

## 1. Personal Details

NAME Angus Smith Macdonald  
 ADDRESS Department of Actuarial Mathematics and Statistics  
 Heriot-Watt University, Edinburgh EH14 4AS  
 Tel: 0131 451 3209, Fax: 0131 451 3249, email: A.S.Macdonald@hw.ac.uk  
 EDUCATION 1981 BSc in Mathematics (First Class), University of Glasgow  
 1984 Fellow of the Faculty of Actuaries (FFA)  
 1995 PhD in Actuarial Science, Heriot-Watt University  
 EMPLOYMENT Scottish Amicable Life Assurance Society  
 1981–84 Actuarial student, 1984–89 Actuary  
 Department of Actuarial Mathematics & Statistics, Heriot-Watt University  
 1989–1997 Lecturer, 1997–2000 Senior Lecturer, 2000–2022 Professor  
 2022– Professor Emeritus

## 2. Selected Administration

1999–2022 Director, Genetics and Insurance Research Centre  
 2003–2007 Director of Research, School of Mathematical and Computer Sciences  
 2005–2007 Director, the Maxwell Institute for Mathematical Sciences  
 2007–2013 Head of Department of Actuarial Mathematics & Statistics  
 2013–2020 Chair, Ordinances and Regulations Committee  
 2020–2022 Member, Governance and Nominations Committee of the Court

## 3. Selected Professional Activities

1993–1998 Scientific Committee, 1998 International Congress of Actuaries  
 1996–1997 Scientific Committee, 7th AFIR Colloquium, Cairns, Australia  
 1998–2007 Elected to Council of the Faculty of Actuaries (Honorary Librarian)  
 2002–2011 Chair, Mortality Sub-Committee (later, Life Office Mortality Committee) of the CMI  
 2002–2004 Scientific Committee, 35th ASTIN Colloquium, Bergen, Norway  
 2008–2009 Scientific Committee, 3rd IAA Life Colloquium, Munich, Germany  
 2009–2011 Member, Monitoring Group on Genetics and Insurance of the Human Genetics Commission  
 2011–2013 Chair, Technical Committee of the CMI

## 4. Ph.D. Supervision (\* co-supervised, † Ph.D. by publication)

1998: A. Berketi	2000: N. Katrakis
2002: D.J. Pritchard, C.T. Wekwete*	2003: E.H. Gui
2004: M. Willder*, W. Tong*	2006: C. Espinosa-Castaneda, L. Lu*.
2007: K. Zhang*, O.B. Akodu, P. Tapadar, B. Lu*	2008: T. Chatterjee*, K.R. McIvor
2009: L. MacCalman	2010: F. Yu
2012: S.J. Richards*†	2014: C.J. Adams*
2019: F. Ungolo*	2020: O. Haçarız*, I.G. Duncan*

## 5. Prizes and Honours

1998 Honorable Mention, James C.H. Anderson Memorial Award  
 2005 David Garrick Halmstad Prize (with H.R. Waters and C.T. Wekwete)  
 2005 Best Paper Prize, North American Actuarial Journal (with H.R. Waters and C.T. Wekwete)  
 2005 Elected honorary member, Actuarial Society of South Africa  
 2006 Elected Fellow of the Royal Society of Edinburgh (FRSE)  
 2011 Finlaison Medal of the Institute and Faculty of Actuaries

## 6. Editorial Work

(1) Ed., *Scand. Act. J.* 2000–06. (2) Ed., *Ann. Act. Sci.* 2008–17. (3) Ed.-in-Ch., *Ann. Act. Sci.* 2018–2020. (4) Assoc. Ed., *South African Act. J.* 2000–2017; *Law, Probability and Risk* 2002–2011. (5) Section Ed., *Encyclopaedia of Actuarial Science*, John Wiley, 2001–2004. (6) Series Ed., *CUP International Series on Actuarial Science*, 2008–.

