

MAJOR CAREER CONTRIBUTIONS OF DAVID A. BESSLER

Over the last thirty years Bessler's research has emanated from the idea that methods used for data collection have implications for the way we ought to do economic science. This idea is discussed in two papers co-authored with two of his former students: Bessler and Covey (*AJAE* 1993) and Bessler and Dearnont (*ERAE* 1996). The inability to perform experiments in much of our work dictates that attempts at structural inference with non-experimental data should be labeled '*prima facie* structural' – meaning that omitted or latent variables may be responsible for observed relationships. Further, given that we generally have to work with data observed in time sequence, there are insights that can be gained from analyzing the regularities in these data that do not require the label "structural" to be useful. Prime among these non-structural analyses is the generation of forecasts. Finally, structural restrictions that we find in our theory, homogeneity in prices, quantities demanded and income, the law of one price, etc., can be modeled effectively as restrictions on a properly specified multiple time series model, which explicitly accounts for the regularities in the observed data. These ideas have been presented in over one hundred refereed papers that have generated a Social Science Citation Index (SSCI) count in excess of 500, in agricultural economics, economics and business over the last thirty years. This work is based on early study as a Ph.D. student at the University of California at Davis and appointments as Assistant Professor at Purdue University and Associate Professor and Professor at Texas A&M University.

I. Contributions in Time Series Analysis of Agricultural Markets

A. *Introduced Vector Autoregression into Agricultural Economics*

In two papers published in 1984 Bessler introduced the agricultural economics profession to the vector autoregression (VAR) for the study of observational data measured over time. While this method was introduced in earlier work in economics by Sims (1980), these two papers started the VAR work in agriculture. Allen (1994) and Vercauteren and Schmitz (2001) offer discussions of Bessler's work in introducing VARs to agricultural economics. Citation counts for these early VAR papers are given as:

- a. Bessler *CJAE* 1984; 23 SSCI cites
- b. Bessler *AJAE* 1984; 31 SSCI cites

VARs and their derivative Error Correction Models (ECMs) have been used to address policy questions with respect to agriculture's interface with the general economy. Authors citing Bessler's VAR work on the interface between agriculture and the general economy includes, among others: Chambers (1984), Orden (1986), Devadoss and Myers (1987), Shiller (1987), Bordo (1989), Arnon (1991), and Frankel (2007). VARs have also been helpful in addressing agricultural trade questions (see for example, US ITC Bulletin 332-419, 2001 and Babula and Jabara (1999)).

B. *Focused on the Error Correction Representation for Testing Substantive Theories with Time Ordered Data*

About a decade after introducing VARs to agricultural economics, Bessler and his former students were the first to model futures and cash prices using an error correction model (ECM), a derivative of the underlying VAR representation for non-stationary data. Two papers on the ECM representation of cash and futures prices for agricultural commodities are:

- a. Bessler and Covey *Journal of the Futures Markets* 1991; 20 SSCI cites
- b. Yang, Bessler and Leatham *Journal of the Futures Markets* 2001; 12 SSCI cites

The ECM representation allows us to model a long-run “equilibrium” or “cointegration-type” relationship between cash and nearby futures. Bessler and his co-authors were able to determine the point of price discovery for both agricultural and financial data to be the futures market and test substantive theory on the “law of one price” in markets separated by time. Further, characteristics related to storability of the asset appear to govern the performance of futures markets in their role in price discovery, leading to the hypothesis that futures on non-storable commodities will not perform as well as futures on storable commodities in terms of price forecasting for the underlying cash market (Nerlove and Bessler *Handbook* 2001 and Yang, Bessler and Leatham 2002). A possible confirmation of this later hypothesis is found in the California energy crisis of early 2000 and reported in Moulton (2005). The set of papers following (citing) these ideas on futures and cash markets and cointegration include, among others: Brenner and Kroner (1995), Foster, et al (1995), Alexander (1999), and Moulton (2005).

