Credit granting in the Swedish unsecured loans market

Empirical testing of risk-aversion among credit managers link to tertiary education and Basel knowledge

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Abstract

This thesis investigates the relationship between tertiary education, Basel knowledge and risk-aversion in credit managers in the market for unsecured loans in Sweden. A survey was made to test these links and the sample of respondents consisted of 30 credit managers. Results showed no obvious effect of tertiary education on risk-aversion, managers ability to contravene the algorithm and the non-occurrence of default. It showed that there may be an effect of the inability to contravene the algorithm on the occurrence of ‘bad business’ and that there may be an effect of acquired tertiary education on Basel knowledge. This implies that not allowing credit managers to contravene algorithms may increase the occurrence of default. The results also imply that banks, credit institutes and regulators should take action towards improving the understanding of the Basel directive and regulations among credit managers.

Keywords: Basel, tertiary education, credit managers, default
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1 Introduction

1.1 Background

Problems in the credit market first surfaced in 2007 and it is a commonly known fact that one of the triggers to the subprime mortgage crisis was credit managers and lenders acting as sales men and women instead of being risk-averse; that quantities of loans granted were more important than the creditworthiness of customers and high-risk loans were given to people who could not afford them.1 This goes back to a policy failure in which the U.S. government “pressured bankers to make loans for people with poor credit” in order to expand home ownership to low-income households.2

In the market for unsecured loans, loans are granted knowing very little about the customer. Parameters such as taxed income, previous loans and having a full-time job are a few of the criteria being assessed.3 Banks and credit institutes cannot demand securities in form of material possessions as vehicles or other property as they offer loans, and thus these loans have higher interest rates. Credit managers face the decision of granting loans on these very few premises and assessing the customers’ payment behaviour.

With new intermediaries and agents on the market, such as Lendo that protect the customers’ interest in providing the best loan possible by comparing offers, banks and credit institutes face direct competition through these agents. By choosing not to use the agent, the bank or credit institute loses potential customers. Therefore, to survive in the unsecured loans market they must join in, use the agents and compete for the customers.

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1.2 Problem Discussion

Many banks and credit institutes use risk models assessing the default risk of the customer, however it is still credit managers that offer customers loans. These credit managers act as insurance for the banks and credit institutes when the model fails or cannot take in account for certain parameters. Therefore banks and credit institutes are depending on the ability of credit managers to avoid default.

Comparing the role, that was previously mentioned, of credit managers in the financial crisis to the one possessed by credit managers granting unsecured loans, it seems of utter importance to emphasize the creditworthiness of customers. Granting loans too loosely could produce another setback to the economy and make it further more difficult to recover from the recent financial crisis. Being aware of what went wrong in the recent financial crisis and credit managers continuing the behaviour of acting as sales men and women would only prove that they, and also the market, are taking unnecessary risks. Moral hazard\(^4\) occurs as they are taking these risks, granting these loans and thus not preparing to take any responsibility for the consequences that might occur.

The pressure of direct competition on the market through agents might lead to a decrease in risk aversion as credit managers grant loans in order to gain a customer, regardless of the creditworthiness of the customer.

But what factors show that the credit manager is being risk-averse in his/her decisions? Taking a starting point in a previous study conducted by Summers, Williamson and Read of whether education or learning-on-the job is most important for credit granting decision\(^5\), it showed that predictions of creditworthiness were best made by those with a tertiary education; i.e. lecturers and students. Credit managers only performed slightly better than laypeople that had no tertiary education within the area of business or economics.

\(^4\) K Dowd, p.142

1.3 Research Questions and Delimitations

The research question that will be focused on in this study is the following.

**Research Question:** Will tertiary education or lack thereof among credit managers working in the Swedish market for unsecured loans affect their attitudes on risk and their awareness of Basel regulations?

**Hypothesis:** The hypothesis is that attending higher education studying business or economics among credit managers would make them more risk averse and emphasizing risk-awareness would thus reduce the occurrence of moral hazard. Risk-aversion is in this thesis measured in how many variables a credit manager takes into account when measuring creditworthiness of a customer and also if the credit manager has had any loans ending up as “bad business”, a default. The greater the number of variables taken into account, the more risk-avert is the behaviour of the credit manager.

An empirical study of credit managers in the Swedish market for unsecured loans is conducted by choosing a sample of credit managers at banks and credit institutes. They will take part of a survey and the results will show their attitudes to risk, if they are informed of the Basel II regulations, but also how many parameters they find important when granting loans. Participants are not only asked on their level of education but also on how the credit granting is conducted at their workplace; i.e. if they base their decisions on manually valuing clients and if so, in respect to the amount of parameters they offer loans; or if they base their decision on a static algorithm (scoring) and if there are any possibilities for the managers to disregard the outcome of the algorithm.
1.4 Purpose and Contributions

The goal of this study is to answer the question of how acquired or lack of tertiary education and knowledge of the Basel accord among credit managers working in the unsecured loans market in Sweden affects their attitudes on risk or rather their risk-aversion. By conducting this study I hope to raise awareness on the risks accompanying credit granting for unsecured loans and also raising questions of the ethics of it. If risk-averse behaviour among credit managers is linked to a tertiary education in business or economics, should it not be required?

In the article by Summers, Williamson and Read it is mentioned that in areas such as medicine you would need a degree or license to practice or to prove your ability, but such a requirement is not available at the moment for credit managers. Is it ethical for banks and credit institutes to allow or risk risk-prefering behaviour among credit managers occurring due to an insufficient level of education? Granting loans under wrong premises to customers with financial problems who are at a higher risk of defaulting is unethical in itself. Is it possible to regulate the conducts and risk behaviour of credit managers by requiring a license for credit granting? Those are a few of the possibilities to reduce risk on the market and increase risk aversion.

This study should contribute to several interest groups such as; banks and credit institutes who would like to decrease their risk internal exposure, regulators who should become more aware of the current state of the market in order to stabilize it further and also customers, who wish to lend, by protecting them against being granted loans they cannot afford.

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7 B Summers, T Williamson, D Read,p.238
1.5 Disposition

The rest of the paper is arranged as following; section two presents the theoretical background of moral hazard, credit granting, use of models and regulations. In section three the sample that has been chosen is presented and methodology is discussed; in section four the results of the empirical study are presented and discussed. The last section, section five, concludes the study and gives suggestion for future research.

2 Theoretical Background and Literature Review

2.1 Moral Hazard

In Kevin Dowd’s article ‘Moral Hazard and the Financial Crisis’, the nature of moral hazard is described as “where one party is responsible for the interests of another, but has an incentive to put his or her own interests first” and an example of that is someone taking risks that somebody else has to bear.\(^8\) This phenomena increases risk-taking as the person taking the risk, for example a manager, on somebody else’s behalf, lets say the bank, expects to be free of eventual negative consequences. If the manager takes the risk of giving out a loan to someone who is not creditworthy, then there is a chance that the bank will incur a loss. Hence, it is important that managers have an incentive to be careful in their credit granting. In the financial crisis, there were many reasons to why the financial risk management failed, and according to Dowd one of the many reasons is the failure of the models as they relied too much on normal market conditions and ignored the events of abnormal market conditions.\(^9\) The author continues to argue that the

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\(^8\) K Dowd, p.142  
\(^9\) K Dowd, p. 145-146
most important failure of financial risk management are basic ones such as if incentives for excessive risk taking is strong enough, the risks will be taken. Dowd also argues that even if managers are to blame, they still act on behalf of “senior management who often pressure” managers to “take short cuts” in order to produce results that keep down capital requirements.\(^\text{10}\) The author believes that the problem is the “limited liability, which allows investors and executives” to enjoy all the fruits of their risk-taking but at the same time limiting their exposure when it goes bad.\(^\text{11}\) This in turn connects back to the problem of moral hazard. If there is risk-taking involved, who will pay the price as things go bad? Why would consumers want to place their money with a bank if the bank will take risky actions in other parts of it’s business so that it would affect the consumers deposit? That is where the deposit-insurance comes in, meaning that bankers need to be moderate in their risk-taking and maintain levels of liquidity reserves to insure the depositors well being.\(^\text{12}\)

