Debt availability: The impact of repo-rate policy on household borrowing in Sweden.

A study of the relationship between the nominal interest rate and the availability of debt for Swedish households.

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Abstract

Households availability to accrue debt remains a major factor affecting both consumption and savings on an aggregate level. The financial crises at the end of 2007 echoed through the Atlantic ocean and hit the European economies, wrecking havoc as it went. Both nominal and real interest rates plummeted as centrals banks tried to conduct damage control in their respective regions. With some nominal interest rates falling past the zero lower bound and inflation hovering around zero percentage points. The recovery of American and European economies is still ongoing but this process is largely dependent on monetary and fiscal policies by central banks and governments. This thesis examines the relationship between the nominal interest rate and the availability of debt for households, using secondary cross sectional survey data and recorded financial data accumulated over a period of ten years collected every other year. This study limits itself to the country of Sweden and includes different independent variables separate of the nominal interest rate, accounting for some variation and internal effects of the data as well as theoretical considerations. In consensus with previous studies the relationship between the availability of household debt and the nominal interest rate is negative and statistically significant in nature. Indicating that the validity of the classical relationship between nominal interest rate, savings and consumption is affirmed.
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1:0 Introduction
In this section background, together with aim of the study, problem statement, scope of study and methodology will be presented.

1:1 Background and aim of study
Swedish households hold more debt now than ever before and changes in the real interest rate affect their ability to borrow (Almberg, Lusardi, Söderbegh and Vestman, 2006). The relation between the real interest rate and consumption is negative since low interest rate increase the opportunity cost of saving. This study aims to determine if the conditions set by financial institutions such as the central bank, actively determines availability of debt of households.

By determining the significance of how financial institutions policies affect household availability of debt, increases the possibility to observe how households appreciate and react to changes in nominal terms. Many studies investigate household’s ability to borrow in relation to the real interest and interest rates that affect debt accumulation and mortgagees, since those are the rates that facing households directly. Fewer examines the relation between household’s ability to borrow and the changes in the nominal interest rate. This study investigates if it is possible to observe this relationship in nominal terms as well.

1:2 Problem statement

• Debt availability: The impact of repo-rate policy on household borrowing in Sweden.

1:3 Scope of study
The scope of this study is limits itself to Sweden with relatively limited availability of data. The period studied contains data from every other year between 2002–2010. The regressions include more than 8000 observations which is a healthy sample size to provide a statistically significant result. The independent variables have been elected in the frame of permanent income hypothesis, intertemporal budget constraint and other theoretical considerations.
1:4 Methodology

In this study OLS is employed to estimate the regressions assumes a normal distribution and that at least five of the classical assumptions are valid, making it B.L.U.E (Studentmund, 2016, p 36–42). Cross-sectional regression analysis has been used to examine how repo rate policy impacts household’s ability to borrowing in Sweden. The majority of the data is of a secondary nature and collected from ESS (Europeansocialsurvey.org, 2018) every other year from 2002 until 2010. The dependent variable describes how Swedish household perceive the ability to borrow. The nominal interest rate, henceforth being used interchangeably with repo rate. The repo rate is the main variable in the study, broken up and into two different independent variables Repo¹ and Repo² in order to see the direction in changes of repo rate. The additional independent variables included is age, gender, education level and household total net income. All off which is adheres to theoretical considerations for the validity of the thesis.

2:0 Previous studies:

This section outlines the previous research done in relation to the elected research problem. Displaying the primary parts of those studies relevant to our own problem formulation and their respective conclusions, thus serving as reference points to our own research. It encompasses three different studies conducted involving the interest rates affect on household debt on a macro level, the driving force behind household debt and attitudes towards household debt and debt behaviour.

