R Square	-0.04597
Standard Error	677.2131
Observations	9

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	297369.6	297369.6	0.648404	0.447168
Residual	7	3210322.622	458617.52		
Total	8	3507692.222			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	3761.444	491.983876	7.6454628	0.000122	2598.087	4924.801449	2598.08744	4924.801
Period	70.4	87.42782904	0.8052356	0.447168	-136.334	277.1339648	-136.3339648	277.134

E. APRIL DESCRIPTIVE STATISTICS

APR	
Mean	4113.444
Standard Error	220.7214
Median	4191
Mode	#N/A
Standard Deviation	662.1643
Sample Variance	438461.5
Kurtosis	-0.61818
Skewness	-0.13284
Range	2027
Minimum	3128
Maximum	5155
Sum	37021
Count	9

APPENDIX N. MAY FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

MAY	Period	AT Execution Rate	n=3	Error	% Error	Error^2
FY09	1	4,944				
FY10	2	3,955				
FY11	3	5,185				
FY12	4	4,589	4694.7	105.7	2.3	11165.4
FY13	5	4,573	4576.3	3.3	0.1	11.1
FY14	6	5,233	4782.3	450.7	8.6	203100.4
FY15	7	5,373	4798.3	574.7	10.7	330241.8
FY16	8	3,912	5059.7	1147.7	29.3	1317138.8
FY17	9	2,992	4839.3	1847.3	61.7	3412640.4
FY18	10		4092.3			
MAD				688.2		
MAPE					18.8	
MSE						879,049.67

MAY	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	4,944				
FY10	2	3,955				
FY11	3	5,185				
FY12	4	4,589				
FY13	5	4,573	4668.3	95.3	2.1	9072.6
FY14	6	5,233	4575.5	657.5	12.6	432306.3
FY15	7	5,373	4895.0	478.0	8.9	228484.0
FY16	8	3,912	4942.0	1030.0	26.3	1060900.0
FY17	9	2,992	4772.8	1780.8	59.5	3171070.6
FY18	10		4377.5			
MAD				808.3		
MAPE					21.9	
MSE						980,366.68

MAY	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	4,944				
FY10	2	3,955				
FY11	3	5,185				
FY12	4	4,589				
FY13	5	4,573				
FY14	6	5,233	4649.2	583.8	11.2	340822.4
FY15	7	5,373	4707.0	666.0	12.4	443556.0
FY16	8	3,912	4990.6	1078.6	27.6	1163378.0
FY17	9	2,992	4736.0	1744.0	58.3	3041536.0
FY18	10		4416.6			
MAD				1018.1		
MAPE					27.4	
MSE						1,247,323.10

MAY	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	4,944				
FY10	2	3,955				
FY11	3	5,185				
FY12	4	4,589				
FY13	5	4,573				
FY14	6	5,233				
FY15	7	5,373	4746.5	626.5	11.7	392502.3
FY16	8	3,912	4818.0	906.0	23.2	820836.0
FY17	9	2,992	4810.8	1818.8	60.8	3308154.7
FY18	10		4445.3			
MAD				1117.1		
MAPE					31.9	
MSE						1,507,164.31

MAY	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	4,944				
FY10	2	3,955				
FY11	3	5,185				
FY12	4	4,589				
FY13	5	4,573				
FY14	6	5,233				
FY15	7	5,373				
FY16	8	3,912	4836.0	924.0	23.6	853776.0
FY17	9	2,992	4720.5	1728.5	57.8	2987712.3
FY18	10		4476.5			
MAD				1326.3		
MAPE					40.7	
MSE						1,920,744.13

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.0000
w2	0.0000
w3	1.0000
Sum	1.00

MAY	Period	AT Execution Rate	n=3	Error	% Error	Error^2
FY09	1	4,944				
FY10	2	3,955				
FY11	3	5,185				
FY12	4	4,589	5185.0	596.0	13.0	355216.0
FY13	5	4,573	4589.0	16.0	0.3	256.0
FY14	6	5,233	4573.0	660.0	12.6	435600.0
FY15	7	5,373	5233.0	140.0	2.6	19600.0
FY16	8	3,912	5373.0	1461.0	37.3	2134520.9
FY17	9	2,992	3912.0	920.0	30.7	846400.0
FY18*	10		2992.0			
MAD				632.2		
MAPE					16.1	
MSE						631,932.15

Weights	n=4
w1	0.4081
w2	0.2538
w3	0.0000
w4	0.3381
Sum	1.00

MAY	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	4,944				
FY10	2	3,955				
FY11	3	5,185				
FY12	4	4,589				
FY13	5	4,573	4573.0	0.0	0.0	0.0
FY14	6	5,233	4476.1	756.9	14.5	572920.0
FY15	7	5,373	5050.0	323.0	6.0	104332.2
FY16	8	3,912	4850.0	938.0	24.0	879923.1
FY17	9	2,992	4517.0	1525.0	51.0	2325519.2
FY18*	10		4510.8			
MAD				708.6		
MAPE					19.1	
MSE						776,538.91

Weights	n=5
w1	0.0000
w2	0.0000
w3	0.0000
w4	0.0000
w5	1.0000
Sum	1.00

MAY	Period	AT Execution Rate	n=5	Error	% Error	Error^2
FY09	1	4,944				
FY10	2	3,955				
FY11	3	5,185				
FY12	4	4,589				
FY13	5	4,573				
FY14	6	5,233	4573.0	660.0	12.6	435600.2
FY15	7	5,373	5233.0	140.0	2.6	19600.0
FY16	8	3,912	5373.0	1461.0	37.3	2134520.5
FY17	9	2,992	3912.0	920.0	30.7	846399.8
FY18*	10		2992.0			
MAD				795.3		
MAPE					20.8	
MSE						859,030.14

Weights	n=6
w1	0.0000
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.0000
w6	1.0000
Sum	1.00

MAY	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	4,944				
FY10	2	3,955				
FY11	3	5,185				
FY12	4	4,589				
FY13	5	4,573				
FY14	6	5,233				
FY15	7	5,373	5233.0	140.0	2.6	19600.0
FY16	8	3,912	5373.0	1461.0	37.3	2134521.3
FY17	9	2,992	3912.0	920.0	30.7	846400.1
FY18*	10		2992.0			
MAD				840.3		
MAPE					23.6	
MSE						1,000,173.81

Weights	n=7
w1	0.0000
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.0000
W7	1.0000
Sum	1.00

