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May 2006

Faith

- An empirical study of expectations of unconditional other-regarding preferences

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Abstract

Expectations of unconditional other-regarding preferences has shown to be important for trust game behavior and can be seen as expectations of generosity or fairness. In this thesis these expectations are captured in the variable faith. A plausible mechanism between faith and trust is developed in line with the findings of Holm and Danielson (2005). An experiment revealing faith and a standard set of survey questions regarding trust is then examined in order to study the predictive power of surveys for faith. The results show that people who donate money expect others to be generous and individuals' who engage in several risky activities have higher faith. The result suggests that questions related to these findings should be incorporated with standard questions when combining trust experiments and surveys. The result also shows that faith is better predicted by variables measuring behavior rather than attitudes.

Keywords: faith, trust, other-regarding preferences, expectations, variable selection.

1 Introduction

1.1 Background

Recent research has shown increasing interest in developing models that incorporate other preferences rather than the self-regarding preferences modeled in standard economic theory. The new models take into account that decision makers care not solely about their own payoff but also about the payoff of others. These models try to capture what is commonly referred to as other-regarding preferences and model preferences such as inequality aversion and reciprocity. Recently Holm and Danielson (2005) has shown that expectations of unconditional other-regarding preferences are important for trust behavior in trust games, i.e., in a strategic investment situation. These expectations are interpreted as expectations of generosity or inequality aversion and are positively related with trust behavior.

Not much research has been done on finding variables, except for trust, that is related to these expectations. Holm and Danielson's study makes it possible to empirically test different kinds of variables that can explain attitudes and behavior behind expectations of other-regarding preferences. Thus by studying background characteristics, trust- and risk-attitudes valuable information regarding what kind of behavior and attitudes that are related with expectations of unconditional other-regarding preferences can be obtained.

1.2 Purpose and the question at issue

The purpose of this thesis is to study expectations of unconditional other-regarding preferences and the determinants behind these. This is done by first analyzing how this type of expectations affects trust behavior. Then a new variable is created to study the impact of such expectations on trust behavior. The new variable is named *faith* and is defined as expectations of unconditional other-regarding-preferences.

Faith is then tested against answers to standard survey questions regarding background characteristics, trust and risk in order to find preferences and behavior that explain this type of expectations. Studying the relationship between these factors makes it possible to draw conclusions whether such characteristics can predict faith. The thesis thus aims to answer the following question:

Is it possible to predict faith by studying background characteristics and survey questions regarding trust and risk?

1.3 Method and disposition

The thesis contains of three parts. The first part, chapters 2 and 3, is a literature-study of trust and other-regarding preferences. Chapter 2 presents general definitions of trust and its consequences for economic behaviour and society. The chapter also deals with how trust is measured, related problems and explanations to trust game behaviour. Further, empirical results from trust games and surveys are presented. Chapter 3 begins with an introduction to the theory of other-regarding preferences followed by the introduction of the variable faith; the way it is measured and its relationship with trust.

The second part, chapters 4 and 5, is an econometric study and the third part, chapter 6, presents the conclusions based on the previous parts. Chapter 4 presents data, methodology and different tests used in the thesis, as well as problems related to the tests and the methodology. Next, chapter 5 presents the results from the tests followed by a discussion of the interpretation of the results. Finally, Chapter 6 gives the conclusions for the thesis.

2 Trust

2.1 What is trust?

The perspective on trust varies within the social sciences but the importance of the concept and its consequences for fostering cooperation, network relations and lowering transaction costs, are widely accepted. But what is trust? Common components in definitions of trust are confident expectations and a propensity to be vulnerable. Expressions such as *willingness to rely on another* and *positive expectations of others* are frequently used. Rousseau et al. (1998 p. 395) gives a general definition of trust.

> "Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another."

According to the above definition, trust can be seen as expectations of positive reciprocity (Buchan and Croson 2004 p. 501). Generally, there are two necessary conditions of trust; risk and interdependence. The former often takes the shape of the decision makers perception of the probability of losses. This perception is in turn dependent on the reciprocal relationship, where risk taking is a prerequisite for trust. In a world with complete information and no uncertainty trust is not needed. However in situations where information asymmetries exist trust is needed and with it comes risk. The latter condition of trust stresses the point that trust is the result of reliance upon another to achieve ones own interest. As this interdependence increases or decreases, trust and risk changes as well. To clarify, trust is neither a behavior such as cooperation, nor is it a choice, i.e. risk taking, but rather a condition which consists of both behavior and choice and is the result of actions caused by underlying psychological conditions (Rousseau et al. 1998 p. 395).

Concepts that has been used in describing trust are, the importance of reputation (trustworthy behavior), social norms (shaping behavior and beliefs) and institutions (facilitates or constrains trust behavior) (ibid p. 397). Having a reputation of being a trustworthy person can be viewed as an asset for the individual (see section 2.1.1). Social norms of acting in a trustworthy manner might be a rational behavior if everyone is expecting others to be trustworthy individuals (see section 2.2.3). Stable public institutions could produce a higher degree of trust at both the micro- and macro level (see section 2.1.2)

Generally there is a distinction between thin and thick trust. Thin trust refers to trust in strangers or in people generally, whereas thick trust refers to trust between close friends, i.e. the kind of trust that works in wider social networks. Since thin trust, i.e. trusting people generally, goes beyond the boundary of people we know, it is more useful than thick trust (Putnam 2000 p. 136). Thin trust and thick trust can thus be thought of in terms of the amount of information we have on the counterpart. The more I know about my counterpart, the thicker the trust and by this the lesser the risk and vulnerability I take if I chose to trust my counterpart.

Coleman (1990 p. 97-99) gives four points to give a definition of a situation that involves trust. The first two concerns with decisions under risk and uncertainty. These two are; the action of trusting increases the trustees range of actions and if the trustee is trustworthy and reciprocates the trust, the trustor is better off than before. Third, the trustor places the trust voluntarily without any prior commitment by the counterpart. Further, the trustee's action is in the future.

Finally, Cox (2004 p. 263) gives a definition that captures the points stated by Coleman and thus gives a more stringent definition which is directly applicable to many economic situations such as investment decisions.

> Trust is inherently a matter of beliefs that one agent has about the behavior of another. An action that is trusting of another is one that creates the possibility of mutual benefit, if the other person is cooperative, and the risk of loss to oneself if the other person defects.

When referring to trust in the coming sections of this thesis it is the Cox definition that is referred to. To sum up, trust is seen as a willingness to take a risk and accept the vulnerability to be dependent on another decision maker in order to achieve a different outcome which makes both decision makers better off. As pointed out by Cox this is a matter of beliefs and a relevant question is to ask what consequences these beliefs have for economic situations.

2.1.1 Does trust lead to economic success?

Trust is generally seen as being an embedded factor in every economic transaction (Arrow 1972 p. 357) and anyone who wishes to transact with another person has to deal with the problem of trust (Dasgupta 2005 p. 3). Trust is thus considered lowering transaction costs. *Trust-sensitive transactions* such as investments and savings decisions are easier obtained in high-trust societies. High trust also lowers the costs for contracts since the need for written contracts decreases. A low level of trust can harm the rate of innovations since entrepreneurs spend more time controlling its partners and employees rather than creating new products (Knack and Keefer 1997 p. 1252-1253). In a cross country study over 29 market economies, trust, measured as in the general trust question (see section 2.2.4), is shown to increase by ten percentage points when growth increase by 0,8 percentage points (ibid p. 1260). The same study was conducted sometime later, but this time increasing the number of countries to 41, it showed that growth increased on average by one percentage point for each 15 percentage point increase in trust (Zak and Knack 2001 p. 307-309).

On a theoretical level, Zak and Knack (2001) show in a general equilibrium model how trust is related to growth. Their result is that the economical, social and institutional environments matters for trust.

Trust is regarded as the basic component of social capital, which in turn is considered related to economic payoff and a stable democracy. The study of social capital has revolved around a wide range of factors such as institutions, social networks, associational activity, cultural factors and lobby organisations. Putnam (1993, 2000) argues that social capital is constituted by social organisations that has within themselves norms, social networks and trust that aid cooperation. Putnam's theory is in short made up by the assumption that the more people engage in associational activity and civic cooperation, the more the aggregated level of trust in the community/society and thus the higher the rate of social capital. A higher rate of social capital, measured as the associational activity, is linked in Putnam's studies to higher levels of trust, more social and political networks and stronger economic performance. This theory has also been applied at the micro-level where the decision to join a social network, e.g. the bowling club, the football team, the choir etc, is seen as an investment in social capital. When an individual joins the network the social distance decreases and trust and cooperation is created (Glaeser et al. 2002 p. 443). Putnam's theory has however been strongly criticized both theoretically and empirically. The reasons for this criticism are many; associational activity has not been shown to be linked to economic performance (e.g. Knack and Keefer 1997), the effects of some associations have negative effects on society, i.e. from associations such as motorcycle clubs, and finally, the causal mechanism behind social capital as presented in Putnam's theory has been shown to be incorrect, it is individuals that already have high trust that engage in civic cooperation and associations which leads to the clear relationship between associations and trust (Rothstein 2003 p. 50). An alternative causal mechanism based on the actions and norms of the implementing side of politics has been raised. I will return to this mechanism later.

2.1.2 Trust in institutions

Trust is seen as contributing to enhanced efficiency of the public institutions (Alesina and La Ferrara 2002 p. 211) and is also empirically linked (La Porta et al. 1997). High trust societies are also considered to a lesser extent being dependent on formal institutions to implement contracts and agreements (Knack and Keefer 1997 p. 1253). Trust in public institutions and the implementing side of politics is distinguished from trust in the government. The latter is contingent on if I have confidence in the politics being run by the government, which if I do not agree with the ruling part(ies)y does not necessarily have to be true. I wish the politicians to act in my interest and make decisions that I favor. If they don't, should I trust them? The general answer is no. On the other hand, trust in the implementing side, the public institutions, which are supposed to act fair and impartial and to implement social policy, is a different thing. Trust in public institutions is thus different from expecting someone to act in my interest. Trust in public institutions is based on if the individual considers the institution to act fair and impartial. If the formal institutions act in this way, then institutions can contribute to the creation of trust (Rothstein 2003 p. 52-59). The causal mechanism between public institutions and trust can thus be explained as below. If the implementing side of politics acts fair and impartial then I have reason to have confidence in these institutions. If I know or think that the government officials are not corrupt, does not take bribes and treat everyone fair, then I have reason to believe that I do not have to engage in such behavior (paying bribes etc) and that none of my fellow citizens have to engage in such behavior either. Hence, I do not have to expect others to act in an untrustworthy manner and I therefore have reason to believe that others will act in a trustworthy way and thus I have reason to believe that most people can be trusted (ibid p. 59-60). This is an interesting and plausible theoretical mechanism that unfortunately is based on weak statistics. The mechanism implies that trust depends heavily on the level of corruption in the region/country. As seen in the latter parts of this thesis, trust game behavior does not differ considerably between countries, continents and regions. According to the theory countries with higher degrees of corruption should show lower degrees of trust.

2.2 Measuring trust

In economics two ways of measuring trust have been predominant; experiments and surveys. Experiments have been used to study how individuals act in an actual economic situation where trust is necessary for economic growth, while surveys, has been used for a longer time period than experiments and has been combined with both micro- and macroeconomic data to measure the effects of, for example, aggregated trust and economic performance between different countries, e.g. Knack and Keefer (1997), La

Porta et al. (1997) and Alesina and La Ferrara (2002). A common experiment to measure trust is the game used in Berg, Dickhaut and McGabe (1995), and one of the most common questions used in surveys is the one asked in among others the General Social Survey, henceforth GSS. In the following section, the design of some of the experiments and some of the questions used in surveys to measure trust will be presented.

2.2.1 Experiments

The games which are used to measure trust are normally constructed as sequentially played prisoners dilemma and allows the subjects to have more than two actions for each player. Games have the advantage, in comparison to surveys, that they show how people actually behave rather than how they believe they behave. A good example is the paper by Fersthman and Gneezy (2001) in which they studied ethnic discrimination in Israel between Ashkenazic Jews (with origin from Europe and America) and Sephardic Jews (with origin from Africa and Asia). The participants in their study did not believe there would be any discrimination but the results from the games showed direct evidence of ethnic discrimination.