The ability of the ECM model to capture long-run or equilibrium relationships is further demonstrated in more recent work of Bessler and his former students: Bessler and Lee (*Empirical Economics* 2002) and Wang and Bessler (*JF* 2002 and *Agribusiness* 2003). They show that structural restrictions from micro or macro theory oftentimes can be found as restrictions on the cointegration space. Wang and Bessler (*JF* 2002 and *Agribusiness* 2003) find the homogeneity condition from demand theory as a cointegrating vector on prices, income and quantity consumed. Imposing such on (observational) US meat prices, income and consumption data improves forecasts of new observations, relative to the static Rotterdam and Almost Ideal Demand System (AIDS) models. Bessler and Lee (2002) study historical US data on prices, income and quantity of money. They find a cointegration relationship which is consistent with the “equation of exchange” from macroeconomic theory. Other theoretical restrictions related to the “law of one price”, which were anticipated in Ardeni’s (1989) work, are given explicit treatment as formal restrictions on the cointegration space in Bessler and Fuller’s (*Transportation Research* 2000) study of rail rates for US wheat exports. Bessler and Yu (*Applied Financial Economics* 1993) demonstrate that the “law” holds in the cointegration space of black market and official exchanges rates between US and Brazilian currencies. Here the official rate responds to movements in the black market rate. This work on testing theoretical restrictions on observational data in the cointegration space has garnered a few citations including: Granger and Jeon (2000) and Chavas and Kim (2005).

Recent work has focused on the study of methods for selecting the number of cointegrating vectors (long run relations) present in a data set. Heretofore, research workers have used the trace test on the eigenvalues from the long-run component of the error correction model, as first proposed in Johansen (1989). The trace test does not perform well in small samples, even with recent Bartlett-like small sample adjustments (Johansen 2000). Bessler and his former student investigate the use of statistical loss metrics (Schwarz Loss and Akaike Information Criterion) as alternatives to probability-based trace tests for the selection of both the number of cointegrating vectors and optimal lag length in multiple time series (Wang and Bessler *Econometric Theory* 2005). Over the last twenty years researchers have studied and often applied these metrics to select the lag order in an autoregression (two examples are Binkley and Bessler *Review of Economics and Statistics* 1983; Bessler and Babula *Journal of Business and Economic Statistics* 1987). The use of these metrics for the simultaneous selection of lag order and cointegrating rank is quite promising.

II. Focused on Out-of-Sample Forecasting for Model Assessment and Policy

A. Introduced Composite Forecasting into Agricultural Economics

With his co-author Brandt, Bessler co-introduced (along with Johnson and Rausser (1982)) composite forecasting to agricultural economics. Three papers covering various aspects of composite forecasting are:

- a. Brandt and Bessler *AJAE* 1981; 11 SSCI cites
- b. Bessler and Brandt *Applied Economics* 1981 18 SSCI cites
- c. Brandt and Bessler *Journal of Forecasting* 1983 17 SSCI cites

Composite forecasting, introduced into economics and business literatures by Bates and Granger (1969), recognizes that policy planning requires a forecast of policy relevant variables and that no one forecast (model or person) contains all available useful information. Early work on composites applied this idea to formal model-based forecasts (e.g. two alternative ARIMA representations of the same data set). In agriculture, as well as business in general, much potentially valuable forecast information exists as informal models forthcoming as subjective expert opinion (human judgment). Bessler's work with Brandt in the early 1980s looked for methods to combine formal model-based forecasts with subjective expert opinion. The evidence presented in Bessler and Brandt (*Applied Economics* 1981 and *AJAE* 1981) shows clearly that such combinations work. The list of papers citing these early ideas on the combination of forecasts of experts and formal models includes: Granger and Ramanathan (1984), Diebold and Pauly (1987), Clemen (1989), Bunn and Wright (1991), Clements and Hendry (2004), and Chen and Yang (2007).