## 7. Research Grants over £10,000 (PI or Joint PI)

1997	£37,800	Standard Life Assurance Company, PhD project, modelling LTC Insurance.
1998	£33,840	Swiss Re Life and Health, breast/ovarian cancer and CHD genetic risks.
1999	£36,100	Swiss Re Life and Health, for continuation of the project above.
1999	£328,500	Association of British Insurers, to set up Genetics and Insurance Research Centre.
2000	£37,800	Swiss Re Life and Health, for continuation of the project above.
2001	£50,455	Standard Life Assurance Company, PhD project, life insurance solvency.
2002	£74,002	Wellcome Trust, adverse selection based on genetic tests (with U. Cardiff)).
2003	£350,335	Association of British Insurers, to continue Genetics and Insurance Research Centre.
2003	£66,329	Wellcome Trust, future need for long-term care (with U. Newcastle & MRC CFAS).
2005	£44,899	Faculty of Actuaries, healthy life expectancy in Scotland (with U. Aberdeen).

## 8. Book

ANGUS S. MACDONALD, STEPHEN J. RICHARDS & IAIN D. CURRIE (2018). *Modelling Mortality with Actuarial Applications*. Cambridge University Press, Cambridge, U.K..

## 9. Selected Publications

LJESKOVAC, M., DICKSON, D.C.M., KILPATRICK, S., MACDONALD, A.S., MILLER, K.A. & PATERSON, I.M. (1991). A model office investigation of the potential impact of AIDS on non-linked life assurance business (with discussion). *TFA* **42**, 187–276.

PAUL, D.R.L., EASTWOOD, A.M., HARE, D.J.P., MACDONALD, A.S., MUIRHEAD, J.R., MULLIGAN, J.F., PIKE, D.M. & SMITH, E.F. (1993). Restructuring mutuals — principles and practice (with discussion). *TFA* **43**, 167–277 and 353–375.

MACDONALD, A.S. (1994). A note on life office models. *TFA* **44**, 64–72.

MACDONALD, A.S. (1995). *A stochastic evaluation of solvency valuations for life offices*. Ph.D. Thesis, Heriot-Watt University.

MACDONALD, A.S. (1996). An actuarial survey of statistical models for decrement and transition data. I: Multiple state, binomial and Poisson models. *BAJ* **2**, 129–155.

MACDONALD, A.S. (1996). An actuarial survey of statistical models for decrement and transition data. II: Competing risks, non-parametric and regression models. *BAJ* **2**, 429–448.

MACDONALD, A.S. (1996). An actuarial survey of statistical models for decrement and transition data. III: Counting process models. *BAJ* **2**, 703–726.

MACDONALD, A.S. (EDITOR) (1997). *The second actuarial study of mortality in Europe*. Groupe Consultatif des Associations d'Actuaires des Payes des Communautés Européennes, Oxford (ISBN 0-9510763-4-5).

MACDONALD, A.S. (1997). How will improved forecasts of individual lifetimes affect underwriting?. *Phil. Trans. Roy. Soc. B* **352**, 1067–1075 and (with discussion) *BAJ* **3** 1009–1025.

MACDONALD, A.S. (1997). Current actuarial modelling practice and related issues and questions. *NAAJ* **1:3**, 24–35.

EASTWOOD, A.M., LEDLIE, M.C., MACDONALD, A.S. & PIKE, D.M. (1997). With-profits maturity payouts, asset shares and smoothing (with discussion). *TFA* **44**, 497–575.

MACDONALD, A.S., CAIRNS, A.J.G., GWILT, P.A. & MILLER, K.A. (1998). An international comparison of recent trends in population mortality. *BAJ* **4**, 3–141.

MACDONALD, A.S. (1999). Modeling the impact of genetics on insurance. *NAAJ* **3:1**, 83–101.

