OVERCONFIDENCE AND BUBBLES IN EXPERIMENTAL ASSET MARKETS

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ABSTRACT

OVERCONFIDENCE AND BUBBLES IN EXPERIMENTAL ASSET MARKETS

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Behavioral and experimental finance literature has grown by leaps and bounds in recent years. However, much work remains to be done in the field. In particular, studies could shed specific light on which factors affect the decisions of investors. There is also need for studies searching for behavioral biases of individual investors. There is also room for studies in the fast-growing field of measuring demographical differences in taking investment decisions. In detecting behavioral biases and their effects on decision making process, experiments are very advantageous in that it is possible to obtain valuable findings about the biases of individuals in controlled laboratory settings. The purpose of this study is to search for the overconfidence bias of

UK subjects, investigate the effect of overconfidence on the formation of stock market bubbles in experimental asset markets. Mainly two economic experiments are conducted to deal with the role of overconfidence in forming of stock-prices' bubbles and the impact of overconfidence on economic behavior of individual traders. Results indicate that people are generally overconfident. Most of them see themselves above average and overestimate precision of their knowledge. Highly overconfident traders trade more frequently. Moreover, it seems that overconfidence is domain specific. In particular, traders are less confident in the domain where financial knowledge is required. Results also indicate overconfidence results in bubbles in markets. It is found that overconfidence is mainly driven by overconfidence in the domain of finance more than overconfidence in the domain of general knowledge.

Keywords: Behavioral Finance, Experimental Asset Markets, Experimental Finance, Overconfidence and Bubbles.

ÖZ

DENEYSEL MENKUL KIYMET BORSALARINDA AŞIRI ÖZ GÜVEN ALGISI VE BALON OLUŞUMU

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Son yıllarda davranışsal ve deneysel finans alanlarındaki çalışmalar önemli gelişmeler kaydetmiştir. Gelişmelere rağmen mevcut çalışmalar yetersiz kalmaktadır. Özellikle, yatırımcıların davranışlarını etkileyen faktörlerin belirlenmesinde yeni çalışmalara ihtiyaç duyulmaktadır. Bunun yanı sıra, yatırımcıların bilişsel algı sapmalarını inceleyen yenilikçi çalışmaların da oldukça önemli olduğu düşünülmektedir. Ayrıca, bireylerin yatırım kararlarını etkileyen sosyo-demografik faktörleri analiz eden çalışmaların da literatürdeki önemi artmaktadır. Bu kapsamda, deneysel çalışmaların değişkenlerin kontrol altına alınabildiği laboratuvar ortamında yapılıyor

olması nedeniyle, bireylerin yatırım kararlarını etkileyen bilişsel algı sapmalarını belirlemede metodolojik açıdan çok büyük avantaj sahibi olduğu genel kabul görmektedir. Bu doktora tezinin amacı bireylerin güven düzeylerini ölçümlemek ve aşırı öz güven duyan bireylerin menkul kıymet borsalarında balon oluşumuna katkısını analiz etmektir. Söz konusu ilişkiyi analiz etmek amacıyla tez kapsamında iki farklı sosyal bilimler deneyi kullanılmıştır. Elde edilen bulgular bireylerin genellikle sahip oldukları bilgilere aşırı öz güven duyduklarını göstermiştir. Çoğu birey kendini diğer katılımcılardan bilgi ve beceri olarak üstün görmekte ve hisse senedi piyasalarında üstün başarı elde edeceklerini düşünmektedirler. Aşırı öz güven duyan bireylerin birçoğu hisse senedi piyasalarında daha sık alım-satım yapmakta ve ciddi ölçüde zararlarla karşılaşabilmektedirler. Ayrıca elde edilen bulgular bireylerin yatırım bilgisi gerektiren konularda kendilerine daha az güvendiğini de göstermektedir. Bulgular piyasalarda balon oluşumuna neden olan yatırımcıların aşırı öz güven algı sapması yaşayan bireyler olduğunu ortaya koymaktadır. Elde edilen bulgular, balon oluşumunu tetikleyen aşırı öz güven algı sapmasının finansal bilgi düzeyinden çok genel bilgi düzeyine bağlı olduğunu göstermektedir.

Anahtar Kelimeler: Davranışsal Finans**,** Deneysel Menkul Kıymet Borsaları, Deneysel Finans, Aşırı Öz Güven Algısı ve Balon Oluşumu.

To my son Rüzgar Alp,

“for being the sufficient condition of existence”

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CHAPTER 1

INTRODUCTION

Traditional finance base on the assumptions that human beings are rational, risk averse and have the required capabilities to understand and analyze the probabilities. Hence, a "rational expectations market" is indeed an efficient market since all available information is included in prices (Akintoye, 2008: 8). Traditional finance has difficulties in explaining some of facts observed in markets which are called as anomalies.

Some of these anomalies are the market-to-book effect (Basu, 1977), Days of the Week effect (French, 1980), January Effect (Keim, 1983), Momentum effect (Jegadeesh and Titman, 1993), post-earnings announcement drift (Bernard and Thomas, 1989), closed-end fund anomaly (Lee et al., 1991), first-day IPO returns (Ritter, 1991), disposition effect (Shefrin and Statman, 1985), excess stock price fluctuations (Barberis et al., 2001), long run reversals (DeBondt and Thaler, 1985) and size effect (Banz, 1981). Even most staunch defenders of traditional finance accepted the insufficiencies of traditional finance in explaining some of these anomalies (Fama and French, 2008).

Since these evidences support the idea that models in traditional finance are insufficient to explain the anomalies observed in markets, a new area of study combining psychology with finance called as "Behavioral Finance" gained importance in the last few decades. Behavioral finance has its roots form prospect theory of heuristics and examines the effect of psychology on financial decisions of individuals. Behavioral finance tries to explain systematic biases of individuals and use these biases to create valid empirical tests to explain the observed anomalies. In contrast to traditional finance, behavioral finance argues that financial decision making is prone to cognitive biases.

The use of experiments in detecting these behavioral biases and their effects on decision making process can provide valuable findings in behavioral finance since experiments are conducted in controlled laboratory settings. It is argued that studies with secondary data face problems in testing the hypotheses in that many supplemental assumptions should be included (Bossaerts, 2000: 3). However, it is possible to eliminate these assumptions in controlled laboratory settings. In experimental studies it is possible to come up precise definitions of the relationships among factors. Experimental methods in finance are widely used in;

- Measuring risk attitudes (Schubert et al., 1999; Keller and Siegrist, 2006; Harrison et al., 2007; Donkers et al, 2001),

- Asset pricing for "pricing risk" (Forsythe et al., 1982; Levy, 1997; Bossaerts and Plott, 2002),
- Information aggregation (Plott and Sunder, 1988; Forsythe and Lundholm, 1990; Copeland and Friedman, 1987),
- Information mirages (Camerer, and Weigelt, 1991),
- Testing efficient market hypothesis (Plott and Sunder, 1982; Forsythe et al., 1984; Friedman et al., 1984),
- Examining bubble formation (Brunnermeier, 2001; Lei et al., 2001; Scherbina and Schlusche, 2011; Malkiel, 2010).

In a study some of the crucial findings which cannot be driven by existing data are summarized as follows by Sunder (2004, 2007);

- Markets may not always efficient,
- Market efficiency is a time consuming process,
- Not only the transaction prices but also the bid/ask prices and are useful in securing the information efficiency.

One of the main issues in experimental studies which is related to individual biases is the so called overconfidence phenomenon. Overconfidence is stated to be one of the robust and powerful behavioral biases in decision making process (Odean, 1998) "Psychologists generally define an overconfident individual as one who believes he has more accurate information than he actually does" (Allen and Evans, 2005: 108). In particular, "individuals

exaggerate the precision of their knowledge, their chances for success, for being better than others, or the precision of specific types of information" (Urbig et al., 2009: 3).

Though there is considerable evidence that overconfidence can affect financial decision making, it is impossible to observe overconfidence in real market. In this respect, studies using real market existing data had to use proxies of overconfidence (DeBondt and Thaler, 1985; DeLong et al., 1991; Kyle and Wang, 1997; Odean, 1998; Benos, 1998; Daniel et al., 2001; Barber and Odean, 2000; Glaser and Weber, 2007, Hirshleifer and Luo, 2001; Peng and Xiong, 2006; Graham et al., 2006; Grinblatt and Keloharju, 2009). However, this may create model misspecification. It is argued that only experimental data allow testing for overconfidence properly (Biais et al., 2005). Trading behavior of investors is shown to be affected by overconfidence.

Literature provide findings on overconfident investors; trading excessively, offering higher prices than their peers and trading above fundamental values (DeLong et al., 1991, Kyle and Wang, 1997, Odean, 1998, Benos, 1998, Daniel et al., 2001, DeBondt and Thaler, 1985; Barber and Odean, 2000; Glaser and Weber, 2007; Hirshleifer and Luo, 2001; Scheinkman and Xiong, 2003; Graham et al., 2006; Grinblatt and Keloharju, 2009), surviving in the market in the long run (Hirshleifer and Luo, 2001) and may help creating bubbles and crashes in financial markets (Shiller, 2002; Scheinkman and Xiong, 2003;

Lovric et al., 2010). In finance literature, bubbles are defined as the price deviations from asset's fundamental value (Kindleberger, 2000). There are three main stages of bubbles and crashes in financial markets. In the first stage, assets are generally traded under their fundamental value. In the second stage, the prices start to increase and most of the time assets are traded above their fundamental value. Finally, in the crash stage prices drops dramatically (Fisher, 1998: 24).

> The typical empirical pattern observed is a price bubble, a sustained episode of high transaction volume at prices that greatly exceed the fundamental value, which is usually followed by a crash to prices close to fundamental values near the end of the asset's lifetime
>
> Haruvy and Noussair (2006: 1120).

As bubble formation is mainly related to fundamental values and observing fundamental values in real markets is not possible studies using existing data had to use proxies for fundamental values such as discount rates, degree of risk aversion and publicly available information. Hirota and Sunder (2006: 2) argued that studies examining bubbles with secondary data face the problem of distinguishing the effects of bubbles and the effects of model misspecification since fundamental values cannot be observable in the market.

The aim of this thesis is to search for overconfidence bias in markets and the effect of overconfidence in forming bubbles in experimental asset markets. We think that subjects are generally overconfident in their decision making

and see themselves better than average. Moreover, we argue that degree of confidence is domain specific. We also infer that individual trading activity increases with the increase in degree of overconfidence however individual gains from trade decrease with the greater degree of overconfidence. Results of this thesis identify significant clues for the effects of overconfidence in forming bubbles in experimental asset markets. From the study, it is concluded that subjects are generally overconfident. In particular, it is found that most of them see themselves above average and overestimate their abilities and the precision of their knowledge. Subjects who are more overconfident trade more frequently and these subjects may earn lower profits than the ones who are less overconfident.

Moreover, it is shown that overconfidence is domain specific as it is hypothesized. In particular, traders are less overconfident in the domain where financial knowledge is required. Results also indicate that higher levels of overconfidence can explain the higher levels of trading volume, price deviations from fundamental values and higher bid prices in markets. It is seen in literature that there are few studies examining the effects of overconfidence in forming the bubbles in experimental asset markets. In this manner, we think that results in chapter 6 contribute to the limited pool of studies of overconfidence and bubbles and the literature for the framework effect of overconfidence.

The remainder of this thesis is organized as follows; Chapter 2 reviews the literature of overconfidence. Chapter 3 focuses on the literature about bubbles in asset markets. Chapter 4 describes hypotheses development. Chapter 5 introduces data and methodology. Chapter 6 presents the findings and results. Finally, Chapter 7 concludes the work, discussing the main findings and contributions of the thesis.

CHAPTER 2

OVERCONFIDENCE

Overconfidence is stated to be one of the well-established and powerful behavioral biases in decision making process (Odean, 1998). "Psychologists generally define an overconfident individual as one who believes he has more accurate information than he actually does" (Allen and Evans, 2005: 108). "Individuals exaggerate the precision of their knowledge, their chances for success, for being better than others, or the precision of specific types of information" (Urbig et al., 2009: 3). "Overconfidence refers to a biased belief about the precision of private information and results in overweighting this information" (Fellner and Krügel, 2012: 142). In this manner, it seems that overconfident people are at least irrational and they irrationally overestimate the precision of their knowledge and their abilities.

Gigerenzer et al. (1991: 506) stated that "overconfidence effect occurs when the confidence judgments are larger than the relative frequencies of the correct answers". Pulford (1996) stressed that overconfidence arises when the subjective probabilities are significantly different from objective probabilities. Inaishi et al. (2010: 661) stated that "overconfidence causes people to be correct in their judgments far less often than they think they are".

Overconfident individuals are prone to overestimate their ability and the precision of their knowledge (Menkhoff et al., 2010). Ludwig and Nafziger (2011: 466-467) showed that people are not only overconfident about themselves but also overconfident about the skills of other people. In particular, they showed that majority of the subjects think that other people are also well calibrated and concluded that self-overconfidence results in overconfident belief about the skills of others. Ludwig and Nafziger (2011: 466-467) also argued that people both feel themselves better than others and see themselves better than other at ranking evaluating their abilities.

In literature it is seen that some phenomenon are confused with overconfidence. Peterson and Pitz (1988) distinguished between overconfidence and uncertainty. Peterson and Pitz (1988) argued that uncertainty is related to the variability of probabilities whereas overconfidence is related to the accuracy of the subjective probabilities. Peterson and Pitz (1988) stated that different form the uncertainty overconfidence is conditional on the type of the task. In many empirical studies, overconfidence is also confused with disposition effect which is firstly introduced by Shefrin and Statman (1985). After their pioneering study, disposition effect is documented in literature by later studies (Ranguelova, 2001; Dhar and Zhu, 2006). Disposition effect is defined as the tendency of investors to postpone realizing their losses but realize their positive returns immediately (Statman et al., 2006). They pointed out two main differences between overconfidence and disposition effect. These are; (i)

disposition effect shows the underlying reason to buy/sell only for the buyer/seller. (ii) overconfidence is related to the all market subjects whereas disposition effect is only related to individual trades. Skala (2008: 41) stressed that disposition effect is the result of overconfidence bias.

2.1. Existence and Robustness of Overconfidence

Ludwig and Nafziger (2011: 490) concluded that "overconfidence is an everyday life phenomenon". Earlier studies proved that individuals generally overestimate the precision of their knowledge (Fischhoff et al., 1977). Overconfidence is accepted as quite a robust cognitive bias (Allen and Evans, 2005) and is seen as one of the hot topics examined in economics and finance (Skala, 2008: 34). Though overconfidence is studied both in empirical and experimental studies. Experimental studies have lots of advantages in detecting and examining the overconfidence.

> While behavioral finance studies based on field data offer the clear advantage of documenting phenomena occurring in natural markets, the advantage of experimental approaches is to study controlled environments, allowing more confident inferences about cause and effect relations
>
> (Biais et al., 2005: 289).

Many experimental studies showed that overconfidence behavior exist in decision making process (Alicke, et al., 1995; Camerer and Lovallo, 1999). It is shown that overconfidence is a robust cognitive bias in different frameworks such as drivers (Svenson, 1981), physicians (Christensen et al., 1981), clinical

pediatrics (Singhal, 2001), game players (Johnson et al., 2006: 2513), students (Clayson, 2005), NASA (National Aeronautics and Space Administration) employees (Greenberg, 1986) and managers (Russo and Schoemaker, 1992).

The existence of overconfidence is also shown for stock market forecasters (Deaves at al., 2010). In addition, entrepreneurs found to be overconfident in that they overestimate the probability of the success of their business (Cooper et al., 1988). Overconfidence is found to exist for both depressed and non-depressed individuals (Dunning and Story, 1991: 521). Dunning and Story also found that the degree of overconfidence is higher for depressed individuals compared to non-depressed counterparties. Using VAR models and impulse response analysis for Tunisian stock market, Salma and Ezzeddine (2009) found weak support for the existence of overconfidence.

Overconfidence is also shown to exist across different cultures (Yates et al., 1996; Yates et al., 1997; Yates et al., 1998; Chen et al., 2007). Chen et al. (2007: 425) found that Chinese investors are more overconfident than their US counterparts. Some of these studies showed that people in Asian countries are more overconfident than those in western countries (Yates et al., 1996; Yates et al., 1997; Yates et al., 1998). Acker and Duck (2008) showed that Asian people are more overconfident than their British counterparties. Literature argues that the observed cross cultural differences may be due to response style differences of subjects in different cultures and response scale differences used by experimenters in these different countries (Jaccard and

Wan, 1986; Hui and Triandis, 1989). However, Yates et al. (1997) found that the observed high overconfidence levels in Chinese are not due to the any response style or scale effect. Though many studies argue that overconfidence is a result of cognitive biases (Odean, 1998; Koriat et al., 1980; Fellner and Krügel, 2012), some studies argued that overconfidence stems from non-cognitive biases. Gigerenzer et al., (1991) argued that the observed overconfidence behavior is strongly related to the test questions and the experimental design. They argued that the existence of unexpected, complicated and skillful questions may yield in high levels of overconfidence. Soll and Klayman (2004: 299) stated that "overconfidence seems to depend to a very large degree on how the questions are chosen, what they are about, and how confidence judgments are elicited".

Hogarth and Grieco (2004) distinguished between rational and irrational overconfident traders. Hogarth and Grieco (2004) argued that rational individuals do not attempt to assess their skills whereas irrational individuals are unable to measure their skills. Van den Steen (2011: 893) stated that "overconfidence is quite a natural bias for Bayesian-rational agents when they may entertain differing priors". Koriat et al. (1980) argues that people tend to rely on a particular chosen answer and they tend to ignore any evidence contradiction to that choice. Merkle and Weber (2011) concluded that the results of Benoît and Dubra (2009) have limited implications on overconfidence and overconfidence does not only stem from "apparent" overconfidence but it is rather a cognitive bias.

Conclusions contrary to overconfidence are also documented in literature. Kogan (2006) concluded only a small part can inferable to true overconfidence. Blavatskyy (2009: 47) developed a new methodology to measure overconfidence based on financial motivations and concluded that majority of the people are mainly underconfident. In their pioneering study Erev et al. (1994) came out against generalizability of overconfidence. Erev et al. (1994) mainly argued that models depending on stochastic process may generate a random error that may finally yield inappropriate conclusions such as observed over or under-confidence behavior. In particular, Erev et al. (1994) argued that analyzing absolute likelihood of an event as a part of the relative likelihood leads to overconfidence.

Budescu et al. (1997: 165-167) showed that observed over/under confidence behavior in many studies can stem from the random error process. They argued that "if random error is sufficiently large, it can create the appearance of over- or under-confidence in cases where, in fact the judge is well calibrated". Moreover, Juslin et al. (1999) concluded that together with the complexity of the quiz questions, their classification and quiz choice problem, random error may explain overconfidence behavior. Ayton and McClelland (1997: 280) questioned whether overconfidence is an illusion recognized by researchers or a cognitive bias experienced by humans. In their study, it is concluded that overconfidence is rather cognitive bias.

2.2. Measurements and Facets of Overconfidence

It is widely accepted in literature that there are three different forms of overconfidence.

> The first definition of overconfidence is the overestimation of one's actual ability, performance, level of control, or chance of success. The second variety of overconfidence occurs when people believe themselves to be better than others, such as when a majority of people rate themselves better than the median. The third way overconfidence has been measured is excessive certainty regarding the accuracy of one's beliefs, or what we will call overprecision
>
> (Moore and Healy, 2008: 502).

In literature, calibration based measurements are accepted as "absolute" overconfidence whereas better than average affect is defined as "relative" overconfidence (Urbig et al., 2009: 3). Though psychological literature accepts miscalibration as the sole definition of overconfidence financial literature is interested in all of these three definitions of overconfidence.

2.2.1. Calibration Based Measurements

According to Klayman et al. (1999) calibration test can be widely used to measure the degree of overconfidence. "In the finance literature, overconfidence is usually modeled as a systematic overestimation of the precision of own knowledge" (Menkhoff et al., 2006: 1757). In measuring miscalibration there are indeed two different approaches. In calibration based measurements, people are given trivia questions (most of them are in the

domain of general knowledge questions) and asked to state their confidence level for their answers. Calibration level is measured by comparing the average accuracy rate of their answers to the average confidence level for their answers.

Mainly two different scale methods are used in literature. In this approach, subjects are given percentage intervals and asked to state where their confidence level falls in (Russo and Schoemaker, 1992). In the second approach, subjects are given choices for the questions and then asked to choose their level of precision in percentages (Winman et al., 2004). In the first scale method, after answering a question people are asked to state their confidence level on a scale ranging from 0% - 100%. In the second approach, people are asked to state their confidence level on a scale of 50% - 100%. While, the first method is appropriate for open ended questions, the second approach is suitable for questions that have only two choices. When questions have multiple answers (K is the number of answers) the confidence scale is in-between (100/K)% - 100% (Adams and Adams, 1961, Pulford, 1996). The confidence (calibration) score has been calculated in different ways. The first calibration score is developed by Brier (1950) and calculated as follows (Pulford, 1996);

$$PS \quad \frac{1}{N} \quad {}^{N}{}_{1} \; r - c \tag{1}$$

where PS is the probability score, r is the subjective probability assessments for item i, c is the accuracy level of the items and equals to zero when the answer is false and equals to one when the answer is true. Hence, overall, the higher the probability score is, the lower the calibration. Adams and Adams (1961) developed another confidence (calibration) score as flows;

$$\frac{1}{N}\sum n \ |r - \bar{c}| \tag{2}$$

where is the confidence (calibration) score, r is stated confidence levels for item i , $\overline{c}$ is average accuracy. Pulford (1996) converted the confidence (calibration) score of Adams and Adams (1961) into under/overconfidence scores as follows;

$$Over/Underconfidence \quad \frac{1}{N}\sum \ {}_1 n \quad r - c \tag{3}$$

where r is the assigned probabilities for the items, c is the accuracy, T is the number of response groups and n is the number of times r is used. Pulford (1996) simplified it as follows;

$$Over/Underconfidence \quad - \ c \tag{4}$$

where reefers to average confidence score and c represent the average accuracy. Hence, negative scores indicate under confidence whereas positive scores indicate overconfidence. Zakay and Glicksohn (1992) developed another overconfidence score as in Equation 5;

$$O \quad ON \quad \frac{CON}{GRADE} \tag{5}$$

where $GRAD$ is the total number of correct answers, ON is the average confidence level across questions and $O \ ON$ is the measure of overconfidence.

2.2.2. Better than Average Effect

People generally fall in to the bias that they are better than their average (Taylor and Brown, 1988; Alicke et al., 1995; Abreu and Mendes, 2012). Skala (2008: 38) argued that "people tend to have an unrealistically positive view of themselves". Better than average affect represent what extent people feel themselves superior to other people. They may express their superiority even though they do not know anything about the people that they compare themselves. In his pioneering study, Svenson (1981) found that over 90% of the sample drivers in U.S and almost 70% of the sample drivers in Sweden place themselves above average in terms of driving skills. In general, traders in almost all types of markets believe that they have superior abilities in investing, their return will be higher than other traders in the market and they may beat the market consistently, they are luckier than other traders and finally they are better than average (Odean, 1998, 1999; Chuang and Lee, 2006; Allen and Evans, 2005).

Baker and Nofsinger (2002) argued that in financial markets traders feel themselves they are better at selecting stocks that yield higher rate of returns. Babcock and Loewenstein (1997) argued that better than average effect arises due to attribution biases. In particular, people feel that their success depends on their own ability but their failure depends on external factors. Mainly, there are two approaches in measuring better than average effect. In the first approach people are asked to state their place compared to their peers and in the second approach people are asked to choose to rate their skills compared to their competing peers (Hoelzl and Rustichini, 2005).

2.2.3. Illusion of Control

Literature indicates that people prone to feel that they control over some events indeed in which they have no power to have any effect on them (Langer, 1975; Langer and Roth, 1975; Presson and Benassi, 1996; Moore and Healy, 2008; Hilton et al., 2011). Manglik (2006: 6) stated that "illusion of control can induce investors to believe that their own actions and skill can cause positive outcomes to occur, even when events are uncontrollable". Langer and Roth (1975) showed that people are confident about controlling the results of even chance driven events such as coin tossing game. Langer (1975) proved that people are also overly confident about choosing winning lottery tickets. Skala (2008: 41) argued that "the role of positive illusions and overconfidence as a whole should not be underestimated, and its impact on economic and financial behavior in the real-world setting should be carefully studied".

2.3. Methodological Problems for the Measurement of Overconfidence

The points that should be considered delicately for the measurement of overconfidence are mainly related to selecting questions among alternatives (Gigerenzer et al., 1991; Juslin, 1994; Soll and Klayman, 2004; Speirs-Bridge, 2010), deciding the right statement in expressing the sentences (Hoelzl and Rustichini, 2005) and the use of different scales. It's seen that using different scales may result in misleading results (Jaccard and Wan, 1986; Hui and Triandis, 1989). Juslin et al. (1999) argued that measurement problems are so severe that sometimes it is very hard to distinguish between the true overconfidence and observed overconfidence raised due to measurement failures. Beside these general measurement problems, calibration measurements are widely questioned specially in overconfidence literature. It is mainly accepted that there are two main aspects of measurements; these are so called "calibration" and "resolution" (Budescu et al., 1997: 165-167). Calibration is mainly related to probability judgments whereas resolution is related to characteristics of judgments (Brier, 1950; Yates, 1982). Moore and Healy (2008: 503-504) also talked about three problems regarding the measurement of overconfidence;

- Misidentify overestimation and over precision measurements: This is the case when it is almost impossible to distinguish between overestimation and over precision measurements. In most of the experiments subjects are asked their confidence level for their answer to come out to be correct using probabilities (50% - 100%). Moore and Healy (2008: 503) argued

most of the time these probabilities exceeds accuracy levels and most of the time these two measurements yield the same result.

- Under confidence: Moore and Healy (2008: 503) argued that there is plenty of literature about the existence of under-confidence which is contrary to overconfidence literature.
- Inconsistency between overestimation and over placement: Moore and Healy (2008: 504) stated that on easy tasks underestimation goes hand in hand with over-placement whereas on hard tasks overestimation goes hand in hand with under-placement.

Measuring overconfidence using better than average effect is also questioned in literature. (Hoelzl and Rustichini, 2005) argued that verbs can cause misunderstandings. In their paper, Hoelzl and Rustichini (2005) found that using choices based on skill ratings cause lower degree of overconfidence. Clark and Friesen (2009: 232) argued that there is a lot ambiguity when people are asked to rate themselves according to their peers. It is highly possible that many subjects may understand different dimensions of their skills to be rated. Clark and Friesen (2009) stressed that if the skill is defined precisely, the degree of overconfidence can diminish. In their paper, Benoît and Dubra (2009: 4) made a distinction between "apparent" and "true" overconfidence. In particular the people without any self-awareness of their abilities, it is highly probable that they place themselves above the average (Benoît and Dubra, 2009).

As an improvement, Urbig et al. (2009: 10) argued that giving these kinds of financial incentives may result in better measurement of overconfidence. However, Urbig et al., (2009: 4) also argued that there are several weakness of these incentive based measurements. First, with the available overconfidence measurements it is impossible to detect the different levels of overconfidence. In other words, with the available incentive based measurements a group of people may be defined either overconfident or not but their degree of overconfidence cannot be detected. Second, majority of the measurements is under the effect of risk attitudes. Regarding these arguments, Urbig et al., (2009) developed an alternative measurement which is robust for both "absolute" and "relative" measurements regardless of the risk attitudes of the individuals.

2.4. Correlation between the Measurements of Overconfidence

It is also seen that different measurement of overconfidence may yield to different results (Menkhoff et al., 2010: 11). Ayton and McClelland (1997) found that measurement methodology affects the overconfidence. Using survey analysis, Oberlechner and Osler (2008) found that better than average effect can explain the observed variances of trading volume whereas calibration measurement cannot. Hilton et al. (2011: 118) showed that there is no significant relationship between miscalibration and better than average tasks. Acker and Duck (2008) concluded that there is no significant relation between the different measurements of overconfidence. However, some other studies showed that different measures of overconfidence are highly

correlated. Biais and Weber (2009) found that calibration based measure and better than average measure are not statistically different from each other.

Moreover, Glaser et al. (2005) found that miscalibration scores are not statistically different from each other. Kaustia and Perttula (2012: 47) argued that calibration based methods and better than average differ in that it is impossible to reduce miscalibraion whereas it is possible to reduce the degree of overconfidence in terms of better than average effect. Moore and Healy (2008) showed that among these measurements over precision gives more consistent results compared to those of over placement and overestimation measurements. Baranava et al. (2004) stated that the degree of overconfidence start to decrease after the abilities of individuals measured.

2.5. Determinants of Overconfidence

Some studies also focused on the underlying causes of overconfidence. Several studies also examined how to reduce the degree of observed overconfident behavior in experimental studies using these determinants with different inducements (Arkes et al., 1987; Griffin and Buehler, 1999; Sieck and Yates, 2001; Sieck and Arkes, 2005). Many psychological reasons of overconfidence are suggested in literature. Chan et al (2004: 5-6) argued that subjects tend to evaluate the probability of an event/item subjectively which belongs to a particular group disregarding the objective probabilities. In other words, people who show representativeness overweight the probability of obvious/familiar information though its objective probability is rather low.

The existence of representativeness bias is first documented by Kahneman and Tversky (1972, 1973).

"In investment decision making, the representativeness bias is the act of irrationally relating a particular aspect of a firm to its expected stock returns" (Chang et al, 2009: 51). Hirshleifer (2001: 1545) also stated that representativeness bias has a significant effect on decision process of investors. (Chan et al., 2004: 5-7) argued that representativeness cause many people to take biased decisions about their investments and concluded that representativeness bias results in dramatic deviations from their fundamental values. Investors having representativeness bias irrationally overestimate the future cash flows of firms and tend to have fewer stocks in their portfolios (Barberis, et. al, 1998: 316-400). Luo (2013) showed that traders who are biased with representativeness may earn higher rates of return since they can benefit from erroneous pricings in the market. Hence, Luo (2013) stated that these traders are so profitable in the market that not only they persist but also they can drive out the rational traders in that market.

Tversky and Kahneman (1973) argued that people are prone to give higher probabilities to the events that are easier to remember or the events that takes much less time to remember. Moser (1989: 435) argued that availability heuristics is beneficial since the events that are easiest to remember are the ones that are most frequently happened. People generally reach their predictions depending on a particular starting point and different starting

points may result in different predictions which are called as anchoring heuristics (Tversky and Kahneman, 1974). Adjustment heuristic argues that biased decisions reached using irrelevant judgments may result in anchoring bias (Tversky and Kahneman, 1974).

"According to the anchoring heuristic, an individual anchors an initial judgment of a stimulus with some of its features and then adjusts that initial judgment to reflect the remaining features" (Carlson, 1990: 665). The existence of anchoring heuristics is well documented in literature (Hershey and Schoemaker, 1985; Switzer and Sniezek, 1991). Wilson et al. (1996: 387) stated that it is almost impossible to remove the effect of according. (Chapmana and Johnson (1999: 115) stated that anchoring is quite prevalent bias mainly stem from using irrelevant starting points. Mussweiler and Strack (2001: 234) argued that anchoring is a robust phenomenon. Block and Harper (1991: 188) concluded that there is no causal relation between anchoring heuristics and overconfidence and stated that inability to "realistically" evaluate their calculation skills may yield overconfidence.

Keren (1997) defined determinants under two main groups which are cognitive and motivational factors. Keren (1997) argued that psychological biases form the cognitive determinants. Russo and Schoemaker (1992: 11-12) listed the cognitive determinants of overconfidence as availability bias, anchoring bias, confirmation bias and hindsight bias which are explained in details in Chapter 2 of this thesis. Merkle and Weber (2011) argued that both

"motivational" and "non-motivational" factors are main the reasons of overconfidence. Pulford (1996) stated that motivation itself may cause overconfidence to arise. Joy is suggested to be one of the reasons of overconfidence (Koellinger and Treffers, 2012). Pulford (1996: 18) stated that "mood may influence confidence or accuracy and thus overconfidence. "Moods are often defined as diffuse, objectless affective states"(Koellinger and Treffers, 2012: 6).

Confirmation bias is widely accepted one of the reason of overconfidence (Skala, 2008: 35). Skala (2008) argued that confirmation bias is partly cognitive and partly motivational and it occurs when people tend to accept conforming information whereas rejecting to accept any contradictory evidence. Manglik (2006: 4) argued that over optimism may cause investors to be overconfident. Researchers mainly argued that people tend to be under confident when they face with easy questions whereas they are defined as overconfident when they face harder questions (Clarke, 1960; and Ronis and Yates, 1987; Gigerenzer, et al., 1991; Bar-Tal et al., 2001). It is shown that the easier the questions, the lower the degree of overconfidence (Bar-Tal et al., 2001: 77). Hence, one of these well-known factors to reduce overconfidence is the so called "hard easy effect". Gigerenzer et al (1991) stated that there is positive relation between level of overconfidence and the difficulty of the questions which is measured by the number of correct answers replied. Juslin et al. (1994) argued that answering fewer questions is due to non-familiarity of the questions rather than the difficulty of the questions.

Cesarini et al. (2009) searched for the effects of genes and environment on the emergence of overconfidence behavior using a data of 460 twin pairs. According to Cesarini et al. (2009: 617) "genetic differences explain 16-34% of the variation in overconfidence depending on the definition of overconfidence used and common environmental differences explain 5-11%". Brenner et al. (2011) searched for the determinants of overconfidence measured by better than average effect and concluded that there is a negative relation between ambiguity and degree of overconfidence. In particular, they showed that ambiguity causes investors to underestimate the probability that their portfolio return will be higher than that of a benchmark portfolio.

Bhandari and Deaves (2006: 10) stated that overconfidence may arise as a consequence of psychological bias or incomplete information. (Oskamp, 1965) argued that the more amount of information is the higher the level of overconfidence. It is seen that experience has some effect on overconfidence though how it affect is still a question since some studies show that the higher the experience the lower the degree of overconfidence (Menkhoff et al., 2006; Gervais and Odean, 2001 and Menkhoff et al., 2010) whereas other studies found the vice versa (Kirchler and Maciejovsky, 2002; Kaustia and Perttula (2012). Pulford (1996) suggested "consensus information" as an effective factor in determining the overconfidence. In particular, Pulford (1996) argued that when the majority of the people in a group of people supports an idea contrary to that of one person in that group, the degree of overconfidence for that person reduces by the effect of dominance of the other people in that

group. Soll and Klayman (2004: 299) stated that "unbiased imperfections" and "variations in judgments" are the main reasons of overconfidence. Moreover Juslin et al. (1999) showed that using interval estimates instead of multiple choice questions results in a substantial overconfidence. Indeed, as Allen and Evans (2005: 110) stated that there is no common point in literature for the underlying reasons of overconfidence. Using computer simulations McKenzie (1997: 141) found that inability to properly evaluate the alternative option may result in overconfidence.

2.6. Factors and Methods to Reduce Overconfidence

Juslin (1994) stated that degree of overconfidence increases when questions are chosen deliberately rather than randomly. Baranski and Petrusic (1994) showed that when "hard easy effect" is taken into account overconfidence still exists. Using a survey data of more than 1500 Portuguese investors, Abreu and Mendes (2012) stressed that type of information affects the trading activity of investors. In addition, overconfident and neutral investors rely on different types of information. In particular, they argued that overconfident investors tend to excessively trade when they use informal information rather than advices of professionals. On the other hand neutral traders seem to trade less when they receive information from their families and friends.

Kaustia and Perttula (2012: 47) gave written warnings to financial professionals to make their confidence levels narrower but failed to reduce their degree of miscalibration. However, when subjects are given information

about the general result that people feel themselves better than average though majority of them are not, it is seen that people tend to decrease their capability about selecting superior mutual funds compared their peers. Blavatskyy (2009: 47) stated that confidence level is not related to the subjects' general knowledge or risk taking behaviors. Yates et al. (1998: 112) stated that type of the questions (either general knowledge or not) does not matter in detecting the overconfidence. In an empirical study, Peng and Xiong (2006: 574) argued that overconfidence causes investors to deviate from using meaningful information to useless information.

Cesarini et al. (2006: 455) argued that when subjects in experiments are asked questions they show strong desire to answer it but in stating their confidence intervals we can see that they may not be totally sure about their answer. Cesarini et al. (2006) also showed that the level of overconfidence can be reduced when subjects are given optional financial incentives to answer the questions correctly and state their true confidence level by using frequencies instead of intervals. Hoelzl and Rustichini (2005) concluded that there is negative relation between the familiarity of the questions asked to subjects and level of overconfidence. In particular, Hoelzl and Rustichini (2005) argued that non-familiar questions cause subjects to be underconfident. Soll and Klayman (2004) mainly argued that in many previous studies people are asked to state their confidence level within narrow intervals which yields in higher level of observed overconfidence.

Speirs-Bridge (2009: 512) showed that shifting question format significantly reduce the level of overconfidence. Moreover, Teigen and Jorgensen (2005) questioned the reliability of overconfidence and found that the use of "anticipated" intervals alternative to "assigned" intervals reduce the level of overconfidence substantially. Dittrich et al. (2001: 1) concluded that "overconfidence increases (i) with the absolute deviation from optimal choices, (ii) with task complexity, and (iii) decreases with uncertainty as indicated by the difference between willingness to pay and to accept". Arkes et al. (1987) underlined the importance of the effect of feedback in reducing the observed overconfidence behavior; they argued that feedback may reduce the degree of overconfidence. Sieck and Arkes (2005) concluded that feedback may reduce the degree of overconfidence and may cause decision making process more efficient.

2.7. Overconfidence in Financial Markets

It seems that overconfident people are at least irrational and they irrationally overestimate the precision of their knowledge and their abilities. However, Kogan (2006: 1) argued that the observed overconfidence in financial markets is not totally due to the irrational behavior of overconfident traders. Kogan (2006) showed that people may be "rationally" overconfident in that they excessively rely on their information as a response to the mistakes/errors of other investors in the market. Köszegi (2006: 674) argued that as the ambiguity level of a task increases much more people tend to become overconfident about their ability to succeed.

Odean (1998) argued that overconfidence may create mispricing which may cause markets to be less efficient. He argued that markets are likely to be less responsive to information when overconfident traders dominate the market. Daniel et al. (1998) concluded that overconfidence affects the predictability of returns in the markets. Chuang and Lee (2006) found that overconfident traders tend to underreact to common knowledge information whereas overreact to private information. In addition, they found that the reason of observed high trading volumes in financial markets is the excessive trading of overconfident traders.

On the other hand, in a recent paper Rubinstein (2001) argued that the existence of overconfident traders contribute positively to the efficiency of the markets. He argued that overconfident traders help to bring irrelevant or useless information into market which may result in markets to be informative. In this respect it can be said that overconfidence may contribute to efficiency of the markets positively. Grossman (1976) argued that when there is no noise in the prices "rational investors" do not feel themselves in need of gathering extra information hence tend to only rely on price information. However, Ko and Huang (2007) argued that overconfident traders bring some information to the market and contribute to price formation. In their paper, Ko and Huang (2007) developed a special model focusing on information production by overconfident traders and concluded that moderate overconfidence contributes "price quality" by means of information production function.

In this respect, many economists and researchers interested in the functioning of the financial markets and searched for overconfidence. Skala (2008: 41) stated that "Overconfidence has also become a field of interest for economists, mainly in the context of behavior on financial markets". The overconfident behavior in financial markets is shown to exist using experimental, empirical survey and field data. The disadvantage of empirical studies in examining the overconfidence is that they have to use proxies for overconfidence since they cannot directly observe the overconfident behavior using secondary data. However, the superiority of experimental studies is that under controlled laboratory settings overconfidence can be detected precisely.

Some of the experimental studies used data of professionals such as investment managers, advisors brokers whereas some of them used data of students. Skala (2008: 42) argued that regardless of the sampling the results are confirmed with empirical analysis. Using survey experiment of financial professional and students, Kaustia and Perttula (2012: 57) concluded that "students and financial professionals are about equally overconfident". Skala (2008: 42) argued that in experimental studies the overconfidence behavior of professionals is even higher than that of students. Acker and Duck (2008: 1823) stated that overconfidence is persistent and widely stable across subjects.

Allen and Evans (2005: 110) argued that overconfident traders not only exist in markets but also may dominate the market. Common believes by traditional finance supporters are that when overconfident traders incur losses they will fix their behavior, training cause overconfidence to disappear and adaptive learning cause it to evaporate. However, Manglik (2006: 10-12) suggested many reasons for the persistence of overconfidence in markets. First, people are overconfident across all of their activities even in their life. Hence, a loss in one domain may be cancelled out by gains in other domains. Second, the overconfidence of financial experts causes other individual investors who use their advices show overconfident behavior. Third, though learning may have some effect on the degree of overconfidence on existing traders, the ones that show most overconfidence is the new traders in the markets since every day lots of new traders enter the market and existing traders go out of the markets.

"A novel approach studying the link between individual investor behavior and financial market dynamics is based on agent-based methodology and has become known as Artificial Stock Markets" (Lovric et al., 2010: 90). Caliendo and Huang (2008: 1349) pointed out that individuals exaggerate their expected return whereas they give lower probabilities for the level of risk. Lovric et al. (2010: 91) argued that overconfident investors underestimate the variance of stock returns. Brenner et al. (2011) showed that ambiguity causes investors to underestimate the probability that their portfolio return will be higher than that of a benchmark portfolio. Gervais and Odean (2001)

designed a dividend induced experiment and argued that overconfident individuals are unable to calculate and interpret the distribution of dividends.

In general, traders in almost all types of markets believe that they have superior abilities in investing, their return will be higher than other traders in the market and they may beat the market consistently, they are luckier than other traders and finally they are better than average (Odean, 1998, 1999; Chuang and Lee, 2006 and Allen and Evans, 2005). Baker and Nofsinger (2002) argued that in financial markets traders feel themselves they are better at selecting stocks that yield higher rate of returns. Some studies showed that overconfidence has been the underlying reasons of some anomalies observed in financial markets which cannot be explained by classical finance.

Many studies using secondary data found that overconfidence leads to excessive trade in financial markets (Kyle and Wang, 1997, Odean, 1998, Benos, 1998, Wang, 2001, Daniel et al., 2001, DeBondt and Thaler, 1985; Barber and Odean, 2000; Glaser and Weber, 2007, Hirshleifer and Luo, 2001 and Scheinkman and Xiong, 2003; Grinblatt and Keloharju, 2009 and Trinugroho and Sembel, 2011). On the other hand, Smith (2012) found that there is no relation between overconfidence and excessive trading in markets. Lovric et al. (2010: 99) concluded that overconfidence cause investor sentiment to increase. Odean (1999) argued that this trading behavior may cause willingness to trade excessively in markets. Ben-David et al. (2007)

showed that overconfidence may cause excessive investments in markets. Abreu and Mendes (2012: 870) argued that inability to adapt different points of views may cause investors trade excessively.

Hirshleifer and Luo (2001) argued that overconfident traders excessively trade since they tend to underestimate risk in their investment decisions. However, In particular they stated that overconfident traders are better at getting advantage of market imperfections. Allen and Evans (2005) concluded 40% of the subjects show overconfident behavior in markets. Hirshleifer and Luo (2001: 74) showed that "overconfident traders survive in the long run, and can even drive out rational traders completely". The survival of overconfident traders in the market is also shown by Kyle and Wang (1997). In their study, Kyle and Wang (1997) argued that when asymmetric information exists in the market, the return and utility of overconfident traders is higher than that of rational traders.

It is shown that overconfidence may cause bubbles in financial markets (Shiller, 2002; Scheinkman and Xiong, 2003). Lovric et al. (2010: 91) concluded overconfidence results in bubbles and crashes in markets. Gervais and Odean (2001) designed a dividend induced experiment and argued that overconfident individuals are unable to calculate and interpret the distribution of dividends. Gervais and Odean (2001) stated this kind of an inability may cause them to offer higher prices. However, they also argued that when individuals are given certain signals such as feedbacks about their

performances, the degree of overconfidence may diminish. They also found that overconfident traders trade excessively which results in lower rates of returns. In a study with secondary data, Daniel et al. (2001: 922) stated that "some or all investors are overconfident about their abilities, and hence overestimate the quality of information signals they have generated about security values". Daniel et al. (2001: 922) argued that the mispricing caused by overconfident traders can be driven out at some extent but cannot be totally cut out of the market.

Trinugroho and Sembel (2011: 147) searched for the effect of bad news on the trading activities of overconfident traders and found no effect in terms of trading activity of highly overconfident traders. However, they found that bad news lowers the trading volume of low overconfident individuals. Odean (1999) showed that investors with a high trading rate receive less profit compared to those who trade less frequently in the markets. Trinugroho and Sembel (2011: 147) also found that overconfidence yields in lower rate of return. Using time series data of NYSE/AMEX with VAR and impulse response analysis, Statman et al. (2006) stated that there is a positive relation between degree of overconfidence and trading volume and concluded that after bull markets, people tend to show overconfident behavior whereas after bear markets, people prone to show less overconfident behavior.

Gervais and Odean (2001) found that there is a negative relation between trading volume and return rates of investors. Benos (1998) documented the excess trading volume empirically and concluded that return of overconfident traders may be higher since they take higher risks. Hirshleifer and Luo (2001) argued that overconfident investors may receive higher rates of returns. These mixed results show that there is no a common point of view for the effect of overconfidence on trading gain. Kirchler and Maciejovsky (2002) found that the returns overconfident investors are lower than their peers. DeLong et al. (1990) found that overconfident traders invest in risker securities compared their peers.

Camerer and Lovallo (1999) measured the overconfidence using a market entry experiment and concluded that overconfident individuals are prone to enter markets excessively at the cost of incurring losses in that markets. Barber and Odean (2000) showed that overconfidence results in losses in portfolio values. Goetzmann and Kumar (2008) showed that overconfident traders tend to have fewer assets in their portfolios indicating the under-diversification. As another anomaly, Weyl (2006) suggested overconfidence as one of the reasons of winner's curse observed in common value auctions. Moreover, Daniel et al. (1998) "long-term reversals" can be explained by overconfidence. In a recent paper, Menkhoff et al. (2006: 1764) suggested experience as the explanation of the overconfidence. However, Chen et al. (2007) found that experience cannot fully drive out behavioral biases of Chinese investors.

2.8. Demographics of Overconfidence in Financial Markets

Lenney (1977) showed that women are less overconfident compared to men. Deaves et al. (2009) concluded that men are more overconfident. Baranava et al. (2004) found that gender does not affect overconfidence whereas there is a positive relation between level of education and degree of overconfidence. Bhandari and Deaves (2006) found that males show higher level of overconfidence. Biais et al. (2005) also found that gender differences for the effect of overconfidence on trading gain. In particular, they found that overconfidence has no effect on trading gain for women. Johnson et al. (2006: 2513) found that males are more overconfident whereas as testosterone is not a significant factor in explaining the overconfidence. Kaustia and Perttula (2012) concluded that gender is not related to overconfidence using survey data of financial analysts. It seems that there is no consensus in literature on the effect of gender on overconfidence.

Menkhoff et al. (2010) concluded that younger people are more overconfident. Bhandari and Deaves (2006) also found that there is positive relation between degree of overconfidence and education level and experience. Results indicating the effect of experience on overconfidence are mixed. Some studies showed that experience lowers the degree of overconfidence (Gervais and Odean, 2001; Menkhoff et al., 2010) whereas other studies concluded that professionals are more overconfident (Kirchler and Maciejovsky, 2002). Kaustia and Perttula (2012) found that concluded

that experience and education level are also not related to overconfidence using survey data of financial analysts.

Moreoever, Bhandari and Deaves (2006) concluded that people receiving investment advices are more overconfident than their peers. Barber and Odean (2001) used gender as the representative of overconfident behavior and stressed that trading frequency for men is higher than that of women. Biais et al. (2005) found that miscalibrated subjects earn less profits on an experimental trading game. Biais et al. (2005: 289) concluded that overconfident traders are worse off in terms of trading gains. Using miscalibration approach, Biais and Weber (2009) found that there is a negative relation between levels of miscalibration and investment returns of traders. Inaishi et al. (2010) found that there is a two way relationship between overconfidence and market activity using market simulations. In particular, as the number of overconfidence traders increases the frequency of observed trends also increases in the market. On the other hand, trends cause overconfident people to be even more overconfident (Inaishi et al., 2010: 661).

2.9. Overconfidence in Corporate Finance

Skala (2008: 41) argued that the number of studies examining overconfidence in corporate finance context is quite less compared to studies in financial markets. Russo and Schoemaker (1992) concluded that managers overestimate the precision of their knowledge. Among these studies, some of them focused on the effect of overconfidence the merge and acquisitions.

Malmendier and Tate (2005) showed that overconfidence affects investment decisions of corporate decision makers using data of almost 400 US firms from the time period of 1980 to 1994. In particular, Malmendier and Tate (2005) stressed that managers of these firms overly rely on their information about the ending value of their firms after the merge. Malmendier and Tate (2005) argued that overconfidence may be the reason of observed excessive merge and acquisitions. Gervais et al. (2007) argued that overconfident managers tend to overestimate their skills in reducing risks. They argued that this phenomena cause managers take higher risk which in turn yield desired results for shareholders. Gervais et al. (2003) found that overconfident managers are better at increasing firm value. Gervais et al. (2003) argued that overconfident managers tend to behave at the interest of increasing firm value while risk-averse managers tend to take decisions parallel to the interest of shareholders.

However, it is also documented that overconfident managers cause decrease in the profitability of firms (Malmendier and Tate 2005; Malmendier et al. 2007 and Malmendier and Tate 2008). Malmendier et al. (2011) stated that CEOs are overly optimistic about the future cash flows of the firms. They also stated that overconfident managers tend to use less debt financing and prefer not to issue new stocks to raise funds. It is also widely argued in literature that overconfidence has effects on principal-agent problems. In particular, it is seen that overconfidence may cause adverse selection problem among principal and agents (Maskin and Tirole, 1990). In addition, entrepreneurs

also found to be overconfident in that they overestimate the probability of the success of their business (Cooper et al., 1988). In comparing the levels of overconfidence Busenitz and Barney (1997) found that entrepreneurs are more overconfident than managers. Bernardo and Welch (2001: 302) tried to explain the results of Busenitz and Barney (1997) argued that entrepreneurs are more innovative and better researchers and bring private information to the market that would possibly vanished otherwise. Bernardo and Welch (2001) concluded that these characteristics let overconfident entrepreneurs to survive in the markets.

CHAPTER 3

BUBBLES in EXPERIMENTAL ASSET MARKETS

Many studies searched for the factors that cause abnormal stock price changes and the effects of these factors in forming bubbles in financial markets. It is seen that two different types of bubbles exist. While the first type is related to the bubbles in asset markets the second mainly refers to bubbles in economics. In particular, asset market bubbles are defined as the price deviations from asset's fundamental value, however bubbles in economics occur when investors expect rises in prices consistently which result in prices go up permanently (Camerer, 1989; Gilles and LeRoy 1992; Komáromi, 2006: 1). Though many different definitions of asset price bubbles exist in literature the common point of all them is that bubbles are the price discrepancies from their fundamental values.

There are three main stages of bubbles and crashes in financial markets. In the first stage, assets are generally traded under their fundamental value. In the second stage, the prices start to increase and most of the time assets are traded above their fundamental value. Finally, in the crash stage prices drops dramatically (Fisher, 1998: 24). In this respect, "high transaction volume at prices that greatly exceed the fundamental value, which is usually followed

by a crash to prices close to fundamental values near the end of the asset's lifetime" (Haruvy and Noussair, 2006: 1120).

Camerer (1989) reviewed the literature and grouped bubbles definitions into three different types of bubbles namely "growing bubbles", "fads" and "information bubbles". Growing bubbles have exactly the same points of views with the rational bubbles theory. In particular, growing bubbles are supporting the efficient market hypothesis since prices equal to the present value of the next period bubble prices. In other words, future bubble prices are included to the current prices. Camerer (1989) suggested that tulip bubble best fits to the growing bubbles category. Fads are "mean reverting" divergences of fundamental values. Camerer (1989) argued that if "mean reverting" process is not so fast, traders are almost rational since they are forced to wait for the time that they "exploit their knowledge that prices are in fad". Information bubbles rise when prices do not include all information available.

It is impossible to directly observe the fundamental values in real markets. "Prices are usually not too difficult to observe, however fundamentals, even several years after the fact, may still remain unknown" (Powell, 2010: 7). Hirota and Sunder (2006: 2) argued that this creates is a problem of distinguishing the effects of bubbles and failure of the models designed to measure bubbles. Fisher (1998: 3) stated that "only experimental data allow one to make a proper test for a bubble". Researchers using empirical

methodologies, have to use discount rates, degree of risk aversion and publicly available information as an estimation of fundamental values. However, experiments have superiority in that they have the certain controls on fundamental values and the factors that cause bubbles and crashes in the markets (Stanley, 1997: 613–614). It is argued that studies examining bubbles in experimental setting are superior in that it is possible obtain more information about bubbles since fundamental values can be observed (Wolfers and Zitzewitz, 2004: 16). Fundamental value is defined as the net present value of the future dividends of a common stock (Scherbina and Schlusche, 2011). In mathematical context, the price of a stock is expressed as in Equation 6 (Brunnermeier, 2009: 4);

$$P \quad \sum_{1} \quad \frac{D}{1} \quad b \tag{6}$$

where D is the dividend payments, r is the discount rate, is the expected value and P is price of the stock at time t . The first component on the right hand side of the equation refers to fundamental value (P^*) whereas the second component (b) is stochastic and called as bubble component. Clearly it is seen that negative and positive mispricing may arise which in turn may yield in negative or positive bubbles. However, positive bubbles are much more common in markets (Scherbina and Schlusche, 2011: 2). Dutch tulip, Mississippi and south sea bubbles, the great depression of 1929, dot.com bubble or internet bubble are the some of the observed well-known bubbles (Kindleberger, 2000). Excessive optimism, overvaluation, and overconfidence

are seen as the major reasons for the rise of internet bubble (Scherbina and Schlusche, 2011: 4-5; Komáromi, 2006: 53-58; Malkiel, 2010). The first financial bubble was the South Sea and Mississippi bubbles. Though "South Sea" and "Mississippi" companies were located in different countries, these firms had three common characteristics that cause bubbles; these are large amounts of issues, higher levels of external financing and finally fraud with the lack of efficient governmental control (Komáromi, 2006: 38; Malkiel, 2010). The price of the shares of South Sea and Mississippi companies went up more than 700% and 1900% respectively and dropped about 50% in the same year for South Sea and fell to its price before the bubble had started for the Mississippi company (Scherbina and Schlusche, 2011: 3; Malkiel, 2010).

The big crash of 1929 had its effects on both financial markets and Mortgage sectors. Average stock prices fell by more than 50% and it took years to reach its previous prices (Komáromi, 2006: 46; Malkiel, 2010). The so called "Internet bubble" or "Dotcom bubble" started in the middle of the 1990s and burst around the beginning of the 2000s. During this time period the price of the stocks of IT firms went up more than 550% and dropped about 285%. This bubble was mainly related to IT firms in business of internet applications. Miller (2002) argued that all of these bubbles are not "real bubbles" in that the observed price changes are results of supply-demand inconsistencies.

Investors have different motivations to trade in the financial markets such as liquidity, hedging, informational or speculative concerns. Informational or

speculative concerns are mainly related to the cases where traders base their decisions on their personal confidential knowledge Angrisani et al. (2008: 2). In this manner, bubbles can form either irrationally or rationally. "We are talking of a rational bubble when the market price of an asset is higher than its fundamental value, but rational expectations of market players may justify such a price" Komáromi (2006: 3). It is argued that rational investors are willing to pay higher prices than the fundamental value since they expect to sell it at a price even higher their buy price (Ackert et al., 2002: 2-3). In this respect, this kind of transaction is a rational speculative trading. "Investors exhibit speculative behavior if the right to resell a stock makes them willing to pay more for it than they would pay if obliged to hold it forever" (Harrison and Kreps, 1978: 323).

Harrison and Kreps (1978) argued that traders in the markets have heterogeneous beliefs though they have the same information. In this respect, though they have the same information about the stream of the dividends they reach to different probability measurements due to subjective assessments which in turn cause subjective fundamental values hence the impossibility of a single intrinsic value of a stock. It is also argued that rational traders tend to push prices back to their fundamental values. However, they face some arbitrage limitations in eliminating the bubbles. In particular, it is argued that arbitrage is not riskless in that there is some uncertainty about the fundamental values (Youssefmir et al., 1998). It is accepted that speculative bubbles form when prices increase without any

justification by dividend payments, a case that causes huge deviations from fundamental values (Brunnermeier 2001; Komáromi, 2006). Lei et al. (2001) designed an experiment eliminating the speculative trading and showed that lack of speculation cannot drive out the formation of bubbles and concluded that trading irrationally may cause bubbles to rise. In other words, speculative trading is sufficient to form bubbles but not the only necessary condition.

Alternative to the rational model, some studies examined the "noise" traders who take psychological factors into account in their trading. In this model, the behaviors of the traders are subject to psychological biases (Shleifer and Summers, 1990). Some studies in literature show that these "noise" traders are generally the trend buyers. It is argued that there are two types of investors which are "fundamentalist traders" and "noise traders" where "fundamentalist traders" adopt fundamental value of an asset in their trading and "noise traders" adopt following price movements (Youssefmir et al., 1998).

It is precisely shown in literature that overconfidence may cause bubbles in financial markets (Shiller, 2002; Scheinkman and Xiong, 2003). Lovric et al. (2010: 91) concluded overconfidence results in bubbles and crashes in markets. Scheinkman and Xiong (2003: 1) argued that "in equilibrium bubbles are accompanied by large trading volume and high price volatility". Scheinkman and Xiong (2003) developed a model where heterogeneous

views among traders arise due to the effect of their different levels of overconfidence. Hence, speculative bubbles occur due to overconfidence.

Test of irrational bubbles are first introduced by Smith, Suchanek, and Williams (1988) (henceforth Smith et al., 1988). In their pioneering study, Smith et al. (1988) had experimental settings of an asset that has definite maturity, hence a definite fundamental value. In this respect, bubbles are irrational because a rational investor would calculate the fundamental value using backward induction. In other words, if an investor aware of the stream of dividends and the length of the experiment pays higher prices than fundamental value, he/she is irrational and contributing to the formation of bubbles irrationally.

The well known cause of irrational trading behavior is the so called "probability judgment errors". "Probability judgment errors" refers to traders intuitively assigning higher probabilities to high payoff dividend outcomes compared to their actual probabilities (Ackert et al., 2006; Ackert et al., 2012). Ackert et al. (2012) defined traders who fall into "probability judgment errors" as irrational traders and showed that these irrational traders cause bubbles. Moreover they found that rational traders in the market are aware of these irrational traders and they benefit from the biases of these irrational traders in making profit.

Ackert et al. (2002) suggested "lottery effect" as the underlying reason of observed bubbles. In this effect, traders pay higher prices than its fundamental value since there is still a chance of earning large payoffs though the probability to earn that amount is rather low. Hence, both speculation and irrational trading behavior are suggested as the causes of bubbles in markets. Arbitrage is not effective in eliminating bubbles when prices deviate from their fundamental values too much (Shleifer and Vishny, 1997). Camerer (1989) suggested "individual utility maximization", "adaptive expectations" and "finite lifetime" as efficient factors that can drive out rational bubbles.

3.1. Measures of Bubbles in Experimental Asset Markets

The commonly used bubble measures in literature are;

- Price Amplitude (PA),
- Total Dispersion (TD),
- Average Bias (AB),
- Turnover, Duration (DUR),
- Relative Absolute Deviation RAD ,
- Relative Deviation RD .

Price Amplitude (PA) is calculated as follows (Porter and Smith, 1995; Noussair et al., 2001; Haruvy and Noussair, 2006; Hussam et al., 2008; Stöckl et al., 2010);

$$PA \quad a \ \frac{\text{ı}}{\text{ı}} - \quad in \ \frac{\text{ı}}{\text{ı}} \tag{7}$$

where P is the mean price for period r, is fundamental value in period r. Price amplitude indicates the difference between the maximum price deviation and minimum price deviation. Total Dispersion (TD) is calculated as follows (Haruvy and Noussair, 2006; Haruvy et al., 2007; Stöckl et al., 2010);

$$TD \quad \sum^{R}{}_{1} |MedianP - \quad | \tag{8}$$

where $MedianP$ is the median price in period r. Total Dispersion measures the deviation from fundamental valued over the life cycle of the stock. Average Bias (A) is estimated as follows (Haruvy and Noussair, 2006; Haruvy et al., 2007; Kirchler et al., 2009; Stöckl et al., 2010);

$$A \quad \frac{1}{R}\sum^{R}{}_{1} MedianP - \tag{9}$$

where R is the total number of periods. Average Bias indicates per period deviation of prices form their fundamental values. Turnover measures the number of executed trades during each of the periods. Turnover rate is calculated as follows (Haruvy and Noussair, 2006; Haruvy et al., 2007);

$$T \quad rnove \quad \underline{\Sigma} \tag{10}$$

where is the number of executed trades in period r and n is the total number of assets in the market. Duration (DUR) is estimated as follows (Porter and Smith, 1995; Stöckl et al., 2010);

$$DUR \quad \max R: P - \quad P_{1} - \quad 1 \quad \cdots \quad P_{R\ 1} - \quad R\ 1 \qquad (11)$$

Duration is obtained counting the number of successive periods that show increasing price deviations from fundamental values. Relative Absolute Deviation RAD is calculated as follows (Kirchler et al., 2009; Stöckl et al., 2010);

$$RAD \quad \frac{1}{R}\sum^{R}{}_{1}\frac{|\quad \text{ı}|}{|\quad \text{ı}|} \qquad (12)$$

Relative Deviation RD is calculated as follows (Stöckl et al., 2010);

$$RD \quad \frac{1}{R}\sum^{R}{}_{1}\frac{\text{ı}}{|\quad \text{ı}|} \qquad (13)$$

3.2. Experimental Market Environments and Bubbles

For the past three decades the market design developed in a ground-breaking study of Smith et al. (1988) has been widely accepted and applied to later studies examining experimental asset markets. In this setting, the total number of periods in the experiment, the stream of dividend payments and the probabilities regarding these payments are known by traders in the

market. Hence, the only uncertainty for a trader is the decisions of other traders in the market. In this manner, a trader start to realize that other traders also take information different from the fundamental value as the price of the stock diverges from its fundamental value. It is argued that conventional pricing theories cannot explain this phenomenon (Çağınalp et al., 2001: 81).

Kirchler (2009) argued that this kind of settings may have an effect on the formation of bubbles. Hence, experimental setting seems to be crucial factor on the formation of bubbles. However, many studies used modified versions of Smith et al. (1988) to eliminate the observed bubbles in experimental markets; however results indicate that the results of Smith et al. (1988) are quite robust (Smith et al., 2000; Lei et al., 2001). Indeed, many experimental studies precisely show that bubbles cannot be eliminated in the laboratory settings (Alevy and Price, 2012: 21). Hirota and Sunder (2006) searched for the effect of investment period on the formation of bubbles. In their study, short term investors are the ones exiting the market before receiving dividend payment whereas long term investors are the ones receiving the dividend payments. Hirota and Sunder (2006) found that since short term investors cannot use backward inductions, they tend to use "forward induction", and concluded that short term trading yields in bubbles whereas long term traders do not cause bubbles to rise.

Moreover, Hirota and Sunder (2006) argued that when the time horizon between dividend payments increases, the possibility of o receiving dividend during their investment period decreases. Hence, traders tend to focus on capital gains rather than dividend payments, which in turn may result in bubbles. Hirota and Sunder (2006) also highlighted that the grater the uncertainty about the stream of dividends is, higher the possibility of bubbles.

Ackert et al. (2002) searched for the effect of short selling and self-financing on the formation of bubbles and found that when traders are forced to buy the assets using their own financing and prohibited from using short selling bubbles are prone to dissipate. Haruvy and Noussair (2006) argued that bubbles cannot be totally driven out by removing the limitations on short sale. Removing limitations on short sale does not induce bubbles in markets (Haruvy and Noussair, 2006: 1121). Porter and Smith (2003) found that short selling, and trader characteristics do not have any effect on bubbles. However, it is argued that bubbles dissipate when the asset market experiment is run with the same subjects third time (Çağınalp et al., 2001).

Stanley (1997: 624) searched for the effect of experience on bubble formation and concluded that when investors are experienced bubbles still occurs. Lugovskyy et al. (2009) found that the only significant factor in reducing the size and magnitude of bubbles is the level of experience. Greenwood and Nagel (2009) examined the effects of inexperience using a data base of mutual

fund managers. Greenwood and Nagel (2009) found that most of the young and inexperienced traders tend to follow the trends and cause bubbles in the markets. Alevy and Price (2012) concluded that advice is some kind of an alternative to the experience in that it also helps to reduce the likelihood of a bubble. Lei and Vesely (2009) argued that experience is not a necessary condition in eliminating the bubbles. Lei and Vesely (2009) stated that when subjects of the market experiment are given "proper instructions" bubbles and crashes are not seen. Porter and Smith (2003) reviewed results of 72 studies designed to reduce bubbles using different treatments and concluded that bubbles dissipate with higher levels of experience, transaction costs/brokerage fees and price limits.

Lei et al. (2001) concluded that bubbles and bursts do not dissipate when speculation is under control. Fisher (1998: 25) concluded that learning effect cause crashes in experimental asset markets. Çağınalp et al. (2001: 80) found that the larger the amount of excess initial endowments available to traders, the higher the number of postponed dividend payments, the greater the amount of information is the lower the size of the bubbles. Jarrow et al. (2010) developed a "continues time model" to search for the bubbles in incomplete derivatives markets and found that bubbles rise in European call options but not in put options. Williams (2010) designed an asset market consists of two types of traders namely the "fundamental traders" and "noise traders". "Fundamental traders" are party rational traders who show anchoring bias and noise traders are totally irrational traders. Williams (2010) found that

bubbles are driven by fundamental traders who fall into anchoring bias whereas noise traders cannot form bubbles by themselves. Fisher and Statman (2002) argued that during the bubble periods expectations of traders are highly optimistic. In particular, most investors think that their portfolios would receive a return higher than the market portfolio. Bottazzi and Devetag (2005) examined the effect of expectations about the prices on the formation of bubbles. Bottazzi and Devetag (2005) asked subjects forecast the future prices and their variances. They found that expectations have no significant effect on the rise of bubbles. Hommes et al. (2008) investigated the effects of expectations and concluded that bubbles are contrary to the rational expectations hypothesis.

Miller (2002) argued that experimental markets are incomplete in that there is no future/forward market available to traders in the spot market. Miller argued that adding future markets in addition to the spot markets can reduce the size and magnitude of the bubbles in that future markets provide information to traders about the prices for spot markets. Moreover, traders can learn to avoid bubbles but learning cannot totally drive out bubbles. Noussair and Tucker (2006) found that when future markets exist, bubbles and crashes in spot markets do not rise. They argued that speculation and biased behaviors that cause bubbles can be abated in the existence of future markets. Deck et al. (2011) found that bubbles rise when new investors enter the markets providing the additional funds available to the market and

bubbles burst as existing traders exit the market taking their funds out of the market.

Asparouhova et al. (2012) examined the “credit market bubble". They argued that bubbles raise when debt price is higher than tis intrinsic value and when the debt is refinanced though it is clearly known that debt cannot be repaid. Asparouhova et al. (2012) experimentally showed that that credit market bubbles occur since “creditors refinance the debt even if it is not in their self-interest to do”. Chan et al. (2012) examined the effects of the “characteristics” of the assets in forming the bubbles. In particular, they defined two types of stocks. The first stock has a life span of 30 periods and a constant dividend of 7 francs for each of the periods, on the other hand second stock has a the life span of 1 to 30 periods and has dividend changing across periods. They found that magnitude and size of the bubbles in which first type of the stock is traded is significantly smaller compared to those of the market where second type of the stocks are traded.

Andrade et al. (2011) examined the effect of mood on the decisions of traders in the markets. In their experiments, some traders are given “an exciting upbeat video” and some other traders are given neutral videos before they start trading. The showed that mood has significant effect on the pricing decisions of traders. In particular, they precisely showed that mood has a significant effect on the size of the bubbles. Abraham et al. (2008) used an agent-based model in examining the bubbles and crashes and concluded that

traders tend to overly rely on the most recent losses and when losses and crashes are highly appraisable, they decide to buy stock rather than sell them.

Alevy and Price (2012) examined the effect of advice on the trading behavior of investors and the formation of bubbles. Alevy and Price (2012) found that though taking advices do not affect the trading gain in significantly decreases the deviation of payoffs for the traders who received advices. They found that investors receiving advices less likely to adopt momentum strategies in their trading. In particular, the advised traders tend to bid less often but offer more frequently right before the start of bullish periods.

Momentum strategies are found to be contributing the formation of bubbles in markets. "Momentum traders" give their decisions regarding their expectations about trends in markets. In particular, "momentum traders" buy securities when they expect prices to continue to rise up, and decide to sell the securities when they are expecting the prices continue to drop. In contrast to "fundamental traders" decide to buy when prices are under the fundamental value and decide to sell when prices are over the fundamental value (Çağınalp and Ilieva, 2008: 644). Çağınalp and Ilieva (2008: 641) concluded that bubbles are mainly driven by these momentum traders.

Kirchler (2009) argued that most of the previous studies adopt the declining fundamental values over the periods of the experiment. Kirchler (2009) argued that in this framework, it is impossible to observe the trading

behaviors in the bull market periods. Hence, Kirchler (2009) developed a changing dividend system and found that traders tend to underestimate the fundamental value in bull market periods whereas overestimate the value in the bear market periods. Kirchler (2009) also found that the informational efficiency of the bear and bull markets also differ. In particular, bear markets show lower degree of informational efficiency. Oechssler et al. (2007) designed an experimental asset market where there is no dividend payments and found that bubbles still occurs in the lack of dividends. Moreover, (Oechssler et al., 2008: 1) concluded that information asymmetry in particular, insider information is the main factor in forming bubbles in markets. In contrary, Sutter et al. (2012) found that at markets where there is asymmetric information, the size of the bubbles in those markets is rather smaller.