B. Introduced Methods of Probability Assessment and Evaluation to Agricultural Economics, Economics and Business

In the late 1980s and early 1990s Bessler and his former students began studying probability forecasts in agricultural economics, economics and business. Building on work of Dawid (1984), Bessler and his former students introduced *prequential* analysis into these literatures. The idea behind prequential analysis is that a major purpose of model-building is to provide good out-of-sample forecasts, not necessarily to provide good fit with prior theory (see Kling and Bessler *Journal of Business* 1989, Bessler and Kling, *AJAE* 1989 and *Journal of the Royal Statistical Society, Series C* 1990, and Covey and Bessler, *Review of Economics and Statistics* 1993). In this early work on probability forecasting calibration is used as the sole indicator of forecasting "goodness." Other metrics that measure sorting as well as calibration, known as *scoring rules* have been proposed in the literature (see Savage 1971). These rules can be used for both motivation and evaluation of "goodness" of probability assessments; see, for example, Bessler and Moore *Agricultural Economics Research* (1979). [For what appears to be the first empirical test of scoring rules as motivational devices in probability assessment see Nelson and Bessler *AJAE* 1989.] Bessler and Ruffley (*Applied Economics* 2004) demonstrate empirically that scoring rules provide more information than calibration metrics when used for evaluation of probability forecasting "goodness", suggesting that these metrics ought to be given further consideration by researchers. Recent work by Casillas-Olvera and Bessler (*Journal of Policy Modeling* 2006) considers probability assessment and evaluation to motivate good economic policy making. Citations of Bessler's work on probability forecasting include: Hammond (1996), Tay and Wallis (2000), Clements and Smith (2000), Clements and Taylor (2003), Miller, Resnick and Zeckhauser (2005), Dawid (2006) and Geweke and Whiteman (2007).

C. Promoted the Professional Literature on Forecasting

Along with his former student, he published the first refereed paper (ever) in the *International Journal of Forecasting* (Kling and Bessler *International Journal of Forecasting* 1985 volume 1 issue 1, pages 5- 24) and served as Associate Editor of *Journal of Forecasting* 1986 – 1999. Both journals have become mainstays in the business and economics forecasting literatures that regularly publish papers from agriculture. Each has a “Journal Citation Report” *impact factor* in the neighborhood of .5 in recent years (as a comparison, the *AJAE* shows impact factors of .6 to .7 in recent years; while the *Journal of Agricultural and Resource Economics* shows recent *impact factors* in a neighborhood of .35). Agricultural papers published in these journals include the major literature review on the “forecast in agriculture” by Allen (1994), with reviews by Freebarin (1994), Tomek (1994) and Bessler (1994) and several papers related to forecasting in agriculture, see for example: Vere and Griffith (1995) and Wang and Bessler (2002).

III. Introduced the Economics Profession to the Use of Directed Acyclic Graphs (DAGs) and Algorithms on Inductive Causation

In the mid-1990s, Bessler began the study of directed acyclic graphs and their use for modeling economic data. Following work laid-out in a paper by Pearl (1995) and the book by Spirtes, Glymour and Scheines (1993), Bessler and his students studied price information flows among agricultural markets in contemporaneous (non-lagged) time. In the preface to the second edition of their 1993 book (published in 2000 by MIT Press), Spirtes, Glymour and Scheines (SGS) write: “We have been equally encouraged by the ingenious uses and modifications of our procedures (DAGs) provided by a number of scientists, including ... David Bessler and his collaborators”; SGS (2000, MIT Press, page ix).

The vector autoregression work discussed above requires the research worker to assume a structural relationship among components of the VAR in contemporaneous time. Traditionally, researchers have solved this problem through a Choleski factorization of contemporaneous error covariance (Sims 1980) or a subjective ordering after Bernanke (1986). Following, and extending, Swanson and Granger (1997), Bessler and Akelman (*AJAE* 1998) propose the use of DAGs and the *inductive causation* work of Pearl (1995) and Spirtes, Glymour and Scheines (1993) to provide empirical evidence on a particular structural ordering. A partial list of Bessler’s recent works that follow this innovation includes study of: millet prices in Mali (Bessler and Kergna *Journal of African Economies* 2002 and Vitale and Bessler, *Papers in Regional Science* 2006); U.S. and international wheat prices (Bessler, et al., *Journal of Regional Science* 2003); 19th century U.S. wheat prices and general macro economic variables (Bessler and Lee *Empirical Economics* 2002); price indices on international equity and futures markets (Bessler and Yang, *Journal of International Money and Finance* (2003), *Economic Inquiry* (2004) and *European Journal of Operational Research* (2007)). The set of papers citing one or more of Bessler’s works with DAGs includes: Spirtes, Glymour and Scheines (2000), Scheines (2002), Demiralp and Hoover (2003), Hoover (2005) and (2007), Danks (2005), Darrat and Zhong (2005), Moneta (2005) and Spirtes (2005).