However, the presence of a government that will bail you out does not encourage financial institutions to work out their own affairs.\(^\text{13}\) Making taxpayers bear the risk of the institutions failure, will only lead to moral hazard and harming the economy further. Samwick concludes in his article ‘Moral Hazard in the Policy Response to the 2008 Financial Market Meltdown’ that the result of government intervention given a financial crisis will breed less prudence in the future in the financial markets. The author believes that in order to prevent a future crisis, “it is better to let an insolvent institution fail and use the governments funds to assist those individuals or institutions damaged by that failure than to reward the behaviour that caused the insolvency in the first place.”\(^\text{14}\)

\(^\text{10}\) K Dowd, p. 149
\(^\text{11}\) K Dowd, p. 153
\(^\text{12}\) K Dowd, p. 159
\(^\text{14}\) AA Samwick, p. 139
2.2 Basel

A series of recommendations on banking laws and regulations, published by the Basel Committee on Banking Supervision in 2006, Basel II became a directive in the EU 2006/49/EC\textsuperscript{15}. It is to further regulate the “measurement of financial and operational risk at individual banking institutions”.\textsuperscript{16} As of December 2010 there has been another reform to the regulations, called Basel III.\textsuperscript{17} This recent reform aims to increase supervision and transparency within the banking industry, in order to minimize systematic risks. Basel III differs from the previous one as it focuses more on common equity. Now, banks must uphold a capital reserve ratio of 7\%, as opposed to the previous 2\%. They must keep a minimum of 2.5\% in comprising common equity, which brings the total common equity standard to 7\%.\textsuperscript{18} This is in order to withstand future periods of economic stress.

However there are those who believe that the Basel regulations in themselves affect outcomes of crisis including Dowd.\textsuperscript{19} The author agrees with Danielson, Embrechts, Goodhart, Keating, Muennich, Renault and Shin\textsuperscript{20} in believing that Basel II in itself affects the outcome of a crisis just by existing. As risks vary over the business cycle, when “the cycle approaches its peak risk assessments will fall, causing risk-based capital requirements to fall and lending to rise”. This when the

\textsuperscript{15}DIRECTIVE 2006/49/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 June 2006 on the capital adequacy of investment firms and credit institutions (recast), Official Journal of the European Union,
Retrieved 2011-11-05


\textsuperscript{18}Basel Committee on Banking Supervision reforms, ‘Basel III-Summary Table’, \texttt{<http://www.bis.org/bcbs/basel3/b3summarytable.pdf>} Retrieved 2011-11-06

\textsuperscript{19}K Dowd, p. 161

danger of systematic downturn is at its greatest and it will lead to over lending in booms and under lending in recessions.\textsuperscript{21}

The aim in a study conducted by Hermsen was to by using “a financial model with heterogeneous interacting agents to show that the regulations of Basel II may lead to a destabilization of financial markets”. The result was that the Basel II regulations in themselves destabilize financial markets. This is alarming as the purpose of the Basel regulations is to do the opposite.\textsuperscript{22} In the study Hermsen notes that of the problems with the Basel II regulation is that banks are not told to use a specific model but instead a formula that considers “Value-at-Risk, VaR, and a multiplication factor that is raised if many back testing exceptions occur in a quarter”. Hence banks use different models to determine risk. The author argues that banks have two possibilities; to raise their level of regulatory capital or sell their level of “risky assets from their portfolio to lower the risk”. In the study a comparison of the behaviour of financial markets with or without the regulations is made. The VaR measure chosen by the BCBS was chosen in order to make sure that banks are prepared for extreme events and ironically these events increased due to the regulations according to the study.\textsuperscript{23}

2.3 Empirical Studies

2.3.1 Basel Implementation

In a study by Wahlström\textsuperscript{24}, which aspires to answer the question ”How do bank staff perceptions define contextual outcomes within a Basel II implementation setting?” criticism of risk measurement is complemented with statistics from interviews with 25 Swedish bank officers involved in the implementation of the Basel II regulations. The interviewees have acknowledged both negative and positive aspects of the implementation.

\begin{itemize}
\item \textsuperscript{21} Danielson et al., p. 5
\item \textsuperscript{23} O Hermsen, p. 36
\item \textsuperscript{24} G Wahlström, p.53-68
\end{itemize}
In the study it is concluded that “for the practical implementation of Basel II” it is dependable on the frameworks relevance to the managers daily work. Basel II was found to be too complex by the interviewees, meaning that its “technical and abstract language”, which is commonly used by risk measurement specialists, would be difficult for people in different parts of an organization to understand. Hence, a problem with implementation of Basel II is a lack of technical knowledge and understanding. Not that many understand Basel II and those who do work at central parts of the organizations. This lead to the concern that the implementation of Basel II would lead to a centralization in operations. The author also mentioned that the potential outcome that “banking staff at decentralized banks will tend to ignore Basel II as mere window dressing for the industry.”

It is mentioned in the article that in Sweden, “the national supervisory authority interpreted Basel II as creating a more uniform regulatory framework”. However, this was seen as unclear and it can cause difficulties if the interpretation of Basel II differs too much from one country to another due to its vagueness. One of the concerns of the interviewed managers was that national supervisors might understand Basel II differently.

The interviewees in the study were however “positive towards risk modelling and the ability of such models to quantify levels of risk“ and that they were favourable for the banks. The importance of risk measurement in Basel II was seen as being more in accord with the actual situation for the banks.

### 2.3.2 Stress Tests

In an article by Jorion, discussing the role of risk management in the credit

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25 G Wahlström, p.58
26 G Wahlström, p.61
27 G Wahlström, p.64
28 G Wahlström, p.65
29 G Wahlström, p.63
30 G Wahlström, p.59
crisis, it is argued in favour of back testing risk systems.\textsuperscript{32} Knowing that risk management systems do not account for liquidity risk, “the Basel Committee did not institute formal capital charges against liquidity risk”.\textsuperscript{33} It is further mentioned that the Basel Committee too advises the use of reverse stress tests, such as to start from a known outcome and then ask what could lead to that outcome. However, Jorion argues that none of this would be possible without position-based risk management systems.\textsuperscript{34} Jorion argues that traditional risk measurements employs historic data and assumes that distributions are relevant and stable for the future. That is why risk management should still involve humans who have access to position-based risk management systems that allows the construction of forward-looking scenarios. Jorion favours stress test of models, changing the assumptions for the distributions and parameters such as volatilities and correlations.\textsuperscript{35} The crisis in itself has made risk management more important and the author concludes that “formal risk management models cannot substitute judgment”.\textsuperscript{36}

In an article by Matz it is put forth that the models did not fail as of the financial crisis, but that instead the problem lies within the ways in which the models are being used. Three errors are addressed; applying historical models to products without history, inability to model extreme events and correlations that develop in distressed markets.\textsuperscript{37} “Careful risk managers always stress-tested their VaR measure. And careful risk managers always applied analytical tools to the fat tails. Neither proved sufficient.” This is due to that the scenarios created for stress tests were inaccurate.\textsuperscript{38} Hence, the author discusses that the problems were in how the models were being used and at what point in time; applying VaR models to situations for which they did not suit and also by applying correlations observed in normal conditions to

\textsuperscript{32} P Jorion, p.925
\textsuperscript{33} P Jorion, p.929
\textsuperscript{34} P Jorion, p.932
\textsuperscript{35} P Jorion, p.930
\textsuperscript{36} P Jorion, p. 932
\textsuperscript{37} L Matz, ‘Market Turmoil: Are our Models Letting Us Down?’, Bank Accounting & Finance, October-November 2008, p.41
\textsuperscript{38} L Matz, p.42
stressed conditions. Matz concludes that the problem is not with the models, but with the user and how the risk manager uses his tools.\textsuperscript{39}

