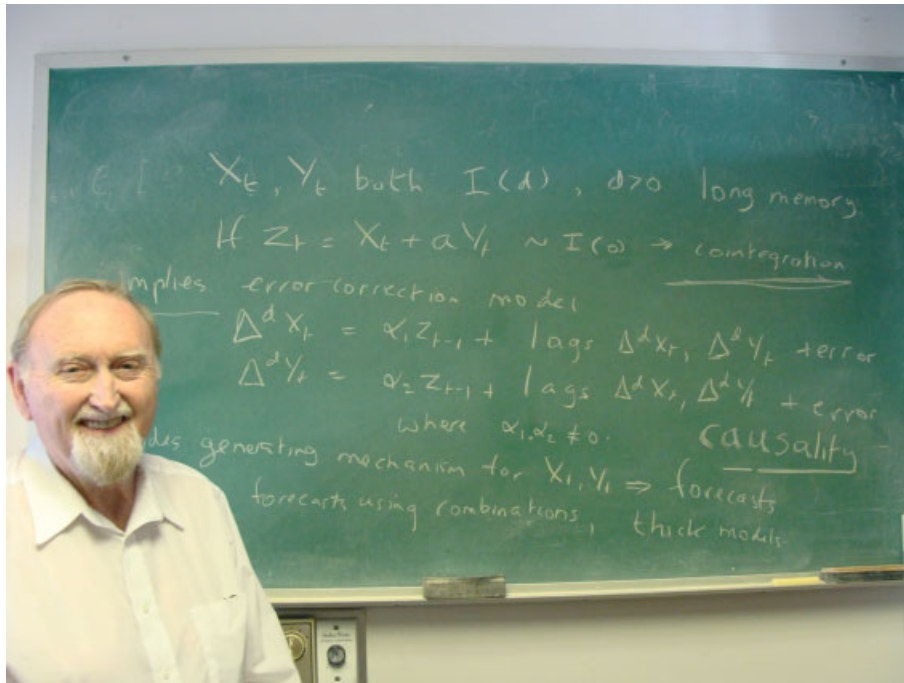


OBITUARY

IN MEMORY OF CLIVE GRANGER: AN ADVISORY BOARD MEMBER OF THE JOURNAL



Professor Sir Clive William John Granger, Kt, Professor Emeritus at the University of California, San Diego, died on 27 May 2009. He was born on 4 September 1934.

In a distinguished career spanning more than 50 years, Clive Granger greatly influenced the theory and practice of time-series econometrics, with major contributions to most of the key concepts and approaches during that period. It is almost impossible to undertake empirical analyses of economic time series without using some of his methods or ideas which spanned causality, spurious regressions, forecasting, long-memory, non-linearity, aggregation and, most importantly, cointegration, where his formulation with Robert F. Engle, with whom he was awarded the Sveriges Riksbank Prize in Economic Science in Memory of Alfred Nobel in October 2003, changed forever our understanding of non-stationary data.

The photo of Clive standing next to a blackboard, reproduced above with the permission of his widow Lady Patricia Granger, shows the breadth and the unity of his contributions. The material on the board clearly illustrates Clive's main contributions to time-series econometrics as he saw them on 14 March 2008 when this photo was taken. The material was choreographed, so to speak, most likely by Clive himself, very much as when dancers or themes are placed within a unified

frame. It starts with integrated processes of order d , inclusive of long-memory processes (with $d < 1$), then it moves to cointegration, followed by error correction models, long-run causality,¹ forecasting, forecast combinations, and ‘thick’ modelling, where the alternative models are ranked and only a fraction of the top models are used in forecast combinations.

These wide-ranging theoretical contributions were combined with an unparalleled range of applied studies, from river flow, through psychopathic behaviour, sunspot activity, consumer attitudes and speculative prices to deforestation, as well as many economic and financial variables. His impact can be seen in the more than 40,000 citations to his work, with eight publications having more than 1000 citations each.

Clive Granger was born in Swansea, Wales, but left as a baby when his parents moved to Lincoln while working for Chivers, a well-known jam maker. When his father, Edward John Granger, enlisted in the RAF during the Second World War, Clive and his mother Evelyn moved to Cambridge to stay with his maternal grandmother, where he attended a local primary school, and showed early promise in mathematics. His father returned from the war in 1946, and as his job now took him to Nottingham, Clive moved to West Bridgford Grammar School, where he prospered in mathematics under the enthusiastic guidance of his teachers. Clive later called it his ‘good luck’ that the University of Nottingham was just creating a new joint undergraduate degree in mathematics and economics and accepted him for that when he left school. He graduated with first-class honours in 1955, and stayed on at Nottingham University to research on ‘testing for non-stationarity’, for which he was awarded a PhD in 1959, having become a lecturer in 1957 at the remarkably young age of 23.