There are several types of games that have been used to measure trust, for example Fehr et al. (1993). The most common game when measuring trust is the game constructedand used by Berg et al. (1995). This game has constituted the foundation for measuring trust in experimental settings and the game is seen as capturing economic trust since it depends on the trustees pure trust in its counterpart and not on social sanctions, relationships or communication (Camerer 2003 p. 85). The use and variations of the design of the Berg et al. experiment are many, e.g. Glaeser et al. (2000), Fershtman and Gneezy (2001), Eckel and Wilson (2004), Cox (2004) and Holm and Danielson (2005). Since the game is not dependent on the surroundings it is therefore replicable and comparisons between different countries are possible, e.g. Buchan and Croson (2004), Buchan et al. (2005) and Holm and Danielson (2005).

2.2.2 The trust game

Berg et al. (1995) call this game *the investment game* but it is commonly referred to as *the trust game*. The game is a one-shot sequential non-cooperative prisoner's dilemma and is played as follows. Subjects are divided into two groups, *A* players and *B* players. The subjects are then paired, one *A* player and one *B* player. The subjects are each given an amount, M, as a show-up fee[1]. The *A* player is then to decide upon whether to send some part, all, or nothing of M to the *B* player, thus x ($0 \leq x \leq$ M)[2]. The *B* player pockets the initial endowment given to him/her. If player *A* decides to send zero then the game ends. On the other hand, if the *A* player decides to send an amount greater than zero this sum is then tripled once it reaches *B*. The *B* player then decides how much to keep and how much to send back of the tripled amount to player *A*, thus y ($0 \leq y \leq 3$x). After the amount sent by *B* reaches *A*, the game ends. The subjects in this game are guaranteed anonymity and the game is played only once. By doing this, mechanisms which could result in investment without trust, such as reputations from previous episodes of the game evolving from repeated interactions, commitments made through contracts or agreements, and threats of punishment, are eliminated (Berg et al. 1995 p. 123-124).

Berg et al. (1995) set up the following conditions for trust to be considered in the investment game. The first stage of the game is to be seen as the risky part since *A* does not know if *B* will reciprocate. *A* thus takes a risk trusting *B* by sending him/her money. In the second stage *B* has to give up some of his/her wealth in order to reciprocate *A*, i.e. to prove him/her to be a trustworthy person. Finally, both can gain from acting in a trust/trustworthy manner relatively to the subgame perfect outcome (ibid p. 126).

The interpretation of the subjects behavior in the Berg et al. game is that the *A* players are faced with a decision whether or not to trust *B* and *B* is faced with a decision whether or not to reciprocate the trust invested in him/her by *A*, i.e. to act trustworthy. Trust is thus defined by sending $x > 0$ and trustworthiness is defined by sending $y > 0$ (ibid). Applying the definition of trust given by Rousseau (1998) to the trust game, the *A*-player

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[1] The set up of providing both *A* and *B* players with an initial endowment varies. In some studies the endowment is only given to *A* but the study used in this thesis provided both groups with the same initial endowment, therefore the equations are written under this prerequisite.

[2] Notation is derived from Holm and Danielson (2005).

accepts the vulnerability by sending the money since he/she has positive expectations of the *B*-player's behavior. As pointed out by Bellemare and Kröger (2003) the trust game also satisfies the four points stated by Coleman in defining a situation involving trust (see section 2.1).

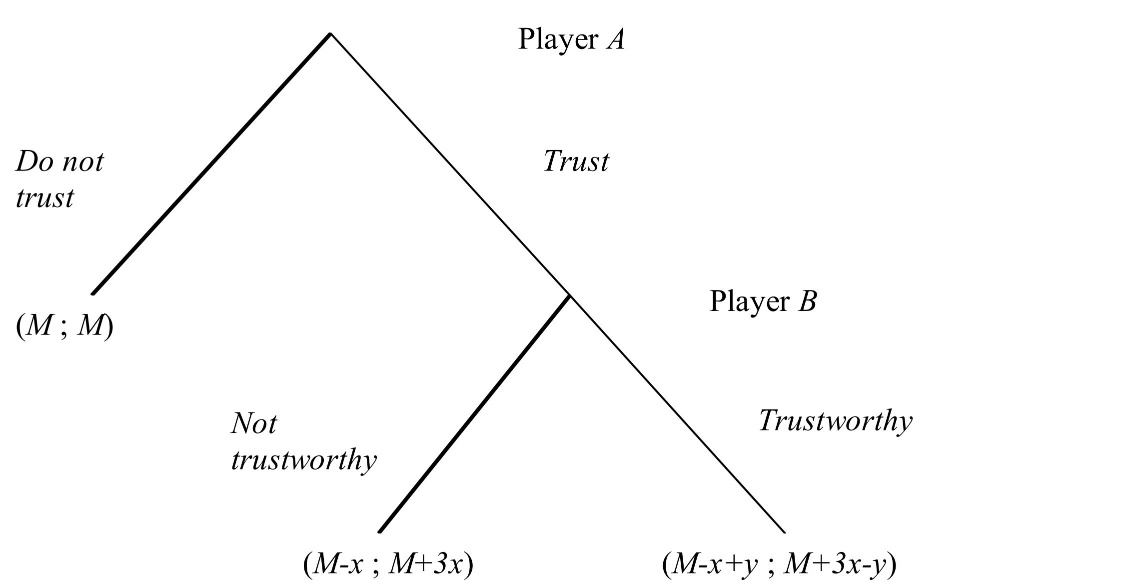
The payoffs for the players in the trust game are as follows:

$$P_A(M, x, y) = M - x + y \quad (1)$$

$$P_B(M, x, y) = M + 3x - y \quad (2)$$

The game theoretical predictions of the model are based upon the assumptions; (1) an agents' utility is equivalent to the monetary payoff assigned to the different strategies in the game and (2) agents are interested solely in their own utility and not in others (neither relative nor absolute) payoff or intentions (Cox 2004 p. 260-261). The players are thus rational and have self-regarding preferences. Therefore, the game theoretical prediction of the game described above is that the game ends after the first round because *A* is predicted not to send anything to *B*. To give a visual explanation, consider Figure 1.

Figure 1. *The trust game in extensive form.*



The subgame perfect Nash equilibrium in this game is thus for *B* to choose strategy *not trustworthy* (since $3x>3x-y$) and to keep all the money sent to him/her. Knowing this, *A* will of course choose not to send any money to *B* and chose strategy *do not trust* (since in maximizing *A*'s payoff we have *M* >*M-x*). The subgame perfect Nash equilibrium of the game is thus node (*M* ; *M*). This strategy is shown in figure 1 by the thicker lines.

The situation that the trust game produces is similar to many economical situations such as the production of a public good or investment decisions (Glaeser et al. 2000).

Holm and Danielson (2005), among others, point out that the second part of the game is a dictator game. This game, developed by Forsyth et al. (1994), is played as follows: two players participate in the game, one is active and one is passive. To continue with the notation used in the trust game, player *A* is passive and player *B* is active. *B* is given an amount q and is then given the possibility to decide what share of q to give to *A*, i.e. *B* decides what share $s \in [0,1]$ to give to *A*. Player *A*'s payoff is denoted as $x = s$ and *B*'s payoff is denoted as $y = 1 - s$. Standard economic theory predicts *B* to send $s = 0$, since if $s > 0$ this implies a lower payoff for player *B* than if $s = 0$. The predicted payoffs for player *A* and *B* in the dictator game are thus $P_A(q, x) = 0$ and $P_B(q, y) = q$.

2.2.3 Empirical results and explanations to trust game behavior

Results from the trust game reject the hypotheses stated in economic theory. People do send money to each other. On average the *A* players send a good half of the initial endowment and the *B* players return approximately one third of the amount sent.

The most common explanation to trust behavior is that the *A* player is motivated by expectations of positive reciprocity. Reciprocal behavior is the result of responding to kind or hostile actions regardless of the expected outcome of the reciprocal behavior generating material gain or not (Fehr and Gächter 2004 p. 511). By sending money *A* assumes that *B* has preferences for reciprocity, i.e. he/she attain utility from reciprocal behavior. This type of preference has been modeled by Rabin (1993) and Dufwenberg and Kirchsteiger (2004) (see chapter 3). *A* player behavior can thus be the result of expectations of the future actions by the *B* player being contingent on the *A* player's behavior. Empirical evidence shows that there is a positive correlation between the amount sent and the amount returned at both the individual and aggregate level in the trust game which is evidence of positive reciprocity (see e.g. Fehr and Gächter (2004), Cox (2004) and Holm and Danielson (2005)).

Fehr and Schmidt (1999) show that preferences for inequality aversion can explain deviations from the predicted self-interest model. Individuals are seen as being inequality averse if they prefer outcomes that are equal rather than outcomes that favors only one part. Individuals with preferences for inequality aversion thus want to avoid unequal outcomes. Empirical results show that inequality aversion has not been significant for trust game behavior (Cox 2004 and Holm and Danielson 2005).

Risk is also a possible explanation to trust game behavior. Recently several papers have examined the relationship between trust and risk. Eckel and Wilson (2004) studied the relationship between the decision to trust an anonymous partner and risk attitudes. They use a binary trust game in which they only doubled the amount sent. In addition to the trust game they used two behavioral measures and one survey to measure risk attitudes. In their trust game 96% chose to trust (Eckel and Wilson 2004 p. 458). This is a remarkable high share. Their result is most likely a consequence to the all-or-nothing choice in the trust game and points at the problem of using binary trust games. They find no statistically significant relationship between the decision to trust and the risk measures they use. They also asked if the subjects perceived the trust game procedure as a situation involving trust. Only 26% of the *A* players mentioned trust when answering the question. Eckel and Wilson sees this as further evidence that risk calculation has a minor impact on behavior in trust game. Of those who said that the situation in the trust game reminded them of trust, no relationship between trust behavior and the three risk measures were found. This holds for those who mentioned risk in the answer to the question as well (ibid p. 463).

Bohnet and Zeckhauser (2004) examined if the decision to trust in a trust game is a result due to the *A* player's valuation of the probability that the *B* player is a trustworthy person. Do the *A* players see this situation as if it was a lottery and keep the money and therefore stay outside the lottery or gamble and run the risk of losing or chance of winning, or is the decision to trust influenced by the possibility of betrayal that goes beyond but probabilities? They showed that subjects trusted and were willing to take higher risks when the outcome was due to chance rather than the outcome being dependent on the counterpart being trustworthy. They interpret the result as trusting another incurs the risk of what they call betrayal costs, i.e., an extra non-monetary loss if the trustee does not reciprocate, making the sender less likely to send.

A norm can be thought of, according to Coleman (1990), as rules existing at the macro-level that governs behavior at the micro-level (p. 241). A social norm is a set of actions seen by individuals as correct or proper, incorrect or improper, behavior that is beneficial if followed and punished if violated. A norm exists when the control over a certain action is socially apprehended as being held by others rather than the individual (p. 242-243).

Several authors have argued that subjects might be partially motivated by social norms in the trust game (see e.g. Berg et al. 1995) and that expectations of other's actions in the trust game provides information about social norms (Buchan and Croson 2004 p. 487). Coleman (1990) argues that there might be a normative conception to reciprocate trust. Where this norm is predominant, it is rational to trust because the norm says that reciprocal behavior can be expected. Even in situations where rewards or sanctions are not possible this norm can still prevail if the sanctions and rewards are intrinsic. This situation is likely to occur when an individual identifies him-/herself with a certain group, i.e. socialisation.

Religious belief has also been put forward as a possible explanation to trust game behavior but has no empirically evidence (Johnsson-Stenman et al. 2005 and Danielson and Holm 2006).

Another explanation related to social norms is social connection. A number of studies have studied the impact of social connection on trust game behavior and the results have been mixed, in some studies thicker trust has increased the amount sent (Glaeser et al. 2000) whereas in others thicker trust has decreased the amount sent (Berg et al. 1995 and Eckel and Wilson 2004).

2.2.4 Surveys

Research on trust has been carried out for a long time[3] and the most common question used in measuring trust has been the one asked in, among others, World Value Surveys, General Social Survey (in the US) and the SOM-institute (in Sweden):

> Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?