### 2.3.3 Financial Management Issues

In a study by Atkinson, it is acknowledged that few risk managers have little background in credit management and hence risk managers need to do more than ask credit managers to “bring down the numbers” in order to be more effective.\textsuperscript{40}

It is argued that risk managers can help credit managers to better understand the contracts they are taking on.\textsuperscript{41} This is consistent with the previously mentioned study conducted by Wahlström, as in the part of that Basel II which is a part of the background in credit granting, that it can be very abstract and difficult to understand the underlying model for others than risk managers. Atkinson claims that it is of great importance that risk managers and credit managers identify a common language, as terminologies differ between the disciplines.\textsuperscript{42}

In a previous study by Bruns, Holland, Shepard and Wiklund the role of general and specific human capital in the decision policies of 114 Swedish loan officers in their assessments of small-business loan requests was conducted. Human capital characteristics were found to have “marginal impact on decision policy contingencies and specific human capital had no significant influence on the probability of loan approval”. There was however a significant indicator of loan approval; “similarity between the loan officers’ human capital and the applicants’ human capital”.\textsuperscript{43}

Bruns et al. argue that in the setting of bank loans, on-the-job experience would let the credit manager “understand the local business environment, the banks’ peculiar strengths, weaknesses, and processes, or the interaction of various

\textsuperscript{39} L Matz, p. 43

\textsuperscript{40} W Atkinson, ‘The Evolving Role of Credit Risk Management’, Risk Management, vol. 52, No.4, 2005, p. 56-58, 60, 62

\textsuperscript{41} W Atkinson, p.58

\textsuperscript{42} W Atkinson, p.62

entrepreneurial/small-business characteristics which may increase the odds” of a positive enterprise. This knowledge has a great influence on the loan decision-making process. Credit managers with “greater human capital will more likely use a multiplicative approach with risk factors by using contingencies in the decision process”. However, credit managers who are more acquainted with small-business loans recognize “relatively less risk in small-business loans” and are therefore “more likely to approve the loan than managers with less experience”, as they have grown more comfortable and are more confident in their decisions.

Another finding in the study conducted by Bruns et al., was the heterogeneity in loan decisions based on the similarity between the credit managers human capital and the borrower’s human capital. It showed that credit managers “with a greater level of specific human capital are more attracted to entrepreneurs with a high level of specific human capital” than are credit managers with “a lesser degree of specific human capital”. Equally, credit managers with “more general human capital place less stress on the importance of the business owner’s specific human capital”.

Summers, Williamson and Read have in their study evaluated the level of expertise acquired through education and on-the-job learning of professional credit managers. They found that lecturers and students outperformed the credit managers in predicting creditworthiness of several medium-sized companies. A test group of lay people with no relevant formal education was also included in the study, and the credit managers only performed slightly better than laypeople. This leaves us to believe that, in consistence with previously mentioned studies that an underlying understanding of risk and risk models is of utmost importance when making credit decisions.

A problem that may occur with experienced credit managers is that they may have

44 V Bruns et al, p.487
45 V Bruns et al, p.488
46 V Bruns et al, p.489
47 V Bruns et al, p.500
48 B Summers et al., 237
developed rule-of-thumb on how to conduct credit decision and this have been developed by trial and error and not as much by cases highlighting certain theories that should affect the judging (as would have been opposed by a formal education).\textsuperscript{49}

Results of this study also showed that credit managers were over twice as likely to offer credit to all companies than were the other groups.\textsuperscript{50} This may not be reckless behaviour, but it can be concluded to that credit managers are more confident in their loan granting, as they are more in touch with the market and its dealings. There may be other parameters that show that the consumer, or in this case the companies, is less likely to default other than what is seen by others. However, it is mentioned in the study that on-the-job experience might change ones attitude to credit granting and that the credit grantor might not necessarily make a loss as the company fails.\textsuperscript{51}

Jacobson and Roszbach have in their study ‘Bank Lending Policy, credit scoring and value-at-risk’ studied a dataset of Swedish consumer credit data containing information about both granted and rejected applicants. The study showed that the size of a small consumer loan (3,000SEK - 30,000SEK) did not affect associated default risk, implying that banks do not provide loans in consistency with default-risk minimization.\textsuperscript{52} The dataset however consists of applications in the mid 1990s, which may not be accurate for today, but in general, the conduct of granting loans remains the same.

The results of this study further showed that the important factors that increased the probability of granting an unsecured loan were in accordance with common bank behaviour; i.e. Income, Home-owning, Number of Loans and Co-applicant

\textsuperscript{49} B Summers et al., p. 241
\textsuperscript{50} B Summers et al., p.251
\textsuperscript{51} B Summers et al., p.252
increased the probability of loan acceptance.\textsuperscript{53} What was striking about this study was that loan size did not affect the default risk significantly, and an additional loan within the sample range did not affect it either at the margin.\textsuperscript{54}

Hashagen, Harman, Conover and Sharma discuss in their article ‘Risk Management in Banking: Beyond the Credit Crisis’ weaknesses in risk management that contributed to the financial crisis.\textsuperscript{55} They refer to a survey, previously conducted by KPMG. The results suggests that banks should be more careful in decision making, based on a clear understanding of the products and the risks involved and that in consistence with the article by Jorion that models should be forward-looking and not entirely based on historic data.\textsuperscript{56}

Further, in consistence with Dowd, Hashagen et al. acknowledges that the biggest pressure on risk professionals comes from executive management but also from regulators.\textsuperscript{57} The results also suggest a stronger focus on stress testing to help measure and manage risk.\textsuperscript{58}

Sepci and Hermle discuss further on the article by Hashagen et al. in their article ‘How the Credit Crisis Has affected Investment Managers’ Use of Complex Structured Investment Instruments’.\textsuperscript{59} The authors are in consistence with previously mentioned studies as they too find that “complex instruments and strategies are only understood by a small number of people”.\textsuperscript{60}

\textsuperscript{53} T Jacobson et al., p. 623
\textsuperscript{54} T Jacobson et al., p.624
\textsuperscript{55} J Hashagen, N Harman, M Conover, J Sharma, ‘Risk Management in Banking: Beyond the Credit Crisis, The Journal of Structured Finance, Spring 2009, p. 92-103
\textsuperscript{56} J Hashagen et al., p.93
\textsuperscript{57} J Hashagen et al., p.99
\textsuperscript{58} J Hashagen et al., p. 101
\textsuperscript{60} AM Sepci et al., p.29
An area that is highlighted is to what degree firms are subject to model risk and how much they rely on models, however no risk controls regarding these models have been made. The authors quote FED Chairman Ben Bernanke in saying that no model can capture all the risks an institution might face and suggest “that a migration of experienced people from investment banks” is needed in risk management operations. 61

Also, in consistence with previous articles, the importance of human capital is emphasized, especially “people with marketable risk and governance skills”, suggesting that this is of great importance for companies to do better than others. 62

3 Method and Methodology

This section depicts the research approach used to analyse the presented problems.

3.1 Scientific Approach and Research Design

The research approach in this study can be classified as a deductive, quantitative. In line with definitions made by Bryman and Bell 63 the chosen research approach in this study is a deductive one, as it aims to answer a research question and hypothesis, which are based on previous theory and research. The questions will be empirically tested in order to confirm or reject the hypothesis, and the result of this will be used to contribute to and revise existing theories.

The method of the study is quantitative. Primary data is collected through a survey questionnaire, and a probit regression model is created in order to analyse the data collected. Analyses are conducted on the basis of the regression result and an

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61 AM Sepci et al., p.32-33
62 AM Sepci et al., p.35
attempt is made to answer the research question. The analyses are descriptive as the results of the regression are simply being analysed.

