STOCCER – A Forecasting Market for the FIFA World Cup 2006

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Abstract

Forecasting markets are a promising approach for predicting future events. The basic idea of a forecasting market is to trade virtual stocks whose final value is tied to a particular future event. The market prices can then be interpreted as predictions of the probability of those future events. The results of recent studies on forecasting markets are encouraging. However, various design issues in such markets deserve further study. This paper outlines the design of our flexible market platform STOCCER which can be used to tackle open questions in the field of forecasting markets. Based on the Market Engineering approach, we discuss different design possibilities. At first, we will use this market platform to set up a forecasting market for the upcoming FIFA World Cup 2006 in Germany which will certainly be one of the most watched events to come. The long-term goal is to thoroughly evaluate the potential of forecasting markets in new fields of application.

Keywords: Forecasting Markets, Prediction Markets, Market Engineering

1. Introduction

To have the advantage of superior knowledge is a key success factor in a dynamic and global economy. With product lifecycles getting shorter and shorter it is, for instance, necessary to make out customer preferences at an early stage. But also in social, political, and intra-enterprise environments being aware of trends and forecasts is increasingly relevant. Provision of information on future events is oftentimes cost-intensive and not practicable by means of traditional market and opinion research. Using widespread internet technologies, electronic forecasting markets contribute to predict future events at lower costs.
The idea of a forecasting market is to establish a stock market with virtual shares that represent specific events which are to be predicted. A forecasting market can be used to predict any conceivable event. The market participants use their own expertise to buy and sell stocks, thus providing amazingly accurate prognoses. Basically, they trade their expectations by buying stocks they consider undervalued and selling stocks they consider overvalued. In information efficient markets the resulting market price represents all available information about the participants' valuations at any time [4]. Due to information efficiency markets can be used for forecasting purposes. In this case the market price reflects the participants' aggregated information concerning the event at stake.

Recent projects on political and sports stock markets resulted in rather accurate prognoses [2]. Therefore, the market platform STOCCER[1,2] will be used to set up a forecasting market for the upcoming FIFA World Cup 2006 which certainly will be one of the most watched events to come. The goal of the stock holders is to maximize their account value by predicting the result of the tournament as precisely as possi-

[1] http://www.stoccer.com
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ble and accordingly trading the stocks that are likely to perform best. The stocks are being traded anytime — before and during the events. The market value of the shares is exclusively determined by trading these products. Pre-determined quotas are not part of a forecasting market's characteristics. So only the traders generate the stock price.

The focus of our work is on the market design. Recent forecasting markets were mostly based on a similar design although it is known that the market design heavily impacts the market outcome. Even minor changes in the market design can totally sway the behavior of market participants [10]. In this paper we present a flexible market platform that can be used to examine various design issues.

The remainder of the paper is structured as follows. In Section 2 we discuss related work in the field of forecasting markets. Section 3 points out the importance of an appropriate market design before discussing Market Engineering as a holistic approach to designing markets. We then outline the realization of our market platform STOCCER and discuss the results from the first two months of trading in our test market. Finally, section 5 concludes with an outlook on future work.

2. Related Work

The Iowa Electronic Market (IEM)[3] for predicting the outcome of the presidential elections in 1988 was the first political stock market [5, 6]. By then, the accuracy of the prediction was amazing and about ten times better than traditional polls. Since then, political stock markets have been widely used as an alternative to polls and initially seemed to be the miracle cure in psephology. But from time to time these markets lead to poor prognoses, e.g. in case of the US presidential election in 1996.

Apart from political stock markets, the idea behind virtual stock markets (VSM) – based on Hayek's theories about the information efficiency of markets [7] – has been used in various settings like in market research or business forecasting in general [15, 16]. The Hollywood Stock Exchange (HSX)[4] is used to predict box-office takings of movies during their first four weeks. Recently, VSM were also used in order to forecast the outcome of certain sports events [14]. Platforms such as BlueVex[5] are widely used by sports fans that are oftentimes used to placing bets in online betting agencies. A first VSM for a FIFA World Cup was set up in 1998 [17, 18]. Based on the data collected in this stock market, one research question dealt with was the investigation of the impact of market structure on market liquidity.

