CASUALTY ACTUARIAL SOCIETY
EDUCATION POLICY COMMITTEE

2005 TRAVEL TIME REPORT

ANNUAL REPORT TO THE BOARD OF DIRECTORS ON TRAVEL TIME STATISTICS FOR CANDIDATES OF THE CASUALTY ACTUARIAL SOCIETY

October 2005

Version 1.1

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EXECUTIVE SUMMARY AND DISCUSSION

Travel time statistics for CAS candidates continue to be difficult to compile and interpret. Using the database tool created last year, and with the assistance and input of outside consultants, the Education Policy Committee is submitting a mixture of new and familiar statistics here. From our analysis of these statistics, we draw the following conclusions:

- For candidates completing exams as fast or faster than the median, travel times are decreasing and have been decreasing for some time. The fastest 50% of candidates from the late 1990's have travel times one to two years shorter than the fastest 50% of candidates from the 1980's. Exam partitioning does not appear to have had a detrimental effect on travel time.

- Travel time is well above the goal of five to seven years defined by the Board of Directors. Historically, the 35th percentile for travel time exceeds seven years for the period 1980 to 1999. That is, more than 65% of fellows with date of first employment since 1980 spent more than seven years to attain Fellowship. To bring median travel time below seven years would require dramatic changes in the structure of the examination process.

- The demographic constituency of the candidate pool is changing and that change affects travel time. Students who are older upon accepting their first casualty employment have shorter travel times. In addition, the average student sitting for their first exam is older today than in past years. However, we have relatively few other demographic markers in the database that we can use to analyze candidate progress. For example, the percentage of members in consulting positions has increased over the past decade. We do not have enough data to study how that shift might affect the candidate population, but we suspect that the effect might be significant. We do not have any means of controlling for employer support of the exams, but suspect that the effect of shifts in the level of support in different employment categories might be affecting travel time.

- Significant numbers of candidates drop out of the process before becoming members of the CAS. We know little about these candidates and cannot cost effectively recover their demographics. We need to begin today collecting the demographics we will use to study travel time in our Centennial year.

- The period from 1990 to present represents a number of significant changes in the examination system. Significant changes in the system disrupt the flow of candidates through the system and affect the supply of candidates to employers (see pages 16-18).

RESULTS AND ANALYSIS

The CAS examination process is lengthy and subject to significant variation across candidates and across examination sessions. For this reason, analysis of travel time statistics is similar to analysis of reserves for long-tail casualty insurance. Some statistics derived from the raw data are subject to "development" in that additional data will emerge as candidates in certain cohorts continue to complete examinations and report them to the CAS. For that reason, this report includes several different statistics that must be analyzed in concert with one another. Equally important in this analysis, much like any analysis of a long-tailed distribution, study must continue and additional statistics must be developed that enhance our understanding of the process. The Education Policy Committee has experienced some success in its efforts to standardize the database and encourage individuals to suggest new statistics for inclusion in this report. This report includes new statistics suggested by CAS members that provide additional insight into the travel time process.

With this report, the Education Policy Committee is not publishing the average travel times for graduating classes. All statistics in this report now define travel time either based on date of first employment, the official definition mandated by the Board of Directors, or based on alternate dimensions suggested by outside contributors.

Among the statistics presented in this report, updated to include results through the May 2005 examination sessions, are:

- Distribution of Travel Times for Members,
- Median Travel Times for Starting Cohorts,
- Percentage Completion for Starting Cohorts,
- Travel Times by Candidate Age, and
- Exam Progress Statistics.

Each of these appears below with separate discussion.

DISTRIBUTION OF TRAVEL TIMES FOR MEMBERS

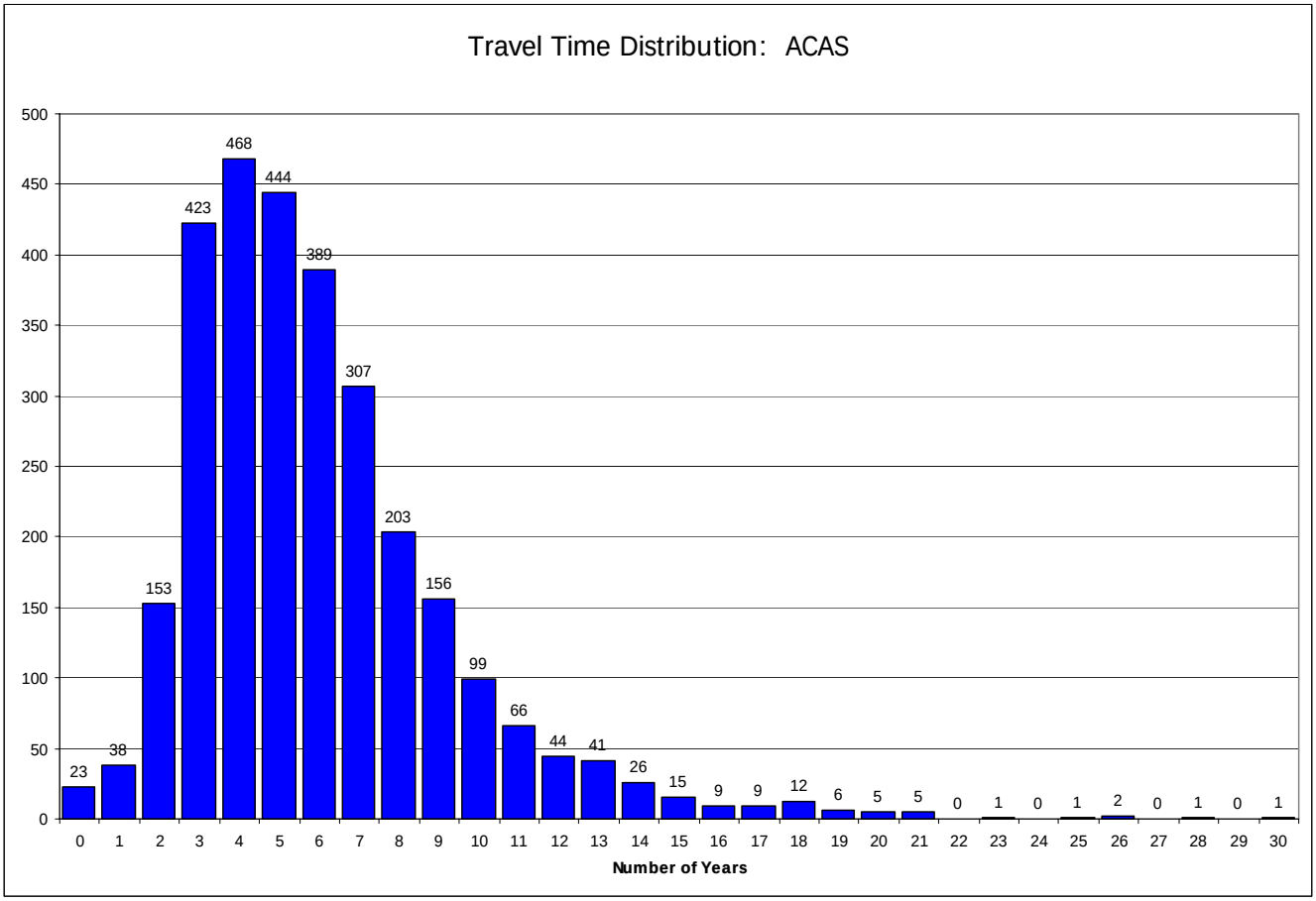
In 2002, the Board of Directors adopted a revised definition of travel time in order to better understand underlying trends. This revised definition contemplates the time from first full-time employment in a casualty actuarial position until attainment of an Associateship or Fellowship designation. Implementation of this statistic required that the CAS collect the date of first employment from its members. As of the date of this report, the CAS has collected the following employment date statistics:

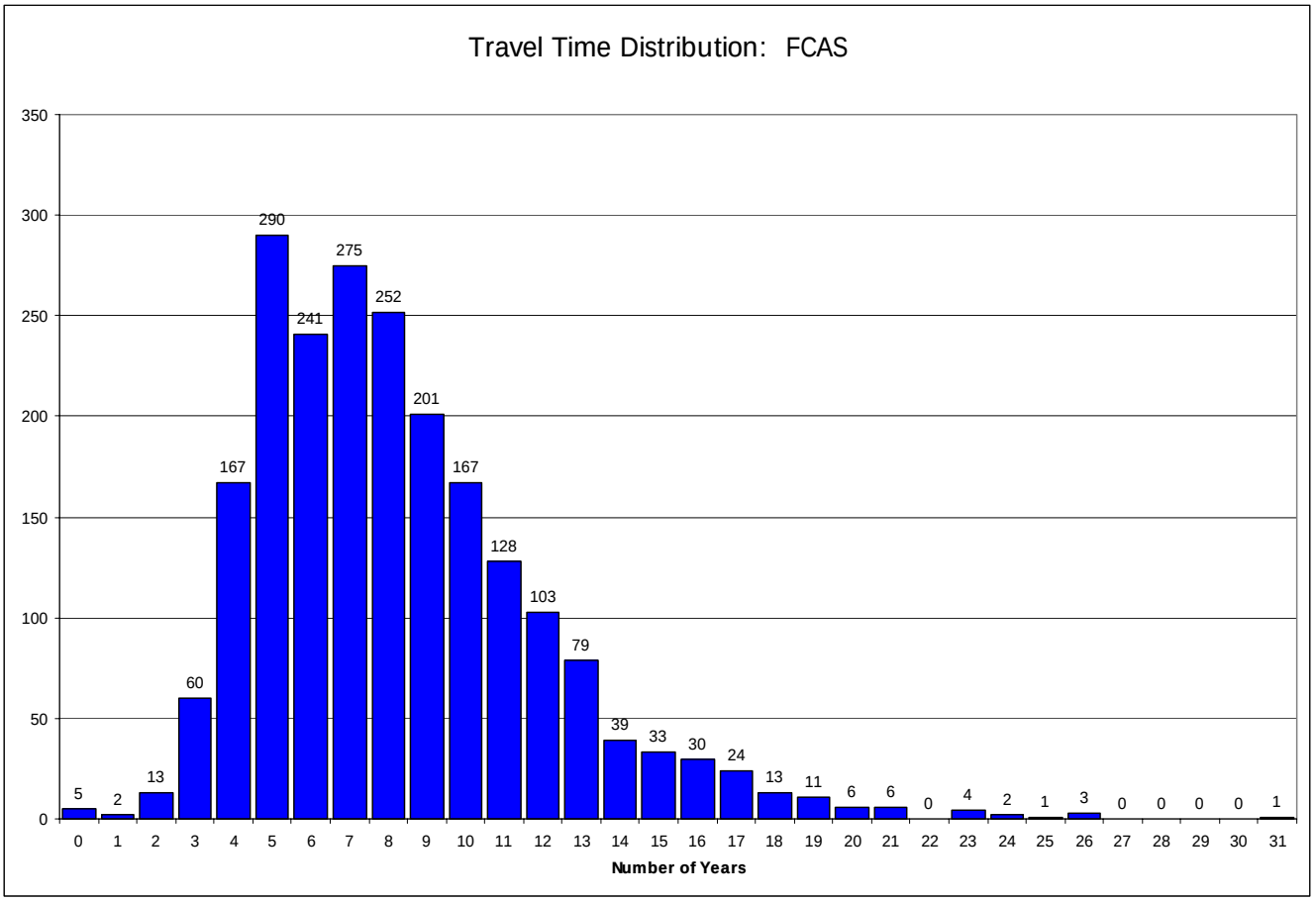
Candidate/Member Population vs. Collection of Employment Dates

Membership Category	Total Population	Number Having Recorded First Employment Dates
ACAS	1,160	791
FCAS	2,630	2,156
STUDENT	14,179	1,784

These statistics represent an increase in the percentage of individuals in the database having coded first employment dates. In last year's report, 60.2% of Associates and 75.1% of Fellows had submitted dates of first employment. This year, 68.2% of Associates and 80.0% of Fellows have submitted first employment dates to the CAS office. In addition, CAS Staff have corrected a number of records by comparing dates of birth, first exam, and first employment date and then contacting candidates/members when these dates appeared to be inconsistent.