In this study a positivistic approach is applied, meaning that phenomena and knowledge is acceptable when confirmed by senses and knowledge.\textsuperscript{64}

\section*{3.2 Sample and Data}

The sample that has been chosen is 24 banks and credit institutes in Sweden that offer unsecured loans. Institutes that have been excluded from the study are those who offer smaller sums on unsecured loans, including so called SMS-loans and microloans, as these loans are often granted and paid out within hours of applying, leading us to think that a proper credit risk assessment of the customer is neglected in favour of higher interest rates on these smaller type of loans. A list of banks and credit institutes was subtracted from the website alltomlån.com\textsuperscript{65} and several others that had not been mentioned by the website was added.

The dataset consists of respondents from 10 banks and credit institutes in the sample that chose to participate after being approached. Four of the major banks in Sweden chose not to participate, either actively or passively. According to Sveriges Riksbank, Sweden’s Central Bank, of the credit institutes, banks stand for barely half of the loans to the general public. This represents approximately 2,100 billion SEK.\textsuperscript{66} However, credit institutes are more relevant for this study as they focus more on unsecured loans than major banks that have a greater variety of financial products and are not as dependent on agents in order to compete for customers. Examples of these agents were mentioned earlier in the introduction, under names such as Lendo.

\begin{itemize}
\item \textsuperscript{64} A Bryman et al., p. 15
\end{itemize}
3.3 Data Collecting Methods

A survey has been made available online through Google Documents for affected credit managers to respond to. Variables that are of main focus are level of education, knowledge of Basel directives, the amount of parameters taken in consideration when granting loans and also if the respondent is able to go against the algorithm, an automated template, in which the consumer is being assessed for creditworthiness. However in order to not get too biased results the aim of the study is presented abstract as measuring risk behaviour among credit managers in Sweden, not informing them of what variables are of interest for this study. An emphasis has been made on those credit managers that are restricted to work in the unsecured loans market in Sweden. This type of loan is not the main focus for many of the banks and credit institutes, and hence only a limited number of credit managers commit most of their working hours to manage these types of applications at each bank.

3.4 Data Processing

Data is processed after the respondents have participated by filling out the form, mainly by using Stata. A Probit regression model is used.

The parameters being measured in the regression model are the following.

3.4.1 Dependent Variable

Acquired tertiary education, the dependent variable Y, or lack thereof will be treated as a dummy variable. A dummy variable is a binary variable that can only take one out of two values, 0 or 1. In this thesis, the dummy variable acquired tertiary education takes on the value 0 if the respondent lacks tertiary education and the value 1 if the respondent has acquired tertiary education. Why this is examined in link to risk-aversion is due to the general hypothesis of this study; that if a credit manager has acquired tertiary education, then he or she is more likely to understand the concepts of risk aversion and therefore act in a risk-averse manner.
3.4.2 Independent Variables

An independent variable is an explanatory variable that aims to explain the dependent variable. In order to measure risk aversion as a whole, several independent variables are added and create a model. The following are the variables in the model that are treated as independent variables, X.

The independent variables are treated differently. If the variable is treated as an ordinal variable it means that the values of the variable have a natural order, i.e. {0, 1, 2, 3…} or { Not at all, A bit, To some extent, In large part, Fully}. A categorical variable is a variable whose values range over several categories.

Table 1: List of Independent Variables

<table>
<thead>
<tr>
<th>( X )</th>
<th>Name</th>
<th>Variable type</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Parameters</td>
<td>Ordinal</td>
<td>How many parameters are taken into account when granting a loan. This variable will also be turned into a dummy variable in order to see if the manager takes more than one parameter into consideration or does not make a manual credit assessment at all.</td>
</tr>
<tr>
<td>2</td>
<td>Algorithm</td>
<td>Dummy</td>
<td>If the manager simply follows an algorithm or not.</td>
</tr>
<tr>
<td>3</td>
<td>Loans</td>
<td>Dummy</td>
<td>If the managers deals with several types of loans, or just unsecured. The variable takes on the value 1 if the manager deals with more than one type of loan and the value 0 if not.</td>
</tr>
<tr>
<td>4</td>
<td>Contravene Algorithm</td>
<td>Dummy</td>
<td>If the manager can go against the algorithm or not. If yes, the variable takes on the value 1, if not the variable takes on the value 0.</td>
</tr>
<tr>
<td>5</td>
<td>Basel knowledge</td>
<td>Dummy</td>
<td>If the manager has any knowledge of Basel regulations or not</td>
</tr>
<tr>
<td>6</td>
<td>Mandatory Information</td>
<td>Categorical</td>
<td>If the information on Basel was mandatory or not, or if they do not know. The variable is generated into three different variables who, similar to dummy variables, cannot coexist.</td>
</tr>
<tr>
<td>7</td>
<td>Bad Business/Default</td>
<td>Categorical</td>
<td>If the manager has had any bad business or not, or does not know.</td>
</tr>
<tr>
<td>8</td>
<td>Institute</td>
<td>Categorical</td>
<td>What type of institute the manager works at</td>
</tr>
</tbody>
</table>
3.4.3 Probit Regression Model

Due to the fact that the dependent variable, whether or not a credit manager has acquired tertiary education, is a binary variable different regression models are preferred. According to Stock and Watson, linear probability, probit and logit regression models, of which the last two are nonlinear, are designed for this purpose.67 Which one to use is up to the researcher, however Stock et al. notes that “the linear probability model provides the least sensible approximation to the nonlinear population regression function”68. Furthermore, Stock et al. notes that the estimates, probit and logit are similar and the choice of method should be based on which is easiest to use with your statistical software due to that they both produce similar results.69 In this study I have chosen to use the Probit regression model.

The Probit regression model with a single regressor70

\[
Pr \ (Y=1 \mid X) = \phi (\beta_0 + \beta_1 X)
\]

where

\( \phi \) is the cumulative standard normal distribution function,

\( \beta_1 \) is the change in the z-value associated with a unit change in X.

The probit regression with multiple regressors71

\[
Pr \ (Y=1 \mid X_1, X_2, \ldots, X_k) = \phi (\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k)
\]

It is suggested that the predicted probability \( Y=1 \), is calculated by computing the z-value,

\[
z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k
\]

---

68 JH Stock et al., p.436
69 JH Stock et al., p.436
70 JH Stock et al., p.429
71 JH Stock et al., p.432
and then looking the z-value up in the normal distributions table. \( \beta_1 \) is the change in the z-value associated with a unit change in \( X_1 \), holding all other \( X \)’s constant. The predicted probability of change in a regressor, \( X \), is then computed by computing the predicted probability for the initial value of the regressors, then computing the predicted probability for the new value of the regressors and finally taking their difference.

The logit regression model, which is not used here but produces similar results, uses the cumulative standard logistic distribution, denoted \( F \), instead of the cumulative standard normal distributions function \( \phi \).

\[
\Pr(Y=1 \mid X_1, X_2, \ldots, X_k) = F(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k)
= 1 / (1+e^{- (\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k)})
\]

The interpretation of the logit coefficients are conducted the same way as for the probit coefficients; i.e. by computing predicted probabilities and differences in them. However, t-statistics and confidence intervals are used to estimate the maximum probability.

### 3.5 Hypotheses

#### 3.5.1 Hypothesis 1:

The first hypothesis is to examine whether or not there is an effect of acquired tertiary education on risk aversion.

\( H_0: \) There is no effect of acquired tertiary education on risk aversion

\( H_1: \) There is an effect of acquired tertiary education on risk aversion

#### 3.5.2 Hypothesis 2:

The second hypothesis is to examine whether or not tertiary education has an effect on the managers ability contravene the algorithm.

---

72 JH Stock et al., p.434

73 JH Stock et al., p.434
There is no effect of acquired tertiary education on managers’ ability to contravene the algorithm.

There is an effect of acquired tertiary education on managers’ ability to contravene the algorithm.

**3.5.3 Hypothesis 3:**
The third hypothesis is to examine whether or not tertiary education reduces the risk of credit loss, so called bad business.

