The American Statistical Association

San Francisco Bay Area Chapter

Since 1928

January, 2003

Joint Biostatistics and General Applications Program

Decomposition Models

David Mould

Background

Decomposition models are primarily used for time series data like production, sales and economic data. Economists attempting to identify and control the business cycle first used them in the early 1900's. The basis of the current versions was developed in the 1920's when the concept of ratio-to-trend was introduced.

Definition

Decomposition models usually try to identify three separate components of a time series: trend, cycle and seasonal factors. The trend represents the long-run behavior of the data and can be increasing, decreasing, or unchanged. This is usually represented by a straight line, but can also be represented by an exponential curve or an S curve or some other pattern. The cycle is the business cycle of a particular industry. The cyclical factor is similar to a wave with peaks and valleys over a long time period. The seasonal factor is similar but the waves are of a constant length. Holiday shopping, rainfall, temperature or quarterly sales quotas can cause seasonal fluctuations. Breaking down (decomposing) the time series can frequently facilitate improved accuracy in forecasting and aid in the better understanding of key factors.

Mathematical Representation

$$X_t = S_t * T_t * C_t * E_t$$

Where Xt is the time series value (actual data) at period t
St is the seasonal component (or index) at period t
Tt is the trend component at period t
Ct is the cyclical component at period t
Et is the random component (or error) at period t

Date: January 30, 2003

Time: 3:30 - 4:00 PM
Refreshments
4:00 - 5:30 PM
Presentation, Q & A

Place: Silicon Valley Conference Room, Exponent

149 Commonwealth Drive,

Menlo Park, CA 94025

See attached map for directions

Business Matters:

Mailing List: *ASA will be sending us the latest membership list soon. If you don't want to miss out on the latest presentation and job opportunities, make sure you check the "Bay Area" chapter affiliation when you renew your ASA membership and keep our address record up-to-date.*

New Chapter Officers for 2002-2003:

President *– Jim Lenihan*
President Elect *– Ann Kalinowski*
Vice President (Biostatistics Program) *-Open*
Vice President (General Application) *- Karuna Ramachandran*
Treasurer *– Ying-Qing Chen*
Secretary *– Tiffani Fordyce*
Secretary *– Dean Fearn*

Major Steps in Decomposition

1. Determine the seasonal factors. If the data is monthly, start by computing the 12-month moving average and the centered 12-month moving average for each value and the ratio of that value to the average. Then compute the medial average for each month and adjust it to get the seasonal index for each month.
2. Determine the trend factors. This requires fitting a trend line to the data. After graphing the time series, try a number of simple time-series smoothing methods in addition to simple regression to obtain the best fit.
3. Determine the cyclical factors. Since the moving average eliminates the seasonal pattern and the randomness, the cyclical factors can be determined by dividing the moving average value by the trend value for each observation.
4. Prepare a forecast for the desired time period. Starting with the time period to be forecasted the seasonal factor for the period can be identified from the adjusted seasonal indices. The trend can be determined by putting the time period t into the trend equation.

The cyclical factor can be estimated from recent patterns in these factors. The forecast (F) is simply F = seasonal * trend * cyclical.

An In-depth Example

An example from my work at Hitachi Data Systems will be provided in this section.

Preparing a Forecast Based on the Decomposition Model

Again, an example will be provided from Hitachi Data Systems previous forecasts.

Two Variations on the Classical Model

1. Julius Shikin of the U.S. Census in the mid-1950s developed the Census II Method. It improves upon the classical model by correcting for monthly working or trading day differences. Also extreme values are eliminated through the use of statistical control theory. Irregular movements are identified and smoothed.

2. McLaughlin developed the Foran System. It can deal with any independent variable (not just time). It provides a summary of the important contribution of each element and provides a number of alternative forecasts.

Other Matters of Interest:

San Francisco Chapter

The San Francisco Chapter of the American Statistical Association maintains an active website (http://www.sfasa.org) and regular newsletter to its membership. Our goal is to encourage and promote professional interaction and networking among the statistical community in the Bay Area.

Please contact Ying-Qing Chen (yqchen@stat.Berkeley.edu). if you are interested in joining (annual dues $9).

