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# Norwegian households' debt capacity

*An empirical analysis of Norwegian households' debt level, financial vulnerability and debt capacity*

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NORWEGIAN SCHOOL OF ECONOMICS

This thesis was written as a part of the Master of Science in Economics and Business Administration at NHH. Please note that neither the institution nor the examiners are responsible – through the approval of this thesis – for the theories and methods used, or results and conclusions drawn in this work.



## Abstract

We have conducted a descriptive and empirical analysis of the Norwegian household debt based on micro data for all Norwegian households. We identify the drivers behind the significant growth in debt levels over the last decade. We further assess the households' financial stability and vulnerability using financial ratios capturing their financial buffers and debt servicing ability. Our work builds on previous studies of the Norwegian households' debt, but include a more thorough analysis of their financial vulnerability as our stress tests decompose the households in segments by age, income and geographic region. We further identify the households' debt capacity, i.e. how much debt they can acquire before they are categorised as financially vulnerable.

Despite the significant growth in debt levels, we find low levels of financially vulnerable households, suggesting that Norwegian households can support even higher debt levels. In 2012, 2.2% of the total debt was identified as vulnerable with high likelihood of default. The stress tests did however reveal that the high debt levels make the households sensitive for increased interest rates in particular. Hence, suggesting that the government and the supervisory authorities should continue to monitor the households closely.

There is considerable debt capacity within the household sector according to our estimates. We find the households to have potential of doubling their debt from the 2012 levels before they are categorised as financially vulnerable. We do however find the households likely having the highest demand for debt to have the least free debt capacity, suggesting that we are unlikely to see full capacity utilization. This enhances the view that the Norwegian credit market for households are approaching a more mature stage with lower credit growth compared to the last ten years.



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## Acknowledgement

This master thesis is the result of the independent work concluding five years of study at Norwegian School of Economics. We have had the pleasure of collaborating with DNB Markets in the search of a relevant topic related to the prevailing economic conditions. DNB Markets and we identified the financial vulnerability and debt capacity of Norwegian households to be an interesting field of study meeting the objectives of both parties. There had been several years since the last stress test of Norwegian households and we were not aware of any previous work trying to estimate the debt capacity of a household. Hence, there was ample space and potential for new contributions in the debate of the financial vulnerability of the Norwegian household sector and to existing academic research. The space was however somewhat narrowed when the central bank of Norway published a stress test of the Norwegian households at the end of October, while we were still working on our thesis. We have used the analysis by the central bank to our advantage, both to validate our results and to enhance the knowledge of the household sector by conducting an even more thorough stress test than Norges Bank. With the extensive use of segments by age, income and geographic region, we argue that our approach is better suited to identify pockets of risk and debt capacity, which can easily be overlooked when studying the household sector on an aggregated level.

There is potential for masked asymmetries when studying households using aggregated data, as the distributions of debt, income and assets can be skewed across households. This makes micro data a required tool to get adequate results, and we would like to thank DNB Markets for ensuring us with register data for all Norwegian households from Statistics Norway and the collaboration throughout the thesis.

We would like to thank our supervisor Trond Døskeland for his contributions in terms of both academic advice, and his enthusiasm and support. We would also like to thank each other for the solid collaboration and strong friendship.

Norwegian School of Economics

Bergen, 16. December 2014

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# 1. Introduction

## 1.1 Background

There has been a growing interest for the Norwegian households' financial stability after the acceleration in the households' debt level seen over the last decade. Ever since the bank crisis in the late 1980's and early 1990's there has been high growth in Norwegian households' debt. The compounded annual growth rate between January 2000 and August 2014 was 9.4% (Statistics Norway, 2014a), significantly above the growth in both the gross domestic product and the households' disposable income (Statistics Norway, 2014b). The households' debt level is commonly measured relative to their disposable income. Both Norway and the other Nordic countries have experienced a substantially higher growth in debt than disposable income and this has resulted in a debt-to-disposable income ratio of close to 200% in Norway. This is not only the second highest in the Nordic region, but amongst the highest of the OECD countries (OECD, 2013). All else equal, higher debt levels leave the households more vulnerable to macroeconomic changes, such as increased unemployment rate, interest rate increases or drop in housing prices.

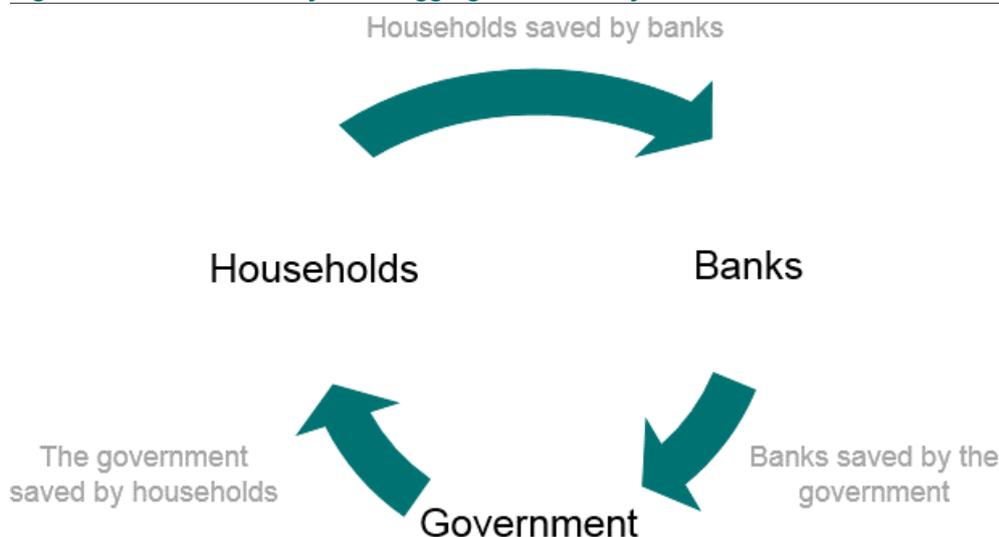
From the household's perspective, financial vulnerability is problematic as it may lead to an inability of servicing current liabilities. Inability of servicing current liabilities, such as interest expenses and debt repayments, forces the households to shift their saving-consumption pattern to a lower current consumption level. If the shock is substantial, the household may run into financial distress and ultimately default on their debt. If so, the lender could take control over the assets pledged as collateral for the loan, most often the dwelling, forcing the household to find a new, poorer housing substitute.

From a perspective where we take the aggregated economy's point of view, both banks and the government should be interested in monitoring the households' debt levels and their financial stability, not only the households themselves. An individual household will naturally be interested in a sustainable debt level where they comfortably can service their debt and still maintain their preferred level of consumption. However, if the economy heads towards a recession or the households face higher interest rates, they can find it difficult to service their debt. The households will be more sensitive to changes at high debt levels and even minor economic shocks can lead to significant shifts in the households' saving-consumption pattern. The banks, and other financial institutions issuing debt to households, would not necessarily

experience loan losses directly on lending to households as the loans in general are well collateralized (the majority is secured on dwellings), and households will reduce other expenditures rather than default on their debt.

A tightening of household consumption budgets will however pose a threat to the corporations, where ultimately some could go bankrupt or at least downsize. Corporate downsizing and bankruptcies will result in increased unemployment and thus directly affect the households' finances, which again increases the likelihood of loan losses for the banks. Corporate bankruptcies and a cyclical downturn are also likely to result in loan losses on the banks' corporate lending exposures. If the loan losses are large enough, some banks could head towards bankruptcy, which leads us to the next step in the circle: who will save the banks? After the financial crisis starting in 2008 the term "too big to fail" has been frequently used. The term relates to large banks where the consequences of a bankruptcy would be so grave for the economy that the government finds it more economically efficient to save the bank. However, if the government has to save a large number of banks it will be costly, and who will have to save the government? The answer is the households and the circle has ended as Figure 1 below illustrate, all households would eventually have to pay if some of the households take on too much debt, working through the channels explained above.

**Figure 1: Financial stability of the aggregated economy**



Source: (Døskeland, 2014)

There is an uneven distribution of debt among Norwegian households, where half of the households hold 95% of the total households' debt (Statistics Norway, 2014c). Analysing Norwegian households' debt dynamics and financial stability using aggregated data may not capture these asymmetries. Using a dataset on household level enables us to more precisely

identify the vulnerability of households with specific attributes and which households have the capacity of acquiring more debt.

## 1.2 The research questions

The objective of this master thesis is to identify the financial vulnerability of Norwegian households and their debt capacity, i.e. their potential of acquiring more debt without being categorised as financially distressed or vulnerable. The primary research question of this master thesis is:

***What is the debt capacity of Norwegian households, and who can acquire more debt?***

We intend to answer this primary research question by answering the following secondary research questions:

*Are Norwegian households financially vulnerable at current debt levels?*

*Which households can acquire more debt, and how much can they increase their debt level before they are characterised as financially vulnerable?*

## 1.3 Existing research

Following the growth in households' debt levels, the household debt has been subject to an extensive amount of research, and is currently one of the major concerns in the debate of the Norwegian macroeconomic development. Norges Bank, the central bank of Norway, holds the role of assuring the financial stability in Norway. With this mandate, they have taken the role as one of the leading institutions for research concerning Norwegian households' financial position. Old snap shots of the financial vulnerability of Norwegian households arguably have limited relevance in periods of significant growth and changes. Thus only the most recent reports are of relevance in terms of results, but the methods used in all the reports are however still relevant. As similar trends of high growth in debt levels are observable in several other Nordic countries, and there is a striking similarity across the Nordic region (Reiakvam & Solheim, 2013), central banks in these countries have also contributed with the development of transferable methods of assessing households' vulnerability. Lindquist (2012) estimates the households' debt capacity based solely on the financial margin, but we are not aware of other research estimating a household's debt capacity based on a combination of financial measures, capturing more than the debt servicing ability.

Similarly as Norges Bank, The Financial Supervisory Authority of Norway (FSA) has a mandate driving them to monitor the vulnerability of household debt, and in particular, the potential impact the vulnerability imposes on the financial system. This master thesis builds on earlier research from both Norges Bank, other central banks and the Norwegian FSA. The most central research will be presented when drawn upon.

## 1.4 The structure of the thesis

This master thesis consists of six chapters. Chapter 2 presents the relevant theory concerning household debt, including an introduction to the debt of Norwegian households. Chapter 3 introduces the reader to the dataset, motivates the research questions and provides a description of the methods used to measure a household's financial status.

Each of the two secondary research questions has been assigned a separate chapter. Chapter 4 addresses the financial status of Norwegian households by identifying vulnerable households and the robustness of the household sector through a stress test. In chapter 5, we identify which households that can take on more debt and the debt capacity of the Norwegian households. Chapter 6 is a conclusion where we answer the primary research question on the back of the two secondary research questions, and address the implications of our results.

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## 2. Theory – Household debt

*For households and individuals, debt is a means of moving future purchasing power and expected income to the present for consumption.*

*A person is in debt when he borrows funds (the principal) from another party against an agreement of repayment in a later period. In addition to the repayment of the principal, most borrowing agreements include payment of interest, as a compensation for the time value of money for the principal.*

### 2.1 Households' demand for credit– Consumption smoothing theory

It is common to explain the households' demand for credit using the frameworks of consumption smoothing theory. These theoretical frameworks separate consumption from income using saving and dissaving (i.e. debt financing). Central academic work in this context are the life cycle hypothesis by Franco Modigliani and the permanent income hypothesis by Milton Friedman. The primary intention of these theories is to explain and model consumption, and in general, they find that the consumer units prefer to smoothen their consumption over the life span. The income level does however vary over the life span, which implies that they will have to save or acquire debt to realize this smoothening. We can thus use the consumption theories to identify the households' demand for debt. We will not go into detail on the theories' consumption functions, as we do not have sufficient data to model or implement these features into our analysis, but rather focus on the conceptual frameworks and the implications they have for households' demand for debt.

#### 2.1.1 The life cycle hypothesis

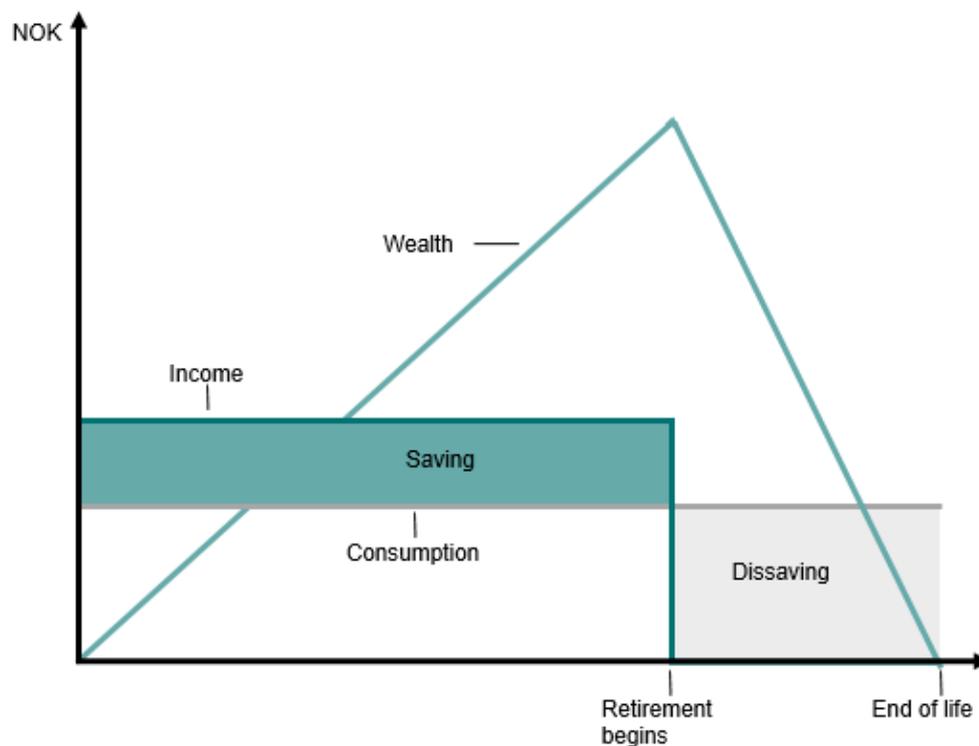
The life cycle hypothesis was first introduced by Franco Modigliani and Richard Brumberg in 1954, and builds on earlier work by Irving Fisher (Modigliani & Brumberg, 1954). Modigliani and Ando expanded the theory for the aggregated economy in 1957 and 1963, where they also included empirical tests (Ando & Modigliani, 1963).

Assuming utility maximisation and perfect capital markets, the life cycle hypothesis imply that the resources a consumer will allocate to consumption at any age will depend solely on its life span resources (Modigliani, 1986). In this context, life span resources are current wealth

and the present value of future income and other benefits. Supported by empirical analysis of budget data Modigliani and Brumberg (1954) claim the proportion of income saved is essentially independent of current income, and that systematic deviations in the savings rate from the normal level of the age group largely are explained by short-term fluctuations in income around the basic earnings capacity of the household.

The most basic version of the framework, assuming constant income until retirement (zero thereafter), zero interest rate and preferences for constant consumption over the life span, can illustrate some of the implications for household saving (and demand for debt). Modigliani (1986) illustrates the basic version with Figure 2. As the figure indicates, the individual know its future income (assuming perfect information) and can calculate the value of total income earned through its work active life, i.e. life span resources. Next, the individual derives which consumption level this yields over the entire life. Given the level of consumption, which in this case is constant, the individual derives how much it has to save every year during the years with income. The savings accumulate as wealth, which the individual draws upon in the period of retirement (dissaving).

**Figure 2: Simplified version of the life cycle hypothesis (no debt financing)**

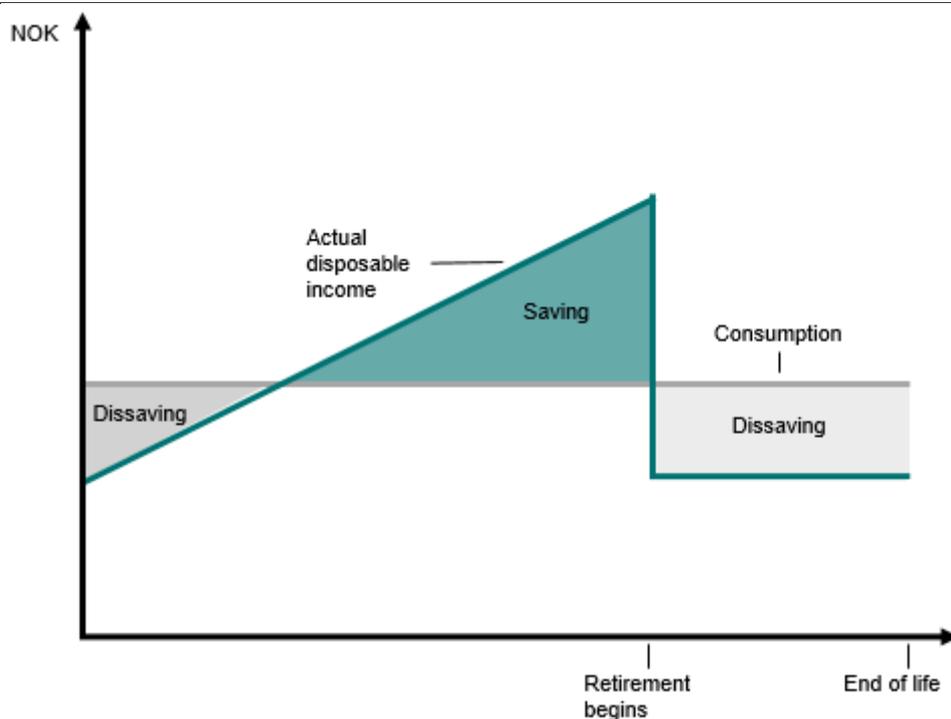


Source: (Modigliani, 1986)

The simplified version of the framework above illustrates how savings allow for smoothed consumption even in the period with zero income. Hence, consumption has been moved from

the current period to the future. In a more complex version, smoothed consumption is not necessarily equivalent to a constant consumption level and the hypothesis allows for variations and growth in consumption over the life span. More importantly, the simplified version does not include debt financing. As savings moved consumption from the current period to the future, debt moves consumption from the future period to the current period, the complete opposite dynamics. In this context, repayment of the principal in the future period can be interpreted as savings. Including debt financing in the framework results in a model that can explain households' demand for credit by age (see Figure 3).

**Figure 3: Simplified version of the life cycle hypothesis (including debt financing)**



Source: (Modigliani, 1986)

Figure 3 has some of the same features as the most basic framework and we recognise the constant consumption level, which have been derived from estimating the life span resources, which then is distributed across the expected lifetime (assuming preferences for constant consumption here as well). This version does however capture the real life situation where individuals and households experience low-income levels early in the life cycle, not only when they retire. In the figure, we find this as the period of dissaving at low age. The early stage is typically years with education, where the investment in education comes at the expense of work and the households experience lower income. Large investments in apartments and houses needed for housing consumption over the entire life also increases the need for funds early in life. When a period of dissaving comes before the households have had the chance to

accumulate savings, and the current income levels are below the smoothed consumption level, they acquire debt. Hence, the framework suggests that young households will have higher demand for credit compared to the mid-life households, which will be in “savings-mode”. In the mid-life period, the households have in general high income and are able to save, both to compensate for the earlier acquired debt and for retirement. The life cycle hypothesis has been empirically verified using both cross-sectional and time series data (Ando & Modigliani, 1963).

An implication of the identified cross-sectional relationship between consumption and income is that permanently higher income levels result in an improved income outlook and higher life span resources, which imply increased absolute saving in the saving-period (Modigliani & Brumberg, 1954). Another aspect of increased savings in the saving-period, due to the revised consumption plan, is higher demand for credit in the early dissaving period in order to support the higher consumption level. An extension of the argument is that households with higher life span resources and higher level of consumption over the life span will have higher demand for credit in absolute terms. A more detailed elaboration follows below as the permanent income hypothesis also discusses this aspect.

### 2.1.2 The permanent income hypothesis

Milton Friedman first presented the permanent income hypothesis in his book “A Theory of the Consumption Function” in 1957 (Friedman, 1957). The hypothesis states that an individual will use a given share of its permanent income, the expected income over the entire life, each year. The purpose is to smoothen consumption in years with extraordinary high or low income. In its most general form the permanent income hypothesis states a consumption function given by the three equations below:

- I.  $c_p = k(i, w, u)y_p$
- II.  $y = y_p + y_t$
- III.  $c = c_p + c_t$

In equation I to III,  $y$  and  $c$  are the current period’s income and consumption, respectively. The subscript  $p$  stands for permanent, while  $t$  stands for transitory. Hence, this period’s income and consumption is modelled as the sum of a permanent component and a transitory component. Friedman explains the transitory component to be perceived as an “accidental” or “chance” occurrence by the individual. As in Modigliani’s life cycle hypothesis, the persons

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or households are regarded as forward looking. In the permanent income hypothesis, the permanent income component,  $y_p$ , captures this feature. The permanent income component is derived from Friedman's concept permanent income. Permanent income reflects the factors an individual regards as determinants for its total wealth over its entire life. That is, its current wealth, the personal attributes of the individual, such as ability, education, personality, but also the economic activity aspect with all its future income. Hence, it is evident that Friedman's permanent income corresponds to Modigliani's life span resources.

According to equation I, the permanent consumption component, the most consistent part of a given period's consumption, is a function of permanent income. It is thus largely independent of current income (current income is only indirectly included in the estimated permanent income). This is the same conclusion as in the life cycle hypothesis, and in general, the two theories have much in common. The underlying assumptions mainly deviate where the permanent income hypothesis assumes that life is indefinitely long (Modigliani, 1986). Equation I defines that the relationship between permanent income and permanent consumption is dependent on  $i$  – the interest rates for borrowing and lending,  $w$  – the ratio of non-human wealth to income and  $u$  – the individuals preferences for consumption relative to increased wealth. For the latter variable, Friedman mentions the numbers of people in a household and their characteristics, such as age, as particularly important. We thus find that age plays a less dominant role compared to the life cycle hypothesis. The main implications for demand for debt from the permanent income hypothesis are the clear relationship between permanent income and permanent consumption (Friedman does however emphasise that it affected by more than just age) and Friedman's reflections around the determinants of permanent income.

The observant reader would have noticed that the three equations would be of limited use in empirical validation or application as there are more unknowns than equations. While Friedman adds some specifications, such applications are not within the scope of this master thesis (due to limited information about household attributes). We note that higher permanent income implies higher permanent consumption, and that the relationship is dependent on more than age. We will thus expect a household with high permanent income to have a higher level of consumption over the life span, which imply higher absolute savings and higher demand for debt. Factors affecting the relationship are interest rates, wealth relative to income and the individual's preferences.

Another important aspect of Friedman's work is the current observable income only partly reflecting the permanent income, where the transitional component makes the current income a less precise signal of permanent income (ref. equation II). Friedman does however emphasise that the permanent income concept is subject to extensive uncertainty alone, regardless of the transitory component. He outlines one interpretation of the concept where an individual, standing at the current stage in life, will attempt to measure future income-experience. At this point, the individual will use already measured income experience prior to that date and current wealth, but meets a more challenging task when looking ahead. Friedman notes that the individual likely will take into account the experience of older individuals with similar characteristics (education, occupation, wealth), but also other information, and combine this in different possible scenarios. He further argues that this process will be subject to continuous revision as the individual gets older or the decision basis changes. This highlights the uncertainties related to estimate permanent income and life cycle resources for both the individual and a third party (who has even less information than the individual).

### **2.1.3 The life cycle balance sheet and human capital**

We have become familiar with the concepts of life span resources and permanent income through the consumption smoothing theories, which we find to be central in order to explain differences in consumption and demand for debt across households. In general, higher life span resources imply higher demand for debt over the life cycle. Milton Friedman (1957) touches some of the complexities with the concept of estimating the resources of a household and the objective of this section is to put some of these complexities into a system. Our intention is to add some colour on the abstract concept of life span resources, which we will refer to as life cycle assets.

A traditional balance sheet is a snap shot of a households' financial position in terms of observable tangible assets, liabilities and equity. However, it does not reflect the contingent assets a household holds in terms of human capital. The concept of human capital captures what Friedman refers to as "future income experiences" (Friedman, 1957) and Modigliani as "the present value of labour income plus bequests received" (Modigliani, 1986). A more comprehensive definition is that human capital is the present value of all future disposable income, pensions and welfare transfers obtained by the household.

The traditional balance sheet does not capture contingent liabilities either. The contingent liability of future consumption can be interpreted as a counterpart to the human capital reflecting future income on the asset side. It can be measured using the same method as for human capital, by estimating the present value of all future consumption. Human capital and the present value of future consumption are arguably the largest asset and liability for the households (especially for young households) (Døskeland, 2014). These values are as mentioned not reflected in a traditional balance sheet, but have been included in several academic papers in what we define as the life cycle balance sheet.

A balance sheet including human capital and future consumption is described by Washer and Nippani (2004), and Reiakvam and Solheim (2013) and Døskeland (2014) put it in a Nordic context. Washer and Nippani do not separate the future consumption from future income on their balance sheet, and include both in the estimation of human capital as part of the households' net wealth. Reiakvam and Solheim do on the other hand separate the contingent liability of future consumption. An illustration of their life cycle balance sheet can be found in Figure 4.

**Figure 4: The life cycle balance sheet of a household**

<b>ASSETS</b>	<b>LIABILITIES AND EQUITY</b>
<b>Estimated real capital</b>	<b>Liabilities</b>
Estimated market value primary dwelling	Study debt
Estimated market value secondary dwelling	Other debt
Other estimated real capital	
<b>Gross financial capital</b>	<b>Future consumption</b>
Bank deposits	Future consumption
Shares and other securities	Future property consumption
Share of unit trusts, bond and money market funds	
Other financial capital	
<b>Human capital</b>	<b>Equity</b>
Expected future income	Estimated net wealth
Pensions	
Welfare transfers	
<b>Estimated gross wealth</b>	<b>Estimated gross wealth</b>

Source: (Reiakvam & Solheim, 2013)

We find that the life cycle assets of a household are the sum of real capital, financial capital and human capital. The *Estimated gross wealth* is equivalent to life cycle assets. The traditional balance sheet items (real capital and financial capital) are described in more detail in chapter 3, and the focus here will be on how to estimate human capital. Friedman (1957) emphasises the uncertainty related to estimating “future income experiences” and that it is subject to the individual’s own perception. This makes it difficult for a third party only observing current characteristics of an individual to get a viable estimate. Solomon Huebner introduced the human life value approach already in the 1930s (Washer & Nippani, 2004).

The approach is based on estimating the future earnings of the household, adjusting for taxes and consumption and discounting it with an appropriate inflation and risk adjusted discount rate. Døskeland (2014) presents a more sterilised version, which suits the objective of this thesis:

$$\text{Human capital}_0 = \sum_{t=1}^T \frac{I_t}{(1+k)^t}$$

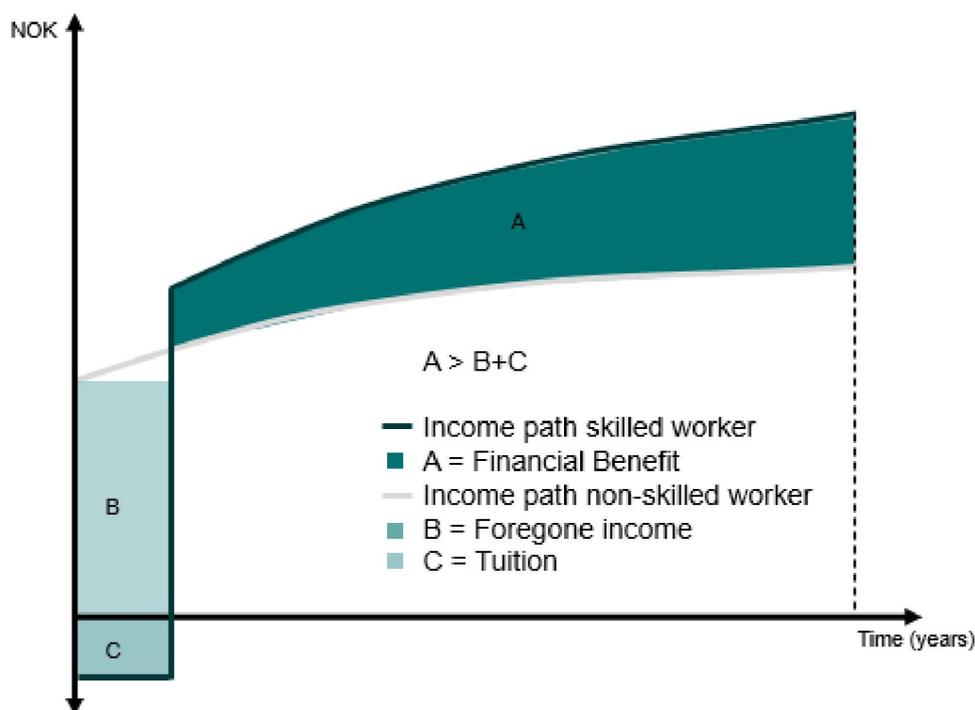
The sterilised version does not adjust for consumption, which makes it more compatible with the life cycle balance sheet introduced above, where human capital and the value of future consumption are separate.  $I_t$  is the disposable income earned in year  $t$ , and  $k$  is the households' discount factor. By summing the discounted values over the expected life span,  $T$ , we arrive at an estimate for human capital, the present value of all future income. All three variables  $I_t$ ,  $k$  and  $T$  are subject to uncertainty. The time aspect is uncertain, as the time of death varies across persons, affecting both the total life expectancy and the expected years of employment (years with income). The discount factor  $k$  is dependent on the risk related to the flow of income. Døskeland uses the following phrasing: “if there is high job certainty, the discount factor is low and close to the risk free rate. If the job is uncertain, the discount factor must be substantially higher than the risk free rate” (Døskeland, 2014, p. 327).

There is arguably most uncertainty related to the estimated future income. Friedman's thoughts on the subject is mentioned in section 2.1.2 and the level of future income is dependent on the person's skills, future health, career advancement opportunities, macroeconomic conditions and to some degree pure luck and randomness. David Card (1999) does however highlight the considerable evidence of a positive correlation between education and labour market status, which makes years of education a decent proxy for the individual's skill and its effect on future income. The general relationship is illustrated in Figure 5. The income path for a skilled worker jumps above the path of the unskilled worker after the education period (or other training), and in this figure the skilled worker will be better off compared to the unskilled worker over the life span (A is greater than B and C combined). This general conclusion is supported by empirical research (Card, 1999). Hence, education can approximate higher human capital, and an extension of this is that higher income may signal higher level of education and higher human capital.

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**Figure 5: Income path of a skilled worker versus a non-skilled worker**


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Source: (Døskeland, 2014)

Despite uncertainties related to the estimation of human capital, the simplified model for estimating the value of future income illustrates some dynamics related to the life cycle theory. The composition of the assets of a household will change over its lifetime. Young households will have many years left of their work active life and thus a large share of human capital on their life cycle balance sheet compared to an older household. As the household get older, the human capital will gradually materialise as real capital and financial capital. The reallocation on the asset side from human capital to material assets does not affect the household's demand for debt, which the hypotheses showed where given by the total life cycle assets. It may however affect the households' ability to realise their demand for debt, but we will come back to this later. First, we look at some of the limitations and weaknesses of the theories used to identify households' demand for debt.

#### 2.1.4 Limitations of the credit demand theories

The life cycle hypothesis and the permanent income hypothesis have several limitations and weaknesses when applying them in practice. Døskeland (2014) outlines some of the central shortcomings of the consumption smoothing theories. The most critical limitation is the assumption that the households prefer and plan to smoothen consumption, even though it

might not be possible for the households to implement. Precautionary reasons, lack of available credit at decent terms, poor planning or an aversion towards debt financing are all rational explanations.

The theories do not capture the effects of mandatory savings, such as a tax-financed public welfare system. This is prevalent practise in Norwegian context and the actual pension wealth of a household is not reflected on the household's balance sheet, as paid-in taxes are not recorded. This makes the households less aware of their wealth status. The households are not in control of this part of the Norwegian pension scheme and the frameworks above do not capture how this affects their actions<sup>1</sup>.

As discussed in relation to the estimation of human capital, the time of death and time until retirement are uncertain. The latter results in uncertainty of the ability to earn the expected full lifetime income, while the uncertainty of the expected age poses uncertainty to the required funds from retirement until death. It is natural to assume that households as risk-averse individuals prefer to have some form of insurance in case of unexpected events. This suggests that they will hold a buffer. The theories do not reflect this feature as they assume perfect information (no uncertainty related to time of retirement and death).

## 2.2 Factors affecting the households' level of debt

The observed debt level of households is not only a result of the demand for credit. A household's realisation of its demand for credit is constrained by its continuous debt servicing ability and the supply of credit (Reiakvam & Solheim, 2013). Both of these factors, as well as the households' debt preferences, is discussed in separate sections below.

