

ANALYSIS OF THE IMPACT OF EXAM ADMINISTRATION AND EXAM SEASON ON THE PERCENTAGE
 PASSING RESULTS OF THE SOA EXAM P

INTRODUCTION:

The actuarial exams play a big role in the career progress of those pursuing an actuarial profession. Having enough preparation time for each exam is critical in achieving a passing grade. Though majority of this preparation time should be spent on covering and mastering the topics in the exam syllabus, it will also be helpful to consider taking the exam on the most convenient season and using the most effective exam administration for the exam taker.

SOA preliminary exam P was administered using paper and pencil method and computer-based method. The exam was previously available once or twice a year. Currently, SOA exam P is offered up to 5 times per year. These changes made by the Society have been advantageous to most exam takers.

This project aims to measure the impact of the type of exam administration and the exam season in the percentage passing results of the SOA exam P. We may expect that these two factors will have little effect since the main driver of the success rate in the exam is the depth and length of study time each exam taker has.

DATA:

The data used are the percentage passing results for the SOA exam from May 2005 to July 2012 from the website of the Society of Actuaries, www.soa.org. There were 31 data points shown in Table 1 below.

Table 1: SOA Exam P Percentage Passing Results

Exam Month	Y
May 2005	39.00%
May 2006	34.90%
November 2006	33.00%
February 2007	37.30%
May 2007	36.60%
August 2007	36.20%
November 2007	37.60%
February 2008	43.70%
May 2008	34.90%
July 2008	37.30%
September 2008	35.30%
November 2008	36.40%
January 2009	38.30%
March 2009	38.40%
July 2009	38.10%
May 2009	38.00%
September 2009	38.70%
November 2009	41.10%
January 2010	42.50%
July-Aug 2010	44.30%
Sept-Oct 2010	37.70%
January 2011	44.70%
March 2011	41.40%
May 2011	44.00%
July 2011	39.80%
September 2011	39.80%
November 2011	42.70%
January 2012	41.80%
March 2012	38.00%
May 2012	39.10%
July 2012	39.20%

Computer-based exams were available starting November 2007. Prior to this period, the average passing percentage is 36.17%. The CBT administration increased this average to 39.71%. We may assume that an exam taker saves more time for calculations taking the CBT exams since the paper-and-pencil method requires shading boxes in order to answer each question, which for me is more time consuming compared to just clicking the answer of your choice.

In order to measure the effect of exam administration, I will use the dummy variable D. The variable will be equal to 1 for CBT (computer-based test) and 0 for PPT (paper-and-pencil test). For the impact of exam season, I will use the 4 quarters of the year and use three dummy variables shown in Table 2.

Table 2: Dummy Variables for Exam Season

Exam Season	S1	S2	S3
First Quarter	1	0	0
Second Quarter	0	1	0
Third Quarter	0	0	1
Fourth Quarter	0	0	0

Regression of Passing Percentage on Exam Administration

Using the Excel Regression function, the regression of Passing Percentage on Exam Administration produces the following results:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.474807424
R Square	0.22544209
Adjusted R Square	0.198733196
Standard Error	0.026843077
Observations	31

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.006081962	0.006081962	8.440712455	0.006955109
Residual	29	0.020895973	0.000720551		
Total	30	0.026977935			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.361666667	0.01095864	33.00287731	1.49151E-24	0.339253731	0.384079603	0.339253731	0.384079603
X Variable 1	0.035453333	0.012203026	2.905290425	0.006955109	0.010495344	0.060411323	0.010495344	0.060411323

Result of R square above shows that only 22.54% of the variation in Y is explained by the dummy variable D. This was part of the expectation mentioned above, that most of the variation in passing percentage should depend on the depth and length of study time.

Regression of Passing Percentage on Exam Season

Using the Excel Regression function, the regression of Passing Percentage on Exam Season produces the following results:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.36617694
R Square	0.134085551
Adjusted R Square	0.037872835
Standard Error	0.029414398
Observations	31

ANOVA					
	df	SS	MS	F	Significance F
Regression	3	0.003617351	0.001205784	1.393636479	0.266123134
Residual	27	0.023360584	0.000865207		
Total	30	0.026977935			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.3816	0.013154519	29.00904297	6.89396E-22	0.354609157	0.408590843	0.354609157	0.408590843
X Variable 1	0.025177778	0.016406567	1.53461581	0.136514327	-0.008485718	0.058841273	-0.008485718	0.058841273
X Variable 2	-0.000885714	0.017223308	-0.051425329	0.959365179	-0.036225023	0.034453594	-0.036225023	0.034453594
X Variable 3	0.0048	0.016110929	0.297934395	0.768033851	-0.028256896	0.037856896	-0.028256896	0.037856896

Using the dummy variables for exam season to regress the results of passing percentage produces an even smaller R square. Only 13.41% of the variation in Y is explained by the dummy variables. This implies that the exam administration is a better measure of the variation in passing percentage than the exam season.

Regression of Passing Percentage on Exam Administration and Exam Season

Lastly, using the Excel Regression function, the regression of Passing Percentage on Exam Administration and Exam Season produces the following results:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.56570615
R Square	0.320023448
Adjusted R Square	0.215411671
Standard Error	0.026562237
Observations	31

ANOVA

	df	SS	MS	F	Significance F
Regression	4	0.008633572	0.002158393	3.059153149	0.034284399
Residual	26	0.018344364	0.000705552		
Total	30	0.026977935			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.354286094	0.015685837	22.5863688	1.30101E-18	0.322043395	0.386528793	0.322043395	0.386528793
X Variable 1	0.034142383	0.012804722	2.666389939	0.013010561	0.007821899	0.060462866	0.007821899	0.060462866
X Variable 2	0.022142899	0.014859364	1.490164673	0.148213457	-0.008400961	0.052686759	-0.008400961	0.052686759
X Variable 3	0.006918259	0.015826238	0.437138557	0.665620269	-0.025613039	0.039449557	-0.025613039	0.039449557
X Variable 4	0.001385762	0.014604977	0.094882843	0.925135374	-0.028635197	0.031406721	-0.028635197	0.031406721

This last regression produces the highest R square. The linear regression of Y on all variables captures 32% of the variation in Y. This increase in R square is due to more explanatory variables used to regress the dependent variables. However, the variation captured is still small.

Conclusion

It can be observed from the small values of R square that the impact of exam administration and exam season does not explain 50% of the variation in Exam Percentage Passing Results. In order to improve R square, a variable X on the average number of hours of study of all exam takers can be introduced. However, it is worth noting that there is a positive percentage explained by the dummy variable used for exam administration. Based from personal experience, it has been easier for me to take a CBT exam than a PPT exam due to the convenience in accessing tables and formulas for the exam, as well as the time saved that can be used in thinking and calculation time.

It is recommended that exam takers, in addition to having fruitful study time, consider using the most convenient type of exam administration and enrol during the exam season when they are most comfortable to take the exam.