There is no effect of acquired tertiary education on the non-occurrence of bad business

There is an effect of acquired tertiary education on the non-occurrence of bad business

**3.5.4 Hypothesis 4:**
The fourth hypothesis is to examine whether or not the ability to contravene the algorithm reduces the risk of bad business.

There is no effect of the inability to contravene the algorithm on the occurrence of bad business

There is an effect of the inability to contravene the algorithm on the occurrence of bad business

**3.5.5 Hypothesis 5:**
The fifth hypothesis is to examine whether or not there is an effect of acquired tertiary education on Basel knowledge.

There is no effect of acquired tertiary education on Basel knowledge

There is an effect of acquired tertiary education on Basel knowledge

**3.6 Comments on Research Design**
There is a possibility that many of the participants lack tertiary education, due to age, but also due to that it is not a prerequisite in order to get a job as a credit
manager. Yet these people may still be very risk-averse for other reasons, which will be taken into consideration when conducting the analysis. Also due to the lack of participation from the four major banks in Sweden, a comparison between types of credit institutes is no longer a current issue.

3.7 Reliability and Reproducibility

Reproducibility of the study is possible as the empirical part of this thesis consists of data from a survey questionnaire. However, some doubts may arise concerning the reliability of the study due to the number of respondents. It should once again be noted that the study focuses on a small group of credit managers in Sweden that concentrate upon the unsecured loans market.

In previous research, such as the study by Jacobson and Roszbach\textsuperscript{74}, a lending institution has provided the dataset and the authors have focused on the loans, consumers and the default rate. This study however focuses on the credit managers and they make up the dataset.

Furthermore, regarding the subject of truthfulness in respondents; one cannot exclude a respondent’s reason for answering in a certain way. Regardless of the answers by the respondent we should regard the as true and sincere. The assumption that the answers are honest allows consideration of why they are presented as such. Also, it must be recognized that workplaces affect the respondents answers and also the refusal to participate in the study; perhaps not wanting their business to seem inferior to other credit institutes.

\textsuperscript{74} T Jacobson et al., p.617
4 Empirical Results and Discussion

This section depicts the results of the empirical study and a discussion of the results.

4.1 General Analysis

4.1.1 Hypothesis 1
The first hypothesis is to examine whether or not there is an effect of acquired tertiary education on risk aversion. Risk aversion is measured by the following variables; Basel knowledge, Parameters, Contravene Algorithm, Mandatory and Loans. The table below contains the mean, standard deviation and the most extreme observations for every variable we included in the regression analysis including the dependent binary variable. The variable Algorithm was omitted as all of the respondents reported to follow an algorithm in their assessment of the customer.

Table 2: Descriptive Statistics of the Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tertiary</td>
<td>30</td>
<td>0.3666667</td>
<td>0.4901325</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Basel knowledge</td>
<td>30</td>
<td>0.5333333</td>
<td>0.5074163</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Parameters</td>
<td>30</td>
<td>5.6</td>
<td>3.838103</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Contravene Algorithm</td>
<td>30</td>
<td>0.6333333</td>
<td>0.4901325</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Mandatory</td>
<td>30</td>
<td>0.4333333</td>
<td>0.5040069</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Loans</td>
<td>29</td>
<td>1.689655</td>
<td>1.038662</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>
In the following analysis of the regression result the alpha level was set to 0.05. If the p-value related with the z-test was less than the chosen alpha level, the null hypothesis would be rejected and for p-values more than the chosen alpha level, the null hypothesis would fail to be rejected. The results in figures can be found in Appendix C – Regression Results, and the do-file used can be found in Appendix B – Do-file.

**Basel Knowledge** - The z-test for the variable Basel knowledge is (-0.2705265/0.8892915) = -0.30 with a related p-value of 0.761. Setting the alpha level to 0.05, the null hypothesis would fail to be rejected and the conclusion that the regression coefficient for Basel knowledge has given Parameters, Contravene Algorithm, Mandatory and Loans are in the model not been found to be statistically different from zero.

**Parameters** - The z-test for the variable Parameters is 0.99 with a related p-value of 0.323. Setting the alpha level to 0.05, the null hypothesis would fail to be rejected and the conclusion that the regression coefficient for Parameters has given Basel knowledge, Contravene Algorithm, Mandatory and Loans are in the model not been found to be statistically different from zero.

**Contravene Algorithm** - The z-test for the variable Contravene Algorithm is 1.19 with a related p-value of 0.235. Setting the alpha level to 0.05, the null hypothesis would fail to be rejected and the conclusion that the regression coefficient for Contravene Algorithm given Basel knowledge, Parameters, Mandatory and Loans are in the model has not been found to be statistically different from zero.

**Mandatory** - The z-test for the variable Mandatory is 0.82 with a related p-value of 0.412. Setting the alpha level to 0.05, the null hypothesis would fail to be rejected and the conclusion that the regression coefficient for Mandatory given Basel knowledge, Parameters, Contravene Algorithm and Loans are in the model has not been found to be statistically different from zero.

**Loans** - The z-test for the variable Loans is 0.19 with a related p-value of 0.912. Setting the alpha level to 0.05, the null hypothesis would fail to be rejected and
the conclusion that the regression coefficient for Loans given Basel knowledge, Parameters, Contravene Algorithm and Mandatory are in the model has not been found to be statistically different from zero.

\_Cons - The z-test for the constant, \_cons, is \((-0.0603566 / 0.5326579) = 0.19\) with a related p-value of 0.910. Setting the alpha level to 0.05, the null hypothesis would fail to be rejected and the conclusion that \_cons given Basel knowledge, Parameters, Contravene Algorithm, Mandatory and Loans are in the model and evaluated at zero has not been found to be statistically different from zero.

An F-test was made for this regression. The following values were calculated in Stata using the values of the first credit manager in the dataset:

\[
\text{\_cons} + (\text{Basel knowledge} \times 1) + (\text{Parameters} \times 6) + (\text{Contravene Algorithm} \times 1) + (\text{Mandatory} \times 1) + (\text{Loans} \times 1)
\]

\[
(-0.0603566) + (-0.2705265 \times 1) + (0.120082 \times 6) + (-1.241966 \times 1) + (-0.6320837 \times 1) + (0.0594717 \times 1) = -1.4249691
\]

\[
F (-1.4249691) = 0.07708307 \text{ which is our predicted probability}
\]

Hence we cannot reject the null hypothesis, \(H_0: \text{There is no effect of acquired tertiary education on risk aversion}\), on a 95% significance level. The cause for this may be that only 11 out of 30 respondents had acquired tertiary education. If using a larger sample it would perhaps be easier to determine the effects of tertiary education on risk aversion. This sample does not confirm the previous findings of Summers et al. that showed that predictions of creditworthiness were best made by those with a tertiary education; i.e. lecturers and students.\textsuperscript{75}

\textsuperscript{75} B Summers et al., pp. 237-258
4.1.2 Hypothesis 2

The z-test for the variable Contravene Algorithm is \((-0.7478253/0.4891652) = -1.53\) with a related p-value of 0.126. Setting the alpha level to 0.05, the null hypothesis would fail to be rejected and the conclusion that the regression coefficient for Contravene Algorithm has not been found to be statistically different from zero.

F-test, constructed as earlier:

\((0.1141853) + (-0.7478253*1) = -0.63364\)

\(F(-0.63364) = 0.26315789\) which is our predicted probability

As mentioned, the null hypothesis, \(H_0: \text{There is no effect of acquired tertiary education on managers’ ability to go against the algorithm}\), cannot be rejected on a 95% significance level. This phenomenon is perhaps rather linked to the institutes’ internal regulations, than tertiary education and the ability of the manager.

4.1.3 Hypothesis 3

The z-test for the variable Not having bad business is \((-0.5882741/0.6874528) = -0.86\) with a related p-value of 0.392. Setting the alpha level to 0.05, the null hypothesis would fail to be rejected and the conclusion that the regression coefficient for Not having bad business has not been found to be statistically different from zero.