- BERKETI, A. & MACDONALD, A.S. (1999). The effect of the nature of the liabilities on the solvency and maturity payouts of a UK life office fund: a stochastic evaluation. *Insurance: Mathematics & Economics* **24**, 117–138.
- MACDONALD, A.S. & PRITCHARD, D.J. (2000). A mathematical model of Alzheimer’s disease and the ApoE gene. *ASTIN Bulletin* **30**, 69–110.
- MACDONALD, A.S. & PRITCHARD, D.J. (2001). Genetics, Alzheimer’s disease and long-term care insurance. *NAAJ* **5:2**, 54–78.
- MACDONALD, A.S. (2000), Human genetics and insurance issues, in *Bioethics for the New Millennium*, ed. I. Torrance, St. Andrew Press (book chapter)
- GUI, E.H. & MACDONALD, A.S. (2001). A Nelson-Aalen estimate of the incidence rates of early-onset Alzheimer’s disease associated with the Presenilin-1 gene. *ASTIN Bulletin* **32**, 1–42.
- GUTIÉRREZ, M.C. & MACDONALD, A.S. (2003). Adult polycystic kidney disease and critical illness insurance. *NAAJ* **7:2**, 93–115.
- MACDONALD, A.S., WATERS, H.R. & WEKWETE, C.T. (2003). The genetics of breast and ovarian cancer. I: A model of family history. *Scand. Act. J.* **2003**, 1–27.
- MACDONALD, A.S., WATERS, H.R. & WEKWETE, C.T. (2003). The genetics of breast and ovarian cancer. II: A model of critical illness insurance. *Scand. Act. J.* **2003**, 28–50.
- MACDONALD, A.S. (2003). Genetics and insurance: What have we learned so far?. *Scand. Act. J.* **2003**, 324–348.
- MACDONALD, A.S. (2003). Moratoria on the use of genetic tests and family history for mortgage-related life insurance. *BAJ* **9**, 217–237.
- MACDONALD, A.S. & YANG, S.Y. (2003). Highly penetrant genetic disorders: An atlas for critical illness insurance. *BAJ* **9**, 875–901.
- DAYKIN, C.D., AKERS, D.A., MACDONALD, A.S., MCGLEENAN, T., PAUL, D. & TURVEY, P.J. (2003). Genetics and insurance — some social policy issues (with discussions). *BAJ* **9**, 787–874.
- GUTIÉRREZ, M.C. & MACDONALD, A.S. (2004). Huntington’s disease, critical illness insurance and life insurance. *Scand. Act. J.* **2004**, 279–313.
- WILLETS, R.C., GALLOP, A.P., LEANDRO, P.A., LU, J.L.C., MACDONALD, A.S., MILLER, K.A., RICHARDS, S.J., ROBJOHNS, N., RYAN, J.P & WATERS, H.R. (2004). Longevity in the 21st century. *BAJ* **10**, 685–832.
- MACDONALD, A.S. (2004), Genetics and insurance management, in *The Swedish Society of Actuaries: One Hundred Years*, ed. A. Sandström, Svenska Aktuarietföreningen, Stockholm
- MACDONALD, A.S., WATERS, H.R. & WEKWETE, C.T. (2005). A model for coronary heart disease and stroke, with applications to critical illness insurance underwriting I: The model. *NAAJ* **9:1**, 13–40.
- MACDONALD, A.S., WATERS, H.R. & WEKWETE, C.T. (2005). A model for coronary heart disease and stroke, with applications to critical illness insurance underwriting II: Applications. *NAAJ* **9:1**, 41–56.
- MACDONALD, A.S., PRITCHARD, D.J. & TAPADAR, P. (2006). The impact of multifactorial genetic disorders on critical illness insurance: A simulation study based on UK Biobank. *ASTIN Bulletin* **36**, 311–346.
- MACDONALD, A.S., STRAUGHN, J.S. & SUTTON, M. (2006). Healthy life expectancy measurement in Scotland (with discussion). *BAJ* **12**, 327–394.
- GUI, E.H., LU, B., MACDONALD, A.S., WATERS, H.R. & WEKWETE, C.T. (2006). The genetics of breast and ovarian cancer III: A new model of family history with applications. *Scand. Act. J.* **2006**, 338–367.
- MACDONALD, A.S. & MCIIVOR, K.R. (2006). Application of a polygenic model of breast and ovarian cancer to critical illness insurance. *Ann. Act. Sci.* **1**, 319–343.
- GUTIÉRREZ, M.C. & MACDONALD, A.S. (2007). Adult polycystic kidney disease and insurance: A case study in genetic heterogeneity. *NAAJ* **11:1**, 90–118.
- MACDONALD, A.S. (2007), Insurance, in *Handbook of Statistical Genetics (3rd edition)*, eds. Balding, D.J., Bishop, M. & Cannings, C., John Wiley, Chichester
- ESPINOSA, C. & MACDONALD, A.S. (2007). A correction for ascertainment bias in estimating rates of onset of highly penetrant genetic disorders. *ASTIN Bulletin* **37**, 429–452.
- LU, L., MACDONALD, A.S., WATERS, H.R. & YU, F. (2007). A dynamic family history model of hereditary nonpolyposis colorectal cancer and critical illness insurance. *Ann. Act. Sci.* **2**, 289–325.