2:1 Household debt and the Macroeconomy

Guy Debelle, dwells into the easing of liquidity constraints of households and their relation to nominal interest rates and inflation. An important factor recognized by Debelle is that of sensitivity of household debt in relation to the nominal interest rate, even small changes in the interest rate would have wide implications when household debt resides at present levels. At the initiation of household mortgages it is assumed that the long term interest rate will be somewhat fixed, in terms of volatility (Debelle, 2004, p58). Fluctuations of nominal interest rates usually reflect the business cycle, which is then adjusted for inflation (referred to as built-in corrections) that will occur during the lifetime of a mortgage (Ibid). Movements in the nominal interest rate thus affects household’s debt accumulation and their ability to accrue new debt.
In the aftermath of the financial crisis, low interest rates have been implemented to stimulate the aggregate economy. These low interest rates have attracted more debt holders on the financial markets and increased the leverage of households throughout Europe. The benefits of variable interest rate is obvious in the current financial climate, but it also presents more risk. With increased debt at low nominal interest rates the sensitivity of households could be a potential “house of cards”, without the buffer that is required at higher interest rates.

2:2 Riksgälden- Forces behind household debt

In this paper, the Swedish national debt office Riksgälden discuss about the forces behind household debt. The paper was developed as a result of a common concern about increased household debt and the risks associated with it. Household debt has increased with 10% from year 2000 until 2010. The macroeconomic factors behind this is; structural changes that has contributed to the increase in household debt, Housing supply has not been able to meet the increased demand, the Swedish banking system has been able to provide large amounts of mortgages.

After the financial crises, the nominal interest rate has been low and even below zero in many developed economies, this has in turn affected the real interest rates and household debt. The relation between disposable income and housing prices is an important discussion, since the increase in disposable income has led to higher housing prices in Sweden. Housing mortgage loan is in most cases the vast cause of debt for households. The housing prices has experienced a larger increase than disposable income and therefore the aggregated household debt has also increased. Number of households in family oriented age is high right at present, these are significant amount of individuals with substantial physical capital that will be affected by movements in the interest rate (Riksgälden,2015, Drivkrafter bakom hushållens skuldsättning).
2:3 Attitudes toward household debt and debt behaviour- Swedish Financial Supervisory Agency

Swedish households have more debt today than ever before and it can be observed as a cultural shift in the attitude toward debt. This paper investigates the household debt as a share of disposable income, it combines attitude towards debt with registry data on household balance sheets. They also ask the respondents if they are uncomfortable with debt, and the parents relation and attitude toward debt. The result shows that attitude towards debt is significant and helps explain individual debt level. The respondents that states that they are uncomfortable with debt has a lower debt to income ratio. Parents attitude towards debt is also very important in the understanding of the children’s attitude, and the transmission can explain behaviour where income and demographics fail. The respondents in the study that are uncomfortable with debt have less education and lower disposable income but also lower levels of financial literacy. The regression result shows that being uncomfortable with debt is linked to debt levels. The result is related to life cycle consumption and intertemporal substitution and shows that lower interest rate is also likely to explain the increase in aggregate household debt.

The study shows the importance of attitude, social norms and individual choice about debt and help us understand the outcomes and that social norm can adjust to changes in economic fundamentals. Social norms and attitude are not changed over one night and the adjustments may occur with time lags. To affect economic outcomes policy makers could target social norms directly and foster the population since attitude can play an important role (Finansinspektionen, 2016, Attitudes towards debt and debt behaviour).

3:0 Theoretical Framework

This section aims to briefly explain and present the major theories relevant to our study. The theoretical framework consists of the permanent income hypothesis by Milton Friedman, the intertemporal budget constraint constructed by Irving Fischer and a short presentation of interest rate elasticity of saving. The latter explaining the relationship between consumption/saving and the movement in the interest rate. Lastly an alternative to the PIH by Singh and Drost, dealing with the problem of transitory income.
3:1 Permanent income hypothesis

A result of the neoclassical consumption model is the permanent income hypothesis (PIH), which uses an average value of income to determine how consumers or households respond to changes in income (Freidman, 1957, p20). Initially the definitions of both consumption and savings are crucial, since the choice is to either consume or save.