However, at markets where traders are equally informed "symmetrically informed" or not informed at all, the size and magnitude of the bubbles are much larger. Hence, they concluded that information asymmetry about the future values of dividend increases the efficiency of the markets. Analyzing the effect underlying mechanisms of bubbles and crashes Ma and Li (2011) concluded that "Double Auction" mechanism, in particular step sizes of bid and ask may cause bubbles and crashes. Ma and Li (2011) argued that efficiency of the markets can be achieved when step sizes of bid and ask are not equal to each other.

Çağınalp et al. (2000) reviewed results of over 150 experimental studies examining bubbles and summarized main findings as follows (Çağınalp et al., 2000: 44);

- Bubbles can be reduced with the experience of traders in the markets,
- The existence of future/forward markets, the precision of the dividend payments and their timings decrease the likelihood of the rise of bubbles,
- Margin buying and price limits tend to increase the possibility of bubbles to rise,
- There is no effect of short selling, brokerage fees and taxes on the rise of bubbles.

CHAPTER 4

HYPOTHESES DEVELOPMENT

There are few studies examining the effects of overconfidence in forming the bubbles in experimental asset markets. It is precisely shown in literature that overconfidence may create bubbles in financial markets (Shiller, 2002; Scheinkman and Xiong, 2003). Lovric et al. (2010: 91) concluded overconfidence results in bubbles and crashes in markets. Scheinkman and Xiong (2003: 1) argued bubbles are positively related with higher levels of that trading volume in markets. Scheinkman and Xiong (2003) developed a model where heterogeneous views among traders arise due to the effect of their different levels of overconfidence. Hence, speculative bubbles occur due to overconfidence.

Excessive optimism, overvaluation, and overconfidence are seen as the major reasons for the rise of internet bubble (Scherbina and Schlusche, 2011: 4-5; Komáromi, 2006: 53-58; Malkiel, 2010). Kirchler and Maciejovsky (2002) found that the returns overconfident investors are lower than those of their peers. DeLong et al. (1990) found that overconfident traders invest in risker securities compared their peers. Camerer and Lovallo (1999) measured the overconfidence using a market entry experiment and concluded that

overconfident individuals are prone to enter markets excessively at the cost of incurring losses in that markets.

Biais et al. (2005) examined the effects of overconfidence with 245 subjects with different signals to subjects and found that though overconfident subjects do not trade more frequently, their returns are lower than those of other subjects in the market. Deaves et al. (2009) focused on the information asymmetry in their experimental setting and conducted experiments with different treatments of markets. In their experimental setting, each market consists of 12 periods with 20 questions and found that subjects are generally overconfident and the more overconfident a subject the more he/she trades and the less he/she earns.

Michailova (2010) examined the effects of overconfidence and risk aversion on bubble formation. Michailova concluded that "experimental market outcomes were overconfidence and not risk aversion driven". Michailova (2010) examined the subjects with symmetric information and hard easy effect settings. In that study, Michailova (2010) grouped subjects under two different markets. In the first market, only overconfident subjects traded whereas in the second market only neutral or under confident subjects traded. Michailova (2010) found that overconfidence cause increase in prices and excess trading volume.

Keeping these results and experimental settings in mind, we developed our hypotheses and designed our experiment. First of all, we used hard easy effect since it is clearly shown that it has effects on the overconfidence hypothesis. In this setting, we developed easy, medium and hard questions with the match of the results of my pilot experiment and pre-defined hard easy classifications. Moreover, we account for the gender bias of the questions. In particular, some questions (especially questions about cars or some certain type of sports such as football) may be hard especially for women. Second, different from previous studies, we do not define subjects as overconfident or not. Hence, we do not group people in different markets. In our experiment, as similar to the real markets both overconfident, neutral and under confident subjects trade in the same market. Hence, we do not create artificial market settings.

Different from previous studies, we use individual data rather than aggregate market data. Third, different from other studies in bubble experiments, we believe that overconfident is domain specific. In particular, bubbles are observed in financial markets and intuitively, subjects should take their decisions using their investment knowledge. Hence, overconfidence in general knowledge questions may not be the perfect representative of the bubbles in experimental asset markets. In the light of these improvements, we developed our hypotheses as follows;

Hypothesis 1: Subjects are generally overconfident about their abilities in both of the domains (general knowledge and financial knowledge).

Hypothesis 2: Subjects are generally overconfident about precision of their knowledge in both of the domains (general knowledge and financial knowledge).

Hypothesis 3: Degree of confidence in financial domain is less than that of in general knowledge domain both in terms of their abilities and precision of their knowledge.

Hypothesis 4: Subjects place themselves above average in both of the domains (general knowledge and financial knowledge).

Hypothesis 5: Degree of better than average confidence level in the domain of finance is less than that of in general knowledge domain.

Hypothesis 6: Subjects place their expected payoff above average.

Hypothesis 7: Compared to entry level in the first part where rankings are random, subjects enter the market more often in the second part where rankings are based on general knowledge.

Hypothesis 8: Compared to entry level in the first part where rankings are random, subjects enter the market more often in the third part where rankings are based on financial knowledge.

Hypothesis 9: Compared to entry level in the second part where rankings are based on general knowledge, subjects enter the market less often in the third part where rankings are based on financial knowledge.

Hypothesis 10: Individual trading activity increases with the increase in degree of overconfidence.

Hypothesis 11: Individual gains from trade decrease with the greater degree of overconfidence.

Hypothesis 12: Overconfidence results in bubbles in the markets.

Hypothesis 13: Women are less overconfident than men.

Hypothesis 14: Subjects who have investment experience are less overconfident in the domain of finance.

Hypothesis 15: Subjects who have investment experience are biased less in the market.

Hypothesis 16: Subjects who have investment experience traded less frequently in the market.

Hypothesis 17: Subjects who are familiar with financial concepts are less overconfident in the domain of finance.

Hypothesis 18: Subjects who are familiar with financial concepts are biased less in the market.

CHAPTER 5

DATA and METHODOLOGY

In this chapter, design of the experiments, sampling and data collection process are introduced. The first experiment is the overconfidence experiment which is programmed and conducted with the software z-Tree (Fischbacher, 2007). The second experiment is the "EconPort MarketLink" experiment (Experimental Economics Center, 2012).

5.1. Overconfidence Experiment

There are three different measurements of confidence levels used in this experiment. The first measurement is the entry level comparison of Camerer and Lovallo (1999) the second is the calibration based measurement and the last one is the better than average effect. The experiment is based on a market entry game. Market has a capacity and subjects' rivals are the other people participating in this experiment. Subjects decide whether to enter the market or to stay out of the market. On the computer screen subjects are sequentially given 24 market cases in total; each market case is independent from each other. During the experiment, subjects are not allowed to communicate with the other subjects. If any subject violates this rule he/she is excluded from the

experiment and from all payments. At the beginning of each market case, subjects are assigned randomly to one of the groups of 4 subjects. For each market case, subjects are playing with a different group of people. In each market case, the number of people in each group is always 4 and the capacity of the market is always 2.

The experiment consists of 3 phases; in the first phase; Subjects make an "enter or not" decision for 8 separate market cases (Round 1-8). If subjects decide not to enter (stay out of) the market: Subjects' payoff for this market case is £6. If subjects decide to enter; Subjects are ranked randomly by the computer among the people that decide to enter the market in subjects' group. If subjects' random ranking is within the capacity subjects will receive a either £15 or £10 depending on their rankings (see Table 5.2**)**. If a subject's random ranking is not within the capacity (This means subjects are ranked 3rd or 4th), his/her payoff is £3 (see Table 5.2). In the second phase; subjects make an "enter or not" decision for 8 separate market cases (Round 9- 16). If subjects decide not to enter (stay out of) the market, their payoff are £6. If subjects decide to enter; they are asked "General Knowledge" questions for each market case.

These questions are called as "Trivia questions". The subjects of these questions have large diversity such as geography, history, astrology, hobbies, music's, movies, entertainment, science and technology, television, art, religion, people and languages. The questions for each market case are the

mixture of questions from any of these categories chosen randomly. The difficulty of the questions also varies randomly. The difficulty levels of the questions are detected using a pilot experiment. Questions are defined as most difficult if the number of people giving right answers is lowest. The questions that received moderate levels of right answers are grouped into moderate group and the questions that receive highest accuracy are defined as easiest questions. In this pilot study, 240 questions are ranked according to their difficulty levels. In the main experiment, 96 out of these 240 questions are used. In the main overconfidence experiment, for each market a set of 6 "General Knowledge" questions (2 hard, 2moderate and 2 easy questions) are asked to subjects who decide to enter the market. This methodology is widely used in literature and called as "Hard-easy effect".

The payoff of a subject depends on his/her rank within his/her group of people that decide to enter (See Table 5.1). The rank of each subject depends on the number of his/her correct answers compared to the other people's correct answers in his/her group. Hence, the higher the number of subject's correct answers is relative to others, the higher subject's payoff is. Subjects are also asked to state thoughts about the number of their correct answers and their confidence level in each of these rounds after answering the questions. Subjects are given incentives for their accurate guesses. They are also informed about their performance at the end of the each round.

The only difference between the first phase and second phase of the experiment is these trivia questions. Subjects are ranked randomly for the first phase whereas they are ranked according to their performance. Hence, the only factor that can affect their entry level is their confidence to answer the questions correctly. However, they decide to enter the market without any information about the questions such as their type, their difficulty level and so on. If we compare the entry levels across these two phases, we can infer a conclusion about the confidence levels of subjects as it was in the case of Camerer and Lovallo (1999). As we have mentioned above, this is the first measurement type for confidence levels in this overconfidence experiment. In this respect excess entry is the difference between the average entry level in the first part of the experiment and the average entry level for the second part of the experiment.

We also think that overconfidence is domain specific. In other words, a person may be overconfident in driving but not in financial markets. Hence we think that general overconfidence may be misleading. To search for the domain effect we ask people about investment questions in the third phase. In this third phase; subjects make an "enter or not" decision for 8 separate market cases (Round 17- 24). If subjects decide not to enter (stay out of) the market, subjects' payoff will be £6. If subjects decide to enter, subjects are asked a set of 6 "Knowledge in Finance" questions for each market case. The difficulty of the questions also varies randomly. Similar to the second phase, subject's payoff depends on his/her rank within his/her group of people that

decide to enter (See Table 5.1). We also calculated their average entry levels in the domain of finance and compare it to the average entry level in the first part.

Table 5.1: Subjects' Payoff according to Their Rankings

Subjects' Ranking in subjects' Group	**Subjects' Payoff (Capacity = 2 people)**
1	15
2	10
3	3
4	3

His/her rank depends on the number of his/her correct answers compared to the other subjects' correct answers in his/her group. Hence, the higher the number of subjects' correct answers is relative to others, the higher subjects' payoff is. We use this third phase to compare the entry levels of people across second and third phases. We think that overconfidence in financial markets is related to their confidence levels in investment decisions rather than their general knowledge levels.

At the beginning of a new market case, subjects are given time to make a guess about the number of people deciding to enter the market. This question is asked to see whether subjects excessively enter the market because they think that the number of entrants is going to less than the capacity or because they are really overconfident.

5.2. Measurement of Overconfidence in the Current Study

In the calibration based measurement, we compare the average accuracy levels of a subject with his/her average confidence level, a methodology used by Pulford (1996) and clearly defined in literature review chapter. Pulford (1996) converted the confidence (calibration) score into under/overconfidence scores as in equations 3 and 4.

Regarding these measurements two different calibration based overconfidence measurements are developed which are some kind of the derivatives of the above measurements. These are "over ability" and "over precision" measures for the second and third periods, "over ability P2" (Over ability in the second period), "over ability P3" (Over ability in the third period), "over precision P2" (Over precision in the second period) and "over precision P3" (Over precision in the third period). "Over ability P2 and P3" variables are the measures of the overconfidence of individuals in term of their abilities for the general knowledge and financial knowledge questions respectively. "Over precision P2 and P3" variables are the measures of degree of the precision of knowledge in general and finance domains respectively. These measures are calculated as follows;

$$OverAbilit \quad \frac{1}{N}\sum \; e - c \tag{15}$$

$$OverPrecision \quad \frac{1}{N}\sum \; e \quad l - c \quad s \tag{16}$$

Where N is the total number of periods that the measures are calculated, t and T values are the first and last period that measures are calculated respectively. e is the estimate of the number of correct answers, c is the accuracy (the number of correct answers), s is the five-level Likert confidence measure, and l is the stated confidence levels.

Better than average measurements are mainly based on verbal statements of the subjects. In particular, subjects are asked "Of the 56 people participating the experiment, how many of them do you think is going to more successful than you in terms of general knowledge trivia questions?". We call this score as TA . They are also asked "Of the 56 people participating the experiment, how many of them do you think is going to more successful than you in investment questions?". We call it, TA . Regarding these questions better than average scores are calculated as in the equation;

$$TA \quad \frac{1}{\quad} - \ stated\ n \quad be \tag{17}$$

where i reefers to either general or financial. Moreover, they are asked "What is the probability that your payoff, will be top %10 in this experiment?". We defined this score TA . If the stated percentage is 10% percent TA score is exactly zero. TA is calculated as follows;

$$TA \quad stated\ percenta \quad - \%10 \tag{18}$$

5.3. Asset Market Bubble Experiment

The asset market bubble experiment used in this thesis is obtained from EconPort experiment database (Experimental Economics Center, 2012). EconPort is an economics digital library providing software for researchers to run experiments. EconPort is designed and developed by Experimental Economics Center, Andrew Young School of Policy Studies at Georgia State University, US. The database currently includes Game theory, market, and auction experiments. "MarketLink" software enables users to conduct several types of auction markets. The software enables the use of double auction, double auction posted offer, and posted bid institutions. In this thesis, double auction market experiment is used to measure the bubbles in financial markets and is conducted via internet.

Though, this experiment is set up by Experimental Economics Center Georgia State University, US, it let its users to modify and configure the experiment in line with needs of the experimenters. There are two elements of the experiment. The first is the server computer and the second is the user computers. Using the server computer, experimenter can parameterize the experiment and each user computer act as a single trader in the experiment. The asset market bubble experiment is set up according to parameters used in the study of Smith et al. (1988). According to this setting, there is only one long lived asset to be traded in the market. In this market, a market is created in which traders take decisions to buy, sell, or hold virtual (fictitious) stocks.

In this experiment, each trader play over a sequence of 15 trading periods with units of a stock paying a dividend at the end of each trading periods which is random, but drawn from a known distribution. Earnings of a trader depend on his/her decisions and those of the other traders. The experimental currency unit used in the market is called as "Gulden". All trading and earnings are defined in terms of "Guldens". At the end of experiment, traders are shown session earnings which are calculated multiplying traders' session earnings with a conversion factor of 0.01, and traders are paid cash in pounds at the end of the experiment.

Subjects are informed that the more "Guldens" they earn the more pounds they receive. Subjects are also asked not to talk to each other until the end of the experiment. Traders played a trial period to make them familiarize to the experiment. Moreover, subjects are told that they should think of each trading period as a "business or trading day". Each trading period has a preview time of 15 seconds. After this preview period, each trading period has a maximum length of 180 seconds at which time the market will close for that period. The remaining time left in each period is shown by a clock on subjects' computer screen. Each trader at the beginning of the trading game is endowed by the either a starting capital of "500" plus 1 stock or a starting capital of "140" plus 4 stocks. During the experiment traders may purchase or sell assets. At the end of each trading period, traders receive a dividend on each stock in their portfolio. There are four possible outcomes for the realization of the dividends.

Table 5.2: Probabilities and Dividend Payments

Probability	Dividend payments per stock
0.25	0.00
0.25	4.00
0.25	8.00
0.25	20.00

The information for the probabilities of the states and amount of dividend is stated in the Table 5.2 below. Traders receive only one of these payments provided by their states at the end of each period and traders receive that amount for each of the stock they have in their portfolios in each period. Traders who wish to buy an asset in may enter his/her "bid" or alternatively accept the "ask" of another player in the market. All bid and ask prices are shown in the screen.

Traders are also informed about the best bid and best ask prices. If a trader wishes to accept Seller's offer and purchase one unit of the asset, he/she can easily do this first clicking on the "Buyer's Action" tab and then the standing in the column on the right named "Market buy". If a trader wishes to accept Buyer's bid, he/she can click on the "Seller's Action" tab and then the standing in the column on the right named ""Market sell". Upon buying/selling one unit of the stocks the transaction price is added/subtracted from traders' available balance immediately; same is valid for the assets' inventory. In addition buyers can increase their prices that they previously bid using "Market buy" tab and seller can decrease their prices that they previously asked using "Seller's buy" tab. Current balance of a trader is calculated as follows;

$$rre\ alanc\ Startin\ alanc\ ndo\ e\ Tradin\ Gain\ Dividend \quad (19)$$

At the end of each trading period current balance of each trader is carried over to the beginning of the next trading period. Traders can buy asset units as long as traders' available balance is greater than or equal to the purchase price. If traders attempt to enter a bid or accept a seller's offer that is greater than their available balance capital, traders receive an error message on traders' display screen. Traders can sell assets as long as their inventory is greater than zero. If traders attempt to enter an offer or accept a buyer's bid, when they have no assets in their portfolio, the action is ignored and traders receive an error message on their display screen.

At the end of each trading period traders have the opportunity to see the market price summary information from the past trading periods, which includes such information as average market contract price, the highest, and the lowest market price, volume traded and dividend for that period. Moreover, at the end of each trading period, traders receive information about which state is realized, the amount of their dividend payments, trade activities and their money balance. We use the market structure of Smith et al. (1988). In that market, there is only one single risky asset with limited supply and many risk-neutral agents in a finite horizon. Since the stream of dividends are known by all traders in the markets, traders should be are supposed to pay exactly the expected per period dividend of the asset times

the number of periods remaining experiment sessions, risk neutral fundamental value (Henceforth, FV). Thus, the FV is calculated as follows;

$$Dividend\ Pa \quad ent \quad Re \quad ainin \ \ Periods \tag{20}$$

where r is the period, is fundamental value in period r, and the is the expected value. The FV in period 1 is therefore 120 and decreases by 8 "Guldens" each period. Hence, subjects are aware of both FV in each period and the value of the stock at the end of the 15th period which reaches to zero, hence no terminal value. We used the all frequently used bubble measures which are Price Amplitude (PA), Total Dispersion (TD), Average Bias (AB), Turnover, Duration (DUR), Relative Absolute Deviation RAD and Relative Deviation RD , the formulations of which are stated in chapter 2. After these estimations, we searched whether these deviations are caused by overconfident traders or not.

5.4. Measurement of Bubbles in the Current Study

We use the market structure of Smith et al. (1988). In this market, there is only one single risky asset with limited supply and many risk-neutral agents in a finite horizon. Since the stream of dividends are known by all traders in the markets, traders should be are supposed to pay exactly the expected per period dividend of the asset times the number of periods remaining

experiment sessions, risk neutral fundamental value (FV). Hence, the FV is calculated as in equation 20.

The FV in period 1 is therefore 120 and decreases by 8 "Guldens" each period. Hence, subjects are aware of both FV in each period and the value of the stock at the end of the 15th period which reaches to zero, hence no terminal value. We used the all frequently used bubble measures which are Price Amplitude (PA), Total Dispersion (TD), Average Bias (AB), Turnover, Duration (DUR), Relative Absolute Deviation RAD and Relative Deviation RD, the formulations of which are stated in chapter 2. After these estimations, we searched whether these deviations are caused by overconfident traders or not.

We expect to find significant price deviations as found in the study of Smith et al. (1988). Most of the analyses on bubbles only examine the market as a whole rather than on individual decisions. However, we both focus on the market and individual data and expect to show that overconfident traders are the ones buying and selling stocks at prices higher than their fundamental values. We use a bubble measure score to analyze the relation between overconfidence and bubble formation. Bubble measure is calculated as follows;

$$\frac{N \quad N \quad be\,of\,N}{Total\,N \quad be\,of\,N} \qquad \frac{N \quad be\,of}{Total\,N \quad be\,of} \qquad \frac{I \quad N \quad be\,of}{Total\,N \quad be\,of} \tag{21}$$

where *S*reefers to Bubble Score, either general, financial or payoff, NEBP stands for Non Executed Bid Price, NEB refers to Non Executed Bids, EBP is the Executed Bid Price, EB is the Executed Bids, BP is the Bid Prices and finally B stands for buys.

5.5. Sampling and Data Collection

Experiments are conducted with students of University of York, UK. Undergraduate, Master and PhD students (Fifty six subjects in total) form the sampling of this thesis. These students are randomly selected from the database of the University of York, (EXEC). EXEC is among the oldest and reliable centers for experimental economics in the world. EXEC is designed to test for the economic theories and investigate human behaviors. EXEC offers a registration system for the potential subjects called as ORSEE (Online Recruitment System for Economics Experiments). If students are interested in participating the experiments, they should first register on ORSEE. Registered users of this program are educated prior to the experiments about what does an experiment mean and how should they behave in the experiments by University of York, EXEC. The registered students receive invitation e-mails asking to participate a particular experiment. Potential subjects are informed by ORSEE about the starting and ending time of the experiment and how much they might earn.

They are also informed that their final payoff partly depends on their performance, the performance of other people participating the experiment and partly chance. Before they accept the invitation, they are told that they are going to ask to give some decisions or solve a problem. They are also told that they will be paid cash at the end of the experiment. Subjects register the experiment online and voluntarily and sign for the general rules of the experiment when registering the experiment. ORSEE automatically eliminate people who accepted to participate the experiment but not show up without a valid excuse. In so doing, robustness of the database is secured. Mainly two different experiments are conducted to measure the effect of overconfidence in creating the bubbles. The first experiment called as "overconfidence experiment" is designed to measure not only the confidence levels of subjects but also to gain some information on certain economic behaviors. The second experiment is the so called "Bubbles experiment".

CHAPTER 6

ANAYLSIS and RESULTS

In this chapter of this thesis, the results of the bubbles and overconfidence experiments are presented. The graphical and statistical analyses are carried out for each of the periods in each of these markets. After these analyses individual data are analyzed in terms of overconfidence levels of traders in the bubble experiment. Mainly, the effects of overconfidence on the trading behaviors of individuals are investigated.

6.1. Demographics of Traders

It is seen that majority of the students are young undergraduate students.

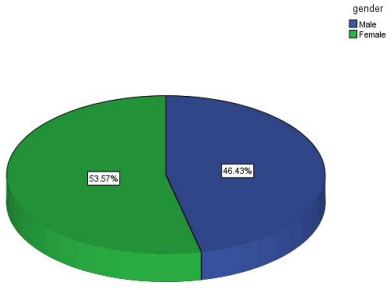

Figure 6.1: Gender Statistics

Of the 56 subjects 54% of them are female. Almost all of them (91.07%) are undergraduate, almost 4% of them are master students whereas 5% are PhD students.

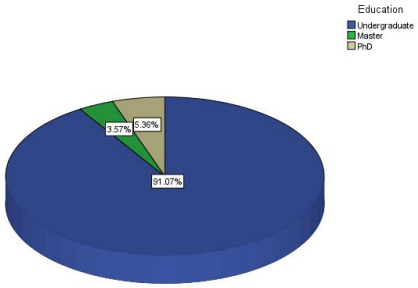

Figure 6.2: Education Statistics

More than half of them (62.5%) are aged in between 16-25, 33.93% are in between 25 to 35, whereas only 4% are over 35.

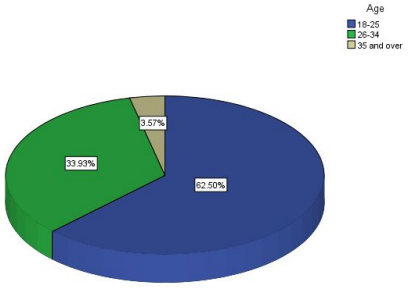

Figure 6.3: Age Statistics

More than half of them (54.29%) have taken at least one finance courses in their education. Since majority of the subjects are not the students of economics or Business administration we may infer that subjects are

interested in finance. The surprising result is that almost half of the subjects have invested either in a stock/mutual fund or both of them in their lives.

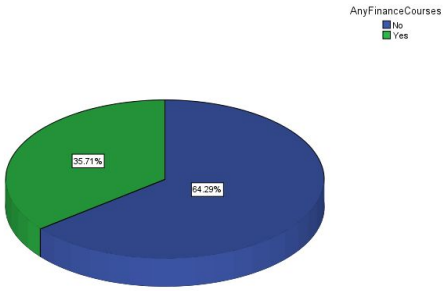

Figure 6.4: Familiarity with Financial Concepts

In particular, 17.86% invested in stocks, 14.29% invested in mutual funds and 14.29% invested in both of these financial instruments.

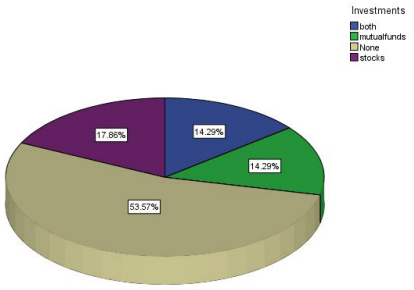

Figure 6.5: Experience in Investment

54% of the value of the UK quoted shares is owned by individual investors in 1963. Though this statistics declined to its lowest level (10.2%) in 2008 with the effect of financial crisis, it started to increase at the end of the 2010 to the level of 11.5% (National Statistics UK, 2012). Though there is a decline in

individual ownership of shares in financial crisis times, it's not surprising to see higher levels of individual investments in UK.

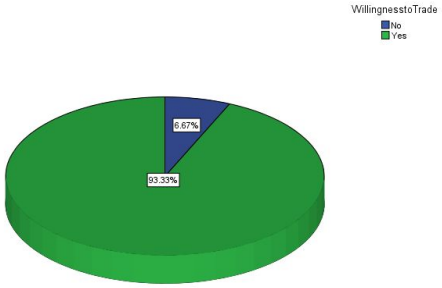

Figure 6.6: Willingness to Trade in the Future

Another interesting result for the demographic analyses is that 93.33% of the subjects who have not invested in either stocks or mutual funds are willing to trade in the future. This result is quite important in that though almost half of the subjects are real traders, the results show that the majority none traders are also potential real traders.

6.2. Descriptive Results for the Experiments

Table 6.1 gives the descriptive statistics for the overconfidence experiment for all of the subjects. It is seen that subjects see themselves above average in terms of their general knowledge but not their financial knowledge. Moreover, subjects are overconfident about their abilities (Over Ability P2) but under confident about precision of their knowledge (Over Precision P2) in the domain of general knowledge. However, subjects are not overconfident

about their abilities in domain of general knowledge (Over Precision P3) and even under confident about precision of their financial knowledge.

Table 6.1: Descriptive Statistics for all of the Subjects of Overconfidence Experiment

	Minimum	Maximum	Mean	Std. Deviation	P-Value
Entry P1	0.13	1.00	0.74	0.18	N/A
Entry P2	0.25	1.00	0.69	0.23	N/A
Entry P3	0.25	1.00	0.56	0.21	N/A
BTA General	-19.50	28.50	8.09	10.08	0.000
BTA Financial	-24.50	28.50	2.95	13.85	0.161
BTA Payoff	-10.00	90.00	25.71	33.66	0.000
Over Ability P2	-1.50	2.25	0.45	0.86	0.000
Over Ability P3	-2.00	1.33	-0.05	0.97	0.694
Over Precision P2	-16.67	8.50	-2.00	5.81	0.013
Over Precision P3	-22.00	2.86	-4.99	6.15	0.000

Table 6.2 shows domain differences. It is seen that subjects generally enter the market less often when investment related questions are asked. However, it is also seen that subjects did not enter the market more frequently when general knowledge is required which is contrary to the result of Camerer and Lovallo (1999). In line with this result, it is found that on average subjects place themselves better than other people less frequently in investment domain compared to the general knowledge domain. Moreover, both overconfidence in terms of abilities and precision of the knowledge scores are on average lower in the domain of financial knowledge. Table 6.2 shows the domain differences across the overconfidence measures. Results in Table 6.2 indicate that in general, subjects are less overconfident in financial domain both in terms of their abilities and precision of their knowledge. Figure 6.7 plots the self-rankings versus actual rankings of the individuals in terms of their

general knowledge who answered the questionnaire. Such a graph is often used in the literature (see Ackerman et al., 2002). The figure shows that there is no relation between the self-rankings and actual rankings.

Table 6.2: Wilcoxon Signed and Rank Test for Domain Differences

	Mean Ranks			
	Negative R.	**Positive R.**	**Z stat.**	**P-value**
Over Ability P3 – Over Ability P2	28.12	17.00	-5.955[b]	0.000
Over Precision P3 – Over Precision P2	29.57	9.67	-6.273[b]	0.000
BTA Financial – BTA General	21.78	20.60	-3.104[b]	0.002
Entry 2 – Entry 1	31.15	22.69	-1.119[b]	0.263
Entry 3 – Entry 1	29.69	16.59	-3.609[b]	0.000
Entry 3 – Entry 2	22.63	20.67	-5.222[b]	0.000

*b: based on negative ranks, c: based on positive ranks.

The correlation between the self- and actual rankings is 0.079 (p = 0.566) which is not significantly distinguishable from zero. We are thus able to confirm prior research which shows that a correlation between self-rankings objective measures is not existent (see Larrick et al., 2007).

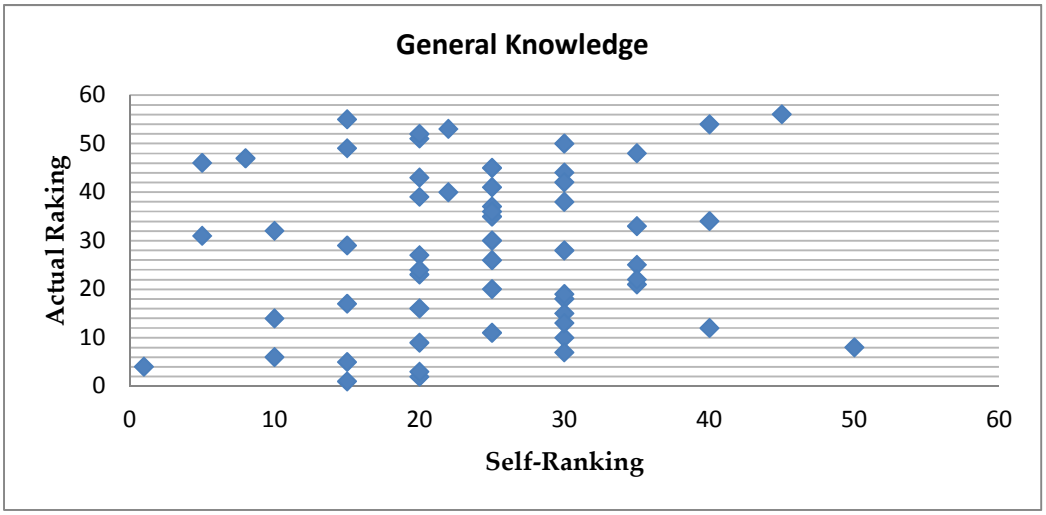

Figure 6.7: Self-Rankings versus Actual Rakings of Individuals in terms of General Knowledge

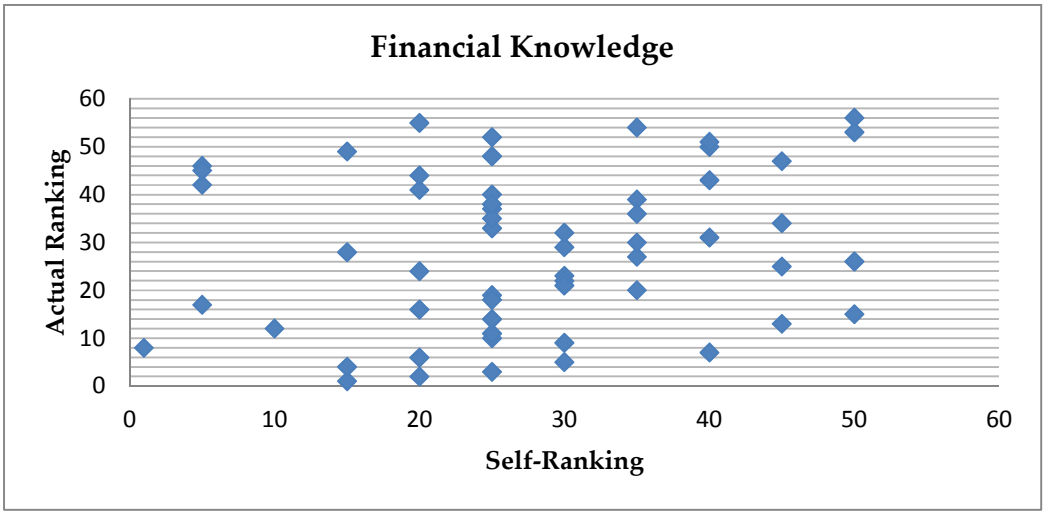

Figure 6.8: Self-Rankings versus Actual Rakings of Individuals in terms of Financial Knowledge

Figure 6.8 and Figure 6.9 plot the self-rankings versus actual rankings of the individuals in terms of their financial knowledge and payoffs. Figures show that there is no relation between the self-rankings and actual rankings in terms of the financial knowledge and payoff of the individuals.

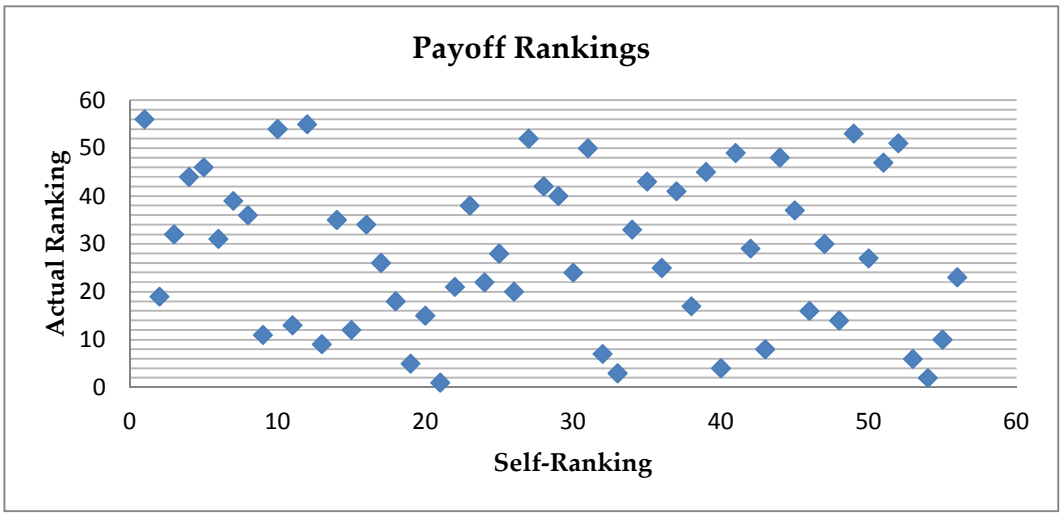

Figure 6.9: Self-Rankings versus Actual Rakings of Individuals in terms of Payoffs

Table 6.3 and Table 6.4 show confidence differences across gender. In general, no gender difference is found, in line with the findings of Baranava et al. (2004) and Kaustia and Perttula (2012). However, females entered the market more frequently when general knowledge is required indicating that women are more overconfident which is contrary to many studies concluding that women are less overconfident (Lenney, 1977; Deaves et al., 2009; Bhandari and Deaves, 2006; Biais et al., 2005).

Table 6.3: Mean Values of the Confidence and Overconfidence Levels Across Genders

Confidence Measures	Mean Conf. (Female)	Mean Overconf. (Female)	Female Overconf. (%)	Mean Conf. Male)	Mean Overconf. (Male)	Male Overconf. (%)	Mean Conf. (All subjects)	Mean Overconf. (All subjects)	All Subjects Overconf. (%)
Over Ability P2	0.58	0.89	80.00	0.31	0.99	57.70	0.45	0.93	69.60
Over Ability P3	0.14	0.62	73.30	-0.27	0.68	42.30	-0.05	0.64	58.90
Over Precision P2	-0.94	2.49	56.70	-3.21	3.70	34.60	-2.00	2.91	46.40
Over Precision P3	-3.78	2.09	20.00	-6.39	1.20	19.20	-4.99	1.68	19.60
BTA General	7.60	12.65	66.70	5.04	12.37	57.70	6.41	12.53	62.50
BTA Financial	3.83	11.38	56.70	1.31	12.65	50.00	2.66	11.93	53.60
BTA Payoff	39.33	49.57	76.70	30.58	56.67	46.20	35.27	52.00	62.50

Table 6.4: Wilcoxon Signed and Rank Test for Gender Differences for Overconfidence Measures

	Mean Ranks			
	Negative R.	**Positive R.**	**Z stat.**	**P-value**
Over Ability P2 (Male) – Over Ability P2 (Female)	15.46	10.73	-0.619[b]	0.536
Over Ability P3 (Male) – Over Ability P3 (Female)	13.64	10.90	-1.172[b]	0.241
Over Precision P2 (Male) – Over Precision P2 (Female)	15.39	11.29	-1.016[b]	0.310
Over Precision P3 (Male) – Over Precision P3 (Female)	17.08	9.92	-1.181[b]	0.238
BTA General (Male) – BTA General (Female)	12.72	8.68	-0.356[b]	0.722
BTA Financial (Male) – BTA Financial (Female)	15.59	10.96	-0.243[b]	0.808
BTA Payoff (Male) – BTA Payoff (Female)	13.00	10.00	-0.538[b]	0.591
Entry 1 (Male) – Entry 1 (Female)	9.00	10.46	-1.662[b]	0.097
Entry 2 (Male) – Entry 2 (Female)	12.94	11.43	-2.009[c]	0.045[*]
Entry 3 (Male) – Entry 3 (Female)	11.32	10.36	-1.500[c]	0.134

*b: based on negative ranks, c: based on positive ranks.

We also searched whether familiarity with financial concepts have an effect on the degree of overconfidence and bubble formation. It is seen in Table 6.5 that the subjects who have taken any finance courses do not differ from their peers. In particular, familiarity with financial concepts does not have an effect on the degree of overconfidence in both general knowledge and financial knowledge domain. Moreover, these subjects do not enter the market more often when financial knowledge is essential. In addition, financial familiarity does not affect bubble formation.

Table 6.5: The Effect of Familiarity with Financial Concepts

	Mean Rank			
	Negative R.	**Positive R.**	**Z stat.**	**P-value**
Entry 1 (Fin. Fam.) – Entry 1	9.35	9.69	-0.352[b]	0.725
Entry 2 (Fin. Fam.) – Entry 2	7.46	13.58	-0.584[b]	0.861
Entry 3 (Fin. Fam.) – Entry 3	8.00	10.13	-0.846[b]	0.831
BTA General (Fin. Fam.) – BTA General	8.85	11.20	-1.288[b]	0.198
BTA finance (Fin. Fam.) – BTA Finance	9.13	11.50	-0.584[b]	0.559
BTA Payoff (Fin. Fam.) – BTA Payoff	10.55	9.25	-0.846[b]	0.398
Over Ability P2 (Fin. Fam.) – Over Ability P2	9.17	12.50	-0.187[b]	0.852
Over Ability P3 (Fin. Fam.) – Over Ability P3	9.54	11.94	-0.355[b]	0.723
Over Precision P2 (Fin. Fam.) – Over Precision P2	9.67	11.75	-0.411[b]	0.681
Over Precision P3 (Fin. Fam.) – Over Precision P3	10.83	10.00	-0.933[b]	0.351
Trading Volume (Fin. Fam.) – Trading Volume	9.95	11.05	-0.205[c]	0.837
AB (Fin. Fam.) – AB	11.30	9.70	-0.299[b]	0.765
Bubble Score (Fin. Fam.) – Bubble Score	9.85	11.71	-0.859[b]	0.391
Total Profit (Fin. Fam.) – Total Profit	11.75	9.67	-0.411[c]	0.681

* Asymp. Sig. 2 tailed, **b: based on negative ranks, c: based on positive ranks.

We also searched for the effects of investment experience on the degree of overconfidence and bubble formation. It is seen in Table 6.6 that the subjects who are experienced investors do not differ from their peers. In particular, investment experience does not have an effect on the degree of overconfidence in both general knowledge and financial knowledge domain

and bubble formation. Moreover, these subjects do not enter the market more often when financial knowledge is essential.

Table 6.6: The Effect of Investment Experience

	Mean Rank			
	Negative R.	**Positive R.**	**Z stat.**	**P-value**
Entry 1 (Fin. Fam.) – Entry 1	10.77	11.25	-0.105[c]	0.916
Entry 2 (Fin. Fam.) – Entry 2	9.96	13.72	-0.098[c]	0.922
Entry 3 (Fin. Fam.) – Entry 3	8.28	10.72	-0.481[b]	0.630
BTA General (Fin. Fam.) – BTA General	10.32	11.75	-0.070[b]	0.944
BTA finance (Fin. Fam.) – BTA Finance	11.25	10.00	-0.562[b]	0.574
BTA Payoff (Fin. Fam.) – BTA Payoff	11.50	10.45	-0.383[c]	0.702
Over Ability P2 (Fin. Fam.) – Over Ability P2	11.42	12.64	-0.030[b]	0.976
Over Ability P3 (Fin. Fam.) – Over Ability P3	10.13	12.17	-0.209[c]	0.835
Over Precision P2 (Fin. Fam.) – Over Precision P2	11.09	12.83	-0.487[b]	0.627
Over Precision P3 (Fin. Fam.) – Over Precision P3	11.92	12.09	-0.152[c]	0.879
Trading Volume (Fin. Fam.) – Trading Volume	9.79	11.61	-1.634[b]	0.102
AB (Fin. Fam.) – AB	10.67	13.45	-0.304[b]	0.761
Bubble Score (Fin. Fam.) – Bubble Score	12.27	11.75	-0.091[b]	0.927
Total Profit (Fin. Fam.) – Total Profit	11.86	12.22	-0.852[c]	0.394

* Asymp. Sig. 2 tailed, **b: based on negative ranks, c: based on positive ranks.

Figure 6.10 and Figure 6.11 show the relation between confidence scores of individuals in terms of their general and financial abilities and their confidence levels in terms of their precision of general and financial knowledge. It is seen that confidence in general knowledge and financial knowledge are highly correlated in both of the ability and precision frameworks.

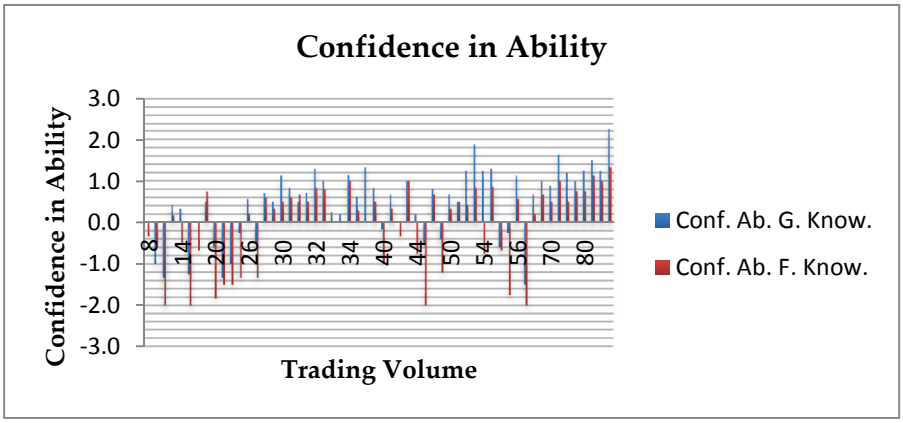

Figure 6.10: Confidence Scores of Individuals in terms their General and Financial Abilities

However, it seems that confidence scores based on general knowledge are almost always higher than scores based on financial knowledge. Moreover, the trading volume seems to be positively related to both of the confidence scores.

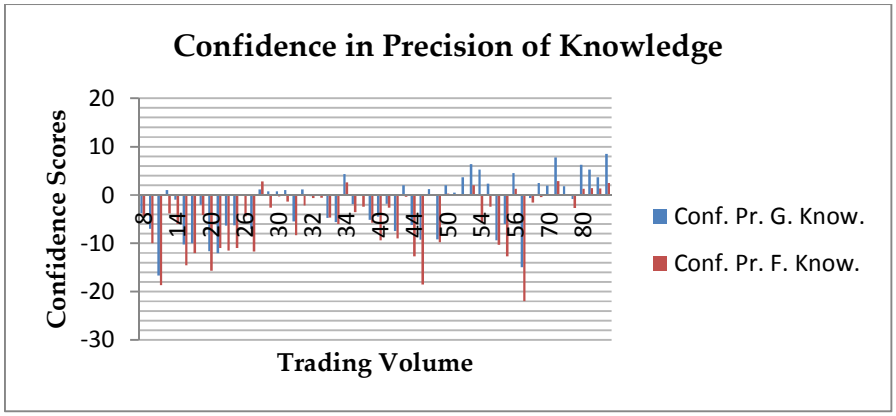

Figure 6.11: Confidence Scores of Individuals in terms of Precision of their General/Financial Knowledge

Figure 6.12 plots the self-rankings versus actual rankings of the individuals in terms of better than average scores.

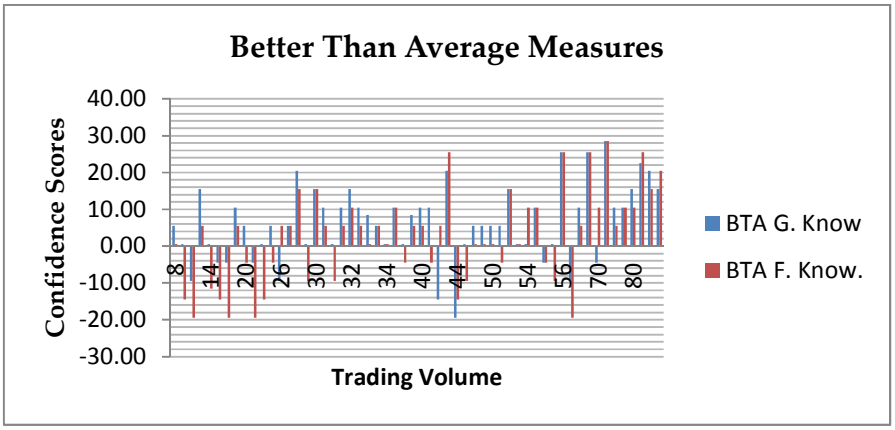

Figure 6.12: Better than Average Scores of Individuals in terms of their General/Financial Knowledge

Figure 6.12 shows that there similar to the previous results there is high correlation between scores based on general and financial knowledge. Moreover, similar to the previous results, it seems that better than average confidence measures and trading volume is positively related. We will go on the details of these analyses for each of the markets later in this chapter.

6.3. Analyses for the First Market

The first market consists of 24 subjects and the market summary is presented in Table 6.7. In this table it's seen that mean contract prices in the very first periods (1-3) are lower than the fundamental values. However, starting from the 4th period subjects start to pay higher prices than the FV. The prices between the periods 4 and 11 are quite close to each other's. Though the number of contracts decreases in some of these periods mean prices are almost same.

Table 6.7: Market Summary of Mean Prices for the First Market

Period	Contracts	Volume	Mean Price	Median Price	Fund. Value (FV)	Mean Price - FV
1	37.00	37.00	95.00	100.00	120.00	-25.00
2	35.00	36.00	84.72	100.00	112.00	-27.28
3	32.00	33.00	106.64	100.00	104.00	2.64
4	35.00	35.00	103.46	100.00	96.00	7.46
5	32.00	33.00	101.67	99.50	88.00	13.67
6	20.00	20.00	95.65	95.00	80.00	15.65
7	28.00	30.00	98.60	97.50	72.00	26.60
8	37.00	38.00	97.90	98.00	64.00	33.90
9	38.00	39.00	99.74	99.00	56.00	43.74
10	36.00	38.00	97.90	95.00	48.00	49.90
11	24.00	26.00	96.09	94.20	40.00	56.09
12	22.00	23.00	88.37	87.24	32.00	56.37
13	20.00	20.00	65.64	71.50	24.00	41.64
14	20.00	23.00	15.17	10.50	16.00	-0.83
15	32.00	43.00	2.64	1.65	8.00	-5.36

This may imply that though the number of people paying higher prices may decrease, these people consistently pay higher prices. Individual statistics in Table 6.9 show that some traders consistently pay higher prices though some traders reasonably pay prices equal to or under the FV. We think that not only the buy prices but also the bid prices affect the rise of the bubbles in markets. Table 6.10 shows that mean bid prices are almost always under the FV, whereas mean ask prices are higher than the FV almost all of the periods. However, individual price statistics for the first period traders (Please see Appendix A) show that though some traders bid higher than the FV, some of them are consistently bid under the FV or even do not bid and/or buy at these prices.

Table 6.8: Mean Statistics for the First Market

ID	Mean Buy Price	Number of Buy Cont.	Mean Sell Price	Number of Sell Cont.	Trad. Volume	Number of Stocks at the end	Ending Balance
31	85.50	14	86.00	14	28	1	346.50
41	86.33	6	99.20	7	13	2	502.00
51	81.74	31	68.26	41	72	0	3.22
61	95.43	21	94.39	23	44	0	442.10
81	94.39	14	97.15	16	30	0	909.00
91	86.47	32	99.36	22	54	15	30.00
101	77.67	6	78.43	10	16	0	707.50
111	50.37	20	100.00	2	22	19	601.00
121	38.17	10	94.50	10	20	5	1111.00
141	72.06	16	83.60	17	33	1	397.00
151	78.67	4	97.50	4	8	1	579.00
161	117.13	15	82.21	16	31	0	729.00
171	76.08	55	89.05	62	117	0	367.02
211	85.22	42	80.69	34	76	8	13.84
221	94.58	33	89.61	34	67	5	654.01
231	64.81	19	71.75	15	34	0	397.98
241	80.86	13	72.91	16	29	0	368.20
251	69.81	11	34.72	12	23	0	3.00
261	95.83	12	97.94	14	26	0	801.00
271	107.69	16	79.86	22	38	0	338.49
301	57.80	5	78.67	6	11	1	600.00
311	91.53	16	84.97	18	34	0	524.50
321	99.14	11	77.99	15	26	1	384.60
331	77.79	28	77.31	28	56	0	710.04

Table 6.9: Summary Statistics for the First Market

ID	Number of Non Executed Bids (Bid Price>FV)	Number of Non Executed Bids (Bid Price<FV)	Number of Non Executed Bids (Bid Price=FV)	Number of Executed Bids	Number of Non Executed Bids	Mean Non Executed Bid Price	Number of Buy Cont. (Buy Price>FV)	Number of Buy Cont. (Buy Price<FV)	Number of Buy Cont. (Buy Price=FV)	Mean Buy Price
31	0	1	0	1	1	60.50	10	13	0	85.50
41	0	2	0	0	2	22.50	5	6	0	86.33
51	25	16	0	10	41	85.70	28	21	0	81.74
61	1	4	0	16	5	95.30	18	5	0	95.43
81	10	11	1	7	22	87.00	9	6	1	94.39
91	5	9	0	15	14	85.81	24	17	0	86.47
101	5	8	0	2	13	78.35	2	4	0	77.67
111	0	12	0	0	12	20.57	0	20	0	50.37
121	0	23	0	1	23	29.22	1	9	0	38.17
141	0	5	0	3	5	55.25	9	13	0	72.06
151	3	6	1	1	10	55.98	1	3	0	78.67
161	7	3	0	4	10	82.18	8	11	0	117.13
171	13	13	0	17	26	77.41	46	38	0	76.08
211	7	17	1	5	25	69.72	26	37	0	85.22
221	18	12	2	22	32	94.56	25	11	0	94.58
231	2	19	0	6	21	52.38	10	13	0	64.81
241	1	7	0	5	8	50.50	13	8	0	80.86
251	2	12	0	1	14	63.69	1	9	1	69.81
261	4	10	1	2	15	87.71	3	10	0	95.83
271	2	2	0	2	4	84.60	14	14	0	107.69
301	10	15	0	3	25	59.86	3	2	0	57.80
311	3	9	0	8	12	82.18	13	8	0	91.53
321	8	10	0	9	18	79.45	10	2	0	99.14
331	22	8	0	23	30	77.45	24	5	0	77.79

In Table 6.10, it's seen that the number of ask contracts increases as the end of the experiment is reached whereas the number of bid contracts decreases.

Table 6.10: Market Summary of Mean Bid and Ask Prices for the First Market

Period	Mean Bid Price	Number of Bid Cont.	Mean Ask Price	Number of Ask Cont.	Mean Bid Price - FV	Mean Ask Price - FV
1	56.85	47	98.33	36	-63.15	-21.67
2	53.13	48	107.07	43	-58.87	-4.93
3	65.32	50	127.45	42	-38.68	23.45
4	76.20	41	128.81	37	-19.8	32.81
5	91.71	41	126.05	38	3.71	38.05
6	84.73	37	115.73	33	4.73	35.73
7	83.94	48	119.05	38	11.94	47.05
8	89.35	40	110.66	50	25.35	46.66
9	88.83	40	116.44	59	32.83	60.44
10	91.60	35	121.52	56	43.6	73.52
11	86.29	31	108.47	58	46.29	68.47
12	83.28	27	105.12	56	51.28	73.12
13	49.57	23	82.06	78	25.57	58.06
14	12.00	26	38.93	54	-4	22.93
15	3.50	17	20.97	61	-4.5	12.97

price levels. When we look at the mean bid price and buy price standard deviation in Table 6.11, we see that the deviation of mean bid prices is higher than that of buy prices. Together with the individual mean bid and buy price statistics this result may mean that there is heterogeneity across traders in the first market in terms of their trading behavior.

Table 6.11: Standard Deviations of Mean Buy and Bid Prices for the First Market

Market	Prices	N	Minimum	Maximum	Mean	Std. Dev.
1	Buy Price	448	38.17	117.13	81.88	17.64
	Bid Price	528	20.57	95.30	68.24	21.62

The mean bid and ask prices are also in line with this trend. We can also see the minimum/maximum bid/ask prices and standard deviations in Table 6.12. Indeed, together with positive (mean contract price – FV) values, this trend may indicate the existence of bubble in the first market. We can see the bubble formation simply in Figure 6.13. Figure 6.13 shows contract prices for all of the periods in the first market. The each blue dot represents the contract prices in this graph. The line in the graph is drawn using closing contract prices for each of the period. The diagonal dots represent the expected holding value (fundamental value).

Table 6.12: Min./Max. bid/ask Prices and Standard Deviations for the First Market

Period	Min Bid Price	Max Bid Price	Std. Dev.	Min Ask Price	Max Ask Price	Std. Dev.
1	10.00	200.00	45.41	10.00	250.00	50.64
2	10.00	300.00	50.43	14.00	330.00	53.35
3	5.00	165.00	39.91	30.00	250.00	31.65
4	5.00	200.00	37.31	95.00	230.00	38.18
5	40.00	140.00	21.36	90.00	250.00	38.46
6	1.00	120.00	20.92	93.00	250.00	37.09
7	1.00	150.00	27.91	72.00	300.00	42.83
8	1.00	110.00	18.55	93.00	300.00	33.03
9	1.00	150.00	26.01	95.00	300.00	35.20
10	1.00	180.00	27.23	94.00	350.00	54.96
11	1.00	106.00	18.58	92.00	300.00	38.88
12	30.00	100.00	12.65	81.00	320.00	41.91
13	1.00	100.00	31.32	14.00	200.00	24.54
14	1.00	62.00	14.35	8.00	100.00	28.47
15	1.00	11.00	3.41	1.00	200.00	41.42

It's seen that trading starts with prices lower than FV in the first period. Majority of the contract prices are also over the FV in the second and third period. However, there is a sharp increase in prices starting from the fourth period. Bubble periods go on until the end of the 12th period. 13th period starts with a sharp decline in prices and prices falls to values under FV. In this respect it is possible accept 13th period as the start of the crash of the bubble. After the 13th period, the prices continue at these levels until the end of the experiment.

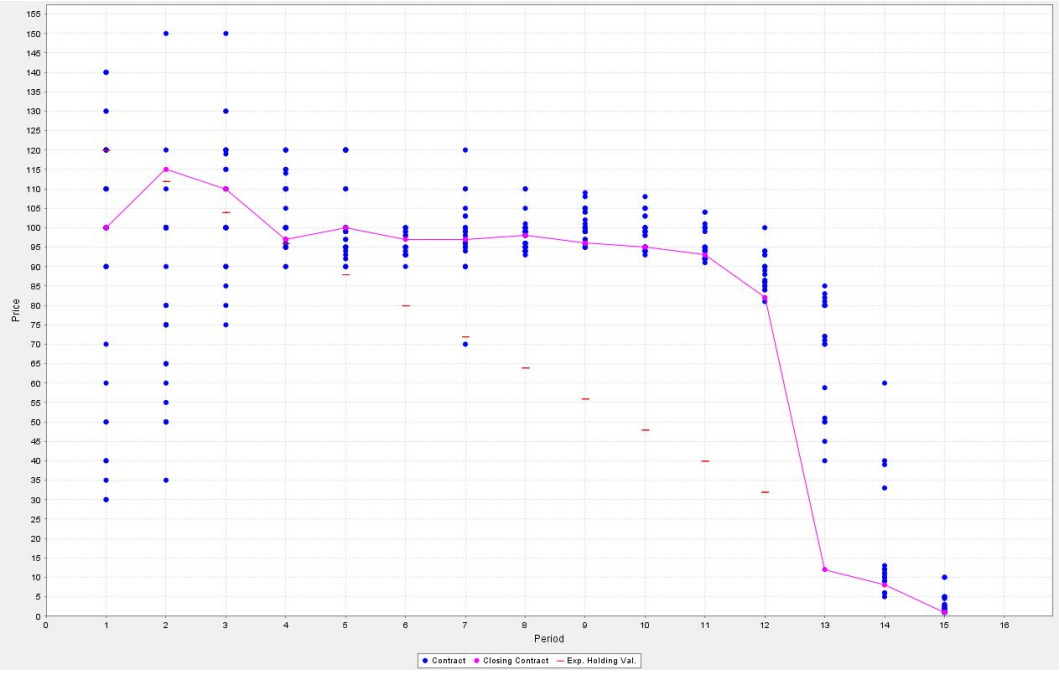

Figure 6.13: Session Summary Graph for the First Market

When we investigate the contract prices graphically, we see that prices are much more volatile until the start of the bubble periods. However, the volatility of the prices declines in the bubble periods. In the periods where

crash starts, we see that volatility is again at its higher levels. This graphics shows the existence of bubble explicitly, however it is also possible use the bubble measures which are widely used in literature.

These measures are Price amplitude (PA), Average Bias (AB), Total Dispersion (TD), Asset Turnover Ratio (Turnover), Relative Deviation (RD), Relative Absolute Deviation (RAD), and finally Duration (DUR) which shows the number of periods where mean prices are above the FV. Price amplitude indicates the difference between the maximum price deviation and minimum price deviation divided by the FV in the first period. Total Dispersion measures the deviation from fundamental valued over the life cycle of the stock. Average Bias indicates per period deviation of prices form their fundamental values. Turnover measures the number of executed trades during each of the periods. When there is no bubble, all of these measures should equal to zero. Higher (PA), (AB), (TD), (RD) and (RAD) imply greater bubbles, and larger deviations in the market price of the asset relative to fundamental value, evidence that prices have grown away from their fundamental values.

Table 6.13: Bubble Measures for the First Market

Market	PA	AB	TD	Turnover	RD	RAD	DUR
1	0.70	19.27	384.79	7.40	30%	42%	10 periods

It is also possible to compare and contrast these results with the results of previous studies using the same methodology in measuring bubbles. It is

seen in Table 6.14 that Turnover rate is among the highest compared the available results of other studies.

Table 6.14: Comparison of Bubble Measures for the First Market

Previous Studies	Turnover	PA	AB	TD
Noussair and Tucker (1996)	0.96	0.33	N/A	N/A
Smith, Suchanek, and Williams (1988)	4.55	1.24	N/A	N/A
Porter and Smith (1995)	5.49	1.53	N/A	N/A
Kirchler, Huber and Stöckl (2009)	N/A	0.82	14.73	202.93
Values for the First Market in our Experiment	7.40	0.70	19.27	384.79

Hence, we may conclude that subjects traded more frequently in this market compared to subjects of other studies. When we compare the results with those of Kirchler et al. (2009), it is seen that AB and total dispersion (TD) measures are also higher which may indicate greater bubble in this market compared to markets in other studies. Figures 6.14 - 6.28 show bid prices, ask prices and contract prices in each of the 15 periods. Buyer bids are represented by the light-blue triangles, and Seller asks are represented by the light-red triangles. If a buyer decides to buy at the current best ask then a dark-blue triangle appears, and if a seller decides to sell at the current best bid then a dark-red triangle appears. The triangles are arranged vertically to show all the bids and asks made after the last unit was sold up to exactly when the next unit was sold.

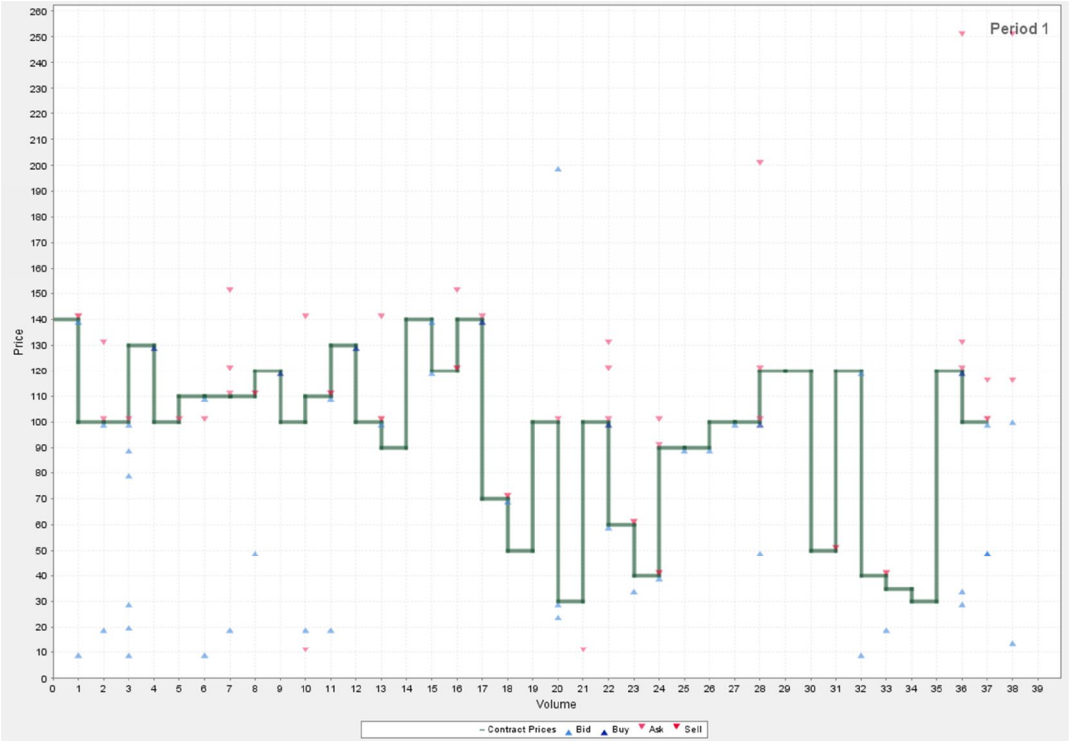

Figure 6.14: Prices for the Period 1 in the First Market

The contract price line shows the price at which each unit was sold. When we look at the Figure 6.14 showing the results for the 1st period, it's seen that the volatility of the contract prices are quite high. In line with contract prices bid and ask prices are also showing high dispersion. Some subjects traded the same stock at a price of 30 guldens whereas some other traders traded at 140 guldens. Mean price is lower than the FV (Please see the Table 6.10).The highest bid price is 200 guldens whereas the lowest price is 10 guldens. The highest and the lowest ask prices are 250 and 10 guldens respectively (Please see the Table 6.12). This result may indicate that traders have different opinions about the price of the stock at the beginning of the experiment. Majority of the contract prices are under the FV (Please see the Figure 6.13).

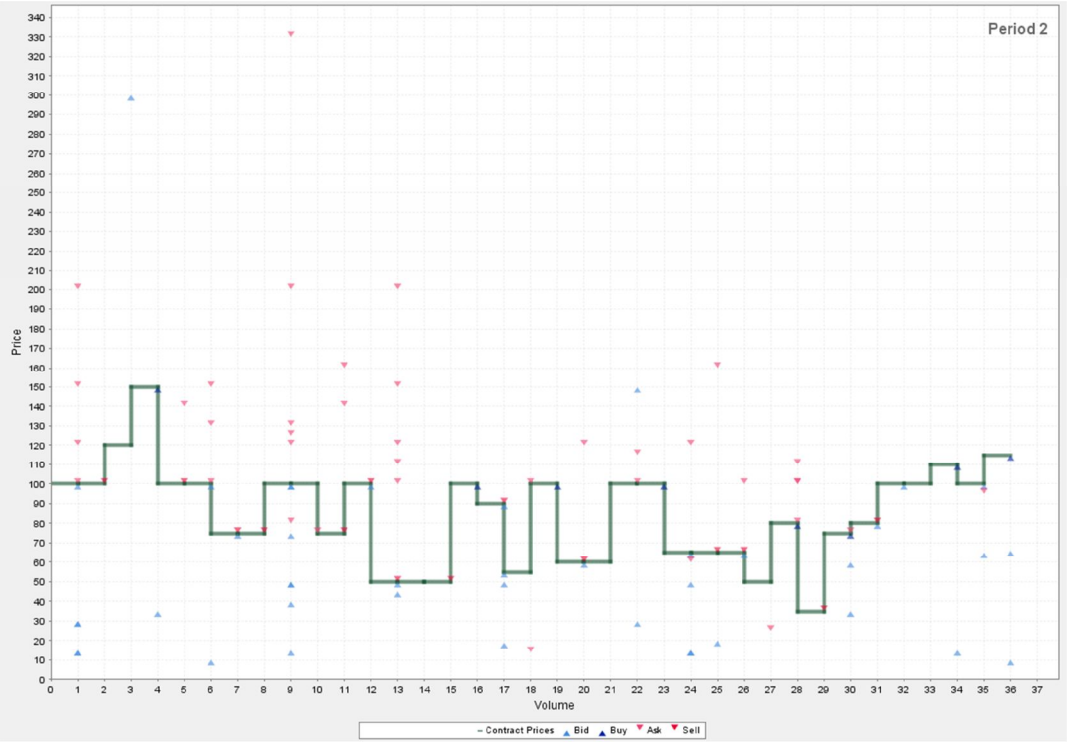

Figure 6.15: Prices for Period 2 in the First Market

Figure 6.15 shows the results for the 2nd period, we can see that the first transaction price is exactly the same of the closing transaction price in the previous period. Though majority of the contract prices are lower than the FV, closing contract price is slightly higher than the FV. Mean price is lower than the FV (Please see the Table 6.7). Moreover, mean bid/ask prices are also lower than the FV (Please see the Table 6.10). It's seen that the volatility of the contract prices is decreased in this second period. However, standard deviation of bid/ask prices are at their highest levels in this session (Please see the Table 6.12). The lowest and the highest contract prices are 30 and 150 guldens. The highest bid price is 300 guldens whereas the lowest bid price is

10 guldens. The highest and the lowest ask prices are 330 and 14 guldens respectively (Please see the Table 6.12). Hence, it is possible say that though some subjects who executed a trade start to agree on prices, some other subjects still confused about the prices.

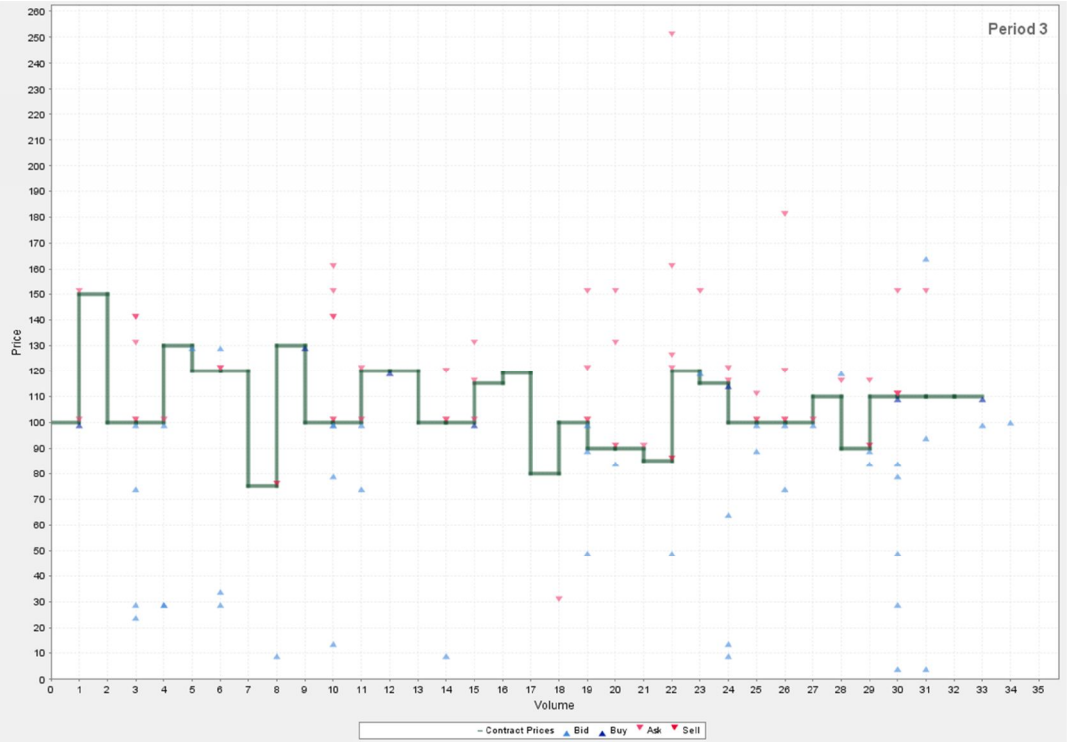

Figure 6.16: Prices in Period 3 for the First Market

Figure 6.16 shows the results of the 3rd period, it is seen that the volatility of the contract prices is quite lower than that of the prices in Period 2. In line with contract prices bid and ask prices are also showing lower dispersion (Please see Table 6.12). The highest bid price for the third period is 165 guldens whereas the lowest price is 5 guldens. The highest and the lowest ask prices are 250 and 30 guldens respectively. Though mean bid price is still

lower than the FV, mean price is slightly higher than the FV first time in this session. Hence, we may infer that buyers accepted the best ask prices in this period. Mean ask prices is also first time higher than the FV in this period. Moreover, after this period, "Mean price – FV" spread is always positive until the 14th period.