All in all, VSM have widely been used for forecasting purposes. Most of the above-mentioned and many other markets adopted large parts of the design of the Iowa Electronic Markets. Nevertheless, slight changes in the market design can heavily impact the market outcome [13]. Therefore, an appropriate market design can be seen as a key success factor of forecasting markets. It has a strong influence on the trading behavior of market participants and therefore on the quality of prognoses.

3. Designing a Forecasting Market

The unsteady quality of prognoses in case of political stock markets calls for a thorough analysis of the influencing factors which are leading to certain market outcomes.

3.1 Quality of Prognoses

Measures such as the mean absolute deviation can be used to quantify the quality of prognoses. As mentioned earlier the prediction of the first IEM in 1988 was amazingly accurate whilst other markets performed much worse. Several influencing factors were discussed in [8].

[3] http://www.biz.uiowa.edu/iem/index.html
[4] http://www.hsx.com
[5] http://www.bluevex.de

First of all, many market participants were not experienced in trading stocks ("unprofessional traders"). Sometimes they were also not familiar with the specific rules and therefore traded irrationally. Due to the occasionally large number of stocks traded, markets were rather complex. Besides, the overall number of participants is mostly rather small, ranging from a few tens to hundreds of users. Markets with several thousand or more active users are scarce. Consequently, we try to address a larger number of traders with our forecasting market for the FIFA World Cup 2006. Building up a larger pool of experienced market participants over time makes it possible to set up more complex markets. We have to offer appropriate incentives to gain a large number of active traders and thereby also achieve an increase in liquidity.

Another problem observed in political stock markets is the overvaluation of improbable events. This often comes due to incentive mechanisms which encourage risk seeking behavior. Another severe design problem observed is manipulation by market participants. Manipulation worsens the quality of prognoses and harms the market efficiency. In general, there are two reasons for manipulation. First, supporting a party or national team regardless of trading losses may be an incentive. This was observed in the 1995 parliamentary election in Austria [11] where some traders bought large numbers of stocks from one party at a high price and the number of buy offers by far exceeded the number of sell offers. Such inefficiencies might be avoided in case of changes in the market design, e.g. when short-selling is permitted [11]. Second, becoming the best market participant is desirable, especially in case of prizes being awarded. In continuous double auctions traders can clear the order book in times of low liquidity. If so, they can determine the stock prices with their own offers and then transfer credit to another account, e.g. by selling stocks at an extremely low amount of money.

Recapitulating, the market design has a strong influence on the market outcome. Design flaws as well as a small number of market participants with sometimes great market power allow for manipulation. Sophisticated market design and surveillance of the trading activity can be used to counteract manipulation. Thus, market designers have to avoid design flaws. Designing a market platform also requires more than designing the market mechanisms. There is a need for a holistic approach, namely Market Engineering.

3.2 Market Engineering

In recent years, economics has experienced a tendency to partially move from a positive science to an engineering discipline. Economic engineering deals with creating new and innovative artefacts. In the last decade it has been applied to market design [12].

In traditional economic theory, the market is only viewed as a virtual matching and allocation function. Quality refers to measures such as efficiency, optimality, feasibility, and fairness. Economists give advice about how to design markets but they concentrate on the coordination capability of electronic markets, omitting technical issues of the market platform as well as entrepreneurial aspects [9]. We argue that designing electronic marketplaces cannot only be restricted to the design of market mechanisms. A more holistic view is needed. This is provided by the Market Engineering approach that was proposed by Weinhardt et al. [19]. The design of adequate business models for the market operator and the design of individual IT platforms are equally important to the design of the market mechanism. Accordingly, Market Engineering comprises the analysis, design, introduction and also quality assurance of electronic markets as well as their legal framework regarding simultaneously their market mechanisms and trading rules, systems and platforms, and business models and rules.