The focus of the theory is that of changes in income in relation to both consumption and savings, when the individual maximizes his/her utility. Changes in future income affects current consumption and hence current savings discounted, either in a positive or negative direction. However, changes in current income are perceived as “transitionary” and thus not affecting current consumption or saving in any considerable manner. I.e. a sudden increase in current income or windfall, should not increase current consumption by the windfalls amount (Freidman, 1957, p28). The individual's consumption and saving pattern will not be indifferent compared to prior the windfall, but not alter in such a way that causes spikes in consumption.

This implies that individuals tend to “smooth out” their current consumption in relation to what they perceive as permanent changes in income, rather than having wildly fluctuating consumption patterns dependent on current income. This essay will employ the theoretical implications of the PIH and its effect on household’s consumption and savings in relation to a discount rate.

3:2 Intertemporal budget constraint

The intertemporal budget constraint introduced by Irving Fischer, presents a dilemma between consumption, income and wealth in several periods. This can be summarized in the equation:

\[ C_{\text{today}} + C_{\text{future}}/(1+R) = F_{\text{today}} + Y_{\text{today}} + Y_{\text{future}}/(1+R) \]

Present day discounted consumption then must equal the individual's total wealth with discounted future income (Jones, 2014, p442). Consumption then, is not contingent on present day income, nor is future consumption contingent on future income. The individual is free to either save or consume according to his/her preferences and within the confines of his/her total income, both present and future.
This also relates to how that consumption or saving is financed, the individual can choose to consume more today by borrowing from future income. De facto affecting both consumption and saving in the future. Furthermore, since what is not spent on consumption is per definition saved, this constraint also applies to savings. By using a correct discount rate, the individual who prefers to save rather than consume today will adjust its consumption accordingly (Jones, 2014, p448). Meaning that changes is the discount rate will affect that individual's choice whether to consume or save in the present and future.

The relationship between consumption and the interest rate is thus negative in nature, since this would increase the opportunity cost of saving. This relationship between the interest rate, consumption and saving will be utilized throughout this study.

3:3 Interest rates effects on household savings and consumption

As previously discussed, whether consumption or saving takes place in the present or future it has a strong theoretical correlation to the prevailing interest rate. The elasticity of interest rates is difficult to measure, but the relevance to households when making decisions whether to consume or save is of utmost importance. Changes in the interest rate would either lower or raise the consumption or saving of a lifetime consumer. This directly affects level of debt households accumulate for purpose of consumption or saving. It is possible to discern two different effects of interest rate movements (Elmendorf, 1996, p5-6).

The substitution effect: An interest rate hike causes the consumer to save more and therefore consume less.

The income effect: An interest rate hike causes the consumer to save less and consume more.

Both of these effects are dependent on: demographics, the type of assets being affected, uncertainty of the future and unexpected economic phenomenon. More liquid assets typically held by young individuals is affected differently in relation to movements in the interest rates than physical capital (Elmendorf, 1996, p8-9). Which is usually held by middle aged or older individuals. Furthermore, whether the liquid assets are held by individuals or firms complicates the matter further. E.g. a bank account would be an asset to the individual holding the bank account, but a liability to the firm in which the bank account is held.
Depending on the conditions mentioned above, the elasticity of the interest rate will be somewhat different from household to household. However, since some of the conditions remain constant, such as type of asset (physical capital) and demographics. Movements in the interest rate should affect households in a similar way.

3:4 An alternative to the permanent income hypothesis: An international comparison

The assumptions made by Friedman regarding income and consumptions are theoretically valid and quite intuitive. However, measurements in the US of these components disagree with the anticipated results (Singh, Drost, 1971, p 330–332). The main problem lies with the difficulty of separating permanent from transitory changes in income. Furthermore, different groups in the labour market respond differently to different changes in income. This is especially visible in entrepreneurs and owners of small businesses, where the non-wage income is more common that transitory effect may be observed.