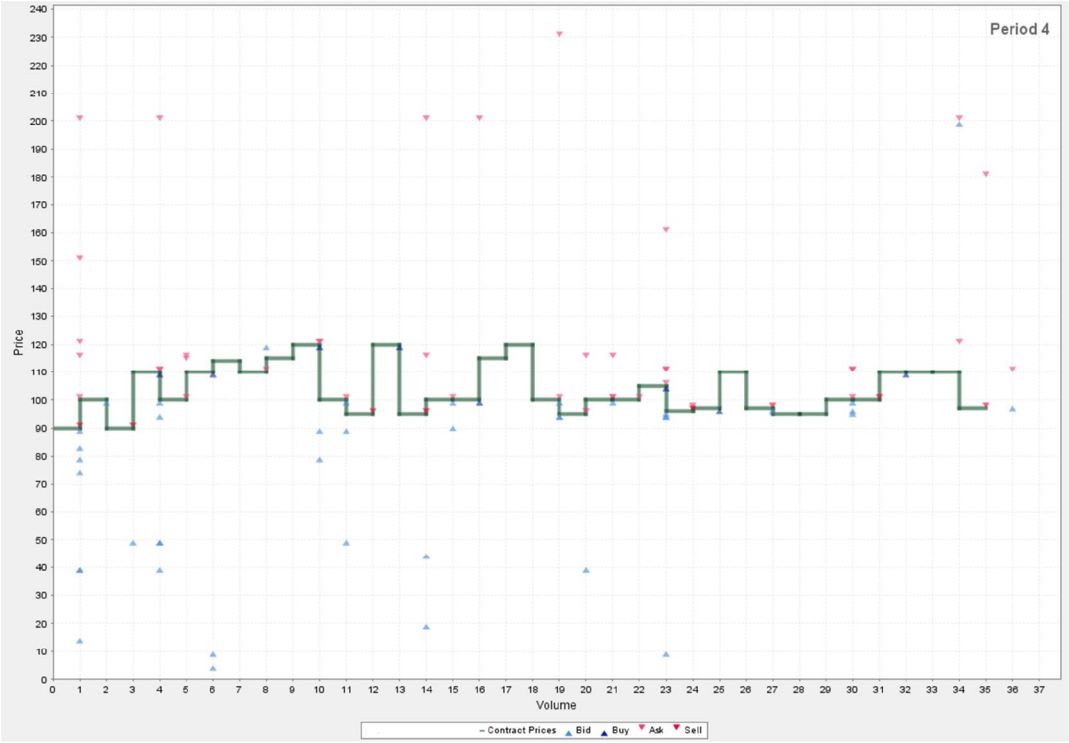

Figure 6.17: Prices in Period 4 for the First Market

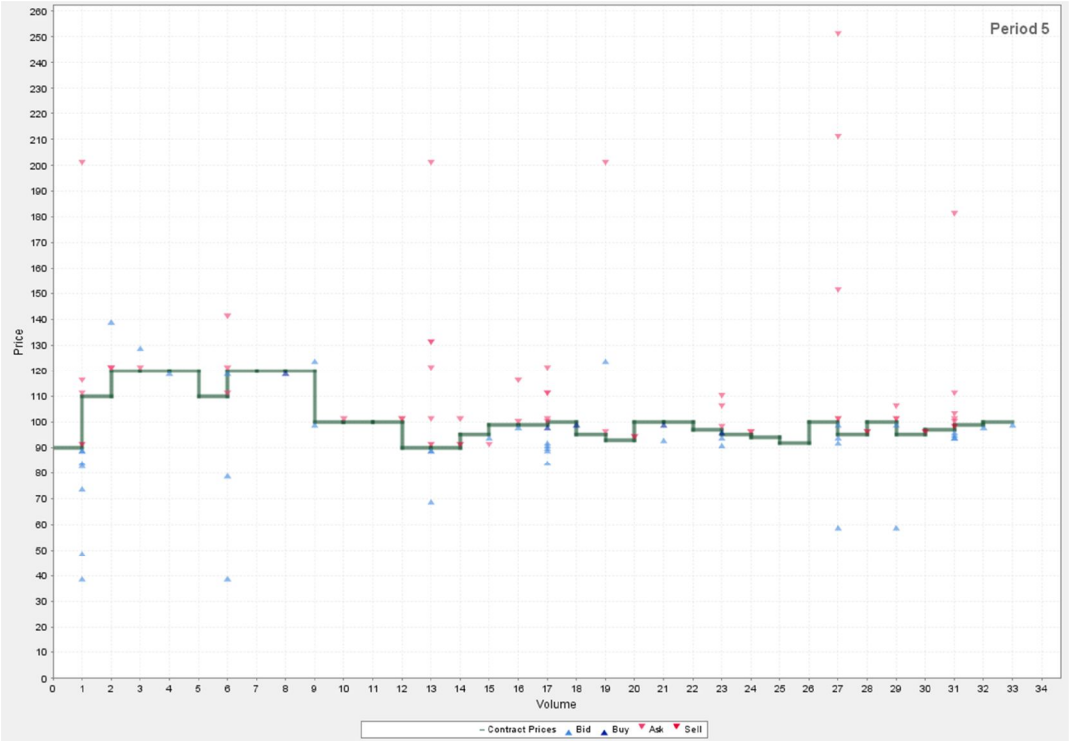

Figure 6.18: Prices in Period 5 for the First Market

Figure 6.18 shows the 5th period, the first period for the start of the bubble. We can see that the volatility of the contract prices is decreased in this second period. The lowest and the highest contract prices are same as those of the fourth market, 90 and 120 guldens. The highest and lowest bid prices are 40 and 140 guldens respectively. Mean bid price is first time higher than the FV in this period (Please see the Table 6.10). The standard deviation of bid prices decreased from 37.31 to 21.36 compared to fourth period. The highest and the lowest ask prices are 90 and 250 guldens respectively (Please see the Table 6.12). After this period mean contract price start to increase until the 13th period.

Figure 6.19 shows the results for the 6th period, we can see that the transaction price at the beginning of this period is exactly the same of the closing transaction price in the previous period. It's seen that the volatility of the contract prices is quite low. The first transaction price is almost equal to the last transaction price. The transaction prices almost form a horizontal line. We may conclude that though not all the subjects but all the traders agreed on the price of the stock in this period. The lowest and the highest contract prices are 90 and 100 guldens. The highest bid price is 120 guldens whereas the lowest bid price is 1 gulden. Standard deviation of bid prices is 20.92 (Please see the Table 6.12).

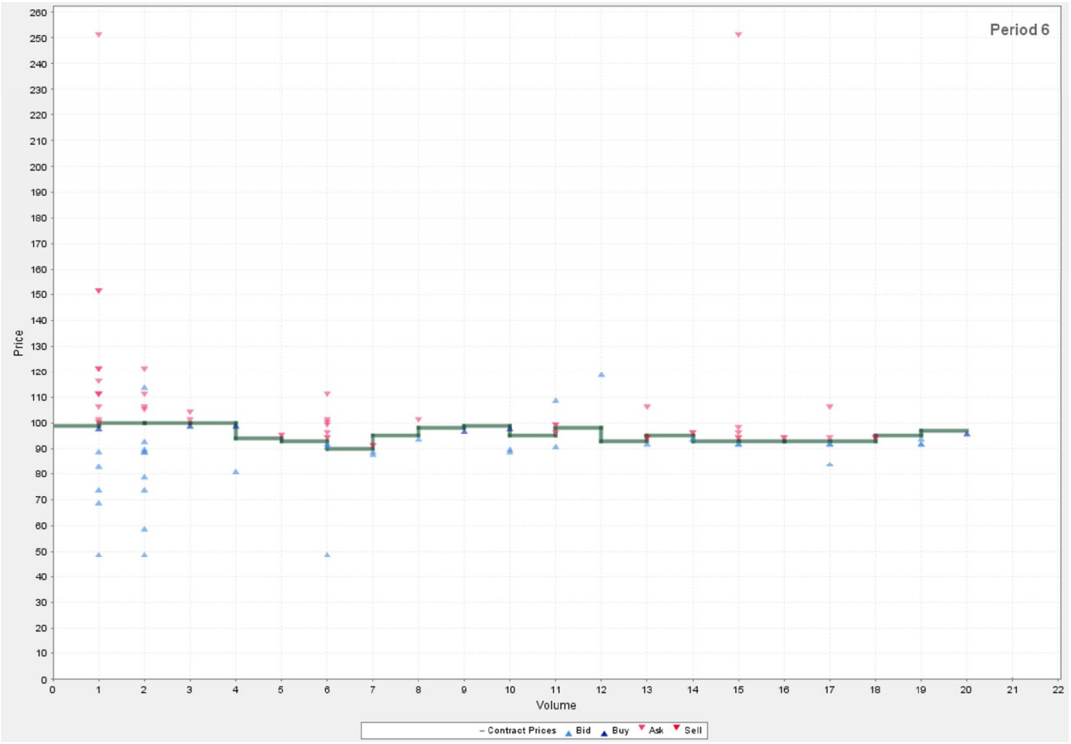

Figure 6.19: Prices in Period 6 for the First Market

The highest and the lowest ask prices are 250 and 93 guldens respectively. Standard deviation of ask prices is 37.09. Figure 6.20 shows the results for the 7th period, we can see that the transaction price at the beginning of this period is higher than that of the previous period. The lowest and the highest contract prices are 70 and 120 guldens. The mean and median prices for this period are 98.60 and 97.50 respectively (Please see the Table 6.7). The highest bid price is 150 guldens whereas the lowest bid price is 1 gulden. Standard deviation of bid prices is 27.91 (Please see the Table 6.12). The highest and the lowest ask prices are 300 and 72 guldens respectively. Standard deviation of ask prices is 42.83.

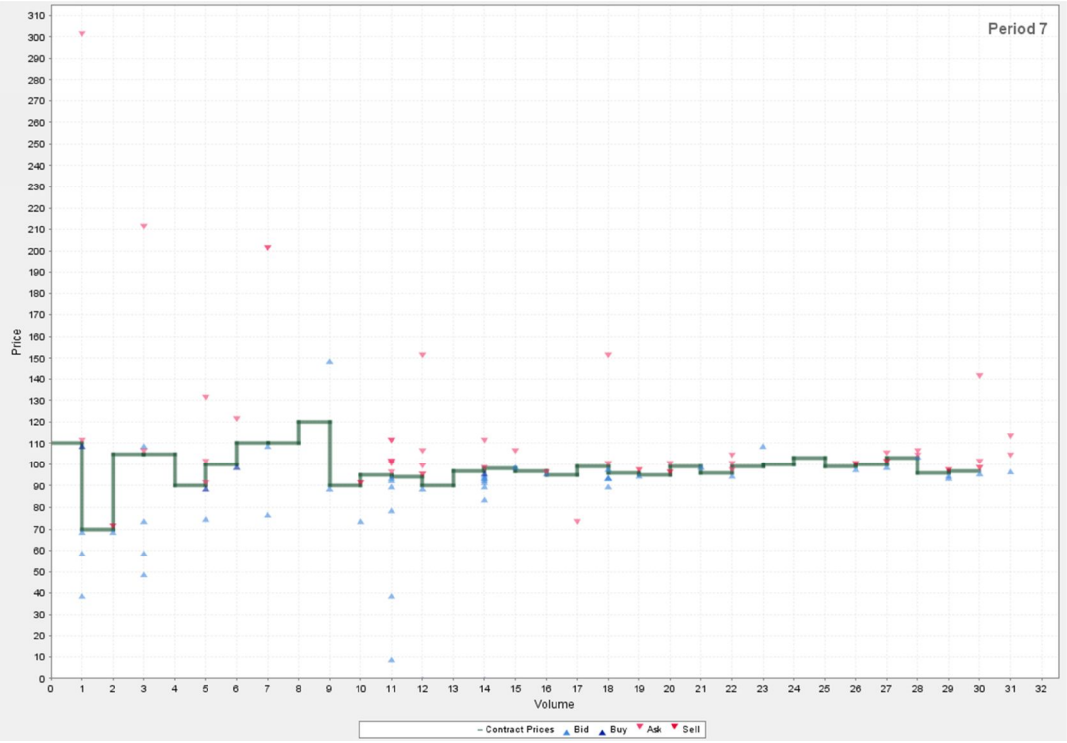

Figure 6.20: Prices in Period 7 for the First Market

It's seen from the Figure 6.21 for the period 8th that the volatility of the contract prices is quite low. Figure 6.13 shows that dispersion of transaction prices are among the lowest ones in the first period. In line with contract prices bid and ask prices are also showing lower dispersion. The highest bid price for this period is 110 guldens whereas the lowest price is 1 gulden. Standard deviation of bid prices is 18.55 (Please see the Table 6.12). The highest and the lowest ask prices are 300 and 93 guldens respectively. Standard deviation of ask prices is 33.03 (Please see the Table 6.12).

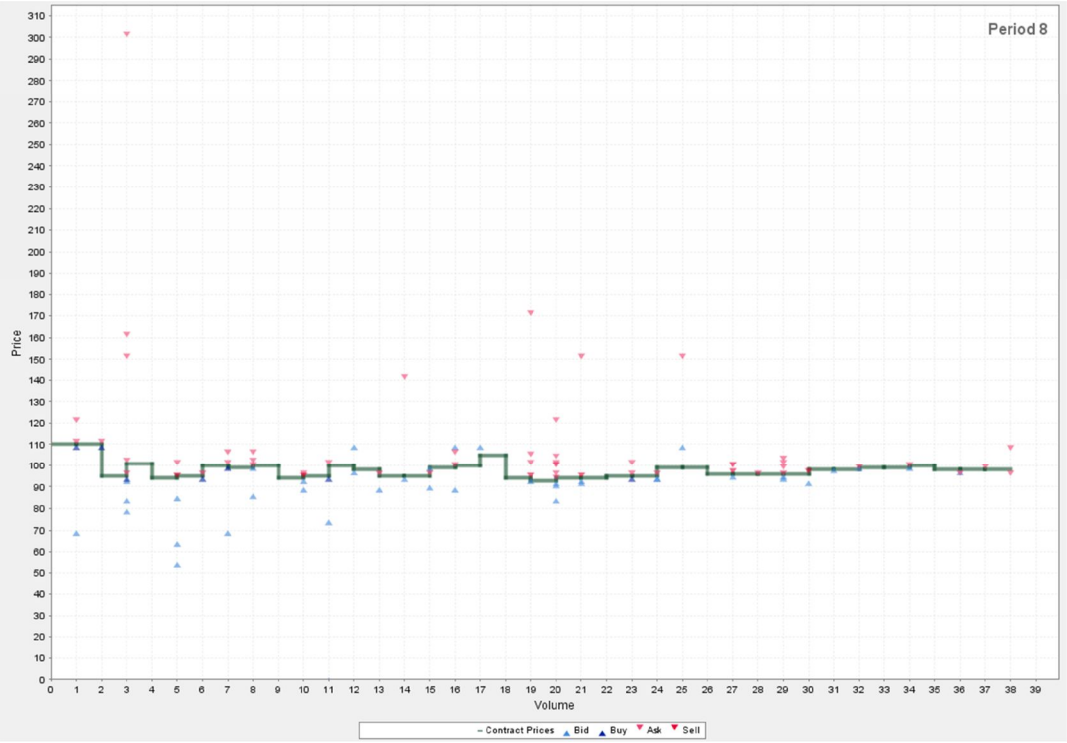

Figure 6.21: Prices in Period 8 for the First Market

Figure 6.22 shows the results for the 9th period, we can see that the transaction price at the beginning of this period is again almost same for the last transaction price. The mean and median prices for this period are 99.74 and 99.00 respectively (Please see the Table 6.7). The highest bid price is 150 guldens whereas the lowest bid price is 1 gulden. Standard deviation of bid prices is 26.01 (Please see the Table 6.12). The highest and the lowest ask prices are 300 and 95 guldens respectively. Standard deviation of ask prices is 35.20. Trading volume in this period is the highest among other periods in this session.

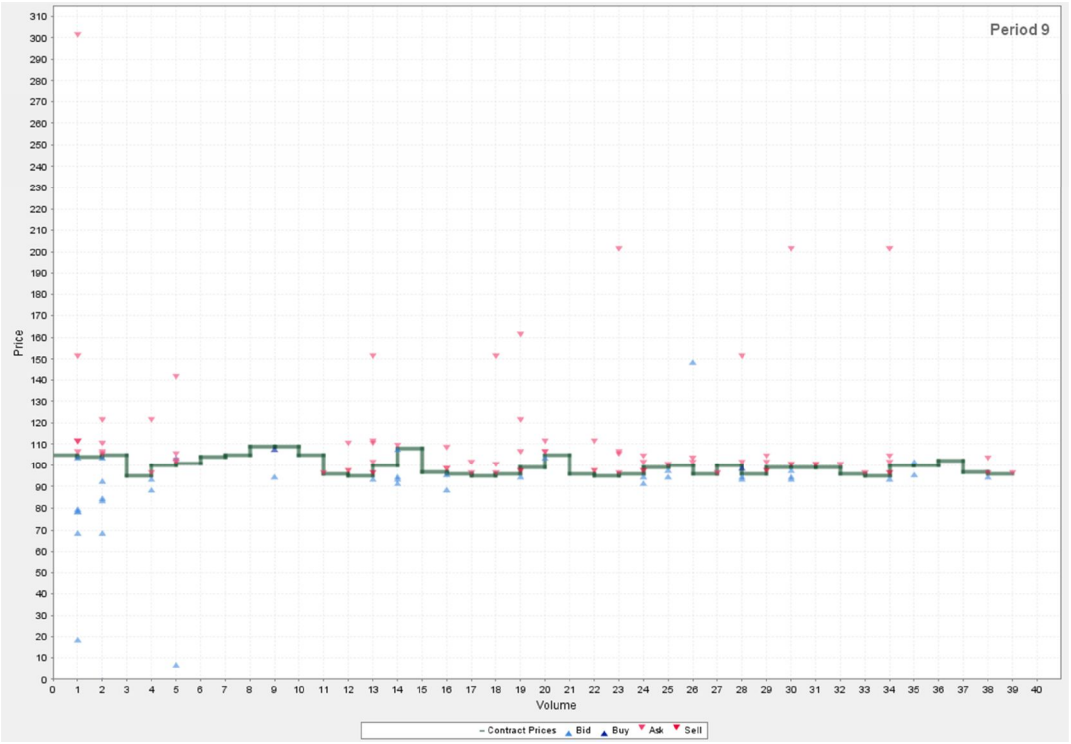

Figure 6.22: Prices in Period 9 for the First Market

It's seen from the Figure 6.23 for the period 10th that the volatility of the contract prices is quite low. The transaction prices almost form a horizontal line for this period. The highest bid price for this period is 180 guldens whereas the lowest price is 1 gulden. Standard deviation of bid prices is 27.23 (Please see the Table 6.12). The highest and the lowest ask prices are 350 and 94 guldens respectively. Standard deviation of ask prices is quite high 54.96 (Please see the Table 6.12).

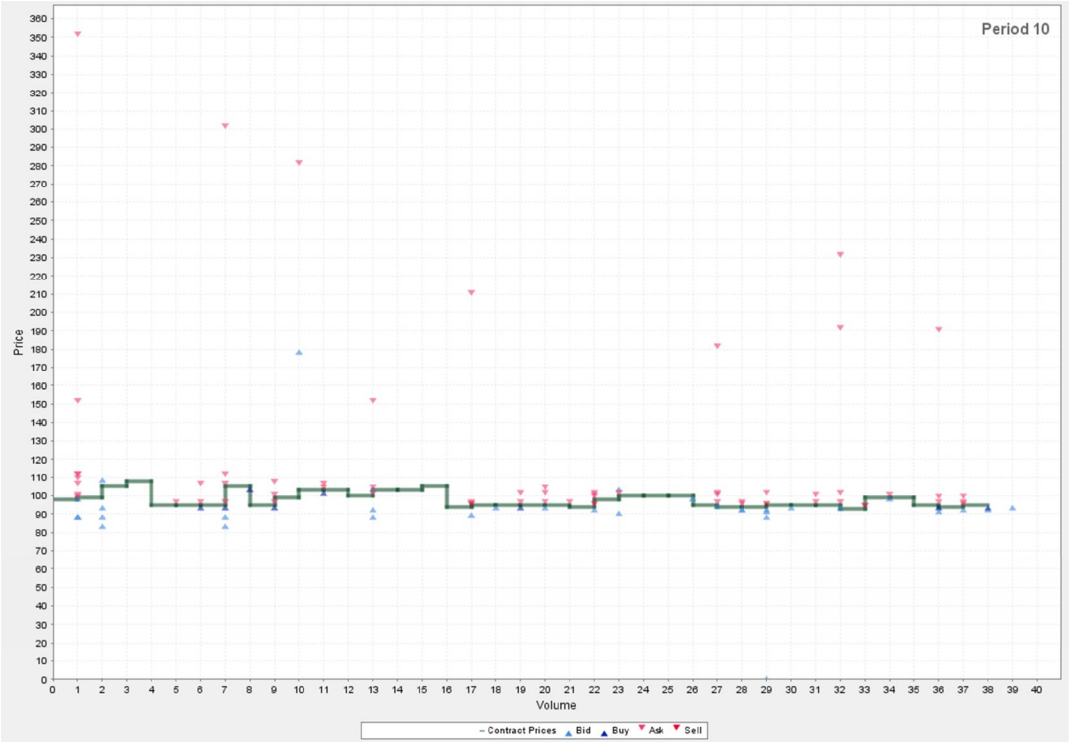

Figure 6.23: Prices in Period 10 for the First Market

Figure 6.24 show bid, ask and contract prices in for the 11th period. When we look at the Figures 5.1, it's seen that the after this period the mean prices start to decrease. Mean transaction prices between the periods 6 and 11 are in between 95.65 and 99.74. "Mean price – FV" spread is the highest of the session (Please see the Table 6.7). Moreover, "Mean bid price – FV" spread is also highest (Please see the Table 6.7). After this period these prices start to diminish. The volatility of the contract prices is quite low. The highest bid price is 106 guldens whereas the lowest price is 1 gulden. Standard deviation of bid prices is 18.58 (Please see the Table 6.12). The highest and the lowest ask prices are 300 and 92 guldens respectively.

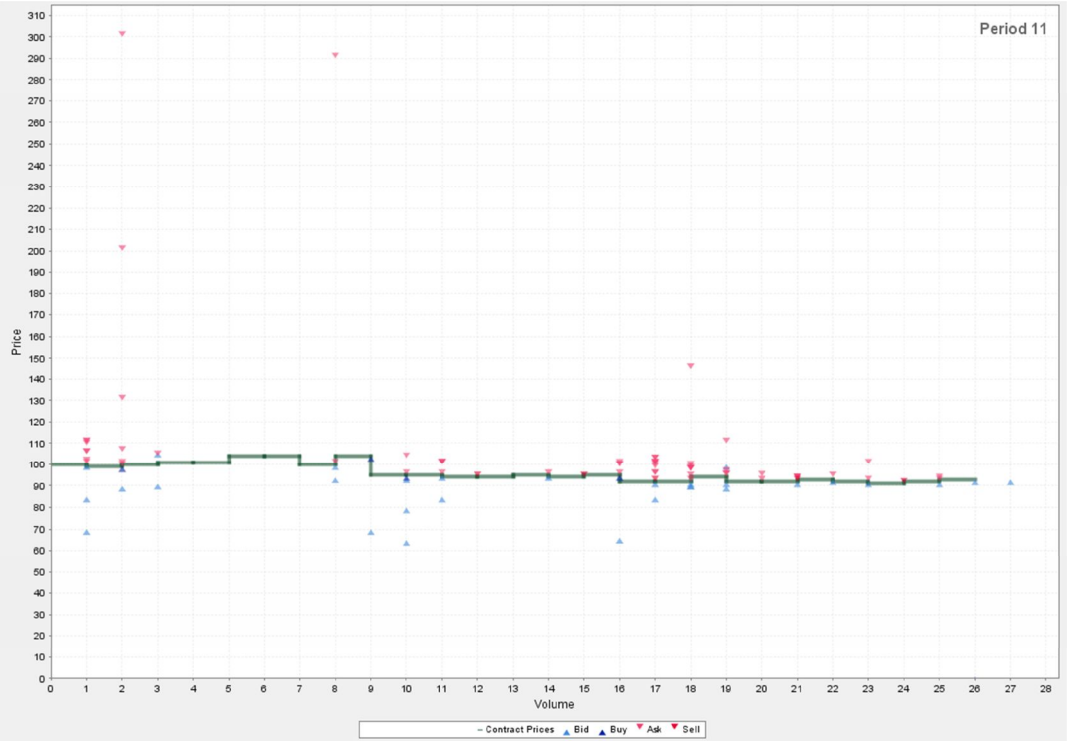

Figure 6.24: Prices in Period 11 for the First Market

Standard deviation of ask prices is quite high 38.88 (Please see the Table 6.12). Figure 6.25 shows the results for the 12th period, we can see that the transaction price at the beginning of this period is exactly the same that of in the previous period. It's seen that the volatility of the contract prices is quite low. The first transaction price is almost equal to the last transaction price. The transaction prices almost form a horizontal line. The highest bid price is 100 guldens whereas the lowest bid price is 30 guldens. Standard deviation of bid prices is 12.65 (Please see the Table 6.12). The highest and the lowest ask prices are 320 and 81 guldens respectively.

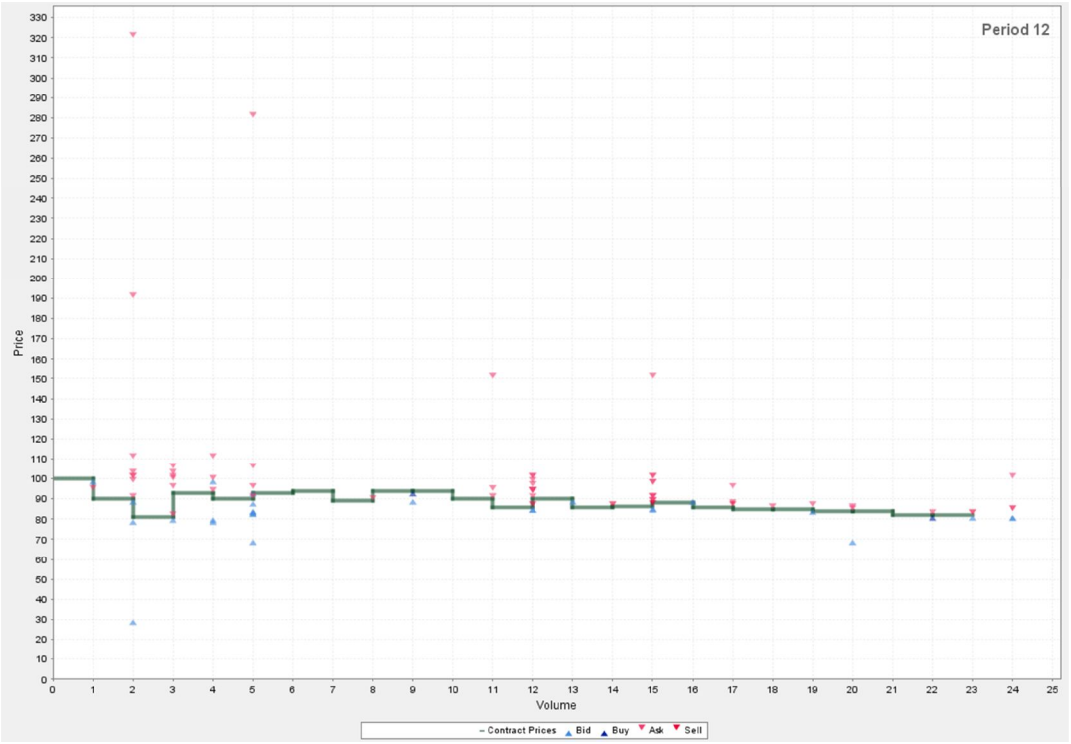

Figure 6.25: Prices in Period 12 for the First Market

Standard deviation of bid prices is the lowest in this period. Looking at Figure 6.13, we may infer this period as the last period of the bubble. It's seen from the Figure 6.26 for the period 13th that the volatility of the transaction prices starts to increase again. The transaction prices almost form a horizontal line for this period. The highest bid price for this period is 180 guldens whereas the lowest price is 1 gulden. Standard deviation of bid prices is 27.23 (Please see the Table 6.12). The highest and the lowest ask prices are 350 and 94 guldens respectively. Standard deviation of ask prices is quite high 54.96 (Please see the Table 6.12). Trading volume is at its lowest point in this period.

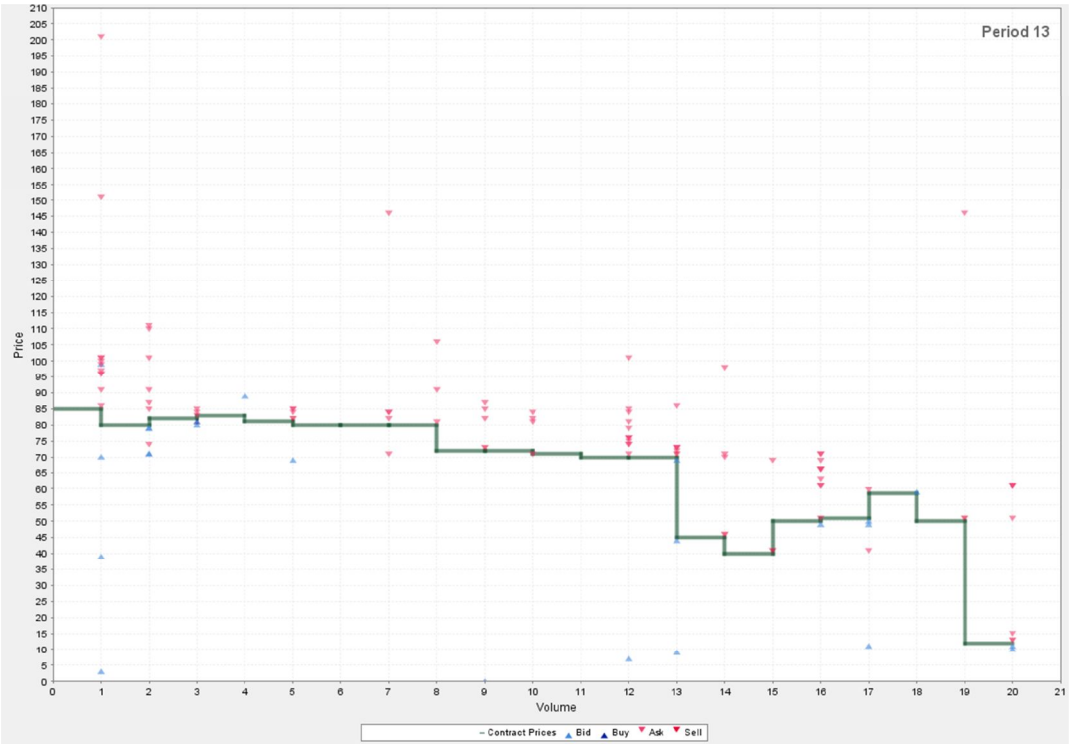

Figure 6.26: Prices in Period 13 for the First Market

Figure 6.13 shows that there is a sharp decline in prices in this period. Hence, it is possible to infer this period as the start of the crash of the bubble. It's seen from the Figure 6.27 that sharp declines in prices continue in this 14th period. The highest transaction price is 60 whereas the lowest price is 5 guldens in this period. Contract prices crashed to lowest levels in this period. The mean price for this period is lower than the FV (Please see the Table 6.7). The highest and lowest bid prices for this period are 62 and 1 gulden respectively. Standard deviation of bid prices is 14.35 (Please see the Table 6.12). The highest and the lowest ask prices are 100 and 8 guldens respectively. Standard deviation of ask prices is quite high 28.47 (Please see the Table 6.12).

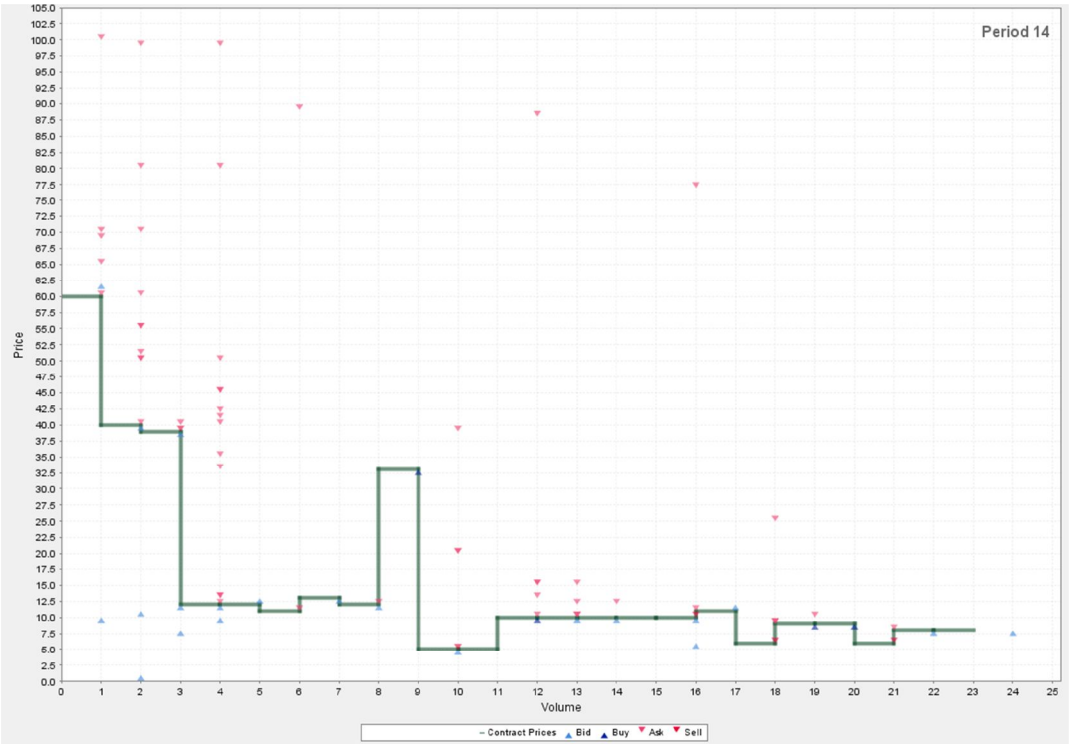

Figure 6.27: Prices in Period 14 for the First Market

Figure 6.28 shows the results for the last period, we can see that the transaction prices are quite low in this period. It's seen that the volatility of the contract prices is quite low. The mean transaction price is 2.64, which is quite lower than the FV (Please see the Table 6.7). The highest bid price is 11 guldens whereas the lowest bid price is 1 gulden. Standard deviation of bid prices is 3.41 which is quite low compared to that of previous periods (Please see the Table 6.12). The highest and the lowest ask prices are 200 and 1 gulden respectively. Standard deviation of ask prices is 41.42.

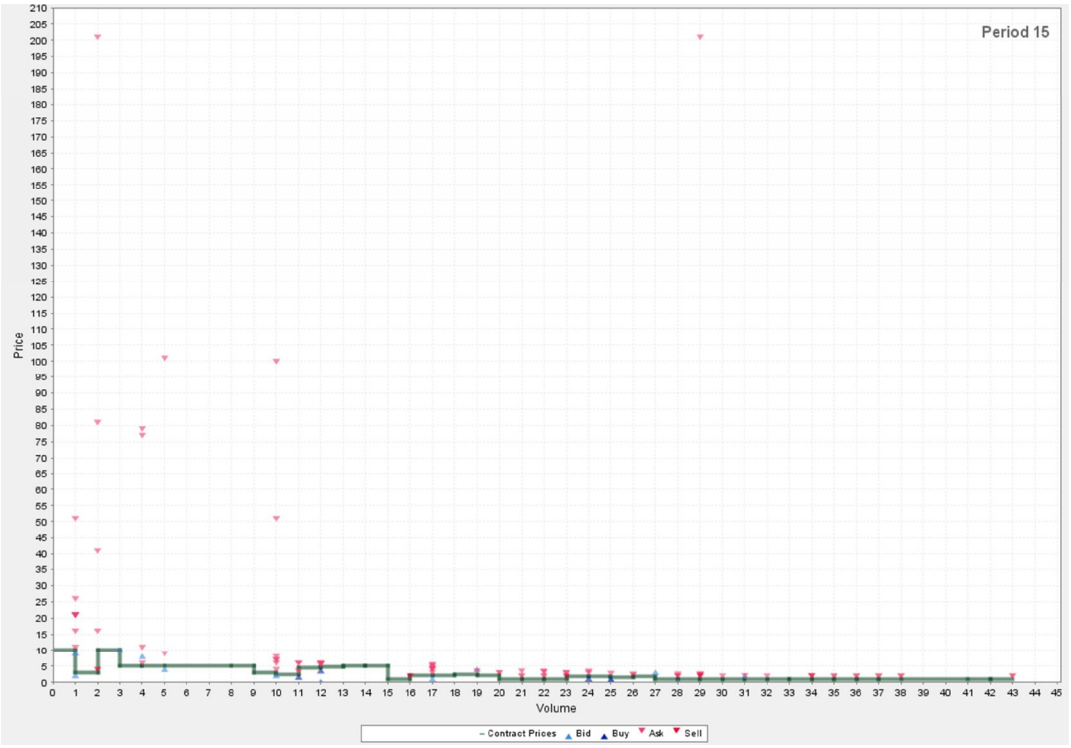

Figure 6.28: Prices in Period 15 for the First Market

Overall, it is seen that bubble form in the fourth period and bursts in the 13th period in this first market of the asset market experiment. Hence, we may go

on with the second experiment, the overconfidence experiment. Descriptive statistics for the first market of the overconfidence experiment is given in Table 6.15 and abbreviations for the variables are as follows;

- Entry level for the first part (Entry P1),
- Entry level for the second part (Entry P2),
- Entry level for the third part (Entry P3),
- Better than average score for the general knowledge trivia questions (BTA General),
- Better than average score for the investment knowledge questions (BTA Financial),
- Better than average score in terms of payoff (BTA Financial),
- Overconfidence score in terms of abilities for the second part (Over Ability P2),
- Overconfidence score in terms of abilities for the third part (Over Ability P3),
- Overconfidence score in terms of precision for the second part (Over Precision P2),
- Overconfidence score in terms of precision for the third part (Over Precision P3)

Table 6.15: Descriptive Statistics for the First Market of the Overconfidence Experiment

	Minimum	Maximum	Mean	Std. Deviation	P-Value
Entry P1	0.13	1.00	0.69	0.18	N/A
Entry P2	0.38	1.00	0.74	0.23	N/A
Entry P3	0.25	1.00	0.61	0.25	N/A
BTA General	-4.50	28.50	11.63	8.93	0.000
BTA Financial	-19.50	28.50	7.46	13.31	0.017
BTA Payoff	-5.00	90.00	30.21	34.02	0.000
Over Ability P2	-1.33	1.63	0.55	0.75	0.002
Over Ability P3	-1.50	1.13	0.17	0.83	0.330
Over Precision P2	-12.00	7.75	-1.16	4.53	0.221
Over Precision P3	-11.67	2.86	-3.60	4.34	0.000

It is seen that subjects of this first market see themselves above average in either of the domains. Moreover, subjects also estimate their payoff above average. It is also seen that subjects are overconfident about their abilities in the domain of general knowledge but not in the domain of finance. In addition, it is seen that subjects are not overconfident about precision of their knowledge in general knowledge domain but under confident about precision of their knowledge in the domain of finance. Wilcoxon sign and rank test for the first market is also given below.

Table 6.16: Wilcoxon Signed and Rank Test for the First Market

		Mean Ranks			
		Negative R.	Positive R.	Z stat.	P-value
First Market	Over Ability P3 – Over Ability P2	12.23	7.00	-3.987[b]	0.000
	Over Precision P3 – Over Precision P2	13.57	5.00	-3.857[b]	0.000
	BTA Financial – BTA General	8.69	3.50	-3.035[b]	0.002
	Entry 2 – Entry 1	14.94	10.43	-0.567[b]	0.571
	Entry 3 – Entry 1	12.13	9.50	-1.049[c]	0.294
	Entry 3 – Entry 2	11.14	19.00	-3.641[b]	0.000

*b: based on negative ranks, c: based on positive ranks.

We could not find any entry differences between the first and second and first and third parts for this first market. It is seen that mean entry levels for the first and third part are different from each other. In particular, subjects entered the market less when financial knowledge is essential. However, we could not found any significant difference between the entrance levels of no domain and general knowledge domain and no domain and financial knowledge domain. Moreover, Mean BTA score for the general knowledge questions seem to be higher than the BTA score for the investment questions. It is seen in Table 6.15 and Table 6.16 that subjects place themselves better than average less in the domain of financial knowledge compared to that of in the domain of general knowledge.

Since BTA payoff calculation methodology is different from those of other BTA scores, it is not meaningful to compare them with others. In comparing the calibration based measurement scores, it is seen that subjects are much more overconfident in the second part compared the third part. In addition, it is seen from Table 6.15 and Table 6.16 that subjects in this first market are less overconfident in the domain of finance both in terms of their abilities and precision of their knowledge. When overconfidence scores for the precision of the knowledge of the subjects are examined, it is seen that on average subjects are overconfident in the domain of general knowledge questions whereas they are under confident on average in domain of financial knowledge. It is also possible to examine the relation between overconfidence and bubble using correlation matrix and regression analysis.

Correlation matrix for the first market is given below. It is seen that there is no significant relation between bubble score and entry levels for the first part. However, there is negative significant relation between the AB scores of individuals and the frequency of the entries of individuals. Hence, the more subjects are overconfident the less often they entered the market for the first part. There is positive relation between entry levels for the second and third part. This indicates that the ones who are more overconfident entered the market more frequently in the second and third part, where subjects are asked questions. This may indicate that these overconfident people preferred not to enter the market for the first part since rankings are random but they preferred to enter the market where rankings depend on the performance of subjects.

This result is consistent with the result of Camerer and Lovallo (1999). Camerer and Lovallo argued that these overconfident traders enter the market where knowledge is required since they believe that they are better than their peers and overestimate their abilities. Positive significant relation between AB, Bubble Score, Trading Volume and all of the overconfidence measures support this conclusion. Correlation matrix shows that there is no significant relation between payoff for asset market bubble experiment (ending balance) and any of the overconfidence measures. This implies that overconfidence may not be related to the earnings.

Table 6.17: Correlation Matrix for the First Market

	Bubble Score	AB	Trading Volume	Ending Balance	Av Buy Price	Av Bid Price	Number of Bids	Number of Asks
Entry P1	-0.229	-0.575**	-0.106	0.339	-0.492*	-0.407*	-0.179	-0.359
Entry P2	0.690**	0.824**	0.561**	-0.112	0.469*	0.785**	0.678**	0.677**
Entry P3	0.650**	0.704**	0.503*	-0.080	0.347	0.720**	0.576**	0.587**
BTA General	0.775**	0.738**	0.607**	-0.172	0.396	0.706**	0.777**	0.606**
BTA Financial	0.776**	0.779**	0.670**	-0.206	0.494*	0.814**	0.745**	0.664**
BTA Payoff	0.778**	0.756**	0.654**	-0.090	0.320	0.665**	0.828**	0.668**
Over Ability P2	0.716**	0.798**	0.614**	-0.401	0.630**	0.676**	0.460*	0.571**
Over Ability P3	0.639**	0.779**	0.550**	-0.313	0.547**	0.641**	0.401	0.548**
Over Precision P2	0.753**	0.680**	0.579**	-0.350	0.393	0.510*	0.574**	0.483*
Over Precision P3	0.684**	0.755**	0.515*	-0.218	0.478*	0.554**	0.530**	0.552**

** Significance at 1% , * Significance at 5%.

Moreover, mean buy price is not significantly related to the entry level in the third part, BTA effect in general knowledge domain, BTA effect in the payoff domain and over precision measure. It is also seen that overconfident subjects trade more in this first market. Moreover, overconfident traders bid and buy at higher prices and bid and ask more often than their peers.

6.4. Analyses for the Second Market

Second market consists of 12 subjects and the market summary is presented in Table 6.18. We can see that mean contract prices in this period are always slightly over the fundamental value.

Table 6.18: Market Summary of Mean Prices for the Second Market

Period	Contracts	Volume	Mean Price	Median Price	Fund. Value (FV)	Mean Price - FV
1	13.00	13.00	137.69	100.00	120.00	17.69
2	17.00	18.00	75.89	80.00	112.00	-36.11
3	21.00	21.00	121.48	140.00	104.00	17.48
4	26.00	30.00	105.37	95.00	96.00	9.37
5	24.00	26.00	104.96	100.00	88.00	16.96
6	37.00	41.00	110.20	100.00	80.00	30.20
7	29.00	29.00	96.14	100.00	72.00	24.14
8	14.00	15.00	87.47	100.00	64.00	23.47
9	11.00	11.00	98.09	99.50	56.00	42.09
10	5.00	5.00	96.00	60.00	48.00	48.00
11	0.00	0.00	n/a	n/a	40.00	n/a
12	8.00	8.00	62.00	80.00	32.00	30.00
13	13.00	17.00	60.06	65.00	24.00	36.06
14	5.00	5.00	55.98	60.00	16.00	39.98
15	8.00	8.00	52.63	30.09	8.00	44.63

Compared to the first market, "Mean Price – FV" values are higher those of in the first periods but lower than those of in the middle periods. Surprisingly, there is no trade in the 11th period. In contrast to the first market, though mean prices slightly decrease through the end of the experiment, prices are still over the fundamental values. Individual statistics in Table 6.20 indicate that some traders consistently pay/bid higher prices whereas some of them reasonably pay/bid prices equal to or under the FV.

Table 6.21 shows that mean bid prices are under the FV until the end of the 7th period, mean bid prices are higher than the FV after 8th period. Mean ask prices are higher than the FV for all of the periods. However, individual price statistics for the second period traders (Please see Appendix A) show that though some traders bid higher than the FV, some of them are consistently bid under the FV or even do not bid and buy at these price levels. When we look at the mean bid price and buy price standard deviation in Table 6.22, we see that the deviation of bid and buy prices are also quite high. Together with the individual statistics this result may mean that there is heterogeneity across traders similar to the first in terms of their trading behavior.

Table 6.19: Mean Statistics for the Second Period

ID	Mean Buy Price	Number of Buy Cont.	Mean Sell Price	Number of Sell Cont.	Trading Volume	Number of Stock at the end	Ending Balance
32	88.93	28	105.24	26	54	1	750.00
62	91.77	28	101.38	26	54	3	459.00
82	92.78	13	73.67	13	26	0	502.00
92	60.99	20	94.53	24	44	0	1686.89
232	112.04	17	72.77	22	39	0	21.01
242	104.39	17	94.28	16	33	1	588.00
272	75.83	7	77.50	4	11	6	917.00
292	94.00	5	101.00	8	13	0	640.00
302	108.45	15	89.76	17	32	3	612.00
312	84.58	42	63.59	38	80	10	442.00
322	86.66	36	108.02	33	69	6	133.10
332	79.63	20	107.01	21	41	0	1529.00

Table 6.20: Summary Statistics for the Second Period

ID	Number of Non Executed Bids (Bid Price>FV)	Number of Non Executed Bids (Bid Price<FV)	Number of Non Executed Bids (Bid Price=FV)	Number of Executed Bids	Number of Non Executed Bids	Mean Non Executed Bid Price	Number of Buy Cont. (Buy Price>FV)	Number of Buy Cont. (Buy Price<FV)	Number of Buy Cont. (Buy Price=FV)	Mean Buy Price
32	26	13	1	6	40	67.54	24	22	0	88.93
62	4	37	0	0	41	29.55	23	28	0	91.77
82	0	4	0	10	4	79.50	11	3	0	92.78
92	14	38	2	3	54	54.05	4	17	0	60.99
232	6	20	1	3	27	43.80	13	14	0	112.04
242	11	13	0	6	24	66.00	13	11	0	104.39
272	0	2	1	1	3	82.50	2	6	0	75.83
292	0	3	0	0	3	30.00	4	5	0	94.00
302	2	5	1	3	8	76.25	15	12	0	108.45
312	0	5	0	5	5	65.88	36	37	0	84.58
322	4	6	0	17	10	93.85	24	19	0	86.66
332	4	18	2	3	24	61.67	6	17	0	79.63

Table 6.21: Market Summary of Mean Bid and Ask Prices for the Second Market

Period	Mean Bid Price	Number of Bid Cont.	Mean Ask Price	Number of Ask Cont.	Mean Bid Price - FV	Mean Ask Price - FV
1	78.90	21	202.50	24	-41.1	82.5
2	60.59	22	113.92	37	-51.41	1.92
3	74.92	24	141.45	31	-29.08	37.45
4	66.28	25	128.00	31	-29.72	32
5	65.37	27	115.77	31	-22.63	27.77
6	74.24	33	120.74	39	-5.76	40.74
7	71.52	27	130.61	36	-0.48	58.61
8	70.13	23	126.50	26	6.13	62.5
9	66.31	16	130.00	36	10.31	74
10	58.26	19	110.95	20	10.26	62.95
11	57.09	11	109.21	14	17.09	69.21
12	38.57	14	110.89	19	6.57	78.89
13	34.15	13	79.75	20	10.15	55.75
14	26.50	12	78.16	18	10.5	62.16
15	19.04	13	57.97	24	11.04	49.97

In Table 6.21, it's seen that the number of bid contracts through the end of the experiment. The number of ask contracts increases until the end of the 10th period, and then start to decrease. We may infer that traders are willing to buy/sell in the middle of the experiment and prefer to hold on their position after then. The traders holding their positions might have expected to get high dividend payouts.

Table 6.22: Standard Deviations of Mean Buy and Bid Prices for the First and Second Market

Market	Prices	N	Minimum	Maximum	Mean	Std. Dev.
1	Buy Price	448	38.17	117.13	81.88	17.64
	Bid Price	528	20.57	95.30	68.24	21.62
2	Buy Price	231	6.01	250.00	97.23	32.25
	Bid Price	300	1.00	250.00	61.83	41.07

Minimum/maximum bid/ask prices and standard deviations are shown in Table 6.22. It's seen that standard deviation for bid prices are quite higher than those of buy prices. Mean buy and bid prices of the second market are also higher than that those of first market. This may indicate that though some traders bid at FV or under FV, buy prices might be over the FV. We can see the min/max bid and ask prices for each of the periods in Table 6.23. It's seen that deviations are also high for each of the periods, indicating the heterogeneity across traders. Compared the same statistics in the first period, minimum price is lower, maximum and mean buy price is higher but mean bid price is lower for the second market.

Table 6.23: Min./Max. bid/ask Prices and Standard Deviations for the Second Market

Period	Min Bid Price	Max Bid Price	Std. Dev.	Min Ask Price	Max Ask Price	Std. Dev.
1	1.00	200.00	66.55	50.00	300.00	90.90
2	1.00	100.00	21.79	10.00	250.00	54.13
3	10.00	160.00	45.97	80.00	200.00	28.49
4	1.00	150.00	43.14	50.00	200.00	34.91
5	10.00	150.00	42.15	15.00	150.00	25.49
6	1.00	150.00	41.71	80.00	200.00	26.97
7	10.00	250.00	48.51	80.00	290.00	45.14
8	1.00	200.00	36.14	70.00	250.00	45.22
9	20.00	100.00	22.97	90.00	250.00	49.98
10	10.00	95.00	26.87	95.00	200.00	26.58
11	1.00	85.00	23.65	88.00	200.00	30.76
12	5.00	70.00	17.28	36.00	300.00	70.49
13	10.00	68.00	15.51	50.00	200.00	35.85
14	1.00	65.00	20.67	50.00	200.00	38.58
15	1.00	56.00	20.96	12.00	200.00	41.38

Standard deviations are also higher for the second market. This may indicate that there is higher dispersion of both bid and buy prices of traders in this second market. We may see the bubble formation simply in Figure 6.29. It's

seen that trading starts with mean price lower than FV in the first period. Mean prices continue to decrease in the second period. In the third period, mean price start to increase but prices are still under the FV. Figure 6.29 shows that most contract prices are lower than the FV until the 4th period. However, there is an increase in prices in 4th period. After the 4th period, contract prices continue to increase. There is no contract price lower than the FV until the last period; prices are always higher than FV. In the last period, there is a sharp decline. Hence, we may infer this period as the crash of the bubble.

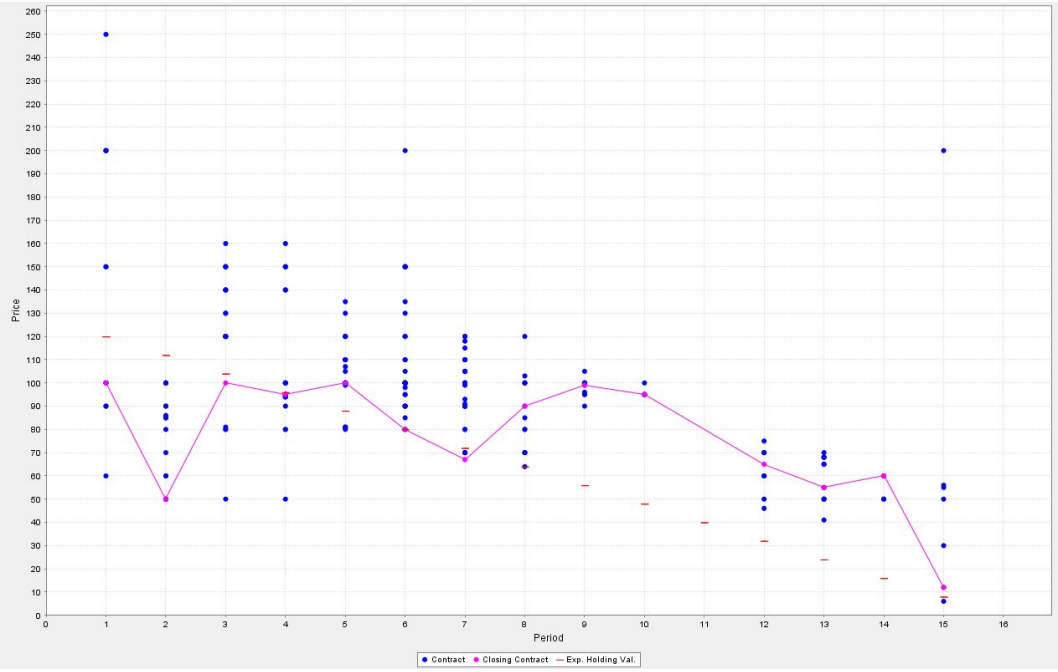

Figure 6.29: Session Summary for the Second Market

When we examine prices in second market graphically, we see that prices are much more volatile until the start of the bubble periods. However, the volatility of the prices diminishes in the bubble periods.

Table 6.24: Bubble Measures for the First and Second Market

Market	PA	AB	TD	Turnover	RD	RAD	DUR
1	0.70	19.27	384.79	7.40	30%	42%	10 periods
2	0.70	20.69	395.59	7.70	36%	43%	7 periods

We may compare the bubble measures of the first market to those of the second market. PA is exactly the same of the first market, (AB), TD, Turnover, RD and RAD measures are also quite similar. The only difference is the duration of the bubble. Duration of the bubble in the second market is shorter than that of the first market. We may also compare our results with the results of other studies in literature.

Table 6.25: Comparison of Bubble Measures for the Second Market

Previous Studies	Turnover	PA	AB	TD
Noussair and Tucker (1996)	0.96	0.33	N/A	N/A
Smith, Suchanek, and Williams (1988)	4.55	1.24	N/A	N/A
Porter and Smith (1995)	5.49	1.53	N/A	N/A
Kirchler, Huber and Stöckl (2009)	N/A	0.82	14.73	202.93
Values for the Second Market in our Experiment	7.70	0.70	20.69	395.59

It is seen in Table 6.25, that turnover rate, AB and TD scores are even higher in this market. Hence, we may again conclude that subjects traded more frequently in this market compared to subjects of other studies. Moreover, AB and total dispersion (TD) measures are also higher which may indicate greater bubble in this market compared to markets in other studies.

Figures 6.30 - 6.44 show bid prices, ask prices and contract prices in each of the 15 periods in the second market. When we look at the Figure 6.30 showing the results for the 1st period, it's seen that the volatility of the contract prices are quite high, similar to the 1st period in the first market.

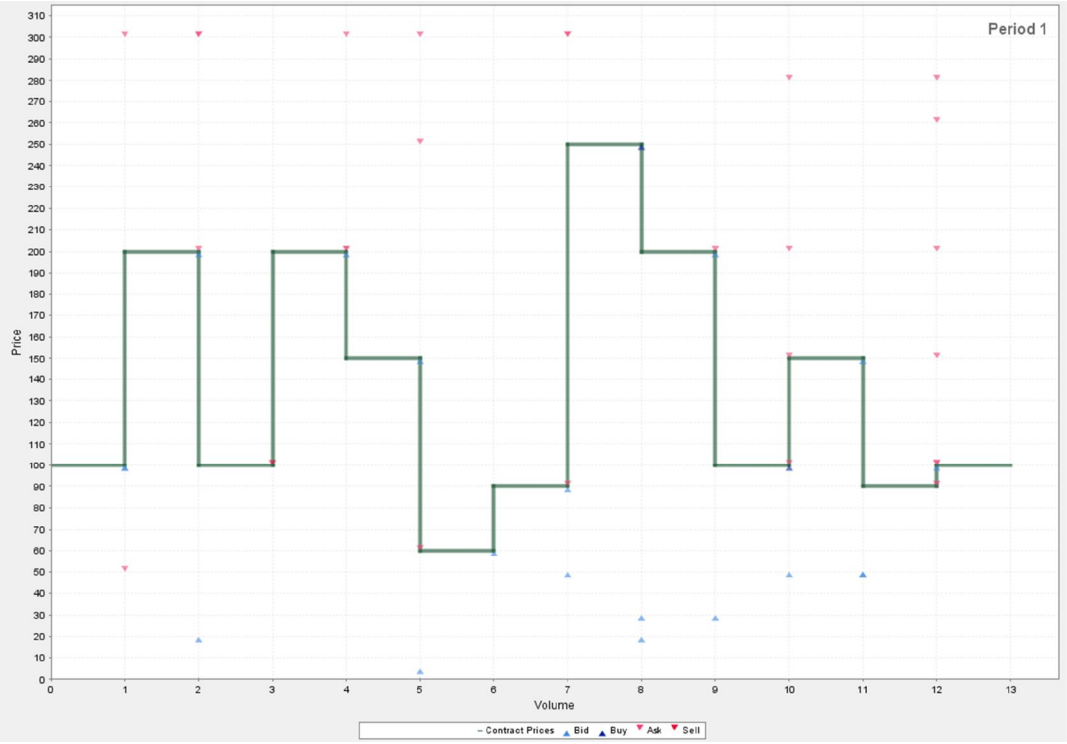

Figure 6.30: Prices in Period 1 for the Second Market

The FV of the stock in this period is 120 and some traders buy/sell the same stock at a price of 60 guldens whereas some other traders traded at 250 guldens. We see high deviation of prices. This result may indicate that traders have different opinions about the price of the stock at the beginning of the experiment, similar to the first market. Indeed, it's surprising to see mean

prices over the FV in the first period, a case contrary to the previous findings of other studies using the same methodology.

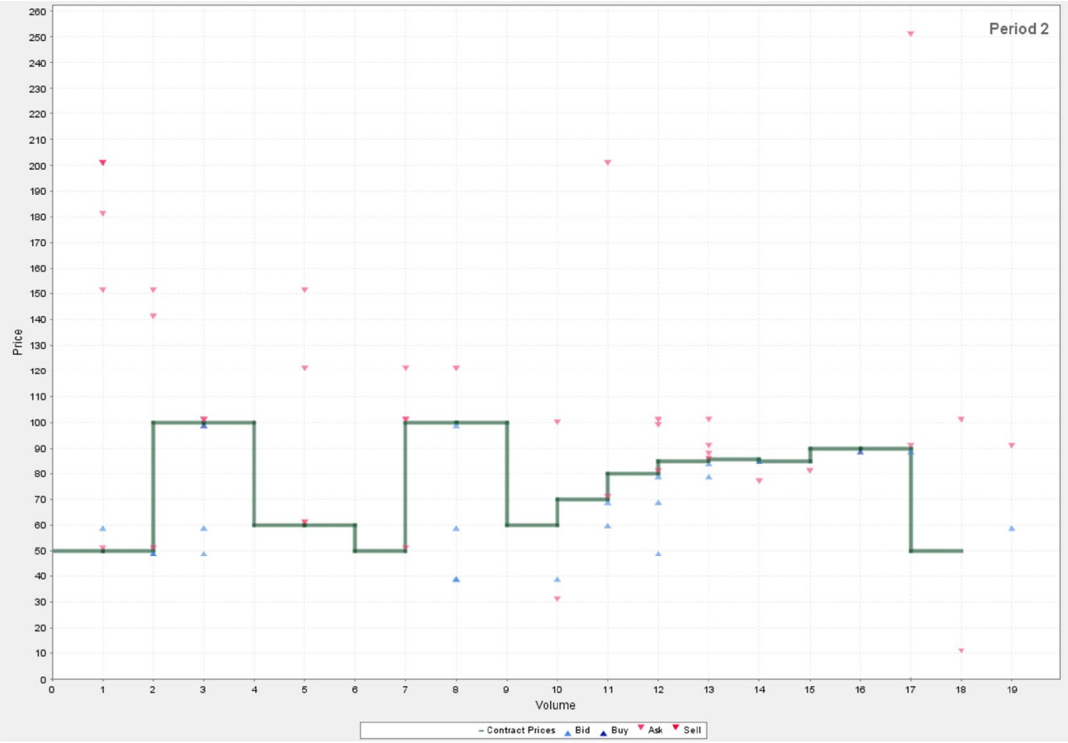

Figure 6.31: Prices in Period 2 for the Second Market

Figure 6.31 shows the results for the 2nd period, it's graphically seen that the volatility of the contract prices is lower than that of the first period. The lowest and the highest contract prices are 50 and 100 guldens. The highest bid price is 100 guldens whereas the lowest bid price is 1 gulden. The highest and the lowest ask prices are 250 and 10 guldens respectively. All of these values are smaller than those of first periods, indicating the lower deviations. Mean and median prices are also lower than those of the first period (Please see Table 6.18). The mean bid and ask prices are under the FV. Compared to bid

prices mean contract prices are slightly higher (Please see Table 6.18 and Table 6.21). Contrary to the first market mean and median prices are under the FV. After this period, all of the mean and median prices are indeed over the FV.

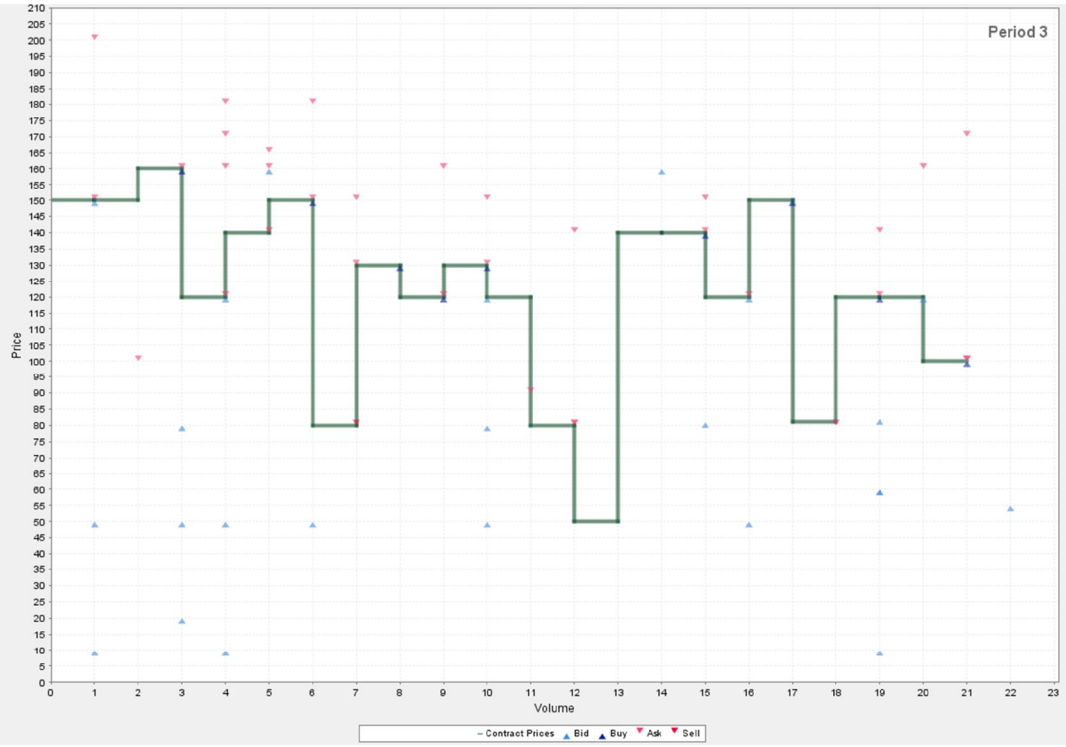

Figure 6.32: Prices in Period 3 for the Second Market

Figure 6.32 shows the results for the 3rd period. It's seen that though there is high volatility in prices, there is an increase in this period. Bid and ask prices are also increased (Please see Table 6.23).

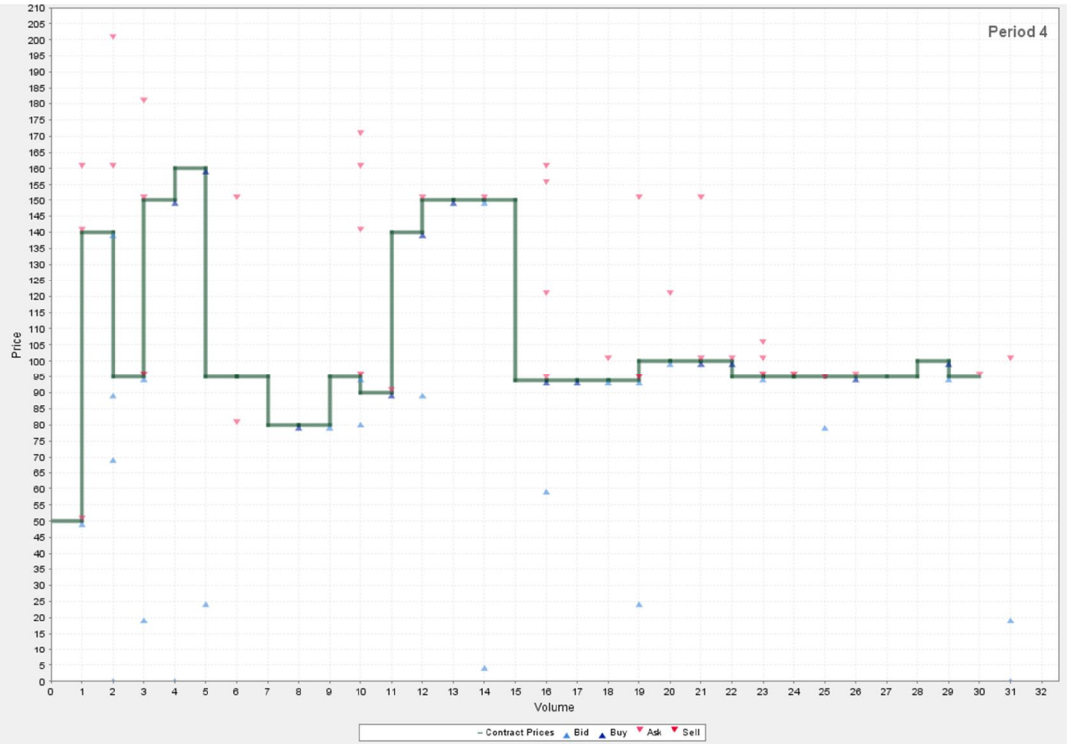

Figure 6.33: Prices in Period 4 for the Second Market

Figure 6.33 shows the results for the 4th period, we can see that the prices at the end of the period are higher than the prices at the beginning of the period. It's seen that the volatility of prices is lower through the end of the experiment. Both bid and contract prices are slightly lower than those of in the previous period. Both mean and median prices are lower compared to the previous period. Mean prices are lightly over the FV.

Figure 6.34 shows results of the 5th period, the first period for the start of the bubble. The lowest and the highest bid prices are 10 and 150 guldens. The lowest and highest ask prices are 15 and 150 guldens respectively. The maximum ask price in this period is indeed the lowest among all of the periods. Mean Price-FV spread starts to increase after this period (Please see Table 6.18).