### 2.2.1 Continuous debt servicing ability and liquidity requirements

A household's ability to service the desired debt level may limit the household from acquiring its perceived optimal level of debt (Modigliani, 1986). That is, the household is required to have sufficient current disposable income to pay the running costs of debt, such as interest

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<sup>1</sup> It arguably puts a constraint on the households, which may limit them in the optimisation of allocation their funds, savings and consumption over the life span.

payments and instalments, in addition to regular living expenses. For example, a household with low current disposable income, but expectations of significantly higher income in the future (back-end loaded income pattern) will have a considerable amount of human capital on their life cycle balance sheet. Considerable human capital on the asset side imply high life cycle assets and a corresponding high level of consumption smoothed over the expected lifetime. Due to the low current income, the household would likely prefer to acquire a large amount of debt in order to reach the desired level of consumption. The currently low income may however also leave the household with insufficient funds to pay interest and instalments after consumption expenses are subtracted from the disposable income. Hence, the household has to acquire a smaller loan than the desired level.

### **2.2.2 The supply of credit**

The credit market, like other markets, have a supply side affecting the households' access to credit. Important factors restricting households from acquiring their desired level of debt is industry regulation, the financial institutions own processes and the available products they offer to households (Reiakvam & Solheim, 2013).

Regulations of the bank sector includes the International regulatory Framework for Banks (Basel III<sup>2</sup>) and more stringent local Norwegian regulations, enforced by the Ministry of Finance and the Financial Supervisory Authority of Norway (FSA) (Ministry of Finance, 2014). In addition, the banks face guidelines from the Norwegian FSA, which include specific recommendations related to mortgage lending to households (The Financial Supervisory Authority of Norway, 2011). Empirical indications of regulation and guidelines affecting households' access to credit can be found in the paper by Solheim and Vatne (2014). Using micro data for Norwegian households they show that the new and stricter loan-to-value requirements (see chapter 4 for details), suggested by the FSA after the financial crisis, have led to a decrease in the maximum observed debt-to-value ratios. They also find that younger households and low-income groups in particular have faced more constrained access to credit.

The internal processes of a bank is another factor affecting the households' access to credit. When distributing loans to households the banks assess the creditworthiness of the households.

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<sup>2</sup> See (Bank for International Settlements, 2014) for details.

In this process, banks usually consider several indicators. Solheim and Vatne (2014) simplify the credit evaluation process to a two-step procedure:

1. The bank observes the development in the household's ability and capacity to service debt, primarily by looking at the income of the household and then decides on a maximum level of debt given this income (decide a Debt-to-Income ratio).
2. Next, the bank determines collateral requirements, property promised to the lender if the borrower defaults, for the level of debt identified in step 1 (determine a Loan-to-Value ratio).

Step 2 concerns the banks' reluctance to distribute loans without sufficient collateral in fixed property or real capital. The limit on how much collateral they require might be affected by the banks' internal risk calculations, but also by regulations and statements from the FSA (Solheim & Vatne, 2014). The banks requiring collateral in liquid capital imply that some households may face limitations from acquiring the desired level of debt. This can be relevant for the younger households. Even though their life cycle balance sheet indicates positive net wealth, it may not be liquid (human capital is illiquid and uncertain), and the banks do not accept human capital as collateral. The explanation is based on the problem of moral hazard, a problem created by asymmetric information after the loan has been distributed, and the risk that the borrower might engage in activities that are undesirable from the lender's point of view (Mishkin, Matthews, & Giuliadori, 2013). A loan pledged solely on human capital, i.e. future income, will increase the borrower's incentive to work less after getting the loan and not pay it back. The risk of moral hazard is however reduced if the value of the collateral pledged to the lender is high, because the borrowers themselves have a lot to lose. If the borrower pledges its house as collateral it will stand without a home in case of default and the lender can sell off the house and use the proceeds to make up for the losses on the loan. Despite human capital being disapproved as collateral, banks tend to relax the requirements for younger households based on their relative large amount of human capital compared to older households (Døskeland, 2014).

The introduction of new financial products has on the other hand increased households' access to credit. Credit lines secured on dwellings have for example allowed households to acquire loans for consumption or smaller investments at decent terms compared to traditional consumer loans.

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### 2.2.3 The households' debt preferences

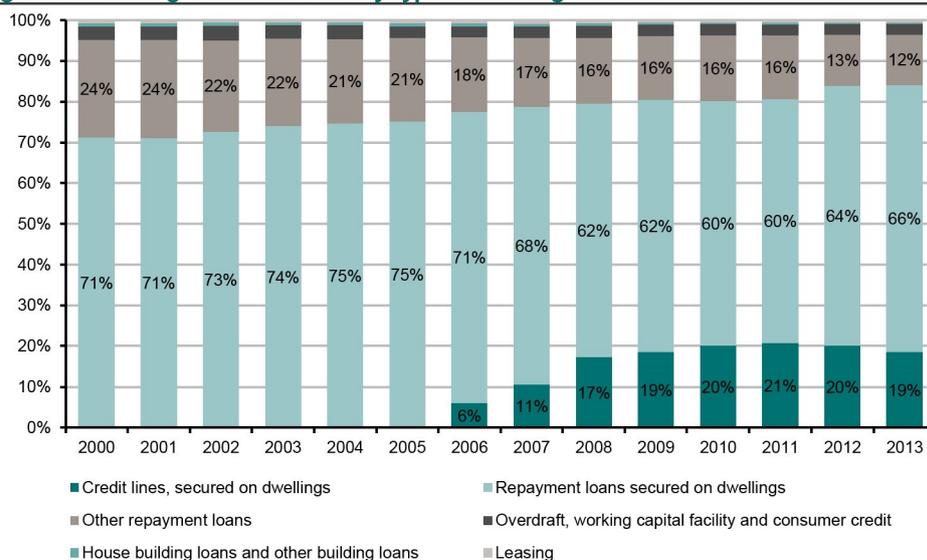
In addition to the factors discussed above, we need to take into account the households' preferences when assessing their eagerness to acquire debt. A household's preferences for risk (risk averse versus risk lover) may explain why some have lower debt than their potential debt level. Some households have a cautious approach to debt and wait until some of the human capital has materialised into financial wealth before increasing the debt level substantially, while others will acquire large amounts of debt in the early stages of life in the belief that they will be able to service the debt in the future (Døskeland, 2014).

## 2.3 The debt of Norwegian households – characteristics

Before we address whether the Norwegian household debt corresponds with debt theory, we look at its characteristics. This brief descriptive analysis forms the groundwork for our study of the Norwegian households' debt, covering the most fundamental attributes.

### 2.3.1 Type of debt

A household has access to various types of debt with different characteristics (see appendix 8.1 for a detailed description). The Norwegian households' debt allocation between these various classes have been stable from 2008 to 2013 (see Figure 6). In 2013, 66% of households' total debt was repayment loans secured on dwellings, 19% was credit lines secured on dwellings, 12% was other repayment loans, while the remaining 3% was other types of credit. Even though the distribution of debt by debt classes has been stable the last six years, a different picture emerges if we look at the period from 2000 to 2013. The share of loans secured on dwellings (both credit lines and repayment loans) has climbed from 71% in 2000 to 84% in 2013. The share of repayment loans has grown on the expense of other repayment loans in particular, which has seen a decline from 24% in 2000 to 12% in 2013. The credit lines secured on dwellings was introduced in 2006 and the lending class amounted to as much as 19% of total lending to households in 2013.

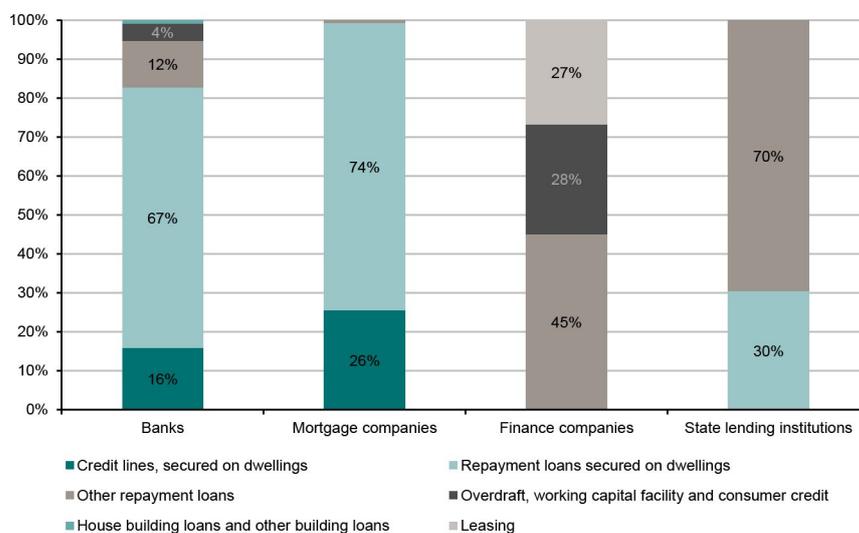
**Figure 6: Lending to households by type of lending – all finance institutions**

Source: (Statistics Norway, 2014a)

Figure 6 shows that the majority of Norwegian households' debt is secured on dwellings. Hence, it is worthwhile to take a closer look at the characteristics of this debt-class; how the debt is issued and by whom, the properties of the debt (floating versus fixed interest rate) and how the cost of debt, the interest rate, is derived. This will give us further insight in the Norwegian households' debt, which is essential when identifying the debt capacity.

### 2.3.2 Issuers of household debt

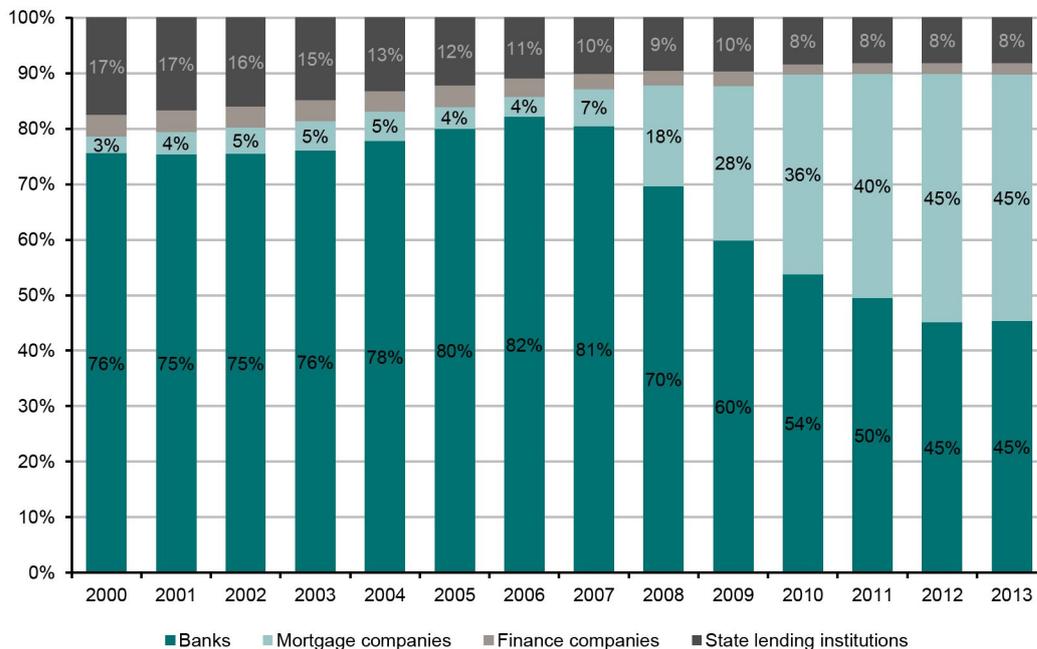
There are in broadly four types of finance institutions issuing loans to households, and an overview of their lending products to households can be found in Figure 7.

**Figure 7: Finance institutions' lending by type of lending, 2012**

Source: (Statistics Norway, 2014a)

Loans secured on dwellings, both credit lines and repayment loans, are issued and operated by banks, mortgage companies and state lending institutions. State lending institutions do however have significantly less lending secured on dwellings to households compared to banks and mortgage companies, with only 30% of lending to households secured on dwellings. Lending from state lending institutions represented 8% of total lending to households in 2013. Hence, it is more relevant to look closer at how the banks and mortgage companies operate towards households as they represent 90% of total lending to households (see Figure 8). In addition, most of their lending is secured on dwellings (100% for mortgage companies and 83% for banks).

**Figure 8: Total lending to households by finance institution**



Source: (Statistics Norway, 2014a)

### 2.3.3 A simplified model for banks' and mortgage companies' pricing of credit

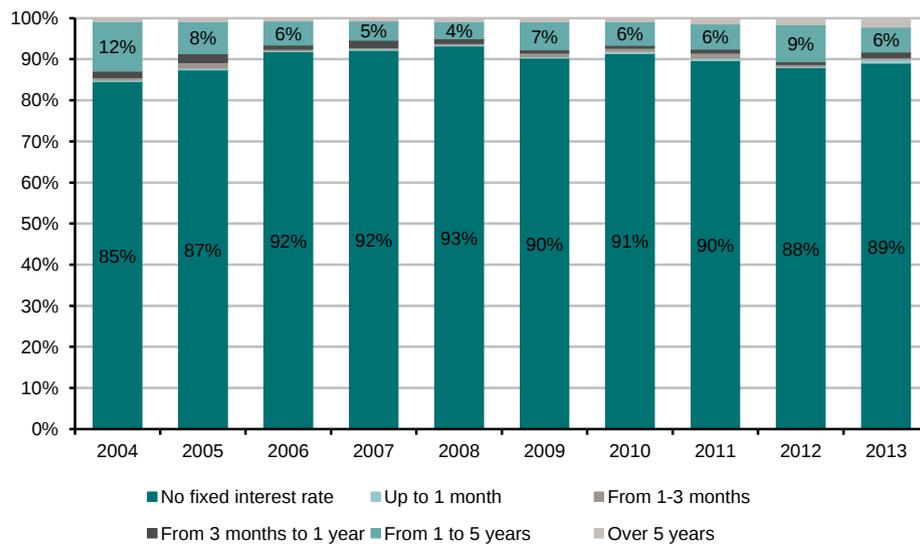
In the evaluation process of how much debt to acquire, the borrower take into account the interest rate the lender offer. The interest rate is the risk-adjusted cost of borrowing and we outline a simplified framework of how banks decide the interest rate below (see Figure 9). The framework is based on Døskeland's (2014) framework in his book "Personlig Finans".

**Figure 9: Simplified model for banks' pricing of loans (numbers only for illustration)**

<b>Banks' lending rate</b>	
Funding cost	2.0 %
+ Operational costs (IT, wages etc.)	1.0 %
+ Risk premium (cost of capital and losses)	0.5 %
+ Profit	0.5 %
<b>= Lending rate to customers</b>	<b>4.0 %</b>

Source: (Døskeland, 2014)

The basis for the price the end consumer has to pay for the capital, i.e. the interest rate, is the bank's funding cost. The funding cost is how much the bank pays for the capital they distribute to the borrower. The most important sources of funding are deposits and the money market (wholesale funding). The banks must cover their operational costs, such as IT costs, salaries and general administrative expenses, which is added to the funding cost. The banks add a risk premium and profit as well. The profit a bank can take is dependent on the competitive situation, while the risk premium is dependent on the expected loss (the risk that the borrower could default) and the capital the bank is required by the government to hold on their balance sheet as a buffer in case of default. The risk premium is dependent on the risk related to a specific loan. Therefore, holding all else equal, a larger loan will require a higher risk premium, as the loan is less secure both in terms of the borrower's ability to pay and the size of the collateral relative to the size of the loan. Equivalently, for a loan of equal size the risk premium will be higher for the borrower with the lower degree of security. The interest rate offered to an individual or household will therefore vary based on loan size, collateral provided, the borrowers debt servicing ability and the bank's pricing strategy. The bank can to some extent practise price discrimination, for example target high creditworthy clients through academic unions or students within certain fields of profession. The groups targeted through this type of price discrimination do often have high human capital, suggesting high demand for credit combined with high creditworthiness (Døskeland, 2014).

**Figure 10: Lending to households by fixed interest period – all financial institutions**

Source: (Statistics Norway, 2014d)

The interest rate of individual household can also vary in the way that the interest rate can be fixed, floating or with a maximum interest rate (has an upper limit). The different arrangements for the interest rate should be taken into account in an analysis modelling changes to interest rates, as households with longer fixed interest rate contracts would be affected differently by a change compared to the households with floating. However, looking at Figure 10 we find that as much as 89% of Norwegian households have floating interest rate, and the distribution of interest rate fixation has been stable the last ten years.

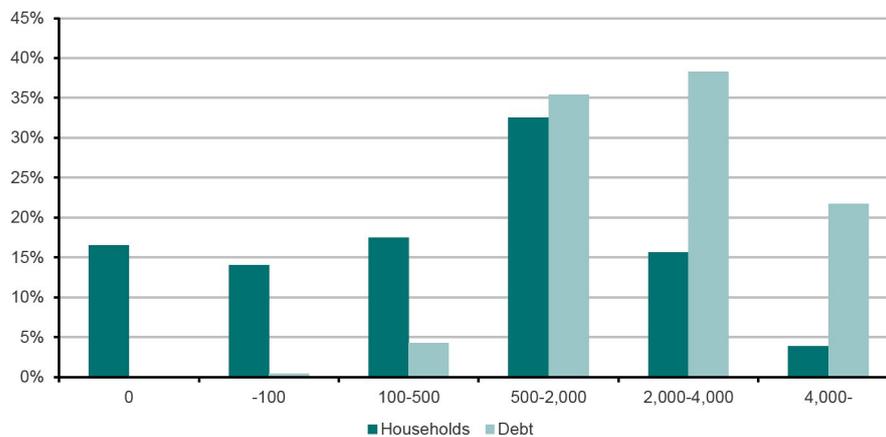
## 2.4 The debt of Norwegian households versus theory

The purpose of this section is to identify how well the theory outlined above explains the debt of Norwegian households. An assessment of how well the theory reflects reality will be used to evaluate and validate our results. The section will also establish a comprehensive understanding of the Norwegian household debt by identifying how it is distributed across the households and which factors that have driven the significant growth. Identifying which individuals and segments that have increased their debt level may help in identifying which segments that either have more growth potential or may have limited potential due to high historical growth. This will however only be an initial indication as a segment may have seen significant debt growth, but from low levels, and could thus have further growth potential if the segment have high debt capacity.

### *Which households hold debt?*

Our first observation is that a large share of households have little debt. Figure 11 shows the distribution of households and debt by the size of debt. We find that 16.5% of households had no debt in 2012, while 48% had less than NOK500,000. At the same time, we observe that the mentioned 48% of households with less than NOK500,000 in debt, represents negligible 5% of total debt. Hence, approximately half of Norwegian households hold 95% of total debt in the sector. This suggests that the households holding debt are at high debt levels. In order to identify what characteristics these households hold and whether it corresponds to theory, we have divided the households into groups by income, age and geography.

**Figure 11: Distribution of households and debt by size of debt (NOK'000), % of total debt, 2012**

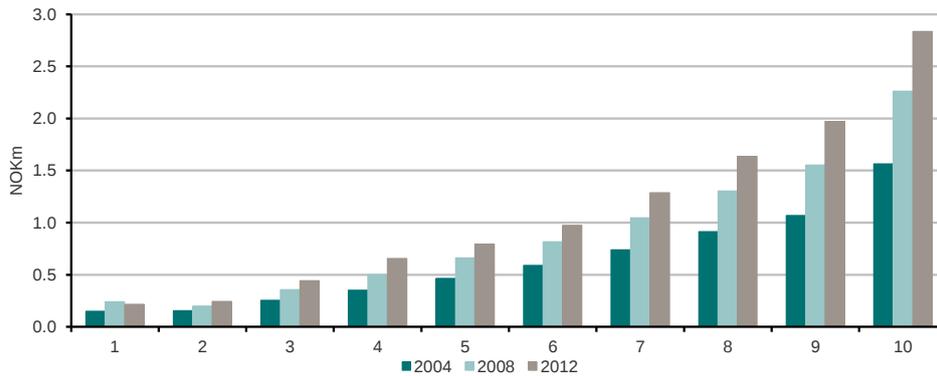


Source: (Own calculations, 2014)

#### **2.4.1 The distribution of debt by income and wealth**

According to the life cycle hypothesis and the permanent income hypothesis, households with high current income would likely have expectations of substantial future income and thus high life cycle assets. Hence, resulting in a higher desired consumption level and higher demand for debt in absolute terms compared to low-income groups. The liquidity constraints of having debt further suggest that households with high current income have higher debt servicing ability all else equal, and can realise the desired amount of debt (or at least come closer to the desired level compared to households with tighter margins). Hence, theory suggests that we would observe increasing debt levels as we move from low-income deciles to high-income deciles.

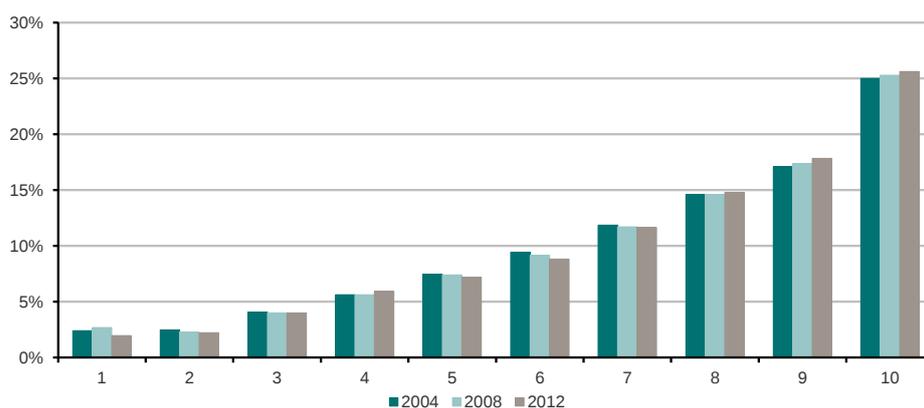
**Figure 12: Average debt per household by income decile, NOKm (current prices)**



Source: (Own calculations, 2014)

Figure 12 shows the average debt per household by income decile and the figure indicates a clear pattern where the average debt per household is increasing with income decile. The average debt per household is below NOK500,000 for the three lowest income deciles, while the ten percent with highest income had on average NOKm2.8 in debt in 2012. The impression that households with high disposable income hold more debt is further enhanced by Figure 13. This figure tells us that the households with the 10% highest disposable incomes hold 26% of total debt, significantly more than both the households in the 9<sup>th</sup> income decile (which hold 18% of total debt) and the lower deciles. Hence, our results of debt distributed by income is in line with the theoretical hypothesis.

**Figure 13: Distribution of debt by income decile, % of total debt**

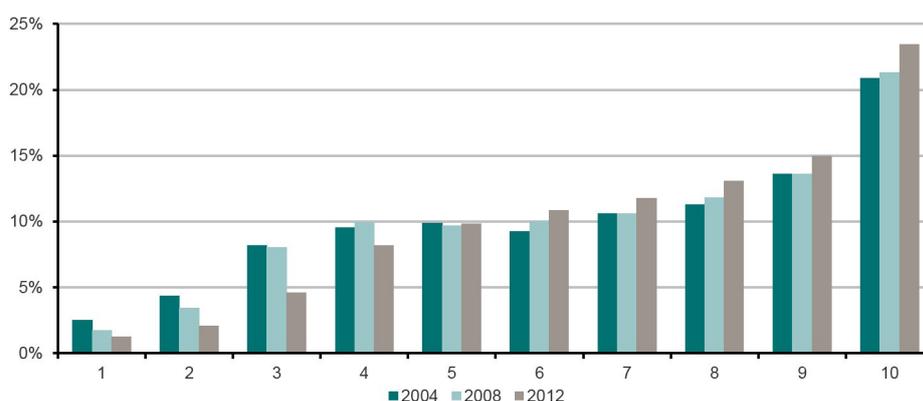


Source: (Own calculations, 2014)

When we look at the distribution of households' debt by total assets (Figure 14), we find the same pattern as for distribution by disposable income. It is skewed towards the upper deciles and the debt increases with total assets. Some of the trend is likely explained by the banks requirements of collateral in fixed property when they grant a loan, where high value of

dwelling on the households' balance sheet is correlated with high debt. High value of total assets may also reflect high value of life cycle assets, which all else equal should result in higher demand for debt. However, we have to remember that older households likely have more materialised human capital on their recorded balance sheet compared to younger households, which weakens the connection between the households' recorded assets and their life cycle assets. Note that the total assets for 2004 and 2008 may be affected by a different estimation method regarding market values of primary dwellings, which could be causal for some of the changes in the shares of total debt when comparing 2004 and 2008 to 2012. Despite some concerns about the reliability of estimates prior to 2012, we conclude that the debt increases with total assets, where the 20% wealthiest households hold 38% of total household debt.

**Figure 14: Distribution of debt by total assets decile, % of total debt**



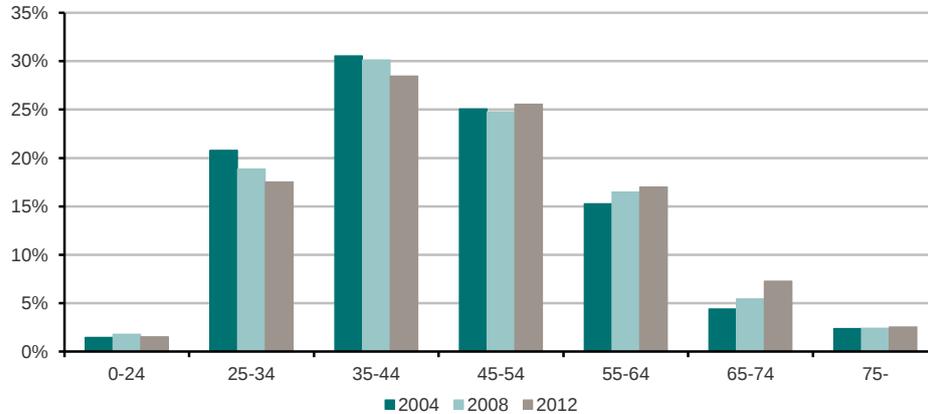
Source: (Own calculations, 2014)

## 2.4.2 The distribution of debt by age groups

Figure 15 shows the distribution of debt by age groups and reveals a skewness in the distribution towards younger households. The age groups 25-34 and 35-44 held 46% of total debt in 2012, where the latter held as much as 28%. These age groups can be categorised as first-time homebuyers (and possibly also be in the age where they step up from smaller housing categories when starting a family). More importantly, these findings are in line with the life cycle theory where the households acquire large amount of debt in earlier stages of life and deleverage when the human capital materialises as financial capital. We will go into details of the empirical evidence of the life cycle theory for Norwegian households below. Another initial take from Figure 15 is the trend of older households increasing their share of total debt

on the account of younger households. This reallocation and a more thorough growth analysis covering demographical changes will be addressed in section 2.4.4.

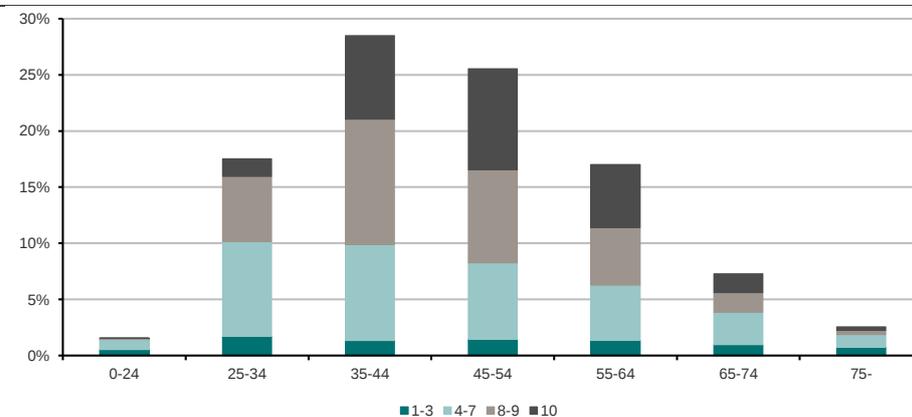
**Figure 15: Distribution of debt by age, percentage of total debt**



Source: (Own calculations, 2014)

We started this chapter by noting that 95% of households' debt is held by 50% of the households. After the segment analyses by income and age above, we can combine these segmentations to add some colour on the characteristics of debt-holding households. Figure 16 displays the distribution of debt by both income decile and age group and we find that the already identified high-income households, which hold the majority of total debt, are found in the middle to upper age groups (35-64 years). For the age groups ranging from 35-64 years, these upper income households (8<sup>th</sup>-10<sup>th</sup> decile) hold about two-thirds of the debt, while they hold significantly less when we look at the age group 25-34 (hold ~40%). These findings enhance the view that the younger households more easily are subjects to the liquidity constraints, with their lower average disposable income, limiting them from acquiring the desired amount of debt.

**Figure 16: Distribution of debt by disposable income decile and age, % of total debt**

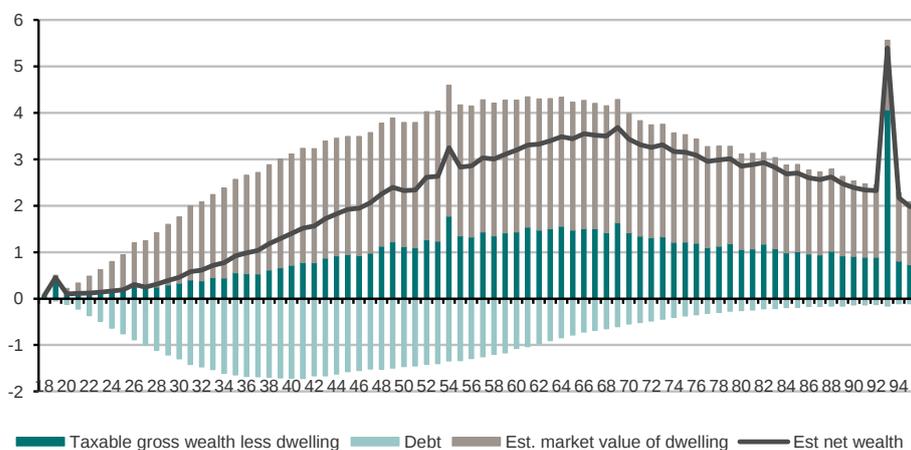


Source: (Own calculations, 2014)

### *Evidence of the life cycle hypothesis for Norwegian households*

Based on Modigliani's life cycle hypothesis, one would expect to observe young households with large amounts of debt to compensate for income being lower than the smoothed consumption level derived from their life cycle assets. This could likely result in negative net wealth. As the households get older, the human capital materialises in financial assets and the households are in "savings-mode" with higher income level than the smoothed consumption level. Hence, one would expect to observe declining debt levels and increasing financial assets and net wealth. Such a pattern seems to be fitting the distribution of Norwegian households' assets, debt and net wealth by the age of the main income earner (Figure 17).

**Figure 17: Average assets, debt and net wealth by age, 2012, NOKm**



Source: (Own calculations, 2014)

The distribution shows that younger households have both low levels of assets and debt, and net wealth is close to zero. Net wealth above zero deviates somewhat from what the theory suggests, but is likely explained by the banks' demand for collateral in fixed assets, where the collateral on the asset side offsets the debt liability. The deviation may also be partly driven by our exclusion of pure student households, which we on average would assume to have negative net wealth due to student loans not having requirements of collateral.

As the households get older, we find that they increase both their debt and their assets. There is a sharp increase in the debt level from the mid-twenties to the mid-thirties, a period for first time homebuyers and possibly the step up from smaller housing towards the end of the period, when the family starts to grow. Again, the banks' requirements of collateral and equity when distributing loans may cause the households to acquire debt later than the life cycle theory predicts, as it might take some years raising enough equity. The households are also likely to

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start their working career from the mid-twenties, which enables them to service the debt as well (ref. liquidity constraints from chapter 2.2). Debt peaks among households around forty years, and thereafter decreases slowly towards zero. Related to the life cycle theory, this would be the turning point where the households have higher disposable income than the expected level of smoothed lifetime consumption, and start to deleverage.

Taxable gross wealth and estimated market value of dwelling peaks in the early sixties. There is a lagged peak in estimated net wealth, in the late sixties, due to the gradual down payment of the debt. A peak in the late sixties is as expected, as this is close to the average retirement age in Norway. Thereafter, the estimated net wealth gradually declines. Contradictory to what one would expect according to the life cycle hypothesis, the households have relatively stable and high net wealth towards the end of life. On average, they have an estimated net wealth of NOKm2.4 when they reach 90, and they hold a significant buffer of NOK~900,000 in estimated liquid financial capital. This is supported by Lindquist et al. (2014), who find deposits to grow with age and stay high even among older households. This highlights one of the shortcomings of the life cycle theory identified by empirical research; the need for a buffer due to uncertainty related to the estimation of human capital, expected lifetime and unanticipated events.