For each Associate and Fellow having recorded first employment dates, a travel time was computed as the difference between receipt of the credential at a CAS meeting less the first employment date. Results, rounded to the nearest year, are displayed in histograms below:





In both histograms, the furthest most left bar represents the number of members who achieved their designations in less than one half year after starting their first full time casualty actuarial job (including those who achieved their designations before beginning full time employment). The second bar represents members achieving their designations more than one half year but less than 1.5 years after starting work.

Both populations are skewed with heavy right tails. The six year point in the FCAS histogram is curious. The Education Policy Committee has not yet had time to research the reason for the small population in this class relative to the five and seven year classes. However, one plausible hypothesis is that candidates in the seven year class will have gaps in their exam history that represent situations in which these candidates had to wait a full year between examination sittings to complete their final exam because examinations beyond part 5 are offered only once per year.

MEDIAN TRAVEL TIMES FOR STARTING COHORTS

In order to remove some of the distortions inherent in the statistics representing average travel times for graduating classes caused by the skewed distribution of travel times, a new set of statistics were created in 2002. These statistics group members by year of first employment ("starting cohort") and compute median, rather than mean, travel times for each group. Additionally, medians are computed for each starting cohort truncated at each of five and 10 years.

These data should be viewed carefully, as more recent cohorts are significantly truncated and will continue to "develop" over time. Cells highlighted in gray are not fully developed[1]. Obviously, all cells representing the entire population are potentially truncated until all members of a given starting class reach designations or retire from the examination process.

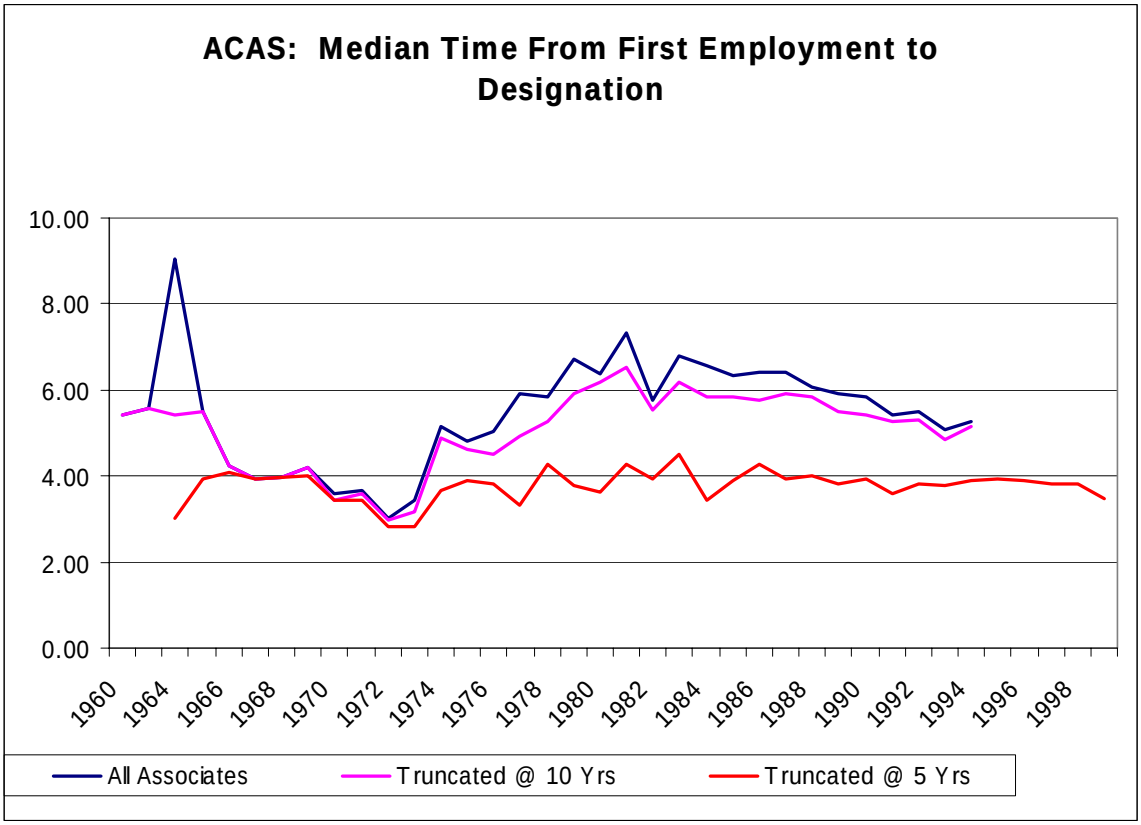
[1] No cell in the overall median column can be considered fully developed until no candidate remains that has not completed the examinations. Cells in the truncated column are considered not fully developed when any candidate in the starting year has not yet had the full number of years to sit for exams and receive their credential.

Travel Time Statistics for Associates: Median Travel Time For Starting Cohorts

	All Candidates			Truncated @ 5 Yrs		Truncated @ 10 Yrs	
Year of First Employment	Number of Candidates	Number of Associates	Median Travel Time	Number of Associates	Median Travel Time	Number of Associates	Median Travel Time
1960	1	1	5.42	0		1	5.42
1961	1	1	5.58	0		1	5.58
1964	4	4	9.04	2	3.00	3	5.42
1965	3	3	5.50	1	3.92	3	5.50
1966	5	5	4.25	4	4.08	5	4.25
1967	9	9	3.92	7	3.92	9	3.92
1968	4	4	3.96	4	3.96	4	3.96
1969	8	8	4.21	7	4.00	8	4.21
1970	25	25	3.58	21	3.42	21	3.42
1971	42	41	3.67	34	3.42	39	3.58
1972	46	46	3.00	38	2.83	44	2.96
1973	60	60	3.42	40	2.83	54	3.17
1974	49	49	5.17	23	3.67	42	4.88
1975	45	44	4.79	26	3.88	42	4.63
1976	65	64	5.04	33	3.83	53	4.50
1977	66	65	5.92	29	3.33	53	4.92
1978	74	71	5.83	30	4.29	62	5.25
1979	86	86	6.71	24	3.79	65	5.92
1980	73	72	6.38	22	3.63	65	6.17
1981	61	59	7.33	16	4.29	50	6.54
1982	64	61	5.75	23	3.92	56	5.54
1983	71	68	6.79	19	4.50	57	6.17
1984	79	76	6.58	23	3.42	61	5.83
1985	75	73	6.33	24	3.88	63	5.83
1986	127	119	6.42	40	4.29	99	5.75
1987	164	153	6.42	56	3.92	126	5.92
1988	133	119	6.08	46	4.00	105	5.83
1989	185	165	5.92	58	3.83	135	5.50
1990	207	180	5.83	76	3.92	166	5.42
1991	169	148	5.42	66	3.58	135	5.25
1992	176	153	5.50	69	3.83	142	5.29
1993	173	151	5.08	76	3.79	140	4.83
1994	199	168	5.25	80	3.88	159	5.17
1995	144	107	5.33	51	3.92	107	5.33
1996	195	133	5.42	58	3.88	133	5.42
1997	171	105	5.00	55	3.83	105	5.00
1998	184	93	4.33	64	3.83	93	4.33
1999	151	58	4.21	40	3.46	58	4.21
2000	150	46	3.96	46	3.96	46	3.96
2001	198	36	3.25	36	3.25	36	3.25
2002	281	14	2.17	14	2.17	14	2.17
2003	310	2	1.46	2	1.46	2	1.46
2004	286	1	0.50	1	0.50	1	0.50
2005	117	1	-0.33	1	-0.33	1	-0.33

Notes: Because many candidates are unknown to the CAS until they enroll in their first CAS exam, and many are still taking joint exams when they begin casualty employment, the total number of candidates in recent year cohorts will increase over time. For example, in last year's report, there were 75 candidates in the 2003 starting cohort versus 310 in this year's report.