F-test, constructed as earlier:

\((-0.2533471) + (-0.5882741*0) = -0.2533471\)

\(F(-0.2533471) = 0.4\) which is our predicted probability
Again, the null hypothesis, $H_0$: There is no effect of acquired tertiary education on the non-occurrence of bad business, cannot be rejected on a 95% significance level. It must be noted that 50% of the respondents answered that they were unaware of whether they had any bad business or not. A third, 10 out of 30 respondents, admitted that they have had bad business and only a sixth, 5 out of 30 respondents, denied having any bad business. Hence acquired tertiary education does not mean a reduction in the occurrence of bad business.

### 4.2 Loan granting Analysis

#### 4.2.1 Hypothesis 4

The z-test for the variable Contravene Algorithm is $(-1.281552 / 0.6088931) = -2.10$ with a related p-value of 0.035. Setting the alpha level to 0.05, the null hypothesis would be rejected and the conclusion that the regression coefficient for Contravene Algorithm has been found to be statistically different from zero.

F-test, constructed as earlier:

$$(5.99 \times 10^{-17}) + (-1.281552 \times 1) = -1.281552$$

$$F(-1.281552) = 0.09999992$$ which is our predicted probability

The null hypothesis, $H_0$: There is no effect the inability to contravene the algorithm on the occurrence of bad business, is in this case rejected on a 95% significance level. This means that there may be an effect of the inability to contravene an algorithm on the occurrence of bad business. Not allowing credit managers to contravene algorithms may increase the occurrence of default. This concurs with the conclusion drawn by Jorion; that “formal risk management models cannot substitute judgment” and that the financial crisis in itself has made risk management more important.  

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76 P Jorion, p. 932
77 P Jorion, p. 932
4.3 Basel Knowledge Analysis

4.3.1 Hypothesis 5
The z-test for the variable Basel knowledge is (-0.6744897 / 0.4777528) = -1.41 with a related p-value of 0.158. Setting the alpha level to 0.05, the null hypothesis would be rejected and the conclusion that the regression coefficient for Basel knowledge has been found to be statistically different from zero.

F-test, constructed as earlier:

\[(5.99e^{-17}) + (-0.6744897\times1) = -0.6744897\]
\[F(-0.6744897) = 0.25000002\] which is our predicted probability

We can reject the null hypothesis, \(H_0: \text{There is no effect of acquired tertiary education on Basel knowledge,}\) on a 95% significance level. Hence there may be an effect of acquired tertiary education on Basel knowledge. However implementations of Basel regulations vary across credit institutes due to that banks are not told to use a specific model but instead a formula that considers Value-at-Risk, VaR, and a multiplication factor that is raised if many back testing exceptions occur in a quarter as mentioned by Hermsen.\(^{78}\)

In a study made by Wahlström it was noted that not that many understand Basel II.\(^{79}\) Hence, acquired tertiary education may help in understanding the complex directive that is Basel II and its implications on a credit managers’ daily work. The questions posed in the survey regarding whether or not the manager felt he or she understood the Basel directive and if he or she understood it to the extent that it was relevant for their work could be tricky to interpret. A credit manager may feel that he or she understands the Basel directive fully but the answer is in itself quite abstract. 13 out of 30 respondents in the survey reported that they did not understand the Basel directive, and only one reported that they understood the

\(^{78}\) O Hermsen, p 29-40
\(^{79}\) G Wahlström, p.61
directive fully. In the same survey 14 respondents reported that they did not understand the Basel directive in the extent that it was relevant for their work and only two respondents reported that they understood it fully in the same context. This concurs with the study by Wahlström. It seems as if the complexity of the Basel directive does not reach the credit managers. Perhaps education is the answer. But most importantly banks that are by law required to inform their employees should take a step in further trying to reach out to their employees.

5 Summary and Conclusions

This section depicts a summary and conclusions of the thesis.

5.1 Findings and Implications

The goal of this study was to answer the question of how acquired or lack of tertiary education and knowledge of the Basel accord among credit managers working in the unsecured loans market in Sweden affects their attitudes on risk or rather their risk-aversion. The results showed that we could not reject the null hypothesis, \( H_0: \) There is no effect of acquired tertiary education on risk aversion. This may be due to our sample size but also due to that only 11 out of 30 respondents had acquired tertiary education.

Further, it showed no obvious effect of tertiary education on managers’ ability to contravene the algorithm or of the effects of acquired tertiary education on the non-occurrence of default. This implies that a managers’ ability to contravene the algorithm, a privilege or rather a sign that the credit institute trusts and wishes to use the managers ability to act when models fail, is not linked to tertiary education as suspected. This phenomenon is perhaps rather linked to the credit institutes’ internal regulations, than tertiary education and the ability of the credit manager. Regarding the effect of acquired tertiary education on the non-occurrence of
default, the null hypothesis could not be rejected. An explanation of the result was the low number of respondents that denied having any bad business. However a large number, 50%, of the respondents, reported that they were unaware of having bad business. This implies that banks and credit institutes should focus on giving feedback to their credit managers on the matter in order to find ways to reduce defaults.

The empirical study showed that there might be an effect of the inability to contravene the algorithm on the occurrence of ‘bad business’, default, and that there may be an effect of acquired tertiary education on Basel knowledge. This means that there may be an effect of the inability to contravene an algorithm on the occurrence of bad business. Not allowing credit managers to contravene algorithms may increase the occurrence of default. Risk models are not perfect, and having a credit manager that can reduce the number of defaults would reduce risk for the credit institute.

Finally, the results showed that there might be an effect of acquired tertiary education on Basel knowledge. However, this result is bittersweet. On one hand it proves that tertiary education is a great advantage in order to understand complex directives, but on the other hand the data showed that 13 out of 30 respondents felt they did not understand the Basel directive. The results imply that banks, credit institutes and regulators should try to get up to par for what the market requires; a stronger understanding of the Basel directive and regulations.

5.2 Limitations of the Study

The main limitation of the study was the sample size in the empirical study. Even though that there are not that many that mainly work in the unsecured loans market in Sweden, a greater participation would have given a stronger validation of the study.
5.3 Suggestions for Future Research

This study was conducted on the Swedish market for unsecured loans, and a suggestion for further research would be to conduct the study on a larger geographical scale, perhaps within the European Union due to the Basel directive. Comparisons could be conducted on national levels to see how well the implementation of the directive has been received, and if any country has distinguished itself from others.

5.4 Concluding Remarks

In short, the results were not that straightforward. Using the collected data, acquired tertiary education had no greater effect on the chosen independent variables apart from Basel knowledge. Results showed however that not allowing credit managers to contravene algorithms may increase the occurrence of default, which leads to think that banks and credit institutes should lean more on the ability of the credit managers in combination with their risk models. One is not good without the other.
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B Summers, T Williamson, D Read, ‘Does Method of Acquisition affect the quality of expert judgment? A comparison of education with on-the-job learning,