Trust is considered to be present if the respondent answers "most people can be trusted". This question thus refers to thin trust. The trust variable obtained from this question is thus at the micro-level a binary variable whereas at the macro-level the variable varies from 0-100.

This question has been the foundation for measuring trust and many results in both economics and other social sciences are based on this question (e.g. Knack and Keefer 1997, La Porta et al. 1997, Glaeser et al. 2000, Zak and Knack 2001, Alesina and La Ferrara 2002, Rothstein 2003, Holm and Danielson 2005). One obvious problem with the formulation of the trust question is the term "people". Which "people" do the respondents have in mind when they answer this question? Knack and Keefer (1997) argue that since the question is referring to "people", subjects should not solely reflect to trust in their family and friends, but also to "people" whom they are transacting with, who are not family and friends (p. 1256). Other problems with the trust question are differences in how the subjects interpret what it means to trust and how they educe if someone is trustworthy or not. Another problem is the psychological results of the bias in answering questions concerning self-reported behavior. Some of the respondents might simply not answer truthfully. Answering that most people can be trusted can make the respondent feel *good* about him-/herself even though he/she might not in reality act as a trusting person (Alesina and La Ferrara 2002 p. 213). The questions used in this thesis are closely

[3] The National Opinion Research Center's has carried out the General Social Survey, which includes questions on trust, since 1972 (http://www.norc.uchicago.edu/about/history.asp).

related to the above type of question (the general trust question is also used) and the problems stated above concerns other trust and risk questions as well.

2.2.5 Comparison of the two measurements

A well motivated question is if the two measurements of trust, experiments and surveys are measuring the same thing? If experiments and surveys are measuring the same thing, one would expect the two measurements to have a significant relationship. It would then be possible to predict trust behavior by studying surveys. However, neither in the United States, Sweden or Tanzania, a significant relationship between subjects who say that they trust most people and who shows trusting behavior was found (Glaeser et al. 2000 and Holm and Danielson 2005). An index of trust questions[4] produces significant results in some studies but is not robust. Thus, the two measurements do not seem to measure the same thing. On the other hand, when testing for trustworthiness, the trust questions has showed to be significant in some studies and in some studies not. This result suggests that trust questions might be picking up trustworthiness rather than trust (Glaeser et al. 2000 and Holm and Danielson 2005). Exceptions are the studies by Bellmare and Kröger (2003), in which the general trust question is robust and highly significant, and Fehr et al. (2003), in which trust in strangers and past trusting behavior is correlated with behavioral trust. It should be pointed out that the latter mentioned studies differs in comparison to the above in that the former use households in the Netherlands and the latter households in Germany as the subject pool instead of students.

The poor and mixed result could be due to different reasons. First, the two measurements could in fact be measuring other things than trust. The trust question is indeed very general and as written above actual and stated behavior does not have to be in accordance with each other. Answers to the trust question could thus be the result of simple cheap-talking. Moreover measuring trust as the percentage sent by the *A* player could also be misleading as a trust-measure since the participants might not see the situation as depending on trust. This argument also has some empirical support, see Eckel

[4] The same index is used in this thesis, for a variable description see *trust index* in appendix 1.

and Wilson (2004) in section 2.2.4. Second, another explanation could be that the most common sample pool for the experiments is undergraduate students from the introductory course in economics. This is a homogenous group and the subjects might have in mind the general trustworthiness of other undergraduate economists while playing the trust game, whereas in answering the general trust question they take into account other people rather than solely economists. Thereby the difference in result from observed and stated behavior. This is a plausible argument since if the participants are aware of which group of people that is participating in the experiment they will probably refer to this group in calculating whether or not the opponent is trustworthy. Recent studies that use other sample pools rather than undergraduate students strengthen this argument e.g. Danielson and Holm (2006) who uses congregation-members, and which shows similar results. The exception is, as mentioned above, Bellemare and Kröger (2003) and Fehr et al. (2003) who uses representative sample pools of the population and who shows significant results.

2.3 Summary and concluding remarks

Trust is seen as a willingness to accept the vulnerability of taking a risk in being dependent on another part in determining the outcome. The impact of trust on economic performance has both theoretical and empirical evidence at the micro-level as well as at the macro-level. Institutions have been brought forward as an important factor in building trust.

There are two main measurements of trust; experiments and surveys. The former has been characterized in this thesis as presented by Berg et al. (1995) in what is generally referred to as the trust game. This game is very common in experimental trust studies and is widely accepted as a behavioral measure of trust. The empirical result from the trust game rejects the theoretical predictions by economic theory. Explanations to the behavior in the trust game has mainly been focused on expectations of positive reciprocity, preferences for inequality aversion, a higher propensity for risk and the degree of social connection, i.e., thick trust. The only explanation that has been robust significant in explaining trust game behavior has been expectations of positive reciprocity. The second measurement was surveys. The general trust question used by WVS, GSS and the SOM-institute has been the dominant way of measuring trust in surveys. Answers to the question have had low predictive power in explaining trust game behavior. This could be due to the choice of subject group.

3 Faith

3.1 Other-regarding preferences

A robust result in experimental and behavioural economics is that individuals constantly violate the assumption of maximizing one's own payoff in a situation where one's actions affect the payoff of others. As seen in the previous chapter, standard economic theory fails to explain this type of behaviour. In addition to standard self-regarding theory an alternative view has been developed and has attracted increasing interest in recent research.

An alternative approach that explains this kind of behaviour is the theory of other-regarding-preferences (henceforth ORP). Subjects that have preferences that take into account their own payoff and the payoff of others are said to have ORP (Cox 2004 p. 262). Decision makers with ORP thus value the outcome of other decision makers either positively or negatively (Camerer and Fehr 2006 p. 47). Examples of such ORP are altruism and reciprocity which were examined in chapter 2 as explanations of trust behaviour.

3.1.1 Conditional and unconditional ORP

Cox (2004) argues that it is important to distinguish between conditional and unconditional ORP. Reciprocity is an example of the former since an action motivated by reciprocity is conditional upon ones own actions. I expect you to be generous towards me if I have been generous towards you, i.e. conditional in the sense that I expect you to honour my generosity by acting generous. Examples of models that incorporate this kind of behaviour are the models proposed by Rabin (1993) and Dufwenberg and Kirchsteiger

(2004). Rabin (1993) argues that people has a will to sacrifice some of their own well-being in order to reward kind behavior and to punish unkind behavior. The outcome of such behavior results in what Rabin calls fairness equilibrium. In these models intentions of the players are of great significance. This implies that to reciprocate a kind or a hostile action, one has to take into consideration the kindness of my own action as well as the actions of the other person. Thus, the monetary payoff is complemented by a psychological payoff which is a function of the kindness of the players and dependent on beliefs. Dufwenberg and Kirchsteiger expresses this as "…how kind *i* believes *j* is depends on a belief of *i* about a belief of *j*, since *j*'s kindness depends on *j*'s belief." (2004 p. 270-271). This relationship is also contingent on the possibilities of the players.

An example of unconditional ORP is inequality aversion. In this case, individuals are willing to relinquish some of their own payoff in order to obtain a more equal outcome. The motivation for this behaviour is perceived as unconditional since the subject act in this way unconditional on the other individuals' behavior. Models that use this approach are Fehr and Schmidt (1999) and Bolton and Ockenfels (2000). In the latter model individuals compare their payoff with the average payoff of the group, i.e. the individuals compare themselves in relative terms and prefer the average payoff to be as close as their own payoff. In the former model an individual dislikes any payoff that deviates from equity, i.e. individuals only compare themselves to other individuals, not with a certain group. Unconditional ORP can thus be seen as preferences for a certain distribution. Holm and Danielson (2005) also refer to these types of preferences as *unconditional distribution motives*. Unconditional ORP are usually measured in the dictator game, see chapter 2. The predicted self-regarding result is refuted when the game is actually played, e.g. Forsythe et al. (1994) show that 80% of the B players chose $s > 0$ and Andreoni and Miller (2002) show that 60% chose $s > 0$. Individuals thus sacrifice their own well-being for the benefit of others.

Unconditional ORP thus neglect expectations of others' behaviour whereas trust behaviour as presented in chapter 2 is seen as conditional on expectations of others' behaviour.

3.1.2 Faith

A seen in the previous sections ORP is a determining factor behind behavior in various economic situations. Since this behaviour has shown to be present in empirical research there must also be expectations of such behavior. Beliefs about other individuals ORP are important since decision makers act in response to their beliefs and that these beliefs affect the way decision makers behave. Expectations of ORP is thus of interest in studying microeconomic behavior. It also has macroeconomic effects since beliefs about ORP may affect how collective goals are reached (Coats and Neilson 2004 p. 614).

Faith should be seen as expectations of unconditional ORP, i.e. expectations of others' preferences for fairness or generosity. In addition to expectations of positive reciprocity must be expectations of how the opponent acts unconditionally of my behaviour, i.e. what his/her motives for sending back money looks like independent of my behaviour and how my expectations of these preferences looks like. Holm and Danielson (2005) raises the possibility that if the *A* player thinks that player *B* is not motivated by reciprocity but rather that the *B* player is motivated by inequality aversion and will for example divide the money sent to him/her equally, *A* can then send *B* all the money and expect to receive at least the amount sent back (p. 509-510). That is, according to the reasoning by Holm and Danielson, if *A* has faith in *B* he/she might expect *B* to send *A* money unconditional of *A*'s behavior in the trust game.

3.2 Measuring faith

Holm and Danielson (2005) studied expectations of unconditional ORP by letting the *A* player evaluate a donation made by a *B* player. They call this game a trictator game since it captures the trust in a dictator but will henceforth be called the faith game. The faith game is played by first letting the *B* player play a dictator game and then letting the *A* player evaluate the donation by *B*.

The faith game was played according to the following procedure; first the *B* players played the dictator game. No information was given to the players that their donation was to be evaluated by an *A* player. Then the *A* players, who were in another room, were informed that the *B* players had participated in a dictator game. The *A* players were informed that the donations from the *B* players, who had written down their donations on separate papers, were gathered in a pile of papers at which the experimenter pointed at. The *A* players were informed that their respective *B* player had had the opportunity of sending maximum 200 SEK and minimum 0 SEK, without unveiling what their dictator actually had sent. Each *A* player was then asked to state a price for which they were willing to sell their donation to the experimenter. After this a random number between 0 and 200 was drawn. If the random number was higher than the stated reservation price the *A* player "sold" his donation, i.e. he/she was paid an amount equal to the reservation price. If the random number was lower than the stated reservation price, the *A* player kept the donation sent by his/her dictator. Since the faith game is not as straightforward as e.g., the dictator game, an exercise round was carried out before the real faith game was played. Thus, the *A* players were asked to state what price they were willing to sell their donation for and a random number was drawn. The random number was then compared to the stated reservation price. After the exercise round was completed the real faith game was played (Holm and Danielson 2005 p. 515-516).

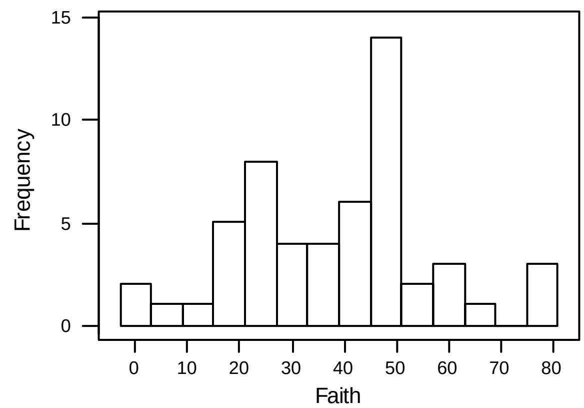
The procedure of asking the participants to state reservation prices is a procedure which is taken from Becker et al. (1964). The point of the procedure, which is commonly known as the Becker-DeGroot-Marschak procedure, is to make the stated reservation price as truth-revealing as possible, i.e. to make the *A* player state how much he/she truthfully expects *B* to have sent. This procedure is incentive compatible since the optimal strategy for the *A* player is to state the highest price that he/she is willing to let go of the donation. To state a higher reservation price than expected is not optimal since it lowers the probability of receiving the reservation price which in that case is higher than the expected donation. To state a lower reservation price than the expected donation is not optimal either since the probability of obtaining the reservation price increases the probability of obtaining the donation which in this case would not be preferred to the reservation price since the reservation price in this case is higher than the expected donation. Thus, the optimal strategy for the individual is to state his/her true evaluation of the donation. This procedure thus reveals the *A* players' expectations of the *B* players' unconditional ORP, i.e. his/her trust in the dictator or rather his/her faith in the other.