Singh and Drost investigate this by applying both the framework constructed by Friedman using OLS and their own version of NILES (Nonlinear Iterative Least Squares). The OLS results confirm the previous problems of the PIH, with unrealistic values of the marginal propensity to consume that are outside the interval of 0 <MPC < 1. Their own estimation seems to provide a better fit, although the pair recognize that there are several external factors that affect the results. These include institutional factors, mainly in Japan and Sweden that affects consumption and income in terms of government subsidies and tax regulation (Ibid).
4:0 Data
This section will comprehensively describe the data used, variables employed and how they operate.

4:1 Variable description

Brwmny:
Based on the survey conducted by ESS in Sweden, the question “If for some reason you were in serious financial difficulties and had to borrow money to make ends meet, how difficult or easy would that be?” was asked. The answer sheets consisted of 9 different alternatives, ranging from “very difficult” to “very easy” with “refusal”, with “no answer” and “don't know” included. All alternatives are graded from 1 to 9 (excluding 6) and are thus numeric in nature. To be more precise, 1 equals “very difficult”, 2 equals “quite difficult”, 3 equals “neither difficult nor easy”, 4 equals “quite easy” and 5 equals “very easy”. Values such as 7 through 9 captures “refusal”, “no answer” and “don’t know”, with the majority of the data being graded between 1 though 5. The data was collected from ESS and consists of data sets ranging from 2002 to 2010, with the survey being conducted every other year.

Repo¹:
The nominal interest rate set by the Swedish Riksbank, which is the rate at which banks may borrow and place SEK in the accounts available in the RIX system (Riksbanken, 2017). I.e. determining the short-term market rates for interbank lending and thus affecting the interest rate charged of households. It is thus the main tool used by the monetary authorities to control the amount of currency available in the economy. Since the available funds in the economy affect the interest rate charged by the business banks on households, this is highly relevant to the availability to borrow. The variable is dummy in nature, with a value equal to 1 if a statement by the Riksbank was issued within 14 days prior to the interview and 0 if this condition is not met. The intention of the variable is to act as a both a control variable (for Repo2) and measurement variable of the dependent variable. It does not take into account movements in the repo rate, only whether statements made by the Riksbank impact the dependent variable. The data stretches from 2002 to 2010 with the survey being conducted at nearly the same time every other year.
Repo²:
Much like the previous repo rate variable this entails a dummy function, where the variable is equal to 1 if the Riksbank issued a statement where the change in nominal interest rate is positive, equal to 0 if the change in nominal interest rate is null and equal to -1 if the change in nominal interest rate is negative. Regardless of the direction in the change in of interest rate, the values other than zero can only be taken if the interviews were conducted within a time period of 14 days after the statement being issued. Interviews conducted outside of this time period will automatically be equal to zero. This intent of this variable is to measure if the Riksbanks statements are related to the dependent variable in a lagged fashion. Depending on the change in repo rate, it is expected to affect the availability to borrow for households both positive and negative in nature. It also depends on the interest rate elasticity of the households in question. The data consists of different dates of changes in the repo rate, stretching from 2002 through 2010.

Age:
The age of the individual questioned is taken into consideration when determining the risk of issuing debt, since it is related to the individual's ability to pay back a loan, whether the individual is working or not working is related to age. In Sweden this boundary is generally set at 65 years of age. Apart from the dichotomy of workers and non-workers, it is important to consider individuals classified neither as workers or non workers. Individuals below the age of 18 are usually enrolled in some form of educational institution, i.e. either upper secondary education or tertiary education (Ec.europa.eu, 2018). Students rarely possess assets that enable them to borrow. The variable Age is designed to measure if the dependent variable is affected by the ith individual's age being below that of 65 and above that of 18 years. The variable is thus dummy in nature and is equal to 1 if the ith individual is below 65 years of age and above 18 years. It will be equal to 0 if the ith individual is either 65 years or above alternatively below 18 years of age.