MAY	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	4,944				
FY10	2	3,955				
FY11	3	5,185				
FY12	4	4,589				
FY13	5	4,573				
FY14	6	5,233				
FY15	7	5,373				
FY16	8	3,912	5374.0	1462.0	37.4	2137444.0
FY17	9	2,992	3913.0	921.0	30.8	848241.0
FY18*	10		2993.0			
MAD				1191.5		
MAPE					34.1	
MSE						1,492,842.50

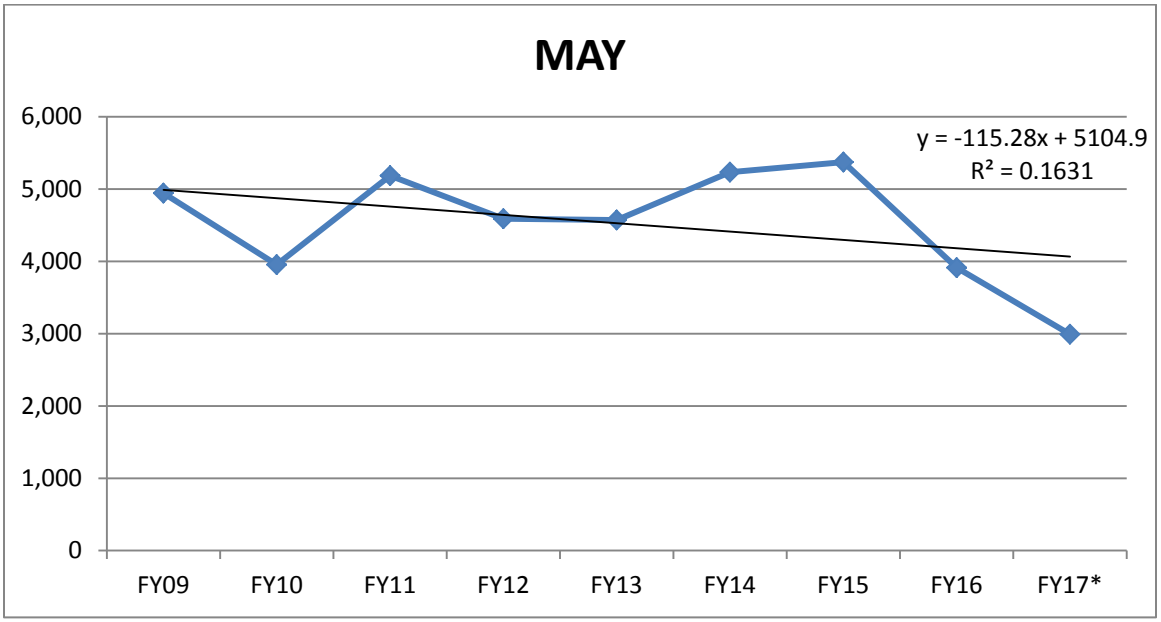
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	0.1580

MAY	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	4,944	4,944	0.0	0.0	0.0
FY10	2	3,955	4,944.0	989.0	25.0	978121.0
FY11	3	5,185	4,787.8	397.2	7.7	157795.9
FY12	4	4,589	4,850.5	261.5	5.7	68391.2
FY13	5	4,573	4,809.2	236.2	5.2	55792.6
FY14	6	5,233	4,771.9	461.1	8.8	212621.9
FY15	7	5,373	4,844.7	528.3	9.8	279065.6
FY16	8	3,912	4,928.2	1016.2	26.0	1032632.5
FY17	9	2,992	4,767.7	1775.7	59.3	3152952.2
FY18	10		4,487.1			
MAD				629.5		
MAPE					16.4	
MSE						659708.1

D. LINEAR TREND ANALYSIS FORECAST MODEL

MAY	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	4,944	4989.6	45.6	0.9	2077.3
FY10	2	3,955	4874.3	919.3	23.2	845102.3
FY11	3	5,185	4759.0	426.0	8.2	181466.5
FY12	4	4,589	4643.7	54.7	1.2	2995.1
FY13	5	4,573	4528.4	44.6	1.0	1985.2
FY14	6	5,233	4413.2	819.8	15.7	672135.8
FY15	7	5,373	4297.9	1075.1	20.0	1155887.8
FY16	8	3,912	4182.6	270.6	6.9	73221.4
FY17	9	2,992	4067.3	1075.3	35.9	1156294.0
FY18	10		3952.0			
MAD				525.7		
MAPE					12.6	
MSE						454573.9



Regression Statistics								
Multiple R	0.403879							
R Square	0.163118							
Adjusted R Square	0.043563							
Standard Error	764.4947							
Observations	9							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	1	797414.8167	797414.82	1.36438	0.281019			
Residual	7	4091165.406	584452.2					
Total	8	4888580.222						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	5104.861	555.3925492	9.1914469	3.72E-05	3791.566	6418.155802	3791.56642	6418.156
Period	-115.283	98.69584598	-1.1680667	0.281019	-348.662	118.0952576	-348.6619243	118.0953

E. MAY DESCRIPTIVE STATISTICS

MAY	
Mean	4528.444
Standard Error	260.5704
Median	4589
Mode	#N/A
Standard Deviation	781.7113
Sample Variance	611072.5
Kurtosis	0.303594
Skewness	-0.92274
Range	2381
Minimum	2992
Maximum	5373
Sum	40756
Count	9

APPENDIX O. JUNE FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

JUN	Period	AT Execution Rate	n=3	Error	% Error	Error^2
FY09	1	5,866				
FY10	2	5,778				
FY11	3	6,491				
FY12	4	5,910	6045.0	135.0	2.3	18225.0
FY13	5	6,784	6059.7	724.3	10.7	524658.8
FY14	6	6,750	6395.0	355.0	5.3	126025.0
FY15	7	6,284	6481.3	197.3	3.1	38940.4
FY16	8	6,192	6606.0	414.0	6.7	171396.0
FY17*	9		6408.7			
MAD				365.1		
MAPE					5.6	
MSE						175,849.04

JUN	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	5,866				
FY10	2	5,778				
FY11	3	6,491				
FY12	4	5,910				
FY13	5	6,784	6011.3	772.8	11.4	597142.6
FY14	6	6,750	6240.8	509.3	7.5	259335.6
FY15	7	6,284	6483.8	199.8	3.2	39900.1
FY16	8	6,192	6432.0	240.0	3.9	57600.0
FY17*	9		6502.5			
MAD				430.4		
MAPE					6.5	
MSE						238,494.55