Displayed graphically, these data are somewhat easier to interpret:



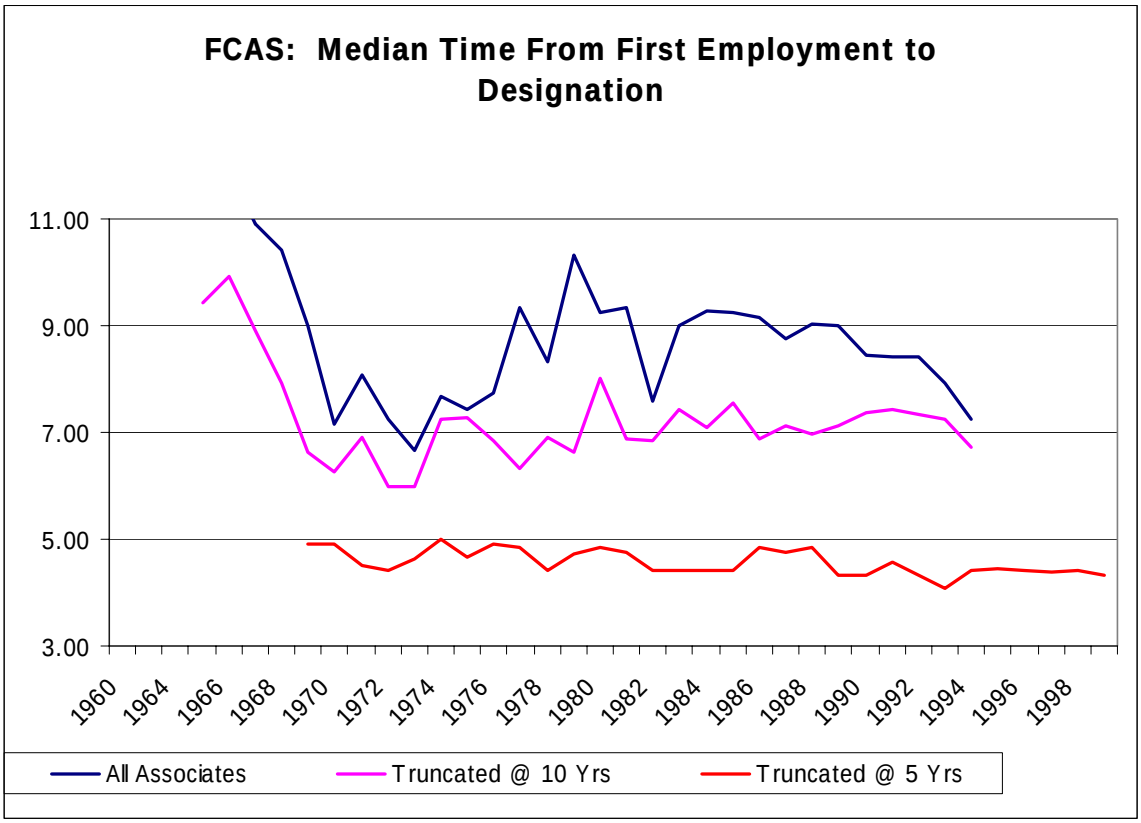
Keeping in mind that the data prior to 1970 are very sparse, travel time appears to have peaked in the early 1980's, following the transition in 1975 that increased the number of exams required from 5 to 7. The transition to partitioned exams in 1990 does not appear to increase travel time as had been previously feared. Statistics have been included in previous reports that indicate that students sat for fewer exams following partitioning; leading many to conclude that partitioning increased travel time. However, this interpretation of those statistics now appears to be questionable. New statistics included in this year's report provide evidence that exam partitioning may not have had a materially deleterious effect on candidate travel time[2]. Older reports also included statistics on mean travel times for graduating classes. Those statistics were often cited as indicating sharp increases in travel time. Statistics here based on starting year and using median and earlier percentiles do not show sharp increases.

[2] See "Fisher Statistics" below.

Travel Time Statistics for Fellows: Median Travel Time For Starting Cohorts

	All Candidates			Truncated @ 5 Yrs		Truncated @ 10 Yrs	
Year of First Employment	Number of Candidates	Number of Fellows	Median Travel Time	Number of Fellows	Median Travel Time	Number of Fellows	Median Travel Time
1960	1	1	17.42	0		0	
1961	1	1	12.58	0		0	
1964	4	2	13.79	0		0	
1965	3	3	17.50	0		1	9.42
1966	5	5	11.92	0		3	9.92
1967	9	9	10.92	0		5	8.92
1968	4	4	10.42	0		3	7.92
1969	8	6	9.00	1	4.92	4	6.63
1970	25	20	7.17	3	4.92	14	6.25
1971	42	38	8.08	3	4.50	28	6.92
1972	46	37	7.25	9	4.42	28	6.00
1973	60	45	6.67	8	4.63	35	6.00
1974	49	35	7.67	3	5.00	29	7.25
1975	45	34	7.42	7	4.67	28	7.29
1976	65	53	7.75	7	4.92	39	6.83
1977	66	47	9.33	9	4.83	29	6.33
1978	74	59	8.33	7	4.42	41	6.92
1979	86	70	10.33	8	4.71	34	6.63
1980	73	61	9.25	5	4.83	40	8.00
1981	61	41	9.33	3	4.75	24	6.88
1982	64	42	7.58	6	4.42	31	6.83
1983	71	49	9.00	4	4.42	29	7.42
1984	79	56	9.29	8	4.42	32	7.08
1985	75	53	9.25	3	4.42	34	7.54
1986	127	84	9.17	3	4.83	48	6.88
1987	164	105	8.75	11	4.75	62	7.13
1988	133	90	9.04	7	4.83	54	6.96
1989	185	112	9.00	15	4.33	68	7.13
1990	207	134	8.46	9	4.33	88	7.38
1991	169	107	8.42	9	4.58	75	7.42
1992	176	106	8.42	15	4.33	73	7.33
1993	173	111	7.92	15	4.08	89	7.25
1994	199	119	7.25	19	4.42	98	6.71
1995	144	75	7.42	10	4.46	70	7.29
1996	195	90	6.92	17	4.42	90	6.92
1997	171	80	6.17	22	4.38	80	6.17
1998	184	67	4.92	39	4.42	67	4.92
1999	151	36	5.21	18	4.33	36	5.21
2000	150	33	4.75	21	4.42	33	4.75
2001	198	25	4.25	25	4.25	25	4.25
2002	281	8	3.33	8	3.33	8	3.33
2003	310	2	2.46	2	2.46	2	2.46
2004	286	1	1.50	1	1.50	1	1.50

Here again, graphical display makes these figures somewhat easier to interpret.



Again, data prior to 1970 are very sparse and travel times appear to have peaked in the early 1980's. No clear trends appear as a result of the 1990 transition. The effect of the 2000 transition is not yet evident in the data. For the period from 1970 to 1992, the average median travel time is approximately 8.5 years. Standard deviation for classes starting 1970-1992 is 0.90 years. Of all Classes from 1970 to present, only the class of 1973 succeeded in achieving a median travel time less than seven years. The decrease in median travel time truncated at five years during the latter 1990's is encouraging; the fastest students are completing the exams more quickly.

PERCENTAGE COMPLETION FOR STARTING COHORTS

Another means of analyzing travel time data is to look at the percentage of each cohort that reaches Associateship or Fellowship within a given number of years. This is a predictor of future direction in median travel time for starting cohorts. If greater numbers of candidates reach designations earlier, median travel time can be expected to decrease. If the percentage of candidates reaching designations at early points falls, median travel time can be expected to increase. It should be noted that this statistic is heavily influenced by the recording of date of first employment. The CAS database contains records for almost 18,000 individuals. Of these, only 4,731 have recorded employment dates. Note that the CAS database increased in size by over 1,800 candidates in the past 12 months. Date of first employment is now required for all candidates registering for examinations[3]. For candidates that dropped out of the examination system prior to the capture of this data element, there is no cost effective

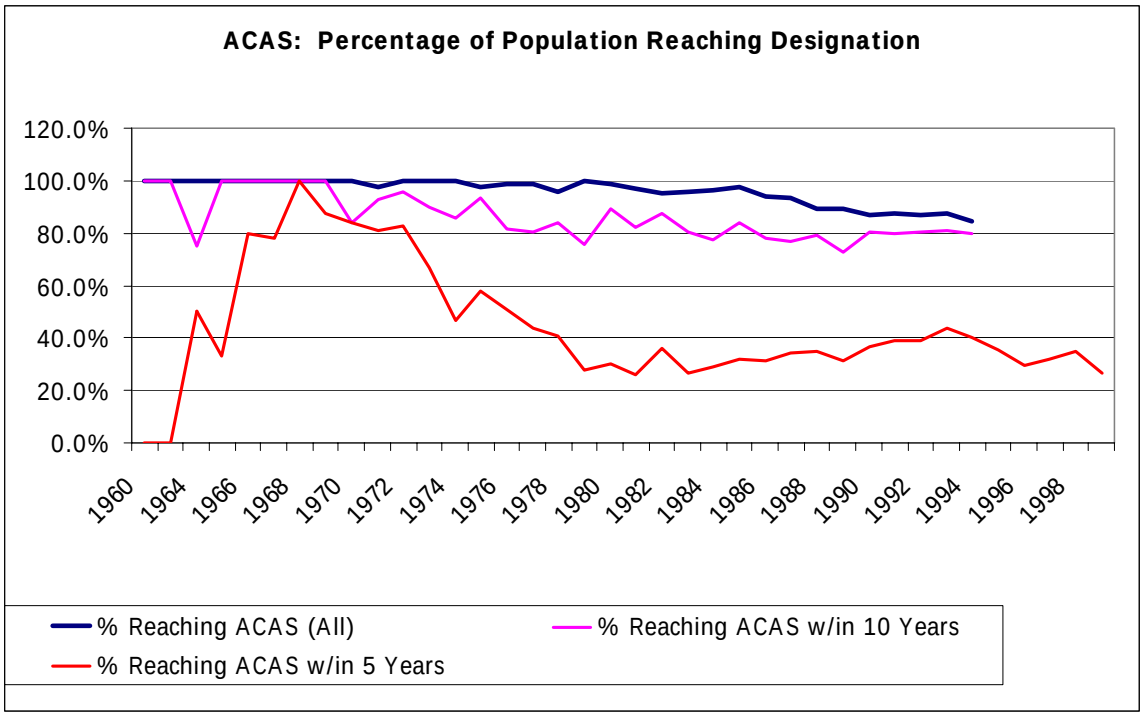
[3] The registration form asks for this information. Not all candidates complete this field.

means available to capture their employment dates. These candidates are therefore not included in the population prior to this century. The exclusion of these candidates therefore causes the completion percentages for early years to be inflated. The inclusion of these candidates going forward will cause percentages to fall. Following the earlier convention, cells highlighted in gray are not fully mature.