3.2.1 Results from faith-experiments

In the Holm and Danielson study the players expected the dictator to send 38.8% of his/her share, the median was 40%. The correlation coefficient between trust behavior in the trust game and the amount expected in the faith game was 0.35 and highly significant. Holm and Danielson also run linear regressions on trust game behavior with faith as an independent variable combined with variables measuring trust. In their tests faith was highly significant and robust and showed that the more the *A* player expected the dictator to have sent in the dictator game, the more the *A* player sent in the trust game. Thus, a higher faith leads to more trust in the trust game. Comparing the results from the faith game with what the *A* players actually received from the dictator game shows that the *A* players overestimated the amount sent. The average amount sent in the dictator game was 28% and the median 25% but the evaluations stated by the *A* players agrees rather well with what the *B* players did actually send (2005 p. 520-522).

The results from the faith game are presented in the figure below which shows the distribution of the reservation prices in percent. Only a very few subjects expected the dictator to have sent nothing whereas none expected the dictator to have sent more than 80% of the initial sum. Expecting a donation between 40-45% of the sum occurred most frequently and the vast majority of the *A* players expected the dictator to have sent between 15% and 50%. This implies that individuals expect generosity but they expect the amount being donated to be less than the amount being kept by the dictator.

Figure 2. *The distribution of the variable faith*.



3.2.2 The relationship between faith and trust

Holm and Danielson (2005) uses faith as an independent variable when they test for trust behavior, implying that the causal mechanism goes from faith to trust. Faith can thus be seen as an exogenous variable determining the level of trust. This implies the following causal direction: generally I have faith in people, i.e. I expect individuals to have unconditional ORP. Unconditional of my behavior, I therefore expect in the faith game people to share money given to them. In the trust game this implies that I can expect to receive some amount being sent back to me given that I have sent money in the first stage. Faith can thus be seen as a determining factor behind thin trust.

In chapter 2, presented results showed that positive reciprocity was a determining factor behind sending money in the trust game. Holm and Danielson (2005) point out that expectations of unconditional ORP are something different from sending money due to expectations of triggering reciprocal preferences.

A plausible mechanism is that trust is the effect of a more general belief, namely faith. Expectations of the *B* player being motivated by positive reciprocity presumably explain the specific amount sent but not the deviation from the predicted Nash equilibrium in the first place. Positive reciprocity is a plausible explanation conditional on the *B* player viewing the second part of the trust game not as a dictator game but as if the trust game was to be repeated. In such a case the *A* player can expect the *B* player to be motivated by feelings of reciprocity. If, on the other hand, the *B* player views the second part of the trust game as a dictator game then putting trust in positive reciprocal behavior does not provide a reasonable explanation. What mechanism or feelings should the *A* player expect the *B* player to be motivated by? As argued above, sending money in the dictator game is viewed as having unconditional ORP. Beliefs about a donation greater than zero can thus be interpreted as having expectations of unconditional ORP, i.e. to have faith. The decision maker thus has to decide if people in general have positive ORP or if they do not have positive ORP. If the decision maker believes the former, he/she can expect the opponent to return money sent to him/her.

3.3 Summary and concluding remarks

In this chapter a new way of analyzing *A* player behavior in the trust game is introduced. Since the second part of the trust game is a dictator game the *A* player must have expectations on how the *B* player acts in such a situation. Sending money in the dictator game can be interpreted as having unconditional ORP, therefore the *A* player must have expectations of unconditional ORP. I refer to this type of expectations as *faith*, i.e. how I expect the opponent to act being given money and the opportunity to donate some or all of the money to me unconditional of my own behavior. Faith can thus be seen as a belief in the trustworthiness of the other person. Since in the trust game the subjects were anonymous, beliefs in the trustworthiness of the other person becomes a belief in the trustworthiness of a generalized other. It can thus be argued that faith is capturing a general belief in the trustworthiness of others. In order to trust, as defined in the trust game, I argue that a person needs to have faith in others. If a subject has faith he can expect to receive some amount being sent back to him, given that he sends money in the first stage to the opponent. Faith has been measured in the paper by Holm and Danielson (2005) with an incentive-compatible mechanism making truthful statements of expectations of unconditional ORP optimal. In their study they find that unconditional ORP are important for the *B* players in the trust game and they also find that faith is significant when testing for the amount sent in the trust game. It is thus natural to ask what kind of characteristics and what kind of behavior that is related to these expectations. The study by Holm and Danielson makes it possible to examine this. Hence, in the next two chapters faith is studied empirically in order to answer the question above.

4 Data and methodology

4.1 Description of the data

The data is taken from an article by Holm and Danielson (2005) *Tropic trust versus Nordic trust: experimental evidence from Tanzania and Sweden*. Their study contains of two parts, one conducted at the Dar Es Salaam University, Tanzania, on October 24, 2001 and one conducted at Lund University, Sweden, at November 27-28, 2002. In this thesis only the data from the Swedish study is analyzed.

In the Swedish study, 110 students from the introductory course in Economics at Lund University participated in two experiments and answered a survey with questions related to trust. The subjects were divided into two groups, one with 29 pairs and the other one with 26 pairs. In the pairs, one subject was assigned the role of *A* player and the other the role of *B* player. The average subject was a 24-year-old man and the gender distribution was 63 percent males and 37 percent females. The *B* players started by playing the dictator game. The *A* players started by playing the trust game. The *B* players dictator decisions were thus done before they acted respondents in the trust game. The *A* players and the *B* players were both given the same initial endowment. After the *A* players had done their trust game decisions, each player participated in the faith game with a different *B*-player than their counterpart in the trust game. The faith game was played according to the process described in section 3.2.

4.1.1 The variables

The experiment conducted at Lund University provides in total 16 variables measuring personal facts, such as age and gender, and attitudinal questions such as trust, risk behavior and confidence. The dependent variable used is *faith* which is measured as the reservation prices stated in the faith game and expressed in percentage of the total amount given to the opponent and written as integers.

The set of independent variables can be divided into three sections. The first section concerns with personal characteristics, the second section gives information on risk, and finally the third section concerns with attitudes towards trust or trust related behavior.

The first section, denoted *the background section*, contains the variables *age*, *male*, and *siblings*. These variables are of interest since e.g. gender differences have been studied in experimental settings resulting in mixed significant results (see e.g. Croson and Buchan 1999, Andreoni and Westerlund 2001). Holm and Danielson (2005) showed in their study that *siblings* was not significant whereas *age* had a significant effect. Since this is the same data, it is interesting to see if the same relationship holds when testing for faith. Glaeser et al. (2000) tested if subjects without any siblings differed from other subjects when testing for trust but found no significant relationship.

The second section, called *the risk section*, consists of the following variables; *excitement-seeking*, *gamble*, *riskbehavior* and *risk-take*. *Excitement-seeking* and *risk-take* measures an individual's attitude to risk whereas *gamble* and *riskbehavior* measures stated behavior. *Excitement-seeking* measures how willing the subject is to seek situations that give the individual thrills. The variable measures an individual's egoistic relationship to excitement e.g. playing load music, being reckless and so on. A negative relation between faith and *excitement-seeking* seems reasonable since expecting others to be generous implies that others should not be selfish and egoistic but that they would "avstå" from some of their wealth. In this case individuals who score high on *excitement-seeking* are looking for egoistic thrills and would therefore not expect others to be generous. *Gamble* measures how much the subject spend on gambling, i.e. playing in casino etc. Participating in such activities is regarded as having a propensity for risk and a positive relation is expected. *Riskbehavior* gives a profile of what kind of activities the subject engages in that involves a clear risk-taking aspect. This variable thus gives a measure of how willing the subject is to expose him/herself to risky situations. *Risk-take* measures how the subject regards his/her propensity towards risk. In both the behavioral and the attitudinal questions on risk, a positive relationship is expected.

The third section, henceforth *the trust section*, contains the variables *trust strangers*, *trust index*, *donation*, *confidence index*, *trusting behavior*, *self-reported trustworthiness*, *other trust index*, and *friendliness*. All of the variables in this section, except for *donation*, have been used in both or either Glaeser et al. (2000) and Holm and Danielson (2005). The variables *trust strangers*, *trust index*, *confidence index*, *trusting behavior*, and *self-reported trustworthiness*, measures how the subject states his/her trust in others and how trustworthy the individual claims he/she is. A positive relationship is expected between faith and all of the above mentioned questions. All the above mentioned variables measures attitude except for *trusting behavior* which measures stated behavior. *Other trust index* consists of statements on how the subject believes others to trust him/her and is also a measure of attitude. *Donation* is a statement on how much he/she donates to charitable purposes and is thus a measure of behavior. Finally, the variable *friendliness* measures how the individual perceives him/her-self in social environments, such as if the individual is making friends easily or feels uncomfortable around others. It is reasonable to predict that individuals who consider themselves to be friendly, expects others to be friendly as well and might therefore have expectations of generosity. This variable is also a measure of behavior. The last mentioned variables are also expected to have a positive relationship with faith. For a complete list of all the variables and how they are calculated see appendix 1.

A problem with the calculation of the variables is that some questions are included in more than one variable. This makes some variables not completely independent of each other. Thus, some variables might be dependent but since the variables are constructed of several questions the problem is not regarded as seriously damaging for the calculation of the regressions.

4.1.2 Problems with the data

There is always a risk when using sample survey that errors will occur. Generally there are two types of errors in sample surveys. The first type of error is called *errors of non-observation*. These refer to the sampling error, i.e. that our sample does not reflect the population (Scheaffer et al. 1996 p. 51-52). In our case the sample is from the introductory class in economics from Lund University, thus the risk of errors of non-observation can be considered high. Since the participants volunteered for the study there is hence a problem of self-selection. According to Putnam, individuals who volunteer are also more trusting and trustworthy persons (2001 p. 136f). This incurs that it seems likely that those who volunteer produce an upward bias on the result. However, Holm and Danielson does not estimate this risk to be a problem since the rate of participation was high (2005 p. 511). The second type of error is called *errors of observation* and refers to errors in what is really being measured. For instance, respondents might differ in motivation when they answer questions. Some might put in a lot of effort in answering as correct or honest as possible, whereas others might not work that hard and thus answers might be incorrect or dishonest (Scheaffer et al. 1996 p. 55-56). This type of error ought to be small since volunteering should in itself imply a motivation to answer correct and honest and in this study the subjects were payed a decent amount of money and this also raises the motivation to answer correct and honest.

Another problem with the data is the risk of spill-over effects when subjects are asked to do more than one task. Unrelated behavior can come out as related behavior due to the order and performance of tasks under a short period of time (Holm and Danielson 2005 p. 514). The above mentioned problems are valid for all studies that uses experimental data and not only for this study.

4.2 Methodology and inference[5]

In univariate regression methods an assumption of a linear relationship between the variables makes significance depending on precisely the linear relationship. If this assumption is not met, insignificant results are simply saying that there is no linear relationship but there might still be a relationship between the observations but in a different way. Statistical methods such as non-linear regression, polynomial regression and semi-log and double-log models are possible functional forms for model specification[6] but the drawback from these models when measuring trust is that the interpretations of the results tend to get difficult. Thus, the method discussed and used in this thesis is linear regression.

In this thesis a linear regression model, ordinary least squares (henceforth OLS) will thus be used to estimate the data. OLS is chosen as an appropriate estimation method for the data for two reasons. First, this is a novel attempt in studying a variable which previously has not been tested as a dependent variable. Assuming a linear relationship between the dependent variable and the independent variables, i.e. a linear relationship between *faith* and for example *gamble*, makes OLS suitable as an estimation process. Holm and Danielson (2005) also uses *faith* as having a linear relationship with trust in their regressions. The second reason is that models that handle polychotomous dependent variables such as the different versions of the Tobit model, unfortunately produces coefficients that are difficult to interpret in a straightforward manner. Therefore OLS is used as estimation method in order to be able to apply straightforward interpretations for the estimates. A linear functional form is normally not recommended when the dependent variable is a fraction (Kennedy 2003 p. 402). As seen in the figure over the distribution of reservations prices in the faith game very few of the observations are close to zero therefore it should not be any problems using a linear functional form.