JUN	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	5,866				
FY10	2	5,778				
FY11	3	6,491				
FY12	4	5,910				
FY13	5	6,784				
FY14	6	6,750	6165.8	584.2	8.7	341289.6
FY15	7	6,284	6342.6	58.6	0.9	3434.0
FY16	8	6,192	6443.8	251.8	4.1	63403.2
FY17*	9		6384.0			
MAD				298.2		
MAPE					4.6	
MSE						136,042.28

JUN	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	5,866				
FY10	2	5,778				
FY11	3	6,491				
FY12	4	5,910				
FY13	5	6,784				
FY14	6	6,750				
FY15	7	6,284	6263.2	20.8	0.3	434.0
FY16	8	6,192	6332.8	140.8	2.3	19834.0
FY17*	9		6401.8			
MAD				80.8		
MAPE					1.3	
MSE						10,134.03

JUN	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	5,866				
FY10	2	5,778				
FY11	3	6,491				
FY12	4	5,910				
FY13	5	6,784				
FY14	6	6,750				
FY15	7	6,284				
FY16	8	6,192	6266.1	74.1	1.2	5497.2
FY17*	9		6256.9			
MAD				74.1		
MAPE					1.2	
MSE						5,497.16

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.1369
w2	0.0000
w3	0.8631
Sum	1.00

JUN	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291	1932.7	358.3	15.6	128412.7
FY13	5	2,119	2119.0	0.0	0.0	0.0
FY14	6	2,734	2109.1	624.9	22.9	390449.9
FY15	7	1,850	2673.3	823.3	44.5	677879.5
FY16	8	1,737	1886.8	149.8	8.6	22451.3
FY17	9		1873.5			
MAD				391.3		
MAPE					18.3	
MSE						243,838.67

Weights	n=4
w1	0.0000
w2	0.1369
w3	0.0000
w4	0.8631
Sum	1.00

JUN	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119	2119.0	0.0	0.0	0.0
FY14	6	2,734	2109.1	624.9	22.9	390449.4
FY15	7	1,850	2673.3	823.3	44.5	677878.3
FY16	8	1,737	1886.8	149.8	8.6	22451.7
FY17	9		1873.5			
MAD				399.5		
MAPE					19.0	
MSE						272,694.86

Weights	n=5
w1	0.3511
w2	0.0000
w3	0.6489
w4	0.0000
w5	0.0000
Sum	1.00

JUN	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119				
FY14	6	2,734	1753.8	980.2	35.9	960754.2
FY15	7	1,850	1850.0	0.0	0.0	0.0
FY16	8	1,737	2093.7	356.7	20.5	127248.9
FY17	9		2578.5			
MAD				445.6		
MAPE					18.8	
MSE						362,667.71

Weights	n=6
w1	0.0302
w2	0.4180
w3	0.1860
w4	0.0001
w5	0.0000
w6	0.3656
Sum	1.00

JUN	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119				
FY14	6	2,734				
FY15	7	1,850	1850.0	0.0	0.0	0.0
FY16	8	1,737	1989.8	252.8	14.6	63899.8
FY17	9		2049.1			
MAD				126.4		
MAPE					7.3	
MSE						31,949.91

Weights	n=7
w1	0.0000
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.0000
W7	1.0000
Sum	1.00

JUN	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	1,212				
FY10	2	1,035				
FY11	3	2,047				
FY12	4	2,291				
FY13	5	2,119				
FY14	6	2,734				
FY15	7	1,850				
FY16	8	1,737	1851.0	114.0	6.6	12996.0
FY17	9		1738.0			
MAD				114.0		
MAPE					6.6	
MSE						12,996.00

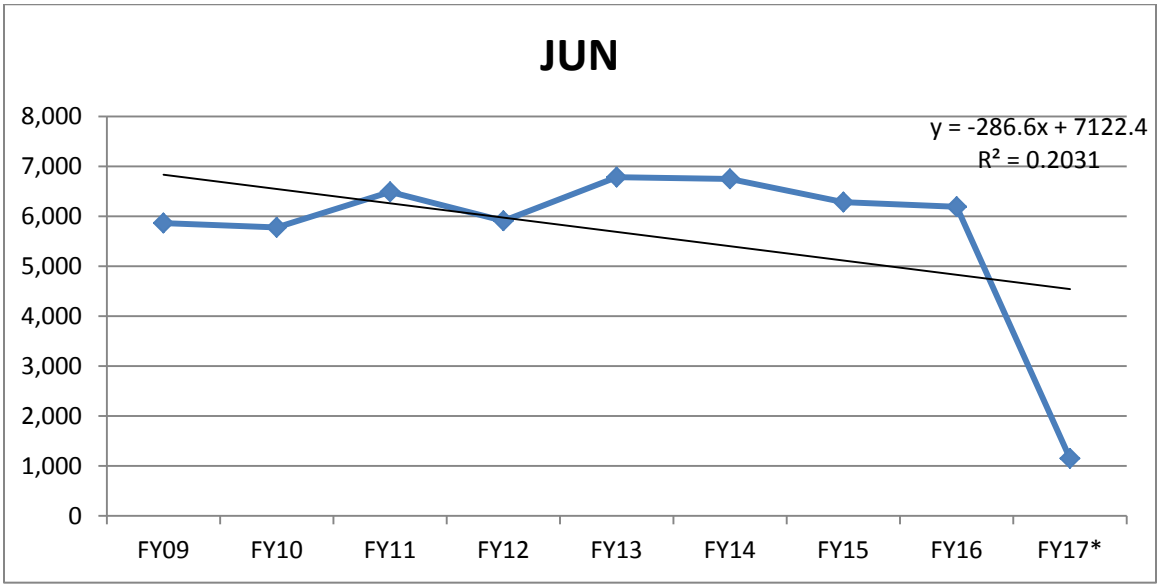
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	0.2214

JUN	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	5,866	5,866	0.0	0.0	0.0
FY10	2	5,778	5,866.0	88.0	1.5	7744.0
FY11	3	6,491	5,846.5	644.5	9.9	415356.8
FY12	4	5,910	5,989.2	79.2	1.3	6272.1
FY13	5	6,784	5,971.7	812.3	12.0	659890.6
FY14	6	6,750	6,151.5	598.5	8.9	358199.9
FY15	7	6,284	6,284.0	0.0	0.0	0.0
FY16	8	6,192	6,284.0	92.0	1.5	8464.0
FY17*	9		6,263.6			
MAD				289.3		
MAPE					4.4	
MSE						181990.9