Completion Percentages for Associateship by Starting Cohort

Year of First Employment	Number of Candidates	% Reaching ACAS w/in 5 Years	% Reaching ACAS w/in 10 Years	% Reaching ACAS (All)
1960	1	0.0%	100.0%	100.0%
1961	1	0.0%	100.0%	100.0%
1964	4	50.0%	75.0%	100.0%
1965	3	33.3%	100.0%	100.0%
1966	5	80.0%	100.0%	100.0%
1967	9	77.8%	100.0%	100.0%
1968	4	100.0%	100.0%	100.0%
1969	8	87.5%	100.0%	100.0%
1970	25	84.0%	84.0%	100.0%
1971	42	81.0%	92.9%	97.6%
1972	46	82.6%	95.7%	100.0%
1973	60	66.7%	90.0%	100.0%
1974	49	46.9%	85.7%	100.0%
1975	45	57.8%	93.3%	97.8%
1976	65	50.8%	81.5%	98.5%
1977	66	43.9%	80.3%	98.5%
1978	74	40.5%	83.8%	95.9%
1979	86	27.9%	75.6%	100.0%
1980	73	30.1%	89.0%	98.6%
1981	61	26.2%	82.0%	96.7%
1982	64	35.9%	87.5%	95.3%
1983	71	26.8%	80.3%	95.8%
1984	79	29.1%	77.2%	96.2%
1985	75	32.0%	84.0%	97.3%
1986	127	31.5%	78.0%	93.7%
1987	164	34.1%	76.8%	93.3%
1988	133	34.6%	78.9%	89.5%
1989	185	31.4%	73.0%	89.2%
1990	207	36.7%	80.2%	87.0%
1991	169	39.1%	79.9%	87.6%
1992	176	39.2%	80.7%	86.9%
1993	173	43.9%	80.9%	87.3%
1994	199	40.2%	79.9%	84.4%
1995	144	35.4%	74.3%	74.3%
1996	195	29.7%	68.2%	68.2%
1997	171	32.2%	61.4%	61.4%
1998	184	34.8%	50.5%	50.5%
1999	151	26.5%	38.4%	38.4%
2000	150	30.7%	30.7%	30.7%
2001	198	18.2%	18.2%	18.2%
2002	281	5.0%	5.0%	5.0%
2003	310	0.6%	0.6%	0.6%
2004	286	0.3%	0.3%	0.3%
2005	117	0.9%	0.9%	0.9%

Graphically, these results produce the following:

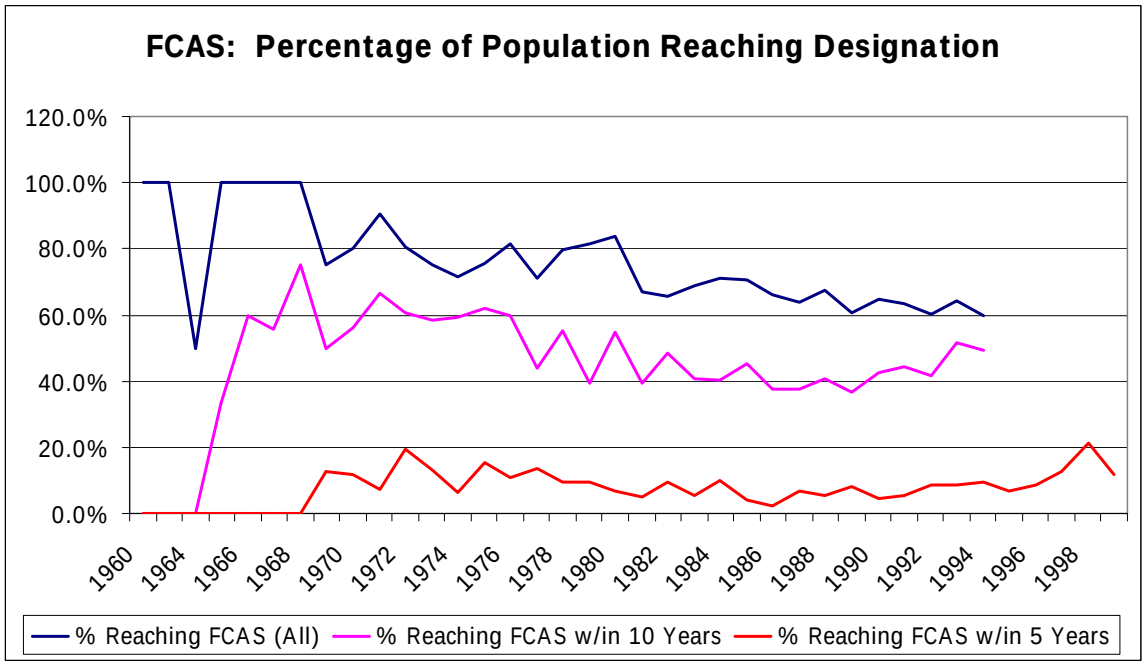


There appear to be some encouraging trends in the percentage of candidates reaching their Associateship within five years during the period from 1984 to 1994. Despite the fact that data points in the late 90's are more likely to be depressed by candidates that will ultimately drop out, but who have not yet (recall that date of first employment is now requested on exam registration forms), the proportion of each starting cohort completing Associateship within five years is higher in recent years than in the past (1990's vs. 1980's). The decline from 1994 to 1999 may represent the effect of the year 2000 transition, during which students shifted their exam taking patterns in an attempt to maximize post-transition credits. That is, during this period, it was common for students to skip partitioned parts 3-5 where credit could potentially be lost in the transition and attempt 6 and 7 for which the transition provided full credit. The long term progress of these cohorts should be monitored closely.

Completion Percentages for Fellowship by Starting Cohort

Year of First Employment	Number of Candidates	% Reaching FCAS w/in 5 Years	% Reaching FCAS w/in 10 Years	% Reaching FCAS (All)
1960	1	0.0%	0.0%	100.0%
1961	1	0.0%	0.0%	100.0%
1964	4	0.0%	0.0%	50.0%
1965	3	0.0%	33.3%	100.0%
1966	5	0.0%	60.0%	100.0%
1967	9	0.0%	55.6%	100.0%
1968	4	0.0%	75.0%	100.0%
1969	8	12.5%	50.0%	75.0%
1970	25	12.0%	56.0%	80.0%
1971	42	7.1%	66.7%	90.5%
1972	46	19.6%	60.9%	80.4%
1973	60	13.3%	58.3%	75.0%
1974	49	6.1%	59.2%	71.4%
1975	45	15.6%	62.2%	75.6%
1976	65	10.8%	60.0%	81.5%
1977	66	13.6%	43.9%	71.2%
1978	74	9.5%	55.4%	79.7%
1979	86	9.3%	39.5%	81.4%
1980	73	6.8%	54.8%	83.6%
1981	61	4.9%	39.3%	67.2%
1982	64	9.4%	48.4%	65.6%
1983	71	5.6%	40.8%	69.0%
1984	79	10.1%	40.5%	70.9%
1985	75	4.0%	45.3%	70.7%
1986	127	2.4%	37.8%	66.1%
1987	164	6.7%	37.8%	64.0%
1988	133	5.3%	40.6%	67.7%
1989	185	8.1%	36.8%	60.5%
1990	207	4.3%	42.5%	64.7%
1991	169	5.3%	44.4%	63.3%
1992	176	8.5%	41.5%	60.2%
1993	173	8.7%	51.4%	64.2%
1994	199	9.5%	49.2%	59.8%
1995	144	6.9%	48.6%	52.1%
1996	195	8.7%	46.2%	46.2%
1997	171	12.9%	46.8%	46.8%
1998	184	21.2%	36.4%	36.4%
1999	151	11.9%	23.8%	23.8%
2000	150	14.0%	22.0%	22.0%
2001	198	12.6%	12.6%	12.6%
2002	281	2.8%	2.8%	2.8%
2003	310	0.6%	0.6%	0.6%
2004	286	0.3%	0.3%	0.3%
2005	117	0.0%	0.0%	0.0%

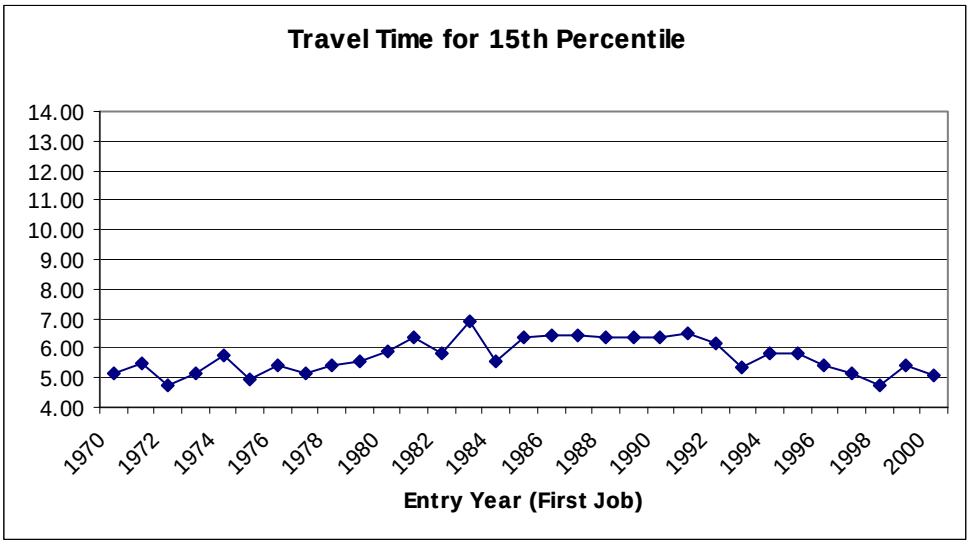
Graphically:

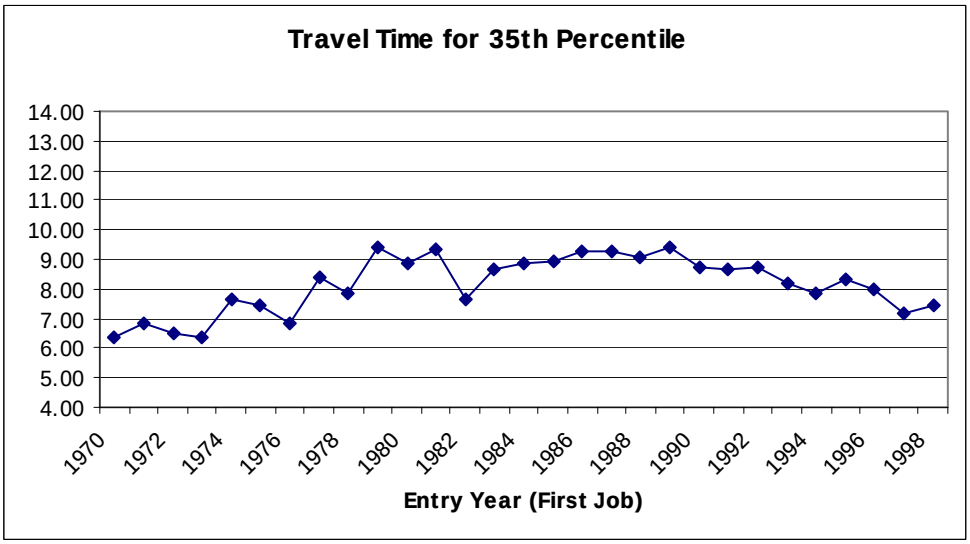


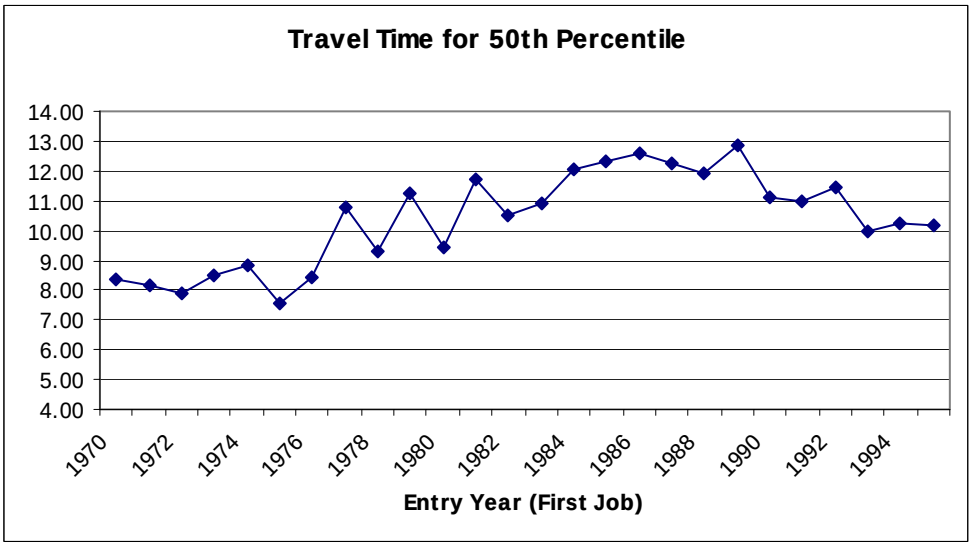
Here again, trends are encouraging, particularly with regard to the percentage of starting cohorts achieving Fellowship within five years. Sharp increases in the late 90's may be the effect of improvements in the exam system and the reduction of the system from 10 to 9 exams. It is notable, however, that the percentage of candidates achieving fellowship within five years is still less than 25% and the percentage achieving Fellowship within 10 years is less than 60%. It will difficult to achieve a median travel time of 5-7 years under these circumstances. The spike in completion percentage for the 1998 year bears watching. Candidates in 1997 through 1999 would have been under the greatest pressure to complete examinations prior to the transition in order not to lose credit.

PERCENTAGE COMPLETION: FISHER STATISTICS

In order to reduce the uncertainty inherent in the emerging nature of the percentage completion statistics, Ginda Fisher suggested an alternative statistic for this year's report. Ms. Fisher suggested that candidates be grouped by starting year and ranked by travel time (date of designation versus first employment date). Various percentiles could then be directly compared across starting cohorts. In the graphs below, the 15^{th} percentile can be interpreted as the 15^{th} fastest candidate in a starting class of 100. Once the population in a starting cohort becomes reasonably stable, that is, no new candidates enter the population by virtue of reporting their date of first employment, these statistics will cease to develop. By comparing various travel time percentiles for starting cohorts, we can determine whether faster candidates in each cohort are progressing more quickly than those in other starting cohorts. The results of this organization of the data are very interesting. Results are shown in each percentile graph where the given percentile is defined. That is, for the 50^{th} percentile graph, 50% of the starting cohort must have reached Fellowship. In this data set, the last starting cohort for which 50% of the class has reached Fellowship is the class reporting year of first employment in 1995.


Travel Time for 15th Percentile
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
Entry Year (First Job)

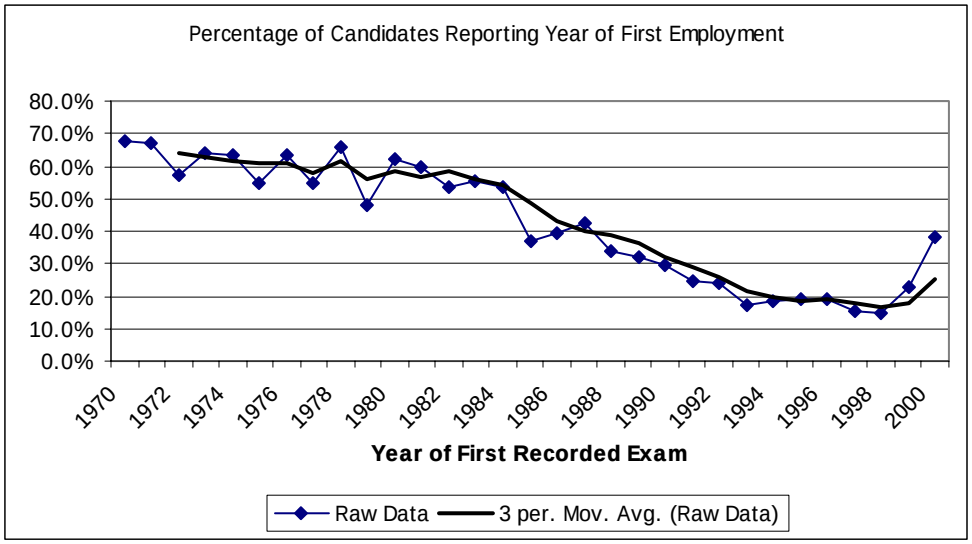

Travel Time for 35th Percentile
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
Entry Year (First Job)


Travel Time for 50th Percentile
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
Entry Year (First Job)

Intermediate percentiles indicate results similar to those above. Initial analysis of these results is encouraging. For candidates having reported date of first employment, the fastest students are moving more quickly through the examination process. At the 35th and 50th percentiles, students in the late 1990's are completing fellowship almost two years faster than their colleagues in the 1980's.

In analyzing these results, it is useful to know how various points on the graph are likely to develop in the future. Recall, that in the CAS database, only 26% of candidates have coded first employment dates. As CAS Staff add additional first employment dates into the data, the size of various starting cohorts will increase. This will cause the travel time for any desired percentile of that population to likely increase (new data points are more likely to be candidates who have not yet achieved Fellowship).

In this respect, it is important to know how various cohorts are likely to have reported their employment dates in order to determine whether this statistic has any likely bias. As a proxy for this statistic, candidates were grouped by year of first exam[4] and coding of first employment date. The percentage of candidates first sitting in a given year with coded dates of first employment are shown below.



This graph indicates that reporting of year of first employment suffers from severe truncation during the 1990's. This could indicate that the Fisher Statistic, while promising for future monitoring, may not represent a valid picture of historical travel time across periods where capture of first employment date across the population is not consistent.

This graph also implies a high rate of candidates dropping out of the process. The CAS now captures date of first employment on exam registration forms. The fact that a very low percentage of candidates from the late 1990's have coded dates of first employment implies that these candidates are no longer taking exams and have not reached at least Associateship status. These statistics are consistent with similar studies conducted by the Society of Actuaries (SoA). The SoA determined that

[4] Year of first exam is defined to be either joint exam or CAS exam, whichever is reported first in the data.

approximately 80% of candidates who sit for their first exam ultimately drop out of the exam process without completing at least an Associateship. The same statistics from the SoA indicate that 70% of candidates completing their old Exam 150 (the watershed "Life Contingencies" exam) fail to complete a Fellowship designation. Initial investigations of the CAS data indicate that far fewer CAS candidates drop out once reaching exam #4[5].

In order to remove some of the uncertainty in these statistics, the Education Policy Committee repeated the production of the Fisher Statistics using year of first examination in place of year of first employment. This compilation of the data removes the truncation produced by the lack of collection of employment dates. Analysis of these statistics indicates that the apparent improvement in travel time indicated above is real and not an artifact of the employment date collection process. Because statistics based on year of first exam contain much larger populations, smaller percentiles are necessary. For example, the 1998 starting cohort, based on year of first employment, contains 184 candidates. The same cohort, based on year of first recorded examination sitting, contains 511 candidates. Tabular and graphic results of the Fisher Statistic based on year of first examination appear on the following pages.

[5] Based on a study of candidates passing our exam 4/4B in the period 1990-1995, over 50% have completed their ACAS or FCAS designation.

Fisher Statistics By Year of First Examination Attempt

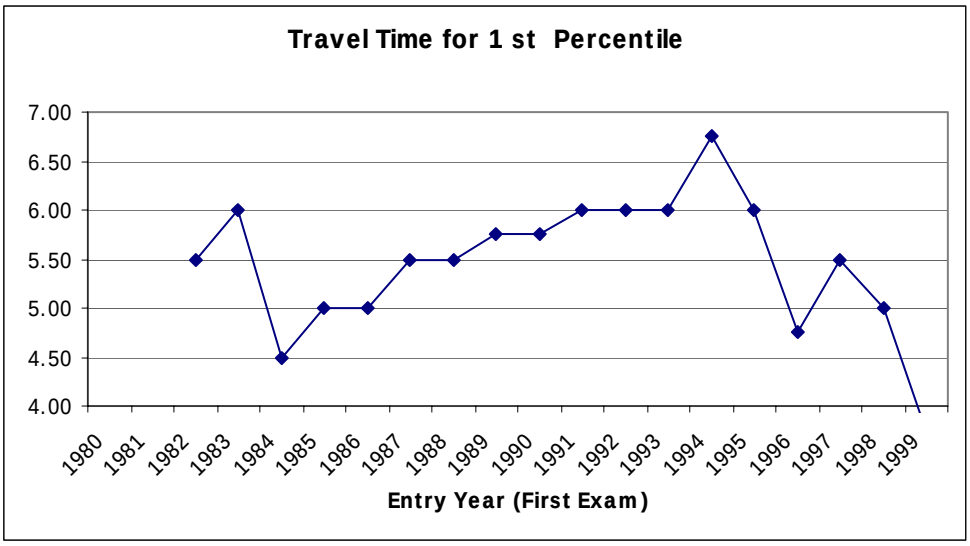
		Travel Time for Various Percentiles of Entering Class					
Entry_Year	Candidates	0.5 th	1st	2.5th	5th	10th	15th
1980	86			6.00	6.50	7.00	7.50
1981	87			5.50	5.50	6.50	7.00
1982	108		5.50	6.00	6.50	7.00	7.50
1983	111		6.00	6.50	6.50	7.50	9.00
1984	137		4.50	5.00	6.00	7.50	8.00
1985	217	5.00	5.00	6.00	6.50	7.50	8.50
1986	307	4.50	5.00	5.50	6.50	7.50	8.50
1987	456	5.00	5.50	6.00	7.00	8.75	11.00
1988	508	5.00	5.50	6.00	7.00	9.00	11.50
1989	735	5.50	5.75	6.75	7.75	9.75	11.75
1990	932	5.50	5.75	6.50	7.50	9.75	12.50
1991	923	5.00	6.00	7.00	8.00	10.75	13.75
1992	917	5.50	6.00	7.00	8.50	10.75	
1993	817	5.50	6.00	7.50	9.00		
1994	743	5.50	6.75	7.50	9.00	11.75	
1995	711	5.00	6.00	7.00	8.00		
1996	764	4.50	4.75	6.75	8.50		
1997	852	5.00	5.50	6.25	7.50		
1998	511	4.75	5.00	6.00			
1999	152		3.75	5.00	5.75	6.50	
2000	1028	4.50	5.00				
2001	664	4.00	4.50				