As demonstrated in case of manipulation in the previous subsection, market design is one of the core challenges in the field of forecasting markets. The auction mechanism at hand, the number of market participants, the number of orders shown in the order book, or the degree of information revelation are examples for design issues influencing the market outcome and the traders' behavior. Hence, the basic idea is to learn more about the individuals' trading behavior and the influence of the market design on the market outcome.

3.3 Market Design of STOCCER

With STOCCER we want to tackle open questions in the field of forecasting markets. To give an example, various markets of the same kind face the problem that they do not attract enough uninformed traders. With well-informed and rational traders only markets unravel. We want to overcome this by attracting soccer fans whose trading motivation is not only the expected returns. In the following we introduce selected facets of our market design. Separate markets may differ in their design, thus allowing for a comparison e.g. with respect to the quality of prognoses and the market efficiency.

3.3.1 Primary Market

STOCCER is highly dynamic. New markets and stocks can be added during the tournament. This is required since we plan to trade stocks for several rounds, such as quarter finals, and it is not known in advance which teams will in the end take part in those rounds. Giving out new stocks can be done in a primary market whereas the actual trading takes place in the secondary markets. That way, several IPO mechanisms can be compared, for instance, with regard to under-pricing. In many cases (IEM, PSM[6]) portfolios consisting of a set of shares are traded on the primary market. In addition, we draw on uniform or discriminatory auctions in order to review whether uniform-price auctions could offer advantages when selling stocks or government bonds [3]. Although the nobel laureates Merton Miller and Milton Friedman claimed so in the early 1990s, recent work does not offer any pressing reason for preferring a uniform auction to a discriminatory auction. Since these standard auctions result in allocative inefficiency, we also compare them to the sealed-bid Vickrey auction or an ascending-bid auction yielding the same outcome in the private value case [1].

3.3.2 Market Models and Order Types

Our market platform allows for a dynamic changeover of market models triggered by the market designer or events such as the end of a soccer match or a halftime break. A switch-over between market models like call markets (CM) or continuous double auctions (CDA) is supported as well as various order types like limit orders, market orders, relative orders, discretionary orders and trailing-stop-orders. Analyzing the influence of innovative order types on the market quality is certainly an interesting field of research. Furthermore, we want to determine transaction fees based on the consumer surplus when using a certain order type and study the participants' willingness to pay.

The forecasting market for the FIFA World Cup 2006 is well-suited for analyzing market models and order types under varying conditions like e.g. the liquidity in the market because we expect that (i) the liquidity varies over time, (ii) certain stocks will be trade more frequently than others, and (iii) preferences for stocks and therefore national teams differ from country to country. In case we get a great number of international participants, we can also analyze cultural differences in the market behavior.

3.3.3 Limitation on Entry

In order to study the effect of limitations on entry on the quality of prognoses we open markets to the public on one hand and control access to other markets on the other hand. Access is restricted by either charging an entrance fee or selecting the top performers among the traders. Both restrictions may heavily influence the traders' behavior because they e.g. keep a person from creating several user accounts.

4. Technical Realization of the Market Platform

In section 3.2 we already explicated that the implementation of a trading platform as a software systems is seen as a major task in the field of Market Engineering – besides elaborating economic, legal, and business aspects [19]. STOCCER, our forecasting market for the FIFA World Cup 2006, has to meet numerous functional and non-functional requirements such as running several markets simultaneously, each of

[6] http://psm.em.uni-karlsruhe.de

them in multiple languages or enabling a dynamic changeover from one market model to another one. In times of low liquidity call markets could e.g. be preferred to continuous double auctions. A fairly flexible platform is also needed in consideration of the fact that we want to reuse it in other areas of application such as market research. Since we want to attract thousands of market participants from several countries the platform has to be powerful and scalable. We act on the assumption that we might have thousands of transactions per minute. In view of trading with real money in the future we also have to meet security requirements.

In order to fulfill all the requirements we decided to build our market platform based on two existing platforms and thus integrate the functionality those systems offer. The two platforms are the political stock market (psm[7]), a field-tested platform which was so far primarily used for psephology, and meet2trade[8], a generic electronic market platform that realizes innovative trading features such as bundle trading and enables users to individually configure their own electronic market.