Age²:
The relationship between age and the dependent variable is not necessarily assumed to be linear in nature, which is also implied by the age dummy variable. The ability to borrow is greatly affected by the sort of assets accumulated by the individual, which vary greatly with age (Debelle, 2004, p54). The theory section describes this is in more detail, but it should be noted that it is considered to be a nonlinear relationship between the dependent variable and the age of respondents. The variable Age² is simply the age of the respondent/observation squared individually.
Gender:
It is generally assumed that males accumulate more capital than females due to various reasons e.g. worked hours and family values, which affects their ability to borrow money in the financial markets. It would therefore be logical to assume some kind of relationship between gender and the dependent variable. The variable Gender is thus a dummy variable, being equal to 1 if the respondent is Male or equal to 0 if the respondent is Female.

Edulevel:
The level of education the ith individual possesses affect not only his/hers type of occupation and thus income, but also how that individual utilizes assets and debt. Higher education usually entails both higher income and a more proficient sense of utilizing assets versus liabilities within their own household. It also implies that households are attentive to how their assets are being affected in the long term. The variable is measured according to international education scale ISCED, which classifies education according to 6 different tiers. The 5th tier is classified as higher education (above secondary school), which will be the focus of this variable. The intent of this variable is to measure the effect of the level of education and its inherent effects on the dependent variable. The variable is dummy in nature where it is equal to 1 if the individual has tier 5 education/tertiary education and equal to 0 if the individual has education equal to tier 4/secondary education or below.

Hnetinc:
Assessing risk when issuing debt involves evaluating the household income of the loan recipient. It is thus important to include both active and passive income streams to the households when examining the dependent variable. This variable is defined as the estimated total net income of the household, rated as intervals ranging from less than 1 400 SEK to more than 94 000 SEK per month. The original data set contained two different variables measuring the same phenomenon, the variable used in this thesis is a configuration of the two using the original data. The variables were converted from their original intervals into a new one, with a narrower band covering the same values as before. This encompasses a total of 7 intervals with values between 1 and 7 depending on the estimated net household income. The intent of the variable is to measure the relationship between household income and the dependent variable.
5:0 Empirical analysis and regression result
In this section, the regression model, result, a detailed econometric discussion and analysis will be presented.

5:1 Regression model and Analysis
The model used in this study is cross sectional and look at each variable every other year from 2002–2010. The regression will be presented in four different models where the first one only includes one variable and the deponent variable, then two more independent variables at will be added per regression run. This to observe the effect on the dependent variable in stages.

\[
BRWMNY_i = \beta_0 + \beta_1 Repo_{1i} + \beta_2 Repo_{2i} + \beta_3 Age_i + \beta_4 Age_i^2 + \beta_5 Gender_i + \beta_6 Edulevel_i + \beta_7 Hnetinc_i + \epsilon_i
\]

Explanation of variables
Dependent variable
BRWMNY: The availability of debt

Independent variable
Repo_{1}: If Riksbanken makes the statement two weeks or less before the ith interview
Repo_{2}: If Riksbanken makes the statement two weeks or less after the ith interview
Age: Dummy variable if the ith individual is below 65 and above 18 or not
Age^2: Individual age squared
Gender: Male or female
Edulevel: Dummy variable, measured according to international education scale
Hnetinc: Household total net income
\(\epsilon\): Error term
The focus of this study is the impact of nominal interest rate policy on household ability to accrue debt in Sweden. Therefore, main focus is on the variable Repo\textsuperscript{1} and Repo\textsuperscript{2} and the other variables are used as control variables, justified primarily by theoretical considerations to test the relationship between the dependent and independent variables. It is important to bear in mind that other external occurrences can affect the study, i.e. the financial crisis of 2008. Sweden was not immune to the financial crisis, but managed well in comparison to many other countries around the world.

Riksbanken responded with expansionary monetary policy to boost the economy and lowered the nominal interest rate, in order for households and firms to have more currency available for consumption, also meaning lower mortgage payments. This is relevant to our research problem considering how changes in the nominal interest rate affect households ability to borrow (Svante Öberg. 2009).