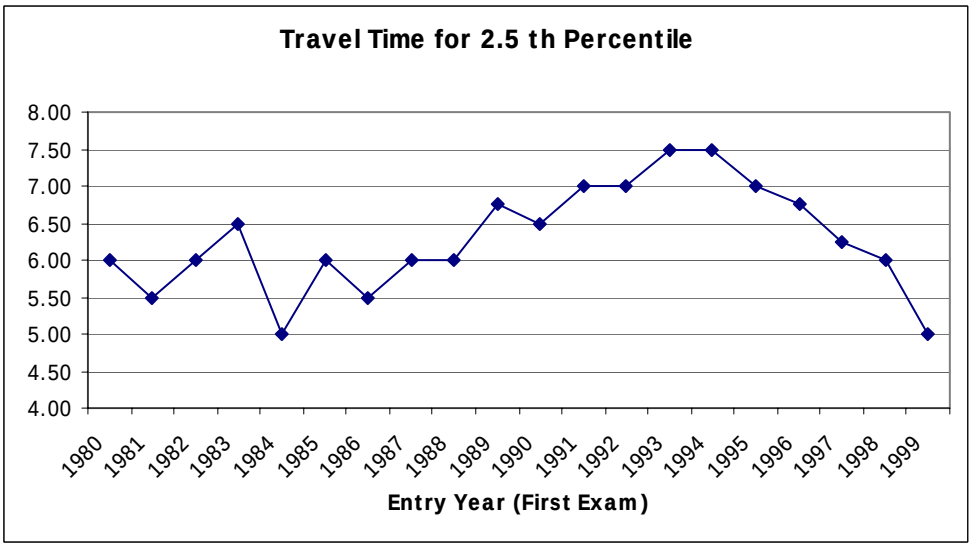
Here, the effect of the 2000 transition is immediately apparent. Note the dramatic drop in number of candidates attempting their first examination in the 1998 and 1999 years with a corresponding bulge in new candidates in 2000. For candidates that elected to begin sitting in these years immediately prior to the transition, progress has been exceptional.

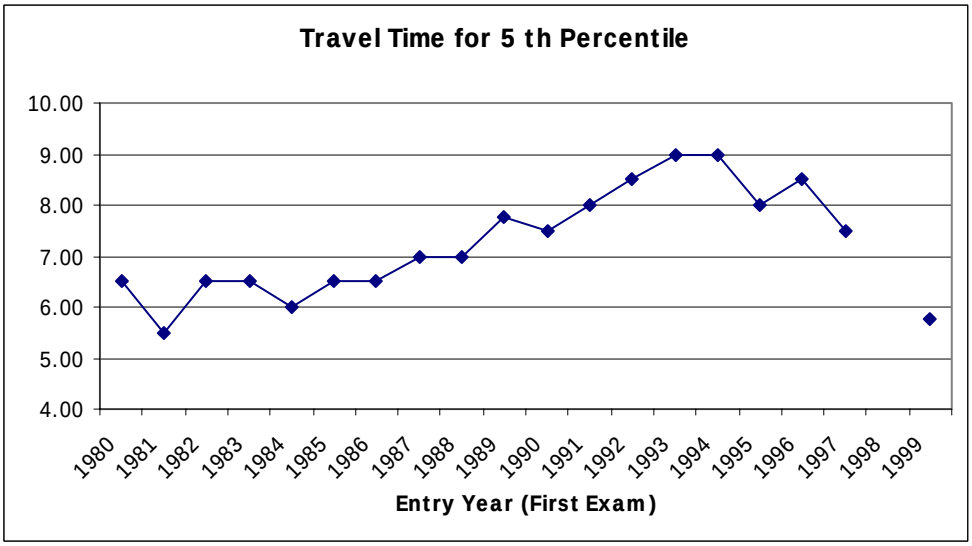
For reference purposes, the number of candidates sitting for their first exam (reported to the CAS) is already at 1,168 for one sitting in 2005. Enrollment is up sharply.

Graphic results follow below:

Fisher Statistics By Year of First Examination



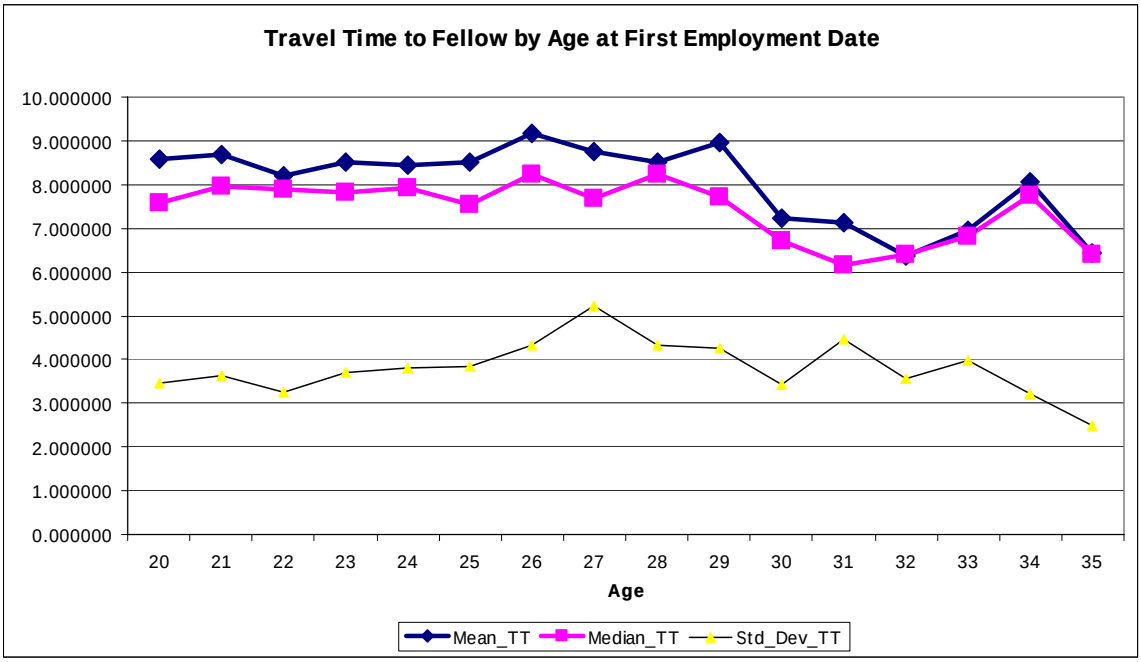




The trend in the latter 1990's in these statistics is clear. The most efficient candidates across the entire population of candidates is progressing through the exams at a faster rate in more recent years. Travel time is improving dramatically for the most efficient candidates.

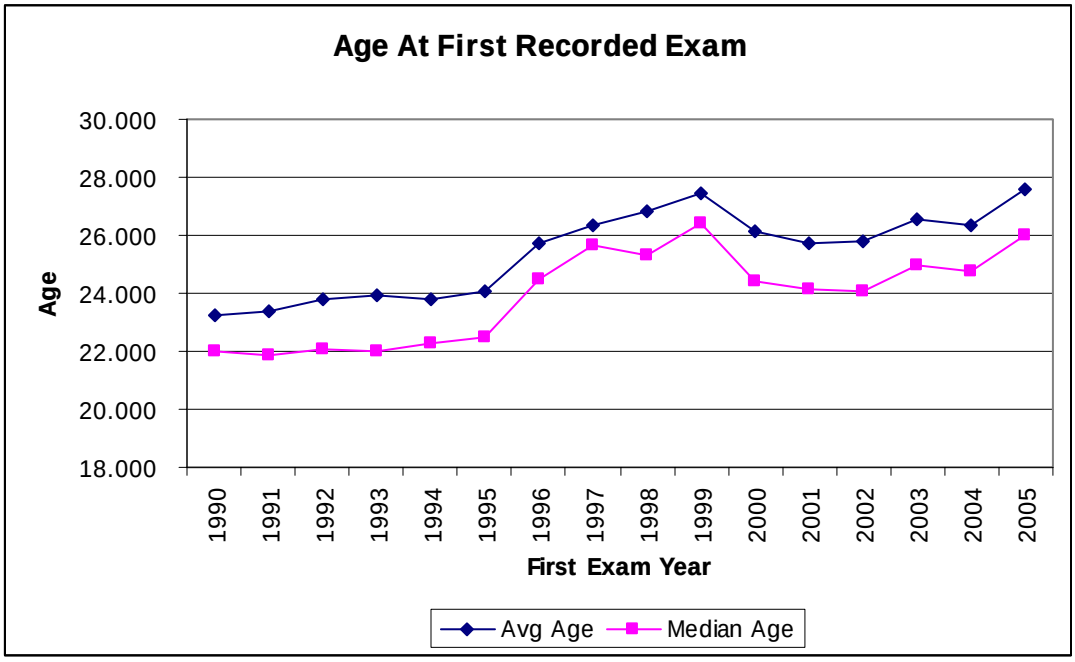
TRAVEL TIMES BY CANDIDATE STARTING AGE: SCHWARTZ STATISTICS

Arthur Schwartz suggested that grouping travel times by the starting age of candidates might provide useful insight into the travel time process. Accordingly, the Education Policy Committee constructed travel time statistics for candidates according to their age at date of first employment. Travel time is computed here according to difference between date of first employment and date of receipt of designation at the CAS meeting. Compilation of this statistic required that candidates have valid birthdates and first employment dates. Results of this analysis are quite interesting.



Candidates entering the profession later in life experience significantly shorter travel times than those entering earlier (sample sizes are smaller for older candidates). Standard deviation of travel time increases through the late twenties and then decreases. This may be indicative of the effect of life experiences (i.e. marriage, children, job changes, etc) on travel time. Candidates whose age profile places them generally beyond these life events at time of first employment progress more quickly through exams. Alternatively (or coincidentally), more mature candidates may be more focused or more disciplined in their approach to the examinations.