This section deals with the technical problems of the data and how to correct for these. Hence, the problems of cross-sectional data, how to correct for problems associated with this type of data and variable and model selection criteria are presented.

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[5] Denotation in this section is taken from Verbeek (2004) unless other sources are stated.
[6] For more details on these models see e.g., Ramahathan (2002) chapter 6.

4.2.1 Cross-sectional data and heteroskedasticity

The model used in this thesis will be the following linear regression model:

$$y = X\beta + \varepsilon \,, \qquad (3)$$

where y and ε are N-dimensional vectors and X is a N*K matrix. To facilitate for the reader who might not be used to matrix notation, equation (3) can be rewritten as

$$y_i = \beta_1 + \beta_2 x_{i2} + ... + \beta_k x_{ik} + \varepsilon_i \,, \qquad (4)$$

and (4) can be written in terms of vectors and thus looks like

$$y_i = x_i'\beta + \varepsilon \,. \qquad (5)$$

In the equations β is the true parameter vector and b will be denoted the approximation of β. One basic assumption of linear regression models when using ordinary least squares, is to regard the residuals as being homoskedastic. This implies that the error terms are considered to have equal variance, i.e. they have the same probability distribution with respective variance. Since the variance is a measure of the uncertainty of the model, the assumption of homoskedasticity state that for no set of observations is the model uncertainty greater or smaller (Hill et al. 2001 p. 149). This assumption can be written as

$$V\{\varepsilon\} = \sigma^2 I_N \,. \qquad (6)$$

Equation (6) is read, the variance of the error terms is equal to the covariance matrix of the vector of error terms, which is a diagonal matrix with σ^2 on the diagonal. I_N is a identity matrix which has ones along the main diagonal and zeros elsewhere.

In cross-sectional data this assumption is commonly violated. Thus the covariance matrix (also called the variance-covariance matrix) has in the diagonal of the matrix the variances and in the off-diagonal positions the covariances of the estimates. The residuals are, if the diagonal of the matrix is not identical, not considered to be homoscedastic but heteroscedastic, i.e. the residual variance is not constant and each residual differ in variance. This is more common when using grouped data rather than individual data (Ramanthan 2002 p. 344-345). In such cases equation (6) does not hold but rather looks like the following

$$V\{\varepsilon\} = \sigma^2 \Psi \,. \qquad (7)$$

Ψ is a positive definite matrix where the diagonal terms are not equal. When the variance of the error terms can be described as in (7) rather than (6) we say that the variance of the error terms is heteroskedastic. This yields that OLS is still unbiased, as long as the independent variables and the errors are independent, but the standard errors and variance will be incorrectly computed. Inference with F-tests and t-tests are thus not valid (Verbeek 2004 p. 80). When dealing with grouped data it is obvious that heteroskedasticity might be a problem since one group might have higher variance than another group. However, it is not that obvious when dealing with individual data, as in this thesis, that the variance should differ between individuals. But very little research has been examining if there are different groups within the variable faith. If different groups exist, such as that high faithers have a higher variance when it comes to variables such as propensity for risk, compared to low faithers, then there might be a problem of heteroskedasticity in the data. It is thus possible to expect, when running a linear regression, that the variance is more accurately described as in equation (7) rather than in equation (6). Hence, diagnostic tests for heteroskedasticity must be carried out on the data in order to make correct inference.

4.2.2 Testing for heteroskedasticity

There are several different tests for heteroskedasticity, e.g. the Goldfeld-Quandt test, the Glesjer test, the Harvey Godfrey test, the Breusch-Pagan test and the White test. All of the above mentioned tests, except for the Goldfeld-Quandt test, are Lagrange multiplier tests. In order to understand how these tests work, a theoretical going thorough is provided to deepen the understanding behind the choice of tests for heteroskedasticity in this thesis.

Lagrange multiplier tests are in short based on the following constraint maximization problem,

$$\max \log L(p) \text{ s.t. } \beta = \beta_0, \qquad (8)$$

where L is the likelihood function of p (see e.g. Ramanathan 2002 chapter 6). The likelihood function assumes that we know the distribution except for the unknown parameters. The value of *p* that maximizes the likelihood function maximizes therefore also the log likelihood function.

By maximizing equation (8) we are actually maximizing the probability of obtaining the sample at hand (Wackerly et al. 2002 p 448-449). Hence, intuitionally this method can be thought of as; an event occurred because it was most likely to. By using the null hypotheses as a constraint when maximizing the log likelihood function in the Lagrange multiplier test, we obtain the maximum likelihood that the estimate is true given the null hypotheses. All of the tests based on the Lagrange multiplier are asymptotically χ^2-distributed with k-1 degrees of freedom.

The White test looks at the squares and cross-products of the regressors to see if the error variance is affected (Kennedy 2003 p. 138). The White test has several advantages. The first advantage of the test is the independence, in contrast to e.g. the Breusch-Pagan test, of the assumption of normality (Ramanathan 2002 p. 353). When using for example the Breusch-Pagan test the type of heteroskedasticity tested for is stated in the alternative hypothesis. This is not necessary in the White test. The second advantage is that the test detects more general forms of heteroskedasticity. Ramanathan (2002 p. 354) suggests that the test can be used in samples containing more than 30 observations. The White test also has some drawbacks. The first drawback is that heteroskedasticity can be detected with the White test but it might be an effect of another specification error (Verbeek 2004 p. 92). Another problem with the test is if some of the independent variables are dummy variables. Then, if included separately, there will be a situation of exact multicollinearity which implies that the model can not be estimated (Ramanathan 2002 p. 215-216, 354). Another problem occurs if the number of independent variables is large. Then there might be a problem with the number of degrees of freedom. Denoting the number of independent variables by k and the number of observations by N, the following relationship has to be satisfied; $N > k(k+1)/2$. If a problem such as this one occurs, it is possible to use the fitted values obtained by OLS, since these include all the dependent variables and its cross products (ibid p. 354). I will return to this test later.

In order to decide which test to use Verbeek (2004) and Ramanathan (2002) suggests looking at the OLS residuals plotted against one or several exogenous variables, or plotting the residuals against the fitted values and then deciding which test to use.

Another test which is common when testing for heteroskedasticity is the Goldfeld-Quandt test. This test divides the sample into different parts and tests with an F-test whether the variances are equal between these parts. An obvious problem in this case is how to divide the data set. Since theory provides little help in dividing the sample this method becomes difficult and vague to implement in this thesis. Another problem with the Goldfeld-Quandt test is that it does not comply with situations where jointly several variables are the cause of heteroskedasticity (Ramanathan 2002 p. 353).

The Glesjer test, the Harvey Godfrey test and the Breusch-Pagan test all demand knowledge of what is causing the heteroskedasticity (ibid). This knowledge can be obtained by economic theory, but as stated above economic theory provides little help in this case. Therefore I chose the White test to test for heteroskedasticity. I am aware of that the White test has lower power than the other tests but the lack of knowledge of what might be causing heteroskedasticity in this case and the advantage of detecting more general forms of heteroskedasticity makes it the most reasonable test for this thesis.

The test statistic for the White test is given below. Consider *x* to be a variable and that there are only two independent variables in the regression,

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \varepsilon_i . \qquad (9)$$

The White test statistic for equation (9) will thus be

$$e_i^2 = \alpha_0 + \alpha_1 x_{i1} + \alpha_2 x_{i2} + \alpha_3 x_{i1}^2 + \alpha_4 x_{i2}^2 + \alpha_5 x_{i1} x_{i2} . \qquad (10)$$

As mentioned above, in cases where there are many variables there will be problems with the number of degrees of freedom. One way to go about this problem is to use the fitted values of y_i, denoted $\hat{y}_i$. The test statistic thus looks as follows

$$e_i^2 = \alpha_0 + \alpha_1 \hat{y}_i + \alpha_2 \hat{y}_i^2 . \qquad (11)$$

The fitted values from equation (11) contain the *x*'s in (10) and the squared fitted values contain the squares and cross-products from (10). Equation (11) also has an χ^2-distribution with degrees of freedom equal to the number of regressors (Ramanthan 2002 p 354). I will refer to this test as the *simplified White test*, henceforth SWT. The hypotheses for both tests, for a general case with *p* coefficients, are $H_0 : \alpha_1 = \alpha_2 = ... = \alpha_p = 0$ against $H_1 :$ at least one of the $\alpha_j \neq 0$, for $j = 1, 2, \ldots, p$. Rejecting the null hypothesis means that heteroskedasticity is present in the data.

4.2.3 Dealing with heteroskedasticity

As seen in table 1, chapter 5, heteroscedasticity is considered to be present in 8 out of 10 regressions. Therefore the theory behind correcting for heteroskedasticity is presented. In general there are two ways of dealing with heteroskedasticity. The first way is to derive an alternative estimator that is best linear unbiased. The second way is to adjust the standard errors to allow for heteroskedasticity and then use OLS (Verbeek 2004 p. 81). In order to fully understand the reasoning behind the different ways of dealing with heteroskedasticity, one needs to see how the variance is calculated when estimating with OLS. The equation from which the variance is calculated is the following

$$V(b) = (X'X)^{-1} X'\sigma^2 \Psi X (X'X)^{-1}. \qquad (12)$$

Equation (12) is obtained by calculating the sum of the squared errors, $\varepsilon\varepsilon'$, taking the derivative with respect to the vector β and then calculating the expectations of the difference between the estimated and the true β squared. If the assumptions of the OLS are satisfied equation (12) can be simplified to

$$V(b) = (X'X)^{-1} X'\sigma^2 I_N X (X'X)^{-1} = \sigma^2 (X'X)^{-1}, \qquad (13)$$

where I_N is a identity matrix. As seen in section 4.2.1 when $\Psi \neq I_N$ there is a problem of heteroskedasticity. We need to find a way to either solve Ψ so that $\Psi = I_N$ or we need to find a way to correct Ψ so that equation 14 can be used for regressions and tests.

In deriving an alternative estimator, the matrix Ψ in equation (15) is assumed to be known. If we know Ψ a transformation of the model to satisfy the Gauss-Markov conditions, i.e., making equation (6) equal to equation (7), can be done. Usually this is carried out by setting

$$\Psi^{-1} = PP' \rightarrow \sigma^2 P\Psi P' = \sigma^2 I \qquad (14)$$

where P is a nonsingular matrix. Transforming our model stated in equation (5) by P yields the following modified OLS,

$$y^* = X^* \beta + \varepsilon^*. \qquad (15)$$

Using the transformation in (14) to obtain equation (6) to estimate the vector β is called the general least squares (GLS) estimator. This is an excellent way of dealing with heteroskedasticity but it has one major drawback: Ψ is generally not known and has to be estimated. Estimating Ψ and then running (6) is called feasible general least squares (henceforth FGLS) (Verbeek 2004 p. 81-82). FGLS is considered to have asymptotically more efficient estimates than OLS estimates (Ramanathan 2002 p. 360-361). FGLS is however associated with several problems. Consider the matrix Ψ in equation (7). This matrix is usually viewed as being equal to a diagonal matrix containing the elements $h_1^2,...,h_N^2$. The problem with FGLS is that we have N unknown h_i^2's that have to be estimated but we only have N observations to estimate them with. Since there is just one specific residual for each observation the error variance is estimated for every observation with only one observation. Thus, in order to find consistent estimators for the h_i^2's, additional assumptions have to be made about what form the heteroskedasticity has (Verbeek 2004 p. 82-86).