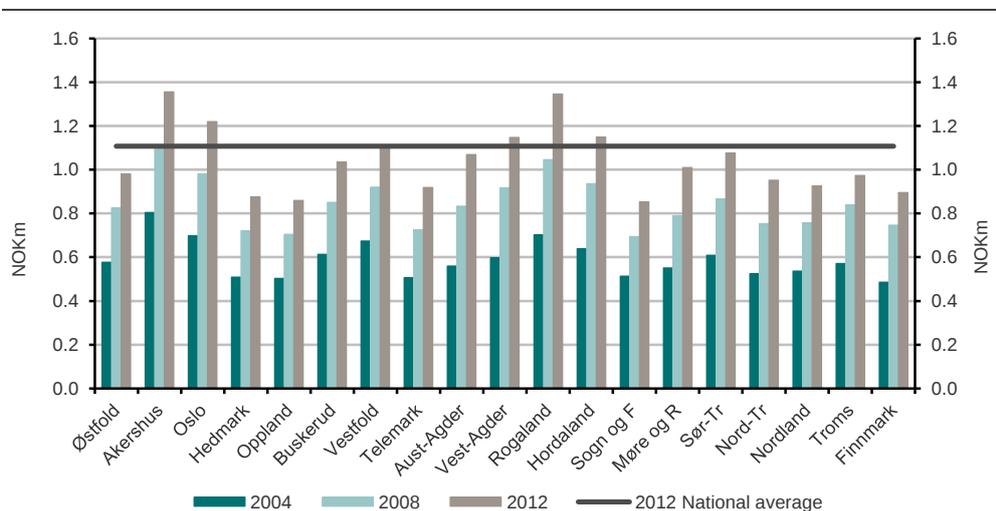
We conclude that empirical evidence based on Norwegian households' balance sheets support the life cycle hypothesis. We do however find that the youngest households hold less debt than the hypothesis suggests, but the deviation is likely explained by the liquidity constraints and the supply side's requirement of security in fixed assets. Hence, the factors outlined in section 2.1 and 2.2 arguably capture central dynamics of Norwegian households' debt level and will be drawn upon in the analysis below.

### **2.4.3 Distribution of debt by geography (county)**

The last segmentation we have included are how the Norwegian debt level varies across geographical regions, where we have segmented the households by county. Norway have 19 counties and as we see in Figure 18 there are significant differences in average debt across counties. It is not within the scope of this master thesis to explain differences in debt levels across counties as this would require a different theoretical foundation. However, we argue that a geographical breakdown is of interest as it relates to our research question of identifying where vulnerable households and debt capacity are located. We refer the interested reader to

Jacobsen and Naug (2004) and Reiakvam and Solheim (2013) for details. They find that the debt of Norwegian households is closely linked to the housing market. Our data support this link where we find the counties with the highest average debt to have the highest market value of dwellings (see appendix 8.6) and the highest housing prices (NEF, EFF, Finn.no, & Pöyry, 2012). We note that the counties with higher population density, Oslo, Akershus, Rogaland and Hordaland, have above average debt levels per household, ranging from NOKm1.15 to NOKm1.36 in 2012. Particularly Akershus and Rogaland stand out with debt levels per household ~22% above average. These counties have the highest levels of disposable income as well, which suggests higher demand for debt and higher debt servicing ability according to our theoretical framework.

**Figure 18: Households' average debt by county compared to the national average**



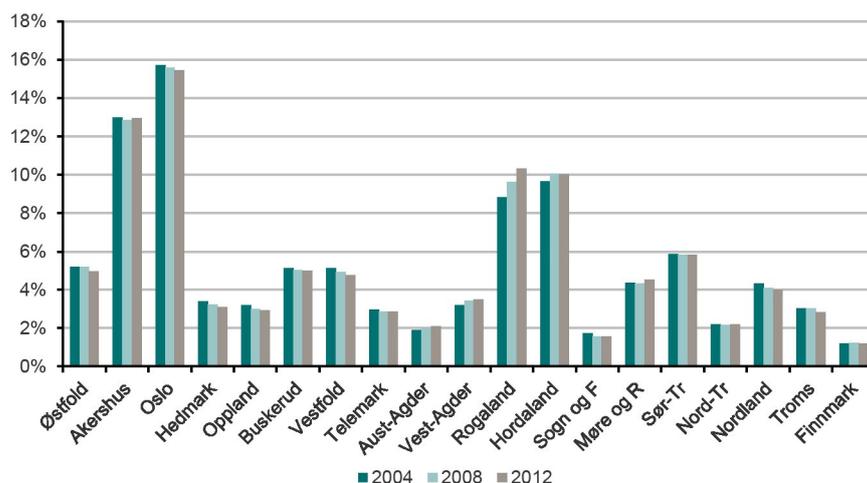
Source: (Own calculations, 2014)

Looking at the compounded annual growth rates (CAGR) in average debt across counties we find that some of the counties with the highest debt level in 2012 also have posted the highest growth rates (Rogaland and Vest-Agder). The general trend is a significant drop in growth rates from the first period to the next, where the average growth rates were 9.4% and 5.4%, respectively. The above-average growth rates in Rogaland and Vest-Agder are also evident when we look at their share of total household debt (Figure 19). Particularly Rogaland has seen their share of total debt increase markedly from already high levels at 8.8% in 2004 to 10.3% in 2012. Unsurprisingly, the distribution reveals that most of the debt is found in the largest cities, Oslo and Akershus close to the capital, Bergen in Hordaland and Stavanger in Rogaland. Despite having the third largest city, Sør-Trøndelag has had a more moderate share of household debt historically.

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**Figure 19: Distribution of debt by county, % of total debt**


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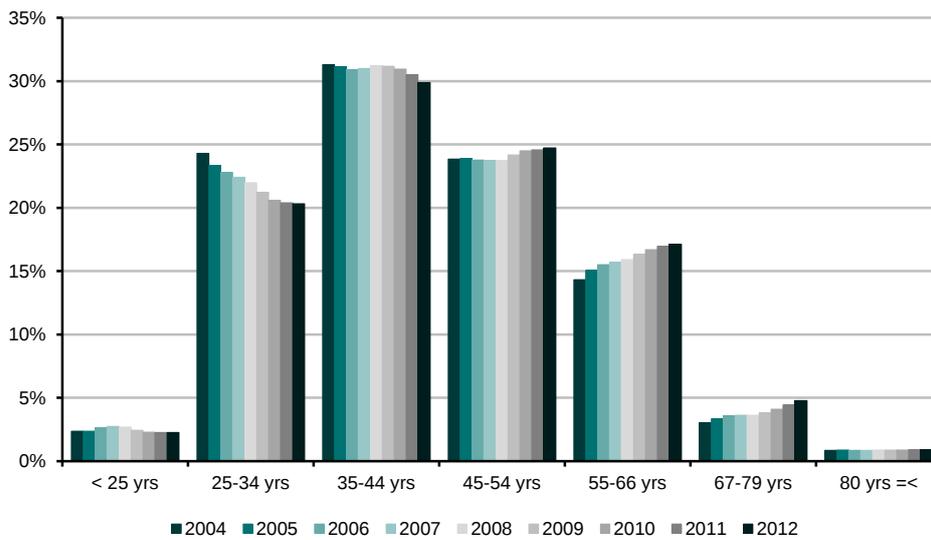

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Source: (Own calculations, 2014)

#### 2.4.4 Growth analysis – Which households have driven the growth?

In this section, we have decomposed the growth in households' debt in order to increase our understanding of the underlying drivers of the significant growth. We have decomposed the aggregated growth on three different factors to identify the main drivers: 1) Change in the number of households, 2) Change in the share of households holding debt and 3) Change in mean debt among the households holding debt. The decomposition is conducted on different age groups and the analysis is based on Lindquist et al. (2014). The breakdown on growth factors focuses on the main overall drivers and can identify which households that have been driving debt growth from 2004 to 2012. Figure 20 shows the distribution of household debt by age of the main income earner from 2004 to 2012 and we see that there has been a shift over time in the distribution of debt from younger to older households. The age group 25-34 years holds ~20% of total debt in 2012 compared to ~24% in 2004, while the older age groups, 45-54 and 67-79, have seen increases of ~3%-points and ~2.5%-points, respectively.

**Figure 20: Distribution of household debt by age of main income earner**



Source: (Statistics Norway, 2014e)

The shift in the distribution of debt from younger to older households is a result of the following: (reference is made to Figure 21, which shows the decomposition for the age groups)

1. **Demographic changes**, i.e. a shift in the distribution of households across age groups. We find that there has been a larger increase in the number of households in higher age groups, which all else equal rises the older households' share of total debt. The number of households where the main income earner is 45 years or older have increased by 15% from 2004 to 2012, compared to the total average of 12%, and on the other hand the households younger than 45 years have seen a 9% increase.
2. **A shift in the share of households holding debt within each age group.** The share of households with debt increased from 81.1% in 2004 to 83.5% in 2012, and the increase was particularly large among older households where it increased from 86% to 91% in age group 55-64 and from 63% to 80% in the age group 65-74. The younger households did on the other hand see a decrease from 78% to 68% in the age group 0-24 and a decrease from 93% to 85% in the age group 25-34.
3. **A change in mean debt of households with debt within each age group.** The most important contribution to overall lending growth comes from an increase in debt per household holding debt. From 2004 to 2012, mean debt increased with 72% among households with debt. Measured in NOK, the increase was largest for the age groups who initially had the highest levels of debt (age group 35-44, but also 25-34 and 45-54). If we look at a change in percent, the increase was highest for older households (55-75 years old).

The conclusion is that the total debt almost doubled from 2004 to 2012. The decomposition reveals that demographic changes are important, but non-demographic effects have been the main growth driver. The dominant factor explaining debt growth has been households with debt increasing their debt level. The effect has been particularly strong within certain segments, where youngest and oldest households with debt have seen close to a 100% increase in mean debt. These findings make our analysis of households' debt capacity relevant. Growth in debt levels driven by households with existing debt increasing their debt further may suggest that some are approaching their debt capacity (compared to a situation where growth mainly had been driven by households without debt acquiring debt).

Figure 21: Decomposition of the growth in debt by demographic segments

	2004	2008	2012	2008/2004	2012/2008	2012/2004
<b>All households</b>						
	<b>Growth factors</b>					
Total debt, NOK billions	1,249	1,905	2,485	1.52	1.30	1.99
No. of households, 1000	1,997	2,127	2,245	1.07	1.06	1.12
Share with debt, per cent	81	83	83	1.02	1.01	1.03
Mean debt of households with debt, NOK 1000	771	1,080	1,326	1.40	1.23	1.72
<b>Growth factor</b>				<b>1.52</b>	<b>1.30</b>	<b>1.99</b>
<b>Age group 0-24</b>						
Total debt, NOK billions	19	34	39	1.85	1.13	2.08
No. of households, 1000	82	100	102	1.22	1.01	1.24
Share with debt, per cent	78	74	68	0.95	0.91	0.87
Mean debt of households with debt, NOK 1000	290	460	560	1.59	1.22	1.93
<b>Growth factor</b>				<b>1.85</b>	<b>1.13</b>	<b>2.08</b>
<b>Age group 25-34</b>						
Total debt, NOK billions	260	360	436	1.38	1.21	1.68
No. of households, 1000	319	328	349	1.03	1.06	1.09
Share with debt, per cent	93	89	85	0.96	0.96	0.92
Mean debt of households with debt, NOK 1000	876	1,229	1,462	1.40	1.19	1.67
<b>Growth factor</b>				<b>1.38</b>	<b>1.21</b>	<b>1.68</b>
<b>Age group 35-44</b>						
Total debt, NOK billions	382	574	708	1.50	1.23	1.85
No. of households, 1000	400	424	421	1.06	0.99	1.05
Share with debt, per cent	95	94	92	0.99	0.98	0.97
Mean debt of households with debt, NOK 1000	1,009	1,446	1,830	1.43	1.27	1.81
<b>Growth factor</b>				<b>1.50</b>	<b>1.23</b>	<b>1.85</b>
<b>Age group 45-54</b>						
Total debt, NOK billions	313	472	635	1.51	1.35	2.03
No. of households, 1000	376	400	431	1.06	1.08	1.15
Share with debt, per cent	93	93	93	1.00	1.00	1.00
Mean debt of households with debt, NOK 1000	892	1,266	1,586	1.42	1.25	1.78
<b>Growth factor</b>				<b>1.51</b>	<b>1.35</b>	<b>2.03</b>
<b>Age group 55-64</b>						
Total debt, NOK billions	191	314	423	1.64	1.35	2.21
No. of households, 1000	333	370	379	1.11	1.03	1.14
Share with debt, per cent	86	89	91	1.04	1.02	1.06
Mean debt of households with debt, NOK 1000	666	950	1,225	1.43	1.29	1.84
<b>Growth factor</b>				<b>1.64</b>	<b>1.35</b>	<b>2.21</b>
<b>Age group 65-74</b>						
Total debt, NOK billions	55	104	181	1.89	1.73	3.29
No. of households, 1000	219	239	298	1.09	1.25	1.36
Share with debt, per cent	63	74	80	1.17	1.09	1.27
Mean debt of households with debt, NOK 1000	396	590	755	1.49	1.28	1.91
<b>Growth factor</b>				<b>1.89</b>	<b>1.73</b>	<b>3.29</b>
<b>Age group 75-</b>						
Total debt, NOK billions	30	47	64	1.56	1.38	2.15
No. of households, 1000	267	266	266	1.00	1.00	0.99
Share with debt, per cent	39	45	51	1.16	1.13	1.31
Mean debt of households with debt, NOK 1000	288	389	473	1.35	1.22	1.65
<b>Growth factor</b>				<b>1.56</b>	<b>1.38</b>	<b>2.15</b>

Source: (Own calculations, 2014)

## 2.5 Summary

In this chapter, we have outlined the theoretical foundation of our study of the Norwegian households' debt level and their debt capacity. We find empirical support for the life cycle hypothesis and the permanent income hypothesis looking at Norwegian households' debt, where both young and high-income households seem to have high demand for debt. We do however find that the youngest households hold less debt than the demand theory suggests. The deviation is likely explained by the liquidity constraints and the supply side's requirement of security in fixed assets. Hence, the factors outlined in section 2.1 and 2.2 arguably capture central dynamics of Norwegian households' debt level and provides a solid foundation for the further analysis of the households financial vulnerability and debt capacity.

The growth analysis revealed that the doubling in household debt from 2004 to 2012 primarily has been driven by increased debt holdings among households with debt. The growth may imply that the households has utilized more of their potential capacity. Whether the growth have increased the share of vulnerable households and how much capacity they have available will be addressed in the next chapters.

### 3. The dataset and the households' finances

This chapter contains an introduction of the dataset applied in the analysis, and we motivate the primary research question and the two secondary research questions. Thereafter, we present the financial aspects of a household through the average balance sheet and profit and loss account of a Norwegian household, before we assess the development in the households' debt servicing ability and the security they provide for the debt they have acquired. A detailed presentation of our methodology can be found in appendix 8.2.

#### 3.1 The dataset

The primary data source of this master thesis is households' income and wealth register data from Statistics Norway. The data is based on administrative register data that cover all Norwegian residents as of 31 December of the fiscal year, and are annual end-of-year observations for 2004, 2008 and 2012. The data is on household level where we rely on Statistics Norway's comprehensive methods to identify the members of each household (see Epland & Kirkerberg (2012) for details). We applied basic screening techniques to identify obvious errors, without finding any; hence, we considered the dataset as solid. The data include every Norwegian household's disposable income, interest payments, taxable gross wealth, taxable value of the primary dwelling, total debt, geographical region (county), number of persons in the household and the age of the main income earner.

The data excludes people living in institutions and 100% student households as we argue that students living together usually do not have a common housekeeping (the deviation from the rest of our observations would be impossible to implement with the available information). In addition, we argue that the general student's income does not reflect its human capital fully as the education comes at the expense of work. Hence, the students will have suppressed income in the years of study, and the investment in human capital will not be visible in their income level before their studies are completed. Our data does however include self-employed persons, and we are not able to separate debt for business purposes from consumer and mortgage debt for this group. Our focus is on the two latter types of debt, but we have chosen to include households with self-employed persons as we argue that we potentially would have lost significant debt capacity if we excluded a whole household because the main income earner is self-employed.

The 2012 observations are the latest available data, thus the most updated information available for an in-depth analysis of Norwegian households' financial position. The observations for 2008 are of interest as it marks the end of a high growth period in household debt. The data could therefore be informative with respects to sensitivity to potential boom bust scenarios. 2004 is the first year with available data on a household level, and is thus a natural starting point for an analysis of the development of Norwegian households' debt levels. As described, our dataset is comprehensive and for 2012 it consists of 4,866,107 persons living in 2,245,460 households.

Figures derived from this dataset is referenced as "own calculations". There are some figures prior to this chapter derived from our dataset, but we did not find it natural to introduce the dataset before due to similar descriptive statistics being available from Statistics Norway's online database.

### 3.1.1 Adjustments

In order to conduct our analysis we have made several adjustments to the dataset. We have segmented the dataset on household attributes, designated them with a standard cost of consumption, randomly imposed job losses and unemployment benefit and estimated a given interest rate for the later analysis of debt capacity. All of these adjustments and the weaknesses related to them are presented in appendix 8.4 to 8.8.

## 3.2 Motivating the research questions

The analysis has the objective of providing a comprehensive and coherent analysis of the financial vulnerability and debt capacity of Norwegian households, and it will give an identification of which households that can acquire more debt. Our primary research question is therefore: *What is the debt capacity of Norwegian households, and who can acquire more debt?* In answering this primary research question, we have separated the analysis into two different sections, which each serves the purpose of addressing a secondary research question. The answers obtained from these secondary research questions should, when combined, ensure a comprehensive and solid foundation in answering the primary research question.

The first secondary research question, *are Norwegian households financially vulnerable at current debt levels?* relates to the current position of the households. Solid and healthy

financial position suggests that a household can support higher debt levels. Hence, the research question will identify whether the Norwegian households can increase their debt level, but not necessarily by how much. The second secondary research question, *which households can acquire more debt, and how much can they increase their debt level before they are characterised as financially vulnerable?*, aims to provide answer to how much the debt level can increase.

Segmenting the results on household attributes (presented in appendix 8.4) allows for identifying the debt capacity of households and the focus is on the dynamics of a household's finances. Note that the geographical breakdown is solely included to see how the debt capacity is distributed across counties, as this adds some colour on where we can find the households with the potential of acquiring more debt.

### 3.3 The financial aspects of a Norwegian household

Before assessing the Norwegian households' financial vulnerability and their debt capacity, we introduce some basic aspects and terms related to a household's finances, which will be drawn upon in the later analysis.

A household is regarded as all persons who live permanently in the same dwelling and having common housekeeping. The household's current financial position is given by its balance sheet at a given point in time. For Norwegian households the financial position is recorded once a year at year-end, and the changes from one year to the next are explained by a profit and loss account. The balance sheet and the estimated profit and loss account for the average Norwegian household in 2012 follow below. We will not go through every line item in detail, but the overview will give insight in the dynamics of a Norwegian household's finances, which will be useful in the analysis of the households' financial stability.

#### 3.3.1 The balance sheet of an average Norwegian household

The balance sheet is a snap shot of the average Norwegian household's tangible assets, liabilities and equity. As human capital is intangible and difficult to estimate accurately it is not included in Figure 22.

**Figure 22: Balance sheet of an average Norwegian household**

ASSETS	NOK	%	NOK	%	LIABILITIES AND EQUITY
<b>Estimated real capital</b>					<b>Liabilities</b>
Estimated market value primary dwelling	1,883,400	61.1 %	43,400	1.4 %	Study debt
Estimated market value secondary dwelling	225,500	7.3 %	1,063,300	34.5 %	Other debt
Other estimated real capital	170,800	5.5 %			
<b>Gross financial capital</b>					<b>Equity</b>
Bank deposits	380,300	12.3 %	1,977,700	64.1 %	Estimated net wealth
Shares and other securities	293,100	9.5 %			
Share of unit trusts, bond and money market funds	41,500	1.3 %			
Other financial capital	89,800	2.9 %			
<b>Estimated gross wealth</b>	<b>3,084,400</b>	<b>100.0 %</b>	<b>3,084,400</b>	<b>100.0 %</b>	<b>Estimated gross wealth</b>

Source: (Statistics Norway, 2014e)

### *The assets of an average Norwegian household*

The balance sheet reveals that the average Norwegian household has 74% of its gross wealth in real capital, of which 61% is the estimated value of the household's primary dwelling. Hence, the majority of the gross wealth and the households' assets are characterised as less liquid. The most liquid asset group is bank deposits, which amounts to 12% of the gross wealth.

### *The liabilities of an average Norwegian household*

The overview of the average household's liabilities and equity is less detailed than that of the asset side, but we find the average household to hold 36% debt, of which only 1.4% is study debt. The data from Statistics Norway on the property account for households did not disclose a further break down of the liabilities (see section 2.3 for more on lending to households by type of lending). The average household has 64% equity. At first sight, this looks financially healthy, but the distribution of debt across households has the possibility to be severely skewed. The existence of pockets of risk within certain segments of the population is challenging to identify when looking at aggregated data, making micro data a necessary tool in the study of households' financial stability.

### **3.3.2 The profit and loss account of an average Norwegian household**

The profit and loss account (P&L) of the average Norwegian household is estimated using statistics from Statistics Norway<sup>3</sup>. Figure 23 provides an illustration of the average profit and loss account for a Norwegian household.

<sup>3</sup>We have used the statistics "The income account for households" (Statistics Norway, 2014f) for income and tax data, "Final consumption expenditures of households" (Statistics Norway, 2014g) for consumption and expenditures and "The quarterly

Figure 23: Profit and loss account of an average Norwegian household

<b>INCOME</b>	<b>NOK</b>	<b>% of disp. income</b>
<b>Income from work</b>		
Wages and salaries	455,800	87.9 %
Net income from self-employment	32,000	6.2 %
<b>Property income</b>		
Interest received	10,900	2.1 %
Share dividends received	15,100	2.9 %
Other property income	8,100	1.6 %
<b>Transfers received</b>		
Taxable transfers	160,400	30.9 %
Tax-free transfers	16,100	3.1 %
<b>Total income</b>	<b>698,400</b>	<b>134.7 %</b>
Total assessed taxed and negative transfers	-179,900	-34.7 %
<b>After tax income/disposable income</b>	<b>518,500</b>	<b>100.0 %</b>
Correction for savings in pension funds <sup>1)</sup>	25,021	4.8 %
<b>Consumption expenditures</b>	<b>-498,930</b>	<b>-96.2 %</b>
Food and non-alcoholic beverages	-63,948	-12.3 %
Clothing and footwear	-25,328	-4.9 %
Housing, water, electricity, gas and other fuels	-100,794	-19.4 %
Transport	-72,305	-13.9 %
Recreation and culture	-59,408	-11.5 %
Other consumption expenditures	-177,148	-34.2 %
<b>Savings <sup>2)</sup></b>	<b>44,591</b>	<b>8.6 %</b>
Capital transfers, net <sup>3)</sup>	-798	-0.2 %
Investment in non-financial capital <sup>3)</sup>	-31,560	-6.1 %
<b>Net lending (+) / net borrowing (-)</b>	<b>12,234</b>	<b>2.4 %</b>

<sup>1)</sup> estimated as a residual of disposable income, consumption and savings

<sup>2)</sup> estimated as 9% of disposable income (the average for households in 2012)

<sup>3)</sup> estimated based on households and non-profit organizations' line items from the quarterly national account

Source: (Statistics Norway, 2014f), (Statistics Norway, 2014g), (Statistics Norway, 2014h)

The P&L shows that the main sources of income are wages and salaries, which are 65% of total income, and transfers received, amounting to 23% of total income. The notation of disposable income is frequently used in the study of households' finances, and will be used in this study as well. Disposable income is the household's income after tax. In 2012 the disposable income for an average Norwegian household was NOK 518,500.

sector accounts for households and non-profit organisations" (Statistics Norway, 2014h) for savings, capital transfers and investments.

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One of the most simplistic definitions of savings is; savings are all disposable income not used for consumption. This comes from a household's choice of allocating its disposable income to either consumption or savings (Halvorsen, 2011). According to the definition, some examples of actions recognized as savings would be:

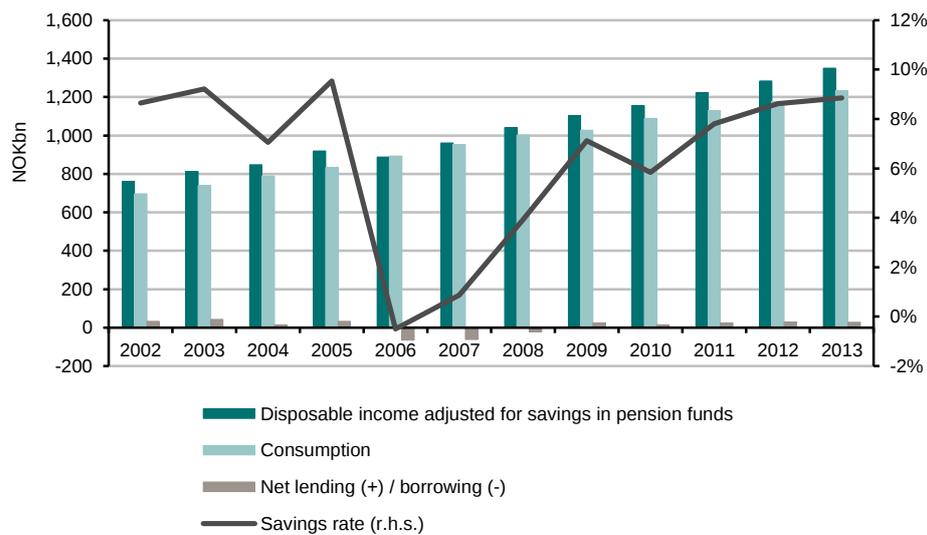
- Increase the holdings at a deposit account in a bank.
- Invest in stocks, bonds, mutual funds etc.
- Pension savings (both private and governmental).
- Grant a loan to another person.
- The down payment of one of your own loans. The interest paid qualifies as consumption (the cost of moving future consumption to the current period), while the principal payment qualifies as savings.

The households' savings rate was 8.6% in 2012, but a household's savings rate can be negative if the household chooses to consume more than their disposable income (debt-financed consumption). Figure 24 shows that the Norwegian households' savings rate in general has been positive over the period 2002-2013, with 2006 as the only exception<sup>4</sup>.

The savings of a household can further be transferred (net capital transfers in Figure 23) or be invested in non-financial capital (real capital and goods with life span longer than the accounting period and thus not qualified as consumption in the current period). The savings not transferred or invested in non-financial capital is the residual in the household's P&L and gives us its net trade in financial receivables or financial liabilities in the period. A household is a net borrower if the investments in non-financial capital (net of capital transfers) are larger than its savings, and the household is a net lender if the opposite is the case. Looking at the aggregate segment of households and non-profit organizations and their disposable income, consumption and net lending/borrowing from 2002 to 2013 (Figure 24) we find that they most of the years are net lenders. The segment was however net borrowers in the pre-financial crisis period, 2006-2008, where the growth in household debt was at its highest (Statistics Norway, 2014a).

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<sup>4</sup> The dramatic fall in the savings rate stems partly from a new tax legislation for dividends, which took effect in 2006 and led to substantial dividend payouts before 2006 and negligible payouts after (Halvorsen, 2011)

**Figure 24: Households' and non-profit organisations' accounts 2002-2013**

Source: (Statistics Norway, 2014h)

### 3.4 Measuring a household's financial stability

As an extension of the introduction of the financial aspects of a Norwegian household, this section addresses methods of measuring a household's financial stability. When one assesses a household's financial stability, one runs into the problem that there is not one evident way of calculating a household's financial stability. Firstly, the absolute size of debt is of limited relevance, due to the inequality and large variations across households. Households differ in the number of members, phase in life, consumption and savings preferences, asset composition and the size of wealth. Hence, the solution is to assess the relative size of the debt and use a combination of measures capturing both the level of debt, the debt servicing ability and the aspects of buffers and collateral. There are a number of different ratios measuring the relative size of debt, but we draw upon three of the most common in academic literature and practitioners' work on households' financial stability, which combined should ensure a comprehensive understanding of the households' finances. These are debt-to-disposable income, financial margin and debt-to-value. The first of these measures captures the relative size of debt level and to a certain extent the debt servicing ability, financial margin focuses solely on the debt servicing ability, and the last of these measures concerns the security of the debt. The objective of this section is to present the different measures, which information they hold, limitations, and how they can be applied in practice in the assessment of the financial stability of a household. Thereafter, we use them to describe the financial position of Norwegian households in 2004, 2008 and 2012.

### 3.4.1 Debt servicing ability

The debt servicing ability concerns the household's ability to service the continuous costs of holding their current debt level. We use the measures debt-to-disposable income and financial margin to reflect the debt servicing ability.

#### *Debt-to-disposable income*

Debt-to-disposable income provides an indication of the households' relative debt level and its ability to service the debt. This measure is for example often used when organisations like OECD measures different countries financial stability (OECD, 2013). It is defined as:

$$\text{Debt-to-disposable income} = \frac{\text{Debt}}{\text{Disposable income}}$$

The ratio measures how many years a household would need to pay down its debt if all disposable income were available for down payments. While this is unrealistic, the ratio gives a relative impression of the debt burden of a household adjusted for size of income (capture that a household with two income earners likely have greater ability to service a higher debt level than a household with one income earner). In addition, the measure is informative as it is not directly sensitive to the interest rate (even though the prevailing interest rate will be one of the key aspects when a household evaluates their ability to take on more debt), it is thus easy to compare over time and across countries. The higher this ratio is, the higher the debt burden and the weaker the financial stability of the household appears.

The weaknesses of the ratio relate to the crude measurement of debt servicing ability if it is to be used for this purpose alone. The disposable income is allocated to more than down payment of debt, mainly consumption and interest expenses, and this feature is not captured by the ratio. If interest rates are high, households might default even though debt-to-disposable income is low in a historical perspective. Another aspect is that the measure does not take into account funding from own savings or external funds when the disposable income falls short of covering interest expenses.

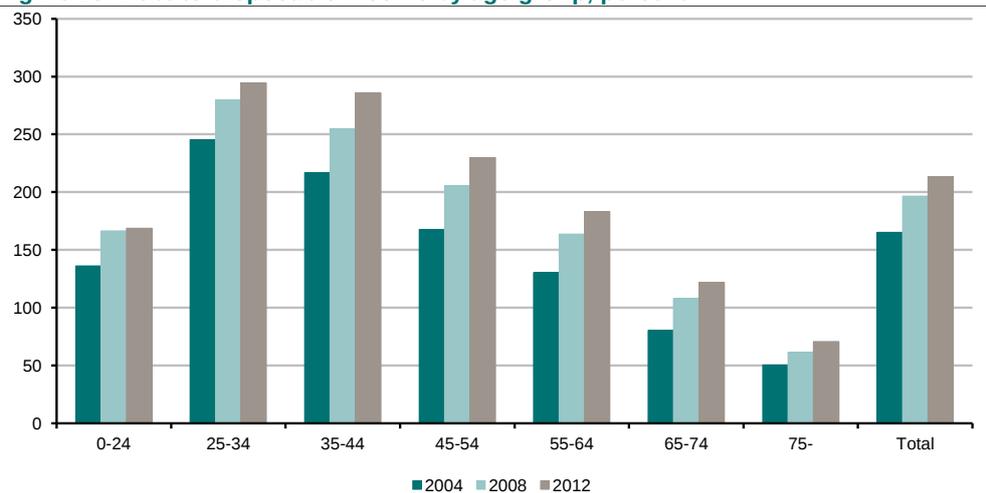
#### **The debt-to-disposable income ratio of Norwegian households**

When assessing Norwegian households' debt-to-disposable income ratio (Figure 25) we find that there has been growth for all the different age categories, with an average annual growth rate of 3.3%. On average, the debt exceeds two times disposable income, which is high relative to other OECD countries (OECD, 2013).

The figure reveals that those between 25 and 44 years have the highest debt-to-disposable income ratio. This is in line with our expectations from the life cycle hypothesis; the younger households borrow to smoothen consumption based on expectation of higher future disposable income and have higher debt levels relative to income. As we observe in the summary statistics (Figure 65), the more senior households have on average passed the peak in disposable income, and we find in Figure 25 that they also hold relatively less debt. With respect to the consumption smoothening theories, they are in a stage in life where they deleverage or draw on saving rather than debt, which explains their lower relative debt level.

In accordance to the life cycle theory, the youngest households hold the most debt relative to their income. However, this is not the case for the youngest age group (0-24), which are at significantly lower levels. Possible explanations could relate to liquidity constrains, which will be analysed further in the following section on financial margin. In addition, the dataset might not be able to fully reflect the debt increase amongst younger households. There are for example an increasing trend of parents helping their children to meet the supply side requirement of sufficient equity behind dwelling investments. Credit lines secured on dwellings have enabled older households to acquire debt at decent terms and transfer the loan within the family. The debt will be registered on the older household's balance sheet, increasing their debt level on the expense of the children's debt level.