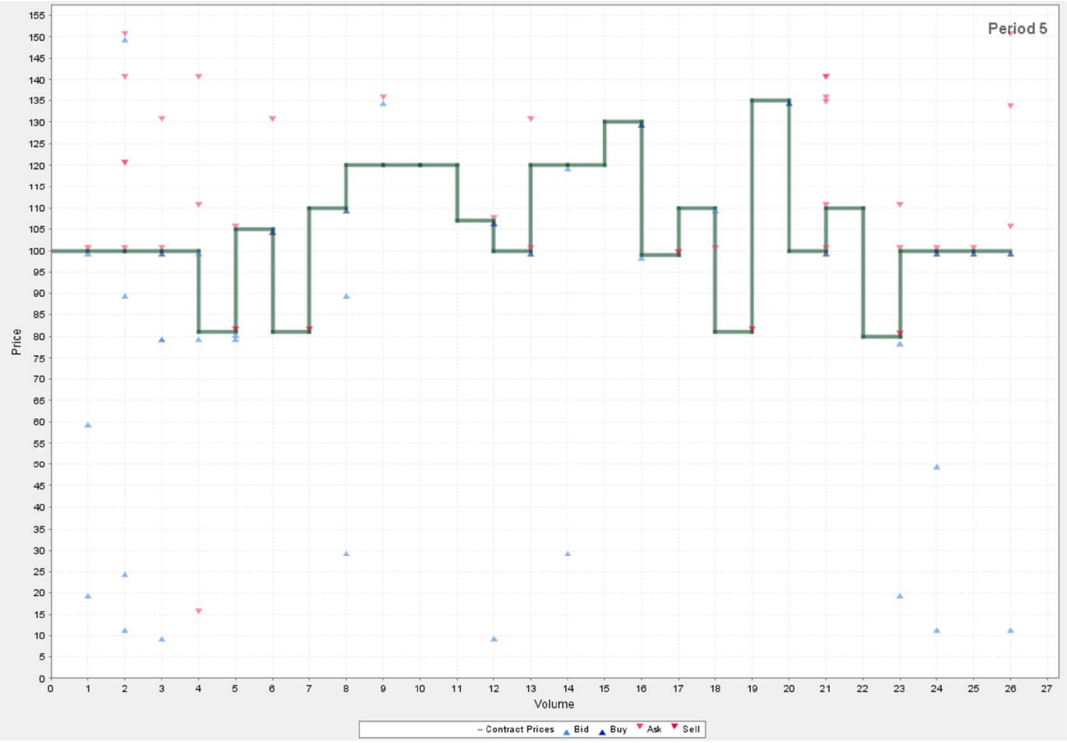

Figure 6.34: Prices in Period 5 for the Second Market

Figure 6.35 shows the results for the 6th period, we can see that the contract prices at the beginning of this period are much more volatile than those of at the end of the period. It's seen that the volatility of the contract prices is quite low. Though minimum bid prices are lower minimum ask prices significantly higher than those of previous period. Mean bid and ask prices, the number of bids and asks are also higher (Please see Table 6.21 and Table 6.23).

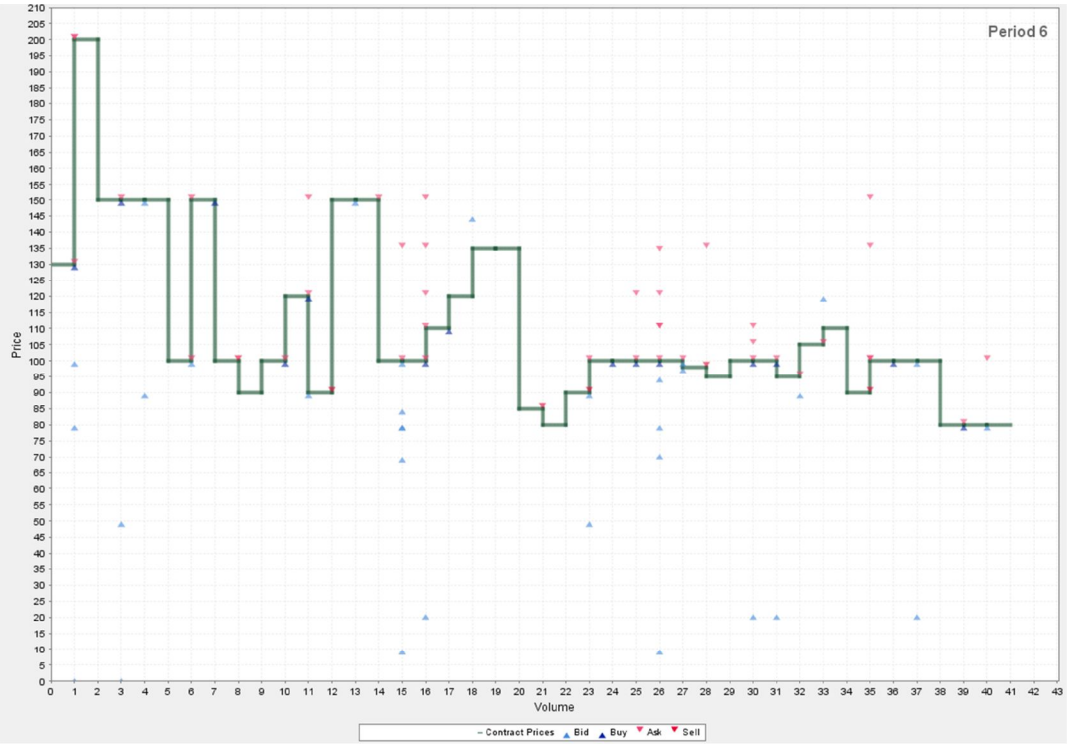

Figure 6.35: Prices in Period 6 for the Second Market

Figure 6.36 shows the results for the 7th period, we can see that the transaction price at the beginning of this period is higher than that of the previous period. The lowest and the highest contract prices are 70 and 120 guldens. The mean and median prices for this period are 98.60 and 97.50 respectively (Please see the Table 6.2). Looking at Figure 6.29, we may say that contract prices are also more volatile in this period. Maximum contract price is 200 whereas the lowest is 80. Though, the entire contract prices are above the FV, the last contract prices is exactly equal to the FV.

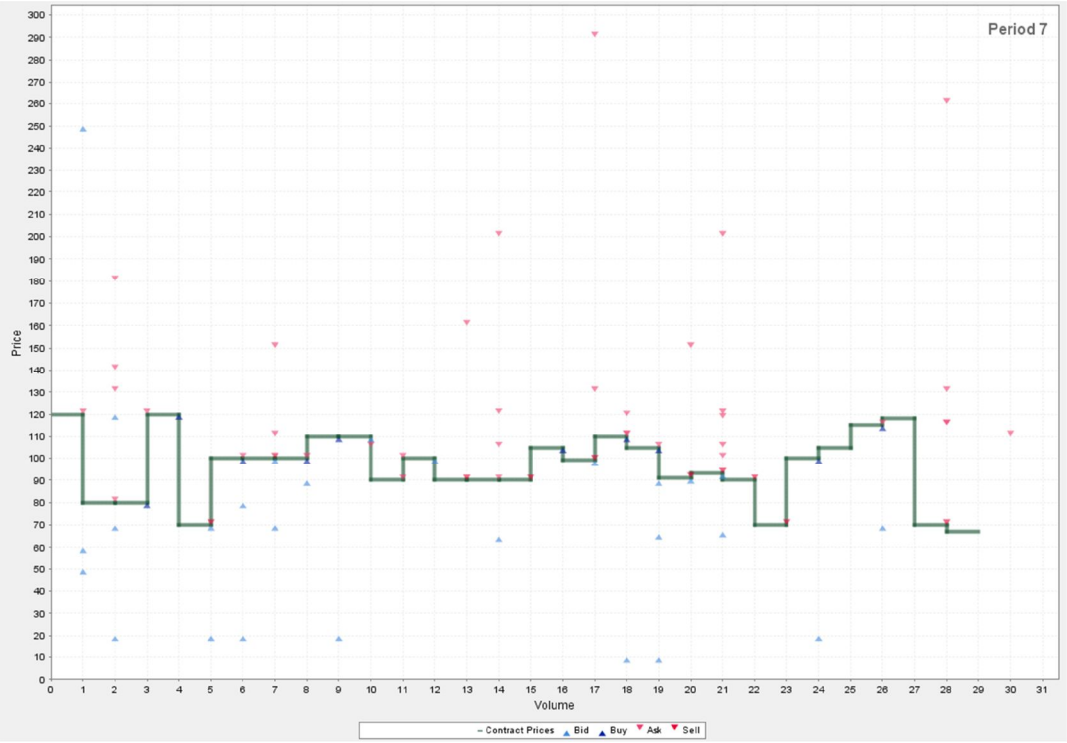

Figure 6.36: Prices in Period 7 for the Second Market

Until 8th period, mean bid prices are under the FV. However, starting from this period, mean and median bid prices are above the FV (Please see Table 6.18). Interestingly closing contract prices are also higher than the FV after this period. It's seen from the Figure 6.37 that the volatility of the contract prices is quite low compared to previous periods. We may infer that either all traders agreed on prices or some traders drive out other traders in the market. The second alternative is possible since the number of contracts decreased by 15 (from 29 to 14) compared to previous period (Please see Table 6.18). The number of bid and ask contracts also decreased (Please see Table 6.18).

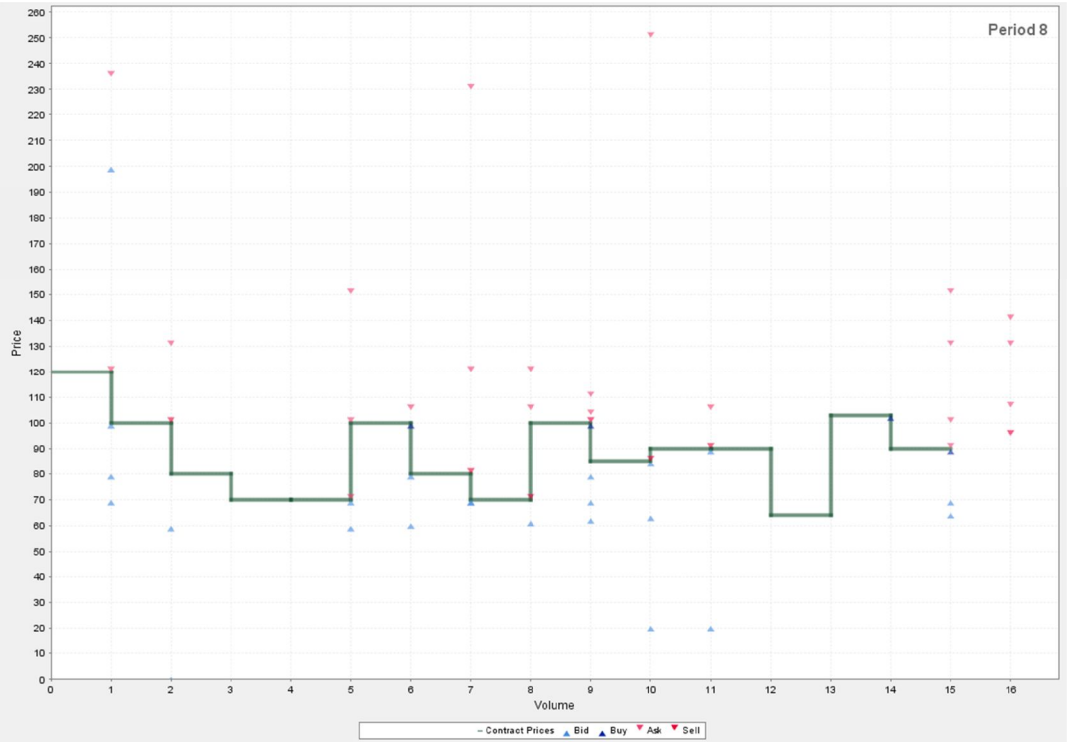

Figure 6.37: Prices in Period 8 for the Second Market

Figure 6.38 shows the results for the 9th period, we can see that the transaction price at the beginning of this period is almost same for the last transaction price, which is above the FV. Mean price for this period is 98.09 whereas FV is 56 (Please see the Table 6.18). The number of bid contracts decreased whereas the number of ask contracts increased in this period (Please see the Table 6.21). Standard deviation of bid prices is also lower than previous period (Please see the Table 6.23). The closing contract price for this period is at its peak of the whole session.

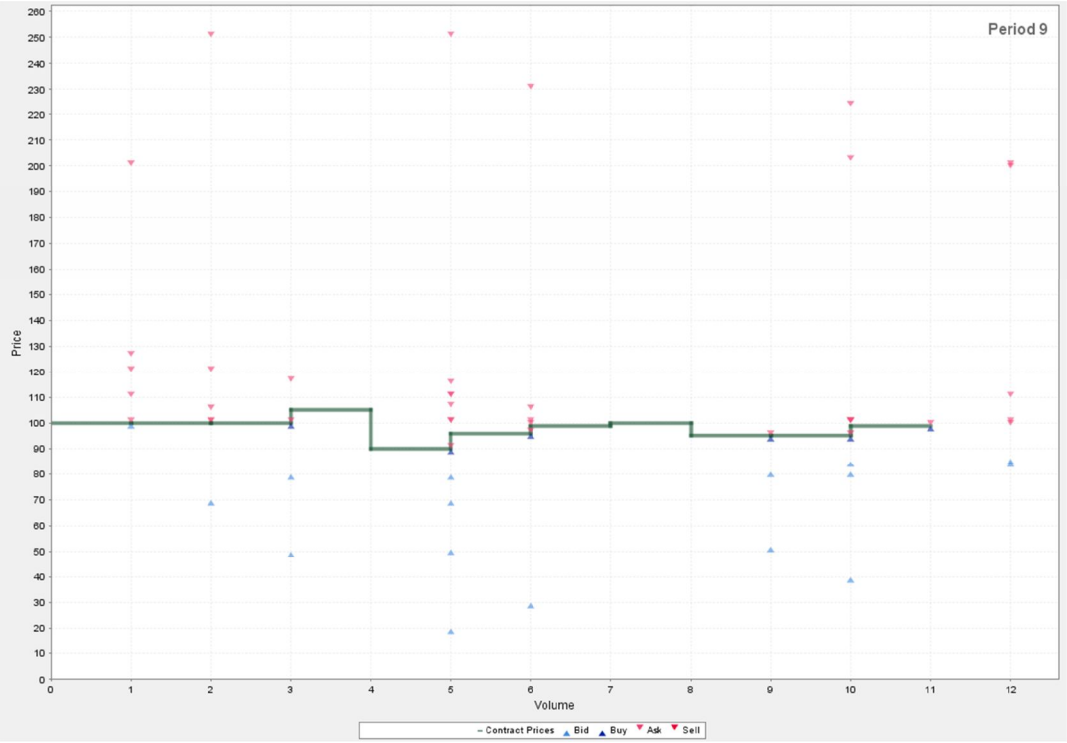

Figure 6.38: Prices in Period 9 for the Second Market

It's seen from the Figure 6.39 for the period 10th that the volatility of the contract prices is quite low. The transaction prices appear as a horizontal line for this period. Though there are bids under these contract prices and FV, trades are executed above the FV. We may infer that though some traders are willing to trade at or under the FV, these traders are driven out of the market. The number of contracts is among lowest except the 11th period where there is no trade.

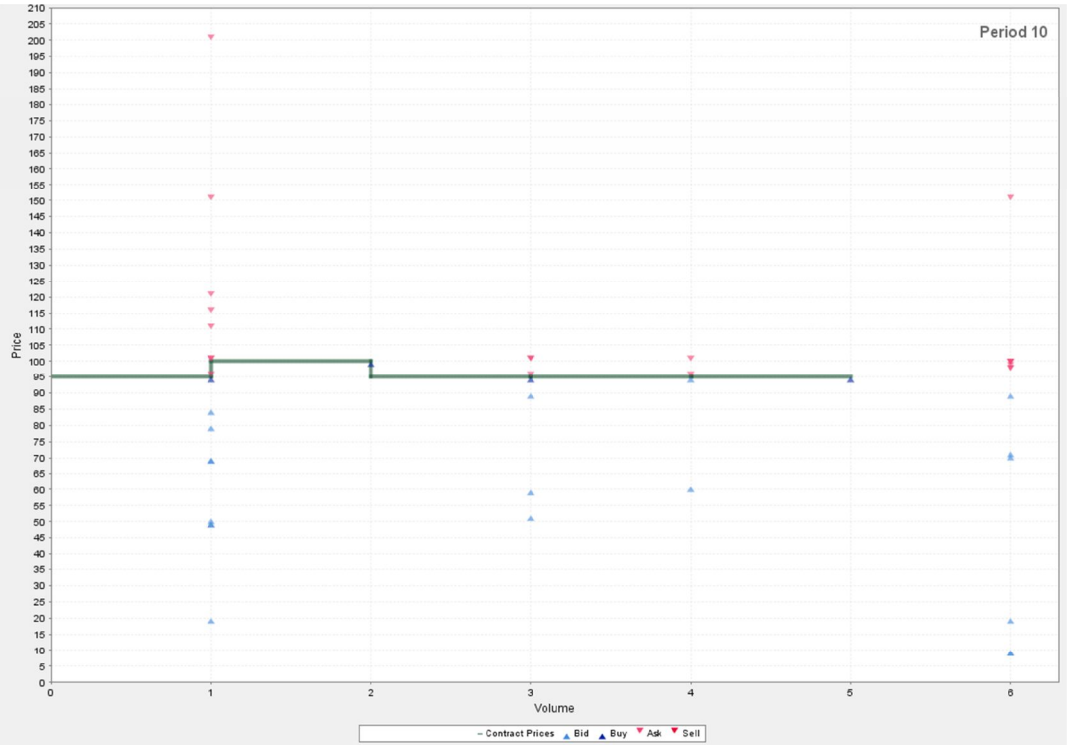

Figure 6.39: Prices in Period 10 for the Second Market

Figure 6.40 show that there is no trade for the 11th period, though there is no reason for no trade. Mean bid and ask prices are 57.09 and 109.21. The maximum bid price is 85 and the lowest ask price is 88 guldens in this period. Though bid ask spread is quite low, the trade has not been executed for this period. In other words, buyers did not accept the best ask and sellers also did not accept best bid price. This may indicate that traders place emphasis on even 3 guldens and are not willing to buy for higher than they think or are not willing to sell for less than they think.

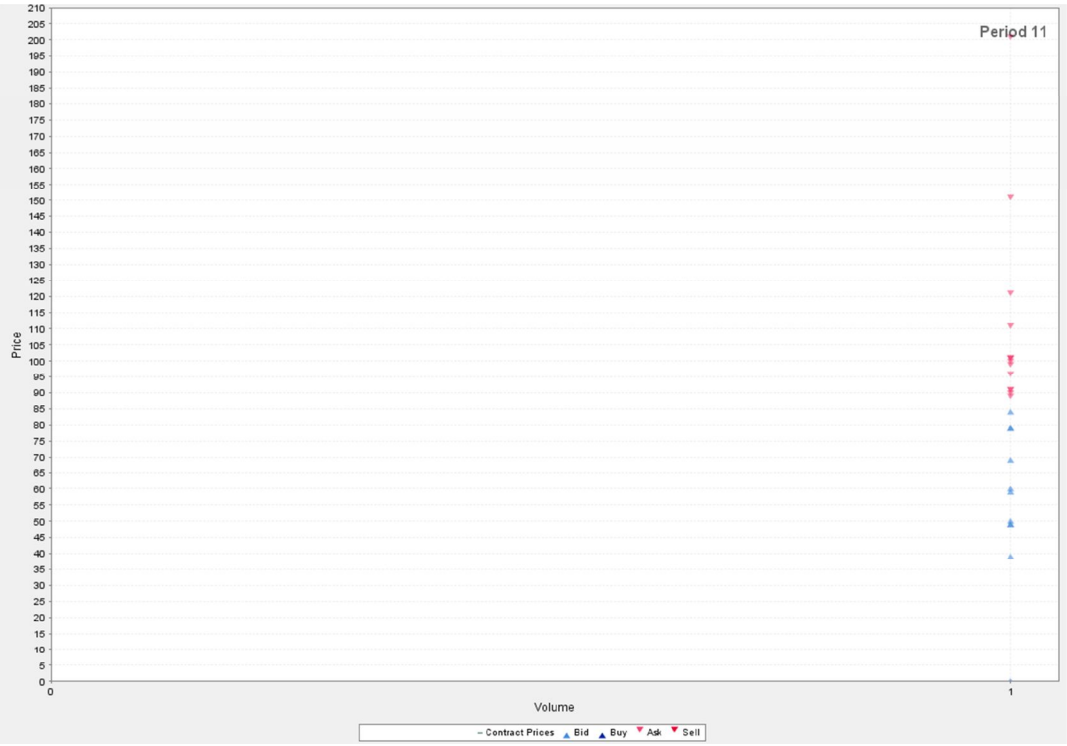

Figure 6.40: Prices in Period 11 for the Second Market

Figure 6.41 shows the results for the 12th period, we can see that mean prices are lower than those of in the 10th period. Mean bid prices decreased by 19 guldens in this period. In this respect, though mean bid prices are lower than the previous period, there are trades in this period. Transaction price at the beginning of this period is almost same through the end of the period. It's seen that the volatility of the contract prices is quite low. The first transaction price is almost equal to the last transaction price. The transaction prices almost form a horizontal line.

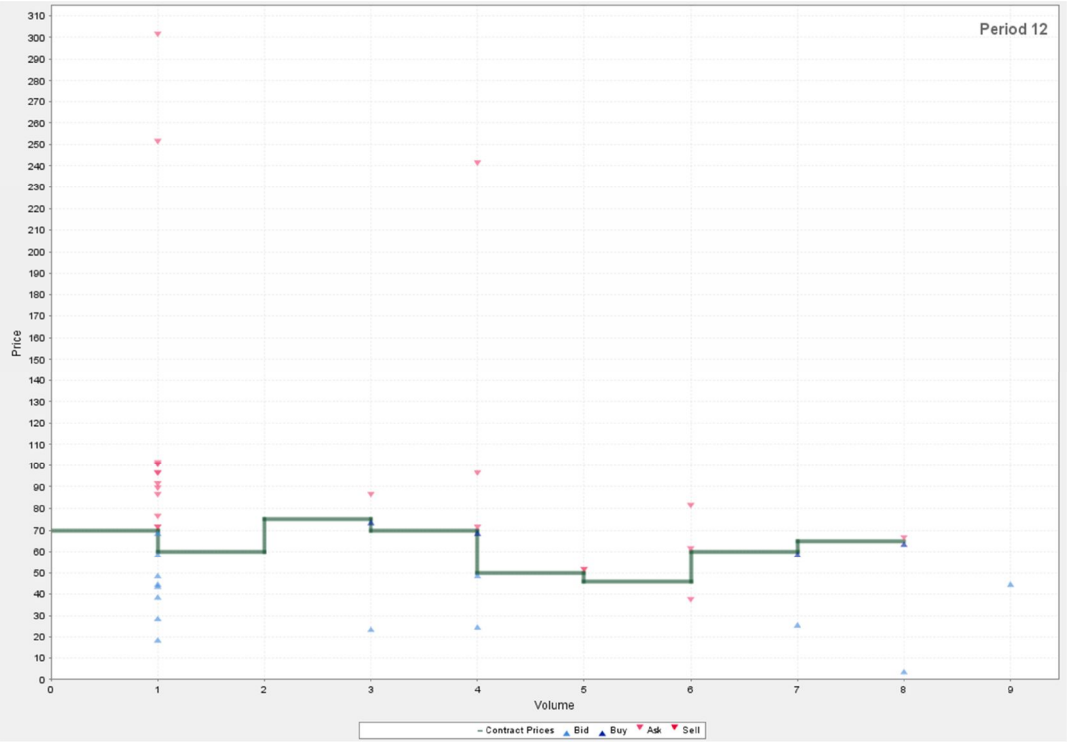

Figure 6.41: Prices in Period 12 for the Second Market

It's seen from the Figure 6.42 for the period 13th that the volatility of the transaction prices slightly increases again. Trading volume in this period is the highest among the last six periods. In this period there is a sharp decline in mean ask prices. Hence we may conclude that traders settle for lower prices as the end of the experiment comes. The highest bid price for this period is 68 guldens whereas the lowest ask price is 50 guldens. Compared to the previous periods, bid ask spread is at its lowest level.

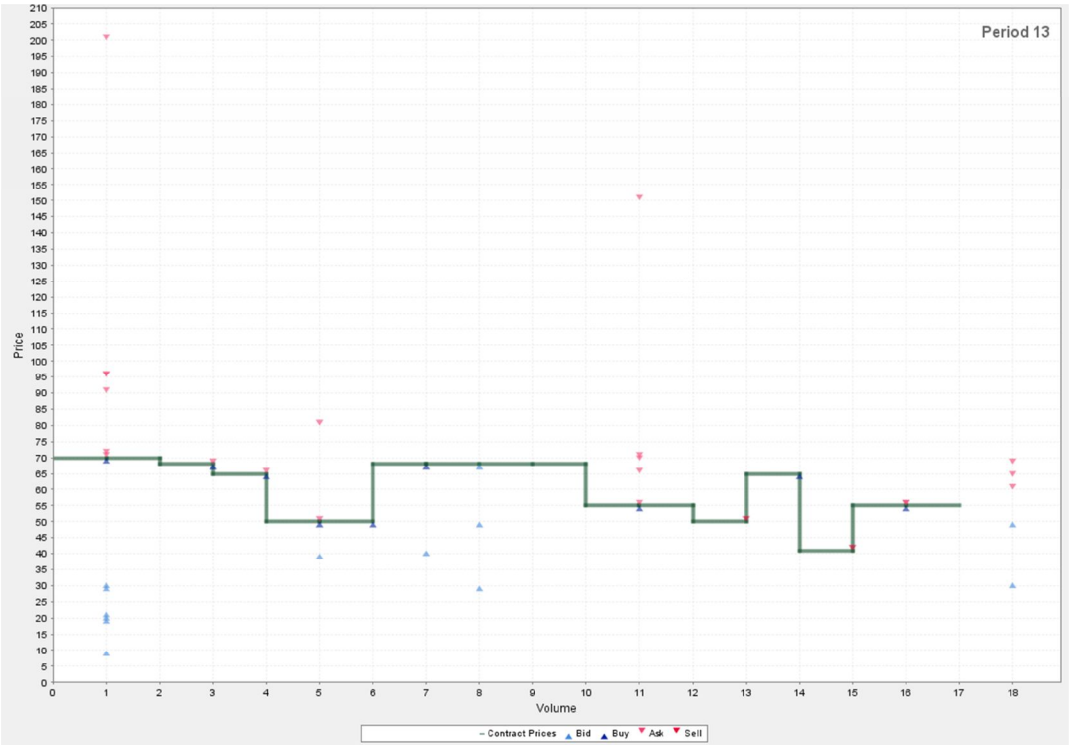

Figure 6.42: Prices in Period 13 for the Second Market

Figure 6.43 shows the results for the 14th period, we can see that transaction price at the beginning of the period is almost same for the last transaction price, which is still above the FV. Mean price for this period is 55.98 whereas FV is 16 (Please see Table 6.18). The number of bid and ask contracts decreased (Please see Table 6.21). Trading volume also decreased. The transaction prices appear as a horizontal line for this period.

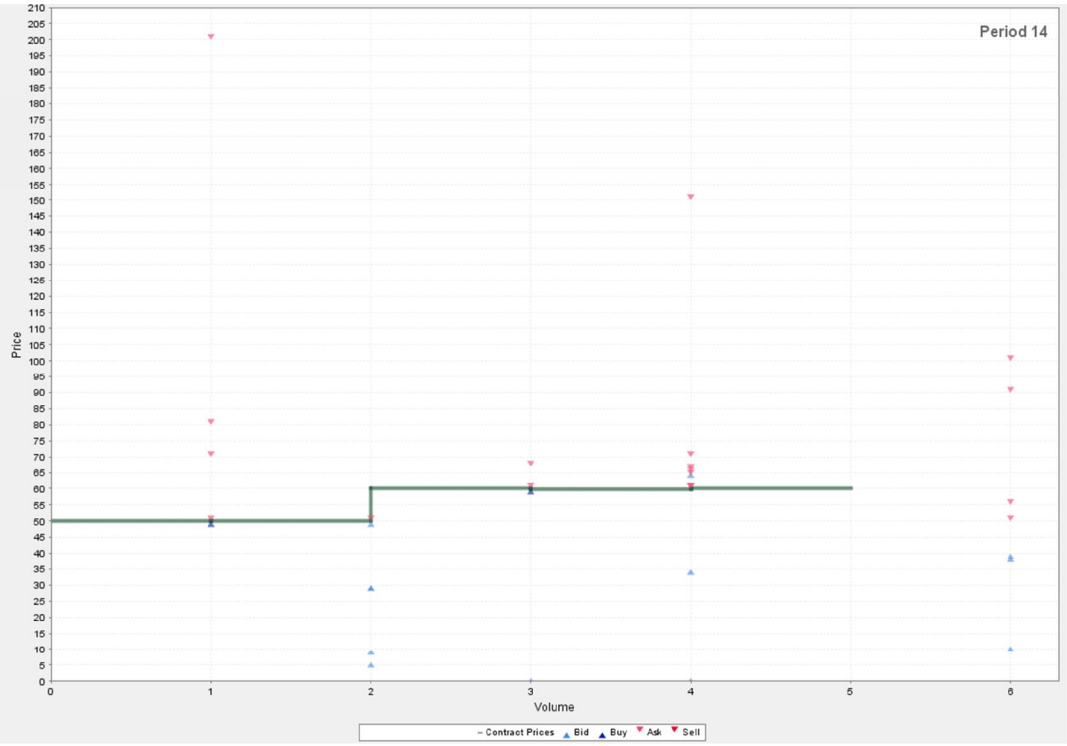

Figure 6.43: Prices in Period 14 for the Second Market

Figure 6.44 shows the results for the last period, we can see that there is decline in prices in this period. Both mean bid and ask prices decreased more than the decrease in FV. Though majority of the number of contracts is above the fundamental value, some trades are executed under the FV. Hence, we may argue that this period might be the burst of the bubble. However, we cannot completely conclude that bubble is burst since not all of the contract prices are equal or under the FV. Compared to the last period of the first market, we may say that the burst of the bubble in the first market is obvious but not for this second market.

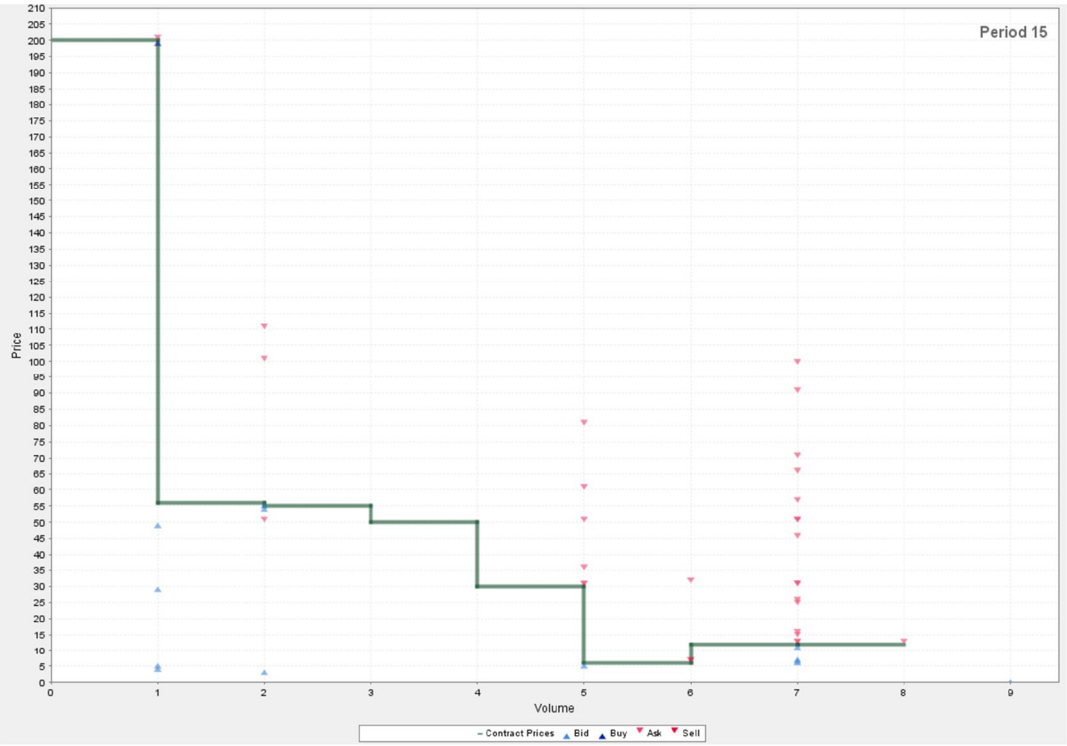

Figure 6.44: Prices in Period 15 for the Second Market

Overall, results indicate that bubble forms and bursts in this second market. Similar to the descriptive statistics of the first market, we may examine the same statistics for the second market of the overconfidence experiment. It is seen that subjects of this second market do not see themselves above average in either of the domains. However, subjects estimate their payoff above average. It is also seen that subjects are overconfident about their abilities in the domain of general knowledge but not in the domain of finance. In addition, it is seen that subjects are not overconfident about precision of their general knowledge but under confident in the domain of finance.

Table 6.26: Descriptive Statistics for the Second Market of the Overconfidence Experiment

	Minimum	Maximum	Mean	Std. Dev.	P-Value
Entry P1	0.50	1.00	0.73	0.17	N/A
Entry P2	0.38	1.00	0.67	0.22	N/A
Entry P3	0.38	0.75	0.53	0.14	N/A
BTA General	-19.50	15.50	-2.00	10.55	0.429
BTA Financial	-19.50	10.50	-0.75	11.31	0.709
BTA Payoff	10.00	70.00	35.41	18.76	0.000
Over Ability P2	-1.33	1.88	0.62	0.83	0.025
Over Ability P3	-2.00	1.00	-0.01	0.90	0.979
Over Precision P2	-16.67	6.38	-1.48	7.25	0.492
Over Precision P3	-18.67	2.60	-5.01	6.78	0.027

Results of wilcoxon signed and rank test for the second market is also given in Table 6.27. It is seen that entry levels for the first and third and for the second and third part is significantly different from each other. In particular, subjects entered the market less when financial knowledge is essential. However, we could not found any significant difference between the entrance

levels of no domain and general knowledge domain and no domain and financial knowledge domain.

Table 6.27: Wilcoxon Signed and Rank Test for the Second Market

		Mean Ranks			
		Negative R.	**Positive R.**	**Z stat.**	**P-value**
	Over Ability P3 – Over Ability P2	6.50	0.00	-3.061[b]	0.002
	Over Precision P3 – Over Precision P2	6.50	0.00	-3.061[b]	0.002
Second	BTA Financial – BTA General	4.70	6.30	-0.412[c]	0.681
Market	Entry 2 – Entry 1	7.50	5.50	-0.473[b]	0.636
	Entry 3 – Entry 1	7.00	2.00	-2.204[b]	0.027
	Entry 3 – Entry 2	4.50	0.00	-2.565[b]	0.010

*b: based on negative ranks, c: based on positive ranks.

Mean BTA score for the general knowledge questions is positive whereas mean BTA score for the investment domain is negative. However, Table 6.27 shows that this difference is not significant. It is seen that subjects of this market are on average overconfident in the domain of general knowledge, whereas on average they are slightly under confident in the domain of investment knowledge in terms of their abilities. Table 6.26 and Table 6.27 indicate that subjects in this second market are less overconfident in the domain of finance both in terms of their abilities and precision of their knowledge. However, overconfidence measures for the excessive precision indicate that subjects are on average under confident. This result may imply that subjects are overconfident about their abilities but not for the precision of their knowledge.

Correlation matrix for the second market is given below. It is seen that bubble score is not significant related to entry levels for the first and second parts. Correlation between bubble score and entry level for the third part indicates that the ones causing bubbles in the market entered the third market where investment knowledge is essential. Hence, this may indicate that rather than general knowledge financial knowledge may be the key factor. However, correlations do not necessarily indicate any causality it is proper to analyze this implication in the regression analysis part. AB score is negatively related to the entry level in the first part. However, except this, there is no significant relation between the AB scores and the overconfidence measures in this second market.

Moreover, it is found that there is no significant relation between any of the overconfidence measures and payoff for the subjects, mean buy, bid prices and the number of bids and asks. However, trading volume is significantly related to the some of the overconfidence measures. In particular, the subjects who stated that they are better than average traded more in this market. . In addition, these people performed worse in the asset market experiment and received lower payoffs. Similarly, the subjects believing in the precision of their knowledge also trade more in this market.

Table 6.28: Correlation Matrix for the Second Market

	Bubble Score	AB	Trading Volume	Ending Balance	Av Buy Price	Av Bid Price	Number of Bids	Number of Asks
Entry P1	-0.388	-0.635*	-0.283	0.204	-0.389	-0.478	-0.257	-0.254
Entry P2	0.488	0.414	0.308	-0.355	0.333	0.493	0.378	0.478
Entry P3	0.633*	0.418	0.421	-0.277	0.141	0.550	0.288	0.671*
BTA General	0.682*	0.064	0.364	-0.717**	0.705*	-0.077	-0.283	-0.181
BTA Financial	0.659*	0.042	0.703*	-0.369	0.288	0.255	0.126	0.532
BTA Payoff	0.404	-0.418	0.330	-0.162	-0.223	0.054	0.192	0.403
Over Ability P2	0.861**	0.147	0.654*	-0.404	0.418	-0.075	0.417	0.555
Over Ability P3	0.708**	0.568	0.496	-0.431	0.562	0.235	0.120	0.305
Over Precision P2	0.895**	0.093	0.715**	-0.468	0.386	0.027	0.360	0.543
Over Precision P3	0.844**	0.382	0.601*	-0.550	0.577*	0.205	0.169	0.388

** Significance at 1% , * Significance at 5%.

6.5. Analyses for the Third Market

Third market consists of 8 subjects and the market summary for mean prices is shown in Table 6.29. In this table, it's seen that mean prices are always quite low. Though mean and median prices significantly increases after 4th period, prices are always lower than the FV until the 11th period. After 11th period prices are slightly over the FV. We observe the trend that prices go up towards the middle of the session similar to previous two sessions. However, different from the previous markets, stocks are traded at very low prices in this period. In this respect, it is not possible to say that these prices form a positive bubble in this market since prices are lower than the FV for the majority of the periods and mean Price - FV spread is quite low, when they are above the FV.

Table 6.29: Market Summary of Mean Prices for the Third Market

Period	Contracts	Volume	Mean Price	Median Price	Fund. Value(FV)	Mean Price - FV
1	8.00	11.00	13.09	13.00	120.00	-106.91
2	14.00	16.00	11.19	9.50	112.00	-100.81
3	17.00	18.00	20.17	15.00	104.00	-83.83
4	10.00	10.00	16.40	14.50	96.00	-79.60
5	15.00	15.00	47.67	40.00	88.00	-40.33
6	5.00	5.00	44.00	40.00	80.00	-36.00
7	11.00	11.00	44.36	26.00	72.00	-27.64
8	7.00	7.00	45.14	50.00	64.00	-18.86
9	8.00	11.00	54.46	42.50	56.00	-1.55
10	7.00	7.00	26.43	28.00	48.00	-21.57
11	12.00	12.00	43.33	43.50	40.00	3.33
12	8.00	9.00	38.78	30.00	32.00	6.78
13	4.00	4.00	34.75	32.50	24.00	10.75
14	3.00	3.00	25.33	35.00	16.00	9.33
15	5.00	5.00	13.60	14.00	8.00	5.60

Individual statistics in Table 6.30 show that some traders buy and sell stocks more frequently than other traders in the market. It's seen that three of the traders trade less frequently in this group of subjects. Looking at Table 6.31 showing the individual statistics for bid prices, it's seen that the number of non-executed bid higher than the FV is also quite low. This indicates that traders in this market offering lower prices. Compared to previous markets, number of non-executed bids over the FV and number of buy contracts over the FV per trader is quite lower in this market. Hence, it is possible to infer that there is no positive bubble, buy may exist a negative bubble in this market. Akifumi (2006: 12) showed that "when individuals become more pessimistic beyond certain level, a negative bubble will be generated". Though negative bubbles are not so common, it is possible to see this kind of bubbles in experimental asset markets.

Table 6.30: Mean Statistics for the Third Period

ID	Mean Buy Price	Number of Buy Cont.	Mean Sell Price	Number of Sell Cont.	Trad. Volume	Number of Stock at the end	Ending Balance
43	24.40	21	35.03	24	45	3	882.00
53	19.40	7	29.00	3	10	5	1016.00
63	26.99	25	25.56	22	47	4	314.00
83	41.11	21	26.86	19	40	3	451.00
93	32.13	27	18.07	29	56	0	28.00
103	27.33	9	48.63	11	20	1	652.00
113	22.86	27	31.34	28	55	1	893.00
133	25.60	6	28.20	7	13	3	564.00

Table 6.31: Summary Statistics for the Third Period

ID	Number of Non Executed Bids (Bid Price>FV)	Number of Non Executed Bids (Bid Price<FV)	Number of Non Executed Bids (Bid Price=FV)	Number of Executed Bids	Number of Non Executed Bids	Mean Non Executed Bid Price	Number of Buy Cont. (Buy Price>FV)	Number of Buy Cont. (Buy Price<FV)	Number of Buy Cont. (Buy Price=FV)	Mean Buy Price
43	0	17	0	3	17	19.40	4	18	0	24.40
53	0	1	0	0	1	5.00	0	7	0	19.40
63	1	13	0	5	14	31.97	4	20	0	26.99
83	7	25	1	3	33	37.83	7	18	0	41.11
93	3	27	1	2	31	14.26	3	24	1	32.13
103	1	11	1	1	13	21.67	1	7	1	27.33
113	4	43	0	1	47	20.59	1	26	0	22.86
133	0	8	0	0	8	9.36	0	6	0	25.60

Table 6.32: Market Summary of Mean Bid and Ask Prices for the Third Market

Period	Mean Bid Price	Number of Bid Cont.	Mean Ask Price	Number of Ask Cont.	Mean Bid Price - FV	Mean Ask Price - FV
1	7.57	7	37.58	12	-112.43	-82.42
2	10.30	10	9.44	16	-101.7	-102.56
3	29.40	20	19.60	15	-74.6	-84.4
4	9.60	15	37.27	11	-86.4	-58.73
5	27.50	12	69.55	11	-60.5	-18.45
6	9.17	12	60.63	8	-70.83	-19.37
7	27.00	8	78.27	11	-45	6.27
8	30.22	18	80.55	11	-33.78	16.55
9	39.79	14	76.50	18	-16.21	20.5
10	21.60	10	59.14	14	-26.4	11.14
11	54.56	9	48.90	21	14.56	8.9
12	29.79	14	59.50	14	-2.21	27.5
13	30.08	12	92.30	10	6.08	68.3
14	14.17	6	56.55	22	-1.83	40.55
15	10.42	12	33.83	18	2.42	25.83

In Table 6.32, it's seen that mean bid prices are always lower than the FV throughout the market except for the 11th, 13th and 15th periods. For these periods, the excess prices are also quite low. Mean ask prices are also lower than the FV until 8th period. These results also indicate that there is no positive bubble in this market.

Table 6.33: Standard Deviations of Mean Buy and Bid Prices for the First, Second and Third Market

Market	Prices	N	Minimum	Maximum	Mean	Std. Dev.
1	Buy Price	448	38.17	117.13	81.88	17.64
	Bid Price	528	20.57	95.30	68.24	21.62
2	Buy Price	231	6.01	250.00	97.23	32.25
	Bid Price	300	1.00	250.00	61.83	41.07
3	Buy Price	133	1.00	100.00	30.61	22.45
	Bid Price	179	1.00	225.00	24.25	26.08

The mean bid and ask prices are also in line with this trend. We can also see the minimum/maximum bid/ask prices and standard deviations from the Table 6.33. It's seen that minimum, maximum and mean prices for this market are lower than those of the previous markets. Standard deviation for the buy and bid prices are higher than that of the first market but lower than that of the second market.

Table 6.34: Min./Max. bid/ask Prices and Standard Deviations for the Third Market

Period	Min Bid Price	Max Bid Price	Std. Dev.	Min Ask Price	Max Ask Price	Std. Dev.
1	1.00	20.00	6.39	12.00	250.00	67.34
2	1.00	40.00	13.56	1.00	35.00	9.33
3	1.00	225.00	54.09	9.00	40.00	10.10
4	1.00	50.00	13.08	12.00	99.00	30.55
5	1.00	90.00	23.75	20.00	100.00	32.89
6	1.00	23.00	6.99	10.00	90.00	28.33
7	1.00	100.00	30.47	10.00	150.00	51.38
8	10.00	65.00	17.64	20.00	150.00	44.22
9	25.00	75.00	13.11	20.00	300.00	62.18
10	1.00	30.00	10.96	25.00	200.01	47.24
11	10.00	102.00	33.94	27.00	100.00	18.37
12	20.00	65.00	11.34	28.00	200.00	44.8
13	20.00	50.00	7.191	30.00	500.00	144.63
14	1.00	40.00	13.90	29.00	200.00	48.02
15	4.00	20.00	4.56	12.00	100.00	26.83

When we investigate the bid and ask prices across periods of this session, we see that even maximum bid price in each period is quite low. Together with lower mean prices, this result also supports the hypothesis that there is no positive bubble in this market. We can see the price graphic and bubble formation (if any) simply in Figure 6.45. Figure 6.45 shows contract prices for all of the periods in this third market. It's seen that majority of the contract prices are lower than the FV in this market. Prices start to increase towards

the middle of the session but still majority of them are lower than the FV. After 11th period, all of the contract prices are higher than the FV, but the number of contracts in these periods is quite low.

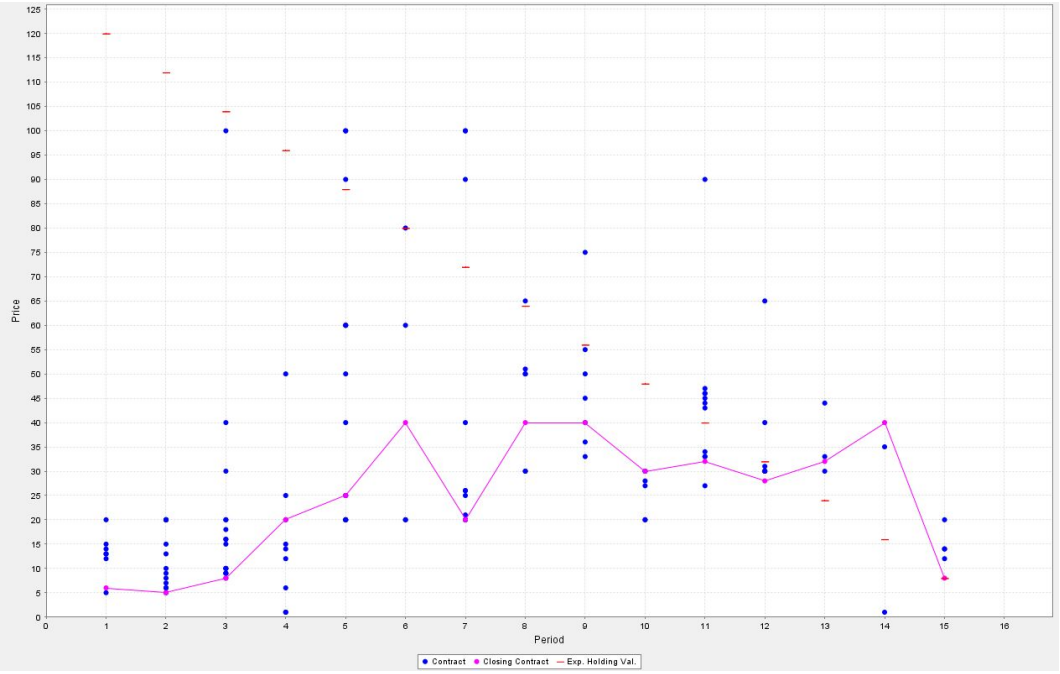

Figure 6.45: Session Summary for the Third Market

Figure 6.45 explicitly shows that there is no positive bubble; however it is possible that there exists a negative bubble.

Table 6.35: Bubble Measures for the First, Second and Third Market

Market	PA	AB	TD	Turnover	RD	RAD	DUR
1	0.70	19.27	384.79	7.40	30%	42%	10 periods
2	0.70	20.69	395.59	7.70	36%	43%	7 periods
3	0.98	-35.10	600.50	6.70	-50%	58%	12 periods

We can use the bubble measures to examine with the Figure 6.45. PA is higher in this market than in the previous markets. This may partly due to the small difference between the minimum deviation and maximum mean price – FV deviations. We see that AB is negative in contrast to the previous markets. Relative deviation is also negative. Asset turnover rate is lower. Total dispersion is the absolute deviation of prices from their fundamental values over the life cycle of the stock. It's seen that TD is the highest for this market among the other markets.

Table 6.36: Comparison of Bubble Measures for the Third Market

Previous Studies	Turnover	PA	AB	TD
Noussair and Tucker (1996)	0.96	0.33	N/A	N/A
Smith, Suchanek, and Williams (1988)	4.55	1.24	N/A	N/A
Porter and Smith (1995)	5.49	1.53	N/A	N/A
Kirchler, Huber and Stöckl (2009)	N/A	0.82	14.73	202.93
Values for the Third Market in our Experiment	6.70	0.98	-35.10	600.50

It is seen that stock prices are highly undervalued in this market. These results may indicate that there is negative bubble in this third market. It is seen in Table 6.36, negative deviation (stocks are undervalued) is only observed in our experiment. This result is also quite interesting in that negative bubbles are not observed in experimental asset markets before.

Figures 6.46 - 6.60 show bid prices, ask prices and contract prices in each of the 15 periods. When we look at the Figure 6.46 showing the results for the 1st period, it's seen that the volatility of the contract prices are quite low. In line with contract prices bid and ask prices are also showing lower dispersion compared to the previous markets.

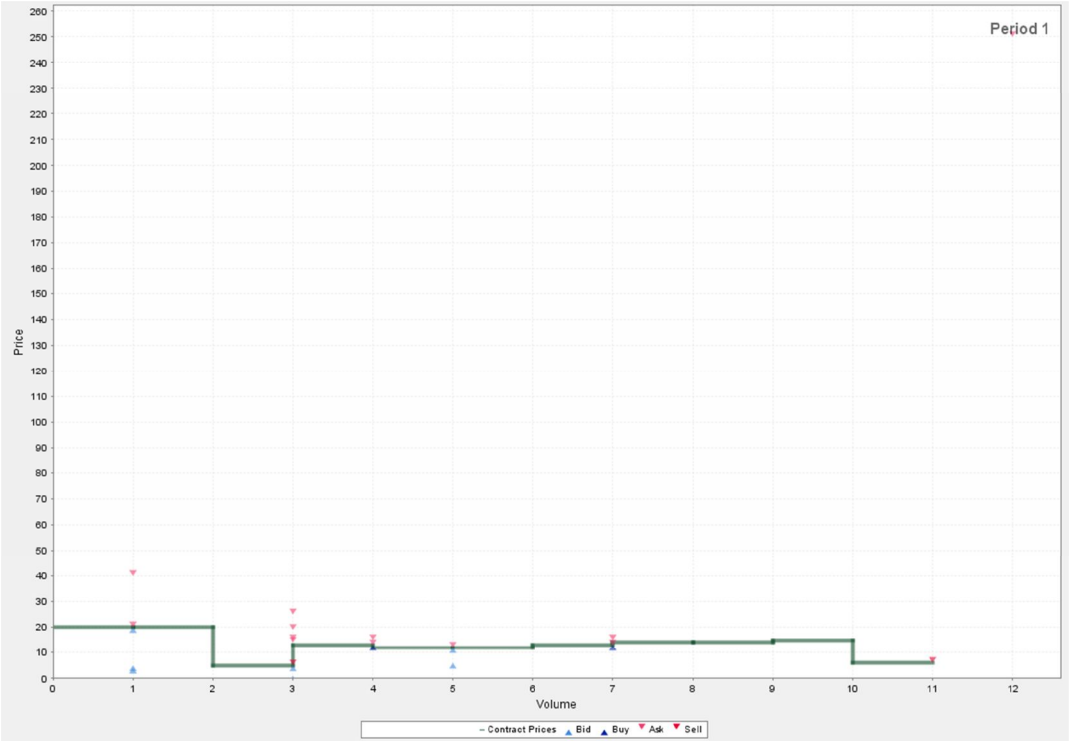

Figure 6.46: Prices in Period 1 for the Third Market

Figure 6.47 shows the results for the 2nd period. Though mean bid and ask prices are very close to each other, it's seen that prices are much more volatile in this period (Please see Table 6.32). This may mean that traders accept best bid/ask prices of other traders. Mean prices are indeed lower than that of previous period. Trading volume slightly increased in this period (Please see Table 6.29). A surprising result is that in contrast to the previous periods traders are willing to sell their stocks at quite low prices.

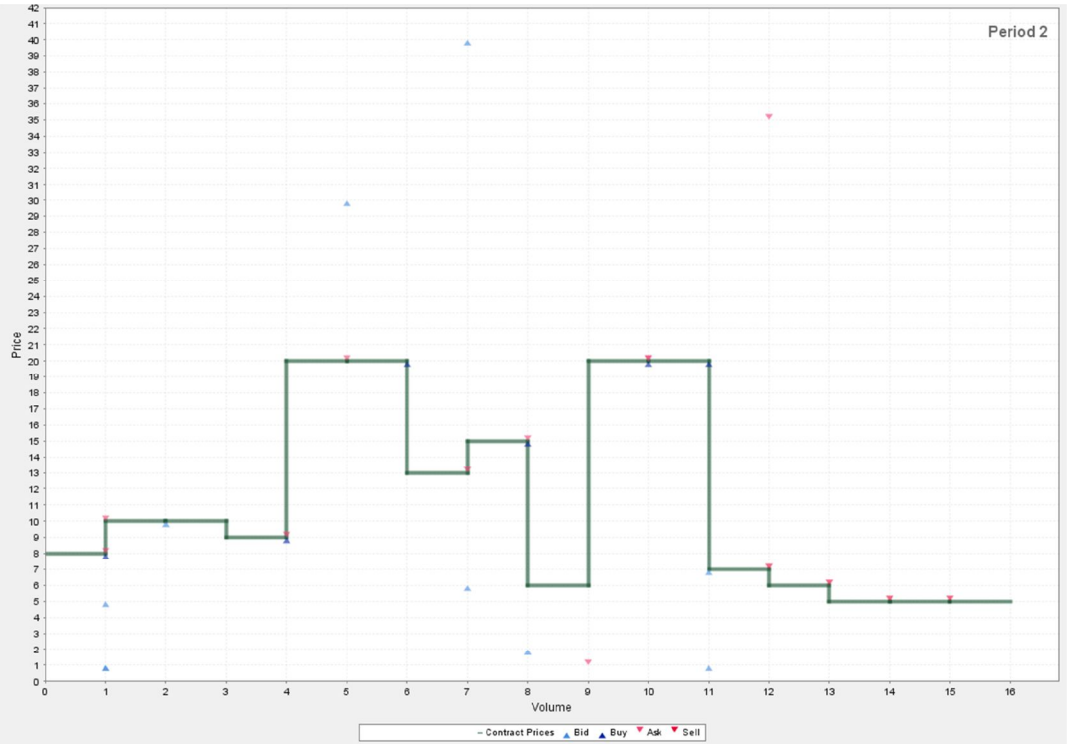

Figure 6.47: Prices in Period 2 for the Third Market

The maximum ask prices in this period is 40, the highest contract price is 20 which shows that none of the traders are willing to buy that stock at that price though its fundamental value is 108. This might be due existence of overly pessimistic traders expecting no dividend payment for all of the periods (lowest dividend payout is 0). However, it's not logical to do so, since these the probability of dividend payments are equal for each of the periods. Figure 6.48 shows the results for the 3rd period, we can see that the except for the contract price at 100 guldens, all of the contract prices are lower than the FV. The contract prices are slightly higher than those of the previous periods. Mean bid/ask prices are also higher together with mean contract prices.

Trading volume is highest among the periods in this market (Please see Table 6.29). Closing transaction price is the lowest contract price in this period.

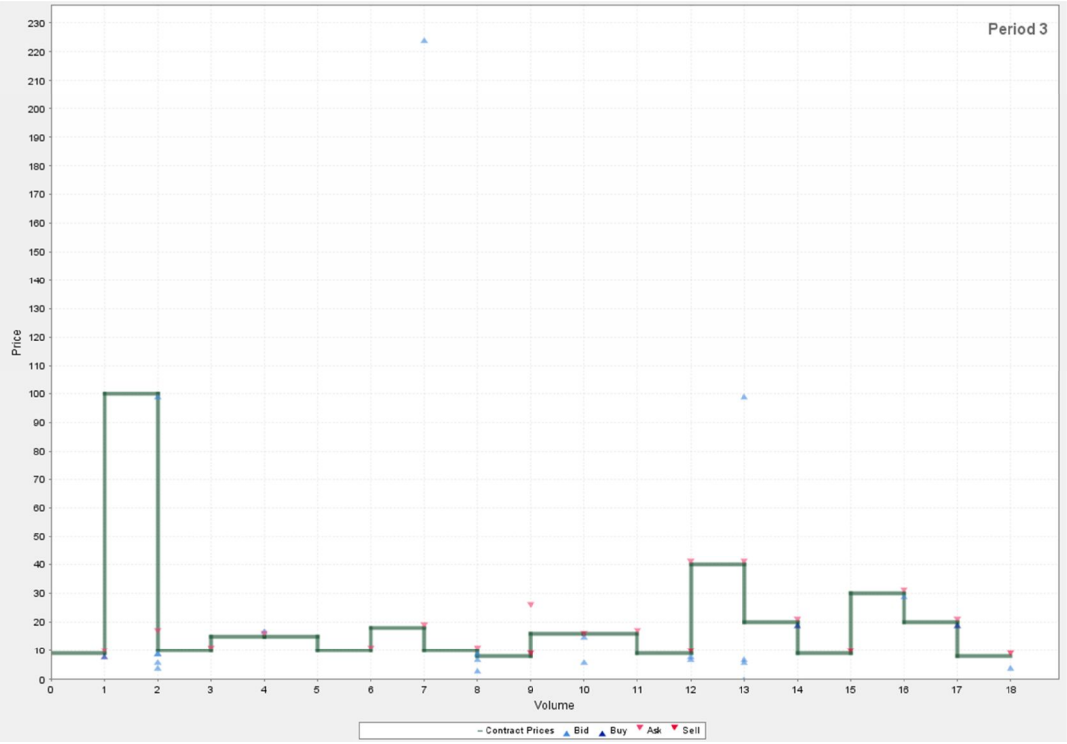

Figure 6.48: Prices in Period 3 for the Third Market

Figure 6.49 shows the results of 4th period, there is high deviation among contract prices, the highest contract price is 50 and the lowest one is only 1. Closing contract price is 20. The prices are still under the FV. The high dispersion of contract prices may indicate there is no consensus for the price of the stock. Starting from this period, mean ask prices significantly increase (Please see Table 6.32). This may point out that traders are willing to sell their stocks at higher levels. In this respect, they may recognize that prices should

be higher than these levels. However, we cannot see a similar trend for the buyers.

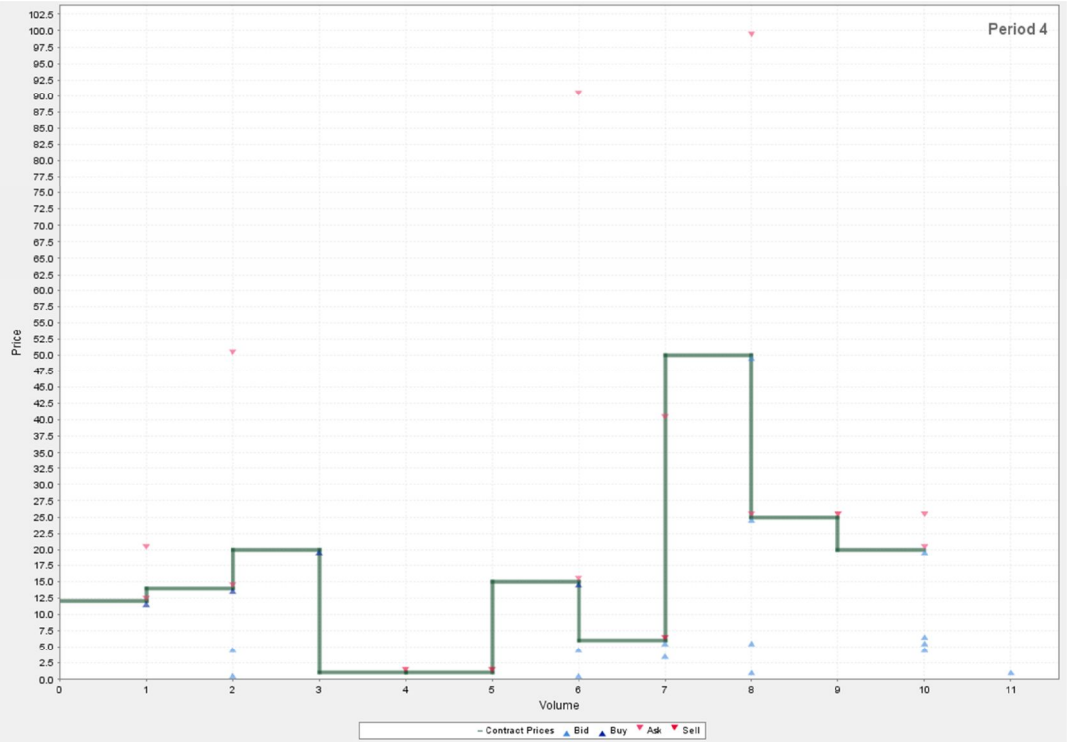

Figure 6.49: Prices in Period 4 for the Third Market

Figure 6.50 shows the results for the 5th period, we see a relatively higher deviation of contract prices. Mean price significantly increased from 16.40 to 47.67 compared to previous period. Mean bid and ask prices also increased in this period. There are two contract prices over the FV and these prices are among the highest in this market. The lowest and the highest contract prices are 20 and 100 guldens. The highest bid price is 90 guldens whereas the lowest bid price is only 1 gulden. Standard deviation of bid prices is 23.75 (Please see the Table 6.34). The highest and the lowest ask prices are 100 and

20 guldens respectively. Standard deviation of ask prices is 32.89. We may infer from these results that there is still no consensus on the price of the stocks. In other words, traders have different opinions about the value of the stock.

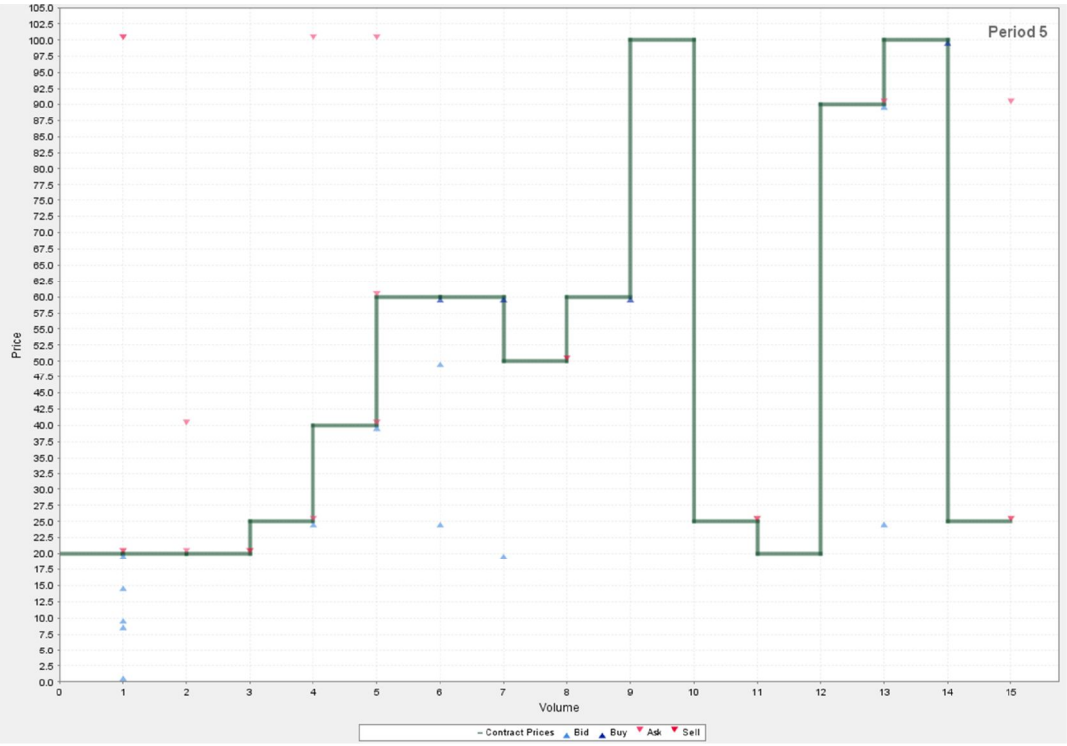

Figure 6.50: Prices in Period 5 for the Third Market

Figure 6.51 shows the results for the 6th period, it's seen that the trading volume is quite low. There is only one trade at a price exactly equal to the FV, and the rest of the trades is under the FV. It's also seen that there are some asks and bids after the 5th contract but traders did not accept best ask/bid prices. The best ask price is 40, whereas best bid price is 22.5. Closing contract price is among the highest across the periods in this market.

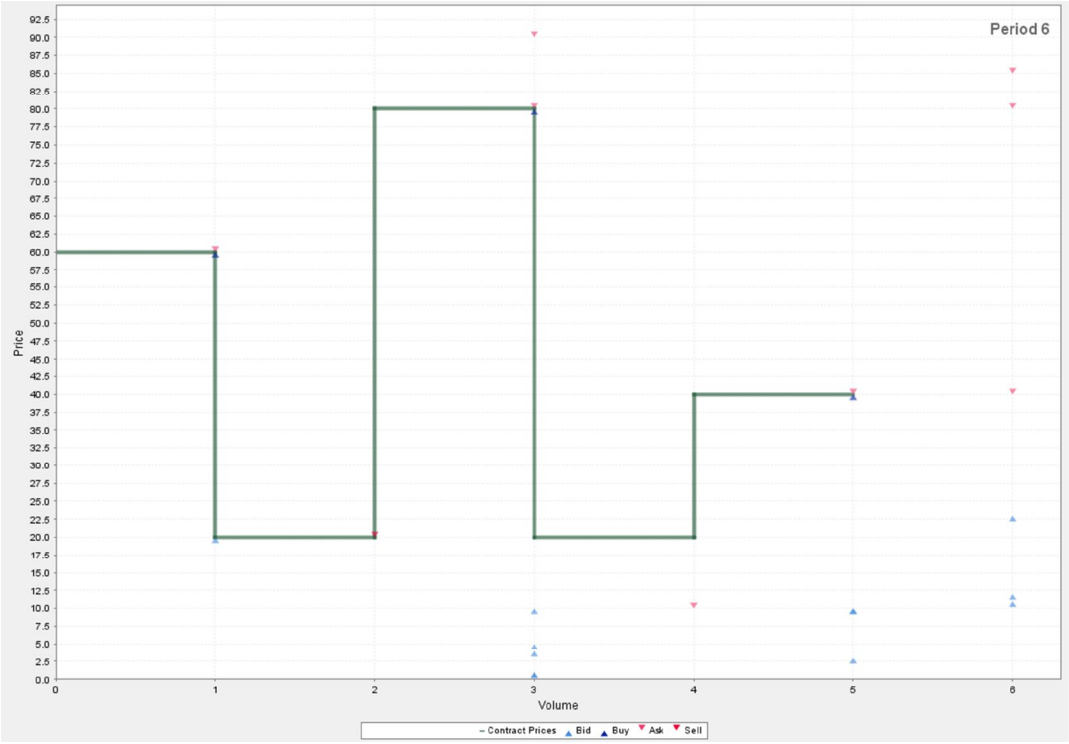

Figure 6.51: Prices in Period 6 for the Third Market

It's seen from the Figure 6.52 for the period 7th that the volatility of the contract prices is relatively higher. Standard deviation of bid prices is the highest in this session (Please see the Table 6.34). There are two trades over the FV, and the minimum contract price is 20 guldens. Starting from this period, mean ask prices are higher than the FV until the end of the session. After the 4th transaction, we see that the volatility of the prices is quite low. Most of the trades are executed at a price in-between 20 and 25 guldens.

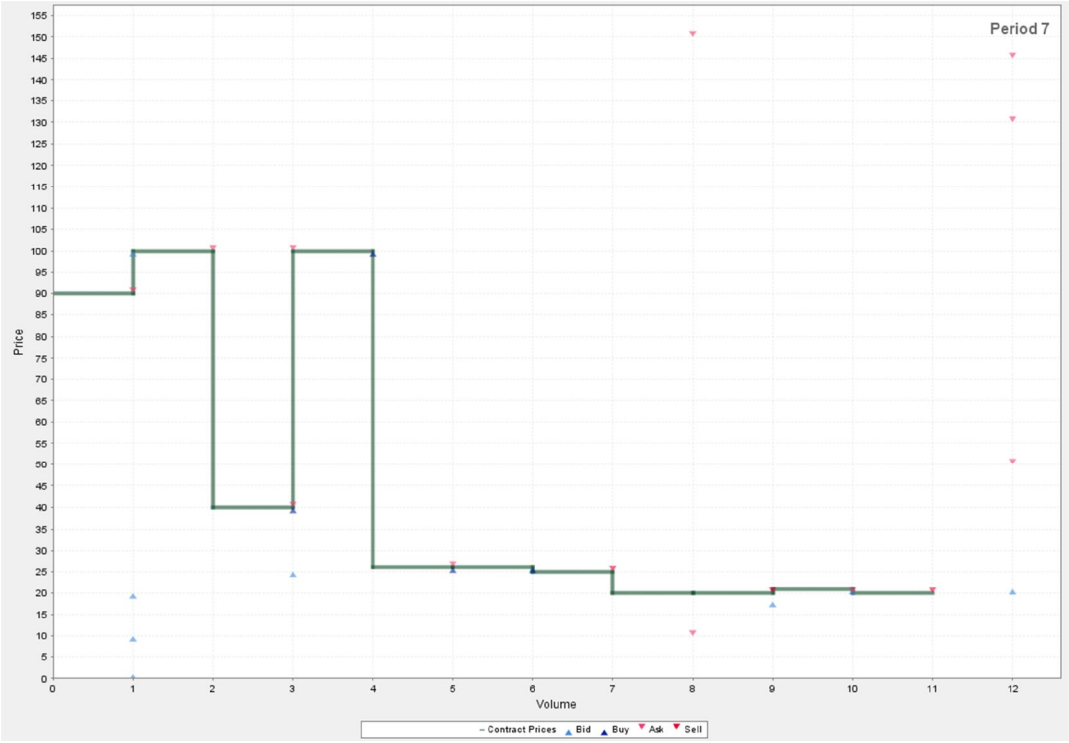

Figure 6.52: Prices in Period 7 for the Third Market

Figure 6.53 shows the results for the 8th period, we can see that the transaction price at the beginning of this period is again almost same for the last transaction price. The mean and median prices for this period are 45.14 and 50.00 respectively (Please see the Table 6.29). Some contract prices are very close to the FV. The highest bid price is 65 guldens whereas the lowest bid price is 10 guldens. Standard deviation of bid prices is 17.64 (Please see the Table 6.12). The highest and the lowest ask prices are 150 and 20 guldens respectively. Standard deviation of ask prices is 44.22. Trading volume is again quite low. The bid-ask spread between best offers is also quite high.