The Schwartz statistics further indicate an interesting trend in the candidate population. Grouping candidates by age at first employment produces the following graphic:



This graph clearly indicates that the average age of entering candidates (reporting both birth date and date of first employment) is increasing. Given that older candidates generally report shorter travel time, this may be an indicator that median travel times are likely to decrease as the candidate age demographic changes. The Candidate Liaison Committee has recommended to the Education Policy Committee that additional demographics be collected from the candidate population to increase our ability to analyze this change in demographics. Included in these recommendations are degree (Bachelors, Masters, Ph.D) and former work experience in other professions. It would appear prudent to act upon these recommendations.

EXAM PROGRESS STATISTICS

Two additional indicators of travel time are examination pass ratios and average candidate examination progress. Examination pass ratios (next page) provide data on number of candidates sitting and number passing for each examination part. Average candidate examination progress (pages 23 and 24) indicates the average number of examinations passed in each examination session.

Examination Pass Ratios:

Exam		S2000	F 2000	S2001	F2001	S2002	F2002	S2003	F2003	S2004	F2004	S2005
1	Exams Taken	2667	2526	3498	3508	4860	4740	5398	5647	6577	5432	6374
	Passed	618	857	1167	1178	2096	1713	2057	2313	2225	1993	2485
	Raw Pass Ratio	23.2	33.9	33.4	33.6	43.1	36.1	38.1	41.0	33.8	36.7	39.0
	Effective Pass Ratio	26.3	36.7	37.4	37.9	46.5	41.5	41.3	46.5	38.5	40.6	44.6
2	Exams Taken	1903	1952	2115	2115	2549	2758	2710	3356	3656	3525	5275
	Passed	509	629	676	860	949	1360	961	1314	945	1464	3857
	Raw Pass Ratio	26.7	32.2	32.0	40.7	37.2	49.3	35.5	39.2	25.8	41.5	73.1
	Effective Pass Ratio	29.4	33.6	35.2	43.0	40.1	51.8	37.6	40.7	27.9	44.5	75.8
3	Exams Taken	1375	1466	1526	1450	1776	1765	2077	231	364	368	339
	Passed	438	528	651	605	745	705	820	101	112	133	136
	Raw Pass Ratio	31.9	36.0	42.7	41.7	41.9	39.9	39.5	43.7	30.8	36.1	40.1
	Effective Pass Ratio	36.5	39.3	46.2	45.6	46.4	43.4	42.8	51.5	38.1	42.2	47.4
4	Exams Taken	913	963	1008	1149	1272	1283	1215	1610	1728	2006	1580
	Passed	309	356	409	491	564	739	613	823	864	1032	835
	Raw Pass Ratio	33.8	37.0	40.6	42.7	44.3	57.6	50.5	51.1	50.0	51.4	52.8
	Effective Pass Ratio	37.3	41.0	43.3	46.5	47.7	60.3	51.8	53.5	52.1	53.9	55.0
5	Exams Taken	606	n/a	524	n/a	458	n/a	497	n/a	563	n/a	679
	Passed	216	n/a	190	n/a	199	n/a	214	n/a	229	n/a	313
	Raw Pass Ratio	35.6	n/a	36.3	n/a	43.4	n/a	43.1	n/a	40.7	n/a	46.1
	Effective Pass Ratio	42.9	n/a	43.7	n/a	49.4	n/a	46.1	n/a	42.9	n/a	50.0
6	Exams Taken	n/a	623	n/a	596	n/a	543	n/a	583	n/a	630	n/a
	Passed	n/a	189	n/a	208	n/a	217	n/a	228	n/a	235	n/a
	Raw Pass Ratio	n/a	30.3	n/a	34.9	n/a	40.0	n/a	39.1	n/a	37.3	n/a
	Effective Pass Ratio	n/a	40.6	n/a	44.7	n/a	48.0	n/a	45.4	n/a	43.2	n/a
7-CN	Exams Taken	40	n/a	48	n/a	47	n/a	58	n/a	48	n/a	60
	Passed	18	n/a	19	n/a	19	n/a	23	n/a	15	n/a	25
	Raw Pass Ratio	45.0	n/a	39.6	n/a	40.4	n/a	39.7	n/a	31.3	n/a	41.7
	Effective Pass Ratio	46.2	n/a	41.3	n/a	43.2	n/a	42.6	n/a	31.9	n/a	41.7
7-US	Exams Taken	516	n/a	494	n/a	442	n/a	378	n/a	373	n/a	405
	Passed	202	n/a	203	n/a	207	n/a	164	n/a	163	n/a	182
	Raw Pass Ratio	39.1	n/a	41.1	n/a	46.8	n/a	43.4	n/a	43.7	n/a	44.9
	Effective Pass Ratio	46.9	n/a	45.0	n/a	50.2	n/a	44.8	n/a	45.2	n/a	47.4
8	Exams Taken	319	n/a	310	n/a	349	n/a	331	n/a	309	n/a	311
	Passed	129	n/a	124	n/a	176	n/a	170	n/a	148	n/a	131
	Raw Pass Ratio	40.4	n/a	40.0	n/a	50.4	n/a	51.4	n/a	47.9	n/a	42.1
	Effective Pass Ratio	45.4	n/a	44.6	n/a	54.7	n/a	53.6	n/a	51.4	n/a	45.2

Exam		S2000	F 2000	S2001	F2001	S2002	F2002	S2003	F2003	S2004	F2004	S2005
9	Exams Taken	n/a	324	n/a	308	n/a	299	n/a	338	n/a	360	n/a
	Passed	n/a	126	n/a	135	n/a	138	n/a	127	n/a	146	n/a
	Raw Pass Ratio	n/a	38.9	n/a	43.8	n/a	46.2	n/a	37.6	n/a	40.6	n/a
	Effective Pass Ratio	n/a	45.8	n/a	49.3	n/a	50.4	n/a	41.5	n/a	44.1	n/a

From these data, two observations are worthy of note:

- Enrollment in the early examinations is up very sharply, indicating increased interest in the profession. Note, the apparent drop in enrollment for Exam 3 in the fall 2003 sitting is the result of the implementation of a separate CAS exam 3. Statistics for Exam 3 for fall 2003 and subsequent do not include candidates sitting for the SoA Exam 3.

- Pass ratios for Spring 2004 fell from the all-time high levels observed in the Fall 2003 examination sessions. Except for Exam 2, pass ratios appear to be in line with historical norms for latter exams. Pass ratios for earlier exams are rising.

Travel Time: Exam Progress Statistics

A. CAS-Specific Exams

CAS Examination	Exam Progress[1]	Pass Ratio[2]	Average Number of Exams Taken[3]
The following statistics are for CAS-administered exams. In 1983, the CAS administered Exams 4-10.			
Spring 1983	0.36	0.35	1.02
Fall 1983	0.29	0.29	1.01
Spring 1984	0.38	0.38	1.01
Fall 1984	0.35	0.35	1.01
Spring 1985	0.36	0.36	1.02
Fall 1985	0.40	0.39	1.02
Spring 1986	0.37	0.37	1.02
Fall 1986	0.38	0.37	1.01
Spring 1987	0.37	0.36	1.02
Fall 1987	0.35	0.35	1.01
Spring 1988	0.35	0.34	1.02
Fall 1988	0.36	0.36	1.01
Spring 1989	0.36	0.35	1.01
Fall 1989	0.39	0.39	1.01
Spring 1990	0.33	0.33	1.01
Fall 1990, CAS begins to administer Exam 3B. Exam 5 is partitioned into two parts.			
Fall 1990	0.26	0.34	0.76
Spring 1991	0.33	0.38	0.87
Fall 1991	0.28	0.36	0.77
Spring 1992, CAS partitions Exam 4 into two parts.			
Spring 1992	0.30	0.38	0.80
Fall 1992	0.30	0.38	0.81
Spring 1993	0.29	0.38	0.78
Fall 1993	0.30	0.38	0.78
Spring 1994	0.30	0.38	0.79
Fall 1994	0.30	0.39	0.76
Spring 1995	0.29	0.37	0.78
Fall 1995	0.27	0.36	0.76
Spring 1996	0.31	0.40	0.78
Fall 1996	0.29	0.40	0.74
Spring 1997	0.30	0.38	0.79
Fall 1997	0.24	0.33	0.73
Spring 1998	0.31	0.38	0.81
Fall 1998	0.24	0.34	0.73
Spring 1999	0.30	0.40	0.77
Fall 1999	0.29	0.40	0.73
Spring 2000, CAS administers non-partitioned Exams 5-9.			
Spring 2000	0.38	0.38	1.01
Fall 2000	0.38	0.38	1.01
Spring 2001	0.39	0.39	1.01

Continued on next page.

CAS Examination	Exam Progress[1]	Pass Ratio[2]	Average Number of Exams Taken[3]
Fall 2001, learning objectives developed for Fall Exams. CAS implements pass mark panels.			
Fall 2001	0.38	0.38	1.00
Spring 2002, CAS implements item writer training (starting with Fall Exams). Learning objectives developed for Spring Exams.			
Spring 2002	0.46	0.46	1.00
Fall 2002	0.42	0.42	1.00
Spring 2003	0.46	0.45	1.01
Fall 2003, CAS begins to administer its own version of Exam 3.			
Fall 2003	0.40	0.40	1.00
Spring 2004	0.41	0.40	1.01
Fall 2004	0.38	0.38	1.01
January 2005, Validation by Educational Experience (VEE) introduced for Economics, Corporate Finance, and Applied Statistical Methods.			
Spring 2005	0.44	0.44	1.01

[1] The number of full examination equivalents passed per candidate. (This is a product of the second and third columns.)

[2] The number of full examination equivalents passed per exam equivalent taken.

[3] The number of full examination equivalents taken per candidate.

h

B. JOINT EXAMS

1. ALL CANDIDATES

CAS/SoA Examination	Exam Progress[1]	Pass Ratio[2]	Average Number of Exams Taken[3]
Spring 2000	0.28	0.27	1.03
Fall 2000	0.35	0.34	1.03
Spring 2001	0.37	0.36	1.04
Fall 2001	0.40	0.38	1.05
Spring 2002	0.44	0.42	1.07
Fall 2002	0.45	0.43	1.06
Spring 2003	0.41	0.39	1.06
Fall 2003, CAS administers its own version of Exam 3 that is reported with CAS-specific exams.			
Fall 2003	0.45	0.42	1.07
Spring 2004	0.36	0.34	1.06
Fall 2004	0.43	0.41	1.06
January 2005, Validation by Educational Experience (VEE) introduced for Economics, Corporate Finance, and Applied Statistical Methods.			
Spring 2005	0.60	0.54	1.11

2. CAS CANDIDATES

CAS/SoA Examination	Exam Progress[1]	Pass Ratio[2]	Average Number of Exams Taken[3]
Spring 2000	0.23	0.23	1.02
Fall 2000	0.28	0.27	1.01
Spring 2001	0.28	0.27	1.01
Fall 2001	0.34	0.33	1.03
Spring 2002	0.37	0.36	1.04
Fall 2002	0.49	0.47	1.04
Spring 2003	0.41	0.39	1.04
Fall 2003, CAS administers its own version of Exam 3 that is reported with CAS-specific exams.			
Fall 2003	0.45	0.44	1.03
Spring 2004	0.32	0.31	1.04
Fall 2004	0.42	0.41	1.03
January 2005, Validation by Educational Experience (VEE) introduced for Economics, Corporate Finance, and Applied Statistical Methods.			
Spring 2005	0.57	0.54	1.05

[1] The number of full examination equivalents passed per candidate. (This is a product of the second and third columns.)