The second approach was to adjust the standard errors to allow for heteroskedasticity and then use OLS. This can be done with what is called a *heteroskedasticity consistent covariance matrix estimator* or *White standard errors*. Consider the model proposed in (3) with the property

$$V\{\varepsilon \mid X\} = \sigma^2 \Psi = Diag\{\sigma_i^2\}. \quad (16)$$

Just to remind the reader, if the errors are homoskedastic then Ψ is an identity matrix whereas in the case of heteroskedasticity Ψ is instead a diagonal matrix. Instead of, as in the case of FGLS, estimating Ψ, White (1980) argues that only a consistent estimator of the variance-covariance matrix of *b* is needed to make correct inference. Consider the following matrix

$$\Sigma \equiv \frac{1}{N} X' Diag\{\sigma_i^2\} X = \frac{1}{N} \sum_{i=1}^{N} \sigma_i^2 x_i x_i'. \quad (17)$$

Estimating (17) gives the estimate *S*,

$$S \equiv \frac{1}{N} \sum_{i=1}^{N} e_i^2 x_i x_i', \quad (18)$$

where e_i are the OLS residuals. White (1980) argues that equation (18) is a consistent estimator of ∑. Using equation (18) to calculate the variance of the residuals in the ordinary equation for the variance *b* makes possible to, without having to specify the specific form of heteroskedasticity, draw correct inference about the data. To show this, consider equation (19) which gives the variance of *b* calculated according to OLS.

$$V(b) = (X'X)^{-1} X'\sigma^2 \Psi X (X'X)^{-1}. \qquad (19)$$

Replacing $X'\sigma^2\Psi X$ in equation (12) by equation (19) gives

$$\hat{V}\{b\} = (X'X)^{-1} \sum_{i=1}^{N} e_i^2 x_i x' (X'X)^{-1}$$

$$= \left(\sum_{i=1}^{N} x_i x_i' \right)^{-1} \sum_{i=1}^{N} e_i^2 x_i x' \left(\sum_{i=1}^{N} x_i x_i' \right)^{-1}. \qquad (20)$$

The variance-covariance matrix calculated as in (20) is called *heteroskedasticity consistent standard errors* or *White standard errors* and gives asymptotically appropriate inference (Verbeek 2004 p. 87-88). It is possible to show that if there is no heteroskedasticity, equation (20) will be reduced to equation (13). Note also that correcting with White standard errors does not change the estimates of the coefficients but changes the estimate of the variance-covariance matrix (Kennedy 2003 p. 402).

FGLS requires additional assumptions of the underlying heteroskedasticity and following the arguments from the section above, White standard errors will instead be used since the sample used is fairly large (N=55) and knowledge of the underlying heteroskedasticity is limited.

4.2.4 Methodology for testing the data

In cases where there are several independent variables of interest for explaining a dependent variable, it is natural to ask how the data should be tested in order to make correct inference? Previous studies in behavioral economics that has combined trust experiments with surveys have used a base equation and then implemented different variables, separately one at a time, to see if that variable is significant in the regression. The argument behind this type of testing has been that the authors wish to control for various characteristics. This type of testing strategy is used in Glaeser et al. (2000), Holm and Danielson (2005) and Danielson and Holm (2006). This type of strategy will not be used in this essay since the author can not find any statistical reasons for applying this type of strategy. Instead the strategy of choice will be chosen according to econometric theory to make sure that the result obtained can not be criticized as data mining.

There are several theories on which methodology to use when testing a data set. Some theories suggest starting small and ending up big. This approach is called "testing up" and suggests going from a simple model to a specific general model. An example of this approach is *the average economic regression process*. This approach is very common in economics. In general, the simple model is viewed as the correct one. Diagnostic tests are run to see if there are any misspecifications and if such tests are significant they are usually interpreted as an indication of estimation problems (Kennedy 2003 p. 83). The testing strategy used in, among others, Glaeser et al. (2000), resembles the testing up approach. The weakness of such approaches is the bias from estimating a model with omitted variables (Verbeek 2004 p. 55). Regressing a model which suffers from omitted variables is biased and obviously not a good place to start. Testing a set of potential regressors individually also increases the possibility of obtaining at least one significant variable, even though there is no true relationship (ibid p. 56).

Another approach suggests "testing down" rather than up. That is to begin big and end up smaller. This approach is called "general-to-specific" modeling or LSE methodology after its strong tradition of practitioners at the London School of Economics (Verbeek 2004 p. 57). The starting point is a big model which is tested for restrictions and different diagnostic tests in order to obtain a more specific model. The main advantage of this approach is that in the long run this strategy leads to correct specification (ibid). The drawback from this approach is the risk of type I errors. (Kennedy 2003 p. 85).

Normally variables are chosen on basis of economic theory but since this thesis is a novel approach in testing for faith, economic theory provides little help.

So which approach should be implemented? The general suggestion is to use testing down. Kennedy (2003) and Verbeek (2004) suggest a mixture of the two approaches, i.e. to apply a simple specification and a general variant is tested down.

4.2.5 Variable selection and criteria

The data consists of 55 observations and there are 19 independent variables. The strategy of choice is LSE methodology, i.e., to start with a general big model and test down to a smaller, more parsimonious model. The data will thus be tested by first including all of the variables. Tests for heteroskedasticity will be carried out. When the set of regressors are many the SWT will be used and as the variables become fewer the White test will be carried out instead of SWT. If heteroskedasticity is present White standard errors will be used.

Since the aim is to study what characteristics and what sort of preferences that is linked to faith, it is obviously desirable with a high adjusted R^2 since this measure takes into account the degrees of freedom (Kennedy 2003 p. 91). Several information criteria can also be used when selecting variables. In this thesis two information criterion are used, the Schwarz criterion (henceforth BIC), also called Bayesian information criterion and Akaikes information criterion (henceforth AIC). BIC minimizes the following equation,

$$BIC = \log \frac{1}{N}\sum_{i=1}^{N} e_i^2 + \frac{K}{N}\log N \, . \qquad (21)$$

AIC minimizes the below equation,

$$AIC = \log \frac{1}{N}\sum_{i=1}^{N} e_i^2 + \frac{2K}{N} \, . \qquad (22)$$

If a model shows a lower BIC and/or AIC than another model, then the latter should be chosen. Both of these selection criteria penalize the model for losses in degrees of freedom (Verbeek 2004 p. 58).

In order to select variables as candidates to be excluded from the model, any variable with a $|t| < 1$ will be considered to be dropped. By dropping variables with $|t| < 1$, adjusted R^2 will increase (Ramanathan 2002 p. 155). If several variables have $|t| < 1$ then that variable that has a t-value closest to zero will be dropped first and then the model re-estimated until a satisfactory model is achieved. By doing this the adjusted R^2 (henceforth $\bar{R}^2$) will increase. This means that the model explains more of the proportion of the variation of the dependent variable explained by the independent variables by dropping those variables than keeping them in the model. Kennedy (2003 p. 409) even suggests a critical value of $t = 1$ in order to keep variables with a meaningful magnitude in the model and not only to look at statistical significance when using the LSE methodology. Choosing a model based on maximizing $\overline{R}^2$ has been criticized of conducting so called "data mining", i.e. torturing the data until nature confesses (ibid p. 96). Incorporating the information criteria in the decision process can be seen as a way of balancing the choice of model.

Since the process of selecting a model will be based on the general-to-specific methodology, this implies that several tests will be run on the same data set. Choosing an appropriate significance level thus becomes a problem. When the data is tested many times the probability of obtaining significance increases. This result arises since usually individual tests are considered to be independent but this is obviously not the case when several tests are being done on the same data. To correct for this, lower *p*-values are demanded in order to reject the hypotheses. In terms of diagnostic testing, such as tests for heteroskedasticity, a higher p-value is recommended since it is better to adjust for heteroskedasticity than testing down on a model that suffers from heteroskedasticity (Kennedy 2003 p. 103-104). In this thesis experimental data with 55 observations is used. This implies that it might be appropriate to use a significance level of 5% for the individual tests and around 20% for the diagnostic tests. Even tough statistical significance is of great interest and importance, one has to take into account the economic significance of the tests (see ibid p. 71-72). A variable that is of economic interest but is statistically significant at e.g. the 15%-level, will thus be left in the model, especially if the parameter is large. Bearing in mind that the number of observations is rather small, increasing the number of observations might give statistic significance for the parameter.

A regression equation specification error test (henceforth RESET) will be carried out to test for misspecification. The RESET tests for omitted variables as well as the functional form. The White test and SWT can be interpreted as an indication of specification error (Kennedy 2003 p. 402) and in order to compliment for a significant result from these tests, the RESET provides additional information. The test is done by from (6) taking out the fitted values, $\hat{y}_i$, and regressing (6) again but this time with the fitted values raised to the power of Q on the lefts hand side. The test equation thus looks like the one below:

$$y_i = x_i'\beta + \alpha_2 \hat{y}_i^2 + \alpha_2 \hat{y}_i^3 + ... + \alpha_Q \hat{y}_i^Q + v_i \qquad (23)$$

Where $H_0 : \alpha_2 = ... = \alpha_Q = 0$ against H_1 : at least one of the α_j's are not zero, where j=2…Q. Equation (23) is called an auxiliary regression and should be viewed only as a way of computing the test statistic. Hence, in chapter 5 only the p-value of the RESET will be reported. If the null is rejected the interpretation of the test is that the fitted values, which are polynomial functions of the independent variables, are picking up the effects of omitted variables by the approximation of the fitted values to different powers. A drawback of the test is that it does not say what kind of misspecification the model is suffering from if the null is rejected (Verbeek 2004 p. 63). A problem is always how to choose Q (counted equivalently to α). Verbeek (2004) suggests testing only for Q = 2, Hill et al. (2001) suggests testing first with Q = 2 and then Q = 3, whereas Ramanathan (2002) suggests Q = 4. When doing the RESET I will use Q = 3 since it can be seen as the average suggestion of the number of Q.

4.2.6 Collinear data

When the independent variables have an approximately relationship the problem of multicollinearity arises. When working with linear regression a high correlation between the independent variable and the dependent variable is desirable. High correlation between the independent variables on the other hand is highly undesirable. The reason for this is that in order to estimate equation (5) the matrix needs to be invertible. In the case of high correlation between the independent variables, the matrix becomes almost not invertible. This leads to erratic signs and estimates that can not be relied upon (Verbeek 2004 p. 42). The estimators obtained with OLS are still unbiased, efficient and consistent but due to the fact stated above, the standard errors increases and thus makes the t-values lower. Hence, variables become less significant (Ramanthan 2002 p. 214-216). If for example two variables are correlated then they have common variation making the OLS estimation process difficult since information is then scarce for the OLS estimator to calculate the estimates of the parameters (Kennedy 2003 p. 207). Thus the results differ when running a multiple regression versus a simple regression when multicollinearity exists.

In cases where multicollinearity is present the independent variables are dependent amongst themselves. Thus one way of detecting multicollinearity is to study the correlation matrix, since this measures the correlation between the independent variables separately. A rule of thumb says that if the correlation coefficient between two variables is higher than 0.9 then multicollinearity might be present. Lower coefficients can also be a problem (Bowerman et al. 2005 p. 223).

A correlation matrix of the variables is shown in appendix 2. In table 2 the highest correlation coefficient is between *excitement-seeking* and *risk-taking* which has a value of 0,644. By looking at the correlation matrix, multicollinearity should not be a problem.

4.3 Summary and concluding remarks

The data in this thesis is taken from an experiment carried out at Lund University. In the experiment 110 students from the introductory course in economics participated in a trust game, a dictator game and a faith game and answered an survey. Not all the data from the experiment is used. The main results from the experiment are presented in a paper by Holm and Danielson (2005) *Tropic trust versus Nordic trust: experimental evidence from Tanzania and Sweden.* The parts analyzed in this thesis are the result from the faith-game and parts of the answers to the survey. From the survey several variables were constructed. These are presented in three different sectors; the background section, the risk section and the trust section.

Experimental data is associated several problems but none for this data is regarded as seriously damaging for the purpose of this thesis.

Linear regression (OLS) was chosen as estimation method based on previous studies and for its simplicity of interpretation. The different problems associated with the type of data used, different tests and solutions to the problems were presented in order to make the reader agree with what will be done on the data in chapter 5.

There exist different methodologies for testing a data set such as the one used here. The method of choice, based on statistical and econometric theory, was LSE methodology. Different criteria and testing strategies were discussed in order to make the reasoning in chapter 5 as clear as possible. Since several tests will be carried out on the same data the problem of mass significance occurs. Considering the type of data used, the level of significance was adjusted but with the importance of economic significance in mind. Finally, the problem of collinear data was presented and tested for. The conclusion was that the data does not show any sings of multicollinearity.