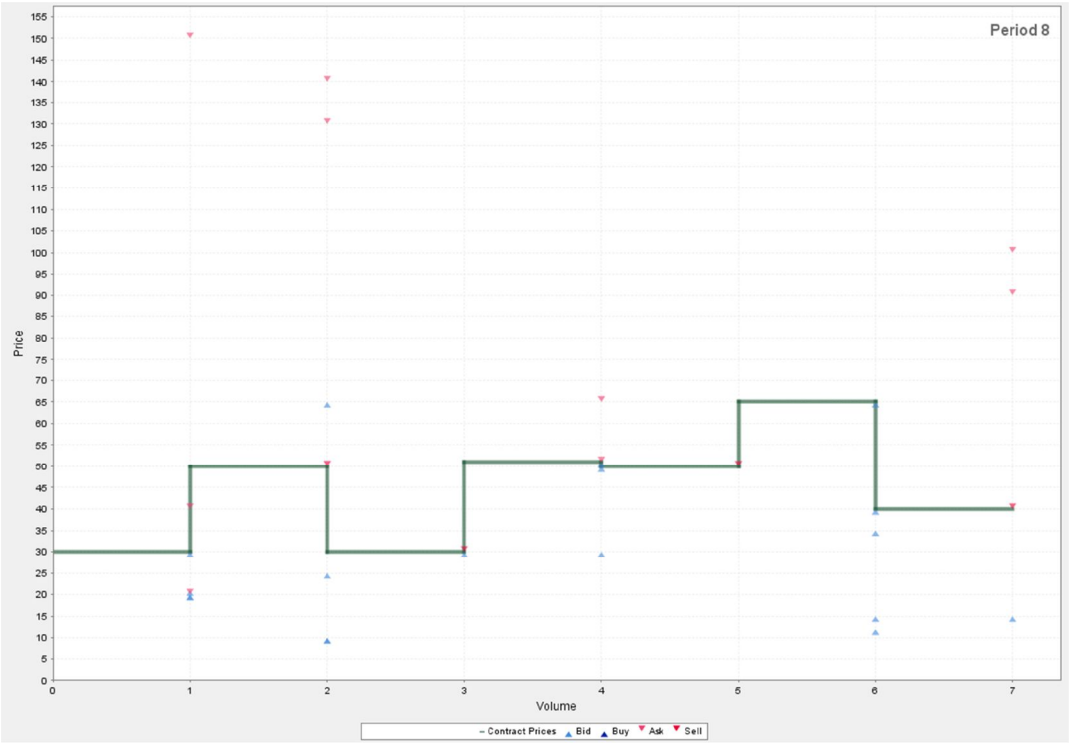

Figure 6.53: Prices in Period 8 for the Third Market

This may indicate that most of the traders are not willing to sell stock at a price lower than the FV, and the executed trades are the ones who are overly pessimistic about the stream of the realized dividend payments. It's seen from the Figure 6.54 that the contract prices are relatively higher. Indeed, mean price for this 9th period is the highest among all of them. The mean price is 54.46, and the FV is 56 for this period (Please see the Table 6.29). The mean price is slightly below the FV in this period. Figure 6.45 shows that most of the contract prices are close the FV. Standard deviation of bid prices is also lower in this period (Please see the Table 6.34).

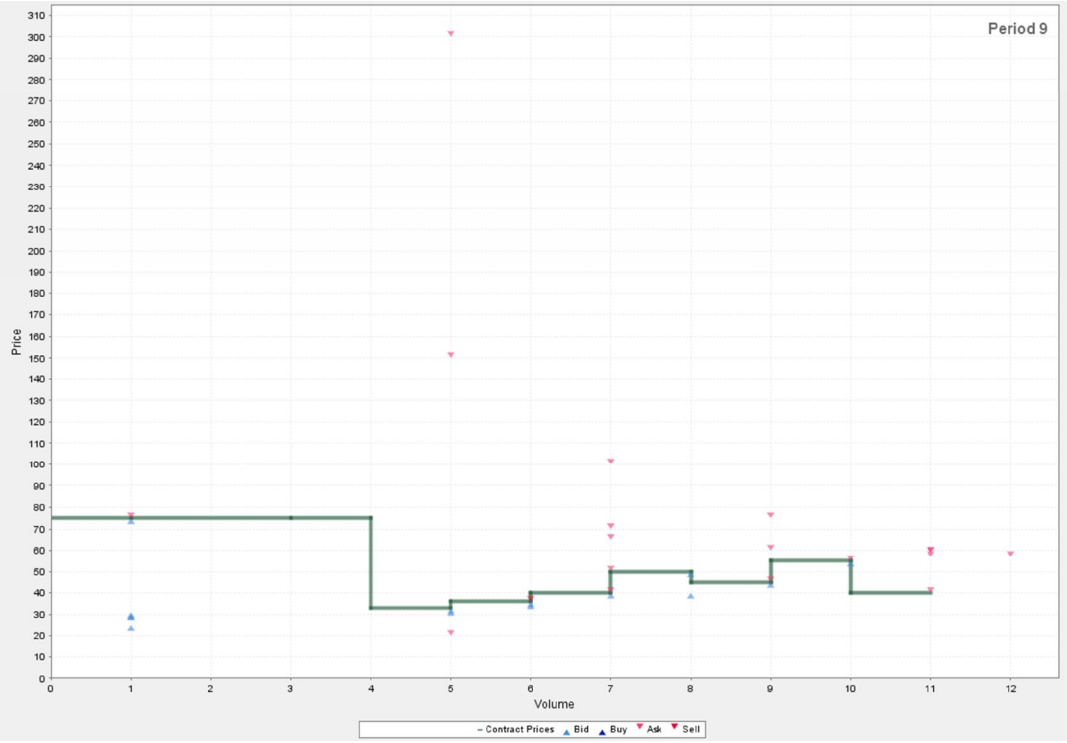

Figure 6.54: Prices in Period 9 for the Third Market

Figure 6.55 show bid, ask and contract prices in for the 10th period. When we look at the Figures 5.43, it's seen that the dispersion of contract prices is quite low. Highest contract price is 30 guldens whereas the lowest price is 20 guldens in this period. Mean prices fall dramatically from 54.46 to 26.43 compared to previous period. Some traders are still expecting to sell their stock at a price higher than the FV. However, it's seen that buyers are not willing to trade at those prices.

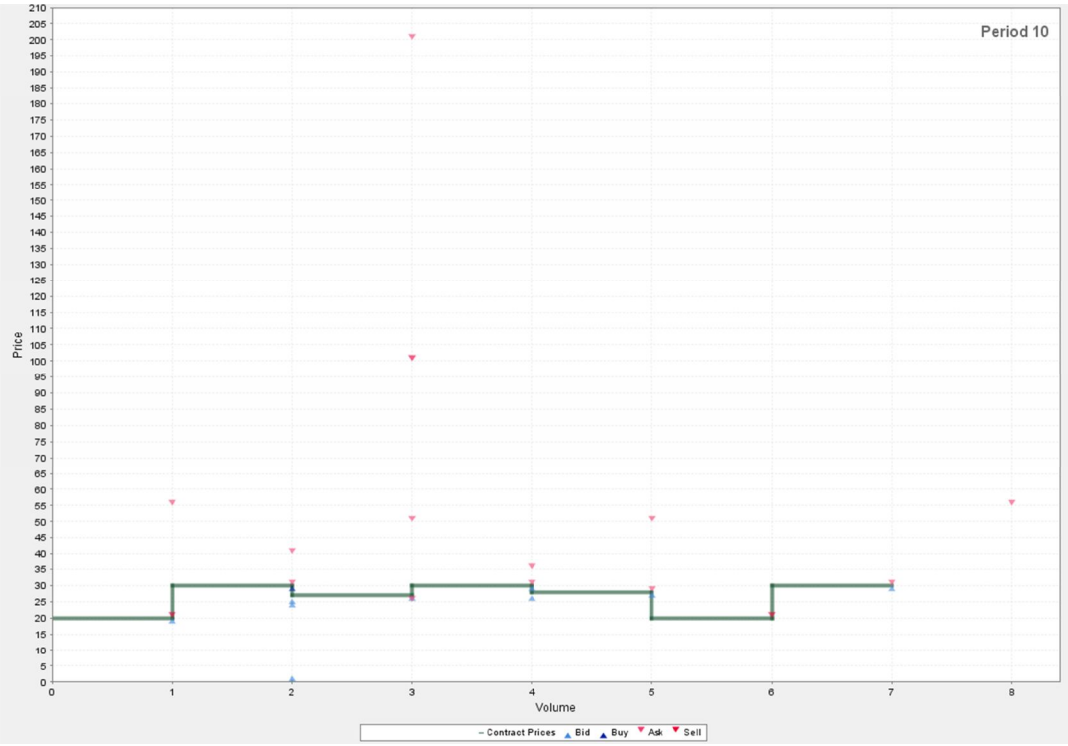

Figure 6.55: Prices in Period 10 for the Third Market

Figure 6.56 shows the results for the 11th period, it's seen that surprisingly, some traders are willing to buy stock at a price higher than the FV in this period. Indeed, mean prices are not at their highest levels in this session but

they are high enough to be above the FV. starting from this period mean prices are always higher than the FV. This result is in contrast to the results of the previous markets. Generally, in a positive bubble, stock prices start to fall towards the end of the experiment. However, the mean prices are higher than the FV for each of the periods starting from this period in this market. This result point out a negative bubble burst. In other words, prices start to goes up towards the end of the experiment. Alternatively, another explanation is that FV may not be the only factor in evaluating the price of the stock for the traders.

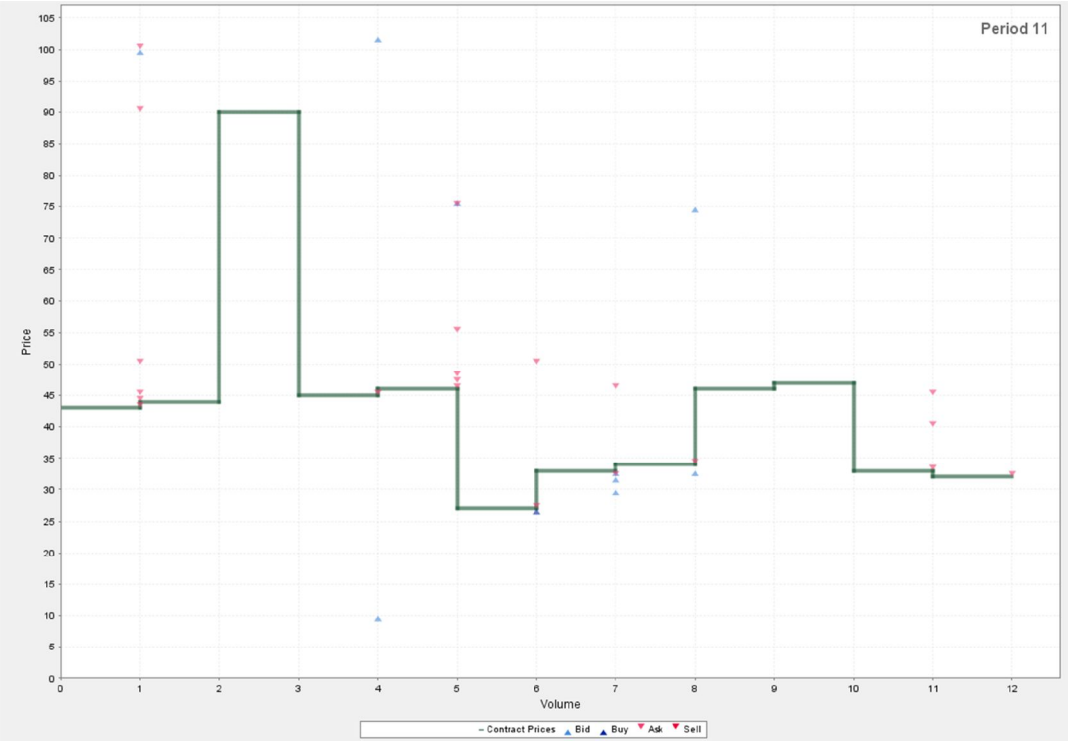

Figure 6.56: Prices in Period 11 for the Third Market

Figure 6.57 shows the results for the 12th period. In comparison to previous period, mean prices in this period fall less than the amount of decrease in FV. Hence, mean prices – FV spread is even higher in this period compared to previous period. Contract prices are also close to each other. Standard deviation of bid prices is also quite low in this period (Please see the Table 6.34).

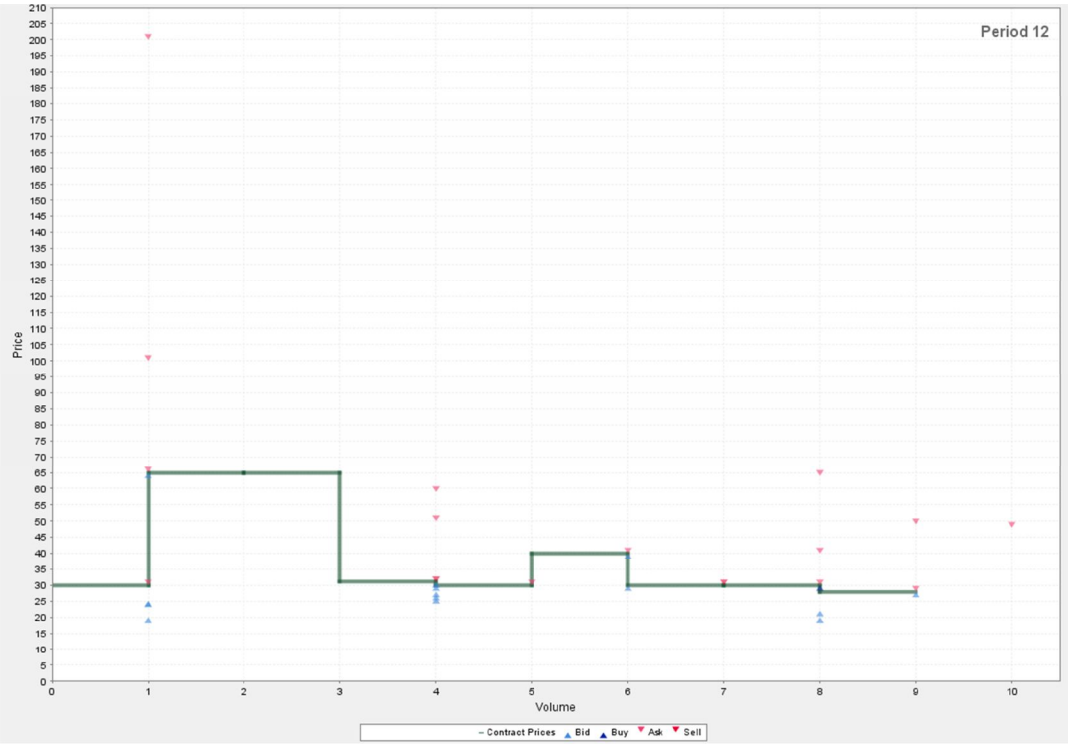

Figure 6.57: Prices in Period 12 for the Third Market

Figure 6.58 show bid, ask and contract prices in for the 13th period. The first transaction price is almost equal to the last transaction price. The transaction prices almost form a horizontal line. Trading volume is very low in this session. However, this is the period where highest mean price – FV spread is observed. This period is also the first period that all of the contract prices are higher than the FV. Hence, we may say that negative bubble burst is still in process.

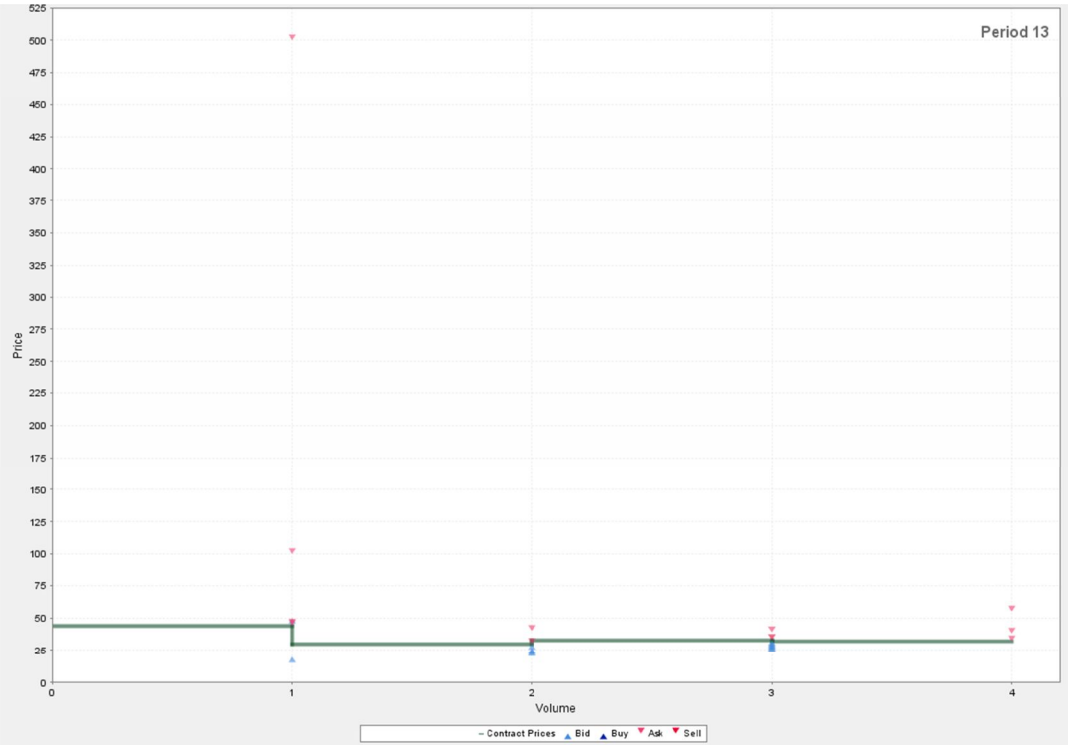

Figure 6.58: Prices in Period 13 for the Third Market

Figure 6.59 shows the results for the 14th period. Mean price decreased from 34.75 to 25.33 in this period, but mean prices are still over the FV (Please see the Table 6.32). Mean bid and ask prices also fall dramatically in this period but there are still lots of asks over the FV. There are only 3 contracts in this period. We think that it is due to the higher ask prices appeared in this period. Since the mean – FV spread is still positive, we may infer that negative bubble burst still exist in this period.

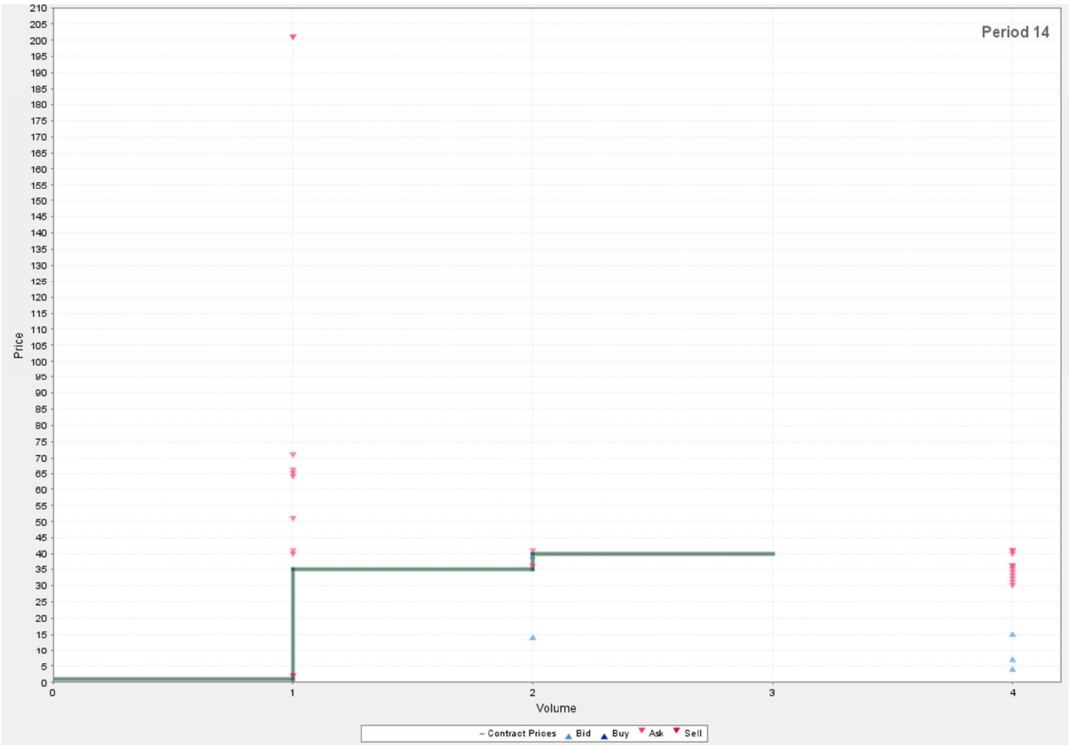

Figure 6.59: Prices in Period 14 for the Third Market

Figure 6.60 show bid, ask and contract prices in for the last period. Mean price decreased from 25.33 to 13.60 in this period, but mean prices are still over the FV. Mean bid and ask prices are 10.42 and 33.83 respectively.

Maximum bid prices are exactly equal to the maximum possible dividend payment (Please see the Table 6.29 and Table 6.34). Mean price - FV spread is among the lowest for the last four periods, and the second lowest one for the whole session. So we may infer that mean prices are very close to the FV in this last session. Hence, we may conclude that negative bubble burst process is ended in this period.

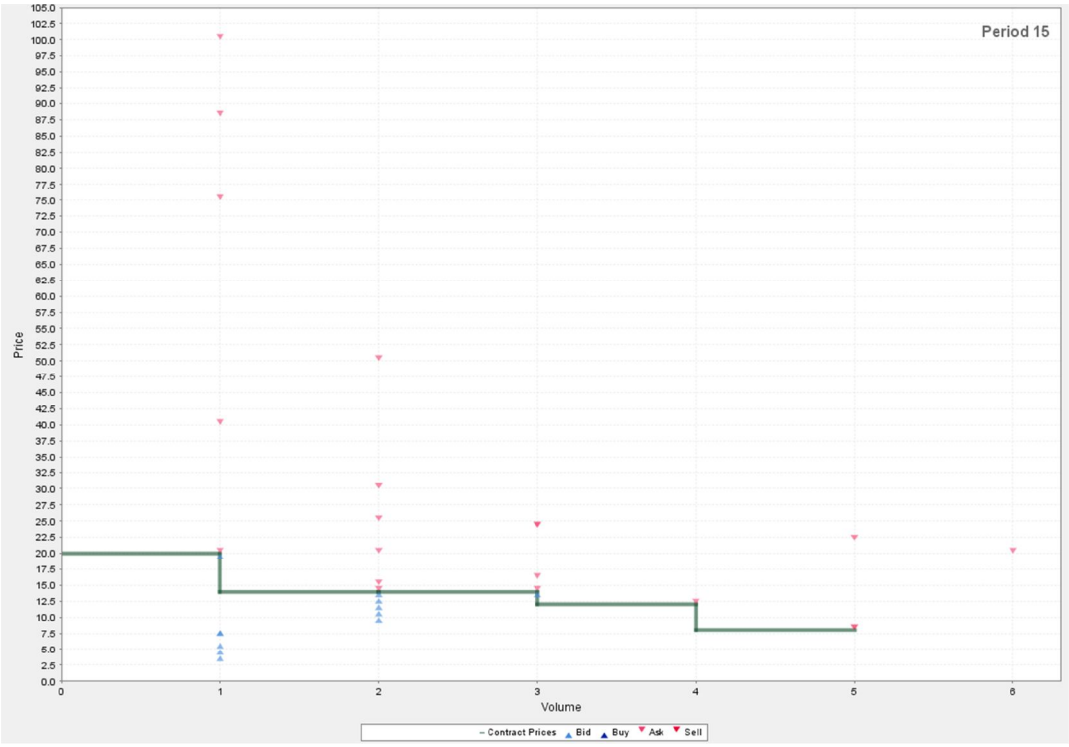

Figure 6.60: Prices in Period 15 for the Third Market

Overall, it is seen that there might be a negative bubble in this third market of the asset market experiment. Different from the previous markets, the prices are quite lower than the fundamental values in this market. Descriptive statistics for this second market is given in Table 6.37. Results indicate that

subjects of this market do not see themselves above average in terms of their knowledge. Moreover, subjects also do not estimate their payoff above average. However, it is seen that subjects see themselves below average in the domain of financial knowledge. It is also seen that subjects are under confident about their abilities in both of the domains. In addition, it is seen that subjects are under confident about precision of their knowledge in either of the domains.

Table 6.37: Descriptive Statistics for the Third Market of the Overconfidence Experiment

	Minimum	Maximum	Mean	Std. Dev.	P-Value
Entry P1	0.63	1.00	0.87	0.13	N/A
Entry P2	0.25	0.75	0.55	0.15	N/A
Entry P3	0.25	0.75	0.52	0.15	N/A
BTA General	-4.50	10.50	1.75	5.18	0.516
BTA Financial	-14.50	5.50	-6.37	7.04	0.028
BTA Payoff	-10.00	20.00	-0.62	9.43	0.857
Over Ability P2	-1.25	-0.17	-0.59	0.37	0.003
Over Ability P3	-2.00	-0.50	-1.37	0.61	0.000
Over Precision P2	-11.60	-4.50	-8.40	2.36	0.000
Over Precision P3	-18.50	-9.40	-12.62	3.33	0.000

In this third market different from previous markets, subjects entered the market less often when rankings based on general and financial knowledge rather than random rankings. However, we could not found any significant difference between the entry levels in the domain of general knowledge and domain of financial knowledge. Only positive mean BTA score is the score for the general knowledge questions.

Table 6.38: Wilcoxon Signed and Rank Test for the Third Market

		Mean Ranks			
		Negative R.	Positive R.	Z stat.	P-value
Third Market	Over Ability P3 – Over Ability P2	4.86	2.00	-2.243[b]	0.025
	Over Precision P3 – Over Precision P2	4.50	0.00	-2.521[b]	0.012
	BTA Financial – BTA General	4.00	0.00	-2.414[b]	0.016
	Entry 2 – Entry 1	4.50	0.00	-2.539[b]	0.011
	Entry 3 – Entry 1	4.50	0.00	-2.539[b]	0.011
	Entry 3 – Entry 2	2.25	1.50	-0.816[b]	0.414

*b: based on positive ranks.

This may indicate that on average, subjects of this period are overconfident only in terms of their general knowledge; however, they are under confident for the rest of the domains. In addition, Table 6.38 shows that subjects place themselves better than average less in the domain of financial knowledge compared to that of in the domain of general knowledge. However, over ability and over precision scores for the second and third part, indicates that subjects in this period are under confident in terms of their general and financial knowledge. Moreover, results in Table 6.38 show that subjects in this third market are less overconfident in the domain of finance both in terms of their abilities and precision of their knowledge. Indeed, these results support the idea that negative bubbles may be formed due the under confidence of the subjects in this market. Correlation matrix for the third market is given below. It is seen that bubble score is significantly related to only for BTA general and BTA financial scores. Other overconfidence measures are not correlated with bubble measures. Trading volume is only correlated with over ability score for the second part. Over ability score for the second part is also positively related to the mean buy price and number of bids. However, these results are not consistent to reach a conclusion for this third market.

Table 6.39: Correlation Matrix for the Third Market

	Bubble Score	AB	Trading Volume	Ending Balance	Av Buy Price	Av Bid Price	Number of Bids	Number of Asks
Entry P1	0.298	0.052	0.816*	-0.204	0.199	0.643	0.659	0.662
Entry P2	0.625	0.572	0.488	-0.700	0.861**	0.809*	0.531	-0.054
Entry P3	0.431	0.416	0.094	-0.204	0.421	0.722*	0.188	0.273
BTA General	0.774*	0.284	0.048	0.032	0.497	0.829*	0.170	0.262
BTA Financial	0.851**	0.528	0.480	-0.586	0.833*	0.919**	0.469	0.038
BTA Payoff	0.744*	0.412	-0.245	-0.268	0.746*	0.535	-0.013	-0.382
Over Ability P2	0.580	0.020	0.768*	-0.157	0.490	0.826*	0.794*	0.523
Over Ability P3	0.263	0.075	0.048	-0.308	0.219	-0.051	-0.030	-0.398
Over Precision P2	0.481	-0.442	0.266	0.212	0.302	0.338	0.513	0.227
Over Precision P3	0.519	-0.076	0.133	-0.424	0.354	0.224	0.181	-0.157

** Significance at 1% , * Significance at 5%.

6.6. Analyses for the Fourth Market

The fourth market consists of 12 subjects and the market summary is presented in Table 6.40. In this table it's seen that mean contract prices in the first three periods are lower than the FV. However, starting from the 4th period traders start to pay higher prices than the FV. The prices in-between 4th and 8th are quite close to each other's. After 8th period, mean prices start to decrease. Mean price reaches its lowest point in the last period. The number of contracts also decreases towards the end of the session.

Table 6.40: Market Summary of Mean Prices for the Fourth Market

Period	Contracts	Volume	Mean Price	Median Price	Fund. Value (FV)	Mean Price - FV
1	30.00	31.00	95.65	100.00	120.00	-24.36
2	33.00	34.00	91.47	100.00	112.00	-20.53
3	22.00	26.00	100.08	92.50	104.00	-3.92
4	20.00	30.00	97.60	90.00	96.00	1.60
5	19.00	21.00	89.29	90.00	88.00	1.29
6	18.00	20.00	87.95	92.50	80.00	7.95
7	21.00	29.00	93.17	90.00	72.00	21.17
8	30.00	33.00	89.18	88.00	64.00	25.18
9	24.00	30.00	76.47	84.00	56.00	20.47
10	23.00	24.00	66.29	55.00	48.00	18.29
11	22.00	24.00	64.08	64.00	40.00	24.08
12	23.00	26.00	54.42	60.00	32.00	22.42
13	19.00	22.00	51.46	52.00	24.00	27.46
14	9.00	9.00	51.56	60.00	16.00	35.56
15	9.00	9.00	20.11	15.00	8.00	12.11

This may imply that though the number of people paying higher prices may decrease, some people may consistently pay higher prices than the FV. Individual statistics in Table 6.42 show that some traders consistently pay higher prices though some traders reasonably pay prices equal to or under

the FV. Table 6.43 shows that mean bid prices are higher than the FV after 6th period whereas mean ask prices are higher than the FV for all of the periods. However, individual price statistics indicate that (Please see Appendix A) though some traders bid and buy higher than the FV, some of them are consistently bid and buy at a price under the FV or even do not bid or buy at these price levels. Hence, again we may infer that there is heterogeneity across traders also in this session similar to the previous sessions in terms of their trading behaviors.

Table 6.41: Mean Statistics for the Fourth Market

ID	Mean Buy Price	Number of Buy Cont.	Mean Sell Price	Number of Sell Cont.	Trad. Volume	Number of Stock at the end	Ending Balance
194	64.96	37	80.54	37	74	1	458.00
214	74.09	31	81.30	21	52	11	788.00
224	89.87	27	81.28	30	57	0	1334.00
234	68.31	24	78.48	26	50	0	1234.00
244	77.70	24	77.88	21	45	4	711.00
254	84.17	16	61.79	20	36	0	53.00
264	67.52	65	56.96	68	133	1	22.00
284	77.68	23	68.62	26	49	0	164.00
294	59.81	15	72.06	15	30	1	1650.00
304	62.40	19	83.61	11	30	10	668.00
324	56.13	29	70.47	29	58	2	1180.00
334	60.98	58	65.45	63	121	0	18.00

Table 6.42: Summary Statistics for the Fourth Market

ID	Number of Non Executed Bids (Bid Price>FV)	Number of Non Executed Bids (Bid Price<FV)	Number of Non Executed Bids (Bid Price=FV)	Number of Executed Bids	Number of Non Executed Bids	Mean Non Executed Bid Price	Number of Buy Cont. (Buy Price>FV)	Number of Buy Cont. (Buy Price<FV)	Number of Buy Cont. (Buy Price=FV)	Mean Buy Price
194	2	28	0	10	30	58.15	23	27	0	64.96
214	20	29	2	17	51	63.84	20	14	0	74.09
224	0	15	0	0	15	47.71	0	27	0	89.87
234	0	2	1	1	3	47.63	18	23	0	68.31
244	3	13	1	5	17	54.07	17	19	0	77.70
254	2	23	1	1	26	70.45	13	15	0	84.17
264	14	31	0	30	45	70.39	46	35	0	67.52
284	11	18	2	3	31	52.48	19	19	1	77.68
294	2	20	1	3	23	51.02	4	12	0	59.81
304	4	9	1	17	14	50.12	19	2	0	62.40
324	5	9	1	17	15	60.51	17	10	2	56.13
334	12	17	2	26	31	75.54	31	31	1	60.98

Table 6.43: Market Summary of Mean Bid and Ask Prices for the Fourth Market

Period	Mean Bid Price	Number of Bid Cont.	Mean Ask Price	Number of Ask Cont.	Mean Bid Price - FV	Mean Ask Price - FV
1	59.26	34	119.50	30	-60.74	-0.5
2	51.23	43	162.35	34	-60.77	50.35
3	70.43	35	107.59	29	-33.57	3.59
4	77.67	30	107.50	26	-18.33	11.5
5	68.40	40	102.69	32	-19.6	14.69
6	77.88	32	104.59	29	-2.12	24.59
7	78.92	37	104.97	38	6.92	32.97
8	78.89	36	107.29	41	14.89	43.29
9	71.18	38	98.03	37	15.18	42.03
10	53.83	23	76.20	40	5.83	28.2
11	58.48	21	85.86	42	18.48	45.86
12	53.07	15	72.06	32	21.07	40.06
13	41.39	23	70.11	36	17.39	46.11
14	39.82	11	72.14	35	23.82	56.14
15	15.72	16	103.71	41	7.72	95.71

In Table 6.43, it's seen that the number of ask contracts increases as the end of the experiment comes whereas the number of bid contracts decreases. This implies that most traders willing to sell their stocks towards the end of the experiment. Since mean prices in the last period is higher than the FV, we may say that it is logical to sell at these prices.

Table 6.44: Standard Deviations of Mean Buy and Bid Prices for the First, Second, Third and Fourth Market

Market	Prices	N	Minimum	Maximum	Mean	Std. Dev.
1	Buy Price	448	38.17	117.13	81.88	17.64
	Bid Price	528	20.57	95.30	68.24	21.62
2	Buy Price	231	6.01	250.00	97.23	32.25
	Bid Price	300	1.00	250.00	61.83	41.07
3	Buy Price	133	1.00	100.00	30.61	22.45
	Bid Price	179	1.00	225.00	24.25	26.08
4	Buy Price	322	8.00	170.00	79.12	24.94
	Bid Price	431	1.00	170.00	64.06	27.67

When we investigate the number of stocks at the end of the experiment from Table 6.41, we see that majority of the sold their stocks in their portfolios. It's seen that most of the stocks are bought by only two traders. We may infer that these traders are optimistic about the last dividend payment, since the FV equals to 8 guldens, mean contract price is 15.72, and the maximum possible dividend payment is 20 guldens. Positive mean price – FV values may indicate the existence of bubble in this fourth market. We may examine the bubble formation simply in Figure 6.61.

Table 6.45: Min./Max. bid/ask Prices and Standard Deviations for the Fourth Market

Period	Min Bid Price	Max Bid Price	Std. Dev.	Min Ask Price	Max Ask Price	Std. Dev.
1	10.00	170.00	38.16	10.00	300.00	72.35
2	1.00	150.00	31.51	20.00	300.00	54.98
3	10.00	130.00	35.06	30.00	250.00	50.31
4	10.00	110.00	26.95	60.00	200.00	25.85
5	10.00	120.00	23.17	50.00	150.00	23.69
6	50.00	110.00	13.20	50.00	200.00	31.62
7	50.00	100.00	14.93	75.00	200.00	24.97
8	50.00	120.00	15.60	50.00	300.00	47.47
9	50.00	105.00	12.79	50.00	500.00	69.96
10	1.00	100.00	19.15	50.00	130.00	21.96
11	35.00	100.00	16.39	55.00	300.00	44.02
12	30.00	75.00	12.95	35.00	200.00	29.87
13	10.00	82.00	21.52	30.00	180.00	33.14
14	10.00	75.00	23.20	30.00	140.00	19.05
15	3.50	60.00	13.79	10.00	438.00	100.46

It's seen that until the 6th period, majority of the contract prices and mean price are lower than the FV. However, after 6th period, all of the contract prices are higher than the FV until the last period. There is a sharp decrease in the last period. Hence we may infer that bubble periods go on until the end of the 14th period.

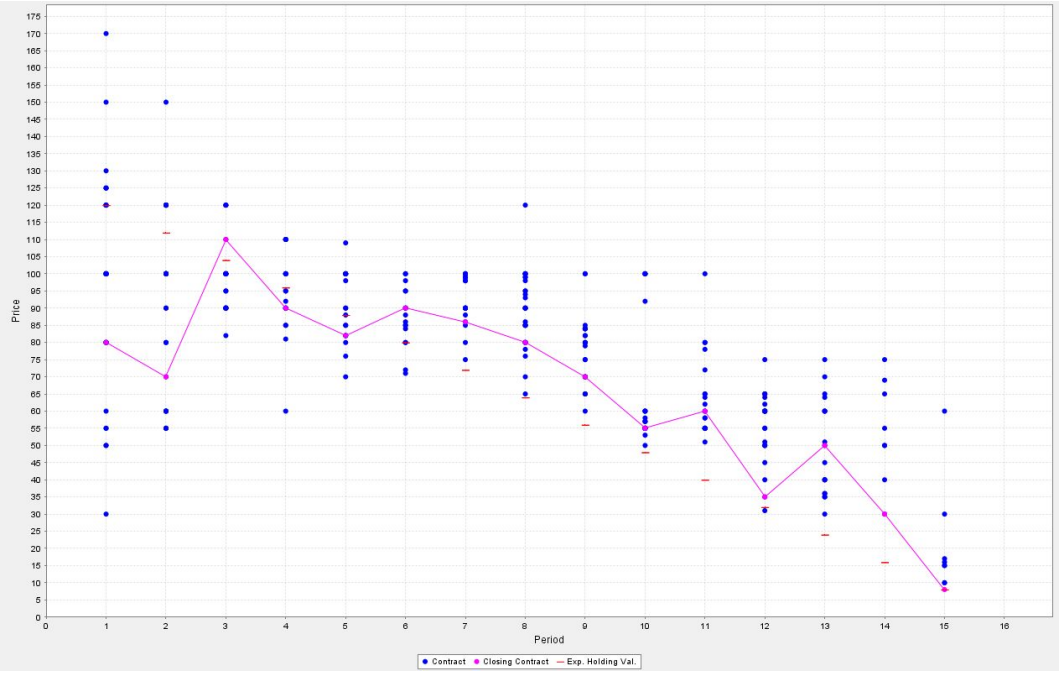

Figure 6.61: Session Summary for the Fourth Market

When we investigate the contract prices graphically, we see that prices are much more volatile in this third market. However, the volatility of the prices declines in the bubble periods. In the periods where crash starts, we see that volatility is again at its higher levels. Figure 6.61 shows the existence of bubble explicitly, however it is also possible use the bubble measures.

Table 6.46: Bubble Measures for the First, Second, Third and Fourth Market

Market	PA	AB	TD	Turnover	RD	RAD	DUR
1	0.70	19.27	384.79	7.40	30%	42%	10 periods
2	0.70	20.69	395.59	7.70	36%	43%	7 periods
3	0.98	-35.10	600.50	6.70	-50%	58%	12 periods
4	0.50	11.53	272.00	10.73	18%	28%	11 periods

It's seen in Table 6.46 that PA, AB, TD, RD measures are the lowest among these four sessions. Surprisingly, Turnover rate is the highest among these sessions. Turnover measures the number of executed trades during each of the periods. When we examined the number of bid/buy contracts in Table 6.44, it's seen that the number of bid/buy contracts is quite high compared to second period where the number of traders is the same of the fourth period. Hence, it is possible to conclude that subjects in this session trade more frequently.

Table 6.47: Comparison of Bubble Measures for the Fourth Market

Previous Studies	Turnover	PA	AB	TD
Noussair and Tucker (1996)	0.96	0.33	N/A	N/A
Smith, Suchanek, and Williams (1988)	4.55	1.24	N/A	N/A
Porter and Smith (1995)	5.49	1.53	N/A	N/A
Kirchler, Huber and Stöckl (2009)	N/A	0.82	14.73	202.93
Values for the Fourth Market in our Experiment	10.73	0.50	11.53	272.00

It is seen in Table 6.47 that Turnover rate is still the highest for the fourth market of our experiment among the other experiments. Hence, we again may conclude that subjects traded more frequently in this market compared to subjects of other studies. However, PA and AB measures are relatively lower whereas total dispersion (TD) is higher for this market. Figures 6.62 - 6.76 show bid, ask and contract prices in each of the 15 periods. Figure 6.62 shows the results of the 1st period. Mean price in this period is 95.65, which is lower than the FV. It's seen that the volatility of the contract prices is quite high. Some subjects traded stocks at a price higher than the FV whereas other traded at lower prices. In line with contract prices bid and ask prices are also showing high dispersion.

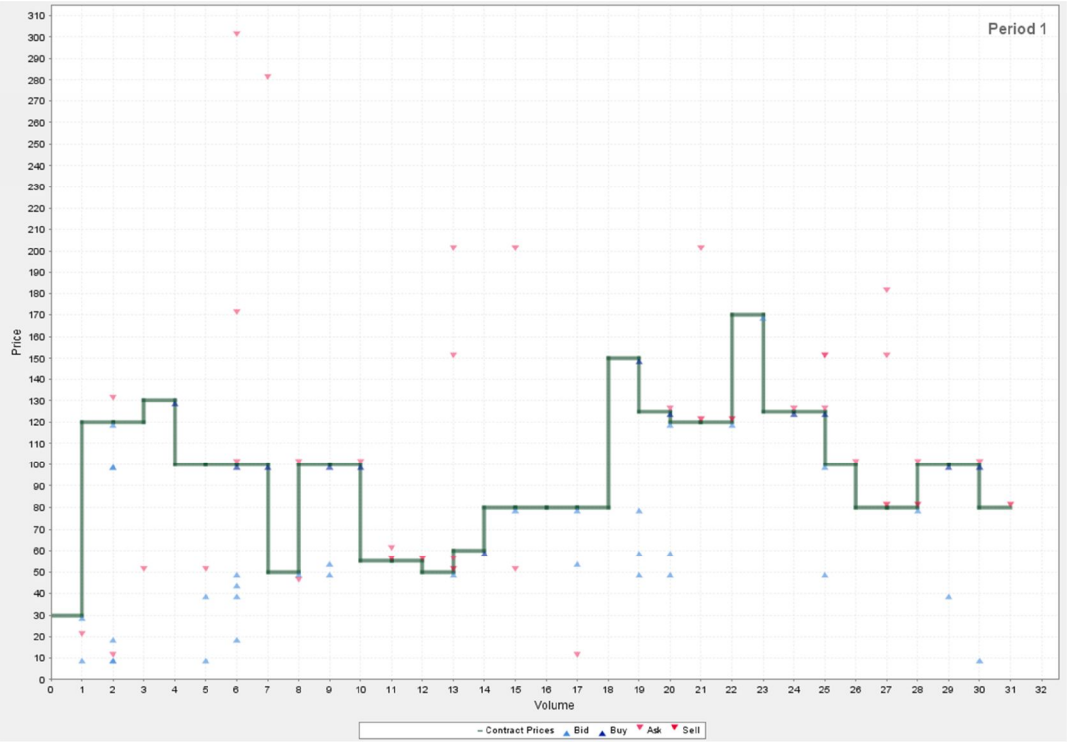

Figure 6.62: Prices in Period 1 for the Fourth Market

Individual bid and buy price statistics in Table 6.42 shows that some traders did not buy at a price higher than the FV whereas some traders are consistently bought at higher prices. For the first period, some subjects traded the same stock at a price of 30 guldens whereas some other traders traded at 170 guldens. Table 6.45 shows that the highest bid price is 170 guldens whereas the lowest one is 10 guldens. Mean bid price is almost equal to the FV (Please see Table 6.43). Standard deviations are also quite high. This result may indicate that similar to the previous periods, traders have different opinions about the price of the stock at the beginning of the session.

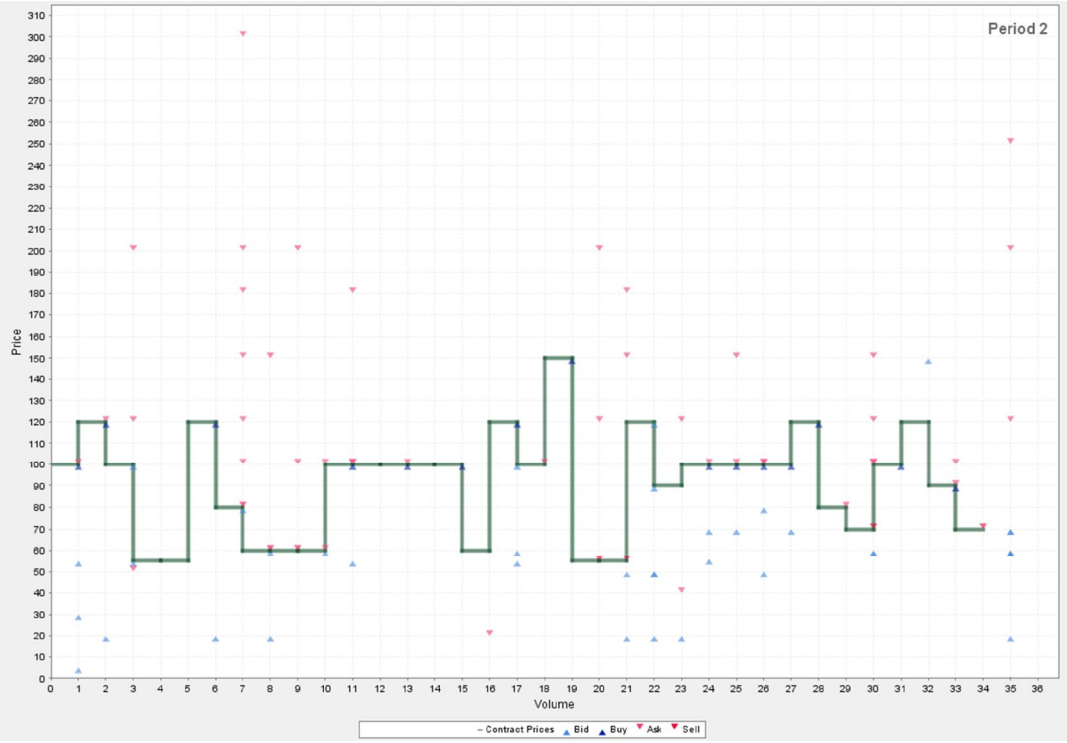

Figure 6.63: Prices in Period 2 for the Fourth Market

Figure 6.63 shows the results for the 2nd period, we can see that the volatility in this period is lower. The standard deviation of bid prices is also lower in this period (Please see Table 6.45). Most contract prices are still under the FV in this period. Mean price is also lower than the FV. The number contract is the highest among the periods of this session (Please see Table 6.40).

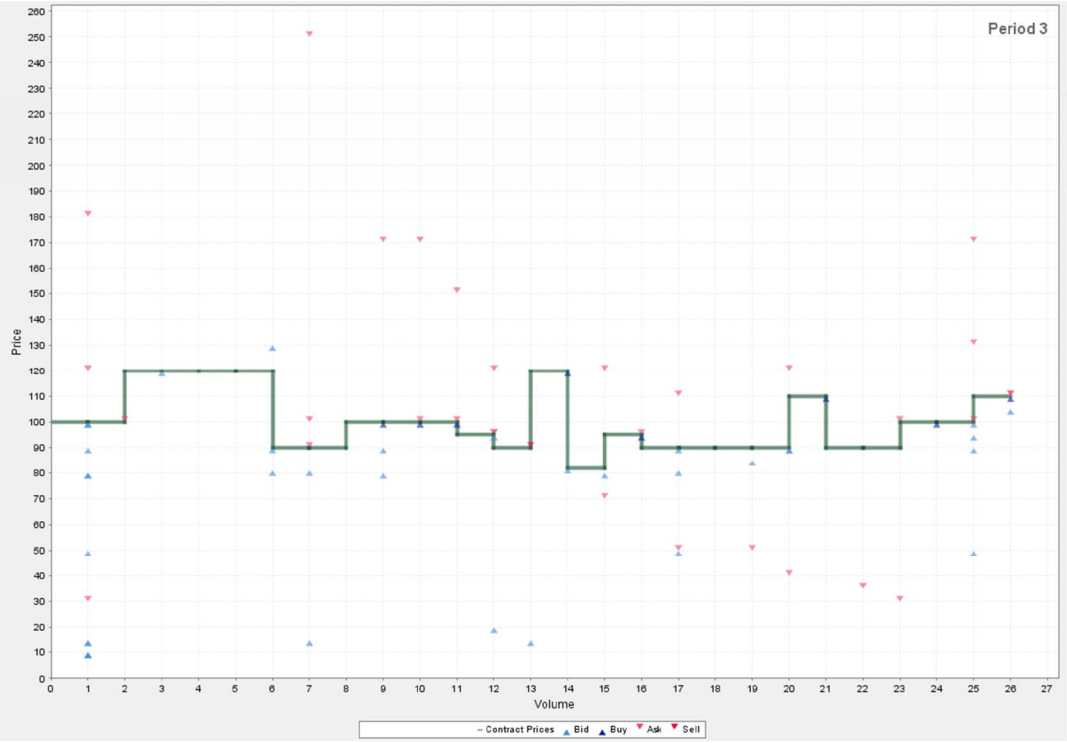

Figure 6.64: Prices in Period 3 for the Fourth Market

Third period is the last period where mean price is lower than the FV. Mean price is slightly under the FV. It's seen in Figure 6.64 that the volatility of the contract prices is lower than that of in previous periods. The lowest and the highest contract prices are 80 and 120 guldens. The highest bid price is 130 guldens whereas the lowest bid price is 10 guldens. Number of bid and ask contracts also decreased in this period. Mean ask price also decreased significantly in this period. Mean bid price is also under the FV (Please see Table 6.45). Closing contract price is first time higher than the FV in this period.

Figure 6.65 shows the results for the 4th period, we can see that the first mean contract price is slightly above the FV (Please see Table 6.40). Standard deviation of bid prices significantly decreased in this period. It is also seen that though the number of contracts decreased in this period, whereas trading volume increased (Please see Table 6.40).

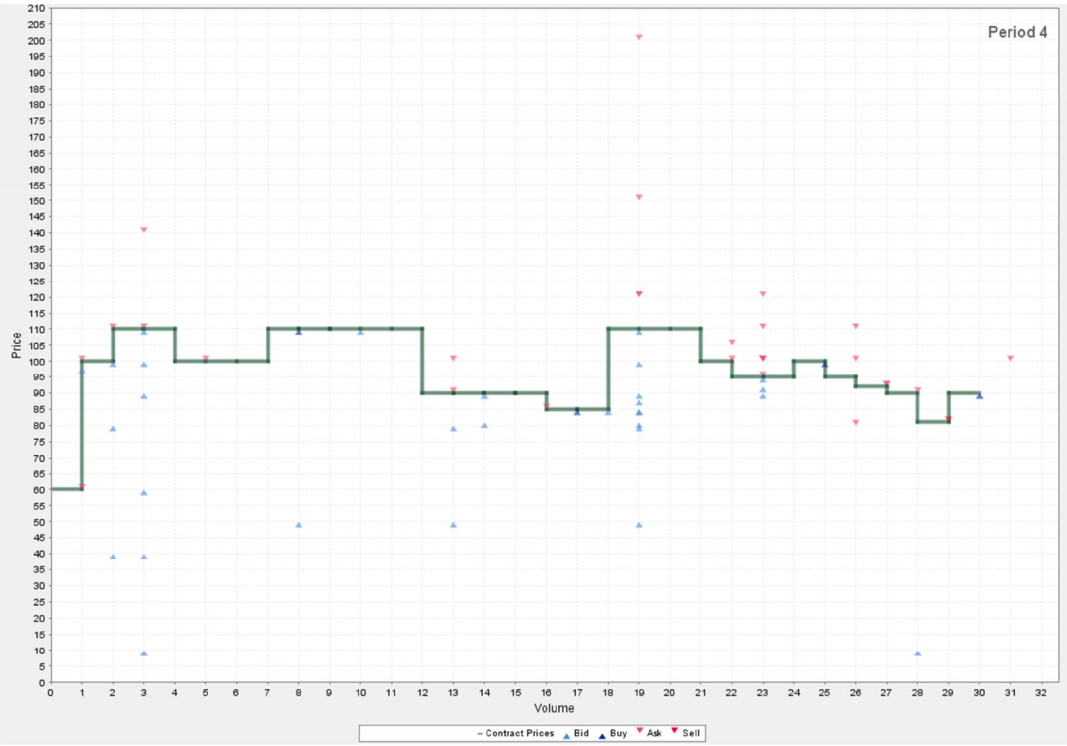

Figure 6.65: Prices in Period 4 for the Fourth Market

This indicates that same people traded more than once in this period and may dominate the market. Since the majority of the contract prices and mean price is above the FV, we may identify this period as the start of the bubble. Figure 6.66 shows the 5th period. It is seen that mean price is almost same of the previous period (Please see Table 6.40). Mean bid and ask prices increased in this period. Standard deviation of bid and ask prices also decreased in this pervious compared to the previous period.

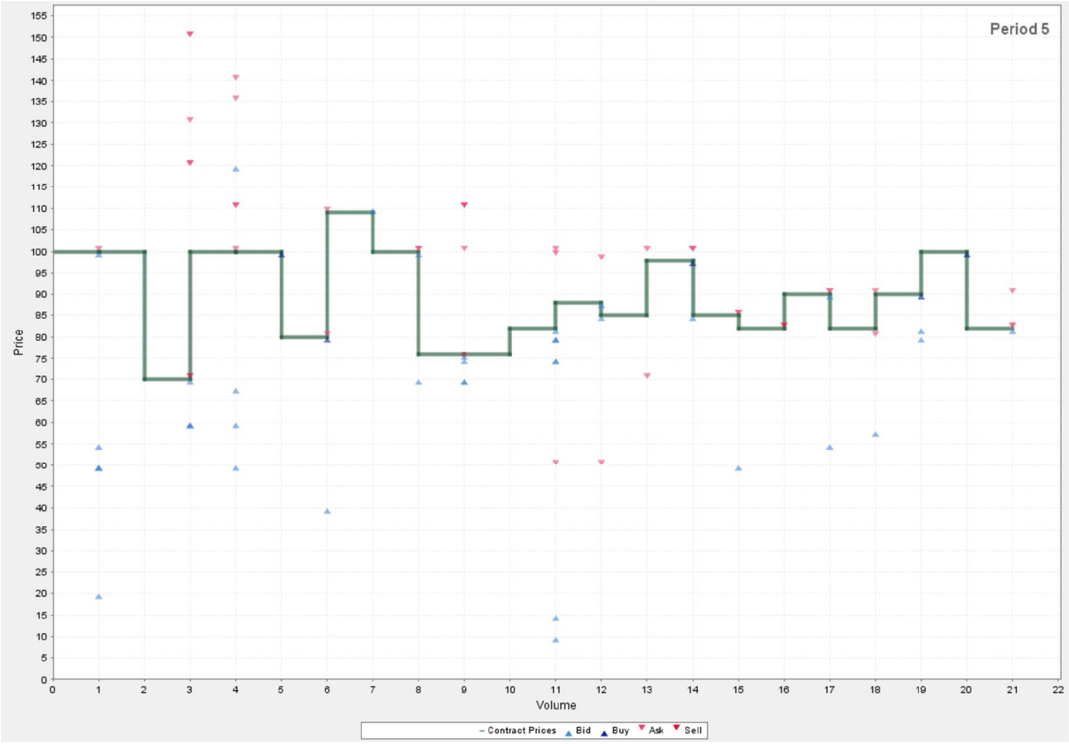

Figure 6.66: Prices in Period 5 for the Fourth Market

Figure 6.67 shows the results for the 6th period. Standard deviation of mean bid price significantly decreased from 23.17 to 13.20 in this period. After this period, deviation of bid price is almost same until the last three periods

(Please see Table 6.45). This may either indicate that most traders agreed on the price of the stock or some particular traders traded and drive out others. Trading volume is also lowest among the other periods except the last two periods. Hence, it is possible to argue that some traders drive out other traders. We may also support this idea by looking at the individual statistics in Table 6.41 and Table 6.32. In Table 6.41, it is seen that the number of bid and buy contracts of some traders are two times the number of other traders in the market.

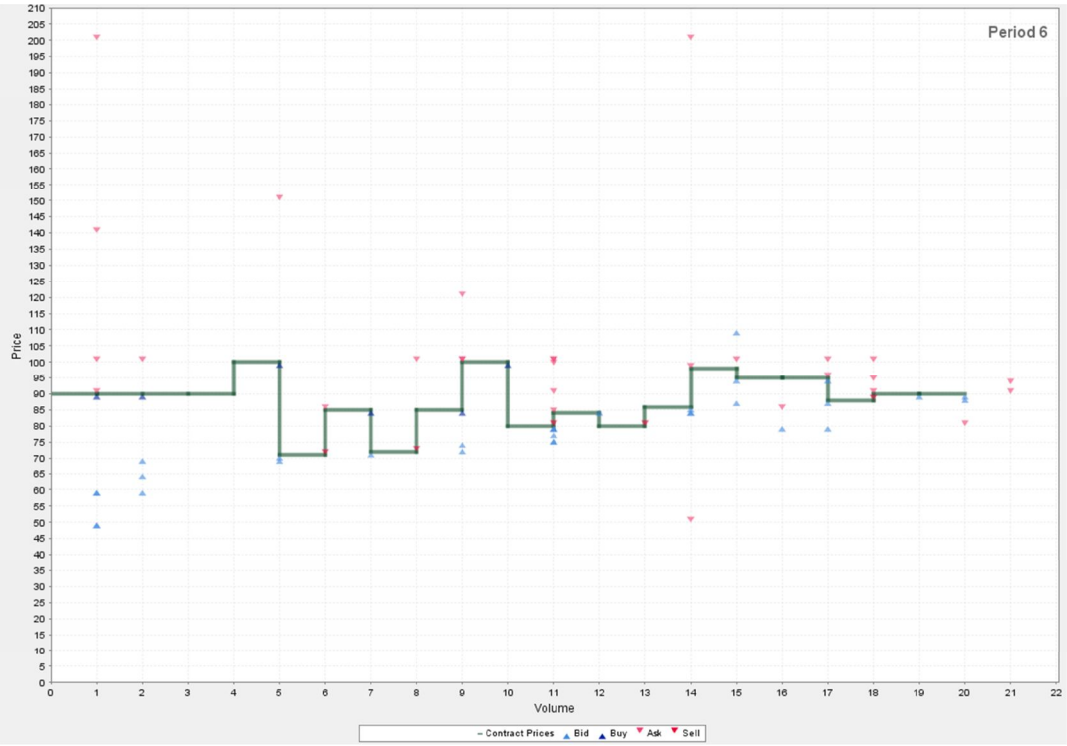

Figure 6.67: Prices in Period 6 for the Fourth Market

After this period, closing contract price is always higher than the FV until the last period (Please see Figure 6.61). Moreover, Table 6.42 shows that though some traders bid and buy at prices higher than the FV, some traders reasonably trade at prices lower than or equal to the FV. Figure 6.68 shows the results for the 7th period. Mean price increased in this period. Indeed, mean price is the highest of the first seven periods. Mean bid price is positive fits time in this session. The number of bid and ask contracts also increased in this period. Though standard deviation of bid price do not change, deviation of ask prices increased significantly in this period (Please see the Table 6.45).

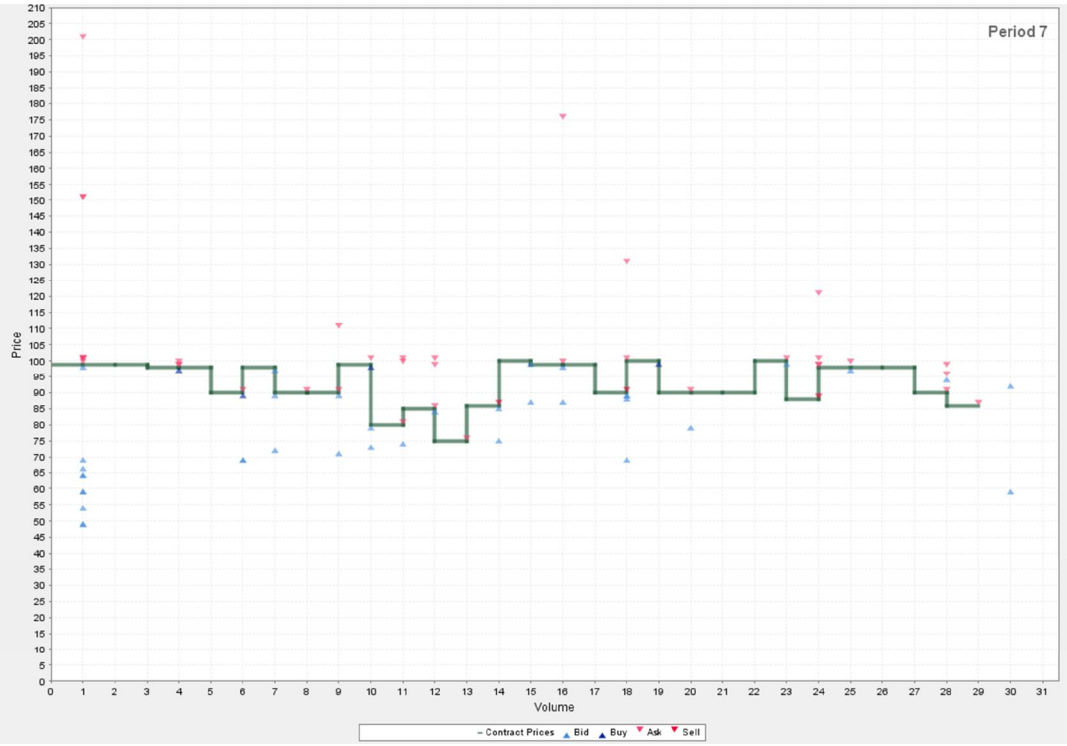

Figure 6.68: Prices in Period 7 for the Fourth Market

Figure 6.61 also shows that all of the contract prices are higher than the FV first time in this session. It's seen from the Figure 6.61 that the volatility of the prices slightly increased in this 8th period. Mean ask price is among the highest ones in this session. After this period mean ask price start to decrease (Please see the Table 6.43). The highest bid price for this period is 120 guldens whereas the lowest price is 50 gulden. Indeed, lowest bid prices are higher than those of the previous sessions of the same periods (Period 6 to 15).

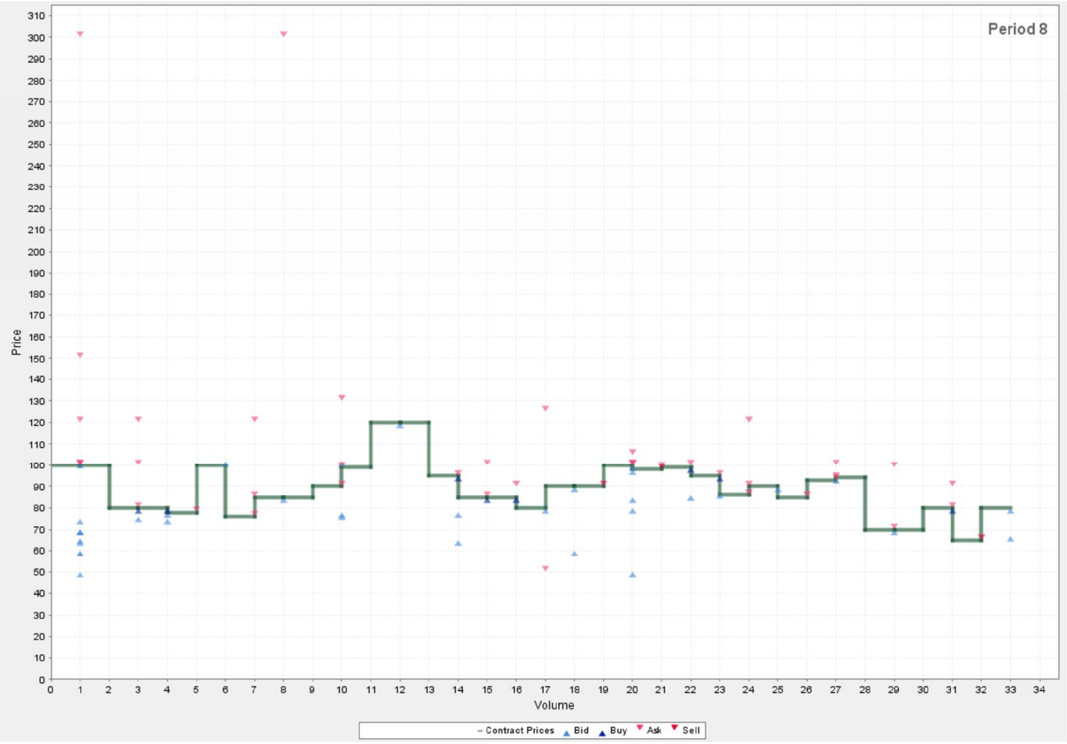

Figure 6.69: Prices in Period 8 for the Fourth Market

Figure 6.70 shows the results for the 9th period, we can see that the transaction price at the beginning of this period is almost same for the last transaction price. The transaction prices almost form a horizontal line in this period. The lowest and highest prices are 120 and 65 in this period. Mean and median prices are quite above the FV.

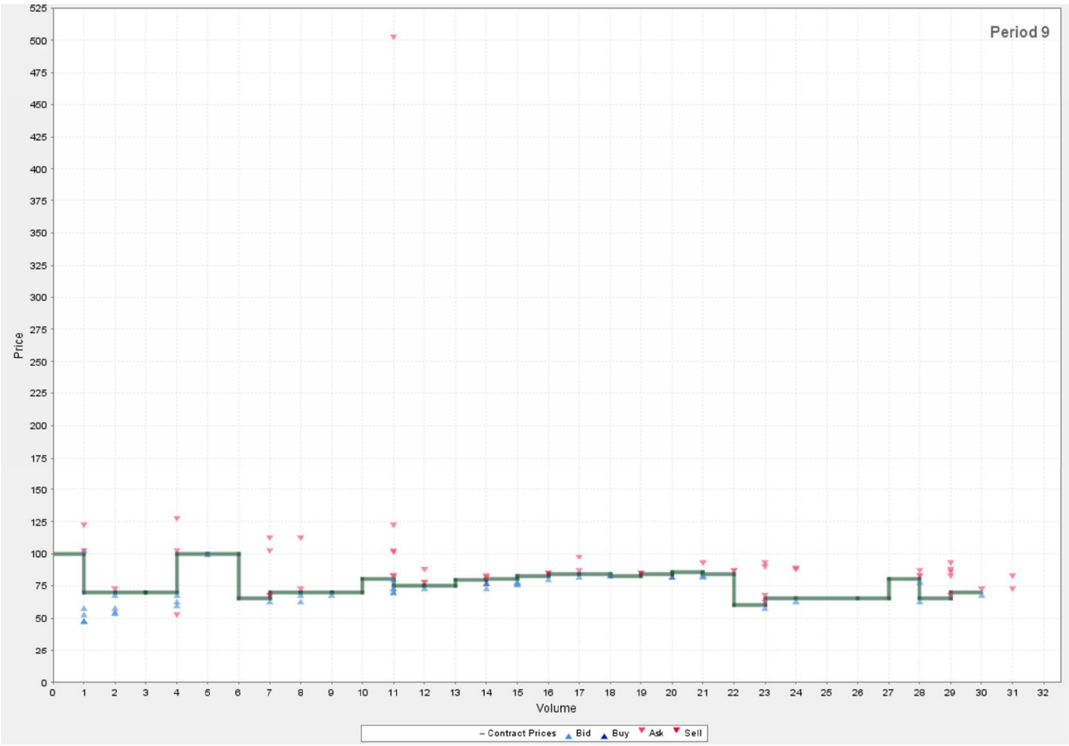

Figure 6.70: Prices in Period 9 for the Fourth Market

Figure 6.71 shows bid, ask and contract prices in for the 10th period. Mean price decreased in this period. Deviation of contract prices is much higher in the first transactions. Mean bid price has significantly decreased from 71.18 to 53.83 compared to the previous period. The number of bid contracts also significantly decreased in this period (Please see the Table 6.43). Standard deviation of ask prices significantly decreased in this period. Maximum bid price decreased from 500 to 130 in this period. Mean ask price also decreased from 98.03 to 76.20 in this period (Please see the Table 6.43).

