Predicting Donations from a Cohort Group of Donors to Charities:
A Direct Marketing Case Study

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ABSTRACT
Charity fundraising organizers increasingly attempt to predict the donations to their causes to maximize the effectiveness of their expenditures and achieve their “social good” objectives. Much of the scholarly work in cause-related fundraising uses organization-specific demographic, geographic, psychographic and behavioral information about its donors to forecast donation amounts. Instead of distinguishing the potential donors, this study focuses on the prediction of the donations from existing donors. Specifically, a large dataset containing four years worth of transactional, appeals, source, and donor data related to a leading U.S. charitable organization was made available to the authors by the Direct Marketing Educational Foundation. The current paper contributes to the literature on donor lifetime value by documenting, in the context of a case study, the results of seven models for predicting future contributions using historic data over four years related to the cohort group of acquired donors.

Keywords: Customer Lifetime Value, Customer Relationship Management, Donation Forecasting, Fundraising, Individualized Forecasting, Time-Series Data Forecasting

INTRODUCTION
The challenges associated with maintaining successful nonprofit organizations are formidable. The key to keep the doors open is money and that means fundraising. Interestingly, the science of fundraising with its financial goals and objectives, mailings, events, prospect lists, etc., is considered by some to be short term and interventional in nature (Maynard, 2008). On the other hand, the art of philanthropy leads to long-term investments of time, money, and talent. Focusing on a donor’s personal commitment to the organization helps ensure the stable and continuous gifts (Krabbenhoft, 2008; Terry & Macy, 2007). While the artistic philanthropy view is good in theory, many charitable organizations continue to focus on...
fundraising science to fulfill short-term needs rather than concentrating on long term relationship development (McGinly, 2008).

Substantial research has been conducted about the drivers of philanthropic and fundraising efforts of various industries including higher education (Ficano & Cunningham, 2001; Mann, 2007; Okunde & Berri, 1997; Caboni, 2010), healthcare (Association for Healthcare Philanthropy, 2007; McGinly, 2008), as well as nonprofit organizations like libraries (Degyansky, 2006; Ercolano, 2007; Jennings, 2007), and disease fighting groups (McMaster, 2001; Pawinshi & Laloo, 2006). These studies identify a variety of factors unique to each organizational category or industry. For example, factors that influence fundraising efforts in higher education include time since graduation (Okunde & Beri, 1997), national ranking (Michael, 2005), amount of student debt (Baum & O’Malley, 2003; Christou & Haliassos, 2006), and institutional variables like size, public versus private, and acceptance rate (Terry & Macy, 2007). Healthcare oriented studies note that factors such as stewardship and community connections (Maynard, 2008), the need for upgraded technology and emergency room equipment (Cauchon, 2006; Lerner, 2007), and compensation from grateful former patients (McGinly, 2008) influence fundraising activities and results.

The use of demographic, geographic, psychographic, and behavioral attributes of the donor base helps fundraisers identify when certain donors should be contacted and what message or approach might be more effective than a general plea. However, with each organizational category or industry having such diverse factors influencing fundraising activities, the questions arise - Can a generic model to predict future fundraising results be developed with no prior knowledge of the specific industry? Are there factors common to multiple fundraising efforts that predict future donations?

In 2008, the Direct Marketing Education Foundation (DMEF) announced a challenge for interested contestants to forecast total donations of a cohort group to a charity using limited historical donation data. The cause, organization and any descriptive information about individual donors were not disclosed to the contestants. The DMEF released only transactional and promotional data for a group of 21,166 donors that a leading U.S. nonprofit organization gathered between early 2002 and August 2006. The challenge was to estimate total donations in dollars from the cohort of acquired donors during the targeted two-year period, from September 1, 2006 to August 31, 2008 without the benefit of demographic, geographic, or psychographic data.

Major nonprofit organizations typically estimate business performance using the number of retained donors and donation amounts as they prepare budgets for subsequent years. Some use a “naïve” forecasting method where the prediction for next period ($F_{t+1}$) is simply the donations for the current period ($S_t$) (Carbonneau, Laframboise, & Vahidov, 2008; Lennon, 2004). However, with increasingly user-friendly database marketing and statistical software packages, organizations need to no longer settle for weak forecasts achieved through naïve prediction methods. In multiple studies involving a variety of industries and objectives, more sophisticated methods have been found to produce better forecasts than the naïve method (Abosedra & Baghestani, 2004; Ho & Tsay, 2004; Waters, 2009). The cost of not using a formal business forecasting system far outweighs the savings experienced by postponing the purchase of the necessary software packages. Thus, it is the contention of the authors that, with the help of a statistical package, managers with a college degree in business or applied statistics will benefit from hands-on forecasting techniques available using one of the popular statistical software packages (e.g., SAS, SPSS, EViews, and Stata).

This study focuses on the gift prediction of the current donors where the donor pool has been predetermined. As such, longitudinal data that covers a four-year time span are analyzed to predict the possible monetary donations for a subsequent two-year time period. The remainder of the article briefly reviews notable
On Dynamical Behaviors and Chaos Control of the Fractional-Order Financial System


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