**Figure 25: Debt-to-disposable income by age group, percent**



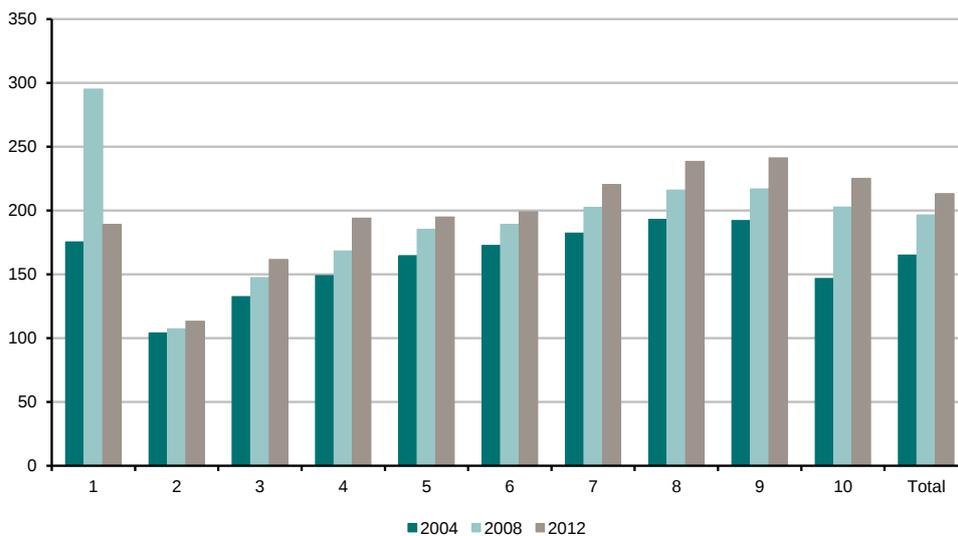
Source: (Own calculations, 2014)

The distribution across disposable income deciles (Figure 26) reveals that the debt-to-disposable income ratio increases as income increases, and that this trend has become clearer since 2004 as the growth in debt relative to disposable income has been higher for the high-

income households. This could be due to the low-income groups being more affected by the liquidity constraints, where the low income makes it more challenging for them to service the costs of debt. In addition, the disposable income is to some extent a signal of the household's level of education and in turn their human capital. Banks are likely to have higher confidence when lending to households with higher expected human capital, as they often are perceived as safer borrowers, allowing them to take on relatively more debt.

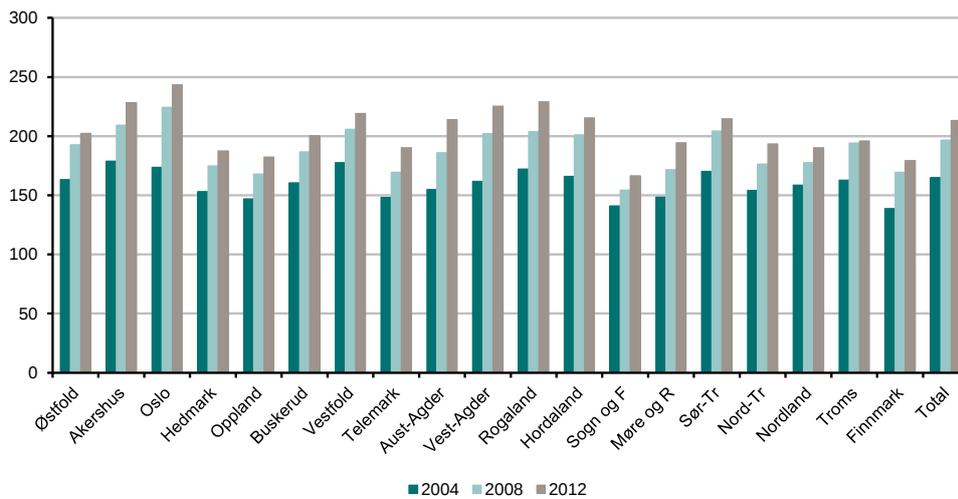
The debt-to-disposable income ratio is lower for the tenth decile, compared to the ninth decile. A possible explanation might be that the households with such high income can service a high level of consumption without the same degree of debt financing, and thus do not find it necessary to take on more debt to reach an even higher consumption pattern. A few households holding debt whilst not having any registered disposable income inflates the debt-to-disposable income for the lowest income decile.

**Figure 26: Debt-to-disposable income by disposable income decile**



Source: (Own calculations, 2014)

Figure 27 illustrates that those living in Sogn og Fjordane and Finnmark hold the lowest amount of debt relative to the disposable income. Finnmark closed up on the national average with an annual growth of 2.5% for the eight year period relative to national average of 2.2%, whilst Sogn og Fjordane is lagging more now than eight years ago due to a low 1.1% growth rate. Oslo, Akershus and Rogaland hold most debt relative to disposable income.

**Figure 27: Debt-to-disposable income by geographic region, percent**

Source: (Own calculations, 2014)

The high growth in debt relative to disposable income is a concern as it leaves the households sensitive to increased interest rates. This sensitivity is especially relevant as the prevailing interest rate is low (Statistics Norway, 2014i), and an interest rate increase could impose a substantial challenge for the households. This is an expressed concern by The Financial Supervisory Authority of Norway (2014) and IMF (2013). As identified, there are asymmetries in the distribution, and some age groups, income levels, and counties hold on average substantially higher debt exposure relative to their disposable income.

### *Financial margin*

The financial margin is a more in-depth measure of the debt servicing ability compared to debt-to-disposable income. Among the more recent literature, we find this measure in Vatne (2006), Solheim and Vatne (2013) and Lindquist et. al. (2014). In this thesis, we will apply the definition from these papers, where consumption expenses are the costs of a standardised level of consumption:

$$\text{Financial margin} = \text{Disposable income} - \text{Interest expenses} - \text{Consumption expenses}$$

The measure gives the absolute magnitude of what is left of the household's disposable income after interest expenses and the standardised level of consumption are subtracted. If a household has a financial margin above zero, there is room for either improved standard of living through increased consumption, or increased net wealth by increased savings (paying down debt is

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defined as savings)<sup>5</sup>. If the household has negative financial margin, they cannot meet their current obligations as they are expected to maintain their minimum consumption to survive, thus forcing a default due to failed interest payments.

The limitations of using financial margin relate to the households ability to meet their obligations through other sources of funding than their disposable income. This is relevant for Norwegian households as we found the average Norwegian household to hold financial assets. It is natural to assume that a borrower is willing to use most of its resources in order to avoid a default and a potential fire sale of assets. The funding sources could be personal funds as bank deposits, or liquidation of assets. Using personal funds in this way would however reduce its wealth, and is considered a short-term solution. Another way of meeting the obligation of interest expenses is through external funding, for example support from a family member (again not sustainable in the long run).

### **The financial margin of Norwegian households**

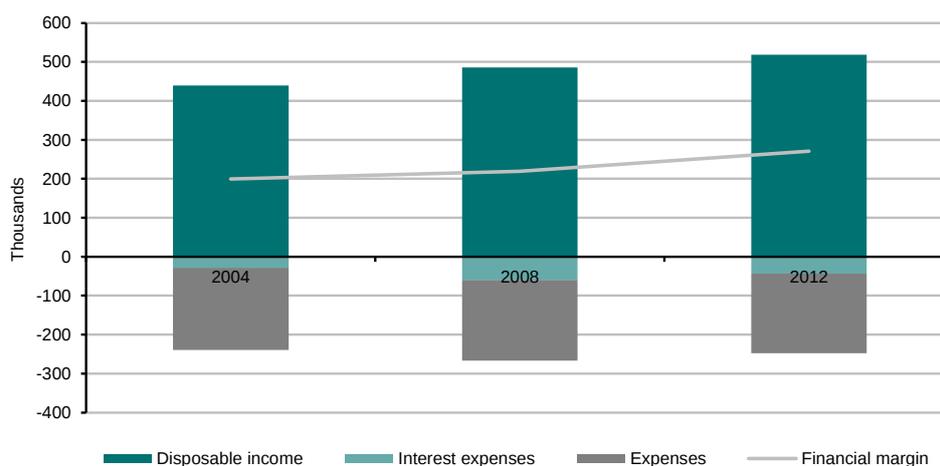
There has been a positive development in the average financial margin from 2004 to 2012 when measured in fixed 2012 prices<sup>6</sup> (illustrated in Figure 28). The positive development is driven by a 2.1% annual growth in average disposable income, whilst the expenses decreased by 0.4% annually in the period. The interest expenses is the most fluctuating of the three (disposable income, interest expenses and consumption expenses), with an annual 20.3% increase between 2004 and 2008, and 5.5% annually for the full eight year period. However, interest expenses are small relative to the disposable income, leaving the growth in total financial margin at 3.9% annually. The financial margin was ~NOK270,000 in 2012.

The growth in interest expenses can be decomposed into debt growth and changes in interest rate. The average interest rate on bank lending was 4.19%, 7.29% and 4.84% for 2004, 2008 and 2012 respectively, compared to the long term (1980-2012) average of 9.57% (Statistics Norway, 2014i). The significant increase in 2008 likely explain a large share of the increase in interest expenses in 2008. The increase in financial margin is in itself a sign of improved solidity of Norwegian households, which enables them to service higher debt levels.

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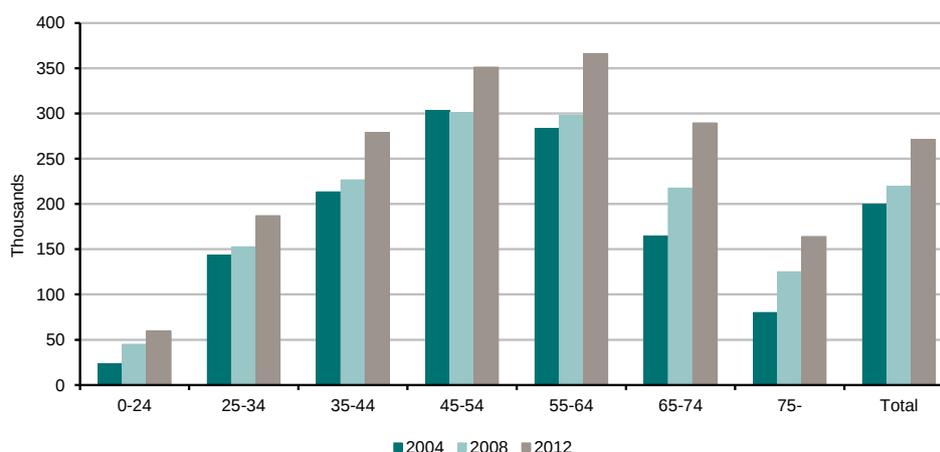
<sup>5</sup> Debt holding households will be expected to pay instalments, but might be able to postpone these instalments for a limited period. It is not included in the measure due to limited data.

<sup>6</sup> Note that this paper operates with 2012 fixed prices, whilst for example Norges Bank often operates with 2000 fixed prices.

**Figure 28: Average financial margin, NOK'000, fixed year 2012 prices**

Source: (Own calculations, 2014), (SIFO, 2014)

The distribution of financial margin by age shown in Figure 29 should not be surprising from a theoretical point of view. Households in the early phase of life have a lower margin than those in the mid-life, where income peaks. The younger households have on average the lowest margin, slightly above NOK50,000, but their margin has grown by a substantial 12.4% annually over the eight year period. The low margin for the younger households is likely related to the liquidity constraints presented in the theory. According to our theoretical frameworks, the younger households will be closer to their liquidity constraints in order to realise their high demand for debt and come as close to the optimal level of smoothed consumption as possible. Hence, they should have tighter margins compared to older households with lower demand for debt.

**Figure 29: Average financial margin by age group, NOK'000, fixed 2012 prices**

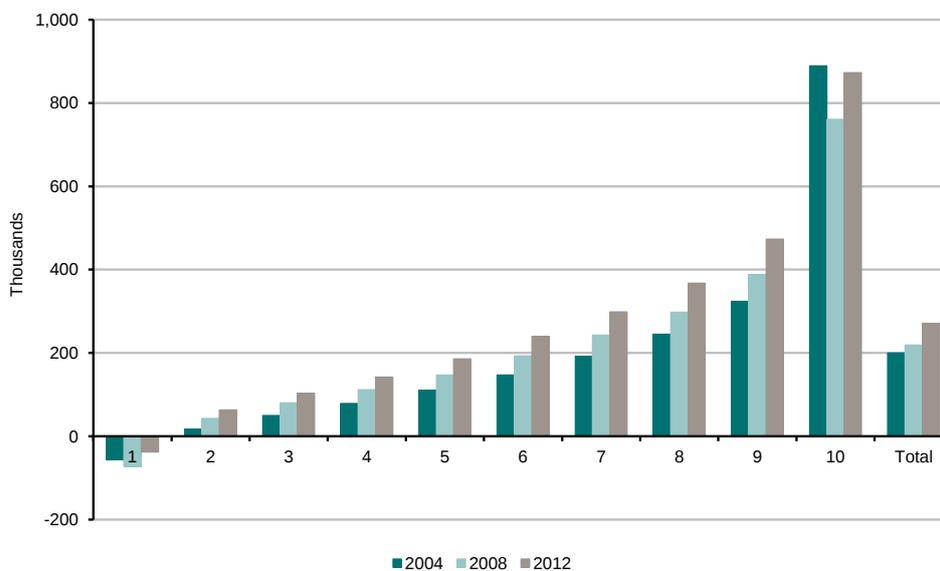
Source: (Own calculations, 2014), (SIFO, 2014)

The higher margins for the mid-life households (Figure 30) is in line with what could be expected from theory and our earlier findings. Financial margin increases with income, which

partly is a reflection of the standardised cost of consumption only being dependent on the number of persons in the household. Hence, the measure does not fully capture high-income households' likely adaptation to a higher standard of living and they will likely be highly reluctant to adjust their consumption pattern to the SIFO standards even in a scenario of financial distress. The underlying trend would however still be as identified, where a higher disposable income allows for more free funds after consumption expenses.

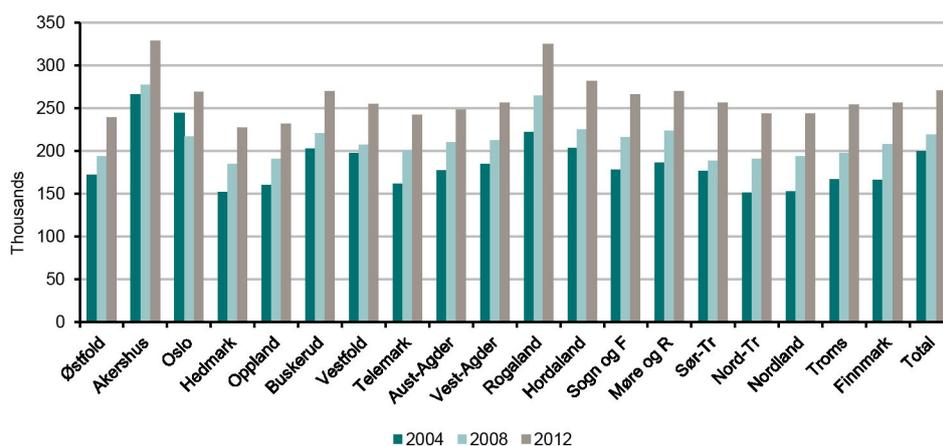
The tenth decile differs from the others, as there was a drop in 2008 and then an improvement in 2012, but still a reduction relative to the 2004 levels. An explanation could be that this group is sensitive to the financial markets. The lowest income decile holds on average a negative financial margin (most of these household have ~0 in registered disposable income).

**Figure 30: Average financial margin by disposable income decile, NOK'000, fixed 2012 prices**



Source: (Own calculations, 2014), (SIFO, 2014)

Figure 31 reveals that the financial margin is largest in Akershus and Rogaland, two of the counties identified with high debt levels with respects to debt-to-disposable income. The average financial margin in most counties is ~NOK250,000, but for Hedmark and Oppland it is somewhat lower. The growth in financial margin seems to be distributed evenly across all counties.

**Figure 31: Average financial margin by geographic region, NOK'000, fixed 2012 prices**

Source: (Own calculations, 2014), (SIFO, 2014)

In general, the households' financial margin seems to be solid, enabling them to service their debt at prevailing levels and cost of debt. However, there are pockets of risk, especially for the low-income households and younger households. These pockets of risk are of concern, as it leaves the households unable to service their debt, which will force them to default or alter the consumption-savings pattern.

### *Validation of the results*

We compare our results for the households' debt servicing ability with the results of Norges Bank in their 2014 Financial Stability Report (Norges Bank, 2014) in order to validate our results. Our findings are concurrent with those of Norges Bank. We observe that for debt-to-disposable income by age, both the distribution and the levels are in line with their results. Concerning the average financial margin, after taking into account the differences in inflation deflator, we are on a slightly higher average margin compared to what Norges Bank finds. The deviation is mostly explained by Norges Bank having lower disposable income, which again can be a result of our exclusion of student households (which likely would have driven the average disposable income down).

### **3.4.2 Security provided**

This section focuses on the security the households have pledged relative to the debt they have acquired. This is an aspect related to the supply of credit and the position of the household in case of a default.

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### *Loan-to-value*

Loan-to-value provides important information of whether the borrower has sufficient collateral. This is one of the most important measures when it comes to the supply of credit, as it provides the lender with assurance in case the borrower defaults on the debt. In addition, it provides information of the financial position of the household in the case of a default. In their guidelines for prudent residential mortgage lending practices from 2011, The Financial Supervisory Authority of Norway uses loan-to-value as one of the recommendations for Norwegian banks when distributing mortgage loans. Their definition is the following:

$$\text{Loan-to-value} = \frac{\text{Mortgage loan}}{\text{Market value of property}}$$

The measure is informative as it contains information of the exposure for the borrower and the relationship between the asset and the liability. If the loan-to-value ratio is one, the borrower should be able to realize the property without loss in the case of a default on the loan (disregarding any transaction costs). If the ratio is above one, a household will not be able to sell the asset and settle the total amount of the liability if it no longer is able to service its debt. Further, the measure is effective in revealing the sensitivity to changes in market value of property. If the borrower sees house values drop there will be a corresponding drop in net wealth, as the debt on the equity and liability side of the balance sheet are unchanged. The higher the loan-to-value, the lower the buffer of net wealth and the higher the financial vulnerability. With respect to the theories presented in chapter 2, the measure loan-to-value relates to the supply of credit to households, as creditors will be more reluctant to lend to borrowers providing low security.

The limitations of the measure relate to that loan-to-value does not provide any information on sources of funding other than the collateral agreed upon in the loan agreement. A borrower carries claims on unsettled debt for life in Norway (cannot walk away from the house and leave the settlement to the bank). One thus expects a borrower to go to great lengths to come up with additional funding to settle the debt.

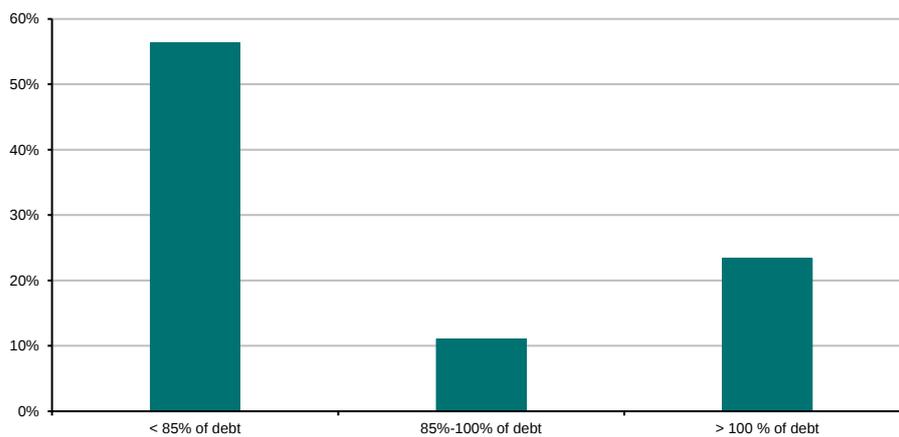
### **The loan-to-value (Debt-to-market value of dwellings) of Norwegian households**

In this thesis, loan-to-value is approximated as debt to market value of dwelling (DTV), since the dataset does not contain information on how the debt is secured. In the section on the characteristics of Norwegian households' debt, we found that 90% of Norwegian household debt is secured on dwellings (Figure 6), and therefore one can assess the measure debt to

market value of dwellings to be a decent approximation. We find support for this approximation in existing research, for example in the latest Financial Stability Report by Norges Bank (2014).

As we have assumed that all debt is secured on dwellings, we will only look at households registered with a primary dwelling in this specific section. When comparing debt to market value of dwellings across time, we must keep in mind the uncertainty in the estimated market value of dwellings prior to 2010, as there was a weaker relationship between the taxable value and the market value. (Ministry of Finance, 2009)

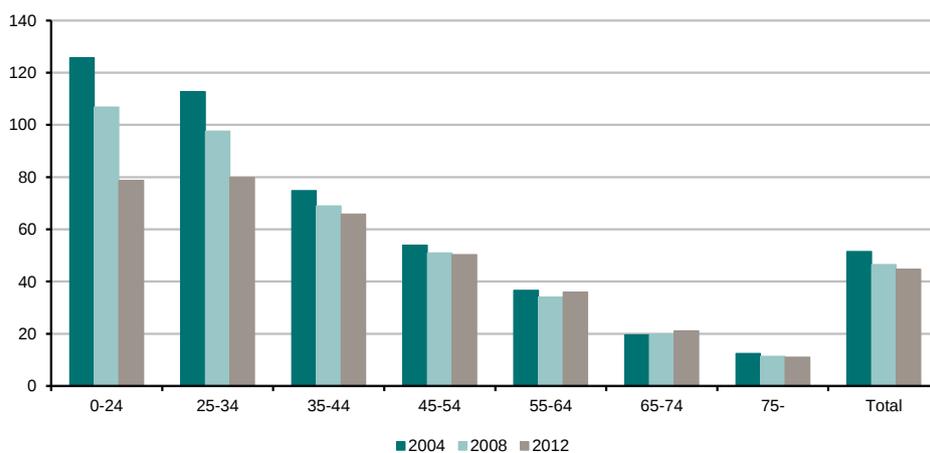
Figure 32 displays the distribution of debt for three different levels of debt to market value of dwellings. Dwellings are, for most Norwegian households, the largest single investment and households will often debt finance this investment in order to “consume” the dwelling throughout the life. In 2012, households with DTV below 85% held only 56% of total debt. This is interesting, as The Financial Supervisory Authority of Norway recommends banks to limit their lending to an 85% loan-to-value ratio (The Financial Supervisory Authority of Norway, 2011). There are three elements with opposing impact on the DTV, which have to be addressed in explaining the high DTV of Norwegian households. Firstly, the market value of dwellings could have dropped in the period after the debt had been issued. This is however an unlikely explanation for Norwegian households, as the housing prices have grown substantially in recent years, resulting in lower DTV ratios. On the other hand, Statistics Norway’s estimates of the market value of dwellings may be too low, not keeping track of the strong growth in house prices. This would result in higher DTV ratios. Secondly, the households can provide other security for the debt than the dwelling. This would result in lower DTV ratios. Lastly, the borrowers paying instalments on their debt reduce the DTV ratios. Hence, either the households provide additional security, Statistics Norway underestimates the market values or the DTV ratios at issuance are even higher than what we currently observe (which is well above FSA recommendations). More than 20% of the debt is held by households with debt exceeding the market value of their dwelling, meaning that a part of the debt is unsecured. In addition, we know that in an economic downturn, where some households likely are unable to service their debt, dwelling prices tend to fall. Thus, weakening the security even more.

**Figure 32: Distribution of debt by debt-to-market value of dwelling**

Source: (Own calculations, 2014) <sup>7</sup>

The distribution of DTV by age (illustrated in Figure 33) reveals that DTV decreases with age. The trend is explained by both an increase in the market value of dwellings in the period the household owns the dwelling, and as described in chapter 2, debt peaks around 35-44 years and decreases thereafter due to instalment payments.

This distribution is in line with what one would expect from the life cycle hypothesis, as the theory prescribes that younger households take on debt in order to smoothen consumption. A high DTV implies that they take on as much debt as they are able to, given the supply side requirements, for investing in a dwelling in the early phases of life (starting their dwelling “consumption”). One special feature of dwelling investments is that the dwelling seldom diminishes in value, thus this is not an ordinary type of consumption.

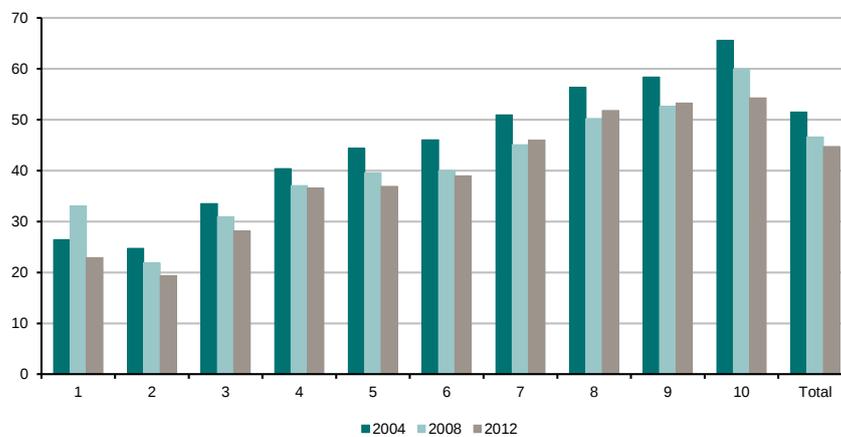
**Figure 33: Debt-to-market value of dwellings by age group, percent**

the Source: (Own calculations, 2014)

<sup>7</sup> Note that the sum of the shares of debt will not sum to one, as non-dwelling owning households hold 9% of total debt.

Figure 34 reveals the distribution of debt-to-value across income deciles, and that the DTV increases as the income increases. Holding disposable income as a proxy of the households' human capital we note that households with higher human capital takes on more debt relative to the market value of the dwelling they own. This could imply that the lenders are more willing to issue debt to households with higher human capital, where the human capital constitutes an implicit security. Another aspect is that other constraints may limit the low-income household before the DTV requirement comes into force. A low-income household likely have a tighter margin than a high-income household and the supply side may require higher security to compensate for the poorer debt servicing ability.

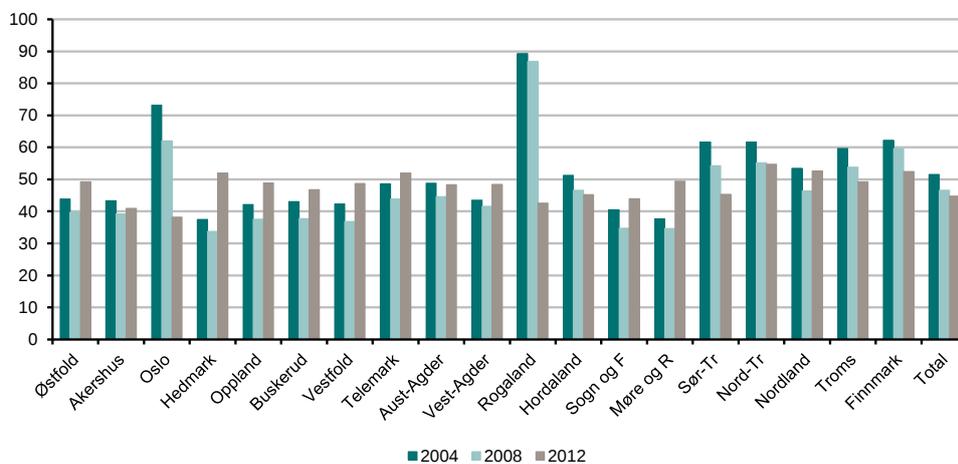
**Figure 34: Debt-to-market value of dwellings by disposable income decile, percent**



Source: (Own calculations, 2014)

The high DTV in Rogaland and Oslo for 2004 and 2008 (Figure 35) seem to stem from an underestimation of the market value of dwellings in those years. For 2012, there are only minor differences in the average DTV, and no counties stand out as especially important.

**Figure 35: Debt-to-market value of dwellings by geographic region, percent**



Source: (Own calculations, 2014)

The combination of high DTV and the rise in dwelling prices signals that the households have been able to borrow substantially more than the market value of the dwelling at the time the debt was issued. We find several pockets of risk where the debt exceeds the market value of dwellings. These households are exposed to uncovered debt in the case of default, which forces them to provide funds through other means. The combination of a substantial drop in the market value of dwellings and default would be particularly challenging for these households.

### *Validation*

We observe that our results for the distribution of debt by debt-to-market value of dwellings (Figure 32) are in line with those of Norges Bank (2014). This is the only direct comparison available. Norges Bank identifies a soft downward trend in debt-to-market value of dwelling. This trend is also observable in our results. These similarities support and validate our results.

## 3.5 Summary

In this chapter, we have presented the dataset, motivated the research question and outlined the financial aspects of an average Norwegian household. In order to assess the financial stability of the Norwegian households we have presented debt-to-disposable income and financial margin as measures of the debt servicing ability. In order to assess the security of the households we have presented the measure debt-to-value. We have found that the financial position of Norwegian households is in line with what is observed by Norges Bank, and mostly corresponds with our expectations with respect to the theories presented in chapter 2. We find the Norwegian households to have high debt-to-disposable income ratios, which make them more vulnerable to increased interest rates. However, the recent development of falling interest rates has decreased the households' interest expenses, improving their financial margin and thus their debt servicing ability. On the other hand, we find a substantial share of the total debt to be held by households with debt exceeding the market value of their dwelling. This makes them vulnerable for potential corrections in the housing market. We thus observe mixed developments in the different measures, which will be analysed further in a comprehensive assessment of households' financial vulnerability in the next chapter.

## 4. Norwegian households' financial vulnerability

In chapter 4, we address the secondary research question: *Are Norwegian households financially vulnerable at current debt levels?* The vulnerability of household debt relates to the household's debt level, its ability to service the debt and the security provided in case of inability to service the debt. We use the measures outlined above to reveal the households financial position. Firstly, we present some approaches used by supervisors and practitioners in Norway when they assess a household as financially vulnerable. We have also included an evaluation of the limits they use for the measures. Secondly, we assess the scope of financial vulnerable households in Norway, and test how sensitive the sector's vulnerability is to economic shocks in a comprehensive stress test. A financially robust household sector may suggest that Norwegian households can service higher debt levels and have higher debt capacity than their debt level in 2012. We continue to decompose the analysis on segments by age, income and geographic region in order to identify where the risk or capacity might be located.

### 4.1 When is a household financially vulnerable?

#### 4.1.1 The Financial Supervisory Authority of Norway's requirements

On December 1<sup>st</sup> 2011, the Financial Supervisory Authority of Norway (FSA) published a circular, "Guidelines for prudent residential mortgage lending practices" (The Financial Supervisory Authority of Norway, 2011). The circular concerns the minimum requirements for banks' internal guidelines for lending, and is thus an appropriate starting point when attempting to identify financially vulnerable households. These guidelines aim to ensure the stability of the financial sector.

Out of the FSA's ten recommendations we focus on the three recommendations with an evident affiliation to mortgage loans (we exclude home equity credit). Two of these three

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recommendations relates to the borrower having a liquidity surplus<sup>8</sup>, also after a five percentage-point increase in interest rate. The third recommendation is that the mortgage loan should not, normally, exceed 85% of the property value, i.e. have a loan-to-value ratio above 85%. The previous circular, of March 3<sup>rd</sup> 2010 (The Financial Supervisory Authority of Norway, 2010), stated that debt-to-gross income should not exceed three. When converting the denominator from gross income to disposable income the ratio increases, and a debt-to-disposable income of five times is equivalent to a debt-to-gross income of three (Solheim & Vatne, 2013).

We would like to emphasize that The Financial Supervisory Authority's role is to assure that the financial sector does not capsize. This may result in too conservative guidelines with respect to the households' true capacity.

#### **4.1.2 The academic approach**

Solheim and Vatne (2013) identify the scope of financially vulnerable households due to high leverage. They combine the three measures debt-to-disposable income, financial margin and net debt-to-value in order to assess a household's riskiness. They define debt above five times disposable income, financial margin below one month's salary and net debt-to-value above one as their thresholds for financial vulnerability. Households' riskiness is dependent on how many of the categories they are above the threshold. The households in all three categories are the most vulnerable (illustrated in Figure 36) and they argue that they have high probability of default. These households are characterised with high debt levels, low debt servicing ability combined with debt exposure exceeding the value of the collateral. These features leave a household highly sensitive to economic shocks and the limited financial manoeuvrability results in a high probability of financial distress and default. Solheim and Vatne's levels for when a household is categorized as financially vulnerable have been applied in financial stability analyses of Norwegian households by Norges Bank, for example in Lindquist et. al. (2014) and in the Financial Stability Report (Norges Bank, 2014).

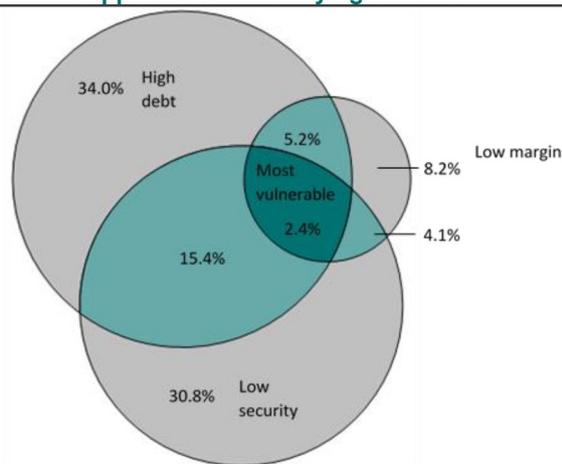
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<sup>8</sup> The FSA defines liquidity surplus as the financial margin less instalments.

