ACTUARIAL SCIENCE AT ITAM

BACKGROUND

The Instituto Tecnológico Autónomo de México (ITAM) is a private university founded in 1946 by a group of Mexican businessmen. It is a small institution of higher education, specializing in the management and social sciences and related disciplines. It is recognized in Mexico for its programs in Economics and Business. It was recently ranked number one among universities in Mexico City by the Newspaper "*Reforma*" (July 29, 2001). Our Business School has consistently been ranked among the top programs in Latin America; we were ranked number 5 for 2001[1]. We also are one of only two business programs in Mexico that have *AACSB* accreditation. The Mexican magazine "*EXP"* ranked ITAM as number two in management and number one in finance[2]. We are also a member of the *Program in International Management* (PIM) since 1997; again, we are one of only two universities in Mexico that belong to this network.

Our Departments of Statistics and Mathematics are acknowledged as being among the top six in Mexico[3]. In the last five years the faculty in the Department of Economics has published 47 articles in leading international Economics journals, for example the Journal of Economic Theory (10), Econometrica (3), the Journal of Econometrics (1), the American Economic Review (1), and others. The ones that are more related to Actuarial Science are included in the list at the end of this paper and marked with an asterisk. Many of our graduates from the Economics program are distinguished government officials, notably the current Minister of Finance.

ACTUARIAL PROGRAM

Mexico is one of those countries where the system for actuarial qualification is solely through the university education system. Once a person gets his or her Bachelor's in Actuarial Science, accredited actuaries receive a 'title' (diploma) that is registered in the Ministry of Education, and can hence legally use the designation of Actuary. Formal training in Actuarial Science began in Mexico in 1946, at the National Autonomous University (UNAM). There are eleven universities that offer undergraduate programs in Actuarial Science. Up to 1999 there were 3092 accredited actuaries in Mexico[4], of which 273 were from ITAM. Our program was the third to be established; in 1982. Since then, enrollment in it has grown steadily. To date we have a total enrollment of 615 students and the number of alumni has now reached

[1] *Revista América-Economía* (2001), September 13, 2001, pp. 47-54.
[2] *Revista EXP*, Septiembre-Octubre 2001, pp. 23-31.
[3] Sociedad Matemática Mexicana (2000), *Catálogo 1997-1999 de Programas de Recursos Humanos en Matemáticas*, SMM.
[4] Secretaría de Educación Pública (2001), *Actuaría. Progresión XX-XXI de las Profesiones*, SEP.

362. Thus in the period from 1982 to date ITAM has produced about 11% of all accredited actuaries in Mexico. Our Actuarial Science program is larger than all other programs of this area in Mexico, except for the one at UNAM.

Our students go through a strict selection and admissions process aimed at receiving the best. One of the criteria is the SAT exam. This is essentially the same as the one used by many US universities. It is standardized and administered by the same organization: The College Board. The minimum score required for entry to ITAM is 1300 points. The average score among our Actuarial Students in the past few years appears in the following table:

Table 1

Year	SAT Score
1999	1103
2000	1094
2001	1102

A comparison of the characteristics of our students, with respect to some of the Top 10 US Universities (U.S. News & World Report, 2001) will provide some idea of where we stand. These are presented in Table 2.

THE ACTUARIAL SCIENCE FACULTY

Our Department of Actuarial Science and Insurance includes 8 Full Time faculty, most of which are fully certified Actuaries in Mexico, that is we have our 'title' registered at the Ministry of Education and we are members of the *Colegio Nacional de Actuarios* (CONAC). Those who are not actuaries, are either PhD's in some related field , or are in the process of obtaining their FSA through the normal process. It is important to note (Table 2) that we do not have TA's teaching any of our courses; they are fully taught by the Faculty.

Table 3 compares the Department with some of the main Actuarial Science Departments in the US and Canada, based on the data published by the Society of Actuaries (http://www.soa.org). The 11 Full Time faculty indicated for ITAM include four professors from other departments that teach mainly to Actuarial students and/or do research in Actuarial related fields: they are three in the Department of Statistics and one in the Department of Mathematics. Their names and degrees are given in Table 4.