D. LINEAR TREND ANALYSIS FORECAST MODEL

JUN	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	5,866	5987.6	121.6	2.1	14782.5
FY10	2	5,778	6064.5	286.5	5.0	82095.9
FY11	3	6,491	6141.5	349.5	5.4	122175.2
FY12	4	5,910	6218.4	308.4	5.2	95113.5
FY13	5	6,784	6295.3	488.7	7.2	238783.5
FY14	6	6,750	6372.3	377.7	5.6	142668.1
FY15	7	6,284	6449.2	165.2	2.6	27299.7
FY16	8	6,192	6526.2	334.2	5.4	111667.4
FY17*	9		6603.1			
MAD				304.0		
MAPE					4.8	
MSE						104323.2



Regression Statistics								
Multiple R	0.479095							
R Square	0.229532							
Adjusted R Square	0.10112							
Standard Error	372.9579							
Observations	8							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	1	248633.1488	248633.15	1.78747	0.229691			
Residual	6	834585.7262	139097.62					
Total	7	1083218.875						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	5910.643	290.6064814	20.338992	9.2E-07	5199.554	6621.731301	5199.554414	6621.731
Period	76.94048	57.54865871	1.3369638	0.22969	-63.876	217.7569712	-63.87601883	217.757

E. JUNE DESCRIPTIVE STATISTICS

JUN	
Mean	5,689.44
Standard Error	580.54
Median	6,192.00
Mode	#N/A
Standard Deviation	1,741.61
Sample Variance	3,033,199.28
Kurtosis	7.89
Skewness	(2.74)
Range	5,634.00
Minimum	1,150.00
Maximum	6,784.00
Sum	51,205.00
Count	9.0

APPENDIX P. JULY FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

JUL	Period	AT Execution Rate	n=3	Error	% Error	Error^2
FY09	1	6,227				
FY10	2	8,155				
FY11	3	7,282				
FY12	4	7,035	7221.3	186.3	2.6	34720.1
FY13	5	5,807	7490.7	1683.7	29.0	2834733.4
FY14	6	6,511	6708.0	197.0	3.0	38809.0
FY15	7	5,177	6451.0	1274.0	24.6	1623076.0
FY16	8	6,168	5831.7	336.3	5.5	113120.1
FY17*	9		5952.0			
MAD				735.5		
MAPE					12.9	
MSE						928,891.73

JUL	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	6,227				
FY10	2	8,155				
FY11	3	7,282				
FY12	4	7,035				
FY13	5	5,807	7174.8	1367.8	23.6	1870740.1
FY14	6	6,511	7069.8	558.8	8.6	312201.6
FY15	7	5,177	6658.8	1481.8	28.6	2195583.1
FY16	8	6,168	6132.5	35.5	0.6	1260.3
FY17*	9		5915.8			
MAD				860.9		
MAPE					15.3	
MSE						1,094,946.23

JUL	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	6,227				
FY10	2	8,155				
FY11	3	7,282				
FY12	4	7,035				
FY13	5	5,807				
FY14	6	6,511	6901.2	390.2	6.0	152256.0
FY15	7	5,177	6958.0	1781.0	34.4	3171961.0
FY16	8	6,168	6362.4	194.4	3.2	37791.4
FY17*	9		6139.6			
MAD				788.5		
MAPE					14.5	
MSE						1,120,669.47

JUL	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	6,227				
FY10	2	8,155				
FY11	3	7,282				
FY12	4	7,035				
FY13	5	5,807				
FY14	6	6,511				
FY15	7	5,177	6836.2	1659.2	32.0	2752834.0
FY16	8	6,168	6661.2	493.2	8.0	243213.4
FY17*	9		6330.0			
MAD				1076.2		
MAPE					20.0	
MSE						1,498,023.69

JUL	Period	AT Execution Rate	n=7	Error	% Error	Error^2
FY09	1	6,227				
FY10	2	8,155				
FY11	3	7,282				
FY12	4	7,035				
FY13	5	5,807				
FY14	6	6,511				
FY15	7	5,177				
FY16	8	6,168	6599.1	431.1	7.0	185884.2
FY17*	9		6545.3			
MAD				431.1		
MAPE					7.0	
MSE						185,884.16

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.0000
w2	0.5736
w3	0.4264
Sum	1.00

JUL	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	6,227				
FY10	2	8,155				
FY11	3	7,282				
FY12	4	7,035	7782.8	747.8	10.6	559143.8
FY13	5	5,807	7176.7	1369.7	23.6	1876026.1
FY14	6	6,511	6511.4	0.4	0.0	0.2
FY15	7	5,177	6107.2	930.2	18.0	865235.8
FY16	8	6,168	5942.2	225.8	3.7	50989.2
FY17	9		5599.6			
MAD				654.8		
MAPE					11.2	
MSE						670,279.01

Weights	n=4
w1	0.0000
w2	0.0000
w3	0.7429
w4	0.2571
Sum	1.00

JUL	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	6,227				
FY10	2	8,155				
FY11	3	7,282				
FY12	4	7,035				
FY13	5	5,807	7218.5	1411.5	24.3	1992307.0
FY14	6	6,511	6719.3	208.3	3.2	43370.1
FY15	7	5,177	5988.0	811.0	15.7	657743.1
FY16	8	6,168	6168.0	0.0	0.0	0.0
FY17	9		5431.8			
MAD				607.7		
MAPE					10.8	
MSE						673,355.04

Weights	n=5
w1	0.0655
w2	0.2669
w3	0.0000
w4	0.0406
w5	0.6270
Sum	1.00

JUL	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	6,227				
FY10	2	8,155				
FY11	3	7,282				
FY12	4	7,035				
FY13	5	5,807				
FY14	6	6,511	6511.0	0.0	0.0	0.0
FY15	7	5,177	6795.9	1618.9	31.3	2620682.7
FY16	8	6,168	5864.9	303.1	4.9	91875.3
FY17	9		6088.2			
MAD				640.7		
MAPE					12.1	
MSE						904,185.99

Weights	n=6
w1	0.0095
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.7216
w6	0.2689
Sum	1.00

JUL	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	6,227				
FY10	2	8,155				
FY11	3	7,282				
FY12	4	7,035				
FY13	5	5,807				
FY14	6	6,511				
FY15	7	5,177	6000.3	823.3	15.9	677803.1
FY16	8	6,168	6168.0	0.0	0.0	0.0
FY17	9		5463.5			
MAD				411.6		
MAPE					8.0	
MSE						338,901.53

Weights	n=7
w1	0.0000
w2	0.0001
w3	0.0001
w4	0.0001
w5	0.0001
w6	0.1518
W7	0.8480
Sum	1.00