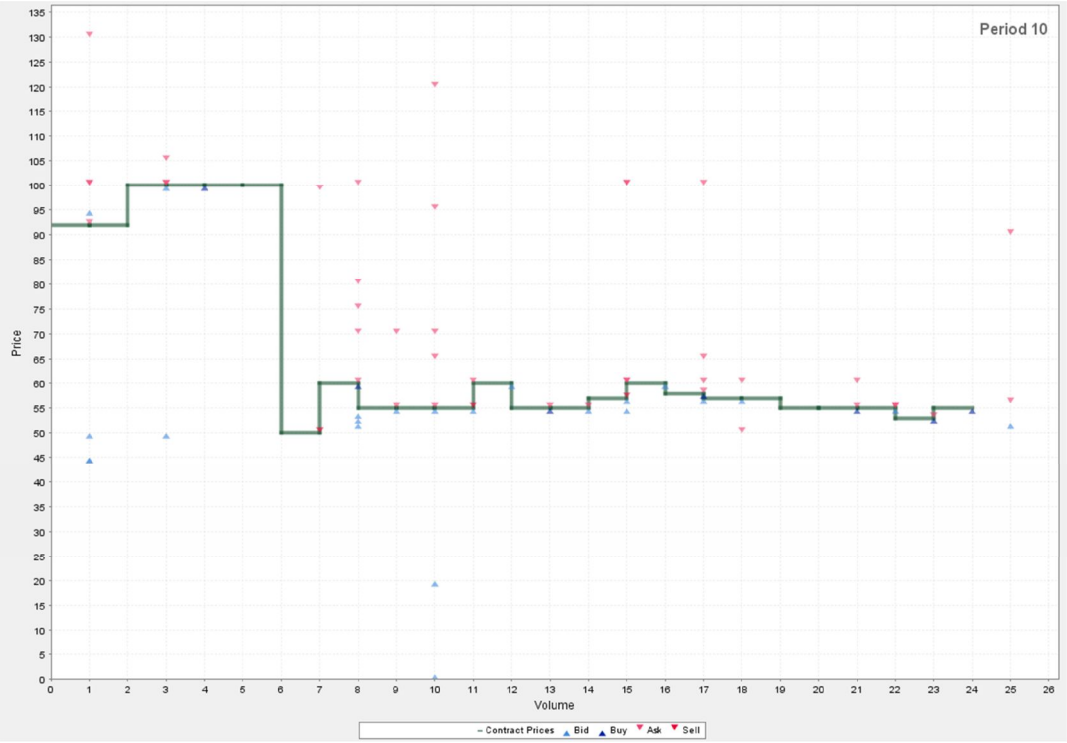

Figure 6.71: Prices in Period 10 for the Fourth Market

It's seen from the Figure 6.72 that the volatility of the contract prices is quite low. Standard deviation of bid prices also decreased in this 11th period. After this period, maximum bid prices significantly decreases each of the periods until the end of the session (Please see the Table 6.45). The lowest contract price is well above the FV (Please see the Figure 6.61). Mean prices decreased by only 2 guldens, which is well above the decrease in FV. Number of ask contracts is the highest among the periods in this session (Please see the Table 6.43). We may infer that traders start to sell their stock towards the end of this session.

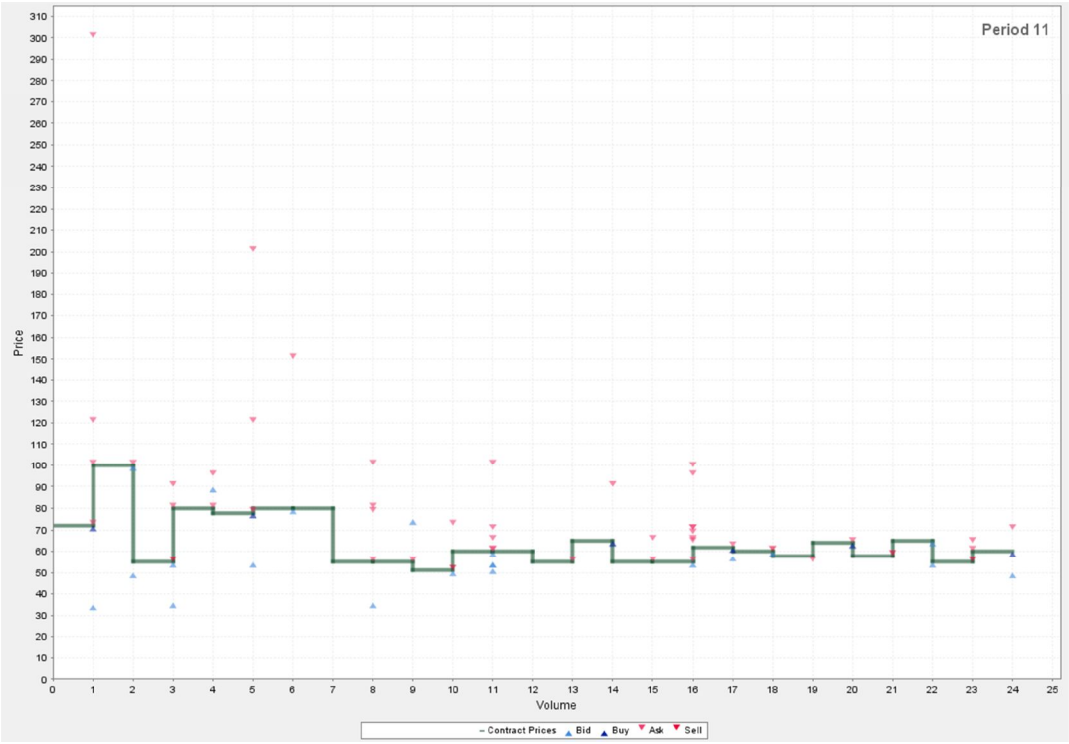

Figure 6.72: Prices in Period 11 for the Fourth Market

Figure 6.73 show bid, ask and contract prices in for the 12th period. When we look at the Figures 5.61, it's seen that the mean prices start to decrease. Mean price in this period is almost half of the price in the third period (Please see the Table 6.40). The number of bids decreased to 15 which is the one of the lowest points. Maximum bid price decreased from 100 to 75 and minimum bid price also decreased from 30 to 10 guldens in this period. Moreover, standard deviation of bids reaches its lowest level in this period (Please see the Table 6.45). Mean, maximum and minimum ask prices also decreased in this period. However, number of asks is quite higher than the number of bids (Please see the Table 6.43 and Table 6.45).

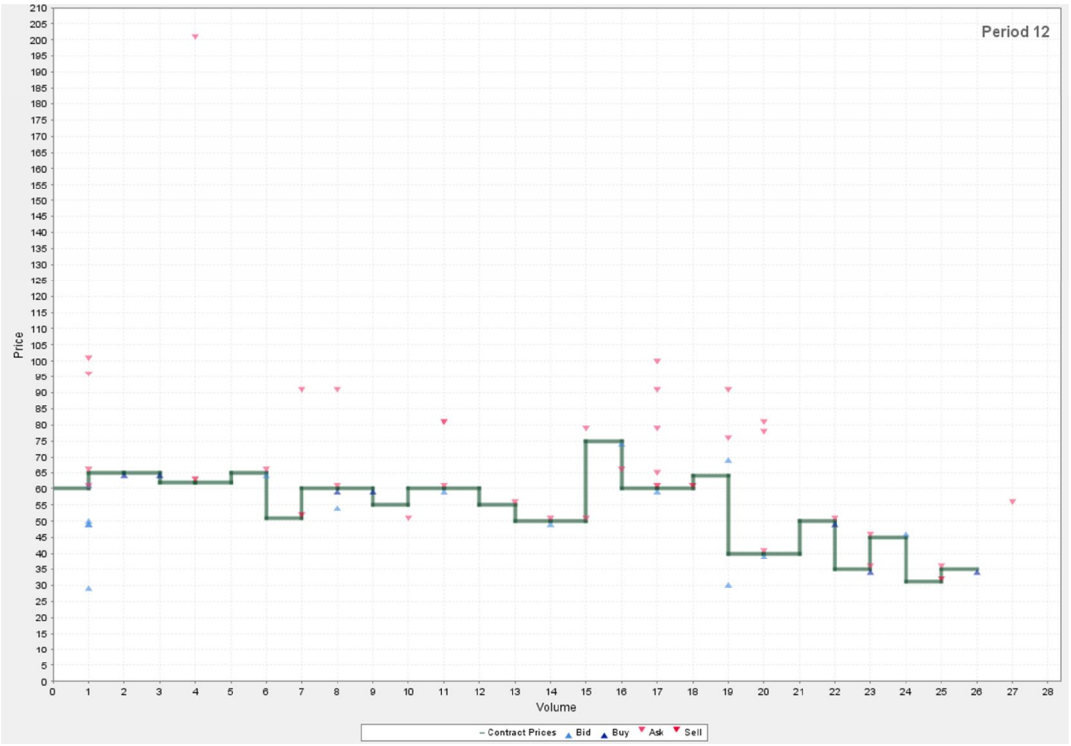

Figure 6.73: Prices in Period 12 for the Fourth Market

Moreover, there are also some contracts traded at prices under the FV (Please see the Figure 6.61). This may mean that traders start form a bear market. Figure 6.74 shows the results for the 13th period, we can see that the volatility of the contract prices start to increase again in this period. The number of contracts decreased compared to previous period (Please see the Table 6.40). Mean bid price is 41.39 whereas mean bid price is 70.11 in this period. Though the number of bids slightly increased, the number of asks is still above it. All of the contract prices are above the FV (Please see the Figure 6.61).

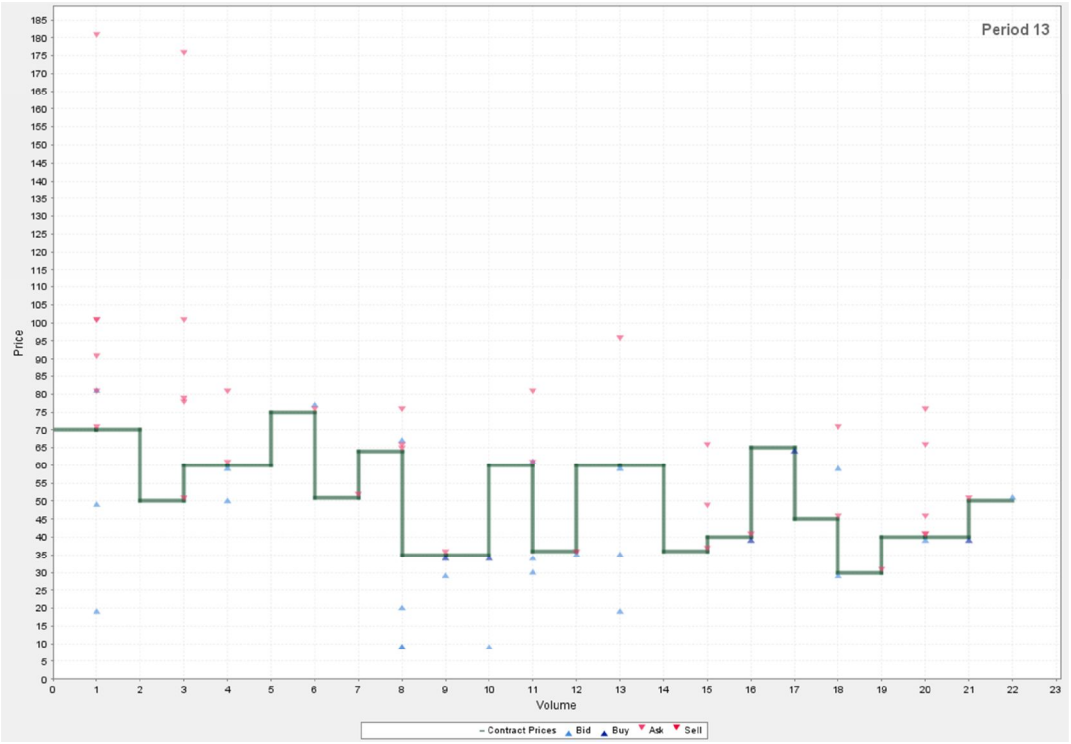

Figure 6.74: Prices in Period 13 for the Fourth Market

It's seen from the Figure 6.75 that the number of contract prices decreased significantly in this 14th period. The number of asks is more than three times the number of bids in this period. Mean ask price slightly increased in this period, whereas mean bid price decreased (Please see the Table 6.43). It is also seen that mean contract price decreased towards the end of this period. Hence we may infer that traders are much more willing to sell their stocks in their portfolios in this period. However, all executed trades are still above the FV.

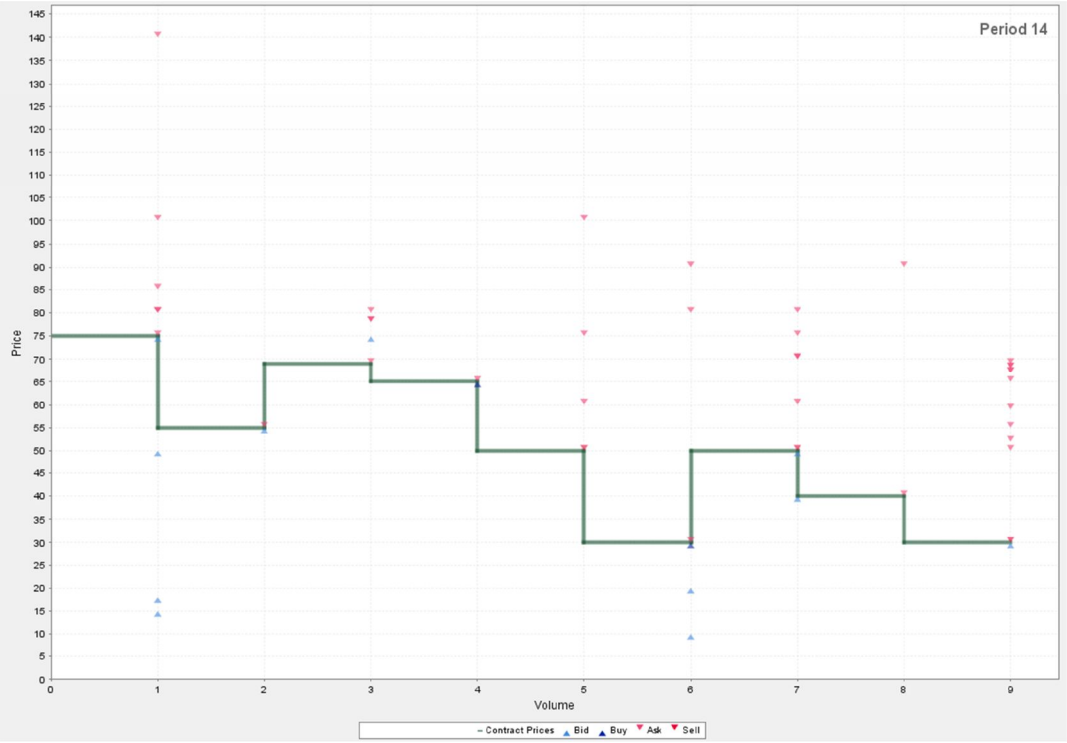

Figure 6.75: Prices in Period 14 for the Fourth Market

Figure 6.76 shows the results for the last period of the last session; we can see that the mean prices are quite low compared to previous markets. Mean price

decreased from 51.56 to 20.11 in this period. Median price is 15 guldens (Please see the Table 6.40). The number of asks is quite higher than the number of bids. The number of asks is one of the highest points for throughout session (Please see the Table 6.43). Standard deviation of bid prices is quite lows whereas deviation of ask prices is 100.46, which is the highest point of the session (Please see the Table 6.45). This may indicate that traders try to sell their stock in their portfolios at larger volumes and at prices quite different from each other. We can also observe this trend from Figure 6.76. The minimum ask price is 10 whereas maximum ask price is 438 guldens.

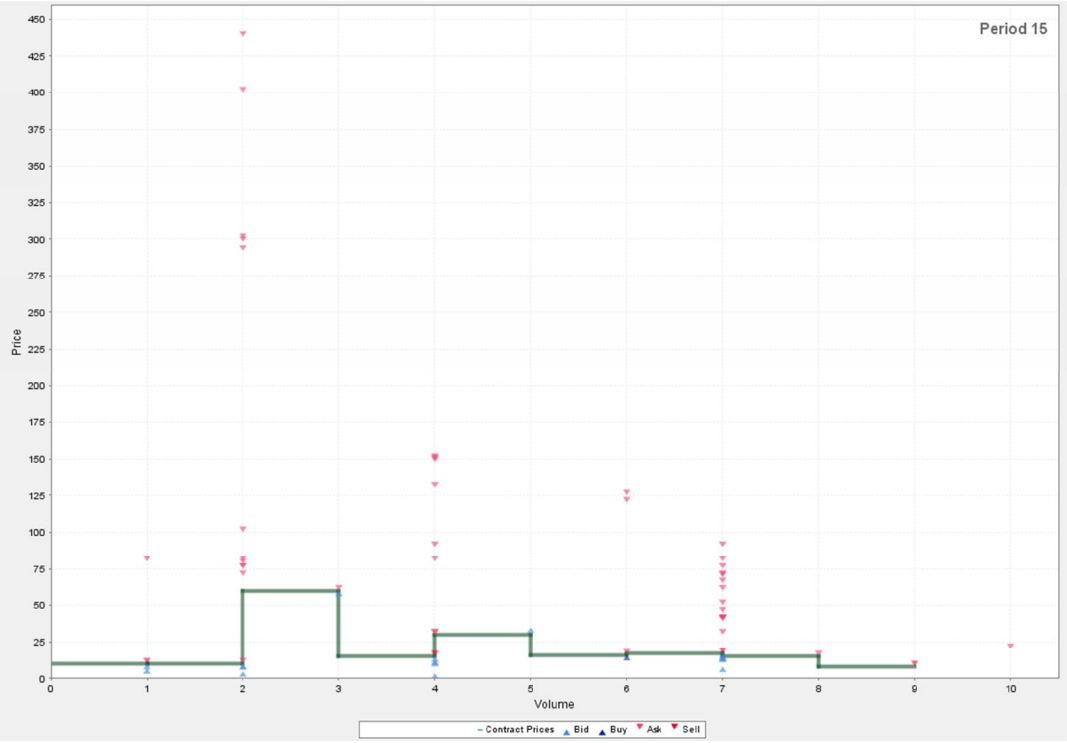

Figure 6.76: Prices in Period 15 for the Fourth Market

Mean price is slightly over the FV and "Mean Price- FV" spread is the lowest throughout the bubble periods, where prices are higher than the FV. Hence, we may conclude that this period is the crash of the bubble in the fourth session of the experiment. Overall, it is seen that bubble form and bursts in the in this fourth market. Descriptive statistics for the fourth market of the overconfidence experiment is given below. Similar to the previous markets, on average subjects in this market entered the market more often in this first part compared to the other parts. On average, it is also seen that subjects entered the market in the second part more frequently than in the third part. It is seen that subjects of this fourth market see themselves above average in the domain of general knowledge but not in the domain of finance. Moreover, subjects also estimate their payoff above average. It is also seen that subjects are overconfident about their abilities in the domain of general knowledge but not in the domain of finance. In addition, it is seen that subjects are not overconfident about precision of their knowledge in either of the domains.

Table 6.48: Descriptive Statistics for the Fourth Market of the Overconfidence Experiment

	Minimum	Maximum	Mean	Std. Dev.	P-Value
Entry P1	0.50	1.00	0.75	0.18	N/A
Entry P2	0.25	1.00	0.68	0.26	N/A
Entry P3	0.25	0.75	0.53	0.19	N/A
BTA General	-9.50	20.50	7.58	8.11	0.012
BTA Financial	-19.50	20.50	2.58	11.37	0.539
BTA Payoff	-10.00	80.00	22.50	31.08	0.029
Over Ability P2	-1.50	2.25	0.80	0.88	0.009
Over Ability P3	-2.00	1.33	0.34	0.82	0.172
Over Precision P2	-15.00	8.50	0.10	5.75	0.952
Over Precision P3	-22.00	2.50	-2.69	6.66	0.190

Table 6.49: Wilcoxon Signed and Rank Test for the Fourth Market

		Mean Ranks			
		Negative R.	Positive R.	Z stat.	P-value
Fourth Market	Over Ability P3 – Over Ability P2	6.40	2.00	-2.756[b]	0.006
	Over Precision P3 – OverPrecision P2	6.50	0.00	-3.059[b]	0.002
	BTA Financial – BTA General	6.15	4.50	-2.652[b]	0.008
	Entry 2 – Entry 1	6.70	4.30	-0.616[b]	0.538
	Entry 3 – Entry 1	7.57	3.25	-1.789[b]	0.074
	Entry 3 – Entry 2	6.25	3.50	-2.697[b]	0.007

*b: based on positive ranks.

Correlation matrix for the fourth market is given below. It is seen that except for the entry level for the first part, all of the overconfidence scores are positively related to the bubble score. Similar to the first and second market, these results may indicate that the traders that causing bubbles in the market are the ones that are more overconfident. When the mean difference of entries for these three parts is investigated, it is seen that entry levels for the second and third part is significantly different from each other. Among the BTA scores, AB score is only significantly related in domain of general knowledge. Moreover, trading volume is only significantly related to the BTA score in the domain of financial knowledge. Surprisingly, different from the previous periods, the payoff for the asset market experiment (Ending Balance) is negatively related to the Over ability P2 measure. This may imply that subjects who are more overconfident in terms of their abilities earn less profit in the asset market. Moreover, Over precision P2 measure is also negatively correlated to the payoff of the subjects. Similarly, this result may indicate that subjects who have excessive precision for the accuracy of their knowledge receive lower profit than the others.

Table 6.50: Correlation Matrix for the Fourth Market

	Bubble Score	AB	Trading Volume	Ending Balance	Av Buy Price	Av Bid Price	Number of Bids	Number of Asks
Entry P1	-0.444	-0.460	-0.221	0.210	0.595*	-0.198	-0.558	-0.555
Entry P2	0.729**	0.538	0.527	-0.496	-0.493	0.535	0.849**	0.725**
Entry P3	0.667*	0.430	0.539	-0.318	-0.521	0.403	0.770**	0.656*
BTA General	0.736**	0.652*	0.594*	-0.513	-0.620*	0.621*	0.751**	0.766**
BTA Financial	0.825**	0.641*	0.642*	-0.529	-0.512	0.664*	0.806**	0.739**
BTA Payoff	0.726**	0.336	0.625*	-0.496	-0.311	0.580*	0.791**	0.576
Over Ability P2	0.757**	0.654*	0.455	-0.624*	-0.422	0.691*	0.660*	0.583*
Over Ability P3	0.637*	0.786**	0.364	-0.446	-0.630*	0.442	0.529	0.561
Over Precision P2	0.784**	0.811**	0.461	-0.632*	-0.424	0.563	0.611*	0.575
Over Precision P3	0.613*	0.817**	0.306	-0.571	-0.467	0.473	0.455	0.503

** Significance at 1% , * Significance at 5%.

6.7. Regression Analysis

Regression analysis has been carried out to the data of the all four markets since we do not have enough observations to run the regression analysis separately for each of the markets. We have run three different regressions with ten different models since we have added each variable step by step in these analyses. Dependent variables are trading volume, average bias (AB) and bubble score (BS) which are calculated for each of subjects of the markets. The categories and list of independent variables are as follows;

- Demographic Factors
  - Gender,
  - Age,
  - Seniority at the university.
- Familiarity with financial concepts
  - Taking any finance courses
- Investment experience
  - Investment in mutual fund,
  - Investment in stocks.
- Entry level measures
  - Entry P1: Entry levels for the first part where rankings are based on simply chance,
  - Entry P2: Entry levels for the second part where general knowledge is essential,

- Entry P3: Entry levels for the third part where financial knowledge is essential.

- Calibration based measures
  - "Over ability P2 and P3" variables as the measures of the overconfidence in abilities in the domain of general knowledge and finance,
  - "Over precision P2 and P3" variables as the measures of the overconfidence for the precision of their knowledge in the domain of general knowledge and finance,
  - Interaction of operability scores, "over ability P2xP3", the interaction over precision scores, "over precision P2xP3".
  - Interaction of ability and precision scores in general knowledge framework, "over ability and precision P2",
  - Interaction of ability and precision scores in financial knowledge framework, "over ability and precision P3"
- Better than average effect measures
- BTA general: Better than average effect in the domain of general knowledge,
- BTA financial: Better than average effect in the domain of financial knowledge,
- BTA payoff: Better than average effect in payoff framework.
- Interaction of these three different better than average measures, BTA general and financial, "BTA general and payoff" and "BTA financial and payoff".

Table 6.51: Summary of Regression Analysis for Variables Predicting Trading Volume using White heteroskedasticity-consistent standard errors and covariance

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Gender	-2.54	-9.17	-4.57	-4.80	-5.87	-3.84	-4.35	-1.63	-3.41	-3.51
	(0.670)	(0.109)	(0.401)	(0.406)	(0.300)	(0.482)	(0.436)	(0.776)	(0.563)	(0.544)
Age	0.14	0.61	0.27	0.45	0.01	0.48	0.22	-0.06	0.27	0.21
	(0.858)	(0.414)	(0.682)	(0.602)	(0.992)	(0.513)	(0.798)	(0.924)	(0.715)	(0.748)
Year	0.32	-1.28	0.98	0.83	0.38	1.74	1.61	1.77	0.62	0.55
	(0.909)	(0.625)	(0.686)	(0.718)	(0.877)	(0.338)	(0.445)	(0.484)	(0.817)	(0.817)
Investment in Stock	10.75									
	(0.175)									
Investment in M. Fund	-8.55									
	(0.275)									
Taking Finance Courses	-0.31									
	(0.742)									
Entry P1	45.32	41.82*								
	(0.054)	(0.026)								
Entry P2	31.47	86.67*								
	(0.285)	(0.012)								
Entry P3	-19.74	-11.29								
	(0.442)	(0.704)								
BTA General	-0.23		-0.49					-0.76	-0.28	
	(0.585)		(0.175)					(0.073)	(0.607)	
BTA Financial	1.04*		1.09*					1.30**		0.48
	(0.041)		(0.015)					(0.001)		(0.260)
BTA Payoff	0.22		0.21						0.33**	0.12
	(0.058)		(0.074)						(0.001)	(0.329)

Table 6.51 (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Over Ability P2				22.53* (0.004)		24.53** (0.000)				
Over Ability P3				-4.20 (0.515)		-3.81 (0.526)				
Over Precision P2					4.10** (0.006)		4.71** (0.000)			
Over Precision P3					-1.61 (0.259)		0.59 (0.689)			
Over Ability P2xP3						13.85** (0.001)				
Over Precision P2xP3							0.26** (0.007)			
BTA General and Finance								0.04 (0.076)		
BTA General and Payoff									0.01 (0.280)	
BTA Finance and Payoff										0.01 (0.239)
Adjusted R	0.31	0.20	0.28	0.27	0.25	0.44	0.37	0.30	0.23	0.30

** Significance at 1% , * Significance at 5%. Values are unstandardized coefficients and values in Parentheses are p-values.

Trading volume is accepted to be one of the key bubble measures in literature. In this first regression, 10 different models are examined to investigate the relation between trading volume and the independent variables previously mentioned. Results for first model indicate that none of the demographic factors are affecting the bubble formation in markets. In particular, males and females do not differ in terms of forming bubbles in markets. This result is quite surprising since many studies showed that females and males are different. This might be reasonably logical since majority of the subjects are young university students, their age are almost same with each other. Moreover, seniority is also not a significant variable. It is also seen that neither "Investment in Stock" nor "Investment in Mutual Fund" variables are significant. This might indicate that experience cannot explain the variability trading volume. In addition, familiarity with financial concepts seems not to be one of the factors that explain the bubbles in markets. Model 2 shows that higher levels of trading is explained by higher levels of entrance both for the first part where rankings are determined only by chance and for the second part where rankings are based on the performance in general knowledge questions.

Model 9 shows that overconfidence in terms of their payoff can partly explain the bubbles. It is also seen from model 1, model 3 and model 8 that rather than overconfidence in general knowledge, overconfidence in financial knowledge results in higher trading volume, hence higher levels of bubbles in market. This may indicate the subjects who see themselves above average in

domain of finance rather than in the domain of general knowledge contribute to higher levels of trading in the market hence bubbles formation. However, model 4 and model 6 indicate that overconfidence in terms of the abilities of subjects about their general knowledge contributes to the formation of bubbles rather than the financial knowledge. In addition, the interaction term (Over Ability P2xP3) can explain higher levels of trading volume observed. This indicates that though overconfidence in the domain of finance cannot significantly explain the bubble formation, it contributes to the explanatory power of the overconfidence in the domain of general knowledge. In particular, R is much higher when interaction term is added in model 6 compared to model 4. In this respect, when subjects are overconfident in both of the domains the effect of overconfidence in forming the bubbles is much higher. Moreover, Model 5 and 7 indicate that similar to the ability overconfidence measure, overconfidence for the precision the general knowledge seems to results in bubbles in the markets.

In the second regression analysis, we have examined 10 different models to investigate the relation between Average Bias (AB) and the independent variables. Different from the previous regressions, one of the demographic factors, seniority can explain the bubble price deviation from fundamental values. Junior students are more biased in the market, which is intuitively correct (Model 2, 5, 9 and 10). Model 8 and 10 indicate that rather than overconfidence in general knowledge, overconfidence in financial knowledge results in bubbles in the market.

Table 6.52: Summary of Regression Analysis for Variables Predicting Average Bias (AB) using White heteroskedasticity-consistent standard errors and covariance

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Gender	-10.35 (0.166)	-12.63 (0.081)	-7.03 (0.301)	-10.18 (0.126)	-10.18 (0.114)	-10.00 (0.137)	-9.43 (0.131)	-6.22 (0.398)	-8.74 (0.255)	-10.41 (0.147)
Age	-0.42 (0.583)	-0.13 (0.848)	-0.51 (0.495)	0.19 (0.825)	0.27 (0.751)	0.19 (0.822)	0.37 (0.655)	-0.62 (0.434)	-0.33 (0.666)	-0.25 (0.738)
Year	-4.09 (0.085)	-4.09* (0.039)	-4.23 (0.058)	-3.01 (0.083)	-4.44* (0.028)	-2.84 (0.103)	-3.83 (0.061)	-4.27 (0.069)	-4.98* (0.029)	-4.42* (0.048)
Investment in Stock	5.88 (0.349)									
Investment in M. Fund	8.33 (0.158)									
Taking Finance Courses	-1.39 (0.300)									
Entry P1	-36.94 (0.120)	-26.71 (0.338)								
Entry P2	43.71 (0.152)	64.71 (0.059)								
Entry P3	-40.24 (0.144)	-33.69 (0.203)								
BTA General	-0.46 (0.271)		-0.34 (0.405)					-0.35 (0.423)	0.41 (0.474)	
BTA Financial	0.11 (0.786)		0.61 (0.185)					0.91* (0.033)		1.03* (0.046)
BTA Payoff	0.20 (0.072)		0.19 (0.123)						0.35* (0.025)	0.31* (0.038)

Table 6.52 (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Over Ability P2				-3.09 (0.814)		-2.71 (0.836)				
Over Ability P3				19.47 (0.128)		19.54 (0.124)				
Over Precision P2					-1.76 (0.264)		-1.46 (0.301)			
Over Precision P3					3.86* (0.038)		4.95* (0.017)			
Over Ability P2xP3						2.61 (0.456)				
Over Precision P2xP3							0.13 (0.103)			
BTA General and Finance								0.01 (0.654)		
BTA General and Payoff									-0.01 (0.353)	
BTA Finance and Payoff										-0.02 (0.035)
Adjusted R	0.29	0.28	0.22	0.43	0.38	0.43	0.39	0.20	0.21	0.30

** Significance at 1% , * Significance at 5%. Values are unstandardized coefficients and values in Parentheses are p-values.

Similarly, Model 9 and 10 show that overconfidence in terms of their payoff can partly explain the bubbles. This means that the subjects who expect to earn higher rates of return deviate from the fundamental values much more. It is also seen that rather than overconfidence in abilities overconfidence in terms of precision of the financial knowledge can explain the variability in bubbles. In this regression analysis, it seems that excess entry levels seem not to explain the bubble formation.

Table 6.53 shows the results for the regression analysis where bubble score (BS) is the dependent variable. Results for first model indicate that none of the demographic factors are affecting the bubble formation in markets. Similar to the previous regression results, it is also seen that neither "Investment in Stock" nor "Investment in Mutual Fund" variables are significant. In addition, familiarity with finance and market concepts seems not to be one of the significant factors that can explain the bubble formation. In the second model, it is seen that the excess entry in the domain of financial knowledge can explain the higher levels of bias in the market. We think that these people enter the market more frequently since they think that they are superior to other people. Another implication of the regression result for the second model is that financial knowledge does not affect the bubble formation. Results derived from Model 4 indicate that excess confidence in ability of general knowledge results in bubble, whereas there is no relation between overconfidence in the domain financial knowledge and bubble formation. In addition, the interaction term (Over Ability P2xP3) can explain

price deviations that can cause bubbles in the market. This indicates that though overconfidence in the domain of finance cannot significantly explain the bubble formation, it contributes to the explanatory power of the overconfidence in the domain of general knowledge. In particular, R is much higher when interaction term is added in model 6 compared to model 4. In this respect, when subjects are overconfident in both of the domains the effect of overconfidence in forming the bubbles is much higher.

Similarly, Model 5 shows that overconfidence for excess precision of their general knowledge can explain bubbles formation. However precision o financial knowledge is not a significant factor. It is seen in model 7 that all of the over precision measures and interaction term of these measures are explaining the variability in price deviations. It is clearly seen that coefficient of the interaction term (Over Precision P2xP3) much more reliable. The same appears in model 8, it is seen that the combined BTA score is significantly explaining the variability in bubble measure. This result indicates that interaction of overconfidence in general and financial knowledge measure explains the bubble formation in markets. However, model 9 indicates that when better than average measure in the domain of general knowledge, better than average measure in payoff framework and the interaction of them are included in regression, the only significant factor is the BTA in payoff framework. This is also same when BTA financial and BTA payoff and interaction of them are examined in model 10.

Table 6.53: Summary of Regression Analysis for Variables Predicting Bubble Score using White heteroskedasticity-consistent standard errors and covariance

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Gender	-117.72	-197.64	-118.23	-116.78	-138.96	-104.03	-116.35	-53.22	-103.74	-106.71
	(0.184)	(0.056)	(0.094)	(0.195)	(0.112)	(0.152)	(0.093)	(0.474)	(0.096)	(0.084)
Age	-3.23	5.91	-0.29	3.48	-3.68	3.84	-0.52	-8.22	-0.94	-1.17
	(0.726)	(0.517)	(0.966)	(0.693)	(0.681)	(0.568)	(0.931)	(0.270)	(0.878)	(0.852)
Year	9.76	-20.71	8.01	14.30	4.51	26.40	22.78	18.56	8.08	9.17
	(0.694)	(0.491)	(0.744)	(0.664)	(0.882)	(0.359)	(0.407)	(0.534)	(0.744)	(0.699)
Investment in Stock	1.74									
	(0.980)									
Investment in M. Fund	30.34									
	(0.762)									
Taking Finance Courses	6.84									
	(0.434)									
Entry P1	132.40	46.14								
	(0.616)	(0.813)								
Entry P2	118.55	986.00**								
	(0.727)	(0.021)								
Entry P3	-52.67	355.64								
	(0.890)	(0.490)								
BTA General	2.48		1.75					-2.46	0.55	
	(0.560)		(0.638)					(0.668)	(0.906)	
BTA Financial	5.41		5.70					16.72**		4.73
	(0.252)		(0.105)					(0.000)		(0.157)
BTA Payoff	7.92**		7.93**						8.22**	7.55**
	(0.000)		(0.000)						(0.000)	(0.000)

Table 6.53 (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Over Ability P2				310.15** (0.000)		337.16** (0.000)				
Over Ability P3				47.18 (0.496)		52.15 (0.492)				
Over Precision P2					62.78** (0.000)		71.94** (0.000)			
Over Precision P3					-9.64 (0.322)		23.24* (0.024)			
Over Ability P2xP3						184.34** (0.003)				
Over Precision P2xP3							3.91** (0.000)			
BTA General and Finance								0.73** (0.015)		
BTA General and Payoff									0.11 (0.393)	
BTA Finance and Payoff										0.06 (0.572)
Adjusted R	0.62	0.66	0.67	0.50	0.53	0.63	0.66	0.55	0.65	0.67

** Significance at 1% , * Significance at 5%. Values are unstandardized coefficients and values in Parentheses are p-values.

It is also seen that when our new bubble measure, "bubble score" is the dependent variable, explanatory power of the regression is higher compared those of other regression analyses. Hence it is proper to argue that our new bubble measure can be explained better by the well-known explanatory variables. To sum up, regression results indicate that demographic factors cannot explain the bubble formation. It seems that overconfidence in the domain of general knowledge can explain bubbles but overconfidence in the domain of financial knowledge can only explain it partly. It is also found that when investors are overconfident in both of the domains the effect of overconfidence in forming the bubbles is much higher. In this respect, it seems that bubbles in markets are driven by overconfidence in the domain of general knowledge rather than overconfidence in the domain of financial knowledge.

We have also run regression analysis without the data of third market where negative bubbles is observed. The results indicate that there is not any major change that can affect our previous findings except for the gender effect (Please see Appendix F). It is found that males biases and deviate from fundamental values more which results in bubbles in markets when we exclude third market data. We have also run regression these regressions to deal with the end of the experiment effect. We could not find any significant difference which deviates from the previous regressions except for the effect of seniority (Please see Appendix G). It is seen that seniority cannot explain the bubble formation in markets when we exclude the last period.

CHAPTER 7

DISCUSSIONS AND CONCLUSIONS

Investment psychology has increasingly gained importance in the last decades. The behaviors of individuals in investment decision making, factors affecting their decisions have been widely investigated in the literature. Common point of these studies is that rather than fundamentals and news, some psychological factors affect behaviors of individuals in markets. In particular, literature has shown that cognitive illusions are among the reasons of anomalies observed in markets. Among these cognitive illusions, overconfidence is stated to be one of the well-established and powerful behavioral biases in decision making process (DeLong et al., 1991; Kyle and Wang, 1997; Odean, 1998; Benos, 1998; Wang, 2001; Daniel et al., 2001; DeBondt and Thaler, 1985; Barber and Odean, 2000; Glaser and Weber, 2007; Hirshleifer and Luo, 2001; Scheinkman and Xiong, 2003; Graham et al., 2006 and Grinblatt and Keloharju, 2009).

This thesis aims to shed light on overconfidence bias and bubbles in asset markets through using experimental methodology. Mainly two economic experiments are conducted to deal with the effects of overconfidence on stock-prices' bubbles and on economic behavior of individual traders. The

first experiment called as "overconfidence experiment" is mainly designed to measure the confidence levels of subjects, besides gain some information on certain economic behaviors. The second experiment is called "bubbles experiment". Experiments are conducted with students of University of York, UK; undergraduate, master and Ph.D. students. This thesis contributes to the literature from many aspects. Based on our knowledge, this is the first study combining experimental methodology with questionnaire in measuring the overconfidence. It is possible to compare and contrast the results of these two different measurements in this methodology. Moreover, to our knowledge, this is the first study examining the effect of overconfidence on bubble formation with individual data rather than aggregate data. This study supplements the limited pool of current literature by examining the framework effect of overconfidence. Besides, we could not find any study examining financial domain effect in explaining the bubble formation. Moreover, we also develop a new bubble measure in this study.

Overconfidence and bubbles are both examined with secondary and experimental data. Experimental studies are highly useful in that it is possible control variables and market settings in social science laboratory experiments. In examining overconfidence, experiments are widely used since overconfidence cannot be directly observed in markets. In this manner, using secondary data may not be the most efficient methodology. Sunder (2004, 2007) argued some crucial findings in finance that cannot be examined by studies using secondary data. The same argument is also valid for the bubble

formation in markets. Using secondary data is not adequate to control the factors that may influence bubble formation. It might be not possible considerable to observe a bubble in real markets where there are lots of noises. However, bubbles in experimental asset markets arise even in markets where all uncertainties about a security are eliminated in experimental settings. In our experimental setting, the stream of the dividend payments is known, and the value of the stock can be easily calculated by simple algebra. In this manner, it is much easier to detect bubbles in our experimental setting.

In this thesis, the first experiment designed to measure overconfidence was programmed and conducted with the software z-Tree (Fischbacher, 2007) and the second experiment examining bubble formation is obtained using EconPort internet based experiments (Experimental Economics Center, 2012). With the first experiment, it is possible to detect the degree of confidence of subjects in different domains. In measuring overconfidence, we use well-known confidence measures such as absolute confidence, over precision and better than average effect. With the second experiment, it is possible observe bubbles, crashes and trading behaviors of subjects. As for how to measure the bubble formation in our experimental asset market setting, we use well-known bubble measures namely; price amplitude, total dispersion, average bias, turnover, duration, relative absolute deviation and relative deviation. All of these measures are based on contract price deviations from their fundamental values. In addition, we think bid prices may also contribute the

bubble formation in markets. Hence, we develop "Bubble Score" and use that measure in the analysis.

Demographic findings indicate that majority of the subjects are young undergraduate students. 54% of them are female. More than half of them (62.5%) are aged in between 16-25. 54.29% of them have taken at least one finance courses in their education. The surprising result is that almost half of the subjects have invested either in a stock or in a mutual fund or both of them in their lives. Another interesting thing about the demographic characteristics of the sample is that 93.33% of the subjects who have not invested in either stocks or mutual funds are willing to trade in the future. In this respect, it is proper to conclude that we have a pool of subjects who are either familiar with financial concepts, had investment experience or interest to trade in their future life.

Findings indicate that overconfidence has an effect on the bubble formation in experimental asset markets. Further, it is concluded that subjects are generally overconfident. Moreover, it seems that overconfidence is domain specific. Subjects generally enter the market less often when investment related questions are asked indicating that they are less overconfident in financial domain. Yet, subjects do not enter the market more frequently when general knowledge is required which is contrary to the result of Camerer and Lovallo (1999). Most of them overestimate their abilities and the precision of their knowledge and see themselves above average. Results indicate that

subjects are less confident in the domain where financial knowledge is essential both in terms of their abilities and precision of their knowledge. In line with this result, it is found that on average subjects see themselves better than others less frequently in investment domain compared to the general knowledge domain. Also, there is no correlation between self-rankings objective measures in both domains. In general, no gender difference is found, in line with the findings of Baranava et al. (2004) and Kaustia and Perttula (2012). However, females entered the market more frequently when general knowledge is required indicating that women are more overconfident which is contrary to many studies concluding that women are less overconfident (Lenney, 1977; Deaves et al., 2009; Bhandari and Deaves, 2006; Biais et al., 2005). Findings indicate that subjects who have investment experience and subjects who are familiar with financial concepts do not differ from their peers in terms their confidence levels. In addition, we could not find any effect of familiarity with financial concepts and investment experience on the formation of bubbles.

In comparing our bubble measures with those of previous studies, it is seen that asset turnover rate is among the highest indicating that subjects in our study traded more frequently than the subjects of previous studies. Duration of the bubble for these four markets is 10, 7, 12 and 11 periods respectively. Positive bubbles are observed in three of the four markets (1st, 2nd and 4th markets). In all of these three markets, prices generally start below the fundamental values until the 3rd or 4th of 15 periods. After then, prices start to

increase and majority of the contract prices are above the fundamental value until the last few periods. In the last four periods, sharp declines in prices are observed. In particular, prices crash to their fundamental values in this last stage of the experiment. However, in the 3rd market stocks are traded generally under their fundamental values and increased to fundamental values through the end of the experiment. Hence we infer that there is negative bubble in this third market.

Overconfidence and bubble measures are found to be significantly related. Results indicate that subjects that are relatively more overconfident trade more frequently which may result in lower profits than their peers. We use different factors to explain our dependent variables; trading volume, average bias and our bubble measure, "Bubble Score". Higher levels of overconfidence can explain the higher levels of trading volume, price deviation from fundamental values (AB) and higher levels of bid and buy prices (Bubble Score). Higher levels of overconfidence in the domain of general knowledge can explain bubbles but overconfidence in the domain of financial knowledge can only explain it partly. It is also found that when investors are overconfident in both of the domains the effect of overconfidence in forming the bubbles is much higher. We could also find that explanatory power of the regression analysis is higher when our bubble measure, "Bubble Score" is the dependent variable.

Though, we have to run regressions with the combined data of the four markets. We are able to run regression analyses excluding the data of the third market since different from other markets there is negative bubble in this third market. When the third market data is excluded, gender comes out a significant factor in explaining the price deviation from fundamental value, (AB) (Please see Appendix F). In particular, it is seen that more overconfident females are biased more in the market. In addition, we also run regression analyses excluding the last period to consider end of the experiment effect. Findings indicate that different from the previous regression analyses, seniority of the subjects at their universities cannot explain the bubble formation (Please see Appendix G).

Results of this study may not be generalizable, yet findings are important to note for investors, experts and financial intermediaries. First, overconfidence does exist and affects the individual beliefs about abilities, precision of knowledge and expected returns. Moreover, overconfidence influences trading behaviors. More specifically, overconfident individuals tend to trade more in the market, which may result in lower rates of returns. In addition, overconfidence may result in bubbles and crashes in markets. Hence, experts and financial intermediaries should consider degree of overconfidence as one of the key factors in detecting the characteristics of traders, and use it in their portfolio construction and financial decision making process. Moreover, they should consider the argument that bubbles in markets is driven by overconfidence in the domain of general knowledge rather than

overconfidence in the domain of financial knowledge. Though bubbles may regulate the allocation of capitals and may eliminate the inefficient investments, crashes of the bubbles may cause serious adverse implications in markets. In this respect, experts and financial intermediaries may also find our new bubble useful since our new bubble measure can be explained or forecasted better by the well-known explanatory variables.

Similar to any of the experimental studies in literature, this thesis has some limitations such as number of subjects, internal and external validity concerns, generalizability of the results and poor realism. It is widely argued in literature that there is tradeoff between internal and external validity. It is argued that highly controlled experiments may be too far removed from real world contexts (Jimenez-Buedo and Miller, 2010). In our experiment, it is possible to say that both internal and external validity seems to be satisfied, since asset market experiment is almost replication the real world markets and overconfidence experiment does not induce many restrictions, and causality between independent and dependent variables has been established.

Behavioral finance put financial knowledge together with psychology. Hence, when human beings are involved in an experiment, they might behave differently than they would behave outside the laboratory context. In this respect, laboratory experiments are often criticized as having poor realism however, “it would be premature to dismiss the findings of laboratory

experiments simply because they do not superficially resemble a specific real-world setting" (Altermatt, 2013: 1).

Another limitation of this thesis is the endowment effect. In particular, subjects start with different endowments at the beginning of each period which may affect their trading behavior. Unfortunately, EconPort (Experimental Economics Center, 2012) experimental settings do not allow analyzing this kind of an effect. This effect combined with learning and sequence effect may be examined in future studies. In addition, future studies may focus on the effect of the beliefs of subjects about their peers, and experimental demand effect, and may also examine the cultural differences since it is shown in literature that overconfidence is subject to cultural effects. We also think that overconfidence can be reduced and even can be eliminated by ensuring that investors are aware of their overconfidence. Hence, different settings and implicit measures of overconfidence can also be developed. Finally, new designs of experiments to measure bubble can be established such as experiments with price ceilings, short selling, and predefined buyer/seller settings.

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APPENDICES

APPENDIX A: Tables for Individual Statistics for the Bubbles Experiment

Trading Statistics for Trader 101

ID	Period	Av.Bid Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	140.00	1	N/A	0	140.00	1	N/A	0
	2	20.00	1	140.00	1	N/A	0	N/A	0
	3	80.00	2	110.00	1	80.00	1	110.00	1
	4	87.50	2	107.50	2	95.00	1	107.50	2
	5	75.00	1	111.67	3	N/A	0	103.50	2
	6	70.00	1	101.80	5	N/A	0	97.50	2
	7	70.00	1	90.00	1	70.00	1	90.00	1
101	8	70.00	1	N/A	0	N/A	0	N/A	0
	9	80.00	1	N/A	0	N/A	0	N/A	0
	10	90.00	1	N/A	0	N/A	0	N/A	0
	11	85.00	1	N/A	0	N/A	0	N/A	0
	12	80.00	1	N/A	0	N/A	0	N/A	0
	13	71.00	1	73.00	1	71.00	1	N/A	0
	14	N/A	0	69.00	1	10.00	1	39.00	1
	15	N/A	0	8.00	3	N/A	0	1.50	1

Trading Statistics for Trader 331

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	101.00	1	N/A	0	N/A	0	N/A	0
	2	66.00	1	N/A	0	N/A	0	N/A	0
	3	101.00	1	N/A	0	N/A	0	N/A	0
	4	98.00	1	N/A	0	N/A	0	N/A	0
	5	93.40	5	99.00	2	94.33	3	99.00	2
	6	92.00	9	100.50	2	93.00	4	98.00	1
	7	92.30	10	128.86	7	96.00	4	98.67	3
331	8	91.00	6	128.57	7	70.50	4	98.67	3
	9	93.86	7	116.92	13	96.00	7	100.71	7
	10	N/a	0	186.00	12	N/A	0	95.33	3
	11	92.25	4	153.62	7	92.50	2	93.69	2
	12	80.50	2	135.65	9	N/A	0	87.98	1
	13	72.00	1	83.34	14	72.00	1	70.90	2
	14	10.00	4	52.50	8	8.00	3	4.00	2
	15	1.00	1	35.85	12	N/A	0	3.44	2

Trading Statistics for Trader 271

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	50.00	1	N/A	0	130.00	1	115.00	2
	2	N/A	0	N/A	0	150.00	1	100.00	2
	3	85.00	1	150.00	1	100.00	2	100.00	1
	4	97.00	1	123.50	2	103.50	2	97.00	2
	5	91.00	2	N/A	0	90.00	1	97.50	2
	6	N/A	0	100.00	1	N/A	0	N/A	0
	7	N/A	0	152.50	2	N/A	0	70.00	1
271	8	N/A	0	120.00	1	110.00	1	N/A	0
	9	N/A	0	145.00	2	N/A	0	95.00	1
	10	N/A	0	99.33	3	98.33	3	99.33	3
	11	N/A	0	97.31	9	96.33	3	97.66	3
	12	100.00	1	99.25	4	91.00	2	N/A	0
	13	N/A	0	82.00	5	N/A	0	74.33	3
	14	N/A	0	30.67	3	N/A	0	10.00	1
	15	N/A	0	9.37	4	N/A	0	2.50	1

Trading Statistics for Trader 231

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	46.67	6	N/A	0	52.00	5	N/A	0
	2	35.00	1	170.00	2	35.00	1	N/A	0
	3	32.50	2	135.00	2	N/A	0	N/A	0
	4	45.00	2	117.00	2	N/A	0	N/A	0
	5	83.33	3	140.00	1	110.00	1	N/A	0
	6	50.00	1	150.00	1	N/A	0	N/A	0
	7	60.00	1	130.00	1	N/A	0	N/A	0
231	8	65.00	2	120.00	1	N/A	0	N/A	0
	9	87.50	2	109.00	2	103.00	5	108.00	1
	10	N/A	0	108.00	1	N/A	0	108.00	1
	11	46.00	2	99.00	2	91.00	1	92.00	1
	12	83.00	2	92.67	3	83.00	2	90.00	1
	13	42.00	2	76.17	6	42.00	2	N/A	0
	14	5.00	1	39.75	4	2.50	2	29.50	4
	15	N/A	0	7.50	2	N/A	0	3.00	7

Trading Statistics for Trader 171

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	50.00	3	105.00	4	50.00	1	110.00	2
	2	53.33	3	97.50	2	65.00	1	75.00	1
	3	123.33	3	125.00	2	N/A	0	100.00	1
	4	120.00	1	230.00	1	112.50	2	96.00	1
	5	99.50	2	112.50	2	99.50	2	120.00	1
	6	45.50	2	98.33	3	90.00	1	95.00	2
	7	68.67	3	96.67	3	99.25	4	96.00	2
171	8	105.00	4	95.25	12	99.88	8	95.55	11
	9	103.40	5	97.42	12	102.56	9	97.10	10
	10	105.00	4	95.67	15	93.00	12	95.00	14
	11	99.49	2	95.00	5	66.33	6	95.00	4
	12	86.88	4	89.25	4	88.50	3	88.50	4
	13	80.00	1	75.50	2	80.00	1	82.00	1
	14	18.75	4	32.50	2	16.33	3	N/A	0
	15	2.25	2	4.29	9	2.25	2	1.50	8

Trading Statistics for Trader 211

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	105.00	4	162.50	4	113.33	3	50.00	1
	2	41.00	5	144.00	5	102.50	4	75.00	5
	3	8.75	4	158.33	6	111.67	6	95.00	5
	4	47.00	3	195.00	4	113.33	3	94.00	3
	5	94.00	2	216.67	3	97.67	3	92.67	3
	6	120.00	1	250.00	2	98.00	1	93.50	2
	7	90.33	3	150.00	1	97.00	1	95.00	1
211	8	N/A	0	146.67	3	100.00	3	94.67	3
	9	96.00	1	150.00	3	68.33	3	96.33	3
	10	N/A	0	165.00	2	66.00	3	93.50	2
	11	92.00	1	172.50	2	92.00	1	93.00	2
	12	82.00	1	133.33	3	58.67	3	86.00	2
	13	48.00	3	113.50	4	71.00	3	70.00	1
	14	12.50	2	85.33	3	N/A	0	N/A	0
	15	N/A	0	78.00	3	3.54	5	1.00	1

Trading Statistics for Trader 161

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	35.00	1	140.00	1	35.00	1	140.00	1
	2	55.00	1	215.00	2	55.00	1	100.00	1
	3	165.00	1	250.00	1	220.00	1	N/A	0
	4	N/A	0	155.00	2	N/A	1	110.00	2
	5	120.00	1	171.25	4	240.00	1	95.00	1
	6	N/A	0	103.33	3	N/A	1	95.00	1
	7	110.00	1	156.67	3	110.00	1	N/A	0
161	8	85.00	1	98.00	2	N/A	1	96.50	2
	9	85.00	1	101.00	1	N/A	1	101.00	1
	10	90.00	2	99.50	2	190.00	1	99.00	1
	11	72.00	3	101.00	1	N/A	1	50.50	2
	12	84.00	1	99.00	2	84.00	1	N/A	0
	13	N/A	0	85.00	3	N/A	1	N/A	0
	14	N/A	0	35.00	4	N/A	1	14.33	3
	15	3.00	1	3.00	1	3.00	1	3.00	1

Trading Statistics for Trader 31

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	N/A	0	100.00	1	105.00	2
	2	N/A	0	N/A	0	87.50	2	85.00	2
	3	120.00	1	119.00	1	115.00	2	90.00	1
	4	N/A	0	N/A	0	103.50	4	95.00	3
	5	N/A	0	N/A	0	N/A	0	100.00	1
	6	N/A	0	N/A	0	N/A	0	N/A	0
	7	N/A	0	N/A	0	N/A	0	99.00	1
31	8	N/A	0	100.00	1	95.00	2	100.00	1
	9	1.00	1	110.00	1	N/A	0	99.00	1
	10	N/A	0	N/A	0	95.00	2	N/A	0
	11	N/A	0	110.00	1	N/A	0	N/A	0
	12	N/A	0	103.00	4	N/A	0	N/A	0
	13	N/A	0	103.00	4	N/A	0	N/A	0
	14	N/A	0	37.50	2	N/A	0	N/A	0
	15	N/A	0	27.50	2	2.50	1	1.00	2

Trading Statistics for Trader 141

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	106.67	3	N/A	0	100.00	2
	2	50.00	1	81.25	4	60.00	3	100.00	2
	3	N/A	0	103.33	3	60.00	2	96.67	3
	4	15.00	1	113.75	4	105.00	3	98.33	3
	5	60.00	1	100.00	1	120.00	1	100.00	1
	6	50.00	1	99.00	2	98.00	1	93.00	1
	7	110.00	1	98.00	2	52.50	2	96.00	1
141	8	N/A	0	155.00	2	N/A	0	N/A	0
	9	99.00	1	100.00	1	99.00	1	100.00	1
	10	N/A	0	130.00	2	N/A	0	N/A	0
	11	N/A	0	100.00	1	N/A	0	N/A	0
	12	N/A	0	100.00	2	N/A	0	N/A	0
	13	50.00	1	100.00	1	50.00	1	50.00	1
	14	8.00	1	N/A	0	4.00	2	N/A	0
	15	N/A	0	N/A	0	N/A	0	2.00	2

Trading Statistics for Trader 91

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	93.33	3	135.00	3	130.00	1	N/A	0
	2	80.00	1	120.00	3	80.00	1	101.67	3
	3	97.50	4	118.50	4	97.50	4	115.00	2
	4	100.00	4	113.13	8	100.00	6	111.67	3
	5	100.00	1	112.50	4	66.67	3	110.00	1
	6	92.50	2	112.50	2	95.00	1	N/A	0
	7	92.50	2	100.25	4	90.00	1	75.25	4
91	8	92.67	3	103.33	3	96.00	2	100.00	2
	9	96.33	3	106.60	5	97.00	6	105.00	3
	10	94.50	2	102.50	2	94.50	2	105.00	1
	11	95.00	1	101.00	3	95.00	1	N/A	0
	12	82.00	1	93.25	4	N/A	0	85.00	2
	13	80.00	1	79.33	3	80.00	2	85.00	1
	14	N/A	0	50.00	2	N/A	0	N/A	0
	15	5.00	1	15.50	2	2.50	2	N/A	0

Trading Statistics for Trader 121

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	33.33	3	96.67	3	30.00	1	90.00	2
	2	48.00	5	100.00	1	47.50	4	100.00	1
	3	27.50	2	N/A	0	N/A	0	N/A	0
	4	42.50	2	N/A	0	N/A	0	N/A	0
	5	100.00	1	N/A	0	100.00	1	N/A	0
	6	N/A	0	N/A	0	N/A	0	N/A	0
	7	N/A	0	200.00	1	N/A	0	96.00	1
121	8	N/A	0	95.00	1	N/A	0	95.00	1
	9	20.00	1	N/A	0	N/A	0	N/A	0
	10	2.00	1	99.00	1	N/A	0	99.00	1
	11	N/A	0	96.88	8	N/A	0	92.00	2
	12	N/A	0	89.50	2	N/A	0	89.50	2
	13	7.33	3	N/A	0	N/A	0	N/A	0
	14	10.00	4	N/A	0	12.00	1	N/A	0
	15	1.50	2	20.00	1	1.33	3	N/A	0

Trading Statistics for Trader 251

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	45.00	3	125.00	2	111.25	8	56.88	8
	2	42.25	4	150.00	1	75.00	1	70.00	2
	3	40.00	2	N/A	0	N/A	0	N/A	0
	4	84.00	1	N/A	0	N/A	0	N/A	0
	5	84.00	1	N/A	0	N/A	0	N/A	0
	6	84.00	1	N/A	0	N/A	0	N/A	0
	7	40.00	1	N/A	0	N/A	0	N/A	0
251	8	N/A	0	N/A	0	N/A	0	N/A	0
	9	N/A	0	N/A	0	N/A	0	N/A	0
	10	N/A	0	N/A	0	N/A	0	N/A	0
	11	70.00	1	N/A	0	N/A	0	N/A	0
	12	84.00	1	N/A	0	84.00	1	N/A	0
	13	N/A	0	91.00	3	N/A	0	N/A	0
	14	N/A	0	60.00	2	9.00	1	10.00	1
	15	N/A	0	N/A	0	N/A	0	2.00	1

Trading Statistics for Trader 221

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	105.00	4	135.00	2	N/A	0	133.33	3
	2	97.50	4	122.50	2	95.00	2	N/A	0
	3	93.75	4	126.67	3	93.33	3	130.00	2
	4	96.67	3	120.00	1	96.25	4	120.00	2
	5	95.20	5	120.00	3	99.50	2	120.00	3
	6	93.17	6	108.33	3	94.00	4	100.00	2
	7	93.13	8	110.00	1	96.75	4	73.33	3
221	8	94.40	5	110.00	1	97.20	5	110.00	2
	9	94.67	3	106.00	4	96.00	1	69.67	3
	10	93.83	6	104.80	5	95.00	2	62.20	5
	11	92.40	5	106.50	2	92.40	5	69.33	3
	12	85.00	1	92.17	6	85.00	1	90.00	2
	13	N/A	0	79.20	10	N/A	0	75.00	2
	14	N/A	0	22.00	8	N/A	0	12.01	2
	15	N/A	0	12.03	3	N/A	0	N/A	0

Trading Statistics for Trader 111

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	10.00	1	55.00	2	N/A	0	N/A	0
	2	41.67	3	N/A	0	100.00	1	N/A	0
	3	N/A	0	100.00	1	N/A	0	100.00	2
	4	50.00	1	N/A	0	N/A	0	N/A	0
	5	40.00	1	N/A	0	N/A	0	N/A	0
	6	50.00	1	N/A	0	N/A	0	N/A	0
	7	10.00	1	N/A	0	N/A	0	N/A	0
111	8	1.00	1	N/A	0	N/A	0	N/A	0
	9	N/A	0	N/A	0	N/A	0	N/A	0
	10	1.00	1	N/A	0	N/A	0	N/A	0
	11	N/A	0	N/A	0	N/A	0	N/A	0
	12	N/A	0	N/A	0	N/A	0	N/A	0
	13	N/A	0	N/A	0	N/A	0	N/A	0
	14	1.00	1	N/A	0	N/A	0	N/A	0
	15	1.00	1	200.00	1	0.74	19	N/A	0

Trading Statistics for Trader 311

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	40.50	2	115.00	1	60.00	1	140.00	1
	2	50.00	1	150.00	2	50.00	1	100.00	1
	3	65.00	2	106.67	3	100.00	1	80.00	1
	4	90.67	3	103.33	3	97.00	2	103.33	3
	5	90.00	3	95.67	3	115.00	2	96.00	2
	6	76.00	2	N/A	0	N/A	0	N/A	0
	7	87.00	2	105.75	4	99.50	2	103.00	1
311	8	98.00	1	101.60	5	98.00	1	99.00	2
	9	105.00	1	110.00	3	105.00	1	N/A	0
	10	95.00	1	102.67	3	95.00	1	100.00	1
	11	95.00	1	99.00	3	95.00	1	100.00	1
	12	94.00	1	115.00	4	92.33	3	84.25	2
	13	N/A	0	85.00	2	N/A	0	N/A	0
	14	N/A	0	29.33	3	N/A	0	13.00	1
	15	N/A	0	7.83	3	N/A	0	1.00	2

Trading Statistics for Trader 301

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	15.00	2	100.00	1	N/A	0	100.00	1
	2	32.50	2	80.00	1	50.00	1	80.00	1
	3	40.00	2	N/A	0	N/A	0	N/A	0
	4	78.33	3	N/A	0	N/A	0	N/A	0
	5	67.50	2	N/A	0	N/A	0	N/A	0
	6	N/A	0	126.67	3	N/A	0	N/A	0
	7	71.67	3	120.00	1	N/A	0	120.00	1
301	8	87.67	3	N/A	0	N/A	0	N/A	0
	9	89.00	3	115.00	2	97.00	1	N/A	0
	10	90.00	1	N/A	0	N/A	0	N/A	0
	11	91.00	1	110.00	1	N/A	0	N/A	0
	12	85.50	2	92.00	3	86.00	1	81.00	1
	13	19.00	3	76.00	3	45.00	1	80.00	1
	14	11.00	1	30.80	5	11.00	1	11.00	1
	15	N/A	0	50.00	1	N/A	0	N/A	0

Trading Statistics for Trader 41

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	N/A	0	N/A	0	N/A	0
	2	35.00	1	87.50	2	115.00	1	100.00	1
	3	N/A	0	100.00	1	N/A	0	100.00	2
	4	10.00	1	100.00	1	105.00	1	100.00	2
	5	N/A	0	N/A	0	N/A	0	N/A	0
	6	N/A	0	N/A	0	99.00	1	N/A	0
	7	N/A	0	N/A	0	N/A	0	100.00	1
41	8	N/A	0	N/A	0	95.00	1	96.00	1
	9	N/A	0	N/A	0	N/A	0	N/A	0
	10	N/A	0	N/A	0	95.00	1	N/A	0
	11	N/A	0	N/A	0	N/A	0	N/A	0
	12	N/A	0	N/A	0	N/A	0	N/A	0
	13	N/A	0	N/A	0	N/A	0	N/A	0
	14	N/A	0	N/A	0	9.00	1	N/A	0
	15	N/A	0	N/A	0	N/A	0	N/A	0

Trading Statistics for Trader 151

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	73.33	3	N/A	0	100.00	2	N/A	0
	2	N/A	0	110.00	3	N/A	0	100.00	3
	3	N/A	0	N/A	0	N/A	0	N/A	0
	4	93.50	2	N/A	0	96.00	1	N/A	0
	5	N/A	0	130.00	1	N/A	0	N/A	0
	6	N/A	0	N/A	0	N/A	0	95.00	1
	7	1.00	1	N/A	0	N/A	0	N/A	0
151	8	70.00	1	N/A	0	N/A	0	N/A	0
	9	70.00	1	N/A	0	N/A	0	N/A	0
	10	N/A	0	N/A	0	N/A	0	N/A	0
	11	70.00	1	N/A	0	N/A	0	N/A	0
	12	30.00	1	N/A	0	N/A	0	N/A	0
	13	40.00	1	50.00	1	40.00	1	N/A	0
	14	N/A	0	40.00	1	N/A	0	N/A	0
	15	N/A	0	N/A	0	N/A	0	N/A	0

Trading Statistics for Trader 61

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	125.00	2	N/A	0	120.00	1
	2	100.00	1	N/A	0	100.00	1	N/A	0
	3	100.00	3	116.67	3	100.00	2	116.67	3
	4	100.00	1	120.00	1	100.00	1	N/A	0
	5	94.50	2	107.00	3	94.50	2	109.50	2
	6	94.00	1	98.50	2	94.00	1	99.00	1
	7	94.00	1	100.00	2	94.00	2	100.00	2
61	8	94.00	3	99.00	4	94.00	3	99.00	4
	9	95.50	2	100.00	1	97.00	1	100.00	1
	10	94.25	4	99.33	3	94.25	4	99.33	3
	11	94.00	1	99.00	1	94.00	2	99.00	1
	12	88.00	2	99.00	1	88.00	2	N/A	0
	13	N/A	0	N/A	0	N/A	0	N/A	0
	14	N/A	0	39.00	1	N/A	0	N/A	0
	15	N/A	0	7.42	9	N/A	0	1.42	5

Trading Statistics for Trader 321

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	56.67	3	120.00	1	110.00	1	120.00	1
	2	167.50	4	63.75	4	N/A	0	N/A	0
	3	66.67	3	150.00	1	110.00	1	N/A	0
	4	50.00	1	100.00	1	N/A	0	100.00	1
	5	127.50	2	125.00	2	120.00	2	100.00	2
	6	83.50	2	99.50	2	N/A	0	99.50	2
	7	88.33	3	112.00	1	101.00	2	N/A	0
321	8	97.00	2	103.67	3	96.50	2	102.00	2
	9	N/A	0	111.00	2	N/A	0	102.00	1
	10	98.00	2	103.00	2	96.50	2	N/A	0
	11	N/A	0	105.25	4	N/A	0	92.00	1
	12	N/A	0	100.50	2	N/A	0	N/A	0
	13	N/A	0	70.60	5	N/A	0	51.00	1
	14	28.33	3	26.40	5	60.00	1	10.00	1
	15	10.50	2	3.11	5	N/A	0	3.37	3

Trading Statistics for Trader 241

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	10.00	1	62.50	4	N/A	0	100.00	2
	2	32.50	2	N/A	0	N/A	0	N/A	0
	3	32.50	2	N/A	0	N/A	0	75.00	1
	4	40.00	1	N/A	0	120.00	1	N/A	0
	5	N/A	0	N/A	0	100.00	1	95.00	2
	6	N/A	0	N/A	0	100.00	1	93.00	1
	7	90.00	1	N/A	0	90.00	1	90.00	1
241	8	100.00	1	N/A	0	97.50	2	94.00	1
	9	N/A	0	N/A	0	N/A	0	96.00	1
	10	N/A	0	N/A	0	N/A	0	N/A	0
	11	100.00	1	N/A	0	102.00	2	94.00	2
	12	N/A	0	N/A	0	N/A	0	N/A	0
	13	80.00	2	N/A	0	75.27	3	58.00	3
	14	10.00	1	N/A	0	33.00	1	6.00	1
	15	10.00	1	N/A	0	10.00	1	1.00	1

Trading Statistics for Trader 81

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	100.00	2	N/A	0	120.00	1	N/A	0
	2	75.00	1	108.33	3	75.00	2	100.00	1
	3	79.00	5	110.00	3	80.00	2	105.00	3
	4	88.33	3	113.33	3	100.00	1	112.50	2
	5	88.33	3	114.75	4	90.00	2	120.00	1
	6	82.50	2	115.00	2	N/A	0	N/A	0
	7	N/A	0	106.50	2	110.00	1	103.00	1
81	8	90.00	2	102.00	2	N/A	0	99.00	1
	9	92.25	4	104.33	3	95.00	2	105.00	1
	10	90.60	5	101.00	3	93.50	2	105.00	1
	11	85.00	1	99.00	7	N/A	0	N/A	0
	12	86.00	1	94.00	1	86.00	1	72.00	4
	13	N/A	0	75.80	10	N/A	0	50.00	1
	14	N/A	0	N/A	0	N/A	0	N/A	0
	15	N/A	0	N/A	0	N/A	0	N/A	0