Table 2

School:	Georgia State University*	University of Pennsylvania*	University of Wisconsin-Madison*	Temple University*	ITAM
Total Undergraduates	16,439	9,687	29,697	18,394	4,595
Student-to-faculty ratio	16/1	7/1	13/1	15/1	8/1
Full-time faculty	N/A	89%	91%	77%	43%
Classes taught by TAs	8%	19%	21%	N/A	0%
Classes with under 20 students	40%	70%	42%	43%	25% (27.2)**
Classes with 50+ students	6%	8%	19%	5%	1.8%
Acceptance rate	59%	23%	72%	71%	71%
Average high school GPA	3.2	3.94	3.6	3.09	3.45
SAT/ACT (25/75 percentile)	940-1130	1310-1490	NA	920-1140	1060- (1100)**

Source: USNews & World Report; except for ITAM.

* Selected among the Top 10 undergraduate business specialties: Insurance and Risk Management.

** Average

Table 3

	Total Faculty		Faculty with Designation		Degrees			Published
	F.T.	Other	Number	Designation	PhD	MSc	BSc	(3 years)
ITAM	11[1]	8[2]	12	Actuary	7	9	3	5
Canada								
Laval University	10	6[3]	7	FSA, ASA, ACAS, FICA	7	1	2	6
University of Alberta	1	0	1	ASA	1			1
University of Waterloo	10	3	10	FSA,FCIA, FCAS, FIA, Hon. FIA, FFA, FIAA, ASA	9	1		6
United States								
Drake University	2	0	2	FSA, ASA	2			2
Georgia State University	6	0	6	FSA, ASA	4	2		2
University of Pennsylvania (Wharton School)	2	0	1	ASA	2			2
University of Texas at Austin	2	0	1	ASA	1	1		2
Univesity of Wisconsin - Madison	3		3	FSA	4			3

Source: http://www.soa.org/academic/

[1] Includes 3 Faculty from other Departments who teach mainly actuaries.

[2] Part Time. All are outstanding professional actuaries who work in the industry or regulatory bodies.

[3] Part Time. Practicing actuaries

Our part time Actuarial Science faculty members are distinguished actuaries who work in some insurance–related companies, or in regulatory agencies, and come to ITAM to teach in the evenings or very early morning; they are all fully certified actuaries.

Due to the departmental organization of ITAM, there are many more professors in all departments who teach our Actuarial students.

RESEARCH

One of the goals of ITAM is to become a leader in research, in particular in Actuarial Science in Mexico. To this purpose ITAM has two endowed chairs in the field of Insurance and Actuarial Science. They are the "*Alberto Baillères Chair; on Insurance and International Finance*", funded by American Financial Group, and the "*Comercial-América Chair on Insurance and Risk Management*", funded by Seguros Comercial-América. Some of us have participated in several of the last ARC as well as in the IME congresses. We have recently organized a one day *Seminar on Insurance Solvency* as well as two *Seminars on Social Security and Pension System Reforms*.

Prof. Tapen Sinha received a grant from the Actuarial Education Research Fund (*AERF*) of the Society of Actuaries. The project was "*Retrospective and Prospective Analysis of the Privatized Mandatory Pension System in Mexico*" and will be published as a monograph. Professors M. Mendoza and N.D. Shyamalkumar were awarded a grant from the Committee on Knowledge Extension Research (CKER). The title of this project is "*Survey of Bayesian Mortality Data Models with related Robust and Nonparametric Extensions*". Enrique de Alba is currently Associate Editor of the North American Actuarial Journal.

Our faculty has published Actuarial related articles and Working Papers. They are included in the list at the end of this document.