JUL	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	6,227				
FY10	2	8,155				
FY11	3	7,282				
FY12	4	7,035				
FY13	5	5,807				
FY14	6	6,511				
FY15	7	5,177				
FY16	8	6,168	6168.0	0.0	0.0	0.0
FY17	9		6956.5			
MAD				0.0		
MAPE					0.0	
MSE						0.00

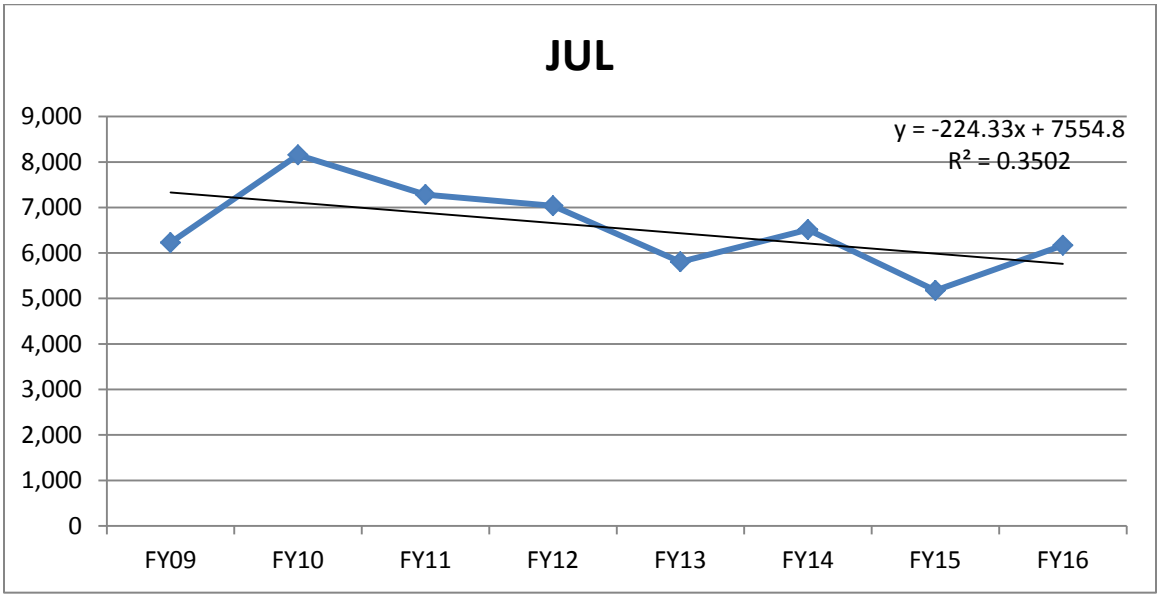
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	0.3501

JUL	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	6,227	6,227	0.0	0.0	0.0
FY10	2	8,155	6,227.0	1928.0	23.6	3717184.0
FY11	3	7,282	6,902.0	380.0	5.2	144435.4
FY12	4	7,035	7,035.0	0.0	0.0	0.0
FY13	5	5,807	7,035.0	1228.0	21.1	1507984.0
FY14	6	6,511	6,605.1	94.1	1.4	8855.2
FY15	7	5,177	6,572.2	1395.2	26.9	1946468.6
FY16	8	6,168	6,083.7	84.3	1.4	7099.4
FY17*	9		6,113.2			
MAD				638.7		
MAPE					10.0	
MSE						916503.3

D. LINEAR TREND ANALYSIS FORECAST MODEL

JUL	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	6,227	7330.4	1103.4	17.7	1217528.3
FY10	2	8,155	7106.1	1048.9	12.9	1100226.2
FY11	3	7,282	6881.8	400.3	5.5	160200.1
FY12	4	7,035	6657.4	377.6	5.4	142569.2
FY13	5	5,807	6433.1	626.1	10.8	391980.3
FY14	6	6,511	6208.8	302.3	4.6	91355.1
FY15	7	5,177	5984.4	807.4	15.6	651921.7
FY16	8	6,168	5760.1	407.9	6.6	166396.0
FY17*	9		5535.8			
MAD				634.2		
MAPE					9.9	
MSE						490272.1



Regression Statistics	
Multiple R	0.591765
R Square	0.350186
Adjusted R Square	0.241884
Standard Error	808.5148
Observations	8

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2113668.667	2113668.7	3.233412	0.122262
Residual	6	3922176.833	653696.14		
Total	7	6035845.5			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	7554.75	629.989636	11.991864	2.04E-05	6013.221	9096.279106	6013.220894	9096.279
Period	-224.333	124.756538	-1.798169	0.122262	-529.602	80.9349181	-529.6015848	80.93492

E. JULY DESCRIPTIVE STATISTICS

JUL	
Mean	6545.25
Standard Error	328.3031
Median	6369
Mode	#N/A
Standard Deviation	928.5815
Sample Variance	862263.6
Kurtosis	0.126113
Skewness	0.389878
Range	2978
Minimum	5177
Maximum	8155
Sum	52362
Count	8

APPENDIX Q. AUGUST FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

AUG	Period	AT Execution Rate	n=3	Error	% Error	Error^2
FY09	1	6,884				
FY10	2	9,069				
FY11	3	5,831				
FY12	4	3,954	7261.3	3307.3	83.6	10938453.8
FY13	5	3,808	6284.7	2476.7	65.0	6133877.8
FY14	6	3,657	4531.0	874.0	23.9	763876.0
FY15	7	4,892	3806.3	1085.7	22.2	1178672.1
FY16	8	3,613	4119.0	506.0	14.0	256036.0
FY17*	9		4054.0			
MAD				1649.9		
MAPE					41.8	
MSE						3,854,183.13

AUG	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	6,884				
FY10	2	9,069				
FY11	3	5,831				
FY12	4	3,954				
FY13	5	3,808	6434.5	2626.5	69.0	6898502.3
FY14	6	3,657	5665.5	2008.5	54.9	4034072.3
FY15	7	4,892	4312.5	579.5	11.8	335820.3
FY16	8	3,613	4077.8	464.8	12.9	215992.6
FY17*	9		3992.5			
MAD				1419.8		
MAPE					37.2	
MSE						2,871,096.83

AUG	Period	AT Execution Rate	n=5	Error	% Error	Error^2
FY09	1	6,884				
FY10	2	9,069				
FY11	3	5,831				
FY12	4	3,954				
FY13	5	3,808				
FY14	6	3,657	5909.2	2252.2	61.6	5072404.8
FY15	7	4,892	5263.8	371.8	7.6	138235.2
FY16	8	3,613	4428.4	815.4	22.6	664877.2
FY17*	9		3984.8			
MAD				1146.5		
MAPE					30.6	
MSE						1,958,505.75