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**Figure 36: Norges Banks' approach for identifying vulnerable households, 2011**


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Source: (Solheim & Vatne, 2013)

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### *Evaluation of the thresholds*

The threshold used for the financial margin by Solheim and Vatne and Norges Bank deviates marginally from the thresholds found in publications by the central banks in Finland (Herrala & Kauko, 2007), Denmark (Danmarks Nationalbank, 2007) and Sweden (Johansson & Persson, 2006). They all define financially vulnerable households as those with negative financial margin, while Norges Bank has the limit at one month's salary. A threshold at zero arguably reflects the limit where a household no longer is able to service its debt and defaults. The threshold by Norges Bank is thus slightly more stringent, but we also have to keep in mind that the financial margin measure does not include principal payments, which also will have to be serviced in the long run (banks will not accept interest-only periods forever). We note the marginal differences but conclude that a threshold of both one month's salary and zero are in line with the liquidity constraints households face.

A net debt-to-value of one implies that the households have no buffer left and that the value of the asset equals the liability attached to that very asset. A net debt-to-value above one does on the other hand imply that if the household suddenly no longer is able to service its debt, it will not be able to sell the asset and settle the total amount of the liability. Assuming that all other buffers are drawn upon (net debt only captures deposits), this would imply negative net wealth. Hence, a threshold of one reflects that the household has limited buffers and security behind the liability and easily can tip over to a situation of financial distress, making it reasonable to categorise it as financially vulnerable.

Categorising a household as financially vulnerable when it has debt more than five times its disposable income is more difficult to explain from a practical perspective, other than that it

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reflects that the household have a high debt level when we adjust for differences in disposable income. Both the Norwegian FSA and Norges Bank apply the threshold, but they do not provide sufficient justification of why, only that the measure capture that households with high income can service a higher level of debt and that banks include this aspect in their assessment of creditworthiness.

We note that the other Nordic central banks' definition only rely on the financial margin measure and that Norges Bank's definition arguably is a more comprehensive approach, capturing more of the financial aspects affecting a household and leading it into financial distress. Solheim and Vatne (2013) argue that the combined measure capture that a household with strong debt servicing ability (high margin) can compensate for weak collateral (high debt-to-value) by using some of the margin for down payments. Thus, reducing the debt-to-value ratio. Similarly, if a household have low debt servicing ability (low financial margin), but have solid security in assets (low debt-to-value) it can easier get interest-only periods or even defer interest payments. They also argue that the debt-to-disposable income measure capture that households with relatively low debt levels get better terms from the bank. Hence, they emphasize the advantages of the combined approach.

## 4.2 Vulnerable households at current debt levels

Last chapter provided a general impression of the current financial situation of Norwegian households, looking at the three measures of financial vulnerability for different segments. In this section, we aim to improve the understanding by setting these measures into context with the vulnerability thresholds presented above. These thresholds are defined as:

*High debt:* Debt-to-disposable income above five.

*Low margin:* Financial margin below one month's salary.

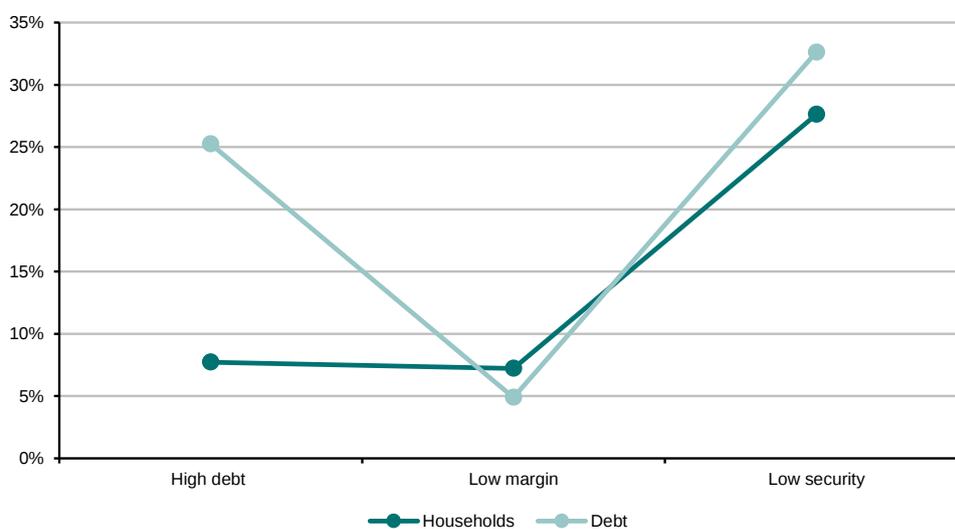
*Low security:* Debt-to-value (DTV) above one.

### 4.2.1 Single measures

Figure 37 provides a snap shot of the vulnerability of Norwegian households as of year-end 2012 based on three different measures. The measure *low security* reveals that as many as 28%

of all households have higher debt than the market value of their dwellings; this amounts to 33 % of all outstanding debt. The frequency of households with *high debt* is close to the frequency of households with *low margin*, both at 7-8%. The households with debt more than five times their disposable income hold 25% of total debt, while households with financial margin below one month's salary hold 5% of all debt. The latter category is arguably the most vulnerable in the short-term perspective, as negative shocks such as reduced disposable income, increased interest rate or unexpected costs may leave them incapable of servicing the running costs of debt and thus result in a technical default.

**Figure 37: Vulnerable households 2012**



Source: (Own calculations, 2014), (SIFO, 2014)

There has been a positive development for the *low margin* households with a substantial reduction in number of households and the debt they represent since 2004 (see Figure 38). Their share of total debt has halved over the eight-year period, and the number of households in this category has dropped even more. The declining trend is likely driven by the same factors that explained the increase in the households' financial margin in section 3.4.1, which were the decline in interest rates and moderate growth in costs. A different picture emerges if we look at the households in the *high debt* category. They have seen a gradual increase in both number of households and the amount of debt they represent. They held 25% of total debt in 2012 compared to 18% in 2004. The *low security* measure is excluded prior to 2010 due to the uncertainty in estimating the market value of dwellings for this period.

**Figure 38: Development in vulnerable households**

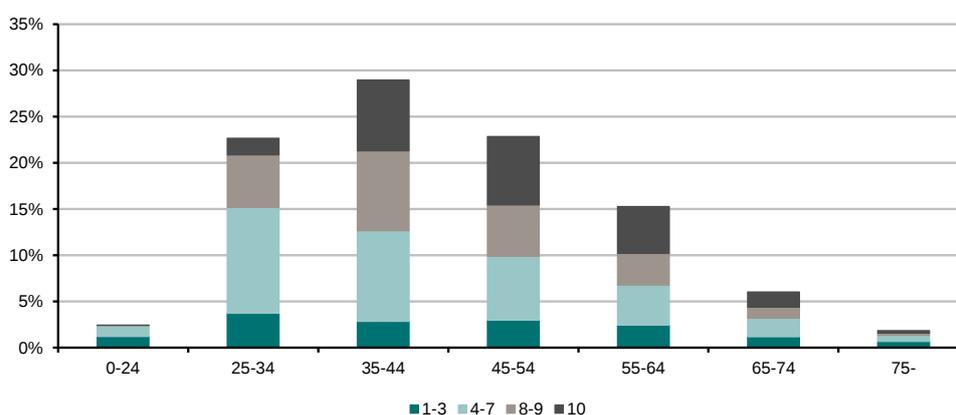
Share of total:	High debt			Low margin			Low security		
	2004	2008	2012	2004	2008	2012	2004	2008	2012
Households	5 %	6 %	8 %	18 %	11 %	7 %	N/A	N/A	28 %
Debt	18 %	23 %	25 %	10 %	11 %	5 %	N/A	N/A	33 %

Source: (Own calculations, 2014), (SIFO, 2014)

The mixed impressions of the vulnerability of Norwegian households, where we find a positive development for the *low margin* category while the *high debt* category is posting a more negative trend, may suggest that a more thorough analysis is required. We first analyse the distribution of the vulnerable debt in each category, and thereafter combine the three measures.

### *The high debt category*

Figure 39 reveals that those between 25 and 54 years hold most of the debt in the *high debt* category. In particular, the age category 35-44 holds close to 30% of this debt. Further, we find that the low-income households hold little of this debt, 15% in total. The group holding the largest share of debt categorised as vulnerable by this measure is those between 25-34 years in the fourth to seventh income decile, who holds 11% of the vulnerable debt. There is a low representation of the households from the older part of the population. This could imply that they have potential to acquire more debt despite that we identified them as the segments with the highest growth earlier.

**Figure 39: Debt of households with debt above 5 times disposable income by age and income decile, 2012**

Source: (Own calculations, 2014)

In order to evaluate whether the *high debt* category is just a representative sample of the total distribution, we have added a deviation table. This table identifies if a segment is over- or underrepresented compared to what we would expect if the distribution of the category was equal to the distribution of the whole population. The deviation table for the *high debt* category is found in Figure 40. For the households in the low-income classes (1<sup>st</sup>-3<sup>rd</sup> decile) there are

82% more debt relatively to distribution of total debt. The eighth and ninth income decile is underrepresented by 24% in the *high debt* category. Hence, indicating that debt held by low-income households are more vulnerable than debt held by high-income households by this measure.

**Figure 40: Deviation table, debt above 5 times disposable income relative to distribution of total debt, percent**

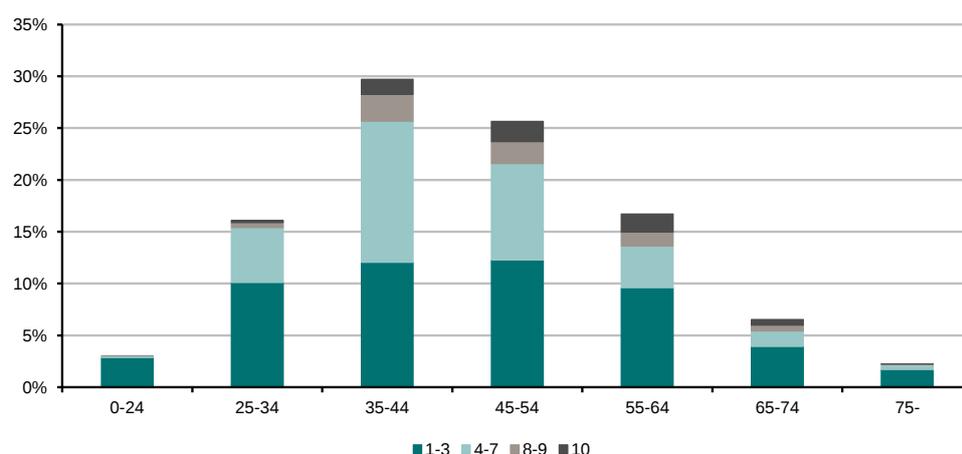
Income decile	Age							Total
	0-24	25-34	35-44	45-54	55-64	65-74	75-	
1-3	115	116	11	103	75	20	-13	82
4-7	29	36	15	2	-12	-30	-39	8
8-9	-27	-3	-23	-33	-33	-30	-38	-24
10	100	16	3	-17	-9	-3	-9	-7
<b>Total</b>	56	29	2	-11	-10	-17	-28	0

Source: (Own calculations, 2014)

### *The low margin category*

Figure 41 reveals that the vulnerable households, with respect to the *low margin* measure, are largely in the income categories 1-3 and 4-7, which totals 87% of the vulnerable debt. This is as expected, as the financial position is weaker for low-income households due to a larger share of their income being required to maintain a standard level of consumption. The distribution across age groups is fairly similar to what was observed for the *high debt* category, but the younger households in age group 25-34 hold significantly less of the vulnerable debt by the *low margin* measure compared to the *high debt* measure.

**Figure 41: Debt of households with financial margin less than one month's salary by age and income decile, 2012**



Source: (Own calculations, 2014), (SIFO, 2014)

The distribution of vulnerable debt by the *low margin* category relative to the distribution of total debt (see deviation table in Figure 42) pinpoints the vulnerability of the first to third

income decile. They are substantially overrepresented, holding a share of vulnerable debt 543% greater than their share of total debt. In addition, we find the youngest age group to be overrepresented. Identifying young households and low-income households as the relatively most vulnerable when it comes to financial margin was, as outlined above, not surprising.

**Figure 42: Deviation table, financial margin less than one month's salary relative to distribution of total debt, percent**

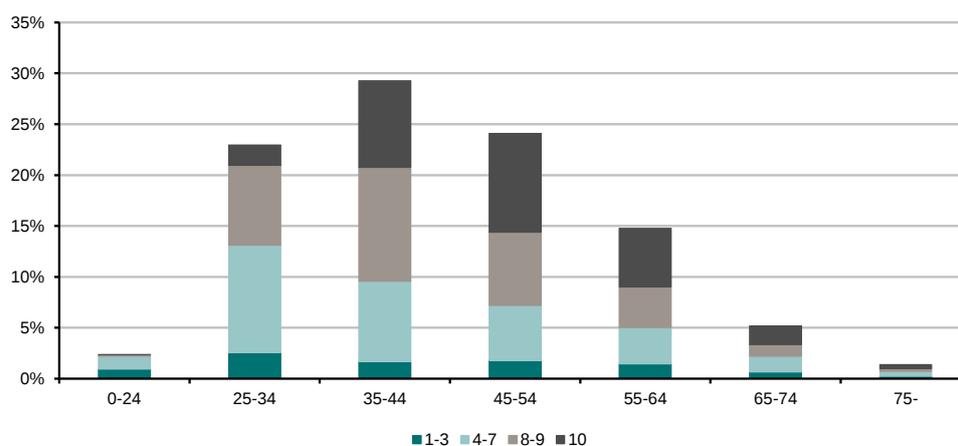
Income decile	Age							Total
	0-24	25-34	35-44	45-54	55-64	65-74	75-	
1-3	416	491	799	740	596	305	127	543
4-7	-80	-37	59	37	-18	-48	-59	2
8-9	-91	-91	-77	-75	-74	-68	-84	-78
10	-100	-84	-81	-78	-69	-67	-97	-77
<b>Total</b>	94	-8	4	0	-2	-10	-13	0

Source: (Own calculations, 2014), (SIFO, 2014)

### *The low security category*

The debt categorised as *low security* debt is displayed in Figure 43. As for the earlier categories, those between 25 and 54 years hold most of the vulnerable debt. However, unlike the two other categories, the majority is held by the upper three income deciles. One possible explanation is a difference in the households' spending allocation across income deciles. The households with higher income can cover their consumption expenses, and have a large share of their disposable income left to finance housing. In addition, from a supply side perspective, the banks may have more confidence in the high-income households, allowing them to take on more debt to finance dwellings than the lower income households.

**Figure 43: Debt above market value of dwelling by age and income decile, 2012**



Source: (Own calculations, 2014)

The deviation table in Figure 44 reveals that there is an overrepresentation of vulnerable debt held by the two youngest age groups and those households in the lowest income deciles, which

seems to be the trend across all the three vulnerability categories. In addition, the highest income group is overrepresented in the *low security* category, which is in line with our findings based on Figure 43. The oldest part of the population holds a relatively small part of the vulnerable debt, despite their substantial growth in the last periods, indicating potential of even more growth in this segment.

**Figure 44: Deviation table, debt above market value of dwelling relative to distribution of total debt, percent**

Income decile	Age							Total
	0-24	25-34	35-44	45-54	55-64	65-74	75-	
1-3	67	49	24	22	4	-34	-69	13
4-7	43	25	-8	-20	-27	-46	-58	-8
8-9	45	35	0	-14	-23	-34	-22	-3
10	100	28	15	8	3	8	18	10
<b>Total</b>	52	31	3	-6	-13	-29	-46	0

Source: (Own calculations, 2014)

Based on the single measures, there seems to be a trend where households between 35 and 44 years with mid-range income holds the largest share of vulnerable debt. However, these households hold most of total debt as well. When we compare to the distribution of total debt, the lowest income and age groups seem to be the most vulnerable. In order to capture whether the vulnerable households, defined by the single measures, are represented in more than one category we now look at the combined measure applied by Norges Bank.

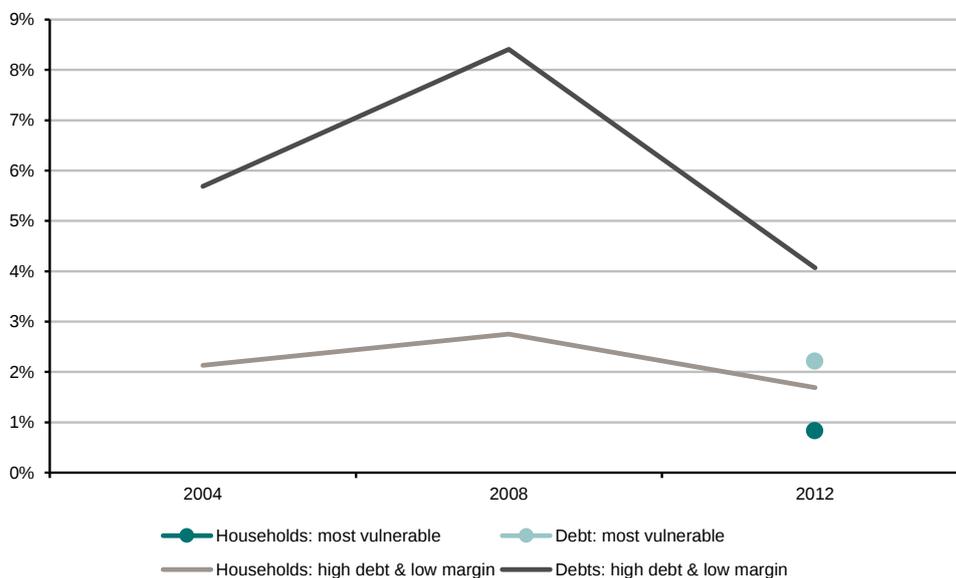
#### 4.2.2 The combined measure of vulnerable households

This section addresses the most vulnerable households, the households exceeding the thresholds for all three measures. These households are characterised as households with high debt relative to their disposable income and low margin combined with a debt exposure exceeding the value of the collateral. These features leave a household highly sensitive to economic shocks and the limited financial manoeuvrability results in a high probability of financial distress and default.

Figure 45 displays the development in vulnerable households from 2004 to 2012. Looking at the households characterised by having both *high debt* and *low margin* we find a close to 50% increase in the share of vulnerable households and the debt they represented from 2004 to 2008. The following period, from 2008 to 2012, the corresponding shares dropped below the 2004 level. A possible explanation for the boost in vulnerable households in 2008 could be the prelude to the Financial crisis, which took place at that time. The period was characterised by

high credit growth driven by innovative lending products and loosened credit standards increasing the availability of credit. The economic uncertainties in the aftermath of the crisis, resulting in more prudent behaviour, combined with a significant drop in interest rates (lowering the cost of debt and improving the financial margin) have likely driven the improvement in vulnerable households towards 2012. Due to poor data, the most vulnerable debt (households exceeding all three thresholds) could not be estimated with sufficient degree of certainty prior to 2010 due to inadequate estimates of the market value of dwellings (see appendix 8.6 for details). In 2012, slightly above 2% of all debt was categorised as vulnerable. This debt was held by less than 1 % of all Norwegian households.

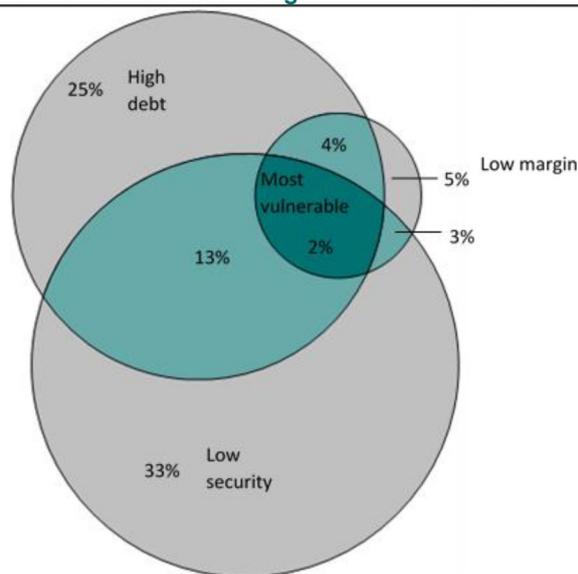
**Figure 45: Development in vulnerable households**



Source: (Own calculations, 2014), (SIFO, 2014)

The venn-diagram in Figure 46 illustrates the relationship between the different categories of vulnerable households. The low levels of vulnerable debt in the *low margin* category act as the determinant factor for the low amount of debt (and the share of households) categorised as most vulnerable. There is however a considerable amount of debt falling into two out of three categories. We find 13% of total debt to be in both the *high debt* and *low security* categories, while 4% is categorised as vulnerable by the combination of *high debt* and *low margin* and 3% by the combination of *low margin* and *low security*.

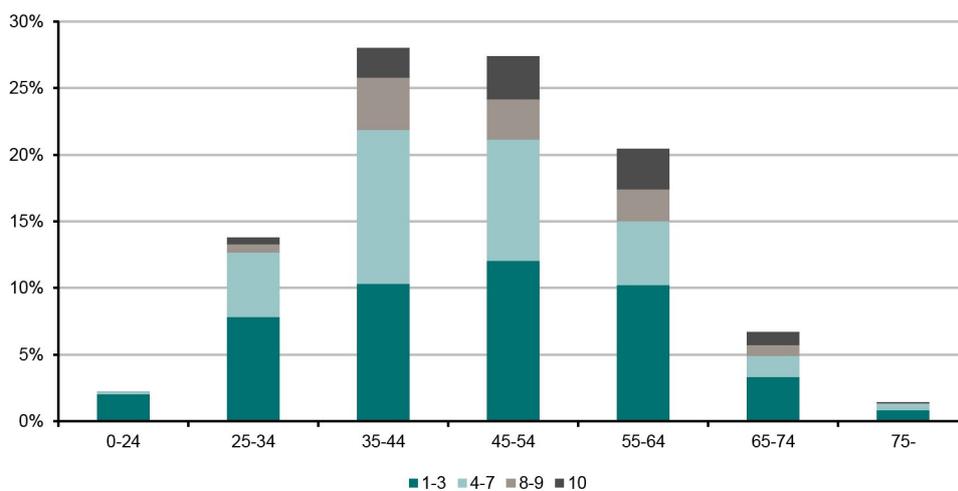
**Figure 46: Vulnerable debt when combining the three measures**



Source: (Own calculations, 2014), (SIFO, 2014)

Figure 47 displays the distribution of the vulnerable debt by the combined measure across age and income decile. Our first observation is the high share of debt held by those in the first to third income decile. This is likely explained by the low-income groups being overrepresented in the distribution of vulnerable debt categorised by the *low margin* criteria alone. The same explanation holds for the vulnerable debt held by households in the 4<sup>th</sup>-7<sup>th</sup> income decile ranging from 35-54 years. We also note the high density in the mid-life age groups. Households between 35 and 54 years hold more than half of the risky debt. This is partly a reflection of these age groups holding the majority of total debt (see section 2.4.2).

**Figure 47: Vulnerable debt by the combined measure by age and income decile, 2012**



Source: (Own calculations, 2014), (SIFO, 2014)

The deviation table in Figure 48 reveals that the low-income groups (1<sup>st</sup>-3<sup>rd</sup> decile) are heavily overrepresented in the most vulnerable category. The mid-life-mid-income groups are

overrepresented as well, but to a lesser extent. Looking at age groups, households in the 0-24, 45-54 and 55-64 range are overrepresented, at the expense of those between 25 and 34 and those above 65 years. Our analysis reveals that the early life households are the most vulnerable relative to debt taken, holding a 44% larger share of vulnerable debt compared to their share of total debt. We keep in mind that the vulnerable debt represents a minor share of total debt (only ~2%), but our findings suggest that low-income households in particular may have limited potential of acquiring more debt and should be monitored carefully. We also note that the oldest households are underrepresented, indicating solid finances and debt capacity exceeding current debt levels.

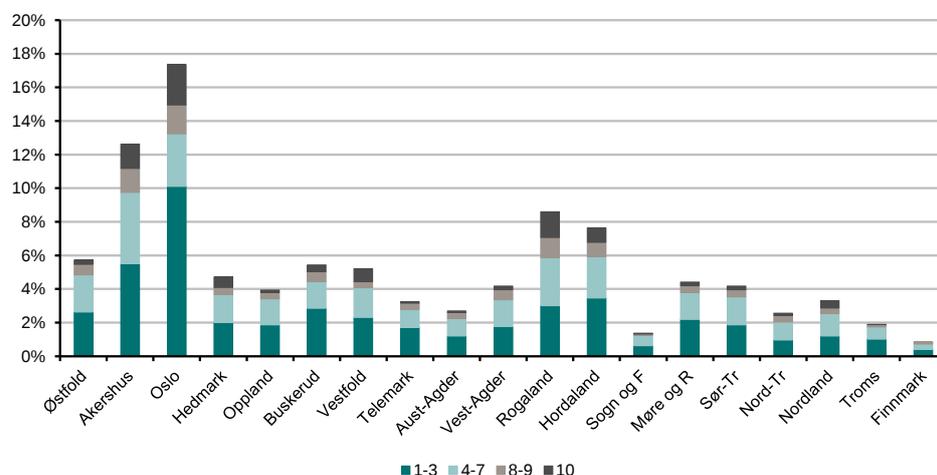
**Figure 48: Deviation table, most vulnerable relative to distribution of total debt, percent**

Income decile	Age							Total
	0-24	25-34	35-44	45-54	55-64	65-74	75-	
1-3	273	359	671	726	643	244	12	473
4-7	-79	-43	35	34	-2	-45	-56	-3
8-9	-100	-89	-65	-64	-54	-54	-86	-67
10	-100	-73	-70	-64	-46	-42	-94	-61
<b>Total</b>	44	-22	-2	7	20	-8	-46	0

Source: (Own calculations, 2014), (SIFO, 2014)

The distribution of the most vulnerable debt by county (Figure 49) highlights Oslo and Akershus as the two geographical regions where most of the vulnerable debt is held. 17% of the vulnerable debt is located in Oslo, while 13% is located in Akershus. The share held by the lowest income groups is particularly high in Oslo. Possible explanations are higher housing prices and costs of consumption pushing households with low-income professions to their limit in order to acquire housing in the larger cities. The counties having the lowest shares of vulnerable debt are Finnmark and Sogn og Fjordane.

**Figure 49: Most vulnerable households' debt by county, 2012**



Source: (Own calculations, 2014), (SIFO, 2014)

Despite the low share of total debt being categorised as vulnerable by all three measures, a significant share of debt is characterised as vulnerable by two out of the three measures. A stress test of the household sector should reveal how robust the households are to macroeconomic shocks and whether these shocks send some of the households into the high-risk category.

### *Validation of the results*

In the assessment of vulnerable households in the Financial Stability Report (Norges Bank, 2014), Norges Bank finds household debt in the *high debt* category and *low margin* category to be slightly higher than our results. Some of the deviation might be explained by differences in the dataset (mainly the exclusion/inclusion of certain households like pure student households, self-employed, persons living in institutions etc.). Their result for *low security* households is on the other hand somewhat above our results. This is likely explained by our use of gross debt, while Norges Bank are able to derive the net debt (we lack data on deposits). The distribution of vulnerable debt by age and income groups for the *high debt* category and *low security* category are in line with the results from Norges Bank, with only minor differences in debt held by those in the age groups 25-34 and 45-54. For the *low margin* category, our distribution is skewed towards the older age groups relative to Norges Bank's. A possible explanation is our exclusion of pure student households. Student households will likely have low income due to education coming at the expense of work, and can easily be categorised as *low margin* households with low or zero income (we do however not know whether Norges Bank includes student households). Norges Bank's distribution of vulnerable debt by income decile is in line with our results.

For the combined measure, our estimation of vulnerable households is very much in line with Norges Banks' results, where we estimate 2.2% of total debt as vulnerable, while Norges Bank's estimate is 2.1%. There are however differences in the distribution of vulnerable debt by age and income decile. Our results are skewed towards the older age groups when we compare to the Financial Stability Report. They find a high share of the vulnerable debt to be held by young households with low income, which enhances our hypothesis that they have included student households.

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## 4.3 The robustness of Norwegian households - Stress tests

We assess the robustness of Norwegian households through a stress test based on the vulnerability analysis above. A stress test is a simulation technique with the purpose of identifying the solidity of an analysis. We do so by altering crucial variables or imposing shocks, and assess the size of the following reaction. The complexity of a stress test can vary substantially. The most basic stress test is to alter one variable, and then assess the impact on one single parameter, as a standard sensitivity analysis. A more comprehensive method is to structure the test as a scenario analysis, where several variables are altered simultaneously and the impact is assessed on one or more parameters. This may be expanded further, by including iterative relations between the different variables.

With respect to households in the Nordic region, there was a high frequency of stress testing in 2006 and 2007, and we have examples of the most basic to more complex methods. Vatne (2006) tested the impact on the financial margin when increasing the lending rate of Norwegian households. The benefit of this crude approach is the easy interpretation of the results. Other research from the Nordic region involve interest rate and unemployment shocks on the financial margin (Danmarks Nationalbank, 2007) and a reduction to asset prices (Johansson & Persson, 2006). Herrala and Kauko (2007) create a comprehensive model to stress test the financial stability of Finnish households. The shocks concern unemployment, house prices and lending rate. In addition, they impose a time aspect, as they allow unemployment to stabilize at a permanent lower level, and they take into account the ability to postpone instalment payments. This allows for a solid understanding of the financial stability of Finnish households under a variety of scenarios. Even though this method might be better suited to fully reflect the sensitivity of the household finances, we must keep in mind that more complex methods often are more difficult to interpret and demand extensive data and information.

We have in our stress test, drawn upon the shocks used in the most recent stress test of Norwegian households in the Financial Stability Report (Norges Bank, 2014). The shocks in the report involve an interest rate increase of 3%-points, a drop in the value of dwellings by 30% and a combination of the two. Both the effect of increased interest rate and reduced market value of dwellings are of relevance under the prevailing economic conditions. This is

due the low interest rate environment (Statistics Norway, 2014i) and the recent house price rally (NEF, EFF, Finn.no, & Pöyry, 2012). We thus find it interesting to assess the impact of a correction in the housing market and more normalised interest rates. With respect to the interest rate changes we argue that due to the of debt having floating rate (as illustrated in Figure 10), changes in interest rate will quickly transfer into increased interest expenses. Unfortunately, we do not have any data on the households' deposits, thus the stress test is only impacting the interest rate on debt. This is a weakness in our approach, causing us to overestimate the vulnerability towards interest rate changes. Unemployment is currently well below the long term average (NAV, 2014a) and the Norwegian economy may face more challenging macroeconomic condition given the recent fall in oil price. Hence, we find it interesting and relevant to test the effect of an unemployment shock as well.

Our stress test only takes into account the isolated effect of the imposed shocks, i.e. in the case of reduced market value of dwelling the only alteration is a reduction in the variable market value of dwelling. This is a simplification, and the potential effects of a drop in housing values are more complex than our model is able to capture. A drop in the housing market transfers directly to an equivalent nominal reduction in the households' equity (ref. chapter 3.3.1 on the households' balance sheet). The reduced equity is expected to drastically affect the households' saving/consumption pattern towards less consumption, in order to compensate for the weaker financial position. When the household sector reduces their demand, it dampens the activity in the economy. Lower demand and economic activity can push businesses into financial distress and possibly bankruptcy, increasing unemployment, which in turn calls for increased government spending in terms of unemployment benefits. In order to prevent the economic downturn the central bank is expected to lower the interest rates, which should result in both increased household spending and improved competitiveness of domestic companies relative to foreign through a weaker currency (less expensive export, more expensive import). The interaction of these events are highly complex, and it is not within the scope of our stress test to model such effects. Nevertheless, our approach of stress testing the isolated effects is informative as it provides some colour on the vulnerability towards macroeconomic changes.

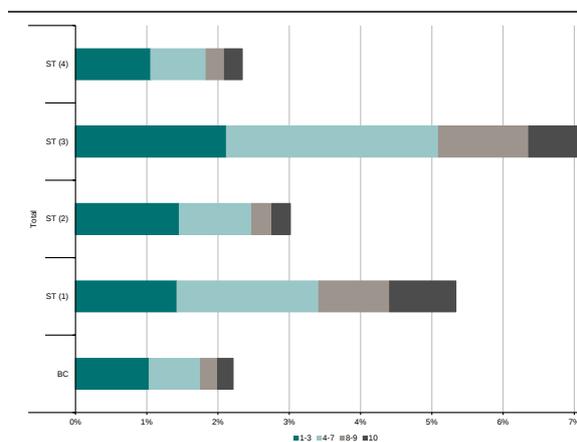
In addition to the shocks on interest rate, market value of dwelling and unemployment rate we have included a scenario combining increased interest rate and reduced market value of dwelling. As discussed above, this is an unlikely scenario as the central bank is expected to lower the interest rate following a drop in house prices. Still, the scenario provides information of the vulnerability of Norwegian households when stressed severely. This is a scenario used

in the Financial Stability Report (Norges Bank, 2014), thus by including this scenario we are able to compare and validate our results.

