Using Virtual Stock Markets as a Research Tool:
Insights from Marketing and Management Science

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INTRODUCTION

Virtual Stock Markets (VSM)[1] are tools that can compile the beliefs of market participants into usable forecasts. They are based on the simple principle of providing monetary incentives for the best use of knowledge (Deimer & Poblete, 2010). VSM in their current form were initially developed in the 1980s as forecasting instruments of election outcomes. Due to their high level of precision in predicting events, they are experiencing increasing levels of interest among researchers and practitioners in the field of business studies, especially e-business. Various business applications of the given concept have been presented, namely, forecast generation, decision support, product concept evaluation and lead user identification.

This article explains the concept of VSM, describes potential applications and provides examples of successful implementations in business practice. Directions for further research as well as possible drawbacks of VSM are identified.

BACKGROUND

VSM are similar to regular stock markets; however, the listed stocks do not represent company shares. Rather, shares are tied to the outcomes of future events, e.g., market shares of a given product or shares of votes in an election. Every stock has a fixed lifetime after which the actual outcome of the predicted event can be measured. The final value of the stock is determined accordingly. During the lifetime of the stock market, traders compare the current market prices with their individual expectations of the outcome and make trades accordingly. Supply and demand determine the prices of stocks.[2] Following the logic of the *Hayek hypothesis* (von Hayek, 1945) and *information efficiency hypothesis* (Fama, 1970), the resulting market prices reflect the traders' aggregate expectations of the future events to which the stocks are tied. According to von Hayek (1945), this information aggregating mechanism works efficiently even in the extreme case of all market participants holding diverging information.

VSM allow participants in a market to bet on specific outcomes of an event. For instance, a participant can buy a contract that pays $1 if the next president is a Republican. This contract can be traded among participants within the VSM. Until the election is decided, the stock will trade for an amount less than or equal to the maximum payment of the contract ($1). If the contract trades at the hypothetical value of $0.70, this would mean that the group assesses the probability that the next President is a Republican at 70% (Borison & Hamm, 2010). It is important to note that values above 0.50 do not imply that an

event will definitely occur. Instead, a value of 0.70 implies that if the event (in this case the election) were repeated 100 times, the election of a Republican would be estimated to occur 70 times. The first application of VSM was the *Iowa Presidential Stock Market* (Forsythe et al., 1992). In this example, virtual stocks representing the vote shares of the candidates in the 1988 Presidential election were traded. Actual outcomes could be predicted very precisely. Forecasts based on VSM outperformed every pollster's forecast in terms of prediction accuracy and low fluctuation levels in forecasts prior to the election. Currently, this principle is being applied to a variety of situations, including the success of Hollywood movies (Karniouchina, 2011), outcomes of sporting events (Borghesi, 2012), and success of corporate projects (Chen, Gao, Goldstein, & Kash, 2011).

VSM have been able to repeat this remarkable performance in subsequent implementations (e.g., Berg et al., 2008), sparking academic interest and laying the basis for different applications in related fields, most importantly in business research and practice.

AREAS OF VSM DEPLOYMENT IN MARKETING AND MANAGEMENT

Forecast Generation

Companies can use VSM to predict a wide range of relevant problems. Market participants can be either company insiders (e.g., sales employees predicting futures price levels in the market) or outsiders (e.g., customers predicting market shares for specific products).

VSM are especially useful when other forecasting techniques cannot be used, e.g., when data are inaccessible or influencing factors are complex (Berg, Nelson, & Rietz, 2003; Hanson, 2006a). In addition, they significantly outperform traditional judgment-based forecasting approaches when high information heterogeneity exists, meaning that each individual possesses a relatively high amount of unique information (Van Bruggen, Gerrit, Spann, Lilien, & Skiera, 2010). Additionally, VSM bypass the flaws of traditional research instruments in business. VSM results are not dependent on a representative sample of a specific size. Research has shown that they can be effective even with comparatively small pools of participants. Traders usually enjoy participating and do not have to be offered large monetary incentives. Furthermore, the results are unbiased by socially desirable behavior or researcher influences because market participants act anonymously (Hanson, 2006b). VSM are dynamic systems, being able to incorporate new information quickly (Snowberg, Wolfers, & Zitzewitz, 2007). In addition, participants can reevaluate their opinions when new information becomes available (Van Bruggen et al., 2010). Therefore, VSM make it possible to observe developments over time, and fluctuations in stock prices allow the estimation of forecast precision and prediction of standard forecast error (Berg et al., 2003).

In addition, VSM minimize the danger of *groupthink,* which can be a problem with traditional forecasting techniques, such as the Delphi method. VSM are immune to groupthink as traders are constantly competing, and profits can be made by deviating from the estimation of the majority of actors in the market (Hopman, 2007). Finally, VSM implementation and operation are very cost-efficient, and VSM are perfectly scalable to integrating large numbers of participants (Spann, Ernst, Skiera, & Soll, 2009).

Various companies have already successfully implemented VSM forecasting tools. For example, *Google* used VSM to predict a wide number of developments relevant to the company, ranging from the future number of *Gmail* users to opening dates for new office locations around the world (Sunstein, 2006). *Hewlett Packard* used VSM to estimate future sales volumes (Chen & Plott, 2002), while *Intel* utilized VSM forecasted customer demand (Hopman, 2007). *Eli Lilly* used a VSM to predict which drugs that

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