Clive visited Princeton University for the year 1959–60 on a Harkness Fellowship, working on ideas with John Tukey towards what became his first book (with Michio Hatanaka), entitled *Spectral Analysis of Economic Time Series*. Clive returned to Nottingham University, becoming Reader, then Professor, before moving to the University of California at San Diego in 1974, where he remained for the rest of his career, helping to build a world-class econometrics group after attracting Rob Engle as a colleague in 1975. He was elected to a Fellowship of the Econometric Society in 1972, became a distinguished fellow of the American Economics Association and a Corresponding Fellow of the British Academy, is listed in the 100 Welsh Heroes, had a building named for him during his life, and held honorary degrees from Nottingham, Carlos III, Stockholm School of Economics, Loughborough, and Aarhus. Clive was made an Honorary Fellow of Trinity College after he had won the Nobel Prize. He greatly enjoyed being a Fellow of the college, as it brought back happy memories of his childhood years in Cambridge. He was a member of the Advisory Board of the *Journal of Applied Econometrics* for many years, and helped younger authors in numerous ways, including his joint editorship of the Oxford University Press *Advanced Texts in Econometrics* with Grayham E. Mizon.

Following a number of early studies outside of economics, including spectral analysis, Clive investigated causality using the operational concept of changes in predictability induced by removing variables from the joint distribution of observables. This notion of *prima facie* causality (generally called Granger causality) stimulated interest in many disciplines, including philosophy, and remains widely used in empirical studies. Clive also kept the theory of economic forecasting alive during its darkest period, when few professional economists regarded the topic as a

¹ Although Granger is also famous for what has come to be known as the ‘Granger non-causality’ test, more recently he increasingly favoured the concept of ‘causality in the long run’, which he published in *Econometric Theory* in 1995, jointly with Jun-Lung Lin.

serious one. Beginning with the discovery that combinations of forecasts could outperform their constituents, Clive then wrote a series of papers on forecasting in joint research with Paul Newbold that remains highly pertinent, and which led to their much-used book, *Forecasting Economic Time Series* (Academic Press, 1977). En route, they also criticized empirical econometric studies where $R^2 > DW$ ('nonsense' regressions induced by unmodelled unit roots, correcting which was a step towards cointegration), an early manifestation of Clive's long-term research agenda of improving the quality of econometric model building by a better match with the empirical evidence. Unit-root non-stationarity was always one of Clive's particular interests, linked to the behaviour of financial prices, and cointegration is the obverse of common 'stochastic trends', where a set of variables is driven by a smaller set of processes with unit roots. The Granger representation theorem shows that when variables are connected by a smaller number of cointegrating relations the joint process cannot be stationary. This explained the prevalence of unit roots in economic time series, and linked economic equilibria with equilibrium correction models, stimulating an explosion in empirical applications. His innovative research into long-memory models with Roselyne Joyeux also opened a major new area, which has seen huge advances since, as did his early ideas on non-linear models, related to Rob Engle's development of autoregressive conditional heteroskedasticity (ARCH), subsequently followed up in extensive research with Timo Terasvirta.

Clive supervised a huge number of successful doctoral students, and was always ready to discuss the ideas of others constructively. He also delighted in collaborating with other researchers and had almost 90 different co-authors. Clive had a deep interest in applied problems, and was far more concerned with finding practical solutions to them than developing statistical tools for their own sake. Even cointegration arose as a solution to validly modelling the levels of economic time series rather than being 'just another estimator'. His *Nobel Prize* autobiography (http://nobelprize.org/nobel_prizes/economics/laureates/2003/granger-autobio.html) reflects his kindness, generosity of spirit and humility: an unassuming gentleman and an honoured knight, who made little of his great distinction.

Clive married Patricia Loveland in 1960 when at Princeton, and is survived by Pat, their son Mark and daughter Claire, and a grandson Luke.

David F. Hendry and M. Hashem Pesaran
Oxford and Cambridge Universities