Trading Statistics for Trader 51

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	140.00	2	250.00	1	N/A	0	N/A	0
	2	78.75	4	89.67	3	N/A	0	40.00	4
	3	88.33	3	140.00	1	N/A	0	N/A	0
	4	76.67	3	200.00	1	110.00	1	96.33	3
	5	125.00	1	N/A	0	98.33	3	93.50	4
	6	105.00	3	N/A	0	98.20	5	92.25	4
	7	97.50	4	140.00	1	106.00	3	95.25	4
51	8	106.67	3	135.00	2	99.50	4	47.00	2
	9	79.00	2	190.00	4	100.00	2	96.50	4
	10	115.00	4	N/A	0	99.50	2	94.00	2
	11	92.50	4	100.00	1	97.20	2	91.50	2
	12	82.50	4	N/A	0	90.49	2	84.00	2
	13	70.00	4	60.00	1	68.25	4	52.33	3
	14	24.50	4	N/A	0	10.00	1	3.67	3
	15	4.10	6	N/A	0	3.40	2	1.00	4

Trading Statistics for Trader 261

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	100.00	1	125.00	2	100.00	4	120.00	1
	2	100.00	2	117.50	2	100.00	2	115.00	1
	3	100.00	3	120.00	5	100.00	1	91.00	5
	4	90.00	1	100.00	1	90.00	2	100.00	3
	5	90.00	2	100.00	2	95.00	2	66.67	3
	6	77.50	2	N/A	0	N/A	0	N/A	0
	7	70.00	1	72.00	1	N/A	0	95.00	1
261	8	65.00	1	N/A	0	N/A	0	N/A	0
	9	90.00	1	N/A	0	N/A	0	N/A	0
	10	90.00	1	N/A	0	N/A	0	N/A	0
	11	90.00	1	N/A	0	N/A	0	N/A	0
	12	90.00	1	94.50	2	90.00	1	N/A	0
	13	N/A	0	N/A	0	N/A	0	N/A	0
	14	N/A	0	N/A	0	N/A	0	N/A	0
	15	N/A	0	N/A	0	N/A	0	N/A	0

Trading Statistics for Trader 32

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	117.00	3	246.00	5	175.00	2	225.00	2
	2	50.00	3	101.86	7	50.00	1	78.67	3
	3	96.67	3	132.50	4	115.00	4	120.00	4
	4	70.00	3	122.50	4	103.33	3	95.00	2
	5	77.25	4	113.00	4	111.33	3	104.00	3
	6	67.25	4	118.33	6	109.20	5	121.00	5
	7	84.00	5	105.00	3	96.67	3	105.00	2
32	8	81.25	4	100.83	6	81.67	3	100.00	2
	9	82.00	3	106.33	3	N/A	0	99.00	1
	10	55.00	3	99.00	2	95.00	1	N/A	0
	11	80.00	1	105.00	2	N/A	0	N/A	0
	12	40.00	2	86.80	5	50.00	1	60.00	1
	13	46.67	3	70.00	3	50.00	1	N/A	0
	14	36.00	4	65.00	2	N/A	0	50.00	1
	15	30.00	1	30.51	2	30.00	1	N/A	0

Trading Statistics for Trader 292

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	95.00	2	N/A	0	90.00	1
	2	50.00	2	100.00	1	50.00	1	100.00	2
	3	10.00	1	N/A	0	N/A	0	N/A	0
	4	N/A	0	125.00	2	150.00	1	100.00	1
	5	N/A	0	N/A	0	N/A	0	N/A	0
	6	N/A	0	110.00	1	100.00	1	110.00	1
	7	N/A	0	110.00	1	80.00	1	110.00	1
292	8	N/A	0	N/A	0	90.00	1	N/A	0
	9	N/A	0	111.00	4	N/A	0	96.00	2
	10	N/A	0	N/A	0	N/A	0	N/A	0
	11	N/A	0	N/A	0	N/A	0	N/A	0
	12	N/A	0	N/A	0	N/A	0	N/A	0
	13	N/A	0	N/A	0	N/A	0	N/A	0
	14	N/A	0	N/A	0	N/A	0	N/A	0
	15	N/A	0	N/A	0	N/A	0	N/A	0

Trading Statistics for Trader 232

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	50.00	2	70.00	3	250.00	1	102.00	5
	2	50.00	1	20.00	2	70.00	2	55.00	2
	3	50.00	3	130.00	2	143.33	3	86.67	3
	4	8.00	4	N/A	0	93.50	4	94.67	3
	5	11.33	3	15.00	1	103.50	2	93.33	3
	6	30.67	3	N/A	0	130.00	2	90.00	2
	7	67.67	3	N/A	0	93.00	1	70.00	1
232	8	45.50	2	N/A	0	70.00	1	80.00	1
	9	75.00	2	N/A	0	N/A	0	N/A	0
	10	80.00	1	N/A	0	N/A	0	N/A	0
	11	80.00	1	N/A	0	N/A	0	N/A	0
	12	32.50	2	N/A	0	N/A	0	50.00	1
	13	N/A	0	N/A	0	N/A	0	N/A	0
	14	1.00	1	N/A	0	N/A	0	N/A	0
	15	31.50	2	N/A	0	55.00	1	6.01	1

Trading Statistics for Trader 82

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	65.00	2	225.00	2	100.00	2	N/A	0
	2	50.00	1	50.00	3	N/A	0	50.00	3
	3	85.00	2	180.00	1	140.00	1	N/A	0
	4	N/A	0	50.00	1	N/A	0	50.00	1
	5	100.00	1	120.00	1	100.00	1	120.00	1
	6	100.00	3	113.33	3	100.00	3	115.00	2
	7	100.00	1	112.50	2	100.00	1	115.00	2
82	8	100.00	1	105.00	1	100.00	2	N/A	0
	9	N/A	0	110.00	1	N/A	0	N/A	0
	10	95.00	1	99.50	2	95.00	1	100.00	1
	11	N/A	0	100.00	1	N/A	0	N/A	0
	12	N/A	0	99.00	1	N/A	0	N/A	0
	13	N/A	0	95.00	1	N/A	0	41.00	1
	14	50.00	1	60.00	1	50.00	1	60.00	1
	15	50.00	1	55.00	2	50.00	1	12.00	1

Trading Statistics for Trader 92

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	20.00	1	196.67	3	N/A	0	90.00	1
	2	66.71	7	133.00	3	51.50	4	100.00	1
	3	81.50	2	134.00	5	81.00	1	137.50	4
	4	93.80	5	143.50	4	81.43	7	97.00	6
	5	80.00	3	138.40	5	81.00	3	135.00	1
	6	80.33	3	127.33	6	100.00	2	99.00	5
	7	64.50	4	119.00	3	N/A	0	120.00	1
92	8	62.00	5	135.00	4	N/A	0	120.00	1
	9	64.00	5	108.17	6	N/A	0	99.00	1
	10	59.50	6	N/A	0	N/A	0	N/A	0
	11	50.67	3	N/A	0	N/A	0	N/A	0
	12	44.00	3	65.00	1	46.00	1	65.00	1
	13	27.67	6	68.00	1	41.00	1	N/A	0
	14	10.50	2	64.98	4	N/A	0	59.90	1
	15	5.51	2	20.07	4	6.01	1	12.00	1

Trading Statistics for Trader 322

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	117.50	4	205.00	2	146.67	3	150.00	1
	2	80.00	1	123.33	6	80.00	1	90.00	2
	3	120.00	4	140.00	7	120.00	4	140.00	3
	4	103.75	4	125.71	7	81.25	4	121.67	6
	5	123.75	4	101.43	7	76.67	6	102.50	8
	6	133.00	5	101.00	10	92.73	11	100.00	8
	7	N/A	0	113.75	4	N/A	0	100.00	2
322	8	N/A	0	169.00	2	N/A	0	103.00	1
	9	100.00	1	220.80	5	100.00	2	N/A	0
	10	N/A	0	115.25	4	N/A	0	N/A	0
	11	N/A	0	92.00	2	N/A	0	N/A	0
	12	45.00	1	86.50	2	N/A	0	N/A	0
	13	68.00	1	65.00	2	22.67	3	65.00	2
	14	47.50	2	70.00	1	59.95	2	N/A	0
	15	N/A	0	68.33	3	N/A	0	N/A	0

Trading Statistics for Trader 312

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	25.00	3	N/A	0	N/A	0	N/A	0
	2	N/A	0	250.00	1	100.00	2	N/A	0
	3	50.00	1	130.00	2	120.00	1	81.00	1
	4	80.00	1	100.00	2	58.75	4	63.75	4
	5	N/A	0	120.00	1	101.67	3	60.00	4
	6	95.00	1	107.50	2	107.50	2	59.00	5
	7	90.00	1	100.00	3	92.86	7	86.67	3
312	8	N/A	0	100.00	1	N/A	0	65.71	7
	9	85.00	1	110.00	1	97.67	6	N/A	0
	10	90.00	1	98.50	2	95.00	2	N/A	0
	11	N/A	0	94.50	2	N/A	0	N/A	0
	12	N/A	0	76.67	3	62.50	2	71.25	4
	13	N/A	0	68.00	4	49.38	8	40.80	5
	14	N/A	0	58.00	4	55.00	2	60.00	1
	15	12.00	1	31.25	4	74.67	3	47.75	4

Trading Statistics for Trader 332

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	70.00	3	300.00	1	80.00	2	N/A	0
	2	80.00	2	110.00	4	80.00	2	100.00	1
	3	70.00	2	155.00	2	100.00	3	150.00	1
	4	75.50	2	156.67	3	92.00	2	160.00	1
	5	70.00	2	128.75	4	N/A	0	130.00	1
	6	85.00	4	123.33	3	95.00	2	126.67	3
	7	70.00	3	133.33	3	70.00	4	93.00	1
332	8	75.00	4	85.00	3	45.00	4	80.00	2
	9	N/A	0	100.71	7	N/A	0	96.67	3
	10	70.00	1	101.25	4	N/A	0	95.00	4
	11	N/A	0	110.00	2	N/A	0	N/A	0
	12	N/A	0	95.00	1	75.00	1	N/A	0
	13	N/A	0	65.00	3	N/A	0	38.75	4
	14	6.00	1	N/A	0	N/A	0	N/A	0
	15	6.83	3	N/A	0	N/A	0	N/A	0

Trading Statistics for Trader 272

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	N/A	0	N/A	0	N/A	0
	2	85.00	1	150.00	1	85.00	2	N/A	0
	3	N/A	0	120.00	1	N/A	0	120.00	2
	4	N/A	0	N/A	0	N/A	0	N/A	0
	5	80.00	1	N/A	0	80.00	1	N/A	0
	6	82.50	2	N/A	0	62.50	4	N/A	0
	7	N/A	0	110.00	1	N/A	0	N/A	0
272	8	N/A	0	130.00	1	N/A	0	N/A	0
	9	N/A	0	N/A	0	N/A	0	N/A	0
	10	N/A	0	105.00	2	N/A	0	N/A	0
	11	N/A	0	N/A	0	N/A	0	N/A	0
	12	N/A	0	90.00	1	N/A	0	N/A	0
	13	N/A	0	70.00	1	N/A	0	35.00	2
	14	N/A	0	65.00	1	N/A	0	N/A	0
	15	N/A	0	N/A	0	N/A	0	N/A	0

Trading Statistics for Trader 242

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	100.50	2	200.00	3	200.00	1	150.00	2
	2	50.50	2	127.67	3	100.00	2	85.00	1
	3	10.00	1	135.00	2	160.00	1	135.00	2
	4	78.33	3	94.67	3	109.33	3	92.50	2
	5	30.00	3	100.00	1	100.00	1	100.00	1
	6	70.00	2	200.00	1	90.00	1	N/A	0
	7	185.00	2	93.33	3	100.00	2	93.33	3
242	8	111.67	3	121.50	4	95.00	2	N/A	0
	9	N/A	0	122.50	4	N/A	0	96.67	3
	10	56.67	3	N/A	0	N/A	0	N/A	0
	11	45.33	3	N/A	0	N/A	0	N/A	0
	12	60.00	2	36.00	1	70.00	2	46.00	1
	13	30.00	2	75.00	2	68.00	1	N/A	0
	14	N/A	0	50.00	1	N/A	0	50.00	1
	15	30.00	2	67.75	4	56.00	1	N/A	0

Trading Statistics for Trader 302

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	293.33	3	N/A	0	200.00	1
	2	40.00	1	140.00	2	N/A	0	48.33	3
	3	105.00	2	160.00	1	136.67	3	N/A	0
	4	N/A	0	136.67	3	150.00	1	31.67	3
	5	95.00	2	106.67	3	105.00	2	100.00	1
	6	80.00	1	123.33	3	100.00	3	83.33	3
	7	90.00	2	112.00	5	105.00	3	110.00	4
302	8	60.00	1	120.00	1	N/A	0	N/A	0
	9	70.00	1	99.67	3	92.50	2	N/A	0
	10	N/A	0	99.50	2	N/A	0	N/A	0
	11	70.00	1	98.00	1	N/A	0	N/A	0
	12	N/A	0	95.00	1	70.00	1	N/A	0
	13	N/A	0	55.00	1	N/A	0	55.00	2
	14	N/A	0	N/A	0	N/A	0	N/A	0
	15	N/A	0	50.00	1	N/A	0	N/A	0

Trading Statistics for Trader 62

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	100.00	1	N/A	0	95.00	2	N/A	0
	2	50.00	1	142.50	4	50.00	1	N/A	0
	3	41.67	3	161.25	4	N/A	0	130.00	1
	4	21.67	3	180.00	2	100.00	1	95.00	1
	5	21.75	4	136.25	4	110.00	4	80.67	3
	6	12.60	5	155.00	4	106.00	5	93.71	7
	7	16.67	6	198.75	8	110.71	7	85.56	9
62	8	30.67	3	203.33	3	101.00	3	77.50	2
	9	30.00	3	225.00	2	99.00	1	100.00	1
	10	26.67	3	175.00	2	100.00	1	N/A	0
	11	55.00	2	132.00	4	N/A	0	N/A	0
	12	24.50	4	263.33	3	N/A	0	N/A	0
	13	10.00	1	175.00	2	46.00	3	50.00	1
	14	1.00	1	135.00	4	N/A	0	N/A	0
	15	1.00	1	122.25	4	N/A	0	200.00	1

Trading Statistics for Trader 113

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	20.00	1	20.00	2	11.00	3	5.00	1
	2	6.00	1	8.50	2	6.00	2	8.50	2
	3	7.75	4	11.67	3	8.67	3	11.67	3
	4	10.75	4	18.50	6	15.50	2	15.25	4
	5	19.80	5	65.00	2	25.00	4	65.00	2
	6	20.00	1	40.00	2	20.00	2	40.00	1
	7	17.20	5	33.00	2	23.00	2	30.67	3
113	8	27.20	5	50.50	2	30.00	1	50.50	2
	9	31.25	4	55.67	3	34.50	2	50.00	1
	10	26.60	5	77.50	2	27.50	2	N/A	0
	11	32.00	3	43.33	6	33.00	2	40.50	4
	12	25.75	4	49.00	3	30.00	1	N/A	0
	13	29.00	5	41.00	2	33.00	1	44.00	1
	14	15.00	1	43.67	6	N/A	0	N/A	0
	15	N/A	0	15.86	7	N/A	0	15.00	4

Trading Statistics for Trader 53

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	5.00	1	13.00	1	N/A	0	13.00	1
	2	N/A	0	N/A	0	8.50	2	N/A	0
	3	N/A	0	N/A	0	9.00	1	N/A	0
	4	N/A	0	N/A	0	13.50	2	N/A	0
	5	N/A	0	N/A	0	N/A	0	N/A	0
	6	N/A	0	N/A	0	40.00	1	N/A	0
	7	N/A	0	N/A	0	26.00	1	N/A	0
53	8	N/A	0	N/A	0	N/A	0	N/A	0
	9	N/A	0	138.66	3	N/A	0	N/A	0
	10	N/A	0	200.01	1	N/A	0	N/A	0
	11	N/A	0	47.00	5	N/A	0	45.00	2
	12	N/A	0	129.50	2	N/A	0	N/A	0
	13	N/A	0	500.00	1	N/A	0	N/A	0
	14	N/A	0	83.50	4	N/A	0	N/A	0
	15	N/A	0	56.00	2	N/A	0	N/A	0

Trading Statistics for Trader 103

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	12.00	1	27.50	2	6.00	2	N/A	0
	2	1.00	1	14.00	2	N/A	0	14.00	2
	3	10.00	2	40.00	1	10.00	2	40.00	1
	4	N/A	0	N/A	0	N/A	0	N/A	0
	5	N/A	0	N/A	0	N/A	0	N/A	0
	6	N/A	0	81.67	3	N/A	0	80.00	1
	7	N/A	0	95.00	2	N/A	0	95.00	2
103	8	65.00	1	65.00	1	50.00	1	65.00	1
	9	39.00	3	62.00	2	55.00	1	N/A	0
	10	N/A	0	38.75	4	N/A	0	30.00	2
	11	N/A	0	N/A	0	N/A	0	N/A	0
	12	32.33	3	35.00	2	35.00	2	30.00	1
	13	N/A	0	42.50	2	N/A	0	N/A	0
	14	8.00	1	37.50	2	N/A	0	35.00	1
	15	6.00	2	N/A	0	8.00	1	N/A	0

Trading Statistics for Trader 93

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	5.00	1	13.50	2	9.00	5	6.00	3
	2	1.33	3	10.00	1	18.33	3	4.33	6
	3	10.00	3	14.00	2	13.75	4	11.25	4
	4	15.50	4	N/A	0	17.00	2	9.00	3
	5	10.00	1	N/A	0	70.00	4	31.25	4
	6	5.00	1	10.00	1	70.00	2	20.00	2
	7	N/A	0	N/A	0	N/A	0	N/A	0
93	8	33.20	5	50.00	1	40.33	3	40.00	2
	9	40.00	1	N/A	0	40.00	1	36.00	1
	10	2.00	1	N/A	0	N/A	0	20.00	1
	11	10.00	1	N/A	0	N/A	0	N/A	0
	12	27.33	3	N/A	0	31.00	1	30.00	1
	13	26.50	4	N/A	0	32.00	1	N/A	0
	14	5.00	1	39.00	1	N/A	0	1.00	1
	15	8.75	4	N/A	0	12.00	1	8.00	1

Trading Statistics for Trader 43

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	5.00	2	17.67	3	6.00	1	8.50	4
	2	8.50	2	20.00	1	5.67	3	20.00	2
	3	9.33	3	15.33	3	16.00	2	43.33	3
	4	5.00	2	20.00	1	N/A	0	20.00	1
	5	20.00	1	60.00	1	20.00	3	60.00	4
	6	7.00	2	60.00	1	N/A	0	60.00	1
	7	20.00	1	147.50	2	40.00	4	N/A	0
43	8	65.00	1	126.67	3	65.00	1	40.00	1
	9	50.00	1	68.33	3	50.00	1	26.00	5
	10	25.00	2	67.50	2	23.33	3	N/A	0
	11	N/A	0	71.67	3	N/A	0	N/A	0
	12	N/A	0	64.50	2	N/A	0	32.50	2
	13	N/A	0	77.50	2	N/A	0	N/A	0
	14	1.00	1	52.50	2	1.00	1	40.00	1
	15	17.00	2	48.33	3	17.00	2	N/A	0

Trading Statistics for Trader 63

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	1.00	1	N/A	0	N/A	0	N/A	0
	2	5.00	1	1.00	1	3.33	3	6.00	1
	3	5.50	2	20.00	3	10.00	1	15.25	4
	4	1.25	2	90.00	1	1.00	2	N/A	0
	5	60.00	3	58.75	4	60.00	3	22.50	2
	6	1.00	1	90.00	1	N/A	0	N/A	0
	7	N/A	0	26.67	3	N/A	0	20.50	2
63	8	12.33	3	30.00	2	N/A	0	30.00	1
	9	75.00	1	52.50	6	18.75	4	39.50	4
	10	30.00	1	50.00	1	30.00	1	N/A	0
	11	87.50	2	36.75	4	50.67	6	32.67	3
	12	65.00	1	49.50	4	31.67	3	32.67	3
	13	N/A	0	31.00	2	N/A	0	31.00	2
	14	40.00	1	91.67	3	37.50	2	N/A	0
	15	N/A	0	43.80	5	N/A	0	N/A	0

Trading Statistics for Trader 133

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	13.00	1	N/A	0	13.00	2
	2	N/A	0	20.00	1	N/A	0	20.00	1
	3	8.00	1	20.00	1	8.00	1	20.00	1
	4	N/A	0	N/A	0	N/A	0	N/A	0
	5	1.00	1	100.00	1	N/A	0	N/A	0
	6	10.50	2	N/A	0	N/A	0	N/A	0
	7	10.00	1	130.00	1	33.00	2	N/A	0
133	8	15.00	1	115.00	2	N/A	0	N/A	0
	9	N/A	0	150.00	1	N/A	0	N/A	0
	10	1.00	1	50.00	1	30.00	1	20.00	1
	11	N/A	0	68.00	2	27.00	1	68.00	2
	12	20.00	1	N/A	0	30.00	1	N/A	0
	13	N/A	0	39.00	1	N/A	0	N/A	0
	14	N/A	0	32.00	2	N/A	0	N/A	0
	15	N/A	0	22.00	1	N/A	0	N/A	0

Trading Statistics for Trader 83

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	250.00	1	N/A	0	N/A	0
	2	35.00	2	27.50	2	17.67	3	13.50	2
	3	92.00	5	32.50	2	47.00	4	8.50	2
	4	8.83	3	63.00	3	20.00	1	6.00	1
	5	20.00	1	80.00	3	60.00	1	46.67	3
	6	9.80	5	N/A	0	N/A	0	N/A	0
	7	100.00	1	100.00	1	95.00	2	41.25	4
83	8	30.00	2	N/A	0	50.00	1	N/A	0
	9	37.50	4	N/A	0	42.50	2	N/A	0
	10	N/A	0	27.67	3	N/A	0	28.33	3
	11	70.00	3	34.00	1	41.00	3	34.00	1
	12	25.00	2	30.00	1	28.00	1	30.50	2
	13	36.67	3	N/A	0	37.00	2	33.00	1
	14	16.00	1	45.00	2	N/A	0	N/A	0
	15	11.00	4	N/A	0	14.00	1	N/A	0

Trading Statistics for Trader 284

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	42.00	5	67.50	4	126.00	5	84.44	9
	2	22.50	4	150.00	4	110.00	4	66.25	4
	3	45.00	2	N/A	0	N/A	0	N/A	0
	4	45.00	2	N/A	0	N/A	0	N/A	0
	5	72.50	4	100.00	1	89.00	2	85.00	1
	6	85.00	2	132.00	5	90.00	1	80.00	1
	7	81.50	2	118.00	8	99.50	2	90.67	3
284	8	74.25	4	168.75	4	87.50	2	81.50	2
	9	65.00	2	120.00	1	70.00	1	N/A	0
	10	54.00	1	112.50	4	60.00	1	N/A	0
	11	43.00	2	89.50	4	N/A	0	60.00	1
	12	60.00	2	85.00	2	64.50	2	60.00	1
	13	10.00	1	85.00	3	35.00	1	N/A	0
	14	N/A	0	75.00	4	N/A	0	50.00	1
	15	35.00	1	63.33	3	23.00	2	28.33	3

Trading Statistics for Trader 214

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	100.00	3	188.33	6	80.00	5	116.67	3
	2	62.43	7	120.00	5	93.33	3	100.00	3
	3	77.00	5	138.33	6	97.50	2	100.00	1
	4	87.00	5	103.00	5	91.00	2	100.00	2
	5	73.00	5	125.00	4	100.00	1	82.00	1
	6	75.00	3	109.50	4	91.33	3	84.50	2
	7	74.71	7	113.60	5	85.00	3	90.00	1
214	8	73.67	9	99.67	6	81.00	3	99.67	3
	9	67.25	12	106.67	3	78.00	3	N/A	0
	10	52.00	1	98.75	4	N/A	0	77.50	2
	11	51.00	2	157.33	6	N/A	0	N/A	0
	12	50.00	1	96.33	3	50.00	1	31.00	1
	13	50.00	1	137.50	4	50.00	1	N/A	0
	14	50.00	2	83.00	3	50.00	2	N/A	0
	15	14.60	5	61.50	4	16.00	2	13.00	2

Trading Statistics for Trader 224

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	125.00	3	100.00	2	125.00	3
	2	N/A	0	120.00	6	99.00	10	120.00	6
	3	90.00	1	120.00	2	81.25	8	72.00	5
	4	N/A	0	110.00	2	87.50	2	44.00	10
	5	82.00	1	100.00	2	81.60	5	66.67	3
	6	73.00	3	90.00	1	N/A	0	60.00	3
	7	65.00	1	N/A	0	N/A	0	N/A	0
224	8	60.00	1	N/A	0	N/A	0	N/A	0
	9	50.00	1	N/A	0	N/A	0	N/A	0
	10	45.00	1	N/A	0	N/A	0	N/A	0
	11	35.51	2	N/A	0	N/A	0	N/A	0
	12	30.00	1	N/A	0	N/A	0	N/A	0
	13	20.00	1	N/A	0	N/A	0	N/A	0
	14	15.00	1	N/A	0	N/A	0	N/A	0
	15	7.00	1	N/A	0	N/A	0	N/A	0

Trading Statistics for Trader 294

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	46.25	4	200.00	1	46.67	3	N/A	0
	2	58.00	5	225.00	2	50.00	6	N/A	0
	3	65.50	2	250.00	1	N/A	0	N/A	0
	4	72.50	2	90.00	2	85.00	1	60.00	1
	5	55.00	2	116.67	3	N/A	0	100.00	1
	6	85.00	2	100.00	2	98.00	1	100.00	1
	7	60.00	1	103.00	6	N/A	0	79.60	5
294	8	62.50	2	125.00	3	65.00	1	N/A	0
	9	65.00	1	97.25	4	65.00	1	100.00	1
	10	N/A	0	99.00	3	N/A	0	46.00	2
	11	N/A	0	95.00	3	N/A	0	100.00	1
	12	N/A	0	82.50	4	N/A	0	55.00	1
	13	15.50	2	70.00	2	N/A	0	50.00	1
	14	18.00	1	N/A	0	N/A	0	N/A	0
	15	9.00	2	30.00	1	9.00	2	30.00	1

Trading Statistics for Trader 264

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	50.00	3	150.00	1	N/A	0	N/A	0
	2	90.00	5	125.00	8	106.67	3	91.67	6
	3	95.00	7	101.25	4	103.33	3	101.25	4
	4	91.25	8	122.50	8	64.44	9	63.33	6
	5	78.33	6	96.43	7	68.75	4	71.20	5
	6	79.67	6	91.20	5	82.00	3	84.67	3
	7	74.83	6	97.67	3	82.33	3	49.00	2
264	8	93.83	6	87.50	6	83.70	10	74.44	9
	9	87.17	6	77.71	7	74.86	7	35.40	10
	10	75.00	2	65.50	6	49.00	3	56.50	2
	11	66.50	2	61.67	3	57.00	3	46.25	4
	12	61.00	4	52.86	7	51.71	7	36.25	8
	13	60.29	7	47.57	7	52.00	7	35.00	6
	14	41.67	3	48.33	3	54.50	2	42.50	2
	15	11.25	4	10.00	1	15.00	1	10.00	1

Trading Statistics for Trader 194

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	50.00	2	50.00	1	80.00	3	120.00	1
	2	43.33	3	90.00	3	N/A	0	106.67	3
	3	40.00	4	92.50	4	68.00	5	56.00	5
	4	52.50	4	96.25	4	36.67	3	63.33	3
	5	50.80	10	70.00	3	104.50	2	85.00	2
	6	68.33	3	83.00	5	46.25	4	92.75	4
	7	78.00	8	94.80	5	57.80	5	88.33	3
194	8	72.50	2	95.00	3	42.50	2	96.25	4
	9	77.50	2	81.88	8	51.67	3	80.00	2
	10	48.50	2	60.00	4	100.00	3	57.25	4
	11	N/A	0	69.00	6	67.20	5	67.50	2
	12	N/A	0	75.00	4	60.00	2	65.00	3
	13	N/A	0	74.25	4	N/A	0	N/A	0
	14	N/A	0	85.50	8	N/A	0	69.00	1
	15	N/A	0	159.42	19	N/A	0	N/A	0

Trading Statistics for Trader 304

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	10.00	1	10.00	1	N/A	0	80.00	2
	2	10.50	2	100.00	1	N/A	0	N/A	0
	3	30.00	2	100.00	1	N/A	0	100.00	1
	4	30.00	2	N/A	0	N/A	0	N/A	0
	5	100.00	1	N/A	0	100.00	1	N/A	0
	6	80.00	1	90.00	1	N/A	0	90.00	1
	7	89.00	2	99.50	2	89.00	2	100.00	1
304	8	77.67	3	103.33	3	90.00	1	90.00	1
	9	70.00	3	100.00	3	78.00	3	85.00	1
	10	55.00	3	69.20	5	56.00	2	77.50	2
	11	61.67	6	67.50	2	60.00	6	65.00	1
	12	50.00	1	N/A	0	50.00	1	N/A	0
	13	23.00	2	81.67	3	36.00	1	65.00	1
	14	55.00	1	85.00	1	55.00	1	N/A	0
	15	10.00	1	80.00	1	10.00	1	N/A	0

Trading Statistics for Trader 244

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	51.67	6	35.00	2	90.00	3	90.00	2
	2	38.33	3	123.33	3	90.00	1	60.00	1
	3	28.33	3	30.00	1	N/A	0	100.00	1
	4	94.00	2	N/A	0	75.00	2	81.00	1
	5	68.00	1	N/A	0	99.00	2	70.00	1
	6	N/A	0	150.00	2	87.50	2	80.00	3
	7	N/A	0	132.50	2	62.67	3	90.00	1
244	8	N/A	0	161.00	3	97.00	2	91.50	2
	9	67.50	2	500.00	1	67.50	2	79.00	4
	10	54.75	4	N/A	0	55.80	5	50.00	1
	11	N/A	0	74.33	6	N/A	0	68.00	3
	12	N/A	0	139.00	2	N/A	0	N/A	0
	13	30.00	1	70.00	1	52.50	2	N/A	0
	14	N/A	0	68.33	3	N/A	0	75.00	1
	15	N/A	0	72.00	2	N/A	0	N/A	0

Trading Statistics for Trader 334

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	72.50	4	145.00	4	85.00	2	115.00	2
	2	61.25	4	104.00	5	61.25	4	75.83	6
	3	93.00	5	63.57	7	63.33	3	90.33	6
	4	103.33	3	93.75	4	44.29	7	73.33	6
	5	73.75	4	99.00	5	70.00	1	83.50	2
	6	83.75	4	95.00	1	95.00	1	95.00	1
	7	97.00	5	82.75	4	60.63	8	55.17	6
334	8	88.80	5	77.86	7	81.17	6	67.86	7
	9	71.43	7	67.50	6	29.80	5	66.25	4
	10	73.33	3	59.13	8	73.33	3	56.60	5
	11	76.25	4	65.63	8	50.83	6	55.60	5
	12	55.00	3	50.83	6	33.00	5	51.67	6
	13	48.75	4	40.40	5	32.00	5	40.60	5
	14	75.00	1	60.00	2	75.00	1	40.00	1
	15	60.00	1	47.50	2	60.00	1	15.00	1

Trading Statistics for Trader 324

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	46.67	3	45.00	1	80.00	1	50.00	1
	2	50.00	1	140.00	2	N/A	0	100.00	2
	3	82.00	1	110.00	1	82.00	1	110.00	1
	4	81.00	1	N/A	0	81.00	1	N/A	0
	5	76.00	1	104.33	6	38.00	2	99.00	3
	6	75.50	2	90.00	1	77.00	3	N/A	0
	7	83.00	2	99.00	3	30.00	3	32.83	6
324	8	77.50	4	97.00	2	81.00	2	94.00	1
	9	65.00	2	98.00	3	43.33	3	84.00	3
	10	53.75	4	70.80	5	53.75	4	55.00	3
	11	53.67	3	85.00	2	53.67	3	40.00	2
	12	41.00	2	72.00	2	41.00	2	64.00	1
	13	37.00	4	69.25	4	39.00	3	51.80	5
	14	25.00	2	64.67	6	30.00	1	65.00	1
	15	N/A	0	56.86	7	N/A	0	N/A	0

Trading Statistics for Trader 254

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	106.67	3	88.75	4	131.67	3	70.00	7
	2	63.00	5	143.33	3	130.00	3	61.67	3
	3	84.00	3	N/A	0	100.00	1	95.00	1
	4	81.00	1	N/A	0	100.00	1	92.00	1
	5	74.40	5	N/A	0	85.00	1	82.00	1
	6	76.50	6	N/A	0	N/A	0	N/A	0
	7	67.50	2	N/A	0	N/A	0	N/A	0
254	8	N/A	0	N/A	0	80.00	2	90.00	1
	9	N/A	0	N/A	0	N/A	0	N/A	0
	10	10.50	2	N/A	0	N/A	0	N/A	0
	11	N/A	0	N/A	0	65.00	1	53.00	2
	12	N/A	0	N/A	0	50.00	2	51.00	1
	13	N/A	0	40.00	1	35.00	1	40.00	1
	14	N/A	0	69.80	5	65.00	1	30.00	1
	15	N/A	0	30.00	1	N/A	0	15.00	1

Trading Statistics for Trader 234

ID	Period	Av.Bid_Price	Quantity of Bids	Av.Ask_Price	Quantity of Asks	Av.Buy_Price	Quantity of Buys	Av.Sell_Price	Quantity of Sell
	1	N/A	0	175.00	2	90.00	4	170.00	1
	2	60.00	1	180.00	1	N/A	0	N/A	0
	3	N/A	0	170.00	2	105.00	3	90.00	1
	4	N/A	0	140.00	1	55.00	2	N/A	0
	5	N/A	0	130.00	1	N/A	0	90.00	1
	6	N/A	0	99.50	2	92.50	2	N/A	0
	7	72.00	1	N/A	0	N/A	0	90.00	1
234	8	N/A	0	102.25	4	85.00	2	73.00	3
	9	N/A	0	100.00	1	81.50	2	65.40	5
	10	N/A	0	100.00	1	55.33	3	85.67	3
	11	N/A	0	72.00	2	N/A	0	61.67	3
	12	55.00	1	60.00	2	48.75	4	49.25	4
	13	N/A	0	57.50	2	40.00	1	38.33	3
	14	N/A	0	N/A	0	30.00	1	50.00	1
	15	3.50	1	N/A	0	N/A	0	N/A	0

APPENDIX B: Tables for Individual Statistics for the Overconfidence Experiment

Average Entry Levels and Profits for the First Market of the Overconfidence Experiment

	Av. Entry Level P1	Av. Entry Level P2	Av. Entry Level P3	Av.Profit P1	Av.Profit P2	Av.Profit P3
31	0.88	0.50	0.38	12.00	10.50	8.13
41	0.75	0.38	0.25	8.50	8.75	7.00
51	0.63	1.00	0.88	11.63	5.38	9.00
61	0.75	1.00	0.88	11.50	8.00	12.63
81	0.75	1.00	0.75	9.13	5.38	11.50
91	0.50	0.88	0.88	7.75	12.38	11.13
101	0.63	0.75	1.00	9.50	10.88	11.88
111	1.00	0.38	0.25	13.75	8.75	8.75
121	1.00	0.38	0.25	11.63	8.75	8.25
141	0.75	0.50	0.38	8.25	9.25	6.63
151	0.75	0.50	0.38	9.75	6.88	6.63
161	0.50	0.88	0.75	7.13	10.50	7.88
171	0.75	1.00	1.00	7.63	10.13	10.75
211	0.63	0.75	0.50	9.13	5.50	7.50
221	0.88	1.00	0.75	6.63	10.38	9.38
231	0.63	0.63	0.38	8.88	8.25	8.13
241	0.63	0.75	0.63	9.75	7.00	8.25
251	0.75	0.50	0.38	8.13	7.13	8.13
261	0.88	0.50	0.38	8.38	8.38	9.38
271	0.63	0.75	0.50	7.38	10.25	6.25
301	0.75	0.88	0.75	8.75	5.75	8.50
311	0.63	1.00	0.88	7.13	11.38	11.75
321	0.13	0.88	0.63	5.63	8.13	9.75
331	0.50	1.00	0.88	5.38	8.00	8.13

Average Entry Levels and Profits for the Second Market of the Overconfidence Experiment

	Av. Entry Level P1	Av. Entry Level P2	Av. Entry Level P3	Av.Profit P1	Av.Profit P2	Av.Profit P3
32	0.63	1.00	0.75	8.00	5.63	8.13
62	1.00	0.50	0.50	11.25	6.25	10.50
82	0.63	0.88	0.63	8.88	9.63	9.75
92	0.75	0.63	0.50	8.50	5.88	9.25
232	0.63	0.75	0.38	6.50	10.88	8.75
242	0.50	0.88	0.63	7.75	10.50	8.88
272	1.00	0.38	0.38	7.50	8.75	9.38
292	1.00	0.38	0.38	11.38	8.25	9.38
302	0.63	0.75	0.63	7.38	8.50	11.00
312	0.75	0.50	0.50	7.00	9.88	9.25
322	0.63	1.00	0.75	8.88	10.13	6.38
332	0.75	0.50	0.38	7.00	9.88	8.13

Average Entry Levels and Profits for the Third Market of the Overconfidence Experiment

	Av. Entry Level P1	Av. Entry Level P2	Av. Entry Level P3	Av.Profit P1	Av.Profit P2	Av.Profit P3
43	1.00	0.50	0.50	9.25	9.88	9.88
53	0.63	0.25	0.25	8.63	7.88	7.63
63	1.00	0.63	0.63	6.25	7.63	7.63
83	0.88	0.75	0.63	5.75	7.63	7.63
93	0.88	0.63	0.38	7.50	9.50	9.38
103	0.88	0.63	0.75	11.75	10.38	11.50
113	1.00	0.50	0.50	8.63	9.88	7.75
133	0.75	0.50	0.50	6.50	7.63	7.63

Average Entry Levels and Profits for the Fourth Market of the Overconfidence Experiment

	Av. Entry Level P1	Av. Entry Level P2	Av. Entry Level P3	Av.Profit P1	Av.Profit P2	Av.Profit P3
194	0.63	0.63	0.50	8.00	10.38	8.63
214	0.63	1.00	0.75	10.38	11.00	10.00
224	1.00	0.25	0.38	9.38	8.63	10.50
234	1.00	0.38	0.38	9.50	8.75	8.75
244	0.75	0.63	0.38	7.63	10.38	9.38
254	1.00	0.38	0.25	8.63	8.13	7.63
264	0.63	1.00	0.75	8.00	6.88	7.25
284	0.75	0.75	0.50	7.00	11.50	10.50
294	0.88	0.50	0.38	8.38	6.88	8.13
304	0.50	0.88	0.75	6.25	5.75	10.63
324	0.50	0.75	0.63	9.00	9.38	9.13
334	0.75	1.00	0.75	7.88	7.38	9.63

Decisions in First Market of the Overconfidence Experiment

	PERIODS																							
ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
31	1	1	1	1	1	1	1	0	0	0	0	1	1	0	1	1	0	1	0	0	1	0	1	0
41	1	1	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	1	0	0	1	0	0
51	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
61	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
81	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1
91	0	1	1	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1
101	1	1	1	1	0	1	0	0	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1
111	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1
121	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	1	1	0
141	1	0	1	1	1	1	1	0	1	1	1	0	1	0	0	0	1	1	0	1	0	0	0	0
151	1	0	1	1	0	1	1	1	0	1	1	1	0	1	0	0	1	0	1	0	0	1	0	0
161	1	1	0	1	0	1	0	0	0	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1
171	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
211	1	1	0	0	1	0	1	1	1	0	1	0	1	1	1	1	1	0	1	1	1	0	0	0
221	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1
231	1	1	1	0	0	1	0	1	0	1	1	1	1	0	0	1	1	0	0	1	0	1	0	0
241	1	1	1	1	1	0	0	0	1	1	1	1	0	1	1	0	1	0	1	0	1	1	1	0
251	1	1	1	1	1	1	0	0	1	0	0	1	0	1	1	0	0	1	0	0	0	0	1	1
261	1	1	1	1	1	1	1	0	0	0	1	0	0	1	1	1	0	1	1	0	1	0	0	0
271	1	1	1	1	0	0	1	0	1	1	0	1	1	1	1	0	1	0	1	0	0	0	1	1
301	1	0	1	1	0	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1
311	1	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
321	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1
331	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1

Profits in First Market of the Overconfidence Experiment

	PERIODS																							
ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
31	15	10	10	15	10	15	15	6	6	6	6	15	15	6	15	15	6	10	6	6	10	6	15	6
41	15	10	10	3	15	6	3	6	10	15	15	6	6	6	6	6	6	6	10	6	6	10	6	6
51	6	6	6	15	15	15	15	15	3	3	3	10	3	15	3	3	15	10	15	6	10	3	3	10
61	15	15	15	6	6	10	10	15	10	3	10	3	10	10	3	15	10	15	6	15	15	15	15	10
81	3	3	15	10	15	6	6	15	3	3	3	3	15	3	3	10	15	6	6	15	15	10	15	10
91	6	15	3	6	10	6	6	10	15	6	15	15	15	15	3	15	15	15	6	3	15	15	10	10
101	10	15	15	3	6	15	6	6	15	6	15	10	6	10	15	10	10	15	10	15	10	10	15	10
111	15	15	15	15	15	10	10	15	6	6	6	15	6	15	10	6	6	6	6	15	10	6	6	15
121	3	15	10	10	10	15	15	15	15	10	6	6	6	15	6	6	6	6	6	6	6	15	15	6
141	3	6	15	15	15	3	3	6	10	10	15	6	15	6	6	6	10	3	6	10	6	6	6	6
151	15	6	3	3	6	15	15	15	6	15	3	3	6	10	6	6	10	6	10	6	6	3	6	6
161	3	10	6	10	6	10	6	6	6	15	15	10	15	3	10	10	6	10	15	10	6	3	10	3
171	3	6	6	10	15	3	15	3	15	10	10	10	3	3	15	15	10	3	3	15	15	15	10	15
211	10	15	6	6	10	6	10	10	3	6	3	6	10	3	10	3	3	6	15	15	3	6	6	6
221	3	3	3	15	3	6	10	10	10	10	10	3	10	15	15	10	15	10	10	10	6	3	6	15
231	15	15	3	6	6	10	6	10	6	10	10	15	10	6	6	3	15	6	6	10	6	10	6	6
241	10	10	15	10	15	6	6	6	3	3	10	15	6	3	10	6	3	6	10	6	10	10	15	6
251	10	10	10	3	10	10	6	6	10	6	6	3	6	10	10	6	6	10	6	6	6	6	10	15
261	10	3	10	3	10	10	15	6	6	6	3	6	6	15	10	15	6	15	15	6	15	6	6	6
271	3	10	15	3	6	6	10	6	10	15	6	10	10	10	15	6	10	6	10	6	6	6	3	3
301	10	6	10	10	6	3	10	15	3	3	3	15	10	3	6	3	6	6	15	10	15	3	10	3
311	3	6	3	15	6	15	3	6	15	15	15	15	3	15	3	10	15	15	6	15	10	15	3	15
321	6	6	6	6	3	6	6	6	6	3	3	3	15	10	15	10	6	15	6	10	10	10	6	15
331	6	6	3	6	3	6	3	10	3	10	10	10	3	3	10	15	3	3	15	6	3	15	10	10

Scores in First Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
31	N/A	N/A	N/A	3	4	N/A	3	3	N/A	2	N/A	N/A	3	N/A	1	N/A
41	5	3	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A	N/A	4	N/A	N/A
51	2	2	2	0	0	0	3	2	6	2	3	N/A	0	0	2	2
61	5	3	3	3	4	3	3	4	5	3	N/A	5	3	5	2	4
81	4	4	4	0	5	3	3	0	6	N/A	N/A	4	4	3	4	3
91	6	N/A	4	6	6	4	0	6	6	4	N/A	3	4	4	1	3
101	5	N/A	5	5	N/A	4	5	4	5	4	3	4	3	3	1	5
111	2	1	2	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	3
121	5	4	N/A	N/A	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	1	N/A
141	4	2	5	N/A	4	N/A	N/A	N/A	3	2	N/A	3	N/A	N/A	N/A	N/A
151	N/A	4	3	2	N/A	3	N/A	N/A	2	N/A	3	N/A	N/A	1	N/A	N/A
161	N/A	5	5	5	5	3	4	4	N/A	3	1	4	N/A	2	3	2
171	5	4	4	3	5	3	5	5	5	2	5	4	2	5	1	5
211	3	N/A	2	N/A	4	2	4	2	2	N/A	3	3	4	N/A	N/A	N/A
221	5	4	4	4	5	3	4	4	6	3	4	3	N/A	4	N/A	3
231	N/A	2	4	5	5	N/A	N/A	4	4	N/A	N/A	3	N/A	3	N/A	N/A
241	1	2	2	0	N/A	2	0	N/A	1	N/A	4	N/A	2	2	1	N/A
251	4	N/A	N/A	4	N/A	3	4	N/A	N/A	2	N/A	N/A	N/A	N/A	3	5
261	N/A	N/A	3	N/A	N/A	2	3	6	N/A	4	5	N/A	4	N/A	N/A	N/A
271	5	5	N/A	5	4	3	6	N/A	4	N/A	3	N/A	N/A	N/A	2	4
301	2	1	0	0	0	0	N/A	1	N/A	N/A	4	2	2	3	2	3
311	4	4	3	5	4	4	4	3	3	3	N/A	5	4	5	2	4
321	N/A	3	0	0	5	2	0	1	N/A	0	N/A	0	0	0	N/A	0
331	3	4	3	3	2	3	5	4	2	1	5	N/A	2	2	1	5

Self-Predicted Scores in First Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
31	N/A	N/A	N/A	3	4	N/A	4	4	N/A	3	N/A	N/A	2	N/A	2	N/A
41	4	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A	N/A	3	N/A	N/A
51	3	2	3	4	3	2	5	2	4	3	4	N/A	3	2	3	3
61	5	4	5	4	4	4	5	5	6	4	N/A	5	5	5	5	4
81	4	4	5	4	3	5	4	3	4	N/A	N/A	4	5	4	5	5
91	6	N/A	6	6	6	5	6	6	6	5	N/A	4	4	5	3	4
101	5	N/A	6	5	N/A	5	5	5	5	4	4	4	4	4	4	5
111	1	0	1	N/A	N/A	N/A	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	1
121	3	4	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	1	N/A
141	4	5	4	N/A	3	N/A	N/A	N/A	3	2	N/A	3	N/A	N/A	N/A	N/A
151	N/A	4	3	2	N/A	3	N/A	N/A	2	N/A	1	N/A	N/A	2	N/A	N/A
161	N/A	5	6	5	6	6	6	6	N/A	4	2	4	N/A	4	3	3
171	6	6	6	6	6	5	6	5	6	4	5	4	4	6	3	6
211	3	N/A	3	N/A	5	4	5	3	3	N/A	4	4	4	N/A	N/A	N/A
221	3	5	5	6	5	6	5	6	4	5	4	4	N/A	5	N/A	5
231	N/A	4	4	5	5	N/A	N/A	3	2	N/A	N/A	3	N/A	5	N/A	N/A
241	3	1	3	1	N/A	3	1	N/A	2	N/A	5	N/A	2	2	2	N/A
251	3	N/A	N/A	4	N/A	4	3	N/A	N/A	1	N/A	N/A	N/A	N/A	2	3
261	N/A	N/A	3	N/A	N/A	2	3	4	N/A	2	3	N/A	4	N/A	N/A	N/A
271	6	5	N/A	5	6	5	6	N/A	4	N/A	4	N/A	N/A	N/A	3	4
301	1	1	1	1	1	1	N/A	1	N/A	N/A	3	2	3	4	3	2
311	3	3	4	6	5	5	6	4	3	4	N/A	4	5	4	5	3
321	N/A	2	2	2	2	3	2	3	N/A	1	N/A	1	0	1	N/A	0
331	6	4	3	3	5	4	6	5	3	3	3	N/A	3	2	3	5

Confidence Levels in First Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
31	N/A	N/A	N/A	4	5	N/A	4	5	N/A	4	N/A	N/A	2	N/A	3	N/A
41	4	5	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	N/A	N/A	4	N/A	N/A
51	5	5	5	5	4	5	5	5	5	5	4	N/A	4	4	4	4
61	3	5	5	5	5	4	3	5	4	3	N/A	4	3	4	5	4
81	3	5	4	4	3	4	3	4	5	N/A	N/A	3	5	4	4	5
91	5	N/A	4	5	5	4	3	4	4	3	N/A	3	4	4	3	3
101	5	N/A	3	5	N/A	5	4	3	3	4	3	3	3	2	3	4
111	3	2	3	N/A	N/A	N/A	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	1
121	3	4	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	1	N/A
141	4	3	4	N/A	3	N/A	N/A	N/A	3	4	N/A	3	N/A	N/A	N/A	N/A
151	N/A	4	3	4	N/A	4	N/A	N/A	3	N/A	3	N/A	N/A	4	N/A	N/A
161	N/A	4	4	5	4	3	3	4	N/A	5	3	3	N/A	3	4	3
171	4	5	4	5	5	5	4	5	4	5	4	3	5	5	4	3
211	4	N/A	4	N/A	4	3	3	3	3	N/A	4	3	3	N/A	N/A	N/A
221	5	4	4	5	3	5	5	5	5	4	4	4	N/A	4	N/A	4
231	N/A	4	3	3	4	N/A	N/A	3	4	N/A	N/A	3	N/A	3	N/A	N/A
241	2	4	4	4	N/A	4	3	N/A	5	N/A	3	N/A	4	2	3	N/A
251	3	N/A	N/A	4	N/A	4	3	N/A	N/A	2	N/A	N/A	N/A	N/A	3	3
261	N/A	N/A	3	N/A	N/A	4	3	4	N/A	3	4	N/A	3	N/A	N/A	N/A
271	3	4	N/A	3	3	4	3	N/A	3	N/A	3	N/A	N/A	N/A	2	3
301	3	5	4	3	4	4	N/A	4	N/A	N/A	3	3	3	4	3	4
311	4	4	4	5	4	4	3	3	5	5	N/A	3	3	4	3	4
321	N/A	3	5	4	4	3	5	4	N/A	5	N/A	4	3	5	N/A	4
331	5	5	5	5	5	4	5	4	5	5	5	N/A	4	5	4	4

Decisions in Second Market of the Overconfidence Experiment

	PERIODS																							
ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
32	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0
62	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0	0	0
82	1	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1
92	1	1	0	1	1	1	0	1	1	1	0	1	0	1	0	1	0	0	1	0	1	0	1	1
232	1	0	0	0	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	0	1	0	0	0
242	1	0	1	1	0	0	1	0	1	1	1	0	1	1	1	1	0	1	0	0	1	1	1	1
272	1	1	1	1	1	1	1	1	0	1	0	1	1	0	0	0	1	0	0	0	0	1	1	0
292	1	1	1	1	1	1	1	1	0	0	0	1	0	1	1	0	0	0	0	1	1	0	0	1
302	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	0
312	1	1	1	0	1	1	1	0	1	1	1	0	0	0	0	1	0	1	1	1	0	1	0	0
322	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1
332	1	0	1	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	0	0	0	0	0

Profits in Second Market of the Overconfidence Experiment

	PERIODS																							
ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
32	10	10	10	10	15	15	10	10	3	10	6	6	6	6	10	3	15	15	15	15	6	6	6	6
62	15	10	3	15	6	6	6	10	6	3	15	10	15	15	3	10	6	6	15	10	10	15	6	10
82	3	15	6	10	10	3	6	15	10	10	6	3	6	3	6	3	6	6	10	6	10	6	15	15
92	3	6	6	6	10	15	3	3	15	6	15	10	10	6	10	15	10	15	6	6	15	6	6	6
232	3	6	10	15	6	6	10	6	15	3	10	6	15	10	15	10	6	3	6	6	15	10	10	15
242	3	15	15	3	3	3	15	3	6	10	6	15	15	6	6	6	15	6	6	6	6	15	15	6
272	15	10	15	3	15	15	3	15	6	6	6	6	6	15	6	15	15	15	15	6	6	6	6	6
292	6	10	6	3	15	10	3	6	3	3	6	10	10	15	15	6	10	15	6	15	15	6	15	6
302	10	3	3	6	3	10	15	6	10	15	15	6	6	6	6	15	6	10	15	10	6	15	6	6
312	15	6	6	10	6	3	15	10	15	15	10	15	10	10	3	3	6	6	3	3	3	10	10	10
322	10	6	10	3	3	15	3	6	10	15	6	6	6	6	15	15	15	10	10	6	6	6	6	6
332	10	10	10	10	15	15	10	10	3	10	6	6	6	6	10	3	15	15	15	15	6	6	6	6

Scores in Second Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
32	4	3	N/A	N/A	N/A	N/A	2	3	4	5	5	6	N/A	N/A	N/A	N/A
62	N/A	2	3	0	4	2	3	3	N/A	N/A	5	5	4	4	N/A	2
82	2	1	N/A	2	N/A	2	N/A	2	N/A	N/A	5	N/A	4	N/A	3	4
92	3	N/A	4	3	2	N/A	3	4	3	2	N/A	N/A	3	N/A	N/A	N/A
232	5	2	4	N/A	5	4	3	4	N/A	2	N/A	N/A	6	3	2	3
242	N/A	4	N/A	5	5	N/A	N/A	N/A	5	N/A	N/A	N/A	N/A	5	3	N/A
272	N/A	N/A	N/A	2	N/A	3	4	N/A	N/A	N/A	N/A	3	2	N/A	N/A	4
292	3	3	N/A	4	4	4	4	N/A	4	1	N/A	3	1	N/A	3	N/A
302	5	4	6	N/A	N/A	N/A	N/A	4	N/A	1	3	1	N/A	2	N/A	N/A
312	2	5	4	4	1	2	3	4	N/A	N/A	2	2	2	2	2	2
322	5	4	N/A	N/A	N/A	N/A	4	6	5	1	4	N/A	N/A	N/A	N/A	N/A
332	4	3	N/A	N/A	N/A	N/A	2	3	4	5	5	6	N/A	N/A	N/A	N/A

Self-Predicted Scores in Second Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
32	5	4	N/A	N/A	N/A	N/A	4	4	3	6	4	4	N/A	N/A	N/A	N/A
62	N/A	3	2	2	3	3	4	4	N/A	N/A	3	3	5	5	N/A	5
82	2	2	N/A	2	N/A	2	N/A	2	N/A	N/A	3	N/A	2	N/A	3	5
92	4	N/A	4	3	4	N/A	4	4	4	3	N/A	N/A	2	N/A	N/A	N/A
232	5	5	5	N/A	5	5	5	5	N/A	2	N/A	N/A	6	4	4	5
242	N/A	2	N/A	4	4	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	3	2	N/A
272	N/A	N/A	N/A	3	N/A	3	3	N/A	N/A	N/A	N/A	3	2	N/A	N/A	2
292	5	4	N/A	5	5	5	4	N/A	4	4	N/A	3	2	N/A	3	N/A
302	6	6	6	N/A	N/A	N/A	N/A	6	N/A	1	3	3	N/A	3	N/A	N/A
312	5	4	4	4	3	4	3	5	N/A	N/A	3	3	2	3	2	2
322	5	4	N/A	N/A	N/A	N/A	4	6	5	1	3	N/A	N/A	N/A	N/A	N/A
332	5	4	N/A	N/A	N/A	N/A	4	4	3	6	4	4	N/A	N/A	N/A	N/A

Confidence Levels in Second Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
32	5	5	N/A	N/A	N/A	N/A	4	5	5	5	4	4	N/A	N/A	N/A	N/A
62	N/A	5	3	4	3	4	4	5	N/A	N/A	3	3	3	4	N/A	5
82	2	1	N/A	2	N/A	1	N/A	1	N/A	N/A	3	N/A	2	N/A	2	2
92	4	N/A	3	4	4	N/A	3	4	3	4	N/A	N/A	4	N/A	N/A	N/A
232	4	5	4	N/A	5	5	5	5	N/A	5	N/A	N/A	5	4	3	5
242	N/A	2	N/A	1	3	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	1	1	N/A
272	N/A	N/A	N/A	2	N/A	1	2	N/A	N/A	N/A	N/A	1	1	N/A	N/A	2
292	3	5	N/A	5	3	4	4	N/A	3	5	N/A	2	5	N/A	3	N/A
302	5	5	5	N/A	N/A	N/A	N/A	5	N/A	4	4	4	N/A	4	N/A	N/A
312	5	4	4	5	4	4	5	4	N/A	N/A	4	3	4	4	5	4
322	5	4	N/A	N/A	N/A	N/A	3	2	3	2	2	N/A	N/A	N/A	N/A	N/A
332	5	5	N/A	N/A	N/A	N/A	4	5	5	5	4	4	N/A	N/A	N/A	N/A

Decisions in Third Market of the Overconfidence Experiment

	PERIODS																							
ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
43	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	1	0	1	0	0	1
53	1	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0
63	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0	0	1	1	1	0	0	1	1
83	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	0	1	0	1	0	1
93	1	0	1	1	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	0	0	0	0	0
103	1	1	0	1	1	1	1	1	0	0	1	1	0	1	1	1	0	1	1	1	1	1	1	0
113	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	1	0	1	0	1	1
133	0	0	1	1	1	1	1	1	1	0	0	0	1	1	0	1	0	1	0	1	1	1	0	0

Profits in Third Market of the Overconfidence Experiment

	PERIODS																							
ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
43	15	15	3	10	10	3	3	15	15	10	15	15	6	6	6	6	15	6	15	6	10	6	6	15
53	15	3	3	15	3	10	10	10	15	15	3	6	6	6	6	6	6	10	6	6	6	6	6	15
63	3	10	3	3	3	15	10	3	3	10	6	10	10	6	10	6	6	10	3	10	6	6	10	10
83	10	3	15	3	3	3	3	6	3	15	15	3	3	6	6	10	10	3	6	10	6	10	6	10
93	3	6	10	10	15	10	3	3	15	3	6	15	15	10	6	6	15	15	15	6	6	6	6	6
103	15	15	6	15	3	15	15	10	6	6	10	10	6	15	15	15	6	10	10	15	15	15	15	6
113	3	10	15	3	15	3	10	10	6	6	6	6	10	15	15	15	6	6	3	6	10	6	10	15
133	10	6	3	15	6	6	3	3	10	15	6	6	6	6	6	6	6	6	10	6	6	6	15	6

Scores in Third Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
43	6	4	4	4	N/A	N/A	N/A	N/A	4	N/A	4	N/A	4	N/A	N/A	5
53	4	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A	3	N/A
63	4	3	N/A	3	1	N/A	1	N/A	N/A	3	4	1	N/A	N/A	1	2
83	2	1	1	0	0	N/A	N/A	3	2	3	N/A	2	N/A	2	N/A	3
93	5	2	N/A	2	5	2	N/A	N/A	3	3	3	N/A	N/A	N/A	N/A	N/A
103	N/A	N/A	3	4	N/A	3	3	3	N/A	3	4	3	4	3	4	N/A
113	N/A	N/A	N/A	N/A	4	3	4	5	N/A	N/A	2	N/A	3	N/A	3	4
133	4	N/A	N/A	N/A	4	3	N/A	3	N/A	2	N/A	4	5	2	N/A	N/A

Self-Predicted Scores in Third Market of the Overconfidence Experiment

	PERIODS														
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
43	5	3	4	4	N/A	N/A	N/A	N/A	2	N/A	3	N/A	2	N/A	N/A	2
53	3	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A	3	N/A
63	2	2	N/A	2	2	N/A	2	N/A	N/A	1	1	1	N/A	N/A	1	1
83	1	2	1	0	1	N/A	N/A	1	2	1	N/A	1	N/A	1	N/A	2
93	3	2	N/A	1	4	3	N/A	N/A	2	2	3	N/A	N/A	N/A	N/A	N/A
103	N/A	N/A	1	3	N/A	2	3	4	N/A	2	2	2	2	1	1	N/A
113	N/A	N/A	N/A	N/A	5	2	4	4	N/A	N/A	1	N/A	1	N/A	1	2
133	2	N/A	N/A	N/A	3	2	N/A	2	N/A	1	N/A	1	2	1	N/A	N/A

Confidence Levels in Third Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
43	4	3	4	2	N/A	N/A	N/A	N/A	2	N/A	1	N/A	1	N/A	N/A	1
53	4	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A	N/A	2	N/A
63	2	1	N/A	2	1	N/A	1	N/A	N/A	1	1	1	N/A	N/A	2	1
83	1	2	1	3	1	N/A	N/A	1	1	2	N/A	1	N/A	2	N/A	3
93	2	4	N/A	1	3	2	N/A	N/A	2	2	2	N/A	N/A	N/A	N/A	N/A
103	N/A	N/A	1	2	N/A	2	1	2	N/A	1	1	1	1	2	1	N/A
113	N/A	N/A	N/A	N/A	4	4	4	3	N/A	N/A	2	N/A	1	N/A	2	2
133	3	N/A	N/A	N/A	3	4	N/A	3	N/A	2	N/A	1	1	2	N/A	N/A

Decisions in Fourth Market of the Overconfidence Experiment

	PERIODS																							
ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
194	1	0	1	0	1	1	0	1	1	1	0	1	0	1	1	0	1	0	1	0	1	1	0	0
214	1	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0
224	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0
234	1	1	1	1	1	1	1	1	0	0	1	1	0	1	0	0	0	1	0	0	0	1	1	0
244	1	1	0	1	1	1	1	0	0	1	1	0	1	0	1	1	0	0	0	1	1	0	0	1
254	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0
264	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1
284	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	0	0	1	0	0	1	0	1	1
294	1	1	1	1	1	1	1	0	1	0	0	1	1	1	0	0	1	1	1	0	0	0	0	0
304	0	1	1	0	0	1	0	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1
324	1	1	0	1	0	0	1	0	1	1	1	1	1	1	0	0	0	1	1	0	1	0	1	1
334	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1

Profits in Fourth Market of the Overconfidence Experiment

	PERIODS																							
ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
194	3	6	3	6	15	15	6	10	10	15	6	15	6	10	15	6	15	6	10	6	10	10	6	6
214	15	6	15	10	10	6	6	15	15	15	10	10	3	15	10	10	15	3	10	15	6	15	10	6
224	6	6	10	3	10	10	15	15	10	6	6	6	15	10	6	10	6	15	6	15	15	15	6	6
234	3	15	10	3	10	10	15	10	6	6	15	15	6	10	6	6	6	15	6	6	6	10	15	6
244	3	15	6	15	3	3	10	6	6	10	10	6	15	6	15	15	6	6	6	15	15	6	6	15
254	10	3	15	15	10	3	10	3	10	6	6	6	6	6	15	10	10	6	6	6	6	15	6	6
264	15	6	6	3	6	10	3	15	15	3	3	3	10	3	3	15	3	3	6	10	6	10	10	10
284	10	3	10	3	6	15	3	6	6	10	15	15	15	15	10	6	6	15	6	6	15	6	15	15
294	10	3	10	10	3	10	15	6	3	6	6	10	15	3	6	6	10	10	15	6	6	6	6	6
304	6	10	3	6	6	3	6	10	15	3	10	3	6	3	3	3	3	6	6	15	10	15	15	15
324	3	15	6	15	6	6	15	6	10	15	15	10	10	3	6	6	6	10	10	6	15	6	10	10
334	3	10	6	10	15	3	10	6	3	10	3	3	10	10	10	10	10	10	15	10	10	6	6	10

Scores in Fourth Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
194	4	2	N/A	4	N/A	3	3	N/A	4	N/A	2	N/A	4	3	N/A	N/A
214	4	4	3	4	2	3	4	2	5	3	2	3	N/A	3	2	N/A
224	N/A	N/A	N/A	N/A	N/A	2	N/A	5	6	4	5	N/A	N/A	N/A	N/A	N/A
234	N/A	N/A	3	5	N/A	2	N/A	N/A	N/A	3	N/A	N/A	N/A	3	3	N/A
244	N/A	3	3	N/A	4	N/A	4	4	N/A	N/A	N/A	4	2	N/A	N/A	2
254	2	N/A	N/A	N/A	N/A	N/A	3	3	5	N/A	N/A	N/A	N/A	5	N/A	N/A
264	2	1	1	2	0	2	2	2	3	2	N/A	2	N/A	4	3	1
284	N/A	2	4	4	3	4	4	N/A	N/A	3	N/A	N/A	3	N/A	2	4
294	2	N/A	N/A	2	5	1	N/A	N/A	3	3	5	N/A	N/A	N/A	N/A	N/A
304	3	1	2	1	N/A	2	2	3	1	N/A	N/A	3	4	2	2	3
324	3	4	3	3	4	2	N/A	N/A	N/A	2	3	N/A	5	N/A	2	1
334	2	3	3	1	4	2	3	3	2	2	3	1	2	N/A	N/A	2

Self-Predicted Scores in Fourth Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
194	5	4	N/A	4	N/A	4	5	N/A	3	N/A	4	N/A	4	4	N/A	N/A
214	5	6	4	5	4	4	5	3	5	3	3	3	N/A	4	4	2
224	N/A	N/A	N/A	N/A	N/A	1	N/A	3	3	3	3	N/A	N/A	N/A	N/A	N/A
234	N/A	N/A	4	4	N/A	4	N/A	N/A	N/A	2	N/A	N/A	N/A	4	4	N/A
244	N/A	4	5	N/A	4	N/A	5	4	N/A	N/A	N/A	2	4	N/A	N/A	4
254	4	N/A	N/A	N/A	N/A	N/A	4	4	5	N/A	N/A	N/A	N/A	5	N/A	N/A
264	4	5	4	4	3	2	4	4	3	4	N/A	4	N/A	5	4	3
284	N/A	3	4	4	4	4	5	N/A	N/A	4	N/A	N/A	4	N/A	2	4
294	2	N/A	N/A	2	5	3	N/A	N/A	4	4	5	N/A	N/A	N/A	N/A	N/A
304	3	3	3	2	N/A	2	3	3	2	N/A	N/A	4	4	2	2	4
324	4	5	3	4	4	3	N/A	N/A	N/A	2	4	N/A	5	N/A	2	1
334	4	4	4	2	4	4	4	5	3	3	4	3	2	N/A	N/A	3

Confidence Levels in Fourth Market of the Overconfidence Experiment

	PERIODS															
ID	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
194	5	4	N/A	4	N/A	3	4	N/A	3	N/A	5	N/A	5	4	N/A	N/A
214	5	4	5	5	3	4	5	4	4	4	4	5	N/A	4	4	N/A
224	N/A	N/A	N/A	N/A	N/A	2	N/A	1	1	1	1	N/A	N/A	N/A	N/A	N/A
234	N/A	N/A	5	5	N/A	4	N/A	N/A	N/A	3	N/A	N/A	N/A	5	5	N/A
244	N/A	5	4	N/A	5	N/A	4	4	N/A	N/A	N/A	4	4	N/A	N/A	4
254	3	N/A	N/A	N/A	N/A	N/A	4	3	4	N/A	N/A	N/A	N/A	5	N/A	N/A
264	5	5	4	5	3	5	3	4	4	3	N/A	4	N/A	5	4	3
284	N/A	4	5	5	4	5	4	N/A	N/A	5	N/A	N/A	4	N/A	4	4
294	3	N/A	N/A	3	2	2	N/A	N/A	3	2	2	N/A	N/A	N/A	N/A	N/A
304	4	4	5	4	N/A	5	4	3	3	N/A	N/A	4	3	4	4	3
324	3	3	4	5	5	4	N/A	N/A	N/A	4	4	N/A	4	N/A	4	5
334	5	4	5	3	5	4	4	4	4	3	4	4	5	N/A	N/A	3

Descriptive Statistics Individuals for the First Market of the Overconfidence Experiment

ID	Bubble Score	AB	Trading Volume	BTA General Knowledge	BTA Financial Knowledge	BTA Payoff	Over Ability Score Part 2	Over Ability Score Part 3	Over Precision Score Part 2	Over Precision Score Part 3
31	148.57	3.00	28.00	0.50	-9.50	-5.00	0.500	0.333	0.750	-2.667
41	90.83	14.25	13.00	0.50	-11.50	-5.00	0.333	-0.500	-1.000	-6.000
51	1570.23	19.09	72.00	28.50	28.50	85.00	1.625	1.000	7.750	2.857
61	542.71	21.29	44.00	20.50	25.50	80.00	1.000	1.000	2.000	-0.429
81	341.26	19.77	30.00	15.50	15.50	50.00	1.125	0.500	0.750	-0.333
91	581.38	23.64	54.00	10.50	10.50	50.00	1.286	0.857	2.286	-2.429
101	104.83	12.22	16.00	10.50	5.50	20.00	0.500	0.750	-2.000	-4.125
111	0.00	-7.67	22.00	0.50	-14.50	-5.00	-1.000	-1.500	-6.333	-11.500
121	1.20	5.50	20.00	-4.50	-19.50	0.00	-1.333	-1.500	-12.000	-11.000
141	109.69	6.32	33.00	8.50	0.50	0.00	0.250	0.000	-4.750	-4.667
151	25.43	-0.20	8.00	5.50	0.50	0.00	0.000	-0.333	-3.750	-4.333
161	382.67	19.71	31.00	15.50	10.50	35.00	1.286	0.833	-0.286	-0.667
171	1977.83	19.90	117.00	22.50	25.50	80.00	1.500	1.125	5.250	1.375
211	561.34	20.55	76.00	10.50	10.50	25.00	1.000	0.750	-0.833	-2.750
221	892.43	25.25	67.00	25.50	25.50	90.00	1.000	0.667	2.500	-0.500
231	243.68	9.10	34.00	5.50	5.50	0.00	0.200	0.000	-5.600	-6.000
241	447.30	17.29	29.00	10.50	5.50	15.00	0.833	0.600	1.000	-1.400
251	9.96	-3.50	23.00	5.50	-4.50	0.00	-0.250	-1.333	-6.250	-11.000
261	64.18	9.79	26.00	5.50	5.50	5.00	-0.500	-1.333	-7.000	-11.667
271	482.78	19.89	38.00	8.50	5.50	0.00	0.833	0.500	-5.167	-5.750
301	198.30	15.29	11.00	15.50	5.50	30.00	0.429	0.167	1.000	-3.833
311	393.23	16.50	34.00	10.50	10.50	25.00	0.625	0.286	-1.875	-3.571
321	426.93	23.00	26.00	20.50	15.50	70.00	0.714	0.600	1.143	2.800
331	947.21	28.04	56.00	25.50	25.50	80.00	1.125	0.571	4.500	1.286

Descriptive Statistics Individuals for the Second Market of the Overconfidence Experiment

ID	Bubble Score	AB	Trading Volume	BTA General Knowledge	BTA Financial Knowledge	BTA Payoff	Over Ability Score Part 2	Over Ability Score Part 3	Over Precision Score Part 2	Over Precision Score Part 3
32	995.86	24.21	54.00	0.50	0.50	50.00	1.875	0.833	6.375	2.000
62	652.00	-25.00	54.00	0.50	10.50	70.00	1.250	-0.750	5.250	-5.750
82	280.08	12.71	26.00	-9.50	5.50	10.00	0.571	0.200	0.143	-4.400
92	71.39	15.49	44.00	-19.50	-14.50	30.00	0.200	-0.750	-6.200	-12.750
232	388.53	2.60	39.00	10.50	-4.50	20.00	0.667	0.333	-1.833	-2.667
242	619.18	30.08	33.00	0.50	0.50	30.00	1.143	1.000	4.286	2.600
272	2.86	6.40	11.00	-9.50	-19.50	60.00	-1.333	-2.000	-16.667	-18.667
292	86.40	14.43	13.00	-4.50	-19.50	20.00	0.000	-0.667	-10.000	-12.000
302	467.00	27.85	32.00	10.50	5.50	30.00	1.000	0.800	0.167	-0.600
312	1038.86	23.69	80.00	15.50	10.50	40.00	1.250	0.750	6.250	1.250
322	684.60	23.27	69.00	-4.50	10.50	50.00	0.875	0.500	1.875	-0.167
332	50.72	19.83	41.00	-14.50	5.50	15.00	0.000	-0.333	-7.500	-9.000

Descriptive Statistics Individuals for the Third Market of the Overconfidence Experiment

	Bubble Score	AB	Trading Volume	BTA General Knowledge	BTA Financial Knowledge	BTA Payoff	Over Ability Score Part 2	Over Ability Score Part 3	Over Precision Score Part 2	Over Precision Score Part 3
43	8.95	-35.46	45.00	0.50	-9.50	-10.00	-0.500	-2.000	-9.250	-18.500
53	0.00	-67.00	10.00	0.50	-14.50	0.00	-1.000	-0.500	-7.000	-10.000
63	71.18	-35.71	47.00	5.50	0.50	0.00	-0.400	-1.200	-9.200	-9.800
83	92.18	-29.38	40.00	10.50	5.50	20.00	-0.167	-1.000	-4.500	-9.400
93	3.52	-30.54	56.00	-4.50	-4.50	-5.00	-0.600	-0.667	-9.400	-10.333
103	1.03	-25.95	20.00	5.50	-4.50	0.00	-0.600	-1.833	-11.600	-15.667
113	2.70	-102.33	55.00	0.50	-9.50	-10.00	-0.250	-1.750	-6.000	-12.750
133	0.00	-49.57	13.00	-4.50	-14.50	0.00	-1.250	-2.000	-10.250	-14.500

Descriptive Statistics Individuals for the Fourth Market of the Overconfidence Experiment

	Bubble Score	AB	Trading Volume	BTA General Knowledge	BTA Financial Knowledge	BTA Payoff	Over Ability Score Part 2	Over Ability Score Part 3	Over Precision Score Part 2	Over Precision Score Part 3
194	366.96	11.27	74.00	10.50	5.50	0.00	1.200	0.500	1.800	0.000
214	331.40	10.71	52.00	15.50	15.50	60.00	1.250	0.429	3.625	0.167
224	0.00	0.33	57.00	-9.50	-19.50	0.00	-1.500	-2.000	-15.000	-22.000
234	197.25	13.35	50.00	5.50	0.50	0.00	0.667	0.333	2.000	0.333
244	190.72	9.58	45.00	5.50	0.50	5.00	0.800	0.667	1.200	0.000
254	217.13	4.91	36.00	0.50	-4.50	-5.00	1.333	0.000	0.000	-2.500
264	917.34	12.32	133.00	15.50	20.50	60.00	2.250	1.333	8.500	2.500
284	303.57	11.12	49.00	5.50	-4.50	15.00	0.500	0.500	0.500	0.000
294	12.57	7.73	30.00	0.50	-9.50	-10.00	0.500	0.667	-5.500	-8.333
304	355.00	11.85	30.00	10.50	5.50	50.00	0.714	0.500	1.143	-2.167
324	146.15	7.18	58.00	10.50	5.50	15.00	0.667	0.200	-0.667	-1.600
334	527.70	8.43	121.00	20.50	15.50	80.00	1.250	1.000	3.625	1.333

APPENDIX C: Pre-Experimental Questionnaire

1. Please enter your Computer ID
2. What is your gender?

   () Female

   () Male
3. What year are you in university?