5 Tests and results

5.1 Denotations and reading instructions

In this chapter the results from testing down to obtain a suitable model given the data material is presented. The results from the tests are presented in table 2 in section 5.2.1. The values in the table should be read as, for each variable; estimated coefficient, standard error and t-statistic. Significance is reported according to the table below.

Table 1. *Reported significance-levels*

Notation	*Significance level*
*	Significant at 10%
**	Significant at 5%
***	Significant at 1%

Note that *t*-values are reported instead of the usual *p*-values. This is based on that *t*-values will be used as a variable selection criterion in section 5.2.1 and that reporting significance-levels according to table 2 is very common. In the forthcoming sections the general idea of reasoning and practical considerations are presented followed by a description of which variables that are to be omitted from equation to equation. All variables are defined in appendix 1.

5.2 A model for *faith*

The process for running the different tests are as follows; first the regression is run, then the regression is tested for heteroskedasticity. In the first regressions the number of variables is large and therefore the SWT is used. In the last two regressions the number of variables is low enough to use the White test. If heteroskedasticity is present the same regression will be run but with Whites robust standard errors correcting for the violation of the assumption of homoscedastic errors. In determining whether or not to use Whites robust standard errors both the *p*-value of the test and differences between running the regression with or without corrections are considered. A *p*-value lower than 0.1 will immediately lead to the use of robust standard errors but a *p*-value between 0.1 and 0.2 demands more attention and the regression will therefore be run again with Whites robust standard errors to see if there are big differences between using robust standard errors or not. If the difference is evident robust standard errors will be used.

After deciding if heteroskedasticity is present in the regression and if corrections should be used, the rest of the tests are carried out. Signs of the coefficients will not be discussed except if the coefficient is significant and for the final model. Reasoning over insignificant signs is irrelevant since the test statistic says that the coefficient is not significantly different from zero. The following part of the next section will thus contain a description of how the model is obtained. Then the final model and unpredicted results will be discussed.

5.2.1 Selecting regressors

In regression 1 only *donation* and *riskbehavior* are significant. *Age* has the lowest t-value and is thus omitted. The RESET shows no misspecification. Regression 2 shows an increase in $\overline{R}^2$, both AIC and BIC are lower than in regression 1 and no indication of misspecification in the RESET. *Siblings* has the lowest *t*-value and is dropped from the model. In regression 3 all of the model selection criteria are better than in the previous models and no problems of misspecification. Even though the SWT has a high *p*-value Whites standard errors are used in the estimation process since the difference between estimation with and without corrections turned out to be large. *Trust strangers* has the lowest *t*-value and is dropped from the model.

Regression 4 shows improvements in almost all of the model selection criteria. *Confidence index* has the lowest *t*-value and is dropped from the model. Regression 5 shows further improvements of the model and in line with previous reasoning *trusting behavior* is eliminated from the model. Regression 6 shows that omitting *trusting behavior* gives poorer model selection criteria values, i.e. lower $\overline{R}^2$ and higher *AIC* but lower *BIC*. Note also that the SWT shows no indication of heteroskedasticity in regression 6. Since both $\overline{R}^2$ and *AIC* gave poorer result by omitting *trusting behavior*, the variable is included in the model again and instead *other trust index* is omitted since it had the lowest *t*-value in regression 5. Regression 7 is, in comparison to both regressions 5 and 6, an improvement of the model. *Trust index* has the lowest *t*-value and is dropped from the model. In regression 8 the model is still more improved. *Trusting behavior* again has the lowest *t*-value and is dropped from the model.

Regression 9 shows the same development as regression 6 did when dropping *trusting behavior* from the model. By the same discussion as before, the variable with the lowest *t*-value from the previous regression is omitted instead of *trusting behavior*, which is put back into the model. Thus *male* is dropped from the model. Regression 10 shows yet again poorer model selection criteria, especially for $\overline{R}^2$. The results for the separate coefficients differ considerably from the previous regressions. The model in regression 10 is thus not to be preferred to, e.g. regressions 8 or 9. Therefore continuing omitting variables in the same manner as before, does not seem to be reasonable since this would imply finding a variable to omit that gives improvements in the model selection criteria, without having a clear structure in the statistical discussion.

In table 2 $\overline{R}^2$ is maximized in regression 8. AIC is minimized in regression 8 and BIC is minimized in regression 9. The RESET shows no misspecification for any of the regressions. In reasoning between choosing regression 8 or 9, it is worth keeping in mind that BIC tends to select a more parsimonious model than AIC (Verbeek 2004 p. 58). The model proposed in regression 8 and 9 differs in some aspects. First, focusing on the model selection criteria, $\overline{R}^2$ and AIC points out regression 8 rather than regression 9, whereas BIC indicates that regression 9 is to be preferred to regression 8. Second, the overall *p*-value of the regression is lower for regression 8 than 9, indicating that the former is to be preferred. Third, looking at the individual significance tests, the variables *donation*, *excitement-seeking*, *gamble*, *riskbehavior* and *self-reported trustworthiness*, are all significant at the 10% level or better in both regressions. The exception is the variable *risktake* which goes from being significant at the 10% level in regression 8 to be insignificant in regression 9. The point of testing down is not to obtain the perfect model but to obtain a more parsimonious model than the original model. Based on the results above I choose regression 8 as the model to prefer even though BIC points out regression 9 as a more parsimonious model.

Table 2 shows no variable that is robust significant. There are two variables that are close to be robust significant are *donation* and *riskbehavior*. The former is significant at the 5% or the 1% level except in regression 6 and regression 10 and the latter is significant at the 10%, 5% or the 1% level except in regression 10. Looking at the signs of the coefficients in regression 8 shows a few surprises. *Donation* is significant at the 5% level and states that the more the decision maker donates the more he expects others to donate. *Excitement-seeking* is significant at the 5% level but, on the other hand, has a negative sign. This means that the higher the willingness to seek excitement the lower the expectations of others generosity. As predicted in chapter 4 excitement-seeking persons do not expect others to be generous towards them. *Friendliness* has a some what surprising negative sign. As written in chapter 4 a positive relationship between *friendliness* and *faith* was expected. The negative sign could be due to the fact that persons who score high on the friendliness questions are people that take more initiatives in social contexts instead of just waiting for others to take action. Thus they do not expect others to be generous towards them. In contrast to *excitement-seeking* which was significant, *friendliness* is insignificant in every regression and the negative coefficient can thus not be considered significantly different from zero. *Gamble* has a positive sign but is only significant at the 10% level in regressions 8 and 9 and not significant at all in the other regressions. But the positive sign is interesting; the more the decision maker is willing to gamble the more faith he/she has. A decision maker who takes risks and gamble expects others to prefer a fair outcome. *Male* and *trusting behavior* both have positive signs but are not significant. *Risk-take* has a positive sign and is significant at the 10% level in regression 4, 7 and 8 but can not be considered significant since the coefficient is far robust and is significant only at a low level. *Riskbehavior* has a positive sign and is significant in almost all of the regressions and is therefore considered significant. Significance of the variable shows that decision makers who take part in several risky activities have higher faith. *Self-reported trustworthiness* is positive but varies in significance between the regressions and is hence not seen as having a significant relationship in predicting faith. The overall significance (p = 0,015) must be considered to be acceptable but the $\overline{R}^2$ is not satisfactory.

Table 2. *Selecting regressors for modelling faith*

	1'	2'	3'	4'	5'	6	7'	8'	9'	10
Constant	31,752	32,276	34,014	25,155	11,494	10,503	27,302	27,009	35,996	40,388
	40,303	36,951	34,438	38,160	29,455	29,100	21,285	21,784	22,062	24,845
	0,788	0,873	0,988	0,659	0,390	0,361	1,283	1,240	1,632	1,626
Age	0,045									
	1,343									
	0,034									
Confidence index	-7,746	-7,503	-7,887	-5,801						
	14,464	11,473	10,702	9,264						
	-0,536	-0,654	-0,737	-0,626						
Donation	0,008**	0,008**	0,008**	0,008**	0,009***	0,010	0,007**	0,007**	0,006**	0,007
	0,004	0,004	0,004	0,004	0,003	0,006	0,003	0,003	0,003	0,006
	2,056	2,231	2,307	2,262	2,885	1,572	2,359	2,246	2,220	1,124
Excitement-seeking	-9,444	-9,461	-8,960	-9,692*	-9,165*	-9,667	-9,254*	-10,202**	-10,283**	-6,049
	6,554	6,466	5,409	5,169	5,133	5,874	4,988	4,791	4,272	6,458
	-1,441	-1,463	-1,657	-1,875	-1,785	-1,646	-1,855	-2,130	-2,407	-0,937
Friendliness	-6,810	-6,831	-7,156	-6,521	-6,751	-6,265	-7,109	-7,101	-6,697	-9,694
	4,909	4,591	4,706	5,237	5,159	4,948	4,880	4,834	4,912	5,180
	-1,387	-1,488	-1,520	-1,245	-1,309	-1,266	-1,457	-1,469	-1,363	-1,872
Gamble	0,002	0,002	0,002	0,003	0,003	0,003	0,003	0,004*	0,004*	0,005
	0,003	0,003	0,003	0,003	0,003	0,004	0,002	0,002	0,002	0,004
	0,637	0,663	0,674	1,096	1,166	0,700	1,461	2,000	1,926	1,098
Male	7,568	7,533	7,646	7,016	6,096	3,611	6,718	6,118	3,844	
	6,875	6,398	6,211	5,355	5,456	5,138	5,493	5,436	5,487	
	1,101	1,177	1,231	1,310	1,117	0,703	1,223	1,125	0,700	
Other trust index	4,104	4,117	3,934	4,279	5,491	8,264				
	5,426	5,322	5,414	5,786	5,424	5,560				
	0,756	0,774	0,727	0,740	1,012	1,486				
Trusting behavior	-1,828	-1,845	-1,993	-1,782	-1,695		-2,052	-1,770		-1,883
	2,281	2,180	2,024	1,957	1,996		1,968	1,814		1,858
	-0,801	-0,846	-0,985	-0,911	-0,849		-1,042	-0,975		-1,014
Riskbehavior	4,610**	4,613***	4,752***	4,476**	4,200**	3,369*	4,513**	4,401**	3,666*	2,725
	1,734	1,694	1,693	1,751	1,839	1,670	1,864	1,803	1,892	1,798
	2,659	2,723	2,807	2,557	2,284	2,017	2,421	2,440	1,938	1,516
Risktake	10,163	10,193	9,624	10,581*	9,844	8,658	10,759*	12,022*	10,203	9,697
	8,402	8,103	6,589	6,076	6,288	7,093	6,126	6,603	6,520	7,349
	1,210	1,258	1,461	1,741	1,566	1,221	1,756	1,821	1,565	1,319
Self-reported	3,680	3,704	3,659*	3,610*	3,777*	3,523	4,078*	4,189**	3,994*	3,960
trustworthiness	2,267	2,211	2,123	2,139	2,115	2,587	2,046	2,070	2,103	2,797
	1,623	1,675	1,723	1,688	1,786	1,362	1,993	2,024	1,899	1,416
Siblings	-0,439	-0,456								
	1,756	1,584								
	-0,250	-0,288								
Trust strangers	-2,916	-2,903	-3,472							
	10,076	9,828	8,513							
	-0,289	-0,295	-0,408							
Trust index	-1,132	-1,122	-1,159	-1,336	-1,385	-1,418	-0,592			
	1,400	1,323	1,279	1,325	1,289	1,338	0,964			
	-0,809	-0,848	-0,906	-1,009	-1,074	-1,060	-0,614			
No of observations	49	49	49	49	49	50	49	49	50	50
$\bar{R}^2$	0,146	0,171	0,193	0,211	0,226	0,194	0,228	0,242	0,190	0,119
Heteroscedasticity	0,170	0,165	0,204	0,139	0,137	0,386	0,017	0,029	0,100"	0,887"
AIC	8,622	8,581	8,542	8,507	8,474	8,478	8,457	8,425	8,453	8,624
BIC	9,239	9,160	9,082	9,009	8,937	8,898	8,882	8,811	8,797	8,969
RESET	0,296	0,292	0,331	0,386	0,306	0,260	0,567	0,597	0,582	0,569
p -value	0,145	0,101	0,068	0,046	0,030	0,040	0,024	0,015	0,030	0,100

Note : Dependent variable is the reservation prices in the faith game and all equations are OLS regressions.