Appendices

Appendix A – Tables: Descriptive Statistics

Table 1: List of Independent Variables

<table>
<thead>
<tr>
<th>X</th>
<th>Name</th>
<th>Variable type</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Parameters</td>
<td>Ordinal</td>
<td>How many parameters are taken into account when granting a loan. This variable will also be turned into a dummy variable in order to see if the manager takes more than one parameter into consideration or does not make a manual credit assessment at all.</td>
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<td>Algorithm</td>
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<td>If the manager simply follows an algorithm or not.</td>
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<td>3</td>
<td>Loans</td>
<td>Dummy</td>
<td>If the managers deals with several types of loans, or just unsecured. The variable takes on the value 1 if the manager deals with more than one type of loan and the value 0 if not.</td>
</tr>
<tr>
<td>4</td>
<td>Contravene Algorithm</td>
<td>Dummy</td>
<td>If the manager can go against the algorithm or not. If yes, the variable takes on the value 1, if not the variable takes on the value 0.</td>
</tr>
<tr>
<td>5</td>
<td>Basel knowledge</td>
<td>Dummy</td>
<td>If the manager has any knowledge of Basel regulations or not</td>
</tr>
<tr>
<td>6</td>
<td>Mandatory Information</td>
<td>Categorical</td>
<td>If the information on Basel was mandatory or not, or if they do not know. The variable is generated into three different variables who, similar to dummy variables, cannot coexist.</td>
</tr>
<tr>
<td>7</td>
<td>Bad Business/Default</td>
<td>Categorical</td>
<td>If the manager has had any bad business or not, or does not know.</td>
</tr>
<tr>
<td>8</td>
<td>Institute</td>
<td>Categorical</td>
<td>What type of institute the manager works at</td>
</tr>
</tbody>
</table>
Table 2: Descriptive Statistics of the Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tertiary</td>
<td>30</td>
<td>0.3666667</td>
<td>0.4901325</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Basel knowledge</td>
<td>30</td>
<td>0.5333333</td>
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<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Parameters</td>
<td>30</td>
<td>5.6</td>
<td>3.838103</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Contravene Algorithm</td>
<td>30</td>
<td>0.6333333</td>
<td>0.4901325</td>
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<td>1</td>
</tr>
<tr>
<td>Mandatory</td>
<td>30</td>
<td>0.4333333</td>
<td>0.5040069</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Loans</td>
<td>29</td>
<td>1.689655</td>
<td>1.038662</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 3: Descriptive statistics of the survey

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>30</td>
<td>2.1</td>
<td>1.213431</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Employment</td>
<td>20</td>
<td>5.703</td>
<td>8.579042</td>
<td>0.42</td>
<td>35</td>
</tr>
<tr>
<td>Parameters</td>
<td>30</td>
<td>5.6</td>
<td>3.838103</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Number of Default</td>
<td>5</td>
<td>13.4</td>
<td>13.0499</td>
<td>2</td>
<td>30</td>
</tr>
</tbody>
</table>

Mean age: 26-35 years old
Mean employment time: 5.7 years
Mean number of default of those who had defaults: 13.4

Appendix B – Do-file

/*
Finansiering
Supervisor: Asma Mobarek
Pari Ali
Data: Survey Credit managers education and basel knowledge
*/
// Working Directory Changed to local working directory.
cd "~/Users/paris/Desktop"

// Logging the progress, creates thesis.log recording our results
capture log close
log using "thesis.log", replace

// Increase memory to avoid dropping data.
set memory 300m

// Insheet out dataset, Excel saved to .csv and using the insheet function to create a .dta file.
isheet using thesis.ali.txt, delimit(";")
save thesis.dta, replace

/* Generate dummy for Kvinna, Man */
If Gender==1 if not Gender ==0 */
generate Kvinna==1 if gender=="Kvinna" & gender!=".".
replace Kvinna==0 if gender=="Kvinna" & gender!=".".
generate Man==1 if gender=="Man" & gender!=".".
replace Man==0 if gender=="Man" & gender!=".".

/* Generate categorical for Bank, Kreditmarknadsbolag, Sparbank */
If Institute==1 if not Institute ==0 */
generate Bank==1 if institute=="Bank" & institute!=".".
replace Bank==0 if institute=="Bank" & institute!=".".
generate Kreditmarknadsbolag==1 if institute=="Kreditmarknadsbolag" & institute!=".".
replace Kreditmarknadsbolag==0 if institute=="Kreditmarknadsbolag" & institute!=".".
generate Sparbank==1 if institute=="Sparbank" & institute!=".".
replace Sparbank==0 if institute=="Sparbank" & institute!=".".

/* Generate dummy for Ja, Nej */
If Algorithm==1 if not Algorithm ==0 */
generate Ja==1 if algorithm=="Ja" & algorithm!=".".
replace Ja==0 if algorithm=="Ja" & algorithm!=".".
generate Nej==1 if algorithm=="Nej" & algorithm!=".".
replace Nej==0 if algorithm=="Nej" & algorithm!=".".

/* Generate dummy for Ja, Nej */
If Contravene Algorithm==1 if not Contravene Algorithm ==0 */
generate Ja2==1 if contravenealgorithm=="Ja" & contravenealgorithm!=".".
replace Ja2==0 if contravenealgorithm=="Ja" & contravenealgorithm!=".".
generate Nej2==1 if contravenealgorithm=="Nej" & contravenealgorithm!=".".
replace Nej2==0 if contravenealgorithm=="Nej" & contravenealgorithm!=".".

/* Generate dummy for Tertiary Education */
If Education==1 if not Education ==0 */
generate Tertiary==1 if education=="yes" & education!=".".
replace Tertiary==0 if education=="yes" & education!=".".
generate notertiary==1 if education=="no" & education!=".".
replace notertiary=0 if education!="no" & education!="."

/*Generate categorical for Ja, Nej, Vet ej
If Bad Business=1 if not Bad Business =0 */
generate Ja3=1 if badbusiness =="Ja" & badbusiness!="."
replace Ja3=0 if badbusiness!="Ja" & badbusiness!="."
generate Nej3=1 if badbusiness =="Nej" & badbusiness!="."
replace Nej3=0 if badbusiness!="Nej" & badbusiness!="."
generate Vetej3=1 if badbusiness =="Vet ej" & badbusiness!="."
replace Vetej3=0 if badbusiness!="Vet ej" & badbusiness!="."

/*Generate dummy for Ja, Nej
If Basel knowledge =1 if not Basel knowledge =0 */
generate Ja4=1 if baselknowledge =="Ja" & baselknowledge!="."
replace Ja4=0 if baselknowledge!="Ja" & baselknowledge!="."
generate Nej4=1 if baselknowledge =="Nej" & baselknowledge!="."
replace Nej4=0 if baselknowledge!="Nej" & baselknowledge!="."

/*Generate categorical for Ja, Nej, Vet ej
If Mandatory=1 if not Mandatory =0 */
generate Ja5=1 if mandatory =="Ja" & mandatory!="."
replace Ja5=0 if mandatory!="Ja" & mandatory!="."
generate Nej5=1 if mandatory =="Nej" & mandatory!="."
replace Nej5=0 if mandatory!="Nej" & mandatory!="."
generate Vetej5=1 if mandatory =="Vet ej" & mandatory!="."
replace Vetej5=0 if mandatory!="Vet ej" & mandatory!="."

/*Generate dummy parameters
If Parameters>1 -->1 if Parameters<1 ---0 */
generate pmeters=1 if parameters>1 & parameters!="."
replace pmeters=0 if parameters<1 & parameters!=".

/*Descriptive Statistics*/
sum age
sum employment
sum parameters
sum numberbadbusiness

/*regression for Hypothesis 1
probit Tertiary Ja4 parameters Ja2 Ja5 loans
//Testing the Corrolation between potential variables to confirm
that there is no multicollinearity
corr Tertiary Ja2 Ja4 Ja5 parameters loans
/*regression for hypothesis 2
probit Tertiary Ja2
/*regression for hypothesis 3
probit Tertiary Nej3
/*regression for hypothesis 4
probit Nej2 Ja3
Regression for hypothesis 5

probit Tertiary Ja4

//close log
log close

Appendix C – Regression Results

Testing the Correlation between potential variables to confirm that there is no multicollinearity

. corr Tertiary Ja2 Ja4 Ja5 parameters loans
(obs=29)

<table>
<thead>
<tr>
<th></th>
<th>Tertiary</th>
<th>Ja2</th>
<th>Ja4</th>
<th>Ja5</th>
<th>parameters</th>
<th>loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tertiary</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ja2</td>
<td>-0.3300</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ja4</td>
<td>-0.3154</td>
<td>0.6670</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ja5</td>
<td>-0.3622</td>
<td>0.5617</td>
<td>0.7321</td>
<td>1.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>parameters</td>
<td>-0.1621</td>
<td>0.7839</td>
<td>0.6163</td>
<td>0.4256</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td>loans</td>
<td>-0.1348</td>
<td>0.5282</td>
<td>0.3148</td>
<td>0.2741</td>
<td>0.4053</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