Figure 50 illustrates the share of vulnerable debt, and Figure 51 the vulnerable households in the following scenarios:

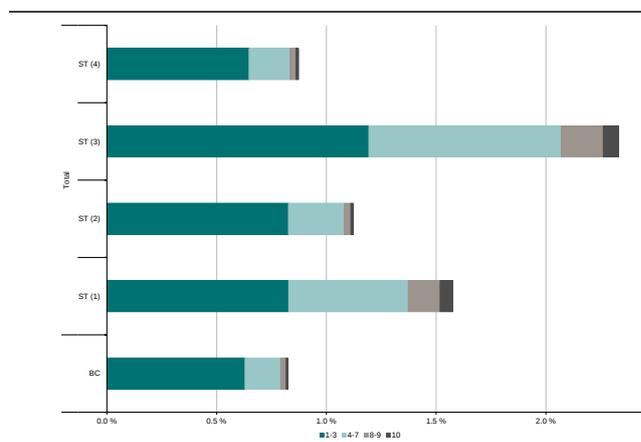
- ST (1) An increase in interest rate by 3%-points.
- ST (2) A decrease in market value of dwelling by 30%.
- ST (3) The combination of ST (1) and ST (2).
- ST (4) A 2.5% increase in unemployment.

**Figure 50: Vulnerable households' debt relative to total debt by income decile**



Source: (Own calculations, 2014), (SIFO, 2014)

**Figure 51: Frequency of vulnerable households by income decile**



Source: (Own calculations, 2014), (SIFO, 2014)

The share of vulnerable debt is highly sensitive to increased interest rate. This coincides with the discussion related to the low margin measure being the determinant measure for the vulnerable households identified by the combined measure. Changes in interest rates only affect the financial margin and the significant increase in vulnerable households from the increased interest rates suggest that a number of households initially being in two categories (*high debt* and *low security*) now are pushed into all three. An increase in the interest rate of 3%-points increases the share of vulnerable debt from 2.2% to 5.3%.

Initially, there is a substantial share of debt assessed as vulnerable by the single measure *low security*. There is however low sensitivity towards an isolated decrease in the market value of dwellings, where the share of vulnerable debt by all three criteria increases to 3% if the house values drop by 30%. The combined scenario, with both increased interest rate and drop in house values, implies an increase in share of vulnerable debt to 7.5%. This is a dramatic change

from what looks, on the aggregated level, to be a safe current position. We do however stress that the combined scenario is unlikely to be realised, as discussed above.

The stress test of increased unemployment reveals that both the debt and the frequency are insensitive to a 2.5% increase in unemployment. Explanations relate to the solidity of the Norwegian welfare system. In addition, there are some limitations to our approach to model unemployment shocks due to the lack of detailed data on the individuals in each household (see appendix 8.5 to 8.7 for details). The result for unemployment sensitivity is in line with international research on the area. The Austrian Central Bank (Albacete & Fessler, 2010) finds the effect of an unemployment shock to be less than the effect of an interest rate shock, mainly due to the flexibility of a household with multiple income sources, which can compensate for a reduction in income from work. For Norwegian households, we know that the subsidies from NAV are substantial, and further that the expenses derived from SIFO's reference budget are fairly low. Thus, the true sensitivity might be higher in a scenario where households have higher consumption levels than designated in this analysis, and therefore in reality are closer to the threshold. Findings from Denmark made by Danmarks Nationalbank (2007) and the Riksbank (Johansson & Persson, 2006) for Sweden, are that a 3%-point increase in unemployed households lead to a 0.3%-point and 0.5%-point increase in vulnerable households respectively<sup>9</sup>. This is in line with our observed 0.38 percentage point sensitivity to the 2.5%-point increase for Norwegian households.

Looking at the frequency of vulnerable households (Figure 51), we find similar sensitivities as we did when looking at debt levels, where they are most sensitive to increased interest rate. One interesting observation is the difference in the frequency and the size of debt for the low-income deciles (1<sup>st</sup>-3<sup>rd</sup>). There is a relatively higher frequency of low-income households compared to the debt held by these households. This is likely explained by their lower debt servicing ability, thus holding less debt compared to the higher income households.

Vulnerable debt at 2.2% seems stable and assuring in the current low interest rate environment. However, when assessing the potential impact of the vulnerable debt we should keep in mind that "the combined losses of the banks at the peak of the Norwegian bank crisis were 3% of

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<sup>9</sup> Danmarks Nationalbank and the Central Bank of Sweden defines vulnerable households only by the single measure financial margin below zero.

total lending” (Solheim & Vatne, 2013, p. 3). Thus, if the vulnerable debt materialises into loan losses for the banks it will constitute a significant risk. Especially so if the materialisation follows the stressed scenarios, with even greater amount of vulnerable debt.

Table 52 displays the results from more thorough stress testing with further changes in interest rate, market value of dwellings, unemployment and combined scenarios. The worst-case scenario of a 5%-point interest rate increase and a 40% drop in dwelling prices would cause 13% of the debt to be categorised as highly risky. We observe that there is low sensitivity with respect to changes in market value of dwelling, and a 40 % drop does only increase the vulnerable debt to 3.3% of total debt. The high interest rate sensitivity is still evident and a change in interest rate levels do have substantial effects on the vulnerable debt. The FSA recommends the banks to tests the borrowers for a 5%-point increase in interest rate. We find that such an increase in interest rate levels would result in a substantial increase in the share of vulnerable debt, leaving the share of vulnerable debt at 8% of total debt.

**Figure 52: Stress scenarios for the aggregated household sector**

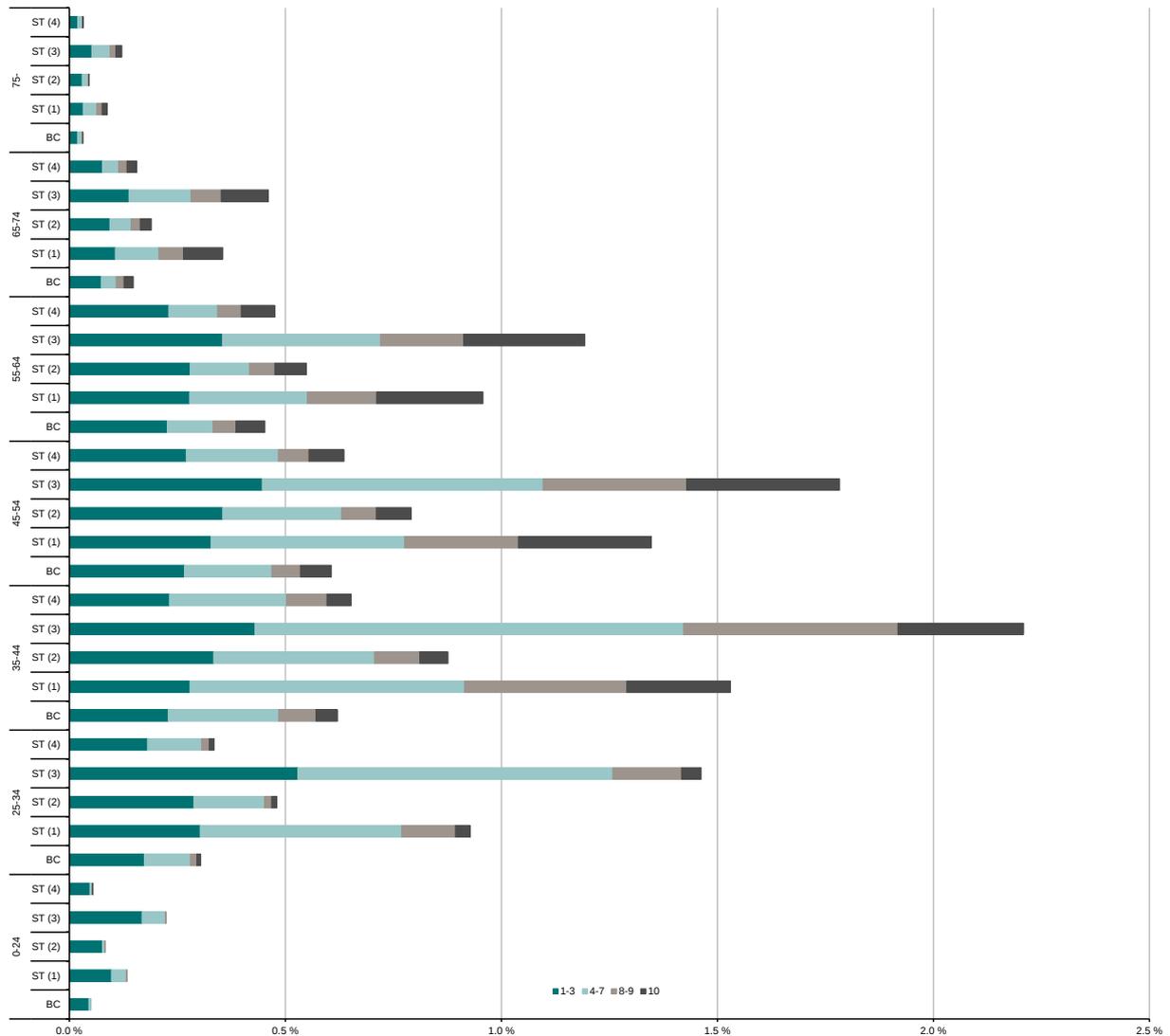
	Number of households (000)	Size of debt (NOKbn)	Share of households	Share of total debt	Households relative to BC (% of total)	Debt relative to BC (% of total)
<b>Base case</b>	<b>18.5</b>	<b>54.99</b>	<b>0.8%</b>	<b>2.2%</b>	<b>0 %</b>	<b>0 %</b>
<b>Interest rate increase</b>						
+ 3 percentage points	35.4	132.68	1.6%	5.3%	91 %	141 %
+ 5 percentage points	51.3	197.69	2.3%	8.0%	177 %	260 %
<b>Reduced market value of dwelling</b>						
- 20 percent	22.6	67.57	1.0%	2.7%	22 %	23 %
- 30 percent	25.2	74.93	1.1%	3.0%	36 %	36 %
- 40 percent	27.8	82.16	1.2%	3.3%	50 %	49 %
<b>Interest rate increase and reduced market value of dwelling</b>						
+ 3 percentage points and - 20 %	46.0	165.92	2.1%	6.7%	148 %	202 %
+ 3 percentage points and - 30 %	52.3	185.24	2.3%	7.5%	182 %	237 %
+ 3 percentage points and - 40 %	58.4	203.06	2.6%	8.2%	215 %	269 %
+ 5 percentage points and - 20 %	68.8	253.39	3.1%	10.2%	271 %	361 %
+ 5 percentage points and - 30 %	78.8	284.73	3.5%	11.5%	325 %	418 %
+ 5 percentage points and - 40 %	88.3	313.65	3.9%	12.6%	377 %	470 %
<b>Increased unemployment</b>						
+ 2.5 %	19.6	58.16	0.9%	2.3%	6 %	6 %
+ 5 %	20.7	60.85	0.9%	2.5%	12 %	11 %

Source: (Own calculations, 2014), (SIFO, 2014)

Figure 53 illustrates the distribution of vulnerable debt by age groups for the different stress scenarios. The figure reveals that those between 35 and 54 are highly vulnerable to changes weakening their financial position. In particular, an interest rate increase has substantial effect on the vulnerability within these segments, which likely is driven by their high debt level compared to the other age groups (see Figure 39). We observe that households in the mid-income segment, with income decile between four and seven (but to some degree households between eight and nine), constitute the majority of the vulnerable debt in the stress scenarios. An interesting remark is the low sensitivity in the oldest parts of the population. This can be a reflection of flexibility to take on more debt. The youngest part of the population

is mostly sensitive in the low-income segment. Low age - high-income households seem to be a fairly safe segment.

**Figure 53: Vulnerable households' debt relative to total debt by age and income decile**



Source: (Own calculations, 2014), (SIFO, 2014)

Figure 54 illustrates the distribution across counties. Oslo, Akershus, Rogaland and Hordaland are very sensitive to macro-economic shocks, and their share of vulnerable debt will significantly increase if interest rates increase. We have also added a chart decomposing the vulnerable debt by county and income decile simultaneously, which can be found in appendix 8.9. The main findings are that for Oslo, the lowest three income deciles represent a high share of vulnerable debt in all four stress scenarios. The share is the largest in the scenario with an isolated drop in the market value of dwellings. This supports our hypothesis that some of the households working in low-income professions may have to stretch their finances to the limit

in order to compete in the housing market with the high-income households (which arguably are overrepresented in the larger cities with higher density of people and jobs).

**Figure 54: Stress tests – Vulnerable households’ debt relative to total debt by county**

County	2012	Increased	Drop in	Increased	Increased
		interest rate (3%-points)	market value of dwellings (30%)	interest rate and drop in house values	unemployment (2.5%)
% of vulnerable debt		Increase in share of vulnerable debt (basis points)			
Oslo	0.38%	42	19	87	2
Akershus	0.28%	34	10	60	1
Rogaland	0.19%	33	9	57	1
Hordaland	0.17%	28	8	51	1
Østfold	0.13%	18	4	27	1
Buskerud	0.12%	16	4	25	1
Vestfold	0.12%	16	4	26	1
Hedmark	0.10%	13	1	18	1
Møre og Romsdal	0.10%	14	3	22	1
Vest-Agder	0.09%	14	4	24	0
Sør-Trøndelag	0.09%	17	4	30	1
Oppland	0.09%	12	2	16	1
Nordland	0.07%	12	2	17	0
Telemark	0.07%	9	2	14	0
Aust-Agder	0.06%	8	2	14	0
Nord-Trøndelag	0.06%	9	1	12	0
Troms	0.04%	7	2	12	0
Sogn og Fjordane	0.03%	5	1	7	0
Finnmark	0.02%	3	0	5	0
<b>Total</b>	<b>2.21%</b>	<b>313</b>	<b>80</b>	<b>524</b>	<b>13</b>

Source: (Own calculations, 2014), (SIFO, 2014)

### *Validation of the results*

In comparison to the results of Norges Bank’s stress test for the aggregated economy, our results are relatively more sensitive to changes in interest rate. This is likely explained by Norges Bank’s ability to model the positive effect of an interest rate increase on deposits, while we only capture the negative effect on the households’ debt. Sensitivities from changes in the market value of dwellings are in line with those of Norges Bank, where Norges Bank finds a 30% drop in house values to increase the share of vulnerable debt to 3.1% versus our result of 3.0%.

## 4.4 Conclusion

We have not found indications of Norwegian households being financially vulnerable at current debt levels despite the significant growth in debt levels seen the last ten years. 2.2% of the household debt is characterised as vulnerable based on our comprehensive approach of using three separate measures in combination. This is in line with what Norges Bank finds in their Financial Stability Report (Norges Bank, 2014). In addition to the results of Norges Bank we have identified the low-income households to be particularly vulnerable, both at current levels and in stressed scenarios. This is likely driven by their low financial margin where they have lower income to cover the same standard consumption as higher income households. We do however also identify the mid-income – mid-life households to represent a large share of vulnerable debt. This is likely explained by the segment holding the majority of household debt and their high debt levels make them sensitive to increased interest rates, which was identified as the factor with the largest impact on households in the stress test. The older households do on the other hand represent one of the more financially robust segments.

Even though the Norwegian households look financially robust at current debt levels, we would like to stress that if the vulnerable debt materialises as loan losses even small amounts of loan losses have historically had large impact on the aggregated economy (ref. the Norwegian banking crisis in the 1990's). The low level of vulnerable debt further suggests that the Norwegian household sector can support higher debt levels, but while the methodology in this chapter mainly focus on which households that cannot acquire more debt, the next chapter will address the opposite; how much debt can the Norwegian households acquire before they are categorised as financially vulnerable?

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## 5. The debt capacity of Norwegian households

In this chapter, we address the secondary research question: *which households can acquire more debt, and how much can they increase their debt level before they are characterised as financially vulnerable?* This secondary research question is also the question closest related to our primary research question: ***what is the debt capacity of Norwegian households, and who can acquire more debt?*** The chapter is structured in four sections. In section 5.1 we present a practical approach of identifying a household's debt capacity. Section 5.2 looks at the aggregated household sector's debt capacity based on the three criteria defining vulnerable households. We have also included a comprehensive sensitivity analysis, which addresses changes to underlying variables with potential of altering our primary capacity estimates. The third section in the chapter, 5.3, will look at the debt capacity broken down by age groups, income deciles and geography in order to identify the households with the largest potential for acquiring more debt. We summarise our findings and answer the research questions in section 5.4.

### 5.1 A practical approach for debt capacity

It is important to keep in mind that this master thesis aims to identify the debt capacity of the households, and not their demand for debt. It is not within the scope of this master thesis to predict realised future debt levels, but to assess their capacity, i.e. how much debt they can service, based on their financial position as of year-end 2012. The actual realised debt level will be dependent on demand and supply side effects and regulations of the financial sector regarding lending to households. Our estimates will thus reflect the liquidity constraints outlined in section 2.2 rather than the demand theories from section 2.1. They will however also reflect certain aspects of the supply side requirements as banks perform an assessment of the households' creditworthiness based on similar measures.

As a way of identifying the households' debt capacity, we will draw upon the practical method presented by Lindquist (2012) in her Norges Bank Staff Memo on Financial Stability. She applies the financial margin in order to identify the maximum debt capacity of the households.

The method builds on households being able to service the debt (both interest and instalments) up to their debt servicing income<sup>10</sup>, giving the following equation:

$$DSI_t = [i_t(1 - T) + \alpha] * debt_t$$

Where  $DSI_t$  is the debt servicing income in the period,  $i_t$  is the loan's interest rate,  $T$  is the tax rate,  $\alpha$  is the down payment in per cent of debt, and finally  $debt_t$  is the debt in the period. When this equation holds the following relationships hold:

$$i_t^{max} = \frac{\frac{DSI_t}{debt_t} - \alpha}{1 - T}$$

$$debt_t^{max} = \frac{DSI_t}{[i_t * (1 - T) + \alpha]}$$

Based on these equations, we have the opportunity of estimating the interest rate capacity at a given level of debt ( $i_t^{max}$ ), or the households' debt capacity at a given interest rate ( $debt_t^{max}$ ). This methodology, of rewriting the measures of financial stability given assumptions of what defines a financially vulnerable household, is easily transferable to the debt-to-disposable income and debt-to-market value of dwelling ratios.

When implementing this approach we increase each household's debt level until it meets the threshold of one of the three measures of financial vulnerability applied by Norges Bank<sup>11</sup>. For the households that does not own a dwelling we exclude the DTV criteria, since it does not provide any sensible information. When applying the approach on the DTV measure we are forced to hold the value of the dwelling as given. This implies that the potential new debt allocated to the households is not reinvested in a dwelling. This is a weakness in the approach, which could result in an underestimation of the capacity by the DTV criteria.

Our approach is more conservative than the method Norges Bank uses to identify the households with very high likelihood of default (they have to exceed all three limits). We argue that our conservative approach is more reasonable to apply when estimating the debt capacity, as the central bank's measure to a greater extent capture when they have exceeded

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<sup>10</sup> Lindquist defines debt servicing income as disposable income less costs of consumption

<sup>11</sup> See appendix section 8.8 for the estimation approach of the interest rate used when applying the financial margin measure. Note that our approach builds on the definition of financial margin used in this thesis, and does not include instalments.

the capacity, i.e. when they have reached a non-sustainable debt level with very high likelihood of default.

## 5.2 The debt capacity of the aggregated household sector

In this section, we aim to identify the aggregated debt capacity of the Norwegian households and identify the sensitivity of the results in a sensitivity- and scenario analysis. Figure 55 summarizes the different measures, their thresholds, and how they are identified in the figures.

**Figure 55: Debt capacity constraints**

<b>Constraint</b>	<b>Measure</b>	<b>Threshold</b>	<b>Notation in figures</b>
<b>1</b>	Debt-to-disposable income	Debt five times the disposable income	Max (1)
<b>2</b>	Financial margin	Financial margin equal to 1/12 disposable income (one monthly salary)	Max (2)
<b>3</b>	Debt-to-market value of dwelling	Debt-to-value equal to 1	Max (3)
<b>Combined</b>	Measure 1-3	The lowest capacity based on the single measures 1-3 (excludes nr.3 if the household does not have a dwelling)	Capacity

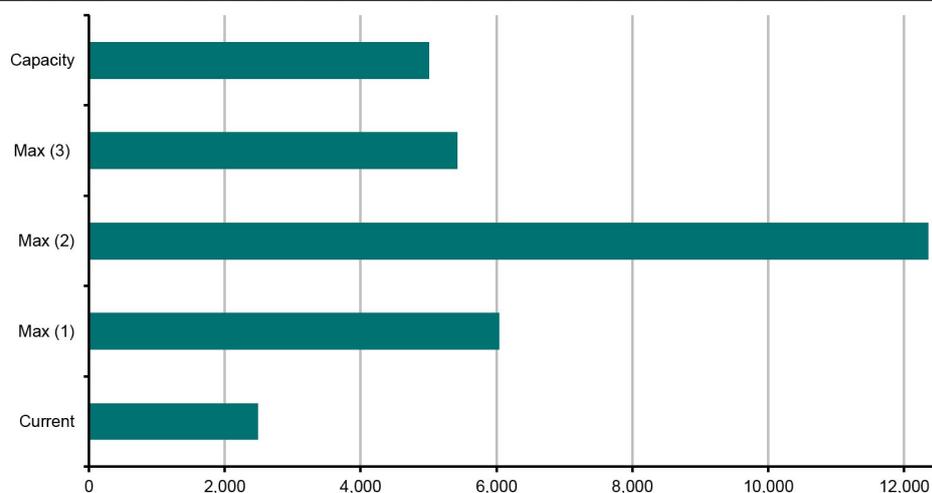
### 5.2.1 Estimated debt capacity of the Norwegian households

The results of our approach of identifying the debt capacity of all Norwegian households can be found in Figure 56. Firstly, we look at the capacity identified by the single measures. The exercise where we increase each household's debt level until it meets the limit of the single measures reveals that the Norwegian households have substantial debt capacity. Particularly when we look at the financial margin. When we increase the household's debt until they have a financial margin equal to one monthly salary we arrive at a debt capacity of NOKbn 12,350, approximately 400% above the current debt level. While this measure alone likely overestimates the households' debt capacity, it clearly indicates that the Norwegian households have high debt servicing ability. The likely overestimation of debt capacity mainly stems from the use of SIFO's standards of costs for consumption. As mentioned earlier, these levels of consumption are lower than most Norwegian households would be comfortable with, and higher costs of consumption would imply lower margins and lower debt capacity. The estimated debt capacity based on the debt-to-disposable income measure and debt-to-market value of dwelling are somewhat more muted compared to the application of the margin

measure, but they still yield capacities 143% and 118% above the current debt level, respectively.

Our estimate of the Norwegian household sector's debt capacity, the combination of the three constraints (see Capacity in Figure 56), is NOKbn5,000. This is 101% above the debt level in 2012 at NOKbn2,485. A debt capacity of NOKbn5,000 for the aggregated sector corresponds to a capacity of NOKm2.2 per household. Naturally, the combined measure yields a lower estimate than the single measures, as adding more constraints reduces the feasible region in the optimisation problem. A doubling of the debt level in 2012 may look a little aggressive given the already high debt level of Norwegian households. However, we have to keep in mind the results from last chapter, where we found the Norwegian households to be financially robust, even in stressed scenarios. A high debt capacity can thus be interpreted as yet another reflection of the households' strong financial position. In order to assess the validity of our estimate we will firstly conduct a sensitivity analysis and then break the estimate down on the now familiar segments we have used in the thesis.

**Figure 56: Debt capacity of all households by capacity measure (NOKbn)**



Source: (Own calculations, 2014), (SIFO, 2014)

## 5.2.2 Sensitivity- and scenario analysis of the estimated debt capacity

The estimated debt capacity of the Norwegian household sector is a result of a number of assumptions and simplifications. Most of these simplifications stem from limited data, for example the lack of information on the consumption level of the individual households and the attributes of the persons in the households (adult or child, education level etc.). In this

section, we will run a sensitivity analysis to identify how potential changes in macroeconomic conditions and potential miscalculations due to the limited data will affect our estimated debt capacity. Figure 57 summarises the sensitivity analysis.

**Figure 57: Sensitivity analysis - Estimated debt capacity for the aggregated household sector**

<b>Debt capacity, NOKbn</b>	<b>Debt capacity</b>	<b>Deviation from current levels (%)</b>	<b>Deviation from base case capacity (%)</b>
Current debt level	2,485		
Capacity	5,004	101%	
<b>Interest rate increase</b>			
3 percentage points	4,857	95%	-3%
5 percentage points	4,700	89%	-6%
<b>Reduced market value of dwellings</b>			
30% decrease	4,464	80%	-11%
<b>Interest rate increase and reduced market value of dwellings</b>			
+3 percentage points and - 30%	4,334	74%	-13%
<b>Increased unemployment rate</b>			
5 percentage points	4,947	99%	-1%
<b>Increased expenses</b>			
10%	4,914	98%	-2%
20%	4,808	93%	-4%
<b>New debt-to-market value of dwellings constraint</b>			
85% of market value	4,694	89%	-6%

Source: (Own calculations, 2014), (SIFO, 2014)

### *Interest rate*

We have included sensitivities on the interest rate as our approach of estimating the debt capacity does not reflect the banks' likely behaviour of increasing the interest rates when the debt level increases. The simplified model for how banks derive the interest rate on a loan (outlined in section 2.3.3) states that the banks in general will require a higher interest rate when the loan increases to compensate for increased risk. A dynamic interest rate capturing individual characteristics and debt levels was however difficult to implement in the estimation process (see appendix 8.8 for details). Once again, we run into the issue of only being able to alter interest rates on debt and not deposits, which is a weakness likely to cause an overestimation of the effect of increased interest rates. Nevertheless, the sensitivity analysis reveals that the estimated capacity is fairly insensitive to an overall increase in the interest rates, where the increase is independent of how much the household's debt increases with. A 3%-point increase in the households' interest rates decreases the debt capacity estimate by 3%, while a 5%-point increase in interest rates decreases the capacity estimate by 6%.

Keeping in mind that the household finances seemed highly sensitive to interest rate increases in our analysis of vulnerable households in the previous chapter, we note that the effects of an interest rate increase are surprisingly more muted when it comes to the estimated debt capacity. The likely explanation is that the margin measure is not the binding constraint for the households' capacity, as Figure 56 indicates. The figure reveals that the margin measure yields significantly higher debt capacity than the other single measures, and the results of the interest rate sensitivity suggest that even a 5%-points increase does not alter this significantly. Another important factor is that increased interest rate, and increased costs in general, will have a greater impact on lower-income households' margin, which we found to be tighter compared to the higher-income households'. Hence, we might have a large number of lower-income households that will see their debt capacity significantly reduced, but as they represent a small share of the total capacity (see section 5.3.2), the effect on the estimated capacity is limited.

### *House prices*

A significant change in house prices results in a larger deviation from the primary estimate compared to the interest rate increase. A 30% drop in house prices lowers the households' debt capacity by 11% to NOKbn4,464, 80% above the 2012 debt level. A shock to the house prices affects the households' debt capacity in terms of reduced market value of their assets and thus lowering the amount of collateral for loans. In chapter 3, we found the primary dwelling to be the largest asset of a Norwegian household and a significant drop in house values will cause a corresponding large drop in households' wealth. We would like to stress that our scenario only look at the isolated effect and not the possible long-term effects. A drop in households' wealth would likely result in cautious spending (Gudmundsson & Natvik, 2012), which would lower the households' demand and affect the aggregated economy, including the households.

### *Combined shock to interest rates and house prices*

If the economy would experience both an increase in interest rates by 3%-points and a drop in housing prices by 30% the result would be a 13% reduction from the current estimated debt capacity. This is a severe weakening of the households' financial position. The scenario is adapted from the most recent Financial Stability Report (Norges Bank, 2014), and allows for a comparison with their results of the households' vulnerability in such a scenario. The severe impact of the shock on the debt capacity is in line with what one would expect from Norges Bank's results of a significant increase in the share of vulnerable debt. However, the realism

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of the scenario can be debated, as one would expect the central bank to meet a significant drop in house prices with a reduction of the key policy rate, reducing the overall interest rate level.

### *Unemployment*

An increased unemployment rate of 5%-points does not affect the estimated debt capacity materially. The increased unemployment rate lowers the aggregated debt capacity by 1% to NOKbn4,947. The annual unemployment rate in 2012 was 2.5% (NAV, 2014a) and the increase thus implies an overall unemployment rate of approximately 7.5%<sup>12</sup>. The unemployment rate has not been recorded above 5% since the early 1990's (NAV, 2014a), which underpins the severity of our scenario. We will again like to stress that we have only looked at isolated effects. A negative unemployment shock will likely be driven by an economic downturn and affect both households (Gudmundsson & Natvik, 2012) and banks' lending practices (Hall, 2001). Many households having multiple income sources, which may enable them to service their debt even if one source is replaced by unemployment benefits, can be one explanation of the muted effect of increased unemployment. The SIFO standards for cost of consumption are in most cases easily covered by unemployment benefits, which also affects the households' ability to maintain a high debt capacity even when unemployment reduces the income level and decreases their margins.

### *Costs of consumption*

The application of SIFO's estimates for standard costs of consumption has been a recurring concern throughout the thesis. Due to the SIFO budget reflecting a parsimonious level of consumption, we have looked at how a consumption level closer to real life consumption levels affects our capacity estimate. When increasing the households' expenses by 10% and 20%, we find the debt capacity to decrease by 2% and 4%, respectively. The households' capacity is thus not very sensitive to increased costs. This is as expected as increased costs of consumption fall in the same category as increased interest rates, only affecting the financial margin measure. Hence, the likely factors explaining the insensitivity are the same as for the increased interest rates.

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<sup>12</sup> Assumed that the random selection does not select already unemployed households

### *The Norwegian FSA's loan-to-value recommendation*

In addition to the scenarios on interest rate, house prices, unemployment and expenses, we have included the effect of banks following the recommended loan-to-value on new mortgages at 85% by the Norwegian FSA. If there were to be no exceptions from the banks and all households would be required to hold 15% equity, the estimated debt capacity would decrease by 6% to NOKbn4,694. This debt-to-value limit is less directly related to a household's maximum debt capacity, as the FSA has the incentive to urge the households and banks to prudence and therefore recommend a buffer. Solheim and Vatne (2014) on the other hand find that the lending practices have changed after the introduction of the recommendation, lowering the observed debt-to-value level. Hence, this capacity estimate may to a greater extent reflect the restrictions imposed by the supply side compared to the primary capacity estimate.

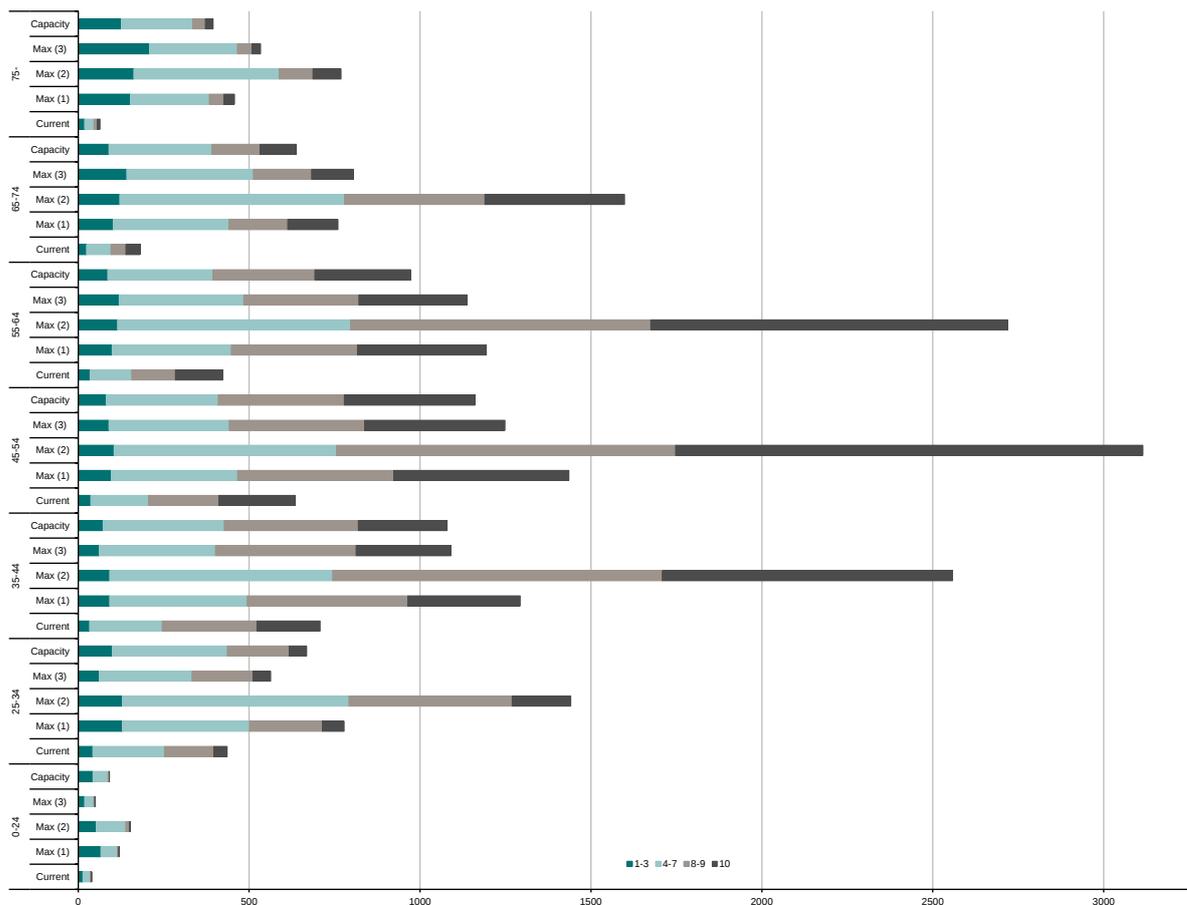
## **5.3 Debt capacity for different segments**

In section 5.2, we found the Norwegian households to have substantial capacity to increase their debt level before they would be characterised as even moderately financially vulnerable (one out of three vulnerability criteria). Our study of households has however taught us that aggregated data may cover underlying asymmetries, and segmenting by the use of micro data is necessary to evaluate and validate our results. In this section, we look at the now familiar segments age, income and geography, firstly to identify which households that have the largest potential, but also to validate our results. The breakdown on age allows for an assessment of the validity related to the life cycle hypothesis, and the segmenting by disposable income deciles can be evaluated based on the permanent income hypothesis and whether they reflect the constraints households face.