- CHATTERJEE, T., MACDONALD, A.S. & WATERS, H.R. (2008). A model for ischaemic heart disease and stroke I: The model. *Ann. Act. Sci.* **3**, 45–81.
- CHATTERJEE, T., MACDONALD, A.S. & WATERS, H.R. (2008). A model for ischaemic heart disease and stroke II: Modelling obesity. *Ann. Act. Sci.* **3**, 83–103.
- CHATTERJEE, T., MACDONALD, A.S. & WATERS, H.R. (2008). A model for ischaemic heart disease and stroke III: Applications. *Ann. Act. Sci.* **3**, 105–119.
- LU, L., MACDONALD, A.S. & WEKWETE, C.T. (2008). Premium rates based on genetic studies: How reliable are they?. *Insurance: Mathematics & Economics* **42**, 319–331.
- LU, L., MACDONALD, A.S. & WATERS, H.R. (2008). Sampling distributions of critical illness insurance premium rates: Breast and ovarian cancer. *ASTIN Bulletin* **38**, 527–542.
- MITCHELL, R.J., FERGUSON, R.K., MACDONALD, A.S., DUNLOP, M.G., CAMPBELL, H. & PORTEOUS, M.E. (2008). Cascade genetic testing for mismatch repair gene mutations. *Familial Cancer* **7**, 293–301.
- CHATTERJEE, T., MACDONALD, A.S. & WATERS, H.R. (2008). A model for ischaemic heart disease and stroke I: The model. *Ann. Act. Sci.* **3**, 45–81.
- CHATTERJEE, T., MACDONALD, A.S. & WATERS, H.R. (2008). A model for ischaemic heart disease and stroke II: Modelling obesity. *Ann. Act. Sci.* **3**, 83–103.
- CHATTERJEE, T., MACDONALD, A.S. & WATERS, H.R. (2008). A model for ischaemic heart disease and stroke III: Applications. *Ann. Act. Sci.* **3**, 105–119.
- MACDONALD, A.S. & MCIVOR, K. (2009). Modelling adverse selection in the presence of a common genetic disorder: The breast cancer polygene. *ASTIN Bulletin* **39**, 373–402.
- MACDONALD, A.S. & MCIVOR, K.R. (2010). Pensions and genetics: Can longevity genes be reliable risk factors for annuity pricing?. *Scand. Act. J.* **2010**, 1–14.
- MACDONALD, A.S. (2010). Survival analysis on pedigrees: A marked point process model. *ASTIN Bulletin* **40**, 35–64.
- MACDONALD, A.S. & TAPADAR, P. (2010). Multifactorial genetic disorders and adverse selection: Epidemiology meets economics. *Journal of Risk and Insurance* **77**(1), 155–182.
- LU, B., MACDONALD, A.S. & WATERS, H.R. (2011). The genetics of breast and ovarian cancer IV: A model of breast cancer progression. *Scand. Act. J.* **2011**, 239–266.
- LU, B., MACDONALD, A.S., WATERS, H.R. & YU, F. (2011). The genetics of breast and ovarian cancer V: Application to income protection insurance. *Scand. Act. J.* **2011**, 267–291.
- MACDONALD, A.S. & YU, F. (2011). The impact of genetics on insurance: Conclusions from the ‘bottom-up’ modelling programme. *ASTIN Bulletin* **41**, 343–376.
- JOLY, Y., BURTON, H., KNOPPERS, B.M., FEZE, I.N., DENT, T., PASHAYAN, N., CHOWDHURY, S., FOULKES, W., HALL, A., HAMET, P., KIRWAN, N., MACDONALD, A., SIMARD, J. & VAN HOY-WEHGHEN, I. (2014). Life insurance: Genomic stratification and risk classification. *European J. Hum. Gen.* **22**(5), 575–579.
- ADAMS, C.J., DONNELLY, C.A. & MACDONALD, A.S. (2015). The impact of known breast cancer polygenes on critical illness insurance. *Scand. Act. J.* **2015**, 141–171.
- ADAMS, C.J., DONNELLY, C.A. & MACDONALD, A.S. (2015). Adverse selection in a start-up long-term care insurance market (with discussion). *BAJ* **20**, 298–365.
- HAO, M., MACDONALD, A.S., TAPADAR, P. & THOMAS, R.G. (2016). Insurance loss coverage under restricted risk classification: The case of iso-elastic demand. *ASTIN Bulletin* **46**, 265–291.
- HAO, M., MACDONALD, A.S., TAPADAR, P. & THOMAS, R.G. (2018). Insurance loss coverage and demand elasticities. *Insurance: Mathematics & Economics* **79**, 15–25.
- HAO, M., MACDONALD, A.S., TAPADAR, P. & THOMAS, R.G. (2019). Insurance loss coverage and social welfare. *Scand. Act. J.* **2019**, 113–128.
- UNGOLO, F., CHRISTIANSEN, M., KLEINOW, T. & MACDONALD, A.S. (2019). Survival analysis of pension scheme mortality when data are missing. *Scand. Act. J.* **2019**, 523–547.
- UNGOLO, F., KLEINOW, T. & MACDONALD, A.S. (2020). A hierarchical model for the joint mortality analysis of pension scheme data with missing covariates. *Insurance: Mathematics & Economics* **91**, 68–84.
- HAÇARIZ, O., KLEINOW, T., MACDONALD, A.S., TAPADAR, P. & THOMAS, R.G. (2020). Will genetic test results be monetized in life insurance?. *Risk Management and Insurance Review* **23**, 379–399.