(Data from Riksbanken. 2017)
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
<th>Expected outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRWMNY</td>
<td>The availability to debt</td>
<td>European Social Survey</td>
<td></td>
</tr>
<tr>
<td>Independent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repo¹</td>
<td>If Riksbanken makes the statement two weeks or less before the interview</td>
<td>Riksbanken</td>
<td>+ -</td>
</tr>
<tr>
<td>Repo²</td>
<td>If Riksbanken makes the statement two weeks or less after the interview</td>
<td>Riksbanken</td>
<td>+ -</td>
</tr>
<tr>
<td>Age</td>
<td>Dummy variable if the ith individual is above 65 or not</td>
<td>European Social Survey</td>
<td>+</td>
</tr>
<tr>
<td>Age²</td>
<td>Individual age squared</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>Gender</td>
<td>Male or female</td>
<td>European Social Survey</td>
<td>+</td>
</tr>
<tr>
<td>Edulevel</td>
<td>Dummy variable, measured according to international education scale</td>
<td>European Social Survey</td>
<td>+</td>
</tr>
<tr>
<td>Hnetinc</td>
<td>Household total income</td>
<td>European Social Survey</td>
<td>+</td>
</tr>
</tbody>
</table>
Regression Result

**Dependent variable:** Brwmny: The availability of debt

<table>
<thead>
<tr>
<th>Models:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent variables</strong></td>
<td>Estimated coefficient</td>
<td>Estimated coefficient</td>
<td>Estimated coefficient</td>
<td>Estimated coefficient</td>
</tr>
<tr>
<td>Constant</td>
<td>3,684101 (0,0161933)</td>
<td>3,502493 (0,0282033)</td>
<td>3,216689 (0,0474492)</td>
<td>2,795753 (0,0556778)</td>
</tr>
<tr>
<td>Repo¹</td>
<td>-0,0095583 (0,0255513)</td>
<td>0,0046431 (0,0257173)</td>
<td>-0,0015127 (0,0245968)</td>
<td>0,0002096 (0,0254772)</td>
</tr>
<tr>
<td>Repo²</td>
<td>0,0766921 (0,0331274)</td>
<td>0,0736785 (0,0329622)</td>
<td>0,0650632 (0,0325691)</td>
<td>0,046**</td>
</tr>
<tr>
<td>Age</td>
<td>0,2255157 (0,0294331)</td>
<td>0,3256388 (0,0354639)</td>
<td>0,1493746 (0,0384736)</td>
<td>0,000***</td>
</tr>
<tr>
<td>Age²</td>
<td>0,0000431 (8,17e-06)</td>
<td>0,0000399 (8,57e-06)</td>
<td>0,000***</td>
<td>0,000***</td>
</tr>
<tr>
<td>Gender</td>
<td>0,207381 (0,0248663)</td>
<td>0,1772537 (0,0249787)</td>
<td>0,000***</td>
<td>0,000***</td>
</tr>
<tr>
<td>Edulevel</td>
<td>0,1399396 (0,0293606)</td>
<td>0,1315619 (0,007427)</td>
<td>0,000***</td>
<td>0,000***</td>
</tr>
<tr>
<td>Hnetinc</td>
<td>0,1399396 (0,0293606)</td>
<td>0,1315619 (0,007427)</td>
<td>0,000***</td>
<td>0,000***</td>
</tr>
</tbody>
</table>

R² | 0,0603 |
Adjusted R² | 0,0595 |

N= 8499

Standard error in parenthesis

*** level of significance at 1%
** level of significance at 5%
* level of significance at 10%
Above is the result from the regressions, the p-values are in italic and standard error in parenthesis. Descriptive statistics, correlation matrix and VIF-test can be found in the appendix. In total four regressions have been run with all of the coefficients except Repo\textsuperscript{1} and Repo\textsuperscript{2} has a significance level equal to 1\% in all models. Repo\textsuperscript{1} does not seem to have a significant effect on the ability to borrow, with a significance level at 90\% in the final regression. Repo\textsuperscript{2} has a significance level of 5\% in all of the regressions where the coefficient is included, but the p-value increases in each regression. All of the other coefficients are decreasing in every regression but the p-values stays at 0,000. The result states that a statement from Riksbanken both affect the ability to borrow and also strongly indicate the direction this effect occurs. The model does not have a good fit due to the low value of adjusted $R^2$, more econometric details about the regression result will be presented in the next section.