### **5.3.1 Debt capacity by age groups**

The breakdown on age groups (Figure 58 and 59) shows that all age groups have potential to increase their debt level, but there are large variations when we measure the debt capacity relative to the current debt level across the segments. The age groups 25-34 and 35-44 have a debt capacity only ~50% above their current debt level, while the older households have debt capacity more than 250% above current levels.

**Figure 58: Debt capacity for all households by age and disposable income decile (NOKbn)**



Source: (Own calculations, 2014), (SIFO, 2014)

In general, we find the households' debt capacity by age to reflect the segments' disposable income level. An age group's debt capacity increases with the segment's average disposable income and the ranking of the segments by debt capacity and disposable income is identical. The estimation method includes two measures where a higher disposable income is equivalent to higher debt capacity, the debt-to-disposable income ratio and the financial margin. The debt-to-value measure where we use the market value of the household's dwelling as collateral also affect the capacity estimate, but the ranking by dwelling value deviates from the other two. Hence, suggesting that the disposable income measures are the binding constraints for the majority of the households.

The youngest and the oldest age groups stand out with significantly lower estimated debt capacity compared to the other age groups, where the households from 0-24 years have on average debt capacity of approximately NOK900,000 and the households older than 75 years have a capacity of NOKm1.5. They are also the two age groups which currently hold the lowest level of debt, but then in the opposite order. The highest debt capacity is identified for the mid-life cycle age groups, where the households with the main income earner in the range

of 35-64 years have on average debt capacity of approximately NOKm2.5. The segments encircling this range, 25-34 and 65-74, follow with a capacity of ~NOKm2.

We note that despite posting the highest historical growth (see section 2.4.4), the older households have the highest relative potential of acquiring more debt. The estimated potential is supported by their strong financial position, where the analysis of the segment's financial vulnerability in chapter 4 identified them to represent a low risk segment even in stressed scenarios. The vulnerability analysis also highlighted the early- to mid-life cycle households to be more risky segments, which also is reflected in the estimated debt capacities. The age groups 25-34 and 35-54 have debt capacities approximately 50% above their current debt levels, while the corresponding potential for 45-54 year old households is 83%. Taken into account that these numbers are averages for the segments, the findings clearly indicate that a number of younger to semi-old households are close to their debt capacity and thus have limited potential of acquiring more debt. We also note that these segments (25-54 year old) hold the majority of Norwegian households' debt and have the highest debt capacities (except for households in age group 55-64, which have the second highest debt capacity). The identification of the households representing both the majority of current debt and total debt capacity to have the least potential of acquiring more debt suggests that the Norwegian debt market has reached a more mature stage. We are thus more likely to see credit growth below the high growth rates seen over the last ten years going forward.

A sensitivity analysis (see Figure 59) reveals that the estimated debt capacities for the youngest and oldest age groups are sensitive to changes in interest rate and consumption expenses. For the youngest households, a 3%-points increase in the interest rate decreases the capacity by 24%-points, while the corresponding number for the oldest households are 50%-points. These two segments are characterised by having the lowest disposable incomes and the lowest financial margins, which likely explain why increased interest rates and increased costs of consumption affect them more severely compared to other segments. The other segments have more robust financial margins, and finances in general, and thus more stable capacity estimates.

**Figure 59: Sensitivity analysis – Estimated debt capacity by age group**

Age group	Current debt level NOKbn	Debt capacity NOKbn	Deviation from current debt level					
			Debt capacity	Capacity (incr. interest rate 3 %-points)	Capacity (red. mv dwelling 30%)	Capacity (incr. interest rate 3 pp & red. mv dwelling 30%)	Capacity (incr. unemployment 5%-points)	Capacity (incr. expenses 10%)
0-24	38.7	91.4	136%	112%	130%	106%	130%	117%
25-34	435.7	668.0	53%	48%	45%	40%	52%	50%
35-44	707.7	1,079.0	52%	49%	37%	34%	51%	50%
45-54	635.0	1,160.6	83%	79%	60%	57%	81%	81%
55-64	423.0	972.9	130%	126%	100%	96%	128%	128%
65-74	181.1	638.0	252%	242%	207%	198%	248%	247%
75-	63.9	394.3	517%	467%	457%	412%	503%	481%
Total	2,485.1	5,004.2	101%	95%	80%	74%	99%	98%

Source: (Own calculations, 2014), (SIFO, 2014)

### *Capacity estimates versus theory*

In chapter 2, we observed the life cycle theory to describe the Norwegian households' borrowing behaviour quite well. We noted that the supply side's requirements for security in fixed and liquid assets and the ability to service the costs of debt likely explain why we do not observe higher debt levels among the youngest households. Their ability to acquire debt pledged on illiquid and unobservable human capital is very limited, and our estimation approach capture this feature. We find the youngest age group to have above average potential for debt increase at 136%, but they have the lowest estimated debt capacity. According to the life cycle hypothesis, young households would both have the highest demand and the highest ability to acquire debt given that they can use their human capital as collateral. Hence, our estimate of the youngest households' capacity might be too low according to demand theory. On the other hand, our estimate likely captures the age group's actual debt capacity as it arguably reflects more of the actual constraints households face when acquiring debt. The age group 25-34 has the third lowest debt capacity, which further enhances the argument that our estimates capture the liquidity constraints rather than the demand dynamics of the life cycle theory.

Using the observable current disposable income as an approximation for a household's human capital has likely resulted in an overestimation of older households' capacity. The households in the mid-life cycle (35-64) have the highest levels of disposable income, but the households in the upper part of this range have less human capital on their life cycle balance sheet as they have fewer years with full income left (the majority of their human capital has materialised as financial assets). Fewer years left imply lower demand for debt to smoothen consumption according to the life cycle hypothesis, as they are in a period of dissaving where they draw upon accumulated savings. We have estimated the age group 55-64 to have the second highest debt capacity and the two oldest age groups (65-74 and 75-) have estimated capacity 252%

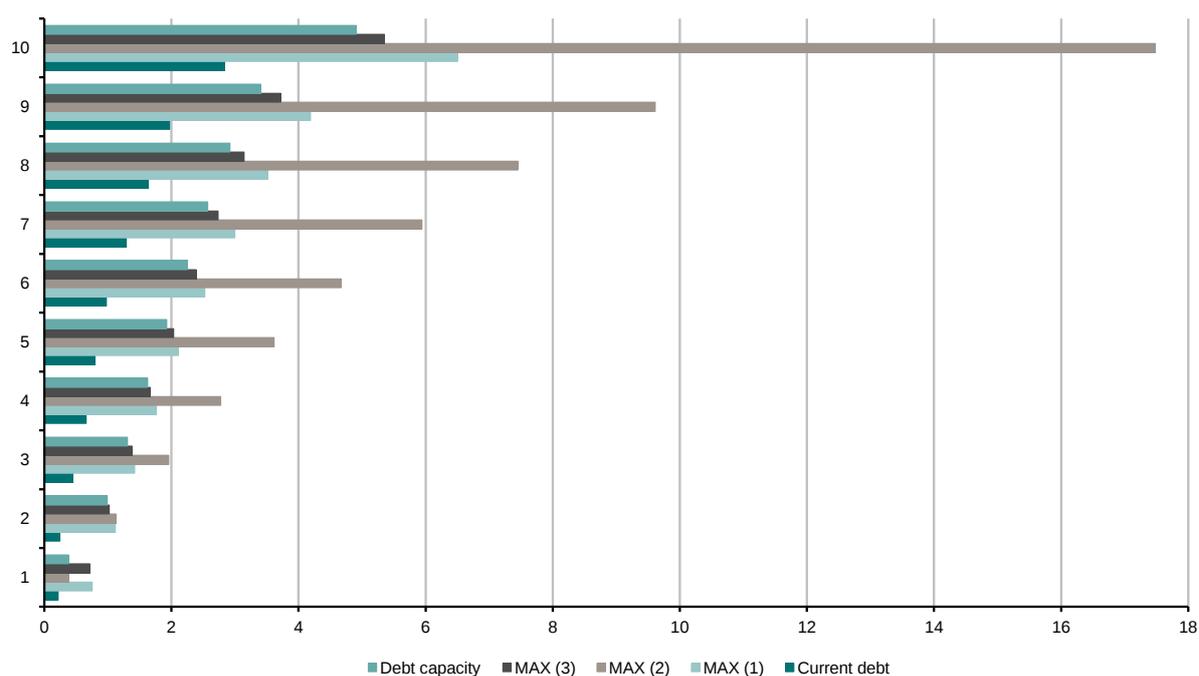
and 517% above their current debt levels. High disposable income and high levels of fixed assets, which can be used as collateral, likely explain the high debt capacities. While both these factors give the older age groups potential for acquiring more debt, they are less likely to realise the potential according to the life cycle theory. We note that we found the older age groups to have increased their share of the household sector's debt (see chapter 2.4.2) and they have posted above average growth rates. The growth have however come from low levels and according to credit demand theory households in the 65-74 age group are not likely to have higher demand than households in the 25-34 age group (which we estimate). The older households acquiring more debt could also be a result of increased perceived financial security where they decrease their financial buffers.

Even though the estimated debt capacity of younger and older households arguably do not fully align with demand dynamics of financial theory, they likely reflect the constraints households face when acquiring debt. We also note that some of the youngest household segments, 25-34 and 35-44, have debt capacities only ~50% above current levels, which suggests that the majority of households in these segments have acquired as much debt as the suppliers would grant them and are close to their maximum capacity. This is fully aligned with the life cycle theory where young households are expected to acquire large amounts of debt, and likely demand more than suppliers are willing to distribute.

### **5.3.2 Debt capacity by income decile**

Figure 60 and 61 reveal that debt capacity increases with disposable income. The lowest income decile has substantially lower average debt capacity compared to the 2<sup>nd</sup> income decile, but from the 2<sup>nd</sup> to the 9<sup>th</sup> decile the steps in capacity are more even. There is however another significant jump in average debt capacity from the 9<sup>th</sup> to the 10<sup>th</sup> decile of NOKm1.5. The disposable income's dominant role in assessing a household's debt capacity, where higher income results in higher capacity for two out of three measures, likely explain the correlation between high disposable income and high debt capacity.

Figure 60: Average debt capacity per household by income decile (NOKm)



Source: (Own calculations, 2014), (SIFO, 2014)

We identified the lower income groups to have relatively more unused debt capacity in the analysis of the aggregated household sector's debt capacity. This is confirmed by the breakdown on the single income deciles, but we note that it is the 2<sup>nd</sup> and 3<sup>rd</sup> deciles that have the largest unused capacity, where the capacity is 305% and 195% above the current levels, respectively. Our analysis of the households' vulnerability in chapter 4 did however identify the low-income households to be exposed to interest rate increases in particular, which suggests that we should not expect significantly higher capacity utilisation as interest rates are at historically low levels. A sensitivity analysis of the estimated debt capacity (see Figure 61) further enhances the low-income households' financial vulnerability, where the estimate for the lowest income deciles is very sensitive to increased interest rates and costs of consumption. This suggests that the financial margin measure is the binding constraint for the low-income deciles, which is supported by Figure 60. The figure shows that the estimated capacity using only the financial margin measure (MAX (2)) is very close to the combined capacity estimate for the 1<sup>st</sup> and 2<sup>nd</sup> income decile.

Additionally, Figure 60 shows that the estimated capacity using the financial margin measure is significantly higher than the other constraints for the higher income deciles. Hence, their debt capacity estimates are less sensitive for interest rate and cost of consumption increases (see sensitivity analysis below). It is however interesting to note that the higher income deciles, which holds the majority of households' debt have debt capacity approximately 70% above

their current levels. This is below the 101% for the aggregated sector, which enhances the impression that the Norwegian credit market for households is approaching a more mature stage.

**Figure 61: Sensitivity analysis – Estimated debt capacity by disposable income**

Income decile	Current debt level NOKbn	Debt capacity NOKbn	Deviation from current debt level					
			Debt capacity	Capacity (incr. interest rate 3 %-points)	Capacity (red. mv dwelling 30%)	Capacity (incr. Interest rate 3 pp & red. mv dwelling 30%)	Max debt (incr. unemployment 5%-points)	Max debt (incr. expenses 10%)
1	48.6	85.9	77%	44%	76%	44%	72%	27%
2	54.9	222.6	305%	206%	296%	203%	287%	248%
3	99.5	293.6	195%	175%	184%	165%	185%	184%
4	147.6	364.9	147%	133%	133%	121%	143%	140%
5	178.6	432.4	142%	134%	121%	115%	139%	139%
6	219.1	504.8	130%	126%	105%	102%	128%	128%
7	289.3	577.2	99%	97%	75%	74%	98%	99%
8	367.7	655.9	78%	78%	55%	55%	77%	78%
9	443.0	764.6	73%	72%	49%	49%	72%	73%
10	636.7	1,102.2	73%	73%	49%	49%	72%	73%
Total	2,485.1	5,004.2	101%	95%	80%	74%	99%	98%

Source: (Own calculations, 2014), (SIFO, 2014)

### *Capacity estimates versus theory*

The identified relationship in our estimates where higher disposable income results in higher debt capacity matches financial debt theory as higher income, all else equal, results in higher value of human capital. Higher value of human capital implies higher life cycle assets and higher life cycle consumption, which results in higher demand for credit in the periods where income is lower than the consumption level. We do not have data on the households' education level or skills, so it is challenging to validate whether the use of disposable income as an approximation for the size of human capital is adequate for all households. One exception is if the household or individual currently is in school or other training. They can expect higher income when they are finished, which increases the value of human capital, but if the training comes at the expense of work, they will currently have suppressed income. This is not captured by our methodology, but we would like to highlight that we have excluded pure student households, which limits the consequences of this shortcoming.

As mentioned in the previous section, older households represent a large share of the households in the high-income deciles. They are an example where the use of disposable income as approximation of human capital likely will overestimate the debt capacity. Consequently, our estimates for the high-income deciles may be overestimated. This further implies that the high-income deciles holding the majority of household debt have even less potential than the mentioned 70% increase from current debt levels.

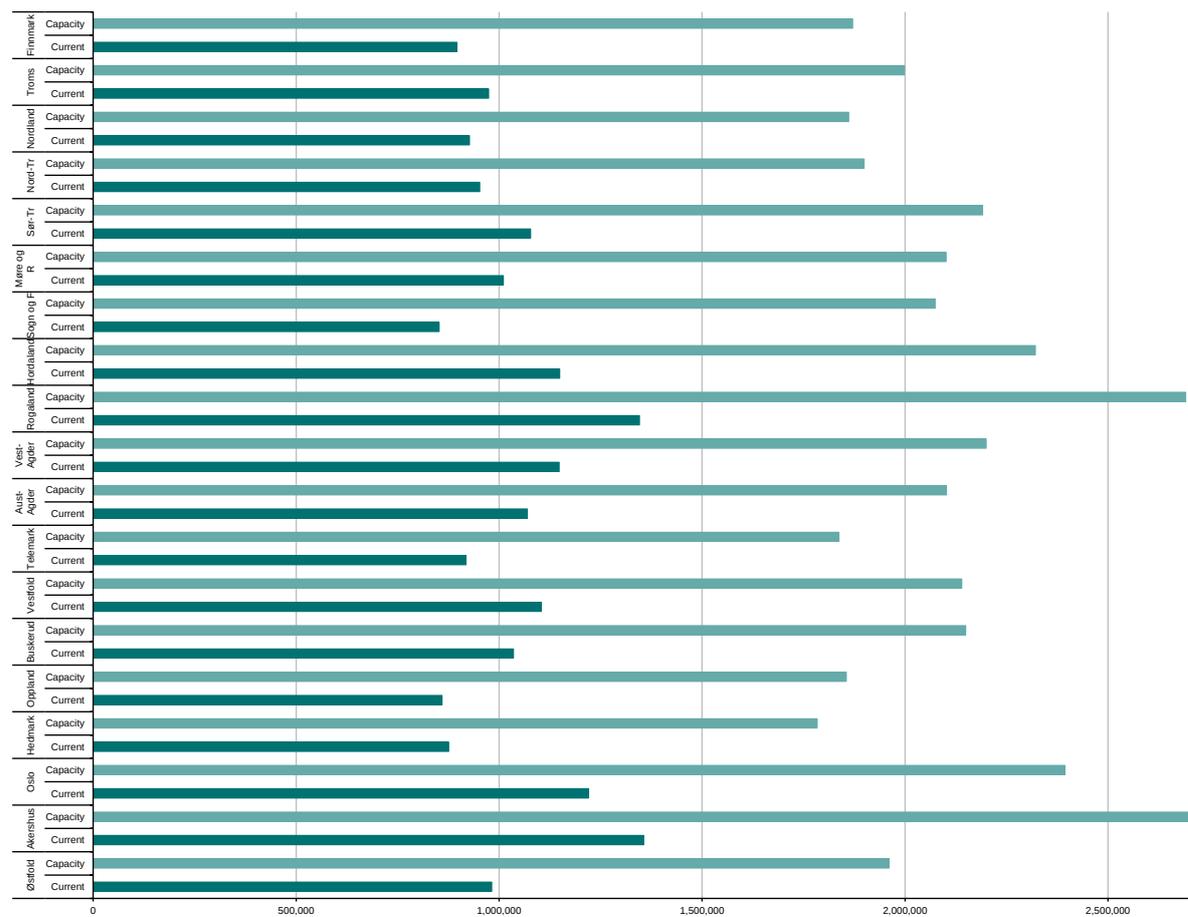
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In addition to the aspect of disposable income as an approximation of human capital, the disposable income is relevant in respect to the liquidity constraints of debt, where higher disposable income allows for higher debt servicing ability and thus improves the ability to acquire debt. This feature is captured by the financial margin measures. Hence, our estimates identifies the potential, but do not necessary imply that the unused capacity will be utilised. The utilisation and the actual debt acquired is the result of an interaction between the mentioned liquidity constraints, demand and also the banks' behaviour and regulation of the supply side.

### 5.3.3 Debt capacity by geography

When assessing the estimated debt capacity by geography we observe a clear trend where counties with high current average debt levels have the highest average debt capacity (Figure 62). In section 2.4.3, we identified the counties to be primarily those surrounding the largest cities in Norway, i.e. Oslo, Akershus, Rogaland and Hordaland, while Sør-Trøndelag (Trondheim) was surprisingly not included. The high capacity indicates that the counties' high debt-to-disposable income levels (illustrated in Figure 27) are offset by the substantial financial margin identified by Figure 31. This results in an average capacity for households in Akershus of NOKm2.71, NOKm2.69 in Rogaland and NOKm2.39 in Oslo.

There is in general large potential from the current average debt levels to the estimated capacity, and all counties can support more than a 90% average debt increase. One county standing out is Sogn og Fjordane, which has the third highest unused capacity per household of NOKm1.2. This yields the highest potential increase of more than 140% from the currently second lowest levels of average debt. Sogn og Fjordane is one of the counties marked having particularly low debt levels and low vulnerability throughout the analysis. Despite the large relative potential and financial solidity, we have to keep in mind that the county has the second lowest number of households, is the second lowest credit market and is located in one of the districts of Norway likely to have problems with depopulation and urbanisation. This suggests that the growth potential is somewhat limited and we find the county to have the third lowest debt increase potential in absolute terms on an aggregated level (see Figure 63).

**Figure 62: Households' average debt capacity by geography (NOK)**


Source: (Own calculations, 2014), (SIFO, 2014)

When we aggregate the capacity for the different counties, capturing the size of the credit markets (Figure 63), we find once more the counties surrounding larger cities to have the largest debt capacity. This is a natural consequence of the high average capacity and the high density of households in the regions. Oslo and Akershus alone hold 28% (NOKbn752 and NOKbn643, respectively) of the NOKbn5,000 total capacity. Interestingly, there are only minor differences in regional share of debt at current levels, compared to the share of the total capacity.

Figure 63: Share of debt by county

County	Current debt level NOKbn	Debt capacity NOKbn	Current share of debt	Share of capacity
Østfold	123.1	245.8	5.0%	4.9%
Akershus	321.6	642.6	12.9%	12.8%
Oslo	383.6	752.5	15.4%	15.0%
Hedmark	77.2	157.1	3.1%	3.1%
Oppland	72.4	156.4	2.9%	3.1%
Buskerud	123.7	256.8	5.0%	5.1%
Vestfold	117.9	228.4	4.7%	4.6%
Telemark	71.0	142.0	2.9%	2.8%
Aust-Agder	52.1	102.3	2.1%	2.0%
Vest-Agder	86.8	166.4	3.5%	3.3%
Rogaland	256.5	512.9	10.3%	10.2%
Hordaland	249.1	503.0	10.0%	10.1%
Sogn og Fjordane	38.6	93.9	1.6%	1.9%
Møre og Romsdal	112.4	233.8	4.5%	4.7%
Sør-Trøndelag	145.1	295.1	5.8%	5.9%
Nord-Trøndelag	54.6	108.9	2.2%	2.2%
Nordland	99.5	199.7	4.0%	4.0%
Troms	70.1	143.8	2.8%	2.9%
Finmark	29.9	62.4	1.2%	1.2%
<b>Total</b>	<b>2,485.1</b>	<b>5,004.2</b>	<b>100 %</b>	<b>100 %</b>

Source: (Own calculations, 2014), (SIFO, 2014)

Figure 64 provides a sensitivity analysis across the different counties. The analysis reveals that the different counties respond fairly similarly, in relative terms, to different macroeconomic changes. We find the capacity estimates to be most sensitive to a 30% decrease in house values followed by a 3%-point increase in interest rates.

Figure 64: Sensitivity analysis by county

County	Current debt level NOKbn	Debt capacity NOKbn	Deviation from current debt level					
			Debt capacity	Capacity (incr. interest rate 3 %-points)	Capacity (red. mv dwelling 30%)	Capacity (incr. Interest rate 3 pp & red. mv dwelling 30%)	Max debt (incr. unemployment 5%-points)	Max debt (incr. expenses 10%)
Østfold	123.1	245.8	100%	92%	74%	68%	98%	95%
Akershus	321.6	642.6	100%	96%	78%	74%	98%	98%
Oslo	383.6	752.5	96%	91%	81%	76%	94%	93%
Hedmark	77.2	157.1	104%	96%	80%	74%	101%	98%
Oppland	72.4	156.4	116%	107%	92%	84%	113%	110%
Buskerud	123.7	256.8	108%	101%	82%	76%	105%	104%
Vestfold	117.9	228.4	94%	87%	70%	65%	92%	90%
Telemark	71.0	142.0	100%	93%	75%	69%	98%	95%
Aust-Agder	52.1	102.3	97%	90%	73%	68%	94%	93%
Vest-Agder	86.8	166.4	92%	86%	70%	65%	90%	88%
Rogaland	256.5	512.9	100%	96%	80%	76%	98%	97%
Hordaland	249.1	503.0	102%	96%	79%	74%	100%	99%
Sogn og F	38.6	93.9	143%	135%	116%	109%	140%	138%
Møre og R	112.4	233.8	108%	101%	83%	78%	106%	104%
Sør-Tr	145.1	295.1	103%	97%	81%	76%	101%	100%
Nord-Tr	54.6	108.9	99%	92%	78%	72%	97%	95%
Nordland	99.5	199.7	101%	94%	77%	71%	98%	96%
Troms	70.1	143.8	105%	98%	84%	78%	103%	101%
Finmark	29.9	62.4	109%	102%	85%	79%	106%	104%
<b>Total</b>	<b>2,485.1</b>	<b>5,004.2</b>	<b>101%</b>	<b>95%</b>	<b>80%</b>	<b>74%</b>	<b>99%</b>	<b>98%</b>

Source: (Own calculations, 2014), (SIFO, 2014)

## 5.4 Conclusion

In this chapter, we have addressed the research question concerning which households that can acquire more debt, and how much they can increase their debt levels before they are characterised as financially vulnerable. We have found the Norwegian households to have substantial debt capacity, 101% above the debt level in 2012. This amounts to NOKbn5,000, or an average capacity of NOKm2.2 per household. Sensitivity analyses and stress tests indicate that our capacity estimates are fairly robust for macroeconomic changes.

When segmenting the capacity on age we find the households between 25 and 44 to have significantly less available capacity than the older households measured relative to the current levels of debt. This is as expected as the younger age groups according to the income smoothing theories have high demand for debt and likely will be very close to the constraints imposed by the banks. The banks' constraints and requirements will again be closely related to the households' maximum debt capacity measured by their debt servicing ability.

We find debt capacity to increase with disposable income, which likely is explained by the dominant role of the disposable income when assessing a household's debt capacity. The identified relationship is in line with the theoretical foundation of the permanent income hypothesis and the liquidity constraints the households face. We identify the lower income groups to have relatively more unused debt capacity. However, their significant sensitivity towards increased interest rates suggests that we should not expect substantially higher capacity utilisation as interest rates are at historically low levels.

When assessing the debt capacity by county we find that Oslo, Akershus, Rogaland and Hordaland have the largest potential capacity, which likely are driven by the counties having high population density and high income levels. There is relatively small differences in the market share when comparing the distribution of current debt levels to capacity levels.

In general, we find the households with the highest demand for debt to have the lowest debt potential, which highlights the evident market imperfection where younger households do not get loans based on their uncertain and immaterial human capital due to problems of moral hazard. The limited unused debt capacity possessed by the households with the highest demand for credit further suggests that the Norwegian credit market for household lending is approaching a more mature stage.

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## 6. Conclusion

### 6.1 Conclusion

The purpose of this master thesis has been to identify the debt capacity of Norwegian households and which households that have possibility to acquire more debt. There has been a growing interest for the Norwegian households' financial stability after the acceleration in the households' debt level seen over the last decade. The growing interest has resulted in the development of comprehensive methods and tools for monitoring and evaluation of the households' debt level and their financial vulnerability. The central bank of Norway has conducted stress tests of the Norwegian households, but we are not aware of other stress tests of Norwegian households as comprehensive as ours, where we break the results down on segments by age, income and geographic region. We argue that our approach allows for a more thorough identification of where we can find pockets of risk across the households. We are not aware of other studies estimating the debt capacity of households reflecting more than just their debt servicing ability measured by the financial margin.

Despite the significant growth in debt levels, we find low levels of vulnerable households, suggesting that Norwegian households can support even higher debt levels. In 2012, only 2.2% of the total debt was identified as vulnerable with high likelihood of default. The stress tests did however reveal that the high debt levels make the households sensitive for increased interest rates in particular, which are at historically low levels. Our findings suggest that the government and supervisory authorities should continue to monitor the financial stability of the Norwegian households carefully as history has shown that even small loan losses on banks' lending exposures towards households have had severe economic consequences.

Our analysis indicates that a number of households likely will run into financial distress if interest rates increase by 5%-points (vulnerable debt increases from 2.2% to 8% of total debt). The Financial Supervisory Authority of Norway recommends banks to ensure that the borrower copes with such an increase when distributing the loan. Despite the more prudent practices by banks (Solheim & Vatne, 2014), our findings suggest that some banks overstep this recommendation. Hence, the FSA might want to monitor banks' lending practices even closer to prevent loosened credit standards, which could have substantial negative effects for the economy when the interest rates start to climb. We also find more than 40% of total debt

to have higher debt-to-value than the 85% recommended by the FSA. However, we have to remember that it might take time before the new loan-to-value guidelines are implemented in the banks' lending books.

There is considerable debt capacity within the household sector according to our estimates. We find the households to have potential of increasing their debt by 101% from their 2012 levels before they are categorised as moderately financially vulnerable. When segmenting the capacity by age we observe the age groups between 25 and 44 to have significantly less available capacity than the oldest households relative to the current levels of debt. These findings are consistent with theory of household debt. Theory identify younger households to have high demand for debt, but more limited debt servicing ability compared to older households due to low current income and banks' requirements of sufficient collateral, driving the realised debt below demanded. Older households are on the other hand less likely to draw upon the identified potential of acquiring more debt. In general, we find the households with the highest demand for debt to have the lowest debt potential, which highlights the evident market imperfection where younger households do not get loans based on their uncertain and immaterial human capital due to problems of moral hazard.

The identification of free debt capacity possessed by other households than those with the demand for additional capacity suggests that there might be room for a reallocation, leaving the economy as a whole better off. The problem of moral hazard and information asymmetries are currently partly solved by the Norwegian State Educational Loan fund (Lånkassen) and familial relationships, where we have seen an increasing trend of parents helping younger generations into the housing market. There should however be potential to utilize the market imperfection where the households with excess capacity, and ability of carrying the risk related to lending pledged on human capital, could pool their funds and make it available for the relevant customers with a compensation for the risk taken.

The limited free debt capacity possessed by the households with the highest demand for credit further suggests that the Norwegian credit market for household lending is approaching a more mature stage. This implies that banks may expect moderated lending growth more in line with the growth of the gross domestic product and the households' income, not significantly above as they have experienced the last decade. On the other hand, our conclusion that the Norwegian households look solid at current debt levels is positive for the banks' asset quality and loan loss outlook. We will however like to stress that our stress tests do only look at isolated effects and do not capture potential ripple effects. For example a negative shock to the households'

finances would likely reduce the households' consumption level, which again could affect the business sector and potentially increase the losses on the banks' corporate lending portfolios.

## 6.2 Robustness and vulnerability

The robustness and vulnerability of this thesis rely on the data and methods applied. Both the data and the method are introduced and assessed in chapter 3 and in the appendix. The analysis relies on the correctness of the household micro data provided by Statistics Norway. We see no reason to doubt this data.

The analysis of the households' finances in chapter 3 is as robust as the data itself. However, more details on the households' portfolio of assets and liabilities would permit even more depth and provide a better reflection of their risks and liquidity. The different types of debt and the allocation of wealth across various asset classes could have provided more accuracy.

When analysing the households' financial vulnerability at current levels, the results are dependent on the measures applied. As discussed, these draw upon theory of household debt and prior work on financial stability, and arguably reflect the vulnerability of a specific household when all the measures are combined. Nevertheless, one might argue that it would be beneficial to add even more measures, and the thresholds classifying a household as vulnerable can be explored further. The results from the stress tests are dependent on what we assess to be the best approach given the available data. Approximations hampers the robustness of the results, but as long as the reader is aware of the limitations and assumptions, we argue that the results should enhance the reader's knowledge of the impact of increased unemployment.

In the analysis of the households' debt capacity, the results are dependent on the approach of rewriting the financial measures. For the financial margin, we estimate an interest rate dependent on the households' prevailing interest rate and the 2012 average interest rate. The assumed interest rate is subject to our discretion, and more details on the households' debt and interest rates should allow for a more refined approach.

## 6.3 Topics of further research

The vulnerability of Norwegian households' debt and their available debt capacity are relevant topics of research in the current macroeconomic environment. This thesis contributes in the understanding of the financial position of the households, but due to the limited scope, it leaves several topics open for further research. We have included a brief introduction to some of these topics below.

Two elements stand out as particularly important. The first is a debate on which financial measures and thresholds that are best suited to identify vulnerable households. The second relates to the comprehensiveness of the dataset. With even more detailed information of the households' financial attributes, and other attributes as household composition, employment status and education, one would be able to make fewer assumptions and model the aspects of human capital better. This would improve the solidity of the analysis.

We would also like to encourage research that expands the stress testing of Norwegian households further compared to our approach of isolated effects to also include long-term macroeconomic effects. A suggestion for such an analysis draws upon the works of Ramdana Djudad (2010) at the Financial Stability Department of the Bank of Canada. A stress test of households could also potentially reflect how the changes in vulnerable debt affects the solidity of the banks in terms of asset quality and loan losses.

Another relevant topic for further research is the possibility of utilizing the identified market imperfection where the households with excess debt capacity, and ability of carrying the risk related to lending pledged on human capital, could pool their funds and make it available for households with insufficient material assets.

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## 8. Appendix

### 8.1 The different types of debt

- Repayment loans secured on dwellings
  - Loans where the borrower service the debt regularly by paying instalments and interest according to a pre-specified plan (serial or annuity). The loan is secured by a pledge of collateral, which is real estate in this case and often the borrowers' primary dwelling. If the borrower defaults on the loan the lender would have legal right to repossess the house and sell it to recover the sums owed by the borrower.
- Credit lines secured on dwellings
  - A loan where the lender agrees to lend a maximum amount and the borrower is free to borrow any amount as long as it does not exceed the given limit. The collateral for the loan is the borrower's dwelling/house. The limit is normally specified as a share of the collateral's value and the used credit has been ~70% of the given limit over the past couple of years (Døskeland, 2014, p. 257).
- Other repayment loans
  - These are loans similar to repayment loans secured on dwellings, only that there is other types of collateral than dwellings (can also be unsecured – ex. Student loans from Lånekassen).
- Overdraft, working capital facility and consumer credit
  - Lending arrangements where the borrower can borrow money up to a given limit and pays a pre-specified interest rate. The loans are unsecured and thus typically have higher interest rate than the debt classes mentioned above.
- House building loans and other building loans
  - Typically a short-term loan used to pay for the cost of building a home or other constructions. In general, the lender demands more control over the process to ensure that the building of the future collateral is proceeding according to plan, and when the building process is finished the building loan is converted to a regular repayment loan secured by the building.