Table 4

Name	Designation	Degree and University
Department of Actuarial Science and Insurance		
Roberto Bonilla	Actuary	M.B.A. (Monterrey Tech.)
Enrique de Alba	Actuary	Ph.D. (Statistics, Wisconsin-Madison)
Georgina Gallardo	Mathematician	M.Sc. (Demography, El Colegio de México)
Mercedes Gregorio	Actuary	Ph.D. (Operations Research, Essex)
Jorge Rendón	Actuary	M.Sc. (Risk Management & Insurance, ITAM)
N.D. Shyamalkumar	Has passed SOA Courses 1-4, 6, 7	Ph.D. (Statistics, Purdue)
Tapen Sinha	–	Ph.D. (Economics, Minnesota)
M. Angeles Yáñez	Actuary	M.Sc. (Operations Research, London School of Economics)
Department of Statistics		
Juan J. Fernández	Actuary	Ph.D. (Statistics & OR, Essex)
Víctor Guerrero	Actuary	Ph.D. (Statistics, Wisconsin-Madison)
Manuel Mendoza	Actuary	Ph.D. (Statistics, Valencia)
Department of Mathematics		
Carlos Bosch	Mathematician	Ph.D. (Mathematics, U Claude Bernard, Lyon)

ALUMNI

The program is very young, it was founded in 1982, so that our alumni are only beginning to arrive at the top echelons in the insurance industry. However one is already the CEO of an important insurance company and another of a brokerage firm. Several of them (about 35) are at the vice-president level.

Many of our graduates from the Actuarial Science program have continued to do graduate work in top foreign universities. A considerable number of them have gone into Statistics programs and others to programs such as MBA, Engineering Economic Systems, Economics or Actuarial Science. Those that have gone on to get a Ph.D. degree are, or have been at, the following universities: Bath (1), Carnegie Mellon (1), North Carolina (1), Chicago (2), Duke (2), Essex (2), Imperial College (1), Oxford (1), Princeton (1), Sheffield (1), Stanford (1), Valencia (1), Warwick (3), Waterloo (2) and Wharton (1)

The universities where some have gotten their Master's degrees are: Alborg (1), California-Berkeley (1), Cataluña, Spain (1), City LBS, London (2), Columbia (1), Cornell (1), Chicago (7), Essex (2), Iowa (2), London School of Economics (1), New York (1), Norway (1), Oxford (4), Princeton (1), Stanford (1), Warwick (3), Waterloo (3) and Wisconsin (2)

In the last five years there has always been an ITAM student among the first places in the *National Prize on Insurance* sponsored by the *COMISION NACIONAL DE SEGUROS Y FIANZAS*; the government regulatory agency for the insurance industry. Our students have won all but four (of seventeen) prizes in the Bachelor's thesis category.

Publications in Actuarial Science and Insurance

Articles

1. de Alba, E. and M. Juárez (2001), "Bayesian Estimation of IBNR Reserves", submitted to *North American Actuarial Journal*
2. de Alba, E. and R. Bonilla (2002), "Un Modelo Para el Tratamiento de Valores Negativos en el Triángulo de Desarrollo Utilizado en la Estimación de Reservas para SONR", *Transactions of the 27th International Congress of Actuaries*, Cancún, México.
3. de Alba, E. (2001), Discussion of: "Principal Applications of Bayesian Methods in Actuarial Science: A Perspective", *North American Actuarial Journal* 5,3
4. de Alba, E. and T. Sinha (1999), Discussion to: "Critique of Mexico's New Social Security Act" (Maupomé-Carvantes, O.), *North American Actuarial Journal* 3,3, 98-101.
5. de Alba, E, M. Juárez and M.T. Moreno (1998), "Bayesian Estimation of IBNR Reserves", en: *Transactions of the International Congress of Actuaries* Vol. 4, 255-273, Birmingham, England.

*6. Goldstein, R. and Zapatero, F. (1996), "General Equilibrium with Constant Relative Risk Aversion and Vasicek Interest Rates", *Mathematical Finance*, 26, 331-340.

7. Guerrero, V.M., R. Juárez and P. Poncela (2001), "Data graduation based on statistical time series methods", *Statistics and Probability Letters* 52, 169-175

*8. Lobato, I. and Velasco, C. (2000), "Long Memory in Stock Market Trading Volume", *Journal of Business and Economic Statistics* 18, 410-427.