5:2 Differentiation between variables

The regression was conducted in four different phases, initially only containing the variable repo1 and the dependent variable. Then gradually introducing the other independent variables two at a time, gradually altering the makeup of the regression while observing how it responds.

The focal point of this essay is to measure the effect of the repo rate on the availability of debt for households. The result of the regression shows that the relationship between the repo rate and the dependent variable is indeed statistically significant, after the fact that the Riksbank has made a statement. I.e. the effect observed is not only that a statement of the Riksbank affects the availability to borrow, but also that the direction of the statement (being positive or negative) affects the dependent variable. It is noted, should the Riksbank issue a statement where the repo rate remains unchanged, would not however affect the dependent variable in anyway. Meaning it is only distinguished between an increase and a decrease of the repo rates affect, holding the repo rate constant is not expected to affect the dependent variable.

Likewise, the insignificance of the first repo rate variable repo1 is indicative of the true relationship between the repo rate and the availability of debt. The underlying theory suggests that the effect of nominal interest rate will translate into the real interest rate in a lagged fashion, et.al not exhibiting any instantaneous effect. Nor was the repo rate expected to show a reverse relationship between it and the dependent variable. Although, finding a statistically significant relationship between repo1 and the dependent variable would have posed a more fascinating result.
Besides the two primary repo rate variables, the variables of Age, Age\(^2\), Gender, Edulevel and Hnetinc all produce statistically significant results. It was expected that these factors would be significant to some extent according to the underlying theory, however both the coefficients and their statistically significance are beyond what was initially expected.

The impact of Age appears to be both partially related to the dependent variable as well as Age\(^2\). The latter not being linear in nature was based on the fact that simply adding a dummy variable with the interval representing the “working age” of man, would not satisfy the models requirements. The results reflect this notion, et.al age not simply being reliant on a linear structure, in a sense: older does not mean better access to debt in all cases.

The overall difference between the variables Age and Age\(^2\) could at first seem impalpable, since they both measure the same phenomenon. However, the measure of age requires more than simply including those that is generally of the working age and those who are not. By including both the ages where man is commonly considered to be working and therefor earning and the age squared, the analysis absorb two different aspects of the age phenomenon which affect the households. The large differences in the coefficients are easily overstated, without considering the differences in how the variables are designed to work.

In terms of the signs of the different coefficients, the initial hypothesis appears to be accurate. Repo1 shifts from negative to positive as more variables are added together with fluctuating significance values. All other variables remain positive throughout the different regressions. The only unforeseen element is the sign stability of the variable Age2. It was expected that its coefficients sign would fluctuate somewhat during the regressions, this did not occur.
5:3 Econometric Discussion

Throughout the phase of adding independent variables to the regression tests of both multicollinearity and heteroscedasticity has been conducted. Only one of these two issues has shown any indication of being present in any of the regressions. Any and all tests for multicollinearity displayed values of <1.7 per independent variable, measured through Variance Inflation Factor (VIF).

Furthermore, a Wald chi-square test was conducted on Repo\(^2\) in order to magnify any dispute in terms of it being equal to zero in the window elected. The reasoning for only conducting an onesided test and excluding repo1, is mainly due to theoretical considerations; the effect of any changes in the repo rate ought to be the precursor of the dependent variable. Not occuring after the fact that the dependent variable has been determined. The results indicate that at a level of 5% significance the hypothesis of repo\(^2\) being equal to zero can be rejected. This also entails that the variable Repo\(^2\) is tested differently; comparing the two-week window against the remaining time. Meaning the variables ability to mesure within a strict time period becomes somewhat compromised.