- HAÇARIZ, O., KLEINOW, T. & MACDONALD, A.S. (2021). Genetics, insurance and hypertrophic cardiomyopathy. *Scand. Act. J.* **2021**, 54–81.
- UNGOLO, F., KLEINOW, T. & MACDONALD, A.S. (2021), Parametric bootstrap estimation of standard errors in survival models when covariates are missing, in *Mathematical and Statistical Methods for Actuarial Sciences and Finance*, eds. Corazza, M., Gilli, M., Perna, C., Pizzi, C. & Sibillo, M., Springer
- CHATTERJEE, I., MACDONALD, A.S., TAPADAR, P. & THOMAS, R.G. (2021). When is utilitarian welfare higher under insurance risk pooling?. *Insurance: Mathematics & Economics* **101**, 289–301.
- GOLINGHURST, D., DE PAOR, A., JOLY, Y., MACDONALD, A.S., OTLOWSKI, M., PETER, R. & PRINCE, A.E.R. (2022). Anti-selection and genetic testing: an interdisciplinary perspective. *J. Law, Medicine and Ethics* **50**, 139–154.
- HAÇARIZ, O., KLEINOW, T. & MACDONALD, A.S. (2022). An actuarial model of arrhythmogenic right ventricular cardiomyopathy and life insurance. *Scand. Act. J.* **2022**, 94–114.
- JOSE, A., MACDONALD, A.S., TZOUGAS, G. & STREFTARIS, G. (2022). A combined neural network approach for the prediction of admission rates related to respiratory diseases. *Risks* **11**, 217.
- JOSE, A., MACDONALD, A.S., TZOUGAS, G. & STREFTARIS, G. (2024). Interpretable zero-inflated neural network models for predicting admission counts. *To appear in Ann. Act. Sci.*
- MACDONALD, A.S. (2024). Genetic testing and actuarial science. *Ann. Act. Sci.* **18**, 1–4.
- ARIK, A. CAIRNS, A.J.G., DODD, E., MACDONALD, A.S., SHAO, A. & STREFTARIS, G. (2024). Cancer insurance pricing under different scenarios associated with treatment and diagnosis. *To appear in Scand. Act. J.*