The user of course should not take notice of the fact that STOCCER is built on two platforms. Both platforms are therefore addressed from a common portal. We provide an integrated web interface which looks exactly the same for both market platforms. An example of our main trading screen is shown in Figure 1. We currently use the platform to trade the stocks of German soccer clubs and in doing so predict the outcome German Soccer League.

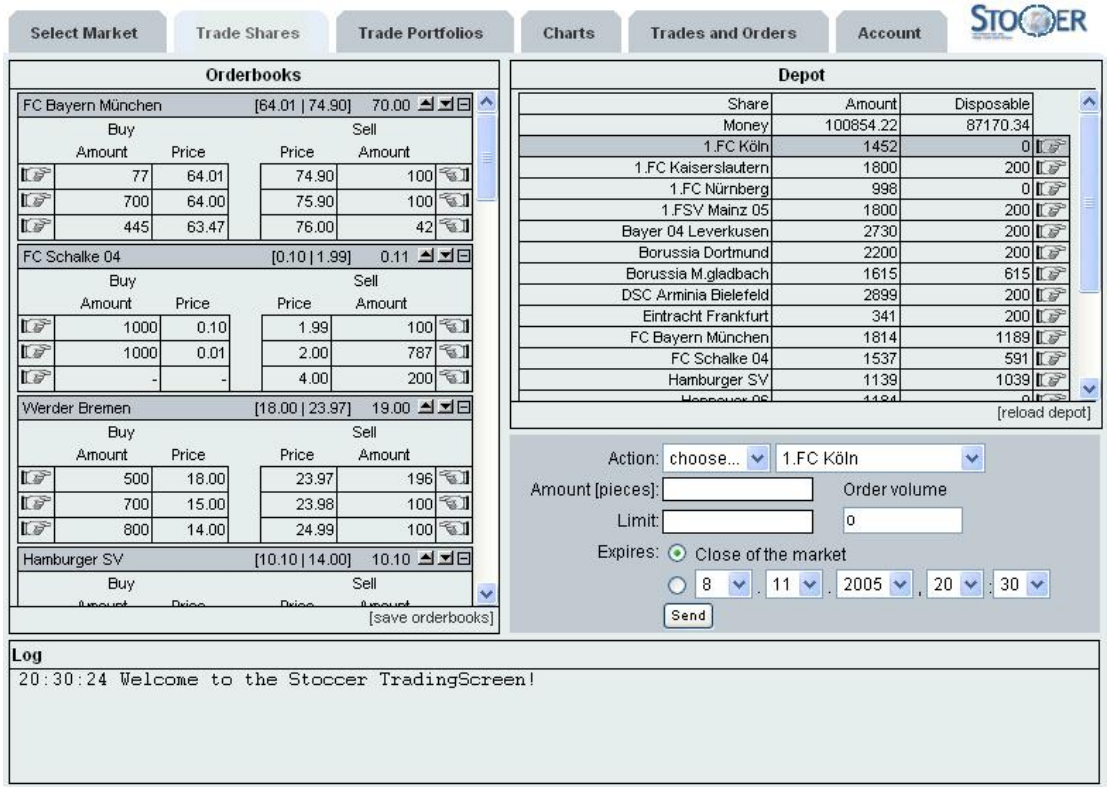

Figure 1: Web Interface of STOCCER

Because psm and meet2trade are not based on the same technology, we decided to integrate the systems on the database level. First, we needed a common user management. The user data is shared by both, psm

[7] http://psm.em.uni-karlsruhe.de
[8] http://www.meet2trade.com

and meet2trade, so that a user needs to register once and then has an account that provides access to both of the underlying platforms. In our scenario, full market integration with the same stocks being traded in both platforms and orders being sent to both of them is not required. In fact, the dividing rule between our platforms is the type of stocks being traded. This means that stocks traded in markets running on the psm are not at the same time traded in meet2trade. Nevertheless, the traders' deposits had to be integrated because both platforms make use of the same liquid funds. Coordinating the trading activity is required in the sense that e.g. the total amount of a trader's buy orders in both systems may not exceed his available cash.