To avoid sample bias, the sampling of the main data used in this essay has been modified to be representative for the country in question, as well as being representative for different groups present in that country. Neither quota sampling or substitution answers for non-respondent have been allowed to interfere with the data sampling (Europeansocialsurvey.org, 2018). The total sample extracted from each country in the source data has a minimum of 800–1500 observations, with the data set used containing five different rounds of the survey. I.e. with a rigorous sampling methodology and a large sample size eclipsing almost eight thousand five hundred observations, any issues regarding statistical power of the sample should be put to rest.

Several tests concerning the problem of heteroscedasticity was conducted including both White and BP tests, strongly indicating that homoscedasticity was not present in the regression. This has been corrected by the use of robust standard errors, which will be reported separately. The entirety of the regressions seems to indicate that one or more independent variables have been omitted producing a low explainability factor.
5:4 Linking the regression to the theory

The result shows a statically significant relation between repo rate and the availability of debt for households, after Riksbanken made a statement (Repo\textsuperscript{2}). This supports the intertemporal budget constraint that the relationship between interest rate and household debt are negative, since higher interest rate increase the opportunity cost of saving. Individuals may consume more today and borrow from the future. E.g. should Riksbanken make a statement that repo rate will decrease individuals will either save or consume more according to his/preferences, the regression show that the availability of debt increase when the repo rate decreases. Meaning that changes in the repo rate actually affect individual’s choice to consume or save both in the present and the future.

The study also found support in Permanent income hypothesis which states that changes in current income are “transitory” and does not affect current consumption and saving substantially (Freidman, 1957, p28). Lowering of the repo rate entails more funds available for consumption for households. The regression is statically significant and we can observe changes in the ability for debt, but the changes are very small and the coefficient is modest, meaning that households smooth their consumption according to the permanent income hypothesis. The regression result is also strongly supported by Singh and Drost previous studies that recognised several institutional factors in Sweden and Japan, that affect individual’s consumption behaviour and their income in terms of government subsidies and tax regulation. Due to these institutional factors changes in the independent variable are very small in relation to changes in the repo rate. We can also observe a substitution effect which causes consumers to save more and consume less when there is a hike in the interest rate.
6:0 Conclusions

From the results of the OLS regression it is possible to discern three different elements of significance. The first being that the nominal interest rate is indeed correlated to household’s ability to borrow, furthermore is that this effect appears to be lagged. I.e. after a nominal interest rate change, the appreciated ability to borrow is affected in the opposite direction of the movement in the nominal interest rate. Second, theoretical considerations in the form of variables accounting for internal factors are indeed important in explaining the movement in the dependent variable. Factors such as demographics, gender, income and education are strongly correlated with the household’s ability to borrow. This conforms to previous research within this area, affirming the factors contributing to the interest rate and household debt relationship. Third, the size of the coefficients reaffirms the implications of the permanent income hypothesis, i.e. individuals and households do not alter their lifetime consumption and savings pattern only due to transitory income changes. The impact of the repo rate variables are quite modest, yet unquestionably of statistical importance. One units change in the repo rate in either direction, results in a 0.065-unit change in the dependent variable. All of the other independent variables (all else held constant), results in less than 0.2-unit change in the dependent variable. This result confirms the previous studies ascertained by Guy Debelle and Douglas W Elmendorf, in that households are sensitive to changes in the nominal interest rate and even small changes would impact household’s availability to borrow.

This study invites for further research to be done on a more aggregated level, the data for several other European countries remains available from the source used here. Investigating whether the classical correlation exists beyond national borders on the European continent, both in the form of interest rates and exchange rates, presents other studies building on this thesis results.
References


7:1 Statistical Sources


Appendix

Descriptive Statistics

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<th>Maximum</th>
<th>Minimum</th>
<th>Std.Dev</th>
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N=8499

Vif-test

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Robust Standard Errors

| Repo¹    | 0,025432 |
| Repo²    | 0,0326004 |
| Age      | 0,0392235 |
| Age²     | 8,83e-06 |
| Gender   | 0,0250077 |
| Edulevl  | 0,0281907 |
| Hnetinc  | 0,007412 |