[2] The number of full examination equivalents passed per exam equivalent taken.

[3] The number of full examination equivalents taken per candidate.

Note:

The Exam Progress Statistics for exams jointly administered by the CAS and SoA are presented separately because the two societies maintain independent databases with different candidate identification numbers. The first chart provides statistics for all candidates who took joint exams; the second chart represents only those candidates who indicate on their application forms that they work in the property-casualty industry.

Key observations from these data are:

- Enrollment has increased sharply in the past several years for exams 1 and 2. This would indicate increased interest in the actuarial profession and an increasing supply of future actuaries.
- Average number of exams taken during the partitioning period should be viewed cautiously. The database does not contain records for all failed attempts on joint exams. These exam attempts are therefore not contemplated in the average number of exams taken. That is, during partitioning, it was possible for a candidate to take partial exams in the CAS system at the same time as exams in the Joint Structure (1, 2, 3A, 3C). The latter are not included in the statistics above unless the candidate passed.

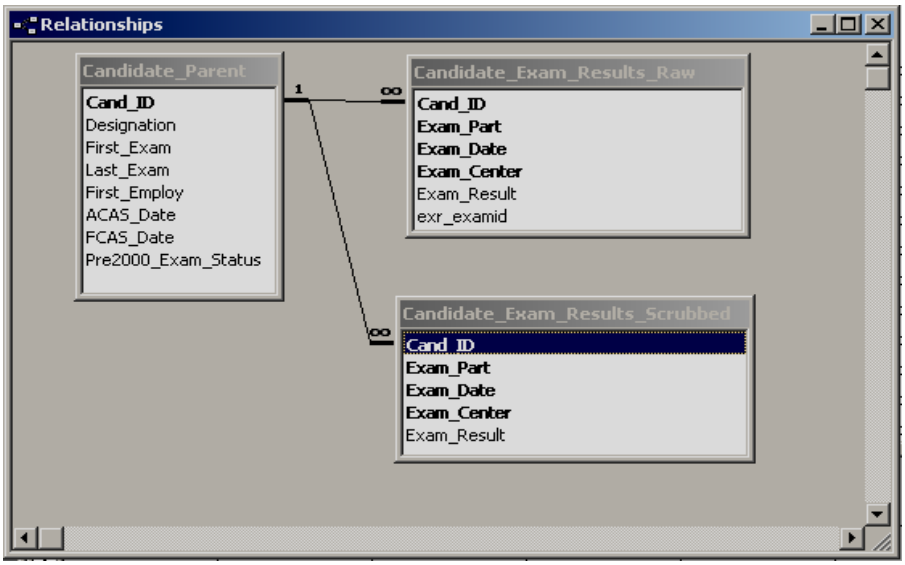
APPENDIX A: DATA AND METHODS

All data presented in this report are derived from examination and membership databases maintained by CAS staff[6]. These databases are updated following each exam session to reflect individual exam results and membership status. Data include exam results from both CAS exams and from exams administered jointly by the CAS and SoA. CAS staff members export a portion of this data and provide it to the Education Policy Committee (EPC) for study. Included in the export are the following data elements:

Field Name	Contents
MAS_ID	CAS Membership Master ID Number
MAS_DESIGN	CAS Membership Status (ACAS, FCAS, Student, Affiliate, etc.)
EXR_EXSIT	Date of Examination (YYYY/MM)
EXR_EXAMID	Examination Part
EXR_CENTID	Examination Center
EXR_GRADE	Examination Result (Pass, Fail, Not-Take, etc.)
EHI_OEXSTA	Examination Credits Prior to 2000 Transition
EHI_CEXSTA	Current Examination Credits
MAS_FTEMPL	Date of Full Time Employment
MAS_ACAS	Date ACAS Achieved
MAS_FCAS	Date FCAS Achieved

[6] Some statistics here include results from joint examinations and are derived from the SoA database. Such statistics include candidates for the SoA and candidates that have not yet declared a preference between the Life/Health and Property/Casualty track.

The EPC scrubs, normalizes, and transforms this table into the following three tables using Microsoft Access:



These tables contain the following data:

Table: Candidate_Parent	
Field	Contents
Cand_ID	CAS Membership Master ID Number
Cand_DOB	Candidate Date of Birth. For candidates with no reported date, this field contains zero.
Designation	CAS Membership Status (ACAS, FCAS, Student, Affiliate, etc.)
First_Exam	Date of first examination record found in Candidate_Exam_Results_Scrubbed. Converted into decimal format for ease of use (i.e. 1998/06 => 1998.5).
Last_Exam	Date of last examination record found in Candidate_Exam_Results_Scrubbed. Converted into decimal format for ease of use (i.e. 1998/06 => 1998.5).
First_Employ	Date of first full time P&C employment if reported by candidate. Converted into decimal format for ease of use (i.e. 1998/06 => 1998.5). For candidates with no reported date, this field contains zero.
ACAS_Date	Date ACAS conferred. Converted into decimal format for ease of use (i.e. 1998/06 => 1998.5). For candidates not having achieved Associateship, this field contains zero.
FCAS_Date	Date FCAS conferred. Converted into decimal format for ease of use (i.e. 1998/06 => 1998.5). For candidates not having achieved Associateship, this field contains zero.
Pre2000_Exam_Status	Free form string containing a list of all pre-2000 exams for which the candidate had credit prior to the transition. For example, “1, 2, 3A, 4B”.

Candidate_Parent is used to construct the travel time statistics displayed in this report.

Table: Candidate_Exam_Results_Raw	
Field	Contents
Cand_ID	CAS Membership Master ID Number
Exam_Part	Standardized exam identifier (see below). Converted from exr_exam_id
Exam_Date	Recorded date (YYYY/MM) for which the candidate registered for the exam.
Exam_Center	Abbreviated examination center
Exam_Result	Pass, Fail, Not-Take, etc.
Exr_Exam_ID	Examination part label from raw data (see below).

Candidate_Exam_Results_Raw is used only for ensuring correct record counts and conversion of examination part labels.

Table: Candidate_Exam_Results_Scrubbed	
Field	Contents
Cand_ID	CAS Membership Master ID Number
Exam_Part	Standardized exam identifier (see below). Converted from exr_exam_id
Exam_Date	Recorded date for which the candidate registered for the exam. Converted to decimal format for ease of use (i.e. 1998/06=>1998.5).
Exam_Center	Abbreviated examination center
Exam_Result	Converted from raw data into Pass, Fail, or Did Not Sit. Note that blank results in the raw data are not imported into this table.

Candidate_Exam_Results_Scrubbed is intended for future use in detailed studies of candidate progress. For example, this table was used in a 2003 study that used Markov Chains to examine the relationship between the current and prior sitting. That study indicated a strong correlation between passing in prior and current sittings. That is, students who pass are more likely to pass the next exam sitting.

It is hoped that publication of these data structures will allow greater numbers of volunteers, including students, to construct queries and applications to assist in the study of travel time. In the coming months, the EPC will publish "dummy" data that conforms to these structures that volunteers can use to construct such tools. Once such tools are constructed and tested against faux data, they can be delivered to the CAS office for application to real data. This plan protects the anonymity of candidate examination records while increasing the pool of volunteers capable of assisting in the construction of new tools and metrics for the study of those data.

DATA TRANSFORMATIONS

In order to make the construction of queries simpler, several of the data fields have been transformed. This section describes these transformations.

Dates:

All dates are transformed into decimal format using the rule:

Decimal Date = Year + Month/12

In this fashion, it is possible to compute the difference between dates in the tables without using special query logic.

Exam Results:

Exam result labels are entered by hand and do not always conform to established data entry standards. The following table contains the transformations from raw data to standardized labels:

Raw Data	Converted Value
FAIL	FAIL
NOT-TAKE	DID NOT SIT
PASS	PASS
REFUND	DID NOT SIT
TRANSFER	DID NOT SIT
HOLD	DID NOT SIT
INVA	DID NOT SIT
INVALID	DID NOT SIT

Exam Part Labels:

Exam part labels as coded in the raw data are difficult to use because their ASCII sort order is not the natural order in which we are accustomed to seeing them and because Microsoft Access SQL does not distinguish between upper and lower case letters. The following table contains the raw data labels and their converted values: The Exam_Value represents the percentage of an exam attributed to each part label.

EXR_EXAMID	Converted_Exam	Exam_Value
1	01X	1
2	02X	1
3A	03A	0.33
3b	03b	0.33
3B	03B	0.33
3C	03C	0.34
3	03X	1
4A	04A	0.5
4B	04B	0.5
4	04X	1
5A	05A	0.5
5B	05B	0.5
5	05X	1
6	06X	1
7C	07C	1
7U	07U	1
7	07X	1
8C	08C	1
8	08X	1
9	09X	1
PC	0PC	0
VE	0VE	0.34
VF	0VF	0.33
VS	0VS	0.33
10	10X	1

SIGNIFICANT NOTES ABOUT THE DATA

Users of this data, including readers of this report, should be aware that the data have significant limitations. An understanding of these limitations is critical to anyone analyzing statistics drawn from this data set. The following points describe the currently known limitations:

- The CAS databases do not contain a complete examination history for every candidate. The databases were constructed in the late 1980's. At that time, an effort was undertaken to locate as many exam results as possible. However, for some candidates, not all history was available.

- Prior to 2000, results for joint exams were often entered with an examination date of 1900/01.

- Prior to 2000, failed attempts on joint examinations were frequently not entered into the database.
- Waivers are frequently coded with the date on which the waiver was approved rather than a May or November date.
- Dates coded for achievement of ACAS and FCAS are recorded as the date of the meeting during which the member was formally recognized. This date is generally six months after the exam sitting during which the candidate sat.
- Dates of first P&C employment are now routinely collected by the CAS for all candidates registering for CAS exams. An attempt is ongoing to collect this data for current members. However, this data element is not present for many candidates who left the process without achieving a designation and for a significant number of members.