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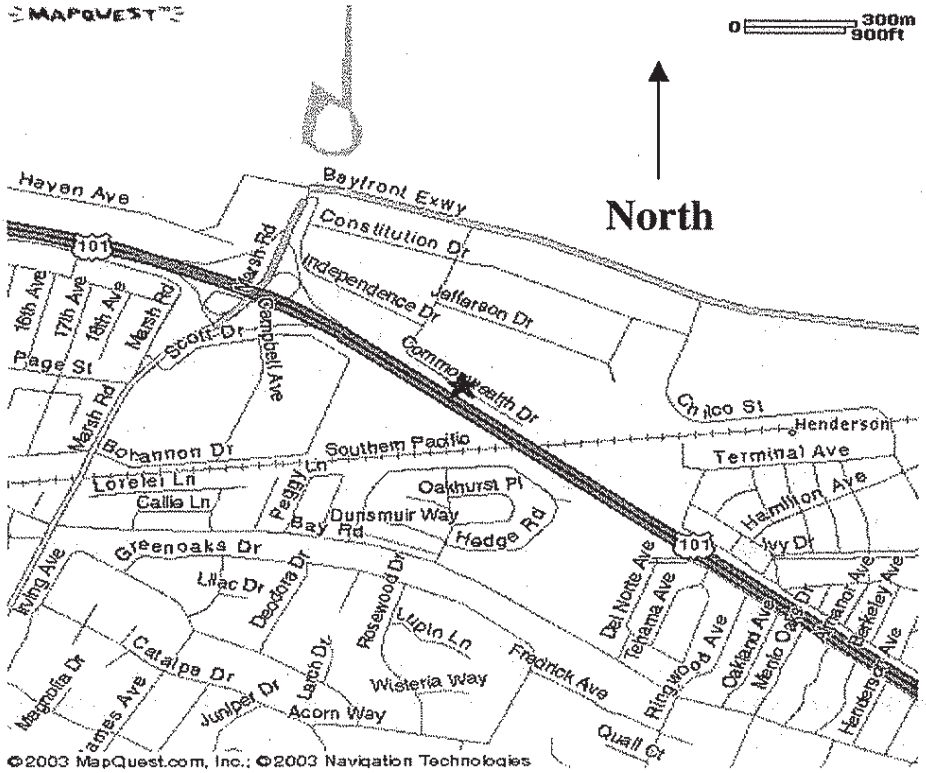
Map and Directions



From San Francisco:

Take US-101 S toward SAN JOSE
Take the MARSH RD exit toward ATHERTON
Turn LEFT onto MARSH RD/CA-84
Turn SLIGHT RIGHT onto INDEPENDENCE DR
Turn RIGHT onto CHRYSLER DR
Turn LEFT onto COMMONWEALTH DR

From San Jose:

Take US-101 N toward SAN FRANCISCO
Take the MARSH ROAD exit toward ATHERTON
Turn RIGHT onto MARSH RD/CA-84
Turn SLIGHT RIGHT onto INDEPENDENCE DR
Turn RIGHT onto CHRYSLER DR
Turn LEFT onto COMMONWEALTH DR

From the East Bay:

Take CA-84 W toward DUMBARTON BR.
Turn LEFT onto CHRYSLER DR
Turn LEFT onto COMMONWEALTH DR

Open Positions

Senior Statistician

Environmental Risk Analysis, Inc.

Environmental Risk Analysis, Inc. (ERA) is a consulting firm that offers services in biostatistics, statistics, epidemiology and environmental risk analysis. Applied research for regulatory and litigation support composes the majority of our work. Our clients are Fortune 500 companies and law firms. We seek a superior professional for the Senior Statistician position with a Doctorate degree in Statistics or Biostatistics and 4+ years experience.

Responsibilities include:

- Perform critical reviews of health and medical literature related to epidemiology, environmental health and health services;
- Communication (written and oral) of findings and conclusions to team members, clients and health professionals;
- Design, perform and supervise statistical analyses of health and environmental data sets using statistical software packages primarily SAS, STATA and SUDAAN;
- Assist in conducting quantitative health risk and statistical analyses.

The ideal candidate will have work experience that includes quantitative health risk analysis. Experience and/ or course work in occupational and environmental epidemiology; quantitative risk assessment; research design; and statistical methods including linear models, categorical data analysis, survival analysis, survey sampling and multivariate analysis are also required. Demonstrated ability to communicate technical information is required as is experience with IBM compatible PCs and SAS. Experience with one programming language is desired.

The candidate must also demonstrate a deep practical understanding of quantitative methods, a passion for analyzing complex data sets, strong interpersonal and communication skills, superb attention to detail and sense of excellence.

The position is located at our San Mateo office (San Francisco Bay Area) and offers competitive compensation and excellent benefits. Please send a confidential application to:

William J. Butler, Ph.D.
Environmental Risk Analysis, Inc.
1810 Gateway Drive, Suite 240
San Mateo, CA 94404
FAX: 650-292-7081
employment@era-inc.com
Equal Opportunity Employer

Statistician / Data Analyst

Environmental Risk Analysis, Inc.

Environmental Risk Analysis, Inc. (ERA) is a consulting firm that offers services in biostatistics, statistics, epidemiology and environmental risk analysis. Applied research for regulatory and litigation support composes the majority of our work. Our clients are Fortune 500 companies and law firms. We seek superior professionals for the Data Analyst and Statistician positions with Bachelor and Master's degrees, respectively. 1+ years of research experience with large epidemiologic data sets is desired.

Responsibilities include:

* Organize and manage multiple, large databases using SAS
* Write computer code to perform specialized statistical analyses
* Work as part of a team to generate, interpret and critique statistical analyses and SAS codes to address specific research topics

Candidates should enjoy analyzing complex data sets, have strong interpersonal and communications skills (written and oral), and work well alone and in a team. Candidates must demonstrate superb attention to detail and a sense of excellence. All positions require experience with IBM compatible PCs and the use of SAS on PCs. Experience with one programming language is desired.