IV. Mentoring of Students

The accomplishments described above have been performed (for the most part) in cooperation with students and former students from both Texas A&M and Purdue Universities. Bessler has served as dissertation or thesis committee chair for twenty-eight Ph.D. and eleven M.S. students. These have gone on to careers with appointments at various universities including: Iowa State University, Southern Methodist University; Auburn University; The University of Delaware; Prairie View A&M University; The University of Wisconsin, Platteville; The University of Wisconsin, Madison; The University of Arizona; University of Missouri, Columbia; Texas A&M University, Aleppo University (Syria); Thammasat University (Thailand); Hansung University (Korea), and Feng Chia University (Taiwan). In addition, his former students have taken research and administrative positions with the United States Department of Agriculture, Economic Research Service; the New Zealand Department of Agriculture; the Nebraska Department of Revenue; the Korean Development Institute; the Korean Rural Economy Institute; The Export-Import Bank of Korea; The Asian Development Bank (Manila); the Ministry of Agriculture (Trinidad and Tobago), The Bank of Mexico and STATA (an econometrics software provider).

While many former students continue to work with Bessler, several have gone on to make scientific contributions severed from Bessler's direct involvement. Papers by his former students **not co-authored by Bessler** include works appearing in *American Journal of Agricultural Economics*(Klemme); *Econometrica*(Barnett); *Journal of Business* (Kling); *Journal of International Economics* (Barnett), *Advances in Econometrics*(Wang); *Canadian Economic Journal*(Awokuse, Barnett); *Southern Economic Journal*(Kling, Wang); *Journal of Applied Econometrics* (Wang, Yang), *Journal of International Money and Finance*(Wang, Yang), *Journal of Empirical Finance* (Wang, Yang), *Journal of Banking and Finance* (Wang, Yang), *Review of Agriculture and Applied Economics*(Nelson); *Transactions of the Charles Sanders Pierce Society* (Dearmont); *Peanut Science*(Nelson); *HortScience* (Nelson); *Economics Letters*(Wang); *The Financial Review* (Yang); *Agribusiness: An International Journal* , as well other refereed publications. (Names in parentheses refer to former students who are listed in Bessler's CV.)

V. Honors and Recognition

Bessler and his former students have been recognized with numerous awards for research contributions. A partial list of award granting associations include: American Agricultural Economic Association, Southern Agricultural Economics Association, Food Distribution Research Society, Transportation Research Form, and the Southwest Finance Association. In addition he has coauthored (with Marc Nerlove) a chapter in Elsevier Science's *Handbook of Agricultural Economics* (2001) and his work on price discovery in equity markets has been reprinted in Sage Publications' *Major Works in Financial Markets* (Bessler and Yang 2003). He was editor of the *Western Journal of Agricultural Economics* (1986-88). In addition he served two terms on its editorial council (1989-1991 and 2006 -09). Further, he served as an Associate Editor of the *Journal of Forecasting* (1986- 2000). He was awarded a *Simon Fellowship* in Econometrics from The Victorian University of Manchester (1991). His biography is listed in Mark Blaug's 1999 *Who's Who In Economics: A list of Major Economist Since 1700* (Cheltenham Press, UK). He delivered the *Eighth Herbert Simon Lecture* in Computational Economics at Feng Chai University, Taiwan in 2005. He delivered a key-note address to the *Australian Agricultural Economics Association* on World Wheat Pricing in February 2006. He was awarded the Texas A&M University System's *Vice Chancellor's Award for Excellence in Research* in 2003 and *Deputy Chancellor's Award for Excellence in Graduate Teaching* in 1987. He received the 2006 Texas A&M University Association of Former Students' *Distinguished Achievement Award for Mentoring Graduate Students* and the 2005-06 Texas A&M Presidential Award for Service to International Students.

Association of Former Students' Summary Statement on Bessler's Award for Graduate Mentoring, Texas A&M University, May 2, 2006.



Dr. Bessler received a B.S. and M.S. from the University of Arizona and the Ph.D. from the University of California, Davis. He came to Texas A&M in 1982. "His efforts are clearly the byproducts of a deep and sincere caring for graduate students," an admirer says. "In his presence, graduate students can see that they have lives which are each a complex mix of academic, personal constraints and gifts that must all be concurrently mastered if the student is to succeed in building a viable future." Associates explain that Bessler works to inspire an excitement for economic science and create an expectation that each student make substantive contributions to society by advancing knowledge of how the economy works. "Dr. Bessler's mentoring efforts exemplify the outstanding character, effort and leadership expected of our very best faculty," another admirer notes. "His work with graduate students is at the cutting edge of econometric analysis and will have long-term payoffs for the citizens of Texas, the United States and society as a whole."

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