   () 1st

   () 2nd

   () 3rd

   () 4th

   () 5th

   () 6th

   () Master

   () PhD
4. What is your age?
5. What is your average monthly income (in pounds)?
6. How many economics and finance courses have you taken at university level (If none please enter zero)?
7. In terms of "general knowledge", of the 56 people participating this experiment, how many of them do you think will be more successful than you?
8. In terms of "knowledge in finance" of the 56 people participating this experiment, how many participants do you think will be more successful than you?

9. What would be your estimation (according to your own judgment) the probability that your return at the end of this game will be at the highest 10% of the people in this experiment?
10. Have you invested in stocks for yourself or others?
11. Have you invested in mutual funds for yourself or others?
12. Are you willing to trade any of these securities in the future (Question for non-traders)

APPENDIX D: General Knowledge Trivia Questions

These questions and answers are obtained from various internet sites as follows;

- http://www.quiz.co.uk (Kirkland, 1997),
- http://www.inquizitive.co.uk (Ashwell, 2006),
- http://www.fanpop.com (Fanpop Inc, 2008),
- http://www.quiz-zone.co.uk (Pollock, 2001),
- http://uvuw.net (Chuang, 2008),
- http://www.funtrivia.com (Ford, 1999),
- http://www.quizballs.com (Chapman, 2006).

9th Period

1. What is the next highest prime number after 29?
2. How many UK monarchs were there in the 20th century?
3. Greek deka, and Latin decem, are what number?
4. How many states are there in the United States of America?
5. Which is the largest body of water on earth?
   () Southern Ocean
   () Atlantic Ocean
   () Indian Ocean
   () Pacific Ocean
6. Which country has the highest population density?
   () Bangladesh
   () Monaco

() Singapore

() Vatican

10th Period

1. 1, 2, 4, 6, 10, 12, 16, 18, 22, 28, _?
2. What is 20% of 40?
3. How many milligrams are in one gram?
4. When did the first man go into space?
5. Which film was advertised with the slogans "Collide with destiny" and "Nothing on Earth could come between them"?

   () Titanic

   () Fight Club

   () Pulp Fiction

   () Top Gun
6. Which artist released an album and movie under the same title of "Get Rich or Die Try in"?

   () Aaliyah

   () B.o.B

   () Mariah Carey

   () 50 cent

11th Period

1. What temperature does water boil at (celculus) ?
2. How many rows of stars are there on an American flag?
3. How many sides does a dodecahedron have?

4. What year did Abba win the Eurovision song contest?
5. What is the capital of Slovakia?

   () Minsk

   () Ljubljana

   () Riga

   () Bratislava
6. Which country does not share a border with Iran?

   () Turkmenistan

   () Afghanistan

   () Pakistan

   () Tajikistan

12th Period

1. What year did the Berlin Wall come down?
2. What number turned on its side (rotated 90 degrees) is the symbol for infinity?
3. What is the larger number of the binary system?
4. After how many years of marriage would you celebrate a ruby wedding anniversary?
5. Which country has the largest population in the world?

   () Indonesia

   () India

   () China

   () Japan
6. By what name is singer Paul Hewson better known?

() U2

() Bono

() Elen

() Jonny

13th Period

1. What is 5 divided by 1/2 plus 3?
2. How many colors are there in a rainbow?
3. The diameter of the Earth is approximately how many times bigger than the diameter of the Moon?
4. How many years was Margaret Thatcher Prime Minister for?
5. Which is the only swimming event to have been held in every Olympics?

   () 400m Individual Medley - Heats

   () 100m Butterfly - Heats

   () 1500m freestyle

   () 4 x 100m Freestyle Relay - Heats
6. What is the largest country in South America?

   () Argentina

   () Brazil

   () Ecuador

   () Colombia

14th Period

1. How many sheets of paper are in a ream?
2. How many plagues of Egypt were there?
3. What year did the USSR invade Afghanistan?
4. Each player begins with (how many) pieces in a game of chess?
5. What is the largest country in South America?

   () Argentina

   () Brazil

   () Ecuador

   () Colombia
6. What is the first astrological sign in the Zodiac?

   () Virgo

   () Scorpio

   () Taurus

   () Aries

15th Period

1. On a darts board, what number is directly opposite No. 1?
2. How many housing property squares are there on a Monopoly board?
3. How many strings are on a violin?
4. According to Douglas Adams what number is the meaning of life?
5. What is the longest river in the Americas?

   () Nile

   () Amazon

   () Mississippi

() Congo

6. What is the capital of Laos?

() Vientiane

() Lilongwe

() Kingston

() Port-au-Prince

16th Period

1. How many emirates make up the United Arab Emirates?
2. Traditionally what number of years anniversary is symbolized by silver?
3. In what year did the London Eye open?
4. What is the first prime number greater than 50?
5. In music, what does allegro refer to?

() Slow Tempo

() Moderate Tempo

() Quick Tempo

() Melody

6. Which is the only continent without a desert?

() Europe

() Antarctica

() Africa

() Australia

APPENDIX E: Investment Knowledge Questions

These questions and answers are obtained from various sources as follows;

- Financial Industry Regulation Authority, http://www.finra.org (FINRA Inc., 2007),
- Barclays UK banking, http://www.barclays.co.uk/Investment/Investmentquiz/P1242580268704 (Barclays Bank Plc., 1996),
- Quiz questions of Jiang (2006)
- http://www.studentoffortune.com (Chegg Inc., 2005).

17th Period

1. If you buy a company's stock…?

() You own a part of the company

() You have lent money to the company

() You are liable for the company's debts

() The company will return your original investment to you with interest

2. If you buy a company's bond...?

() You own a part of the company

() You have lent money to the company

() You are liable for the company's debts

() You can vote on shareholder resolutions

3. You purchased a share of stock for $20. One year later you received a $1 dividend and sold the share for $24. What was your holding period return?
4. Do initial public offerings typically outperform the market index in their first 3 to 5 years?
5. Which one is not accepted as one of the causes of current financial crisis?

   () Imprudent Mortgage Lending

   () Lack of Transparency and Accountability in Mortgage Finance

   () Factoring Agencies

   () Rating Agencies
6. What is the correct abbreviation for the index in London Stock Exchange?

18th Period

1. Which of the following refers selling stock borrowed from another investor?

   () A Stop-loss order

   () A Margin trade

   () A Short sale

   () A Limit order
2. The optimal combination of the risky portfolio and the risk-free security is designated by:

   () The point of tangency between the investor's indifference curve and the capital allocation line

() The point of tangency between the investor's indifference curve and the security market line

() The point of tangency between the efficient frontier and the capital allocation line

() The point of tangency between the efficient frontier and the security market line

3. The Reward-to-Variability ratio is given by:

() The slope of the capital allocation line

() The second derivative of the capital allocation line

() The excess return on a security divided by the security's beta

() None of the above

4. Diversification is most effective when security returns are:

() High

() Negatively correlated

() Positively correlated

() Uncorrelated

5. The market value of a company stock has declined due to competition in the market. The investors of this company are faced with what type of risk?

() Financial risk

() Market risk

() Interest rate risk

() Business risk

6. When did the last financial crisis start?

19th Period

1. What is diversification?

() Putting the majority of your nest egg into one investment to maximize profits

() The spreading of investments across different areas to reduce risk

() Investing equally for both retirement and college

() All of the above

2. How do companies usually share profits with shareholders?

() They pay dividends

() They provide free products and services

() They pay interest

() They promise an increase in the share price

3. Libor means:

() Lending and borrowing funds

() Liquid interest rate margins

() Latest borrowing interest rate

() An average reference rate based on the interest rates offered by banks when they lend money to each other

4. Which of the following investments is likely to be most volatile?:

() Gilts

() Commercial property

() A fund investing in large companies

() Shares in a company based in an emerging market

5. Markets are in turmoil because:

() Banks will not lend to each other, causing a crisis in liquidity

() Widespread mortgage defaults in the US caused the collapse of the under-regulated derivatives market

() Inflation is rising

() Interest rates are rising

6. Credit Default Swap refers to:

() A contract between two parties that insures one of them against default by a third party debtor

() A kind of bartering system

() Credit rates approved by agencies

() Credit swap market

20th Period

1. The investment proposal with the greatest relative risk would have?

() The highest standard deviation of net present value

() The highest coefficient of variation of net present value

() The highest expected value of net present value

() The lowest opportunity loss likelihood

2. Consider the investment opportunity set formed with two securities that are perfectly negatively correlated. The global minimum variance portfolio will have a standard deviation that is always:

() Equal to the sum of the securities standard deviations

() Equal to -1

() Equal to 0

() Greater than zero

3. An issue of equity to the public by a firm that currently has publicly traded equity is referred to as:

() A private placement

() A shelf registration

() An initial public offering

() A seasoned offering

4. Compound interest is ?

() The cost of borrowing money

() Interest paid annually

() The interest you earn on an investment also earns interest

() None of the above

5. In a well-diversified portfolio, which type of risk is negligible?

() Firm-specific risk

() Beta risk

() Market risk

() Systematic risk

6. What is the current interest rate in UK?

21st Period

1. Which one is not the characteristic of a good market?

() Liquidity

() Timely and accurate information

() Low transaction costs

() High profits

2. Which segment of the secondary stock market (listed exchanges of NASDAQ) is larger in terms of the number of issues?
3. Which one is not the use of security-market indexes?

   () A general indication of the aggregate market changes

   () A general indication of productivity

   () A benchmark for evaluating the performance of alternative portfolios

   () A proxy for the market portfolio of risky assets
4. If the issue is_____ the company stands to lose notionally since the securities will be sold at a price lower than its intrinsic value

   () Overpriced

   () Underpriced

   () Fairly priced

   () None of the above
5. Corporate bonds are classified as _____?

   () Secured bonds

   () Unsecured bonds

   () Both of the above

   () None of the above
6. Is it correct that portfolio manager's objective is to maximize the return subject to the risk-tolerance level or to achieve a pre-specified level of return with minimum risk?

22nd Period

1. _____ would mean that no investor would be able to outperform the market with trading strategies based on publicly available information

() Semi strong form efficiency

() Weak-form efficiency

() Strong form efficiency

() None of the above

2. _____ Fund managers try to replicate the performance of a benchmark index, by replicating the weights of its constituent stocks

() Active

() Passive

() Conservative

() None of the above

3. The relationship between risk and return is such that:

() Investors increase their required rates of return as perceived risk increases

() Investors decrease their required rates of return as perceived risk increases

() Investors increase their required rates of return as perceived risk decreases

() Investors decrease their required rates of return as perceived risk decreases

4. In general, if interest rates go down, then bond prices…?

() Go down

() Go up

() Are not affected

() None of the above

5. Which of the following is not a type of investment?

() Venture Capital Trust

() Hedge Fund

() Capital Hedge Trust

() Enterprise Investment Scheme

6. An analyst expects a risk free return of 4.5%, a market return of 14.5 and a return of 16% for Stock A. The beta of the Stock A is 1.2. Which one is true for Stock A?

() Overvalued

() Undervalued

() Fairly valued

() None of the above

23rd Period

1. Adding a security that has a low correlation to an existing portfolio will:

() Increase the overall variability of the portfolio

() Make the portfolio more risky

() Ensure the portfolio achieves a good rate of return

() Lower the overall variability of the portfolio

2. Consider the following information relating to two assets: E (R1) = 0.3, E (R2) = 0.3, E (B1) = 0.2, E (B2) = 0.2 .The weights of each asset in the portfolio are; W1 = 0.5, W2 = 0.5. The correlation coefficient is 1.00. What is the covariance of the portfolio?
3. The market portfolio is ?

   () The portfolio that most of the risk unique to individual assets in that portfolio is diversified away

   () A portfolio in which both systematic and unsystematic risk has been diversified away

   () The portfolio that all investors invest their funds in

   () The portfolio that all the risk unique to individual assets in the portfolio is diversified away
4. Which of the following best explains why many municipal bonds pay lower yields than other government bonds?

   () Municipal bonds are lower risk

   () There is a greater demand for municipal bonds

   () Municipal bonds can be tax-free

   () None of the above
5. When individuals believe they have sufficient income and assets to cover their expenses while maintaining a reserve for uncertainties, they are most likely in the _____ phase of the investment life cycle?

   () Gifting

   () Consolidation

() Accumulation

() Spending

6. Which type of bond is the safest?

() U.S. Treasury bond

() Municipal bond

() Corporate bond

() None of the above

24th Period

1. Which of the following is defined as a procedure for valuing the price of a stock by using predicted dividends and discounting them back to present value?

() Relative strength index

() On balance volume

() Dividend discount model

() Bollinger bands

2. When inflation and interest rates are low, Price per Earning (P/E) ratio tend to be:

() High

() Low

() Minimum

() Average

3. Which of the following is a basket of stocks that tracks a particular sector, investment style, geographical area, or the market as a whole?

() Exchange traded fund

() Open-end fund

() Closed-end fund

() Unit investment trust

4. Which of the following is not included in money market securities?

() Treasury bill

() Certificate of deposit

() Commercial paper

() Future contracts

5. Diversifying without looking at relevant investment characteristics is known as?

() Random diversification

() Non-random diversification

() Horizontal diversification

() Vertical diversification

6. Which of the following refers to the simultaneous purchase and sale in two markets so that the selling price is higher than the buying price by more than the transaction cost?

() Hedging

() Arbitrage

() Speculation

() Brokerage

APPENDIX F: Regression Analyses When Data of Third Market is Excluded

Summary of Regression Analysis for Variables Predicting Trading Volume using White heteroskedasticity-consistent standard errors and covariance When Data of Third Market is Excluded

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Gender	-3.08	-10.42	-7.19	-9.71	-9.43	-7.24	-8.47	-3.81	-6.85	-6.41
	(0.672)	(0.124)	(0.233)	(0.098)	(0.128)	(0.221)	(0.159)	(0.565)	(0.271)	(0.296)
Age	0.59	1.012	0.77	1.08	0.49	1.00	0.70	0.34	0.83	0.69
	(0.515)	(0.292)	(0.363)	(0.399)	(0.717)	(0.341)	(0.553)	(0.680)	(0.388)	(0.412)
Year	0.90	-0.25	0.31	-0.51	-1.10	0.99	0.29	1.09	-0.26	-0.02
	(0.784)	(0.939)	(0.920)	(0.847)	(0.726)	(0.641)	(0.909)	(0.730)	(0.935)	(0.995)
Investment in Stock	14.41									
	(0.192)									
Investment in M. Fund	-9.60									
	(0.274)									
Taking Finance Courses	-0.45									
	(0.730)									
Entry P1	38.12	35.22								
	(0.177)	(0.138)								
Entry P2	31.55	75.23								
	(0.419)	(0.081)								
Entry P3	-11.19	4.18								
	(0.743)	(0.909)								
BTA General	-0.14		-0.33					-0.58	-0.02	
	(0.766)		(0.338)					(0.198)	(0.963)	
BTA Financial	0.85		0.91*					1.27**		0.44
	(0.135		(0.045)					(0.002)		(0.359)

Summary of Regression Analysis for Variables Predicting Trading Volume using White heteroskedasticity-consistent standard errors and covariance When Data of Third Market is Excluded (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
BTA Payoff	0.24 (0.055)		0.27* (0.021)						0.39** (0.000)	0.20 (0.069)
Over Ability P2				17.49* (0.049)		21.80* (0.013)				
Over Ability P3				-4.39 (0.642)		1.78 (0.851)				
Over Precision P2					3.89* (0.040)		4.52** (0.002)			
Over Precision P3					-1.05 (0.640)		1.43 (0.407)			
Over Ability P2xP3						16.09** (0.000)				
Over Precision P2xP3							0.29** (0.004)			
BTA General and Finance								0.03 (0.149)		
BTA General and Payoff									0.01 (0.582)	
BTA Finance and Payoff										0.01 (0.399)
Adjusted R	0.28	0.18	0.31	0.30	0.28	0.53	0.43	0.29	0.26	0.31

**Significance at 1% , * Significance at 5%. Values are unstandardized coefficients and values in Parentheses are p-values.

Summary of Regression Analysis for Variables Predicting Average Bias (AB) using White heteroskedasticity-consistent standard errors and covariance When Data of Third Market is Excluded

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Gender	-3.98	-5.48	-2.72	-5.61*	-4.32	-5.32*	-4.11	-1.48	-2.46	-3.83
	(0.234)	(0.060)	(0.402)	(0.045)	(0.157)	(0.044)	(0.151)	(0.640)	(0.356)	(0.151)
Age	-0.55	-0.20	-0.47	0.09	0.02	0.08	0.02	-0.62	-0.47	-0.36
	(0.075)	(0.459)	(0.245)	(0.740)	(0.951)	(0.777)	(0.921)	(0.157)	(0.285)	(0.423)
Year	0.05	-0.46	-0.59	-1.23	-1.50	-1.05	-1.19	-0.30	-0.67	-0.57
	(0.961)	(0.639)	(0.697)	(0.299)	(0.290)	(0.344)	(0.361)	(0.826)	(0.622)	(0.676)
Investment in Stock	5.95*									
	(0.029)									
Investment in M. Fund	1.99									
	(0.456)									
Taking Finance Courses	0.48									
	(0.182)									
Entry P1	-16.65*	-17.64*								
	(0.030)	(0.040)								
Entry P2	14.36	13.22								
	(0.382)	(0.202)								
Entry P3	5.09	5.97								
	(0.598)	(0.546)								
BTA General	0.02		-0.08					-0.17	-0.06	
	(0.960)		(0.793)					(0.505)	(0.794)	
BTA Financial	-0.20		0.18					0.30		0.33*
	(0.522)		(0.378)					(0.211)		(0.043)
BTA Payoff	0.08		0.09						0.11	0.13
	(0.255)		(0.271)						(0.303)	(0.149)

Summary of Regression Analysis for Variables Predicting Average Bias (AB) using White heteroskedasticity-consistent standard errors and covariance When Data of Third Market is Excluded (Continuned)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Over Ability P2				-7.22 (0.199)		-6.71 (0.186)				
Over Ability P3				14.12* (0.013)		13.81* (0.007)				
Over Precision P2					-1.16 (0.260)		-1.02 (0.255)			
Over Precision P3					1.99 (0.056)		2.55* (0.021)			
Over Ability P2xP3						1.90 (0.244)				
Over Precision P2xP3							0.07* (0.031)			
BTA General and Finance								0.01 (0.121)		
BTA General and Payoff									0.01 (0.654)	
BTA Finance and Payoff										-0.01 (0.082)
Adjusted R	0.40	0.38	0.18	0.40	0.27	0.41	0.31	0.18	0.17	0.22

** Significance at 1% , * Significance at 5%. Values are unstandardized coefficients and values in Parentheses are p-values.

Summary of Regression Analysis for Variables Predicting Bubble Score using White heteroskedasticity-consistent standard errors and covariance When Data of Third Market is Excluded

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Gender	-122.59	-178.59	-122.91	-136.70	-146.28	-107.17	-133.06	-44.94	-109.42	-109.27
	(0.230)	(0.056)	(0.113)	(0.205)	(0.150)	(0.228)	(0.101)	(0.613)	(0.131)	(0.121)
Age	0.52	5.91	2.86	3.63	-4.22	2.73	-1.36	-7.45	2.28	1.52
	(0.960)	(0.517)	(0.711)	(0.779)	(0.728)	(0.771)	(0.871)	(0.396)	(0.758)	(0.835)
Year	33.81	-20.71	29.12	20.01	8.50	37.99	27.79	45.89	27.54	30.54
	(0.303)	0.491	(0.354)	(0.623)	(0.835)	(0.321)	(0.461)	(0.242)	(0.392)	(0.324)
Investment in Stock	20.32									
	(0.819)									
Investment in M. Fund	12.18									
	(0.914)									
Taking Finance Courses	7.65									
	(0.501)									
Entry P1	196.65	300.26								
	(0.545)	(0.282)								
Entry P2	129.56	893.39								
	(0.757)	(0.112)								
Entry P3	131.94	639.99								
	(0.802)	(0.312)								
BTA General	4.26		2.93					-2.08	2.20	
	(0.403)		(0.500)					(0.745)	(0.682)	
BTA Financial	3.60		5.38					16.51**		5.32
	(0.491)		(0.191)					(0.000)		(0.172)
BTA Payoff	7.31**		7.72**						8.05**	7.43**
	(0.000)		(0.000)						(0.000)	(0.000)

Summary of Regression Analysis for Variables Predicting Bubble Score using White heteroskedasticity consistent standard errors and covariance When Data of Third Market is Excluded (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Over Ability P2				331.33**		382.93**				
				(0.003)		(0.002)				
Over Ability P3				48.25		16.909				
				(0.696)		(0.886)				
Over Precision P2					68.55**		7.18**			
					(0.000)		(0.000)			
Over Precision P3					-14.89		19.24			
					(0.313)		(0.141)			
Over Ability P2xP3						192.35**				
						(0.004)				
Over Precision P2xP3							3.96**			
							(0.000)			
BTA General and Finance								0.69*		
								(0.018)		
BTA General and Payoff									0.09	
									(0.490)	
BTA Finance and Payoff										0.05
										(0.647)
Adjusted R	0.58	0.43	0.63	0.44	0.48	0.59	0.61	0.51	0.63	0.63

** Significance at 1% , * Significance at 5%. Values are unstandardized coefficients and values in Parentheses are p-values.

APPENDIX G: Correlation and Regression Analyses for end of the Experiment Effect

Correlation Matrix for the First Market with end of the Experiment Effect

	Bubble Score	AB	Trading Volume	Ending Balance	Av Buy Price	Av Bid Price	Number of Bids	Number of Asks
Entry P1	-0.222	-0.604**	-0.147	0.339	-0.293	-0.471*	-0.179	-0.359
Entry P2	0.679**	0.827**	0.606**	-0.112	0.278	0.833**	0.678**	0.677**
Entry P3	0.641**	0.721**	0.543*	-0.080	0.186	0.780**	0.576**	0.587**
BTA General	0.766**	0.739**	0.642**	-0.172	0.396	0.775**	0.777**	0.606**
BTA Financial	0.768**	0.780**	0.713**	-0.206	0.223	0.864**	0.745**	0.664**
BTA Payoff	0.768**	0.755**	0.679**	-0.090	0.191	0.745**	0.828**	0.668**
Over Ability P2	0.713**	0.804**	0.670**	-0.401	0.438*	0.684**	0.460*	0.571**
Over Ability P3	0.634**	0.795**	0.596**	-0.313	0.365	0.642**	0.401	0.548**
Over Precision P2	0.751**	0.680**	0.607**	-0.350	0.301	0.541*	0.574**	0.483*
Over Precision P3	0.677**	0.764**	0.557*	-0.218	0.313	0.586**	0.530**	0.552**

** Significance at 1% , * Significance at 5%.

Correlation Matrix for the Second Market with end of the Experiment Effect

	Bubble Score	AB	Trading Volume	Ending Balance	Av Buy Price	Av Bid Price	Number of Bids	Number of Asks
Entry P1	-0.392	-0.608*	-0.286	0.204	-0.491	-0.644*	-0.257	-0.254
Entry P2	0.533	0.395	0.334	-0.355	0.424	0.620*	0.378	0.478
Entry P3	0.682*	0.413	0.448	-0.277	0.170	0.648*	0.288	0.671*
BTA General	0.649*	0.012	0.338	-0.717**	0.659*	-0.046	-0.283	-0.181
BTA Financial	0.664*	0.030	0.713*	-0.369	0.238	0.440	0.126	0.532
BTA Payoff	0.445	-0.409	0.352	-0.162	-0.294	-0.015	0.192	0.403
Over Ability P2	0.879**	0.125	0.657*	-0.404	0.456	0.138	0.417	0.555
Over Ability P3	0.703**	0.534	0.492	-0.431	0.601*	0.417	0.120	0.305
Over Precision P2	0.901**	0.064	0.711**	-0.468	0.416	0.240	0.360	0.543
Over Precision P3	0.848**	0.344	0.601*	-0.550	0.599*	0.387	0.169	0.388

** Significance at 1% , * Significance at 5%.

Correlation Matrix for the Third Market with end of the Experiment Effect

	Bubble Score	AB	Trading Volume	Ending Balance	Av Buy Price	Av Bid Price	Number of Bids	Number of Asks
Entry P1	0.314	0.034	0.813*	-0.204	0.186	0.647	0.659	0.662
Entry P2	0.600	0.562	0.505	-0.700	0.868**	0.840*	0.531	-0.054
Entry P3	0.439	0.415	0.100	-0.204	0.474	0.737*	0.188	0.273
BTA General	0.752*	0.280	0.062	0.032	0.519	0.816*	0.170	0.262
BTA Financial	0.834**	0.520	0.506	-0.586	0.829*	0.925**	0.469	0.038
BTA Payoff	0.690	0.417	-0.220	-0.268	0.729*	0.538	-0.013	-0.382
Over Ability P2	0.553	-0.006	0.765*	-0.157	0.486	0.828*	0.794*	0.523
Over Ability P3	0.266	-0.081	0.070	-0.308	0.192	-0.069	-0.030	-0.398
Over Precision P2	0.419	-0.456	0.258	0.212	0.226	0.324	0.513	0.227
Over Precision P3	0.548	-0.057	0.159	-0.424	0.288	0.203	0.181	-0.157

** Significance at 1% , * Significance at 5%.

Correlation Matrix for the Fourth Market with end of the Experiment Effect

	Bubble Score	**AB**	**Trading Volume**	**Ending Balance**	**Av Buy Price**	**Av Bid Price**	**Number of Bids**	**Number of Asks**
Entry P1	-0.445	-0.476	-0.215	0.210	0.539*	-0.236	-0.558	-0.555
Entry P2	0.707**	0.506	0.503	-0.496	-0.408	0.626*	0.849**	0.725**
Entry P3	0.652*	0.411	0.523	-0.318	-0.453	0.546	0.770**	0.656*
BTA General	0.726**	0.584*	0.581*	-0.513	-0.620*	0.670*	0.751**	0.766**
BTA Financial	0.821**	0.592*	0.633*	-0.529	-0.518	0.724*	0.806**	0.739**
BTA Payoff	0.706**	0.287	0.607*	-0.496	-0.268	0.707*	0.791**	0.576
Over Ability P2	0.762**	0.620*	0.444	-0.624*	-0.401	0.675*	0.660*	0.583*
Over Ability P3	0.634*	0.747**	0.346	-0.446	-0.550	0.451	0.529	0.561
Over Precision P2	0.783**	0.766**	0.450	-0.632*	-0.418	0.566	0.611*	0.575
Over Precision P3	0.609*	0.762**	0.294	-0.571	-0.474	0.432	0.455	0.503

** Significance at 1% , * Significance at 5%.

Summary of Regression Analysis with end of the Experiment Effect for Variables Predicting Trading Volume using White heteroskedasticity-consistent standard errors and covariance

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Gender	-2.23	-8.22	-3.19	-4.07	-5.16	-3.16	-3.63	-0.47	-3.04	-2.21
	(0.707)	(0.132)	(0.548)	(0.460)	(0.345)	(0.546)	(0.506)	(0.932)	(0.610)	(0.694)
Age	0.43	0.68	0.27	0.51	0.11	0.53	0.32	0.11	0.12	0.24
	(0.646)	(0.352)	(0.696)	(0.546)	(0.899)	(0.456)	(0.699)	(0.874)	(0.866)	(0.714)
Year	-0.64	-1.59	0.31	0.46	0.01	1.32	1.23	0.96	0.15	-0.03
	(0.813)	(0.536)	(0.899)	(0.834)	(0.998)	(0.454)	(0.548)	(0.698)	(0.957)	(0.989)
Investment in Stock	12.32									
	(0.133)									
Investment in M. Fund	-12.28									
	(0.158)									
Taking Finance Courses	-0.62									
	(0.497)									
Entry P1	40.88	39.72*								
	(0.067)	(0.032)								
Entry P2	38.35	81.22*								
	(0.251)	(0.017)								
Entry P3	-11.10	-7.44								
	(0.670)	(0.800)								
BTA General	-0.16		-0.40					-0.71	0.06	
	(0.754)		(0.336)					(0.109)	(0.924)	
BTA Financial	0.98		1.15*					1.26**		0.55
	(0.070)		(0.014)					(0.001)		(0.241)
BTA Payoff	0.11		1.16						0.27	0.05
	(0.422)		(0.275)						(0.091)	(0.606)

Summary of Regression Analysis with end of the Experiment Effect for Variables Predicting Trading Volume using White heteroskedasticity-consistent standard errors and covariance (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Over Ability P2				22.99*		24.86**				
				(0.003)		(0.000)				
Over Ability P3				-4.94		-4.55				
				(0.419)		(0.418)				
Over Precision P2					3.83**		4.45**			
					(0.008)		(0.000)			
Over Precision P3					-1.43		0.78			
					(0.315)		(0.599)			
Over Ability P2xP3						13.08**				
						(0.001)				
Over Precision P2xP3							0.26**			
							(0.006)			
BTA General and Finance								0.04		
								(0.118)		
BTA General and Payoff									0.01	
									(0.478)	
BTA Finance and Payoff										0.01
										(0.219)
Adjusted R	0.27	0.20	0.25	0.28	0.23	0.44	0.36	0.27	0.17	0.27

** Significance at 1% , * Significance at 5%. Values are unstandardized coefficients and values in Parentheses are p-values.

Summary of Regression Analysis with end of the Experiment Effect for Variables Predicting Average Bias (AB) using White heteroskedasticity-consistent standard errors and covariance

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Gender	-9.18	-12.73	-6.94	-10.40	-10.38	-10.21	-9.63	-5.81	-10.33	-10.08
	(0.207)	(0.082)	(0.314)	(0.120)	(0.114)	(0.111)	(0.128)	(0.429)	(0.174)	(0.141)
Age	-0.97	-0.14	-0.67	0.18	0.26	0.18	0.37	-0.58	-0.64	-0.52
	(0.147)	(0.841)	(0.353)	(0.828)	(0.753)	(0.825)	(0.658)	(0.466)	(0.387)	(0.481)
Year	-3.18	-4.14*	-4.15	-3.01	-4.50*	-2.83	-3.90	-4.53	-4.84*	-4.27
	(0.157)	(0.049)	(0.064)	(0.095)	(0.029)	(0.117)	(0.063)	(0.062)	(0.039)	(0.056)
Investment in Stock	6.52									
	(0.289)									
Investment in M. Fund	11.17*									
	(0.048)									
Taking Finance Courses	-1.22									
	(0.352)									
Entry P1	-43.91	-30.65								
	(0.095)	(0.278)								
Entry P2	30.54	61.43								
	(0.322)	(0.074)								
Entry P3	-47.32	-29.54								
	(0.103)	(0.276)								
BTA General	-0.43		-0.29					-0.36	0.90	
	(0.284)		(0.471)					(0.426)	(0.134)	
BTA Financial	0.24		0.67					0.99*		1.11*
	(0.529)		(0.105)					(0.028)		(0.018)
BTA Payoff	0.33*		0.21						0.49*	0.39*
	(0.022)		(0.064)						(0.021)	(0.021)

Summary of Regression Analysis with end of the Experiment Effect for Variables Predicting Average Bias (AB) using White heteroskedasticity-consistent standard errors and covariance (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Over Ability P2				-3.50 (0.790)		-3.11 (0.812)				
Over Ability P3				20.40 (0.109)		20.49 (0.106)				
Over Precision P2					-1.85 (0.242)		-1.55 (0.275)			
Over Precision P3					4.01* (0.031)		5.10* (0.014)			
Over Ability P2xP3						2.72 (0.442)				
Over Precision P2xP3							0.12 (0.112)			
BTA General and Finance								0.01 (0.607)		
BTA General and Payoff									-0.01 (0.128)	
BTA Finance and Payoff										-0.02 (0.027)
Adjusted R	0.33	0.28	0.25	0.44	0.37	0.44	0.39	0.22	0.25	0.33

** Significance at 1% , * Significance at 5%. Values are unstandardized coefficients and values in Parentheses are p-values.

Summary of Regression Analysis with end of the Experiment Effect for Variables Predicting Bubble Score using White heteroskedasticity-consistent standard errors and covariance

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Gender	-120.06	-204.58	-114.27	-123.24	-144.57	-110.29	-121.86	-43.93	-108.41	-95.98
	(0.196)	(0.057)	(0.142)	(0.187)	(0.118)	(0.143)	(0.093)	(0.532)	(0.134)	(0.169)
Age	-6.33	7.68	-3.97	5.19	-1.90	5.58	1.27	-6.10	-5.70	-4.88
	(0.531)	(0.438)	(0.617)	(0.595)	(0.847)	(0.469)	(0.859)	(0.413)	(0.451)	(0.509)
Year	15.95	-17.42	13.03	18.23	7.59	30.56	25.93	20.86	12.02	14.59
	(0.567)	(0.577)	(0.625)	(0.588)	(0.808)	(0.300)	(0.362)	(0.479)	(0.656)	(0.557)
Investment in Stock	-20.99									
	(0.788)									
Investment in M. Fund	43.40									
	(0.640)									
Taking Finance Courses	7.18									
	(0.468)									
Entry P1	59.52	41.58								
	(0.848)	(0.832)								
Entry P2	106.53	967.98**								
	(0.801)	(0.021)								
Entry P3	-54.98	415.46								
	(0.890)	(0.428)								
BTA General	3.33		2.82					-4.22	6.44	
	(0.482)		(0.556)					(0.477)	(0.195)	
BTA Financial	11.46*		12.02**					18.47**		10.47**
	(0.047)		(0.003)					(0.000)		(0.002)
BTA Payoff	6.11**		6.14**						7.11**	5.28**
	(0.000)		(0.001)						(0.000)	(0.001)

Summary of Regression Analysis with end of the Experiment Effect for Variables Predicting Bubble Score using White heteroskedasticity-consistent standard errors and covariance (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Over Ability P2				304.34**		331.17**				
				(0.000)		(0.000)				
Over Ability P3				56.24		61.88				
				(0.424)		(0.428)				
Over Precision P2					60.86**		70.05**			
					(0.000)		(0.000)			
Over Precision P3					-7.74		25.26*			
					(0.430)		(0.028)			
Over Ability P2xP3						187.65**				
						(0.005)				
Over Precision P2xP3							3.92**			
							(0.000)			
BTA General and Finance								0.80**		
								(0.009)		
BTA General and Payoff									0.11	
									(0.438)	
BTA Finance and Payoff										0.10
										(0.311)
Adjusted R	0.55	0.42	0.60	0.48	0.51	0.62	0.63	0.58	0.57	0.61

** Significance at 1% , * Significance at 5%. Values are unstandardized coefficients and values in Parentheses are p-values.

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MBA	KSU Business Administration	2007
BS	Cukurova Business Administration	2003
High School	CHO, Mersin	1998

WORK EXPERIENCE

Year	Place	Enrollment
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SKILLS & ABILITIES
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Personal Traits:

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HOBBIES

Gourmet, Computer Technologies, Movies, Motor Sports

TURKISH SUMMARY

Günümüzde yatırımcı davranışlarını açıklamada klasik finans teorilerinin yetersiz kaldıkları görülmektedir. Bu oldu klasik finans teorilerine alternatif olarak davranışsal modellerin ortaya çıkmasına neden olmuştur. Bu bağlamda, psikoloji ve finans bilimlerinin ortak noktası olarak davranışsal finans literatürde kendine yer bulmuştur. Davranışsal finans başlığı altında yer alan bu araştırmalarda, bireylerin finansal kararlarını alma süreçleri incelenmekte, yatırımcıların irrasyonel davranışlarının fiyat oluşum sürecindeki etkileri ortaya konulmaktadır. Deneysel finansın, davranışsal finans konularına olan uygulamaları ise özellikle önemlidir çünkü klasik finans yöntemleri ile elde edilmesi mümkün olmayan birçok önemli sonuca ancak deneysel finans yaklaşımları ile ulaşılabilmektedir.

Bu kapsamda, deneysel çalışmaların diğer değişkenlerin kontrol altına alınabildiği laboratuvar ortamında yapılıyor olması nedeniyle, bireylerin yatırım kararlarını etkileyen bilişsel algı sapmalarını belirlemede metodolojik açıdan çok büyük avantajı olduğu genel kabul görmektedir. Son yıllarda davranışsal ve deneysel finans alanlarındaki çalışmalar önemli gelişmeler kaydetmiştir. Söz konusu gelişmelere rağmen bu alanda yapılan çalışmalarda halen büyük eksiklikler bulunmaktadır. Özellikle, yatırımcıların davranışlarını etkileyen faktörlerin belirlenmesinde yeni çalışmalara ihtiyaç duyulmaktadır. Bunun yanı sıra, yatırımcıların bilişsel algı sapmalarını inceleyen yenilikçi çalışmaların da oldukça önemli olduğu düşünülmektedir.

Ayrıca, bireylerin yatırım kararlarını etkileyen sosyo-demografik faktörleri analiz eden çalışmalar da literatür de kendine önemli bir yer edinmektedir Psikoloji literatüründe saptanmış olan birçok algısal sapma bulunmaktadır. Bunlara arasında Demirleme, Yenilik, Aşinalık, Aşırı güven etkileri öne çıkmaktadır.

Bu bağlamda, bu doktora çalışmasının amacı aşırı öz güven algısal sapmasının bireylerin yatırım kararları üzerindeki etkini modelleyebilmek ve ölçebilmektir. Bu çalışma bu alandaki sınırlı sayıdaki literatüre katkı sağlamanın yanı sıra, bireylerin finansal bilgilerine daha az aşırı güven duyduklarını ileri süren ve inceleyen ilk çalışma olması nedeniyle ayrıca literatüre katkı sağlamaktadır. Bunun yanı sıra, literatürde ilke defa deneysel yaklaşımlar bir aşırı öz güven düzeyini ölçümlemek için geliştirilmiş olan farklı değişkenler ile birleştirilmiştir. Ayrıca, literatürde aşırı öz güven ve balon oluşumunu market bazında inceleyen çalışmalardan farklı olarak aşırı öz güven balon oluşumu ilişkisi bireysel veri kullanılarak analiz edilmiştir. Bunun yanı sıra, çalışma kapsamında literatüre katkı sağlayacağı düşünülen ve piyasada balon oluşumunu modelleyebilen yeni bir değişken geliştirilmiştir.

Bilişsel psikoloji alanında yapılan çalışmalar, genel olarak insanların aşırı güven duygusuna sahip olduğunu ortaya koymuştur (Odean, 1998). Aşırı güven duygusu, insanların sahip oldukları bilgiye fazla güven duymalarına, riskleri düşük tahmin etmelerine ve becerilerini de olduklarından fazla

görmelerine neden olmaktadır (Fischhoff ve diğerleri, 1977; Taylor ve Brown, 1988; Alicke ve diğerleri, 1995; Allen ve Evans, 2005; Bar-Tal ve diğerleri, 2001; Moore ve Healy, 2008; Urbig ve diğerleri, 2009; Hilton ve diğerleri, 2011; Abreu ve Mendes, 2012).

Aşırı öz güven algısı bu derece önemli olmasına rağmen ne yazık ki aşırı öz güven duyan yatırıcıları piyasada doğrudan gözlemlemek mümkün değildir. Bu nedenle ikincil veri kullanılarak yapılan ampirik çalışmalar aşırı öz güven algısı yerine farklı değişkenler kullanmak durumunda kalmışlardır (DeBondt ve Thaler, 1985; De Long ve diğerleri, 1991; Kyle ve Wang, 1997; Odean, 1998; Benos, 1998, Wang, 2001; Daniel ve diğerleri, 2001; Barber ve Odean, 2000; Glaser ve Weber, 2007, Hirshleifer ve Luo, 2001; Peng ve Xiong, 2006; Graham ve diğerleri, 2006; Grinblatt ve Keloharju, 2009; Skala, 2011). Bu durumda modeller doğru olmayan sonuçlara yönlendirebilmektedir. Bu bağlamda aşırı öz güven algı sapmasının en iyi deneysel yöntemlerle analiz edilebileceği tartışılmaktadır (Biais ve diğerleri, 2005).

Aşırı öz güven algısının piyasalarda yüksek işlem hacmi yarattığı (Odean, 1999; Gervais ve Odean, 2001; Ben-Davidet ve diğerleri, 2007; Abreu ve Mendes, 2012; Hirshleifer ve Luo, 2001) ve piyasalarda balon oluşumuna neden olabileceği gösterilmiştir (Shiller, 2002; Scheinkman ve Xiong, 2003; Lovric ve diğerleri, 2010). Balon oluşumunun piyasalarda menkul kıymetlerin içsel fiyatlarından sapmaları sonucunda ortaya çıktığı genel olarak kabul edilmektedir (Kindleberger, 2000). Ancak, hisse senetlerinin içsel değerinin

piyasalarda gözlemlenemiyor olması balon oluşumlarını modelleyebilmenin en iyi yönteminin deneysel yaklaşımlar olduğunu ortaya koymaktadır (Fisher, 1998: 3). Literatür de balon oluşumunun üç ana aşaması olduğu genel kabul edilmektedir (Fisher, 1998; Haruvy ve Noussair, 2006);

- İlk aşamada hisse senedi fiyatları genellikle içsel değerinin altında gerçekleşirken,
- İkinci aşamada hisse senedi fiyatları artmaya başlamakta ve çoğu zaman hisse senetleri içsel değerinin altında işlem görmektedir,
- Son olarak çöküş aşaması olarak da tanımlanan bu aşamada ise fiyatlarda büyük düşüşler görülmektedir.

Literatürdeki gelişmeler ışığında geliştirilen hipotezler aşağıdaki gibi sıralanabilir;

Hipotez 1: Bireyler genel anlamda sahip oldukları yeteneklere aşırı güvenmektedirler (Hem genel bilgi düzeyleri hem de finansal bilgi düzeyleri açısından).

Hipotez 2: Bireyler sahip oldukları bilgilerin doğruluk derecesi hakkında aşırı öz güven sahibidirler (Hem genel bilgi düzeyleri hem de finansal bilgi düzeyleri açısından).

Hipotez 3: Bireylerin finansal bilgi düzeylerindeki aşırı güven düzeyi genel bilgi düzeyindeki aşırı öz güven düzeylerine göre daha azdır.

Hipotez 4: Bireyler kendilerini ortalamanın üzerinde görmektedirler (Hem genel bilgi düzeyleri hem de finansal bilgi düzeyleri açısından).

Hipotez 5: Bireyler finansal bilgi düzeyleri açısından kendilerini daha düşük oranda ortalamanın üzerinde görmektedirler.

Hipotez 6: Bireyler performanslarına dayalı beklenen getiri oranlarını ortalamanın üzerinde görmektedirler.

Hipotez 7: Genel bilgi düzeylerinin ölçüldüğü ikinci aşamada piyasaya girme oranı herhangi bir soru sorulmadığı birinci aşamadaki piyasaya girme oranından daha yüksektir.

Hipotez 8: Finansal bilgi düzeylerinin ölçüldüğü üçüncü aşamada piyasaya girme oranı herhangi bir soru sorulmadığı birinci aşamadaki piyasaya girme oranından daha yüksektir.

Hipotez 9: Finansal bilgi düzeylerinin ölçüldüğü ikinci aşamada piyasaya girme oranı genel bilgi düzeylerinin ölçüldüğü ikinci aşamadaki piyasaya girme oranı oranından daha azdır.

Hipotez 10: Bireysel işlem hacmi ile aşırı öz güven algı düzeyi arasında pozitif bir ilişki bulunmaktadır.

Hipotez 11: Bireysel getiri oranı aşırı öz güven algı düzeyi arasında negatif bir ilişki bulunmaktadır.

Hipotez 12: Aşırı öz güven algısı piyasalarda balon oluşumuna neden olmaktadır.

Hipotez 13: Kadın bireyler erkek bireylere kıyasla daha az aşırı öz güven duymaktadırlar.

Hipotez 14: Yatırım tecrübesine sahip olan bireyler finansal bilgilerine daha az aşırı öz güven duymaktadırlar.

Hipotez 15: Yatırım tecrübesine sahip olan bireyler piyasada daha doğru kararlar almaktadırlar.

Hipotez 16: Yatırım tecrübesine sahip olan bireyler piyasada daha az işlem gerçekleştirmektedirler.

Hipotez 17: Finans konusunda bilgi sahibi olan bireyler finansal bilgilerine karşı daha az aşırı öz güven duymaktadırlar.

Hipotez 18: Finans konusunda bilgi sahibi olan bireyler piyasada daha doğru kararlar almaktadırlar.

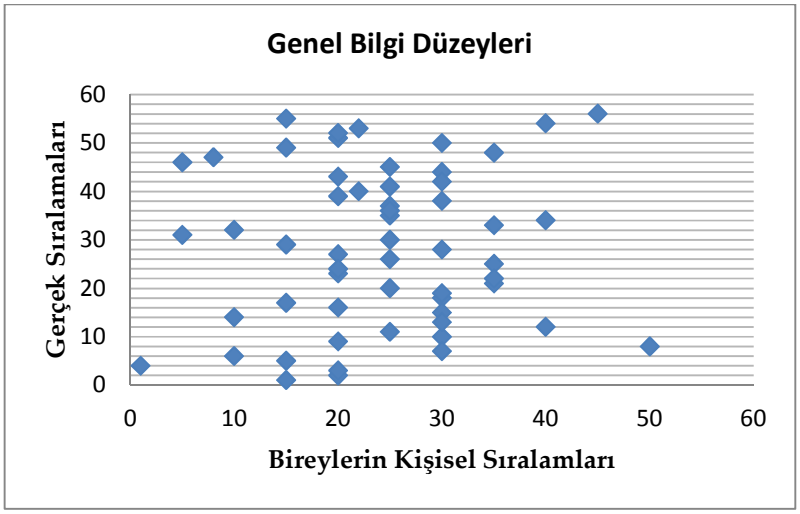
Çalışma kapsamında aşırı öz güven algısal sapmasının psikoloji temelli bir deney yardımıyla ölçülecek ve z-Tree (Fischbacher, 2007) bilgisayar programı ile yapay bir menkul kıymet borsası oluşturularak bu bireylerin menkul kıymet satın almadaki söz konusu sapmalarının piyasayı ne yönde etkileyeceğini laboratuvar ortamında bireyler üzerinde test edilmiştir. İlk deneyde bireyleri öz güven düzeyleri modellenirken ikinci deneyde yapay menkul kıymet borsalarındaki balon oluşumu incelenmiştir. Aşırı öz güven deneyinde literatürde genel kabul gören değişkenlerin yan ısıra Camerer ve Lovallo (1999) aşırı öz güveni modelleyebilmek için dizayn ettiği piyasa giriş deneyi de kullanılmıştır. Balon oluşumunu modelleyebilmek için EconPort (Experimental Economics Center, 2012) "MarketLink" deneyi kullanılmıştır.

Elde edilen bulgular bireylerin %70'inin sahip oldukları genel yeteneklere aşırı öz güven duyduklarını ancak bu bireylerin %60'nın finans konusundaki yeteneklerine aşırı güven duyduklarını ortaya konmaktadır. Bireylerin %46'sı sahip oldukları genel bilgilerin doğruluğuna karşı aşırı öz güven duyarken sadece %20'si finansal bilgilerinin doğruluğuna karşı aşırı öz güven duyduklarını ortaya koymaktadır. Bireylerin yaklaşık %63'ü kendilerini genel bilgi düzeyleri açısından ortalamanın üzerinde görmekte ve ortalamanın üzerinde getiri beklemektedirler.

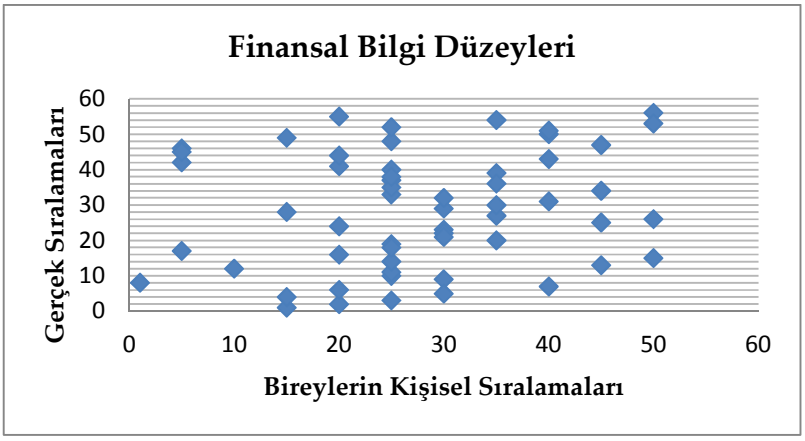
Aşırı Öz Güven Düzeyleri

Aşırı Öz Güven Değişkenleri	Yüzde	Ortalama	P-Değeri
Piyasa giriş düzeyi (1. Aşama)	N/A	0.74	N/A
Piyasa giriş düzeyi (1. Aşama)	N/A	0.69	N/A
Piyasa giriş düzeyi (1. Aşama)	N/A	0.56	N/A
Yeteneklere karşı aşırı öz güven (Genel Bilgi)	69.6	8.09	0.000
Yeteneklere karşı aşırı öz güven (Finansal Bilgi)	58.9	2.95	0.161
Bilgilerin doğruluğuna yönelik aşırı öz güven (Genel Bilgi)	46.4	25.71	0.000
Bilgilerin doğruluğuna yönelik aşırı öz güven (Finansal Bilgi)	19.6	0.45	0.000
Kendini ortalamanın üzerinde görme (Genel Bilgi)	62.5	-0.05	0.694
Kendini ortalamanın üzerinde görme (Finansal Bilgi)	53.6	-2.00	0.013
Kendini ortalamanın üzerinde görme (Getiri Oranı)	62.5	-4.99	0.000

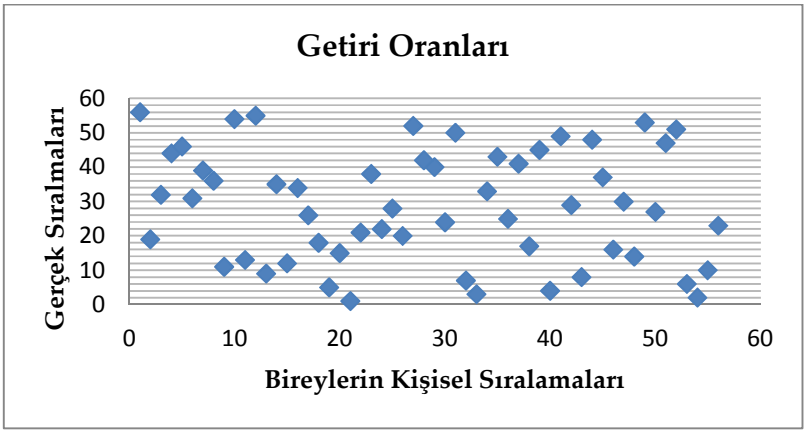
Aşağıda yer alan grafikler bireylerin kişisel sıralamaları ile gerçek sıralamaları arasındaki ilişkiyi genel bilgi düzeyleri, finansal bilgi düzeyleri ve getiri oranları açısından göstermektedir.



Elde edilen bulgular bireylerin gerçek genel bilgi düzeyleri ile sahip olduklarını düşündükleri genel bilgi düzeyleri arasında herhangi anlamlı bir ilişki olmadığını göstermektedir ($r = 0.079$, $p = 0.566$).



Benzer şekilde, bulgular bireylerin gerçek finansal bilgi düzeyleri ile sahip olduklarını düşündükleri finansal bilgi düzeyleri arasında anlamlı bir ilişki olmadığını göstermektedir ($r = 0.183$, $p = 0.177$).



Bireylerin bekledikleri getiri oranı ile elde ettikleri getiri oranı arasında korelasyon ise 0.037 olup istatistiksel olarak sıfırdan farklı değildir ($p = 0.787$). Bu bulgular bireylerin kendilerini ortalamanın üzerinde görmelerine rağmen aslında ortalamanın üzerinde olmadıklarını ortaya koymaktadır. Aşağıdaki tabloda yer alan analiz sonuçları bireylerin finansal konularında

yeteneklerine ve bilgi düzeylerine daha az aşırı güven duyduklarını göstermektedir.

Wilcoxon Aşırı Öz Güven Farklılıkları Testi

	Ortalama Sıralama			
	N. Sır	P. Sır.	Z Değ.	P-Değ.
Yeteneklere karşı aşırı öz güven (Finansal – Genel)	28.12	17.00	-5.955[b]	0.000
Bilgilerin doğruluğuna yönelik aşırı öz güven (Finansal – Genel)	29.57	9.67	-6.273[b]	0.000
Kendini ortalamanın üzerinde görme (Finansal – Genel)	21.78	20.60	-3.104[b]	0.002
Piyasa giriş düzeyi (Entry 2 – Entry 1)	31.15	22.69	-1.119[b]	0.263
Piyasa giriş düzeyi (Entry 3 – Entry 1)	29.69	16.59	-3.609[b]	0.000
Piyasa giriş düzeyi (Entry 3 – Entry 2)	22.63	20.67	-5.222[b]	0.000

*b: negatif sıralama, c: pozitif sıralama

Bunun yan ısıra, bulgular bireylerin finansal bilgilerin gerekli olduğu zamanlarda piyasaya daha az sıklıkta girme kararı aldıklarını ortaya koymaktadır. Çalışma kapsamında yatırım tecrübesi sahibi olan bireylerin böyle bir tecrübeye sahip olmayan bireylerden öz güven düzeyleri ve yatırım stratejileri açısından farklılık gösterip göstermedikleri analiz edilmiştir. Elde edilen bulgular yatırım tecrübesi sahibi olmanın anlamlı bir etkisinin olmadığını göstermiştir. Ayrıca, çalışma kapsamında finansal bilgi sahibi olan bireylerin olmayan bireylere kıyasla ne öz güven düzeyleri açısından nede yatırım stratejileri açısında farklılık göstermediğini ortaya koymaktadır. Cinsiyet farklıklarının bireylerin öz güven düzeyleri ve yatırım stratejileri açısından anlamlı olup olmadığı ayrıca incelenmiştir. Bulgular, cinsiyet farklılıklarının anlamlı olmadığına işaret etmektedir.

Finansal Bilgi Sahibi Olmanın Etkisi

	Ortalama Sıralama			
	Neg. Sıra	Pos. Sıra.	Z Değ.	P-Değ.
Piyasa giriş düzeyi 1 (Finansal - Kontrol)	9.35	9.69	-0.352[b]	0.725
Piyasa giriş düzeyi 2 (Finansal - Kontrol)	7.46	13.58	-0.584[b]	0.861
Piyasa giriş düzeyi 3 (Finansal - Kontrol)	8.00	10.13	-0.846[b]	0.831
Genel bilgi düzeyini ortalamanın üzerinde görme (Finansal - Kontrol)	8.85	11.20	-1.288[b]	0.198
Finansal bilgi düzeyini ortalamanın üzerinde görme (Finansal - Kontrol)	9.13	11.50	-0.584[b]	0.559
Getiri oranını ortalamanın üzerinde görme (Finansal - Kontrol)	10.55	9.25	-0.846[b]	0.398
Genel yeteneklere karşı aşırı öz güven (Finansal - Kontrol)	9.17	12.50	-0.187[b]	0.852
Finansal yeteneklere karşı aşırı öz güven (Finansal - Kontrol)	9.54	11.94	-0.355[b]	0.723
Genel bilgilerin doğruluğuna yönelik aşırı öz güven (Finansal - Kontrol)	9.67	11.75	-0.411[b]	0.681
Finansal bilgilerin doğruluğuna yönelik aşırı öz güven (Finansal - Kontrol)	10.83	10.00	-0.933[b]	0.351
İşlem Hacmi (Finansal - Kontrol)	9.95	11.05	-0.205[c]	0.837
AB (Finansal - Kontrol)	11.30	9.70	-0.299[b]	0.765
Balon Oluşumu (Finansal - Kontrol)	9.85	11.71	-0.859[b]	0.391
Toplam Getiri (Finansal - Kontrol)	11.75	9.67	-0.411[c]	0.681

* Asymp. Sig., ** b: negatif sıralama, c: pozitif sıralama

	Ortalama Sıralama			
	Neg. Sıra	**Pos. Sıra.**	**Z Değ.**	**P-Değ.**
Piyasa giriş düzeyi 1 (Finansal - Kontrol)	10.77	11.25	-0.105[c]	0.916
Piyasa giriş düzeyi 2 (Finansal - Kontrol)	9.96	13.72	-0.098[c]	0.922
Piyasa giriş düzeyi 3 (Finansal - Kontrol)	8.28	10.72	-0.481[b]	0.630
Genel bilgi düzeyini ortalamanın üzerinde görme (Finansal - Kontrol)	10.32	11.75	-0.070[b]	0.944
Finansal bilgi düzeyini ortalamanın üzerinde görme (Finansal - Kontrol)	11.25	10.00	-0.562[b]	0.574
Getiri oranını ortalamanın üzerinde görme (Finansal - Kontrol)	11.50	10.45	-0.383[c]	0.702
Genel yeteneklere karşı aşırı öz güven (Finansal - Kontrol)	11.42	12.64	-0.030[b]	0.976
Finansal yeteneklere karşı aşırı öz güven (Finansal - Kontrol)	10.13	12.17	-0.209[c]	0.835
Genel bilgilerin doğruluğuna yönelik aşırı öz güven (Finansal - Kontrol)	11.09	12.83	-0.487[b]	0.627
Finansal bilgilerin doğruluğuna yönelik aşırı öz güven (Finansal - Kontrol)	11.92	12.09	-0.152[c]	0.879
İşlem Hacmi (Finansal - Kontrol)	9.79	11.61	-1.634[b]	0.102
AB (Finansal - Kontrol)	10.67	13.45	-0.304[b]	0.761
Balon Oluşumu (Finansal - Kontrol)	12.27	11.75	-0.091[b]	0.927
Toplam Getiri (Finansal - Kontrol)	11.86	12.22	-0.852[c]	0.394

* Asymp. Sig., ** b: negatif sıralama, c: pozitif sıralama

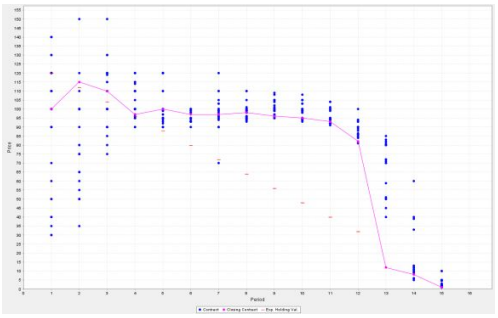
Wilcoxon Cinsiyet Farklılıkları Testi

	Ortalama Sıralama			
	Neg. Sıra	**Pos. Sıra.**	**Z Değ.**	**P-Değ.**
Genel yeteneklere karşı aşırı öz güven (Erkek – Kadın)	15.46	10.73	-0.619[b]	0.536
Finansal yeteneklere karşı aşırı öz güven (Erkek – Kadın)	13.64	10.90	-1.172[b]	0.241
Genel bilgilerin doğruluğuna yönelik aşırı öz güven (Erkek – Kadın)	15.39	11.29	-1.016[b]	0.310
Finansal bilgilerin doğruluğuna yönelik aşırı öz güven (Erkek – Kadın)	17.08	9.92	-1.181[b]	0.238
Genel bilgi düzeyini ortalamanın üzerinde görme (Erkek – Kadın)	12.72	8.68	-0.356[b]	0.722
Finansal bilgi düzeyini ortalamanın üzerinde görme (Erkek – Kadın)	15.59	10.96	-0.243[b]	0.808
Getiri oranını ortalamanın üzerinde görme (Erkek – Kadın)	13.00	10.00	-0.538[b]	0.591
Piyasa giriş düzeyi 1 (Erkek – Kadın)	9.00	10.46	-1.662[b]	0.097
Piyasa giriş düzeyi 2 (Erkek – Kadın)	12.94	11.43	-2.009[c]	0.045[*]
Piyasa giriş düzeyi 3 (Erkek – Kadın)	11.32	10.36	-1.500[c]	0.134

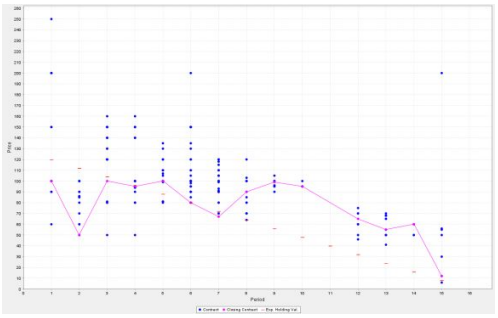
*b: negatif sıralama, c: pozitif sıralama.

Dört marketin üçünde pozitif ancak üçüncü markette negatif balon oluştuğu görülmektedir. Pozitif balon oluşan piyasalarda fiyatlar hisse senedinin içsel değerinin altında başlamakta, deneyin ortalarına doğru fiyatlar artış eğilimi göstermekte, sonlara doğru ise fiyatlarda sert düşüşler yaşanmakta ve fiyatlar içsel değerlerine kadar düşmektedir.

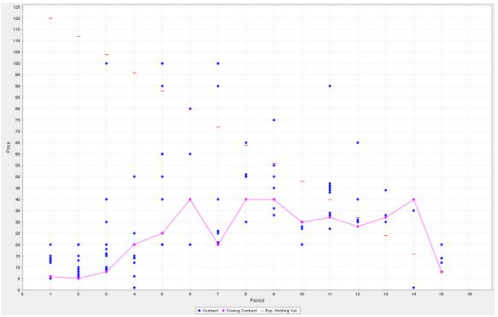
1.Market



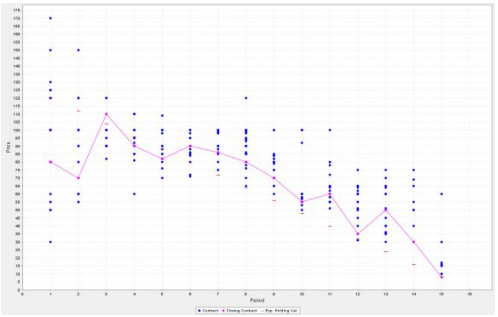
2.Market



3.Market



4.Market



Üçüncü markette ise diğer üç marketten farklı olarak hisse senetleri hemen her aşamada içsel değerinin altında işlem görmüş ancak deneyin sonlarına doğru içsel değere yükselmiştir. Tablo 6.17, Tablo 6.28, Tablo 6.39 ve Tablo 6.50'deki korelasyon analizleri balon oluşumunu modelleyen değişkenler ile aşırı öz güveni temsil eden değişkenler arasında pozitif yönlü anlamlı ilişkilerin varlığını göstermektedir. Bu bağlamda, piyasada balon oluşumuna neden olan bireylerin aşırı öz güven sahibi bireyler olduğu görülmektedir.

Elde edilen bulgular aşırı öz güven duyan bireylerin daha yüksek fiyatlardan yatırımda bulundukları, daha sık işlem gerçekleştirdikleri ve daha düşük getiri elde ettiklerini ortaya koymaktadır. Ayrıca, aşırı öz güven sahibi bireylerin finansal bilgi gerektiren piyasalara daha fazla girme eğiliminde olduklarını göstermektedir. Tablo 6.51, Tablo 6.52 ve Tablo 6.53'de yar alan regresyon analizleri aşırı öz güven algısının piyasalardaki balon oluşumunu ve yüksek işlem hacimlerini açıklayabildiği görülmektedir. Bulgular demografik faktörlerin balon oluşumunu açıklayamadığını ve ayrıca piyasalarda balon oluşumunun finansal bilgiden daha çok genel bilgi düzeyine bağlı aşırı güven algısı sonucunda oluştuğunu ortaya koymuştur.

Özetlemek gerekirse, elde edilen bulgular bireylerin genellikle sahip oldukları bilgilere aşırı öz güven duydukları belirlenmiştir. Çoğu birey kendini diğer katılımcılardan bilgi ve beceri olarak üstün görmekte ve menkul kıymet borsalarında çok başarılı olacağını düşünmektedir. Kendisine aşırı öz güven duyan bireylerin birçoğu borsada daha fazla alım satım

yapmakta ve ciddi ölçüde zararlarla karşılaşabilmektedir. Ayrıca elde edilen bulgular bireylerin yatırım bilgisi gerektiren konularda kendilerine daha az güvendiğini göstermektedir. Bulgular ayrıca piyasalarda balon oluşumuna neden olan yatırımcıların aşırı öz güven algı sapması yaşayan bireyler olduğunu ortaya koymaktadır.

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