AUG	Period	AT Execution Rate	n=6	Error	% Error	Error^2
FY09	1	6,884				
FY10	2	9,069				
FY11	3	5,831				
FY12	4	3,954				
FY13	5	3,808				
FY14	6	3,657				
FY15	7	4,892	5533.8	641.8	13.1	411950.0
FY16	8	3,613	5201.8	1588.8	44.0	2524391.4
FY17*	9		4292.5			
MAD				1115.3		
MAPE					28.5	
MSE						1,468,170.69

AUG	Period	AT Execution Rate	n=7	Error	% Error	Error^2
FY09	1	6,884				
FY10	2	9,069				
FY11	3	5,831				
FY12	4	3,954				
FY13	5	3,808				
FY14	6	3,657				
FY15	7	4,892				
FY16	8	3,613	5442.1	1829.1	50.6	3345763.6
FY17*	9		5213.5			
MAD				1829.1		
MAPE					50.6	
MSE						3,345,763.59

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.0000
w2	0.0000
w3	1.0000
Sum	1.00

AUG	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	6,884				
FY10	2	9,069				
FY11	3	5,831				
FY12	4	3,954	5831.0	1877.0	47.5	3523128.9
FY13	5	3,808	3954.0	146.0	3.8	21316.0
FY14	6	3,657	3808.0	151.0	4.1	22801.0
FY15	7	4,892	3657.0	1235.0	25.2	1525225.0
FY16	8	3,613	4892.0	1279.0	35.4	1635840.9
FY17	9		3613.0			
MAD				937.6		
MAPE					23.2	
MSE						1,345,662.38

Weights	n=4
w1	0.0000
w2	0.0000
w3	0.0000
w4	1.0000
Sum	1.00

AUG	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	6,884				
FY10	2	9,069				
FY11	3	5,831				
FY12	4	3,954				
FY13	5	3,808	3954.0	146.0	3.8	21316.0
FY14	6	3,657	3808.0	151.0	4.1	22801.0
FY15	7	4,892	3657.0	1235.0	25.2	1525224.6
FY16	8	3,613	4892.0	1279.0	35.4	1635841.5
FY17	9		3613.0			
MAD				702.8		
MAPE					17.2	
MSE						801,295.81

Weights	n=5
w1	0.0000
w2	0.0000
w3	0.0000
w4	1.0000
w5	0.0000
Sum	1.00

AUG	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	6,884				
FY10	2	9,069				
FY11	3	5,831				
FY12	4	3,954				
FY13	5	3,808				
FY14	6	3,657	3954.0	297.0	8.1	88209.0
FY15	7	4,892	3808.0	1084.0	22.2	1175056.0
FY16	8	3,613	3657.0	44.0	1.2	1936.0
FY17	9		4892.0			
MAD				475.0		
MAPE					10.5	
MSE						421,733.67

Weights	n=6
w1	0.0000
w2	0.0000
w3	0.5358
w4	0.0000
w5	0.4642
w6	0.0000
Sum	1.00

AUG	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	6,884				
FY10	2	9,069				
FY11	3	5,831				
FY12	4	3,954				
FY13	5	3,808				
FY14	6	3,657				
FY15	7	4,892	4892.0	0.0	0.0	0.0
FY16	8	3,613	3816.1	203.1	5.6	41267.4
FY17	9		4311.2			
MAD				101.6		
MAPE					2.8	
MSE						20,633.70

Weights	n=7
w1	0.0000
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.0000
W7	1.0000
Sum	1.00

AUG	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	6,884				
FY10	2	9,069				
FY11	3	5,831				
FY12	4	3,954				
FY13	5	3,808				
FY14	6	3,657				
FY15	7	4,892				
FY16	8	3,613	4893.0	1280.0	35.4	1638400.0
FY17	9		3614.0			
MAD				1280.0		
MAPE					35.4	
MSE						1,638,400.00

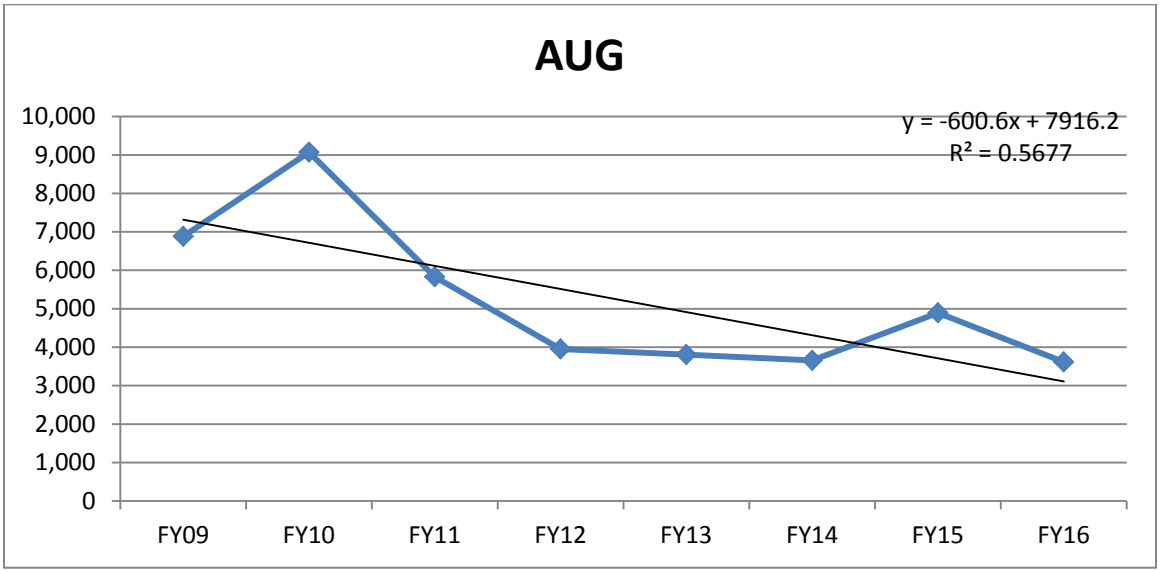
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	1.0000