*9. Lobato, I., Nankervis, J. y Savin, G., "Testing for Autocorrelation Using a Modified Box-Price Q Test", de próxima aparición en *International Economic Review*.

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*12. Ogaki, M. y Santaella, J. (2000), "The Exchange Rate and the Term Structure of Interest Rates in Mexico", *Journal of Development Economics* 63, 135-155.

13. Sinha, Tapen (2000), "Menadzment Rizika i Osiguranje" ("Risk Management and Insurance"), in *Poslovna Politika* (Business Policy), Belgrade, Yugoslavia (in Serbian) with B. Ljutic, Volume 29.

14. Sinha, Tapen (1999), "The Internet, Insurance, and Latin America", *Texas Business Review*, 4-5.

15. Sinha, Tapen (1999), "Some Surprising Results of the AFOREs in Mexico" *Benefits and Compensation International*, 23.

16. Sinha, Tapen (1999), "Developments in the Mexican insurance Market: Implications for the American Insurers", *Chartered Insurance Institute Journal*, London 28-29.

17. Sinha, Tapen & R. Benedict "Aspects of Service Quality of Privatized Pension Plans", in Linda Bock edited volume, An Industry in Transition, *International Insurance Society*, New York, 237-285.

18. Sinha, Tapen, F. Martinez and C. Barrios-Muñoz (1999), "Performance of Publicly Mandated Private Pension Funds in Mexico: Simulations with Transactions Cost (or, My Pension Fund is Better than Yours: Lies, Damn Lies and Statistics)" *ARCH* (Society of Actuaries), 323-354.

19. Sinha, Tapen (1998), "The Great Pension Reform: AFOREs and the Future of Privatized Retirement in Mexico", *Texas Business Review*, 1-4.

20. Sinha, Tapen (1998), "Positive Response to Pension Plan", *Life Insurance International* (UK).

21. Sinha, Tapen (1998), "A Review of Privatized Pension in Mexico", *Pensions and Investments*, p. 14.

22. Sinha, Tapen (1998), "Privatization of Publicly Mandated Retirement System in Mexico: A Scorecard" *IBIS Review*, 21-24.

23. Sinha, Tapen (1998), **"**Changes in the Rules of the Game: Future of Insurance Business in Mexico", in *International Business Lawyer* (London, International Bar Association) Volume 26, No. 1, 14-17.

24. Sinha, Tapen & M. Espinosa (2000), "A Primer and Assessment of Social Security Reform in Mexico", *Quarterly Review of the Federal Reserve Bank of Atlanta First Quarter*, 1-23 (lead article).

25. Sinha, Tapen & R. Benedict (1996), "Retirement Decision of Men and Women: A Preliminary Analysis", *Early Retirement* (Australian Government Publishing Service, Canberra), 217-236.

26. Sinha, Tapen & D. Sinha (1996), "How have the Retirement Patterns Changed in Industrialised Countries and What can We Learn from them?", *Early Retirement* (Australian Government Publishing Service, Canberra), 237-254.

*27. Sundaresan, S. y Zapatero, F. (1997), "Valuation, Optimal Asset Allocation and Retirement Incentives of Pension Plans", *Review of Financial Studies* 10, 631-660.

*28. Zapatero, F. (1998), "Effects of Financial Innovations on Market Volatility when Beliefs are Heterogeneous", *Journal of Economic Dynamics and Control* 22, 597-626.

Books

1. Rendón, J. (2000), "*Tablas de Mortalidad México 2000*" , Joint AMIS-AMA.
2. Rendón, J. (2000), "*Normas y Políticas del Seguro de Vida*", Cuarta Edición, Author.
3. Sinha, Tapen (2000), "*Pension Reform in Latin America and Its Lessons for International Policymakers*" Kluwer Academic Publishers, Boston, Massachusetts, USA, (Huebner international series on risk, insurance, and economic security no. 23), 306 pages.

Working Papers

1. Mendoza, M., A.M. Madrigal and E. Gutiérrez Peña (2001), "Predictive Mortality Graduation and the Value at Risk: A Bayesian Approach", Working Paper DE-C01.5, ITAM, México.

* Publications of the Department of Economics.