- Leasing
  - A contractual arrangement where the lessor, typically a finance institution, owns the asset but the lessee pays for the use of the asset (borrowing the asset and paying interest, instalments and a fee for the use of the asset).

## 8.2 Research method

This section serves the purpose of giving the reader insight in the methodology we have used in order to analyse our research questions. Hellevik (2002) justifies the importance of explaining the methods by the argument that the reader should be able to follow and understand how the results are derived and assess whether the results are reasonable.

Johannesen, Tufte and Kristoffersen (2005) define methodology in this context as the gathering, analysis and interpretation of data. They emphasise that it is vital that methodology and empirical research are built on systematics, thoroughness and transparency, and highlight the importance of objectivity. There will always be some uncertainty related to the results of this kind of research and it is crucial that we face our own results with a critical eye (Tranøy, 1986). Our choices of methodology is built on the intention of providing a thorough answer to our research questions.

In the context of research methods, it is common to distinguish between deductive and inductive reasoning and approaches. An inductive approach starts with the practical results, and thereafter find an explanation of the observed phenomenon based on existing theory. When applying a deductive approach one starts with a theoretical foundation that can explain the relevant phenomenon, and thereafter tests whether this corresponds with the observations and the data (Saunders, Thornhill, & Lewis, 2009). This master thesis applies a deductive approach. We start with theory explaining households' demand for debt and their debt servicing capabilities, and then observe to what extent the theoretical framework is reflected in practise on Norwegian households' lending behaviour, financial vulnerability and estimated debt capacity.

### 8.2.1 Gathering data

In general, when referring to theory on empirical methodology, there are two ways of gathering data. The researcher can collect the data with the specific purpose of conducting the analysis, referred to as primary data. Alternatively, the researcher can use data collected by a secondary party, and often intended for other use, called secondary data (Ringdal, 2001). The dataset applied in this master thesis is household data from Statistics Norway, meaning that for the use in this master thesis, the data are secondary data. A thorough presentation of the dataset is found in chapter 3.1 (for summary statistics 2012 see 8.3) and necessary adjustments and the limitations they impose are described in appendix 8.4 to 8.7.

## 8.2.2 Evaluation of the methodological choices

In order to obtain the trust of the reader, we will now assess the methodology applied through the elements reliability and validity, as advised in the literature. The terms reliability and validity will be introduced briefly, and thereafter the chosen method will be discussed.

### *Reliability*

Reliability relates to the dataset applied in the research; in terms of what data used, how it is gathered and how it is processed (Johannesen, Tufte, & Kristoffersen, 2005). There is a separate section designated to describe and critically assess the dataset used in the master thesis. In general, we are highly confident in the dataset, as this is the official Norwegian statistics on Norwegian households, and several trustworthy sources have assessed and used the same dataset previously, for example the Financial Stability Report (Norges Bank, 2014) and Lindquist et. al. (2014). Our findings is in line with other research relying on the same dataset, and replications conducted by others on the same data should yield the same results. On the back of this, we assess the analysis to have a high degree of reliability.

### *Validity*

The validity relates to how well the data represents the research questions it intends to answer (Johannesen, Tufte, & Kristoffersen, 2005). Hellevik (2002) presents four ways in which the data's validity should be explained. These are construction validity, internal validity, external validity and statistical validity.

#### **Construction validity**

The conformity between the data and the phenomenon they intend to describe is referred to as the construction validity. In our case, this is how well micro data on Norwegian households translates into a solid perception of the financial vulnerability of Norwegian households, and in turn the debt capacity of these households. In general, the household data are well suited to describe the financial position of Norwegian households. The scope of the dataset allows for a high level of detail, both in terms of number of households and degree of correctness. However, due to certain limitations in the dataset, some approximations were required in order to reflect for example the expenses of the different households and the market value of dwelling. The solidity of the approximations assures that the data are well suited to describe the phenomenon. In addition, the uncertainty steaming from these approximations is stress tested in order to assure the solidity of the results.

**Internal validity**

The analysis' ability of determining causal relationships between two variables is described as the analysis' internal validity. This is not relevant for this master thesis.

**External validity**

External validity concerns whether the results of the analysis can be generalised or transferred to other contexts than the one in which it is studied. The thesis is related to all Norwegian households, thus external validity will be the ability of transferring these results to other countries. The method applied is highly transferrable, and as we find in the literature, several countries have conducted similar research. Naturally, results will differ with the structural differences across nations, but for countries with fairly similar attributes we would expect to find the same trends. This is also the case when we compare our results with similar research for other Nordic countries.

**Statistical validity**

Statistical validity concerns the degree to which the results from the analysis reflect the real world i.e. the entire population of Norwegian households in our case. As this master thesis analysis the entire populations one must conclude that the analysis has high degree of statistical validity.

In total, the methods applied are both reliable and valid, and should provide the reader with confidence in the results. More detailed description of our methodology, and how the analysis has been conducted in practice are found in the main part of the master thesis where the respective methods are used. This structure has been evaluated as the most reader-friendly setup, where it is easier to follow our arguments through the thesis.

## 8.3 Summary statistics 2012

Summary statistics of the household micro data (Statistics Norway, 2014c) for 2012.

**Figure 65: Household cost of consumption 2004**

Age group	Number of households	Disposable income	Estimated gross wealth	Est. market value of dwelling	Debt
0-24	101,856	225,532	533,484	383,576	380,415
25-34	348,864	424,449	1,719,938	1,390,136	1,248,864
35-44	421,069	588,315	3,047,247	2,342,777	1,680,684
45-54	430,599	641,474	3,835,350	2,672,745	1,474,651
55-64	379,319	608,434	4,262,248	2,826,773	1,115,135
65-74	298,035	498,314	4,047,588	2,616,048	607,639
75-	265,718	340,110	3,077,091	1,978,338	240,650

County	Number of households	Disposable income	Estimated gross wealth	Est. market value of dwelling	Debt
Østfold	125,364	484,896	2,538,456	1,784,536	981,659
Akershus	237,070	593,856	4,320,007	3,098,514	1,356,375
Oslo	314,323	501,411	4,240,813	2,961,599	1,220,412
Hedmark	88,068	466,855	2,185,174	1,414,221	876,047
Oppland	84,287	471,359	2,325,915	1,466,560	859,456
Buskerud	119,495	516,913	2,996,732	1,990,562	1,035,466
Vestfold	106,722	503,697	2,948,619	2,068,928	1,104,362
Telemark	77,305	482,387	2,336,610	1,588,251	918,491
Aust-Agder	48,677	499,508	2,908,582	2,018,789	1,069,403
Vest-Agder	75,639	509,576	3,144,290	2,180,042	1,148,126
Rogaland	190,560	587,471	3,976,417	2,885,253	1,345,940
Hordaland	216,711	533,047	3,316,527	2,337,252	1,149,324
Sogn og Fjordane	45,266	511,837	2,663,722	1,620,589	852,171
Møre og Romsdal	111,280	519,810	2,808,551	1,833,044	1,010,499
Sør-Trøndelag	134,688	501,818	2,970,729	2,146,504	1,077,521
Nord-Trøndelag	57,360	492,074	2,193,764	1,419,894	952,375
Nordland	107,290	486,889	2,286,702	1,596,420	927,035
Troms	71,977	496,895	2,506,303	1,801,272	974,122
Finmark	33,378	499,481	2,148,959	1,554,993	896,142

Income decile	Number of households	Disposable income	Estimated gross wealth	Est. market value of dwelling	Debt
1	224,545	114,341	1,667,433	627,203	216,516
2	224,548	215,682	1,287,692	958,753	244,683
3	224,546	273,878	1,704,378	1,289,727	443,026
4	224,542	338,679	2,023,030	1,556,603	657,405
5	224,547	407,771	2,525,057	1,916,076	795,593
6	224,546	490,006	3,009,307	2,244,196	975,575
7	224,548	584,591	3,378,730	2,554,524	1,288,587
8	224,546	686,333	3,838,411	2,928,537	1,637,491
9	224,547	817,210	4,615,605	3,465,729	1,972,785
10	224,545	1,258,262	8,147,218	4,899,452	2,835,704

Source: (Own calculations, 2014)

## 8.4 Segmenting the dataset on household attributes

Our analysis rely on extensive use of segmentation based on household attributes such as age, disposable income, size of debt and county. The segmentation on age is based on the age of the main income earner in the household the current year. The disposable income decile is based on the households' total income the current year.

**Figure 66: Average and median disposable by income deciles (NOK)**

Income Decile	2004		2008		2012	
	Average Disposable Income	Median Disposable Income	Average Disposable Income	Median Disposable Income	Average Disposable Income	Median Disposable Income
1	85,745	107,279	81,724	135,268	114,341	158,518
2	148,623	148,181	187,108	186,713	215,682	215,416
3	192,811	192,999	242,549	242,801	273,878	273,567
4	236,369	236,232	298,575	298,604	338,679	338,587
5	282,671	282,050	357,625	356,911	407,771	407,126
6	341,248	341,002	432,503	432,063	490,006	489,424
7	406,659	406,739	517,163	517,230	584,591	584,439
8	472,997	472,496	604,197	603,395	686,333	685,359
9	556,486	553,389	716,243	712,387	817,210	812,796
10	1,065,624	737,041	1,116,709	949,356	1,258,262	1,083,934
Total	378,923	309,631	455,440	392,115	518,675	446,228

Source: (Own calculations, 2014)

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## 8.5 Standard cost of consumption

In addition to the register data from Statistics Norway, we use the Standard Budget compiled by SIFO, the National Institute for Consumer Research, to estimate the cost of consumption for each household (SIFO, 2014). This approach is found in the Norges Bank's Financial Stability Report (Norges Bank, 2014) and in Solheim and Vatne (2014). The Standard Budget does however not include costs of electricity, and we have allocated a monthly cost of NOK2000 to each household. This is in line with the Norges Bank's model for cost approximation (Vatne, Personal Communication, 2014). SIFO describes the Standard Budget as parsimonious and for example Solheim and Vatne (2014) goes even further, evaluating it as a lower bound for costs of consumption, where many would require a higher standard of living.

Our data set does not include age- and gender information of each individual in a household, and our allocation of costs of consumption to each household is solely based on the number of persons in the household. The assumed compositions of the persons' gender and age (adult or child), and their respective cost allocations, is found in the Figure 67, 68 and 69. As the budget is considered parsimonious, we have not included any economies of scale on individual costs even though SIFO guides for 20% reduction when the household exceeds four persons (SIFO, 2014).

Figure 67: Household cost of consumption 2004

	Man	Woman	Boy 11-14 yr	Girl 11-14 yr	Average Adults	Average Kids
Food and drink	1,960	1,610	1,640	1,440	1,785	1,540
Clothes and shoes	590	670	510	530	630	520
Personal care	520	390	210	310	455	260
Leisure activities	850	850	560	560	850	560
Sum	3,920	3,520	2,920	2,840	3,720	2,880
Travel	550	550			550	
Infant equipment (assumed zero)						
Sum	550	550			550	

Members in household	1	2	3	4	5	6	7
Other groceries	190	240	330	440	520	580	640
Houseware	340	370	440	540	580	660	690
Furniture	330	340	400	520	600	720	800
Phone and media	1,330	1,340	1,370	1,480	1,520	1,530	1,540
Car	1,980	1,980	1,980	1,980	2,840	2,840	2,840
Kindergarden (assumed zero)							
School daycare (assumed zero)							
Sum	4,170	4,270	4,520	4,960	6,060	6,330	6,510

Assumed												
Members in household	8	9	10	11	12	13	14	15	16	17	18	19
Other groceries	706	779	860	949	1,047	1,155	1,275	1,407	1,552	1,713	1,890	2,085
Houseware	721	754	788	824	862	901	942	985	1,029	1,076	1,125	1,176
Furniture	889	988	1,097	1,219	1,355	1,505	1,673	1,858	2,065	2,294	2,549	2,833
Phone and media	1,550	1,560	1,570	1,581	1,591	1,601	1,612	1,622	1,633	1,644	1,654	1,665
Car	4,074	4,074	4,074	4,074	5,843	5,843	5,843	5,843	8,381	8,381	8,381	8,381
Kindergarden (assumed zero)												
School daycare (assumed zero)												
Sum	7,940	8,155	8,390	8,647	10,697	11,006	11,344	11,715	14,660	15,108	15,599	16,140

Household composition	Member of household	Economies of scale	Sum individual costs	Household costs	Electricity	Sum monthly costs	Sum annual costs
Avg adult	1	0%	4,270	4,170	2,000	10,440	125,280
Man & woman	2	0%	8,540	4,270	2,000	14,810	177,720
Man, woman & avg kid	3	0%	11,420	4,520	2,000	17,940	215,280
Man & woman + girl & boy	4	0%	14,300	4,960	2,000	21,260	255,120
Man & woman + girl & boy + avg kid	5	0%	17,180	6,060	2,000	25,240	302,880
Man & woman + avg. adults + girl & boy + avg kid	6	0%	21,450	6,330	2,000	29,780	357,360
2 men & 2 women + girl & boy + avg kid	7	0%	25,720	6,510	2,000	34,230	410,760
2 men & 2 women + 2 girls & 2 boys	8	0%	28,600	7,940	2,000	38,540	462,481
2 men & 2 women + 2 girls & 2 boys + avg kid	9	0%	31,480	8,155	2,000	41,635	499,618
2 men & 2 women + 3 girls & 3 boys	10	0%	34,360	8,390	2,000	44,750	536,996
2 men & 2 women + avg adult + 3 girls & 3 boys	11	0%	38,630	8,647	2,000	49,277	591,319
3 men & 3 women + 3 girls & 3 boys	12	0%	42,900	10,697	2,000	55,597	667,168
3 men & 3 women + 3 girls & 3 boys + avg kid	13	0%	45,780	11,006	2,000	58,786	705,429
3 men & 3 women + 4 girls & 4 boys	14	0%	48,660	11,344	2,000	62,004	744,048
3 men & 3 women + 4 girls & 4 boys + avg kid	15	0%	51,540	11,715	2,000	65,255	783,060
3 men & 3 women + avg adult + 4 girls & 4 boys + avg kid	16	0%	55,810	14,660	2,000	72,470	869,643
4 men & 4 women + 5 girls & 5 boys	17	0%	62,960	15,108	2,000	80,068	960,812
4 men & 4 women + 5 girls & 5 boys + avg kid	18	0%	65,840	15,599	2,000	83,439	1,001,274
4 men & 4 women + 6 girls & 6 boys	19	0%	68,720	16,140	2,000	86,860	1,042,322

Source: (SIFO, 2014)

Figure 68: Household cost of consumption 2008

	Man	Woman	Boy 10-13 yr	Girl 10-13 yr	Average Adults	Average Kids
Food and drink	2,340	1,870	1,880	1,680	2,105	1,780
Clothes and shoes	500	570	430	450	535	440
Personal care	470	600	240	350	535	295
Leisure activities	890	890	790	790	890	790
Sum	4,200	3,930	3,340	3,270	4,065	3,305
Travel	670	670			670	
Infant equipment (assumed zero)						
Sum	670	670			670	

Members in household	1	2	3	4	5	6	7
Other groceries	210	270	370	480	570	640	700
Houseware	340	370	440	520	580	650	680
Furniture	320	360	430	550	650	770	880
Phone and media	1,420	1,430	1,450	1,570	1,610	1,620	1,640
Car	2,010	2,010	2,010	2,010	2,920	2,920	2,920
Kindergarden (assumed zero)							
School daycare (assumed zero)							
Sum	4,300	4,440	4,700	5,130	6,330	6,600	6,820

	Assumed											
Members in household	8	9	10	11	12	13	14	15	16	17	18	19
Other groceries	766	837	916	1,002	1,096	1,198	1,311	1,434	1,568	1,715	1,876	2,052
Houseware	711	744	779	815	852	891	933	976	1,021	1,068	1,117	1,169
Furniture	1,006	1,149	1,314	1,501	1,716	1,961	2,241	2,561	2,927	3,345	3,823	4,369
Phone and media	1,660	1,681	1,701	1,722	1,744	1,765	1,787	1,809	1,831	1,854	1,877	1,900
Car	4,242	4,242	4,242	4,242	6,162	6,162	6,162	6,162	8,952	8,952	8,952	8,952
Kindergarden (assumed zero)												
School daycare (assumed zero)												
Sum	8,385	8,654	8,952	9,282	11,570	11,978	12,434	12,942	16,300	16,934	17,645	18,442

Household composition	Member of household	Economies of scale	Sum individual costs	Household costs	Electricity	Sum monthly costs	Sum annual costs
Avg adult	1	0%	4,735	4,300	2,000	11,035	132,420
Man & woman	2	0%	9,470	4,440	2,000	15,910	190,920
Man, woman & avg kid	3	0%	12,775	4,700	2,000	19,475	233,700
Man & woman + girl & boy	4	0%	16,080	5,130	2,000	23,210	278,520
Man & woman + girl & boy + avg kid	5	0%	19,385	6,330	2,000	27,715	332,580
Man & woman + avg. adults + girl & boy + avg kid	6	0%	24,120	6,600	2,000	32,720	392,640
2 men & 2 women + girl & boy + avg kid	7	0%	28,855	6,820	2,000	37,675	452,100
2 men & 2 women + 2 girls & 2 boys	8	0%	32,160	8,385	2,000	42,545	510,540
2 men & 2 women + 2 girls & 2 boys + avg kid	9	0%	35,465	8,654	2,000	46,119	553,425
2 men & 2 women + 3 girls & 3 boys	10	0%	38,770	8,952	2,000	49,722	596,659
2 men & 2 women + avg adult + 3 girls & 3 boys	11	0%	43,505	9,282	2,000	54,787	657,444
3 men & 3 women + 3 girls & 3 boys	12	0%	48,240	11,570	2,000	61,810	741,717
3 men & 3 women + 3 girls & 3 boys + avg kid	13	0%	51,545	11,978	2,000	65,523	786,281
3 men & 3 women + 4 girls & 4 boys	14	0%	54,850	12,434	2,000	69,284	831,406
3 men & 3 women + 4 girls & 4 boys + avg kid	15	0%	58,155	12,942	2,000	73,097	877,163
3 men & 3 women + avg adult + 4 girls & 4 boys + avg kid	16	0%	62,890	16,300	2,000	81,190	974,275
4 men & 4 women + 5 girls & 5 boys	17	0%	70,930	16,934	2,000	89,864	1,078,373
4 men & 4 women + 5 girls & 5 boys + avg kid	18	0%	74,235	17,645	2,000	93,880	1,126,563
4 men & 4 women + 6 girls & 6 boys	19	0%	77,540	18,442	2,000	97,982	1,175,783

Source: (SIFO, 2014)

Figure 69: Household cost of consumption 2012

	Man	Woman	Boy 10-13 yr	Girl 10-13 yr	Average Adults	Average Kids
Food and drink	2,250	2,050	2,050	1,850	2,150	1,950
Clothes and shoes	680	800	560	600	740	580
Personal care	500	640	210	330	570	270
Leisure activities	940	940	810	810	940	810
Sum	4,370	4,430	3,630	3,590	4,400	3,610
Travel	620	620			620	
Infant equipment (assumed zero)						
Sum	620	620			620	

Members in household	1	2	3	4	5	6	7
Other groceries	240	300	390	550	640	730	790
Houseware	320	350	420	540	590	660	690
Furniture	310	350	430	550	640	770	880
Phone and media	1,450	1,460	1,510	1,620	1,660	1,710	1,720
Car	2,230	2,230	2,230	2,230	3,270	3,270	3,270
Kindergarden (assumed zero)							
School daycare (assumed zero)							
Sum	4,550	4,690	4,980	5,490	6,800	7,140	7,350

## Assumed

Members in household	8	9	10	11	12	13	14	15	16	17	18	19
Other groceries	855	925	1,001	1,084	1,173	1,269	1,373	1,486	1,608	1,740	1,884	2,038
Houseware	721	754	788	824	862	901	942	985	1,029	1,076	1,125	1,176
Furniture	1,006	1,149	1,314	1,501	1,716	1,961	2,241	2,561	2,927	3,345	3,823	4,369
Phone and media	1,730	1,740	1,750	1,761	1,771	1,781	1,792	1,802	1,813	1,823	1,834	1,845
Car	4,795	4,795	4,795	4,795	7,031	7,031	7,031	7,031	10,310	10,310	10,310	10,310
Kindergarden (assumed zero)												
School daycare (assumed zero)												
Sum	9,107	9,364	9,649	9,965	12,552	12,943	13,379	13,865	17,688	18,295	18,976	19,739

Household composition	Member of household	Economies of scale	Sum individual costs	Household costs	Electricity	Sum monthly costs	Sum annual costs
Avg adult	1	0%	5,020	4,550	2,000	11,570	138,840
Man & woman	2	0%	10,040	4,690	2,000	16,730	200,760
Man, woman & avg kid	3	0%	13,650	4,980	2,000	20,630	247,560
Man & woman + girl & boy	4	0%	17,260	5,490	2,000	24,750	297,000
Man & woman + girl & boy + avg kid	5	0%	20,870	6,800	2,000	29,670	356,040
Man & woman + avg. adults + girl & boy + avg kid	6	0%	25,890	7,140	2,000	35,030	420,360
2 men & 2 women + girl & boy + avg kid	7	0%	30,910	7,350	2,000	40,260	483,120
2 men & 2 women + 2 girls & 2 boys	8	0%	34,520	9,107	2,000	45,627	547,525
2 men & 2 women + 2 girls & 2 boys + avg kid	9	0%	38,130	9,364	2,000	49,494	593,927
2 men & 2 women + 3 girls & 3 boys	10	0%	41,740	9,649	2,000	53,389	640,664
2 men & 2 women + avg adult + 3 girls & 3 boys	11	0%	46,760	9,965	2,000	58,725	704,696
3 men & 3 women + 3 girls & 3 boys	12	0%	51,780	12,552	2,000	66,332	795,986
3 men & 3 women + 3 girls & 3 boys + avg kid	13	0%	55,390	12,943	2,000	70,333	843,998
3 men & 3 women + 4 girls & 4 boys	14	0%	59,000	13,379	2,000	74,379	892,548
3 men & 3 women + 4 girls & 4 boys + avg kid	15	0%	62,610	13,865	2,000	78,475	941,703
3 men & 3 women + avg adult + 4 girls & 4 boys + avg kid	16	0%	67,630	17,688	2,000	87,318	1,047,813
4 men & 4 women + 5 girls & 5 boys	17	0%	76,260	18,295	2,000	96,555	1,158,665
4 men & 4 women + 5 girls & 5 boys + avg kid	18	0%	79,870	18,976	2,000	100,846	1,210,151
4 men & 4 women + 6 girls & 6 boys	19	0%	83,480	19,739	2,000	105,219	1,262,625

Source: (SIFO, 2014)

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## 8.6 Estimation of market value of dwellings

The value of assets on the households' balance sheet are tax values that may deviate from market values. The taxable values are a poor reflection of the households' financial wealth, as they do not contain information on the cost of acquiring the asset, nor the wealth that can be obtained by selling the asset. Therefore, we are interested in adjusting the taxable value of assets to their market values. In particular we are interested in deriving the market value of the households' primary dwelling. Post 2010 the dwelling's taxable value is estimated using Statistics Norway's model for dwelling prices (Epland & Kirkerberg, 2012). The taxable value of the primary dwelling is calculated to reflect 25% of the market value (Ministry of Finance, 2009), and our observations for the taxable value of the primary dwelling in 2012 are thus multiplied by 4 in order to get an estimate of the market value.

There is no precise relationship between the taxable value and the market value for primary dwellings prior to 2010 (see Epland and Kirkerberg (2012) for a more thorough discussion). As we have limited data on the characteristics of the primary dwellings (lacking information on city, number of square feet, age, etc.) we have not been able to use Statistics Norway's models for market values for the period 2004-2009 (Holiløkk & Solheim, 2011). Our estimates for the market values in 2004 and 2008 rely on the Statistics Norway's analysis of the relationship between the value at sale versus the taxable value for primary dwellings in 2004 (Statistics Norway, 2014j) and 2007 (Statistics Norway, 2014k) (where 2007 is our proxy for 2008). See Figure 70 and 71 for details. The approach apply aggregated numbers for all houses sold in the country over the periods and report the results on ranges for the sales price. The approach should account for that expensive dwellings have lower relative assessed tax values than less expensive dwellings (Epland & Kirkerberg, 2012). On the other hand we are likely to have larger deviations from the real values for dwellings with values in the outer price ranges (both at the bottom and the top), and for dwellings which deviate significantly from the average Norwegian dwelling (both house type and geography/city).

**Figure 70: Estimated market value of dwelling 2004**

<b>Market value of dwelling (NOK)</b>	<b>Taxable value of dwelling (% of market value)</b>	<b>Taxable value of dwelling (lower cap)</b>	<b>Taxable value of dwelling (upper cap)</b>	<b>Multiplier</b>
0 - 999,999	27%		235,000	3.70
1,000,000 - 1,499,999	20%	235,000	285,000	5.00
1,500,000 - 1,999,999	18%	285,000	320,000	5.56
2,000,000 or more	14%	320,000		7.14

Source: (Statistics Norway, 2014j)

**Figure 71: Estimated market value of dwelling 2008 (approximated with 2007 data)**

<b>Market value of dwelling (NOK)</b>	<b>Taxable value of dwelling (% of market value)</b>	<b>Taxable value of dwelling (lower cap)</b>	<b>Taxable value of dwelling (upper cap)</b>	<b>Multiplier</b>
0 - 999,999	32%		285,000	3.13
1,000,000 - 1,499,999	25%	285,000	345,000	4.00
1,500,000 - 1,999,999	21%	345,000	390,000	4.76
2,000,000 - 2,499,999	18%	390,000	437,500	5.56
2,500,000 - 2,999,999	17%	437,500	465,000	5.88
3,000,000 or more	14%	465,000		7.14

Source: (Statistics Norway, 2014k)

## 8.7 Unemployment benefit

When testing the vulnerability of our results and the sensitivity of the max debt capacity we impose unemployment shocks. Due to a solid welfare system the unemployment benefit amounts to 62.4 % of initial gross income, with an upper cap of 6 G (NOK486,918 in 2012) (NAV, 2014b) (NAV, 2014c). The shock should be imposed on an individual level, thus we have assumed that all adults living in the same household have the same disposable income, and replaced the income of the job-losing member with the entitled subsidy. The assumed relationship between members of the households and number of adults is the same as for the distribution of standardised consumption expenses (illustrated in Figure 72). If a specific household is chosen in a random selection the household's total disposable income is divided by the number of adults in the household. If the average disposable income is below 6G, the adult's share of the household's total disposable income is reduced by 37.6%. If the average disposable income is above 6G, the adult's share of the household's total disposable income is replaced by 62.4% of 6G. Information of the size of the workforce and the 2012 unemployment level relies on data from The Norwegian Labour and Welfare Administration, NAV (NAV, 2014a).

**Figure 72: Assumed household composition for estimation of unemployment benefit**

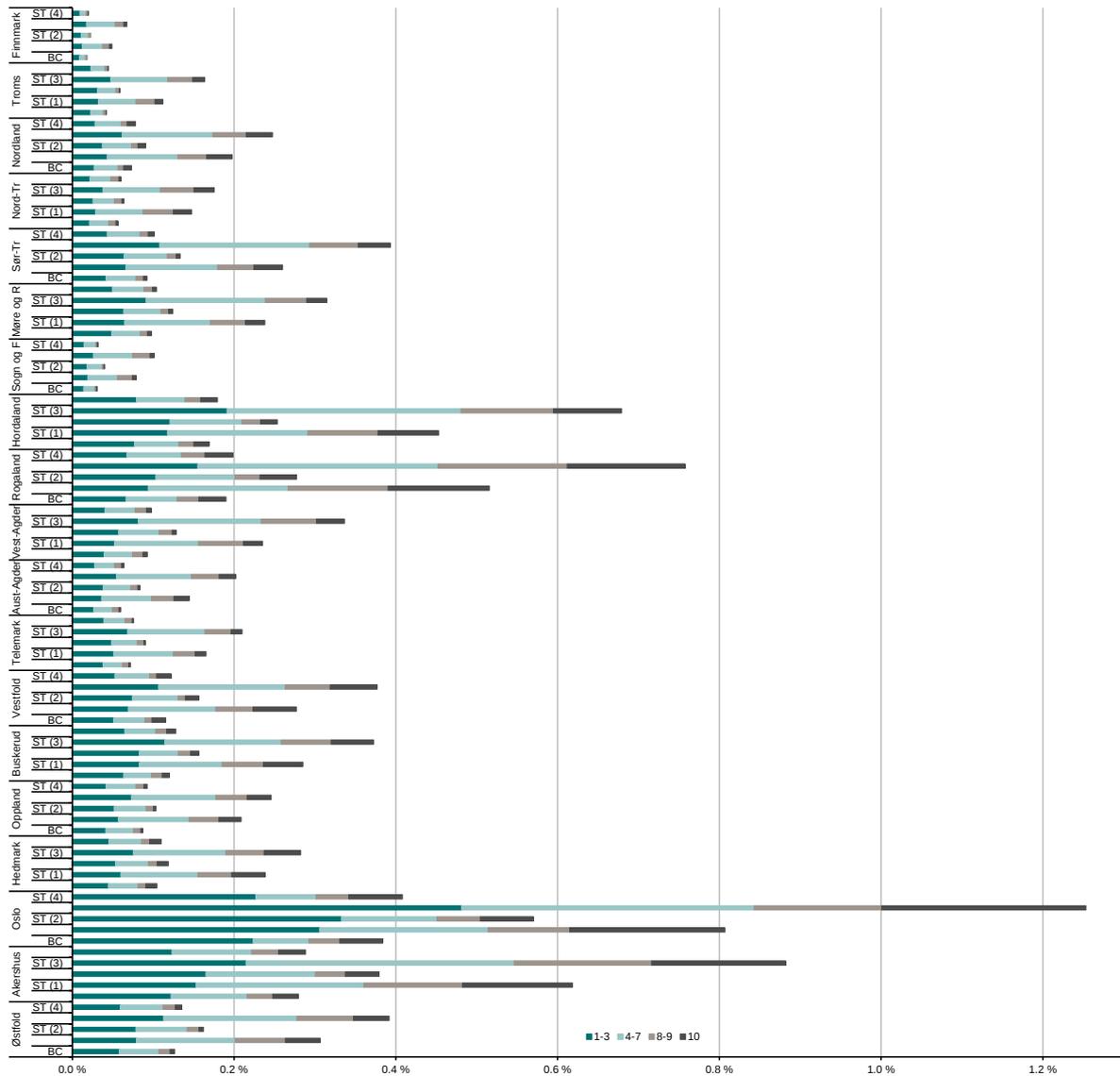
Household composition	Member of household	Adults in household
Avg adult	1	1
Man & woman	2	2
Man, woman & avg kid	3	2
Man & woman + girl & boy	4	2
Man & woman + girl & boy + avg kid	5	2
Man & woman + avg. adults + girl & boy + avg kid	6	3
2 men & 2 women + girl & boy + avg kid	7	4
2 men & 2 women + 2 girls & 2 boys	8	4
2 men & 2 women + 2 girls & 2 boys + avg kid	9	4
2 men & 2 women + 3 girls & 3 boys	10	4
2 men & 2 women + avg adult + 3 girls & 3 boys	11	5
3 men & 3 women + 3 girls & 3 boys	12	6
3 men & 3 women + 3 girls & 3 boys + avg kid	13	6
3 men & 3 women + 4 girls & 4 boys	14	6
3 men & 3 women + 4 girls & 4 boys + avg kid	15	6
3 men & 3 women + avg adult + 4 girls & 4 boys + avg kid	16	7
4 men & 4 women + 5 girls & 5 boys	17	8
4 men & 4 women + 5 girls & 5 boys + avg kid	18	8
4 men & 4 women + 6 girls & 6 boys	19	8

## 8.8 Estimation of a household's interest rate

We have divided the household's into three categories based on their current implicit interest rate (Interest expenses/Debt). If a household has a current implicit interest rate below 4.84%, which was the average interest rate of household debt in 2012 (Statistics Norway, 2014i), they are designated an interest rate of 4.84%. If the current implicit interest rate is between 4.84% and 7% the interest rate remains unchanged. For the remaining households we have imposed an upper interest rate cap of 7%. A weakness to this approach is the inability to adjust the interest rate as the size of debt increases as presented in the simplified model for how banks price credit (see section 2.3.3).

## 8.9 Vulnerable households relative to total debt by county and income decile

Figure 73: Vulnerable households' debt relative to total debt by county and income decile



Source: (Own calculations, 2014), (SIFO, 2014)