As shown in Figure 2 both platforms offer market administration tools, e.g. for adding new markets and stocks as well as managing user accounts. Additionally, meet2trade offers a client for designing and deploying additional markets and for specifying the conditions for a handover from one market model to another one.

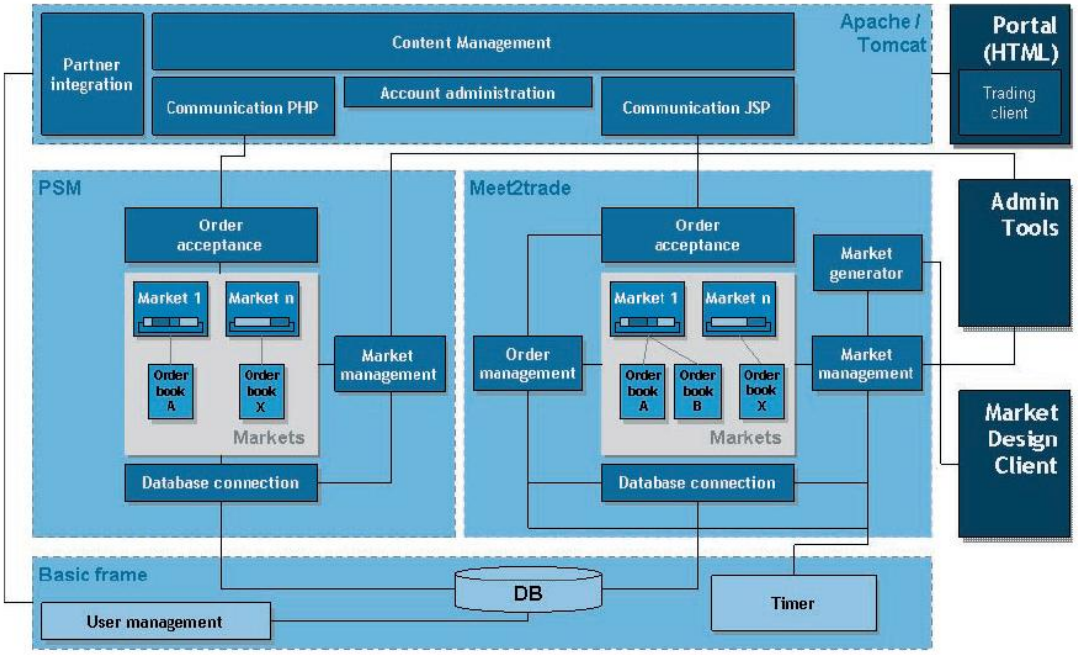

Figure 2: Software Architecture

Currently, we are using a beta version of our trading platform to trade the stocks of German soccer clubs and in doing so predict which team will be on top of the German Soccer League at the end of the first half of the season 05/06. We have almost 100 active users trading on our platform. On average, these users are conducting about 53 transactions a day.

5. Future Work

As a next step we will use our market platform to set up a forecasting market for the upcoming FIFA World Cup 2006 in Germany which will certainly be one of the most watched events to come. By running several markets simultaneously we can evaluate varying market designs, e.g. regarding limitations of entry. STOCCER can thus be seen as a large-scale field experiment.

After the FIFA World Cup 2006 we plan to reuse the market platform and adjust it to innovative fields of application such as project management or to estimate the chance of success of new products by having experienced salesmen with industry knowledge trade their expectations. In general, the platform can be

used to predict any kind of future event. The goal is to evaluate the potential of forecasting markets in new fields of application.

Moreover, we plan to expand the applicability of forecasting markets to long-term predictions. Up to now, the payout in forecasting markets depends on the actual occurrence of the future events to be predicted. In case of long-term predictions it is usually not possible to await the issue. Thus, we have to find another approach to determine the payout ratio.

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