The positions are located at our San Mateo office (San Francisco Bay Area) and offer competitive compensation and excellent benefits. Please send a confidential application to:

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Equal Opportunity Employer

More Open Positions

ASSOCIATE DIRECTOR/DIRECTOR, BIOSTATISTICS
Millennium Pharmaceuticals, Inc., South San Francisco location

ABOUT US:
Millennium Pharmaceuticals, Inc. is creating a leading BioPharmaceutical Company with unparalleled science, dynamic business strategies, and integrated technology that is at the cutting edge. Millennium creates breakthrough products and transcends the limits of medicine. And we have the amazing talent that brings it all together.

JOB DESCRIPTION:
The selected candidate will coordinate the development of project-wide statistical strategy, conventions, and procedures for analysis. You will collaborate with clinicians and scientists in the design of studies and in the development of protocols. You will be responsible for supervising and/or writing analysis plans suitable for implementation by SAS programmers. You will also supervise and/or perform analyses of studies in support of regulatory submissions. Performing interim and supplemental analyses to support management decisions or in response to ad hoc questions from regulatory authorities. Providing statistical support for marketing requests, IND/NDA safety updates, publications, general R&D, and other required analyses. You will supervise and/or write statistical reports that effectively describe statistical methods, results of analyses, and validity of the statistical conclusions. You will collaborate with Medical Research scientists and Medical Writers in the preparation of reports and subsequent publications of study results. Also responsible for writing simple computer programs; reviewing and/or modifying programs written by others; helping build a production environment for routine tables/analyses; automating the analysis of Phase I and II trials; working with the Manager of Data Management in developing and implementing data cross checks and validation tools.

JOB REQUIREMENTS:
Qualified candidates will possess a MS/MA degree in Statistics or Biostatistics, a PhD in Statistics or Biostatistics is strongly preferred with 10 plus years of experience as a statistician with at least 5 years of that in clinical trials. Some non-clinical, pre-clinical, or PK statistics experience is a plus as well as 3 or more years of supervisory experience. You must have a very high level of knowledge of statistical methodology and underlying theory; the ability to develop innovative statistical methods and applications; and the ability to apply knowledge to the design and analysis of clinical and non-clinical studies. Familiarity with the use of statistical computing packages to solve statistical problems is necessary. You must have the ability to oversee implementation of specific algorithms to handle new statistical methodology. Knowledge of regulatory requirements for clinical trials is required. You must have excellent oral and written communication skills, and ability to communicate technical concepts to both technical and non-technical colleagues as well as the ability to work effectively with colleagues in other disciplines. Organizational and planning skills to effectively establish and maintain deadlines is a must. Good SAS programming skills are highly desirable.

CONTACT US:
Please send your resume, referencing Job#2180BR, to: Millennium Pharmaceuticals, Inc., 256 E. Grand Avenue, South San Francisco, CA 94080; Fax: (650) 615-9639; Email: millennium@trm.brassring.com

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Research and Consulting Position in San Francisco

Recent PhD with expertise in epidemiology, biostatistics or statistics to join small San Francisco-based group. In addition to carrying out research,
we give expert witness testimony on life expectancy of persons with disabilities and medical conditions.

Must be energetic, adept with computers, and comfortable with vigorous debate in the legal arena, both oral and written.

See our website: www.LifeExpectancy.com

The work is rewarding, but also demanding and challenging. Serious candidates only please.
Contact: Professor David Strauss at
Strauss@LifeExpectancy.com

More Open Positions

Technical Research Assistant.

Wanted: a creative and innovative thinker for a key support position (part-time or full-time). JP Research is a small and very dynamic statistical consulting firm in Los Altos, specializing in automotive occupant safety research. We are looking for a senior-level researcher (Masters or Ph.D.) with a background in statistical analysis (especially time series analysis/logistic regression) to support analytical research and document results. Must be highly organized, motivated, detail-oriented, and willing to put in the extra effort to understand and add to the company's projects. Interest in transportation safety issues is a MUST. Benefits include health insurance, a pension plan, wild growth opportunity, and a chance to shape your society. Email resume to siebenborn@rvi.net. No calls.

Statistical Programmer, full-time.

JP Research, a small statistical (safety research) consulting firm in Los Altos, CA, is seeking an organized, self-disciplined, detail-oriented programmer with practical experience programming with SAS and using logistic regression methods to analyze large and small databases. Requirements: strong analytical skills and an ability to multi-task. Successful applicant must show capacity to support the company's reputation for solid, unimpeachable results in addition to advancing the company's reputation for innovation in programming and data analysis. Salary commensurate with experience. Benefits include health insurance, a pension plan, wild growth opportunity, and a chance to shape your society. Email resume to siebenborn@rvi.net. No calls.

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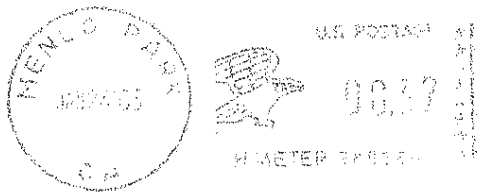

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