AUG	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	6,884	6,884	0.0	0.0	0.0
FY10	2	9,069	6,884.0	2185.0	24.1	4774225.0
FY11	3	5,831	9,069.0	3238.0	55.5	10484644.0
FY12	4	3,954	5,831.0	1877.0	47.5	3523129.0
FY13	5	3,808	3,954.0	146.0	3.8	21316.0
FY14	6	3,657	3,808.0	151.0	4.1	22801.0
FY15	7	4,892	3,657.0	1235.0	25.2	1525225.0
FY16	8	3,613	4,892.0	1279.0	35.4	1635841.0
FY17*	9		3,613.0			
MAD				1263.9		
MAPE					24.5	
MSE						2748397.6

D. LINEAR TREND ANALYSIS FORECAST MODEL

AUG	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	6,884	7315.6	431.6	6.3	186264.2
FY10	2	9,069	6715.0	2354.0	26.0	5541372.0
FY11	3	5,831	6114.4	283.4	4.9	80311.5
FY12	4	3,954	5513.8	1559.8	39.4	2432968.6
FY13	5	3,808	4913.2	1105.2	29.0	1221472.3
FY14	6	3,657	4312.6	655.6	17.9	429820.7
FY15	7	4,892	3712.0	1180.0	24.1	1392371.9
FY16	8	3,613	3111.4	501.6	13.9	251585.8
FY17*	9		2510.8			
MAD				1008.9		
MAPE					20.2	
MSE						1442020.9



Regression Statistics	
Multiple R	0.753465
R Square	0.56771
Adjusted R Square	0.495662
Standard Error	1386.613
Observations	8

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	15150014.88	15150015	7.879575	0.030876
Residual	6	11536167.12	1922694.5		
Total	7	26686182			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	7916.179	1080.439838	7.3268111	0.00033	5272.438	10559.91962	5272.437527	10559.92
Period	-600.595	213.9589702	-2.807058	0.030876	-1124.13	-77.05649814	-1124.133978	-77.0565

E. AUGUST DESCRIPTIVE STATISTICS

AUG	
Mean	5213.5
Standard Error	690.318
Median	4423
Mode	#N/A
Standard Deviation	1952.514
Sample Variance	3812312
Kurtosis	0.944726
Skewness	1.267442
Range	5456
Minimum	3613
Maximum	9069
Sum	41708
Count	8

APPENDIX R. SEPTEMBER FORECAST MODELS BY FY (DOLLARS)

A. MOVING AVERAGE FORECAST MODELS

SEP	Period	AT Execution Rate	n=3	Error	% Error	Error^2
FY09	1	4,793				
FY10	2	3,865				
FY11	3	2,310				
FY12	4	761	3656.0	2895.0	380.4	8381025.0
FY13	5	2,327	2312.0	15.0	0.6	225.0
FY14	6	1,808	1799.3	8.7	0.5	75.1
FY15	7	2,252	1632.0	620.0	27.5	384400.0
FY16	8	1,344	2129.0	785.0	58.4	616225.0
FY17*	9		1801.3			
MAD				864.7		
MAPE					93.5	
MSE						1,876,390.02

SEP	Period	AT Execution Rate	n=4	Error	% Error	Error^2
FY09	1	4,793				
FY10	2	3,865				
FY11	3	2,310				
FY12	4	761				
FY13	5	2,327	2932.3	605.3	26.0	366327.6
FY14	6	1,808	2315.8	507.8	28.1	257810.1
FY15	7	2,252	1801.5	450.5	20.0	202950.3
FY16	8	1,344	1787.0	443.0	33.0	196249.0
FY17*	9		1932.8			
MAD				501.6		
MAPE					26.8	
MSE						255,834.22

SEP	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	4,793				
FY10	2	3,865				
FY11	3	2,310				
FY12	4	761				
FY13	5	2,327				
FY14	6	1,808	2811.2	1003.2	55.5	1006410.2
FY15	7	2,252	2214.2	37.8	1.7	1428.8
FY16	8	1,344	1891.6	547.6	40.7	299865.8
FY17*	9		1698.4			
MAD				529.5		
MAPE					32.6	
MSE						435,901.61

SEP	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	4,793				
FY10	2	3,865				
FY11	3	2,310				
FY12	4	761				
FY13	5	2,327				
FY14	6	1,808				
FY15	7	2,252	2644.0	392.0	17.4	153664.0
FY16	8	1,344	2220.5	876.5	65.2	768252.3
FY17*	9		1800.3			
MAD				634.3		
MAPE					41.3	
MSE						460,958.13

SEP	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	4,793				
FY10	2	3,865				
FY11	3	2,310				
FY12	4	761				
FY13	5	2,327				
FY14	6	1,808				
FY15	7	2,252				
FY16	8	1,344	2588.0	1244.0	92.6	1547536.0
FY17*	9		2432.5			
MAD				1244.0		
MAPE					92.6	
MSE						1,547,536.00

B. WEIGHTED MOVING AVERAGE FORECAST MODELS

Weights	n=3
w1	0.0000
w2	0.3314
w3	0.6686
Sum	1.00

SEP	Period	AT Execution Rate	n=3	Error	% Error	$Error^2$
FY09	1	4,793				
FY10	2	3,865				
FY11	3	2,310				
FY12	4	761	2825.4	2064.4	271.3	4261541.0
FY13	5	2,327	1274.4	1052.6	45.2	1108047.8
FY14	6	1,808	1808.0	0.0	0.0	0.0
FY15	7	2,252	1980.0	272.0	12.1	73981.7
FY16	8	1,344	2104.9	760.9	56.6	578895.5
FY17	9		1644.9			
MAD				830.0		
MAPE					77.0	
MSE						1,204,493.19

Weights	n=4
w1	0.1895
w2	0.0000
w3	0.5176
w4	0.2929
Sum	1.00

SEP	Period	AT Execution Rate	n=4	Error	% Error	$Error^2$
FY09	1	4,793				
FY10	2	3,865				
FY11	3	2,310				
FY12	4	761				
FY13	5	2,327	2327.0	0.0	0.0	0.0
FY14	6	1,808	1808.0	0.0	0.0	0.0
FY15	7	2,252	2171.8	80.2	3.6	6434.9
FY16	8	1,344	1739.6	395.6	29.4	156480.2
FY17	9		2000.3			
MAD				119.0		
MAPE					8.2	
MSE						40,728.78

Weights	n=5
w1	0.0637
w2	0.6006
w3	0.0058
w4	0.0375
w5	0.2925
Sum	1.00

SEP	Period	AT Execution Rate	n=5	Error	% Error	$Error^2$
FY09	1	4,793				
FY10	2	3,865				
FY11	3	2,310				
FY12	4	761				
FY13	5	2,327				
FY14	6	1,808	3348.9	1540.9	85.2	2374286.9
FY15	7	2,252	2253.8	1.8	0.1	3.2
FY16	8	1,344	1344.0	0.0	0.0	0.0
FY17	9		1934.0			
MAD				514.2		
MAPE					28.4	
MSE						791,430.04