Hypothesis 1:

. probit Tertiary Ja4 parameters Ja2 Ja5 loans

Iteration 0: log likelihood = -18.681388
Iteration 1: log likelihood = -15.853086
Iteration 2: log likelihood = -15.825816
Iteration 3: log likelihood = -15.825795
Iteration 4: log likelihood = -15.825795

Probit regression

Number of obs = 29
LR chi2(5) = 5.71
Prob > chi2 = 0.3353
Log likelihood = -15.825795
Pseudo R2 = 0.1529

|             | Coef.     | Std. Err. | z     | P>|z|  | 95% Conf. Interval |
|-------------|-----------|-----------|-------|------|------------------|
| Tertiary    |           |           |       |      |                  |
| Ja4         | -0.2705265| 0.8892915 | -0.30 | 0.761| -2.013506        | 1.472453 |
| parameters  | .120082   | .1215997  | 0.99  | 0.323| -0.1182491       | 0.3584132|
| Ja2         | -1.241966  | 1.045807  | -1.19 | 0.235| -3.291711        | .8077779 |
Ja5 |  -0.6320837    .7700025   -0.82  0.412    -2.141261    .8770935  
loans |   0.0594717    .3067733    0.19  0.846    -0.5417929    .6607363  
_cons |  -0.0603566    .5326579   -0.11  0.910    -1.104347    .9836337  

Hypothesis 2
.probit Tertiary Ja2
Iteration 0:   log likelihood =  -19.714733
Iteration 1:   log likelihood =  -18.530069
Iteration 2:   log likelihood =  -18.52945
Iteration 3:   log likelihood =  -18.52945

Probit regression                                      Number of obs   =        30
LR chi2(1)      =       2.37
Prob > chi2     =     0.1236
Log likelihood =  -18.52945                          Pseudo R2       =     0.0601

---------------------------------------------------------------------
Tertiary |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
---------------------------------------------------------------------
   Ja2 |  -0.7478253    .4891652   -1.53  0.126    -1.706572     .210921
   _cons |   0.1141853    .378785     0.30  0.763    -0.6282196    .8565902
---------------------------------------------------------------------

Hypothesis 3
.probit Tertiary Nej3
Iteration 0:   log likelihood =  -19.714733
Iteration 1:   log likelihood =  -19.328731
Iteration 2:   log likelihood =  -19.327304
Iteration 3:   log likelihood =  -19.327304

Probit regression                                      Number of obs   =        30
LR chi2(1)      =       0.77
Prob > chi2     =     0.3787
Log likelihood =  -19.327304                          Pseudo R2       =     0.0197

---------------------------------------------------------------------
Tertiary |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
---------------------------------------------------------------------
   Ja2 |  -0.7478253    .4891652   -1.53  0.126    -1.706572     .210921
   _cons |   0.1141853    .378785     0.30  0.763    -0.6282196    .8565902
---------------------------------------------------------------------
Hypothesis 4:
probit Nej2 Ja3

Iteration 0:  log likelihood = -19.714733
Iteration 1:  log likelihood = -17.14054
Iteration 2:  log likelihood = -17.113786
Iteration 3:  log likelihood = -17.113773
Iteration 4:  log likelihood = -17.113773

Probit regression  Number of obs = 30
LR chi2(1) = 5.20
Prob > chi2 = 0.0226
Log likelihood = -17.113773  Pseudo R2 = 0.1319

------------------------------------------------------------------------------
  Nej2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    Ja3 |  -1.281552   .6088931  -2.10  0.035    -2.47496   -.088143
  _cons  |   9.15e-17   .2802496     0.00   1.000    -.549279    .549279
------------------------------------------------------------------------------

Hypothesis 5:
probit Tertiary Ja4

Iteration 0:  log likelihood = -19.714733
Iteration 1:  log likelihood = -18.702396
Iteration 2:  log likelihood = -18.701423
Iteration 3:  log likelihood = -18.701423

Probit regression  Number of obs = 30
LR chi2(1) = 2.03
|         | Coef.  | Std. Err. |      z | P>|z|     | [95% Conf. Interval] |
|---------|--------|-----------|-------|---------|---------------------|
| Ja4     | -.6745 | .4778     | -1.41 | 0.158   | -1.610868          | .2618885            |
| _cons   | 5.99e-17| .3349     | 0.00  | 1.000   | -.656514           | .656514             |
Appendix D – The Survey

Survey on credit granting in Sweden in the market for unsecured loans

This survey will be a part of a Masters Thesis in Finance at Stockholm University during autumn 2011. Please answer truthfully and to as many questions possible. It is a total of 11 questions. Thank you in advance for your participation!

1. Are you
   Male
   Female

2. In what age group are you?
   ○ 18-25 (1)
   ○ 26-35 (2)
   ○ 36-45 (3)
   ○ 46-55 (4)
   ○ 56-65 (5)
   ○ 65- (6)

3. What type of education do you have?
   ○ Secondary School Leaving Certificate of Equivalent
   ○ Polytechnic Education
   ○ College/ University
   ○ Further education/Courses at workplace
   ○ Other:

4. What is your current employment status?
   ○ Permanent
   ○ Probationary
   ○ Full-time temporary position
Part-time temporary position
- Hourly employee
- Consultant Full-time
- Consultant employed by the hour

5. How long have you worked as a credit manager?
Respond in years.

____________

6. What type of loans do you deal with in your work?
☐ Unsecured loans
☐ Manufacturer loan
☐ Micro-loans / payday
☐ Car Loan
☐ Recreational loans
☐ Mortgage
☐ Other:_____________________

7. In what type of business do you work at?
☐ Bank
☐ Banking companies
☐ Credit institutions
☐ Credit market companies’
☐ Loan Market Association
☐ Savings Bank
☐ Other:_____________________

8. Do you follow an algorithm (i.e., computer software/model to assess risk) in your credit granting?
☐ Yes
☐ No

8.b. If you answer yes to previous question: Do you have the opportunity to go against the algorithm?
☐ Yes
☐ No
9. In a manual assessment of the client, which of these parameters do you take into account in your credit granting? If other, please specify.
   - □ Requested loan amount relative income
   - □ Age
   - □ Assessed/taxed income
   - □ Declared income
   - □ Marital status
   - □ Previous credits
   - □ Ownership of property
   - □ Number of loan requests within the year
   - □ Basel II
   - □ I perform no manual risk assessment
   - □ Other:____________

10. What is your relationship to Basel II?
   - ○ Have received information on my work /passed a course
   - ○ Have found out information on my own
   - ○ Lack information
   - ○ Other:

10.b. Was the course / information required?
   - ○ Yes
   - ○ No.
   - ○ Do not know

10.c. Do you feel that you understand the Basel Directive?
   - ○ Fully
   - ○ In large
   - ○ To some extent
   - ○ A bit
   - ○ Not at all
   - ○ Other:____________

10.d. Do you feel that you understand the Basel directive to the extent it is
relevant to your work?

- Fully
- In large part
- To some extent
- A bit
- Not at all
- Other:______________

11. Have any of your credit grantings led to a loss, a so-called bad business or default?

- Yes
- No
- Do not know

11.b. If you answered yes to the previous question, how many?

__________

**Appendix E – List of Banks and Credit Institutes Approached**

In Alphabetical Order:
Collector Credit
Danske Bank
Exchange Finans
Forex Bank
GE Money Bank
Handelsbanken – contacted, but actively chose not to participate
ICA Banken
IKANO bank
KonsumentKredit
Länsförsäkringar
Marginalen Bank
Nordax
Nordea
Nordnet
Resurs Bank
SalusAnsvar
SEB
SevenDay
Skandiabanken
Sparbanken Öresund
Svea Ekonomi
Swedbank
Wasa Kredit