' = White standard errors, " = The White test, otherwise SWT

All varaibles are defined in appendix 1.

5.3 Summary and concluding remarks

The model suggested in table 3 shows only two significant variables according to the discussion in the previous section. The significant variables were *donation* and *riskbehavior*. Both variables are significant at the 5% level and have positive signs. Hence decision makers that donate money and engage in risky activities expect others to be generous and prefer fair outcomes. *Excitement-seeking* is also significant at the 5% level but is far from the robustness of the above mentioned variables. Due to the wobbling between significance levels *excitement-seeking* can not be considered significant. *Friendliness*, *gamble*, *male*, *trusting behavior* and *risk-take* are not considered significant but are left in the model. *Self-reported trustworthiness* has a positive sign but shows a similar pattern as *excitement-seeking* and can thus not be considered significant.

To sum up the results from the different sections, no variable was significant in *the background section*, only *riskbehavior* was significant in *the risk section* and *donation* was the only variable significant in *the trust section*. Another interesting result is that no variable measuring attitudes was considered significant whereas two variables measuring stated behavior were significant.

The wobbling of significance levels and the dramatic changes due to omission of a variable points at the problem of collinearity (see section 4.2.6). Therefore, the correlation between trusting behavior and the other variables is considered from the table in appendix 2. The highest correlation is 0,644 and observed between *excitement-seeking* and *risk-taking*. A correlation coefficient of 0,644 can not be considered a damaging level of correlation.

Another explanation could be that the method of choice, OLS, is not suitable for this kind of data. The method was chosen based on previous research and the possibilities of straightforward interpretation of the coefficients. Due to the fact that the dependent variable is continuous but constrained might make Tobit-models more suitable as method.

6 Conclusions

The purpose of this thesis was to study the relationship between survey answers and faith. The question at issue was if it was possible to predict faith by studying background characteristics and survey questions regarding trust and risk? A plausible mechanism was presented arguing that faith was an important decision if the decision maker was to send money to the opponent in a strategic investment situation. Faith is empirically linked by Holm and Danielson (2005) who showed that faith was highly significant and correlated with the decision to trust. Studying the determinants behind faith thus might give answers to why the results from testing for background characteristics, risk- and trust measurements have been poor in recent studies on trust.

The result from this thesis shows several important findings. First, testing for faith against the same variables used in previous studies on trust provides an answer to if previous research on trust game behavior has been biased towards solely measuring positive reciprocity. The poor result from the variables in *the background section* shows no deviation from previous results when using students as the subject pool. In *the trust section* only *donation* was significant. This implies that people who donate money also expect others to be generous. The result suggests that asking subjects about how much they donate gives an indication of the subjects' faith. In *the risk section* only *riskbehavior* significantly affected faith. An increase by one risky activity imposed an increase in faith by on average four percentages. The result implies that people who engage in risky activities have higher faith. People who expose themselves to several risky situations thus have higher faith. The result also provides support for the theoretical suggestion that decision makers who trust have preferences for situations involving a clear risk-taking aspect. Moreover, variables measuring stated behavior seem to be more important than variables measuring attitudes when testing for faith. This result is based on that e.g. *riskbehavior* was significant whereas *risk-take* was not and that *donation* was significant but no variable measuring attitudes was. Thus behavior seems to be more important for faith than attitudes.

What consequences for future research does this result have? First, it seems to be difficult to find survey questions that provide robust and significant predictions for faith. In Holm and Danielson (2005) *trust index* significantly predicted trust-game behavior but this result did not hold for faith. Since other studies which has used other subject pools than students have shown significant relationships with trust questions, survey trust questions seems to be measuring positive reciprocity whereas faith seems to be picked up by questions concerning donation and engagement in risky activities. The result from the thesis thus suggests using both trust questions and questions concerning ORP and risk in coming studies.

The weakness of the econometric study however makes the results vaguer. The argument for using OLS as estimation method was based on previous research on similar variables and the possibility of straightforward interpretation of the estimates. As seen in this thesis, caution should be taken when using OLS with experimental data for several reasons. Most variables are indexes which are limited in the aspect that they can take on only a finite number of distinct values. This increases the risk of only little variation within the variables. The result of wobbling significance levels and the low adjusted coefficient of determination implies collinearity but none was found.

In most papers on trust a linear model has been used for estimation. It is possible that trust and faith does not work in a linear fashion but that subjects are instead grouped together such as low faithers as one group and high faithers as another. Using a linear model in this case would produce a poor model. Using other estimation methods such as multivariate methods, e.g. discriminant analysis, would provide answers to this suggestion.

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Appendix to Holm and Danielson (2005):
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Appendix 1

Variable	Question/description	Answer range	Mean (standard deviation)
Faith	Reservation prices stated by the *A*-players for selling their expected 'donation' in the faith game. The reservation price is calculated as (reservation price / the maximum amount sent in the donation)*100.	{0,100}	38,81 (17,62)
Male $^{\beta}$	"What is your sex?"	0-female; 1-male	0,63 (0,48)
Age $^{\beta}$	"What year is your date of birth?"	Year the study was conducted minus date of birth. Range: 20-33	23,81 (2,9)
Siblings $^{\beta}$	"How many siblings do you have?"	Number of siblings Range: 0-9	1,87 (1,17)
Trust strangers $^{\beta}$	"You can't count on strangers anymore."	More or less agree-0, more or less disagree-1.	0,68 (0,47)
Trust index $^{\beta}$	1. "Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair?" 2. "Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?" 3. "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?"	1. Would take advantage of you-0, would try to be fair-1. 2. Try to be helpful-1, just look out for themselves-0. 3. Most people can be trusted-1, can't be too careful-0. The answers were demeaned and divided by the standard deviation. The three variables were then summed.	0,00 (2,43)
Donation	Stated amount in answering the question: "How much money do you annually donate to charitable purposes (e.g. Amnesty, Greenpeace, Save the Children Sweden)?	{0,∞}	172,3 (439,8)
Confidence index	"Arithmetic average of answers to eleven questions asking the respondents confidence in banks and financial institutions; major companies; organized religion; education; press; TV; scientific community; military; police; central government; and local government."	Each question had three alternatives (great deal of confidence, only some confidence, and hardly any confidence) and the first alternative was given the value of one and the last one the value of three. The Confidence index is the average of these.	1,88 (0,28)

Trusting behavior	"How often do you lend money to your friends?" "How often do you lend personal possessions to your friends (e.g., CDs, clothes, bicycle, etc.)?" How often do you intentionally leave your rooming group's hallway door unlooked (when nobody is home)?"	For each question there were five alternatives ranging from "more than once a week" to "once a year or less". The first alternative was given a value of 1 and the last a value of five. Answers were demeaned and divided by the standard deviation before the results were added."	0,00 (1,53)
Self-reported trustworthiness $^{\beta}$	"I am trustworthy."	Disagree strongly-1, disagree somewhat-2, disagree slightly-3, agree slightly-4, agree somewhat-5, agree strongly-6	5,17 (0,82)
Other trust index	Answers to the following three questions: "People consider me as always being trustworthy", "People who know me well consider me always being trustworthy" and "Superficial acquaintances consider me as always being trustworthy"	The responses were "Very Inaccurate", "Moderately Accurate", "Neither Inaccurate nor Accurate", "Moderately Accurate", and "Very Accurate".	3,67 (0,62)
Friendliness $^{\alpha}$	How well do the following statements describe you? "Make friends easily", "Warm up quickly to others", "Feel comfortable around people", "Act comfortably with others", "Cheer people up", "Am hard to get to know", "Often feel uncomfortable around others", "Avoid contacts with others", "Am not really interested in others", "Keep others at a distance".	The statements from "Make friends easily" - "Cheer up people" were plus keyed and the remaining statements were keyed negative. For plus keyed items (values for negative keyed items in parenthesis), the responses were "Very Inaccurate"- 1 (5), "Moderately Accurate"- 2 (4), "Neither Inaccurate nor Accurate" – 3 (3), "Moderately Accurate" – 4 (2), and "Very Accurate"- 5 (1). The answers were summed and divided by the number of questions.	3,89 (0,61)
Risktake $^{\alpha}$	How well do the following statements describe you? "Enjoy being reckless", "Take risks", "Seek danger", "Know how to get around the rules", "Am willing to try anything once", "Seek adventure", "Would never go hang-gliding or bungee-jumping", "Would never make a high risk investment", "Stick to the rules", "Avoid dangerous situations"	The statements from "Enjoy being reckless" - "Seek adventure" were plus keyed and the remaining statements were keyed negative. For plus keyed items (values for negative keyed items in parenthesis), the responses were "Very Inaccurate"- 1 (5), "Moderately Accurate"- 2 (4), "Neither Inaccurate nor Accurate" – 3 (3), "Moderately Accurate" – 4 (2), and "Very Accurate"- 5 (1). The answers were summed and divided by the number of questions.	2,75 (0,50)

Excitement-seeking [α]	How well do the following statement describe you? "Love excitement", "Seek adventure", "Love action", "Enjoy being part of a loud crowd", "Enjoy being reckless", "Act wild and crazy", "Willing to try anything once", "Seek danger", "Would never go hang gliding or bungee jumping", "Dislike loud music".	The statements from "Love excitement" - "Seek danger" were plus keyed and the remaining statements were keyed negative. For plus keyed items (values for negative keyed items in parenthesis), the responses were "Very Inaccurate"- 1 (5), "Moderately Accurate"- 2 (4), "Neither Inaccurate nor Accurate" – 3 (3), "Moderately Accurate" – 4 (2), and "Very Accurate"- 5 (1). The answers were summed and divided by the number of questions.	3,43 (0,67)
Gamble	Stated amount in answering the question: "Estimate how much you on average spend on playing the pools and games (e.g. horseracing, Casino)	$\{0,\infty\}$	167,9 (567,2)
Riskbehavior	"Put a cross against the activities you have tried: playing football in a club, parachute jumping, *horse jumping*, skiing, free diving, kite flying, mountaineering, riding.	For each activity crossed, a value of one was assigned and then summed. Raging from 1-8	3,10 (1,52)

[α] Explanations taken from International Personality Item Pool: http://ipip.ori.org/newIndexofScaleLabels.htm
[β] Appendix in Holm and Danielson (2005). Can be downloaded at: http://www.res.org.uk/economic/ta/pdfs/ecoj_300_app.pdf

Appendix 2

Table 2. Correlation matrix

	Age	*Confidence index*	*Donation*	*Excitement-seeking*	*Friendliness*	*Gamble*	*Male*	*Other trust index*	*Past trust*	*Riskbehavior*	*Risk-taking*	*Self-reported trustworthiness*	*Siblings*	*Trust strangers*
Confidence index	0,414													
Donation	0,113	-0,004												
Excitement-seeking	-0,055	0,015	0,093											
Friendliness	-0,067	-0,080	0,209	0,504										
Gamble	-0,058	0,067	0,021	0,200	0,108									
Male	0,003	0,246	-0,004	-0,061	-0,326	0,197								
Other trust index	-0,004	-0,365	-0,293	-0,009	-0,072	-0,060	0,041							
Past trust	-0,307	0,033	0,093	0,400	0,103	0,151	0,197	-0,241						
Riskbehavior	0,134	0,153	0,107	0,394	0,232	0,028	-0,118	0,159	0,107					
Risk-taking	-0,011	0,180	0,231	0,644	0,120	0,318	0,175	-0,117	0,319	0,146				
Self-reported trustworthine	0,110	-0,159	0,226	-0,083	0,182	-0,171	-0,008	-0,027	-0,125	-0,131	-0,142			
Siblings	-0,159	0,014	0,078	-0,108	0,014	-0,138	0,063	0,064	0,042	-0,167	0,044	0,129		
Trust strangers	0,000	-0,347	0,008	-0,017	-0,082	-0,373	-0,021	0,343	-0,183	0,210	-0,292	0,085	0,158	
Trust index	0,163	-0,219	-0,085	0,001	0,030	-0,247	-0,065	0,621	-0,198	0,152	-0,293	0,011	0,131	0,471