Weights	n=6
w1	0.0079
w2	0.0298
w3	0.4534
w4	0.0054
w5	0.2643
w6	0.2392
Sum	1.00

SEP	Period	AT Execution Rate	n=6	Error	% Error	$Error^2$
FY09	1	4,793				
FY10	2	3,865				
FY11	3	2,310				
FY12	4	761				
FY13	5	2,327				
FY14	6	1,808				
FY15	7	2,252	2252.0	0.0	0.0	0.0
FY16	8	1,344	1473.4	129.4	9.6	16749.3
FY17	9		2022.5			
MAD				64.7		
MAPE					4.8	
MSE						8,374.67

Weights	n=7
w1	0.0000
w2	0.0000
w3	0.0000
w4	0.0000
w5	0.0000
w6	0.0000
W7	1.0000
Sum	1.00

SEP	Period	AT Execution Rate	n=7	Error	% Error	$Error^2$
FY09	1	4,793				
FY10	2	3,865				
FY11	3	2,310				
FY12	4	761				
FY13	5	2,327				
FY14	6	1,808				
FY15	7	2,252				
FY16	8	1,344	2253.0	909.0	67.6	826281.0
FY17	9		1345.0			
MAD				909.0		
MAPE					67.6	
MSE						826,281.00

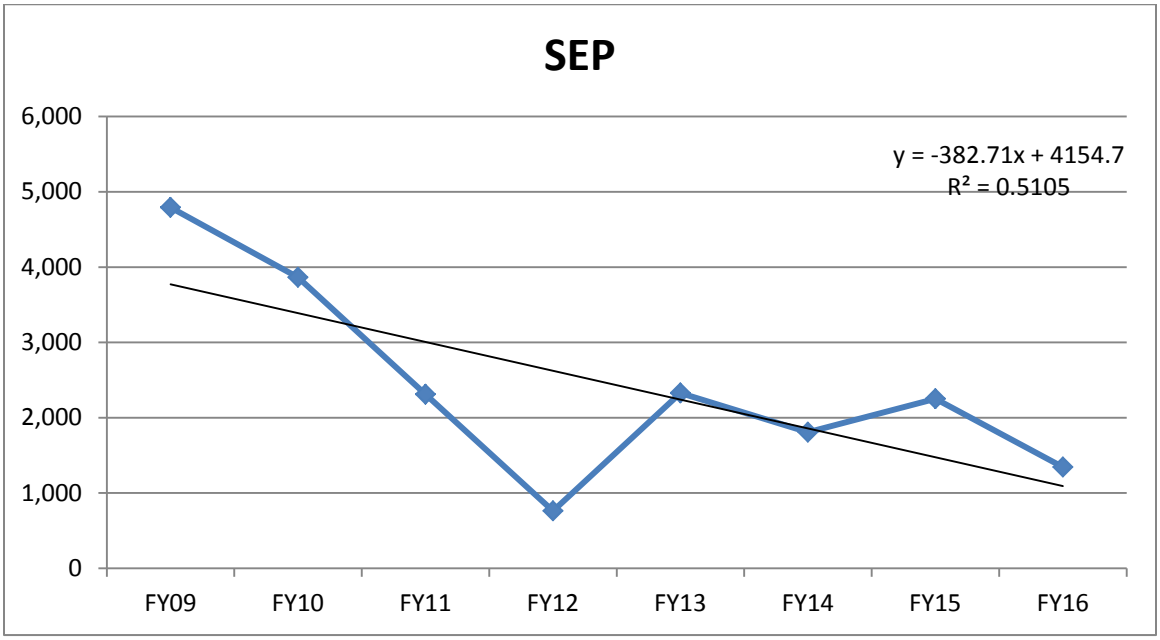
C. EXPONENTIAL SMOOTHING FORECAST MODEL

Alpha	1.0000

SEP	Period	AT Execution Rate	ES	Error	% Error	$Error^2$
FY09	1	4,793	4,793	0.0	0.0	0.0
FY10	2	3,865	4,793.0	928.0	24.0	861184.0
FY11	3	2,310	3,865.0	1555.0	67.3	2418025.0
FY12	4	761	2,310.0	1549.0	203.5	2399401.0
FY13	5	2,327	761.0	1566.0	67.3	2452356.0
FY14	6	1,808	2,327.0	519.0	28.7	269361.0
FY15	7	2,252	1,808.0	444.0	19.7	197136.0
FY16	8	1,344	2,252.0	908.0	67.6	824464.0
FY17*	9		1,344.0			
MAD				933.6		
MAPE					59.8	
MSE						1177740.9

D. LINEAR TREND ANALYSIS FORECAST MODEL

SEP	Period	AT Execution Rate	Trend	Error	% Error	Error^2
FY09	1	4,793	3772.0	1021.0	21.3	1042441.0
FY10	2	3,865	3389.3	475.7	12.3	226304.1
FY11	3	2,310	3006.6	696.6	30.2	485211.8
FY12	4	761	2623.9	1862.9	244.8	3470236.7
FY13	5	2,327	2241.1	85.9	3.7	7371.4
FY14	6	1,808	1858.4	50.4	2.8	2543.0
FY15	7	2,252	1475.7	776.3	34.5	602619.5
FY16	8	1,344	1093.0	251.0	18.7	63001.0
FY17*	9		710.3			
MAD				652.5		
MAPE					46.0	
MSE						737466.1



Regression Statistics	
Multiple R	0.714462
R Square	0.510456
Adjusted R Square	0.428865
Standard Error	991.6088
Observations	8

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	6151749.429	6151749.4	6.256304	0.046449
Residual	6	5899728.571	983288.1		
Total	7	12051478			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	4154.714	772.6553847	5.3771893	0.0017	2264.095	6045.333903	2264.094668	6045.334
Period	-382.714	153.0085661	-2.5012605	0.046449	-757.113	-8.315811876	-757.1127596	-8.31581

E. SEPTEMBER DESCRIPTIVE STATISTICS

SEP	
Mean	2432.5
Standard Error	463.9019
Median	2281
Mode	#N/A
Standard Deviation	1312.113
Sample Variance	1721640
Kurtosis	0.261401
Skewness	0.833077
Range	4032
Minimum	761
Maximum	4793
Sum	19460
Count	8

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