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Managing Interest Rate Risk

- A case study of four Swedish savings banks

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Preface

We wish to thank the participating savings banks for their time and effort, which made this thesis possible. Special thanks to Magnus Olsson for his commitment and help when completing this thesis.

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Abstract

Savings banks differ from other types of banks, in the sense that they have no shareholders. This does however not mean that savings banks can ignore fundamental financial principles. Instead they are even more dependent on their ability to generate profits, since they cannot raise additional equity capital from shareholders or members. Furthermore the world for financial institutions has changed during the last 20 years, and become riskier and more competitive-driven. After the deregulation of the financial market in Sweden, banks had to take on extensive risk in order to earn sufficient returns.

For managing the different types of risks within a savings bank, examining the standard accounting schedules is simply not enough. Asset and Liability Management is the management of both assets and liabilities simultaneously for the purpose of mitigating interest rate risk, providing liquidity and to enhance the value of the bank. Especially the effect of interest rate changes has been an important issue for the banking industry in recent years with many arguing that for example the U.S. savings and loans crisis was a result of bad interest rate risk management. Furthermore small banks, like savings banks lack the liveness of large banks when managing interest rate risk, and the management of interest rate risk varies with bank size. Earlier studies have found that savings banks have lower interest rate risk than commercial banks in Sweden, indicating that managers in savings banks seem to be more risk averse than the managers of commercial banks. This leads us to our inquiry questions:

- What are the reasons for savings banks having lower interest rate risk than commercial banks in Sweden?
- In what ways is the management of interest rate risk affected by the fact that savings banks have no shareholders?
- What tools for managing interest rate risk are applied by savings banks and what makes them most suitable?
- What are the trade-offs between benefits and costs for actively managing interest rate risk for savings banks?

The purpose of this thesis is to study how and to what extent interest rate risk is managed in four Swedish savings banks. We wrote this thesis from the bank managers' point of view and our goal was to create valuable knowledge, regarding management of interest rate risk, for managers of savings banks. We have studied four Swedish savings banks in Västra Götalands Län and how they manage interest rate risk.

This is a qualitative study where we interviewed appropriate staff members from the four savings banks. We have also used books, scientific articles and databases for collection of relevant data.

We found that the level of risk taking in savings banks varies between the different savings banks in our study, and the reason for savings banks having low interest rate risk is that they lack the resources and knowledge for managing higher interest rate risk efficiently. The level of interest rate risk taking is also affected by the fact that the savings banks act in a more limited and riskier markets, and have to balance the level of risk taking within the bank.

Having no shareholder makes it possible for the savings banks to pursue long-term strategies and they do not need to take on more risks in order to earn higher returns. Neither are they exposed to the same pressure as commercial banks are towards the demands from their shareholders. Instead they focus on earning money on traditional banking activities and not on speculations.

All the tools available for managing interest rate risk can be applied by savings banks, but some tools are more commonly used than others. The most common tools for measuring and managing interest rate risk are the gap model and interest rate swaps.

There is no need for savings banks to acquire sophisticated Asset and Liability Management tools because they do not have complex balance sheets and large number of transactions, and thus the costs exceeds the benefits. Furthermore some savings banks choose to hedge their interest rate risk to such extent, making sophisticated Asset and Liability Management tools unnecessary.

The main reason for savings banks having lower interest rate risk than commercial banks is due to more cautious risk policies. However there are great differences among the savings banks that cannot be explained by size and resources. Those savings banks with cautious risk policies have an embedded philosophy within the banks, which states that profits should be earned on traditional banking activities, and not on speculations.

Keywords: savings banks, interest rate risk, duration, gap model, ALM, hedging, banking.

Sammanfattning

Sparbanker skiljer sig åt från andra typer av banker genom att de saknar aktieägare. Detta innebär dock inte att sparbanker kan ignorera grundläggande finansiella principer, utan de är ännu mer beroende av att generera vinst då de saknar ägare att vända sig till vid behov av kapitaltillskott. Vidare har omgivningen för finansiella institutioner förändrats de senaste 20 åren genom att bli mer riskfylld och konkurrensutsatt. Efter avregleringen av den finansiella sektorn i Sverige var bankerna tvungna att ta sig an omfattande risker för att kunna erhålla tillräcklig avkastning.

För att kunna hantera olika former av risker inom en sparbank är det inte tillräckligt att enbart studera traditionella redovisningsunderlag. Asset and Liability Management innebär hantering av både tillgångar och skulder simultant i syfte att kvantifiera och styra ränterisk, sörja för likviditet och öka bankens värde. Effekten av ränteförändringar speciellt, har varit en viktig faktor för banksektorn de senaste åren då många exempelvis hävdar att den amerikanska spar- och lånekrisen var resultatet av bankernas oförmåga att hantera ränterisk. Vidare saknar små banker, som sparbanker, storbankernas flexibilitet att hantera ränterisk. Dessutom varierar hanteringen av ränterisk beroende på bankernas storlek. Tidigare studier har visat att sparbanker har lägre ränterisk än affärsbanker i Sverige, vilket antyder att ledningen för sparbanker är mindre riskbenägna. Detta i sin tur leder oss till våra frågeställningar:

- Vilka är orsakerna till att sparbanker har lägre ränterisk än affärsbanker i Sverige?
- På vilket sätt påverkas ränteriskhanteringen i sparbanker av att de saknar aktieägare?
- Vilka verktyg används av sparbanker för ränteriskhantering och varför är de lämpligast?
- Vad är avvägningen mellan nytta och kostnad för att aktivt hantera ränterisk i sparbanker?

Syftet med denna uppsats är att studera hur och till vilken grad fyra svenska sparbanker hanterar ränterisk. Vi skrev denna uppsats ur bankledningens perspektiv och vårt mål var att skapa förståelse för hantering av ränterisk för ledningen av sparbanker. Alla de fyra

sparbanker, vars ränterisk vi har studerat, är belägna i Västra Götalands Län. Detta är en kvalitativ studie, där vi har intervjuat lämplig personal, för vår studie, från de fyra sparbankerna. Vi har även använt oss av böcker, vetenskapliga artiklar och databaser för insamling av relevant data.

Vi fann att risknivån i sparbanker varierar mellan sparbankerna i vår studie och anledningen till att sparbanker har låg ränterisk är att de saknar resurser och kunskap för att hantera högre ränterisk effektivt. Ränterisktagandet påverkas även av att sparbanker agerar i mer begränsade och riskfyllda marknader och måste på så sätt balansera risktagandet inom banken.

Saknaden av aktieägare gör det möjligt för sparbanker att följa långsiktiga strategier och det finns ingen anledning att höja risknivån i ett försök att erhålla högre avkastning. De är heller inte utsatta för samma kortsiktiga vinstkrav som affärsbanker är gentemot sina aktieägare. Istället fokuserar sparbanker på att generera vinst genom traditionell bankverksamhet och inte genom spekulationer.

Alla verktyg tillgängliga för hantering av ränterisk kan också tillämpas av sparbanker, dock är vissa verktyg mer frekvent använda än andra. De mest förekommande verktygen för att mäta och hantera ränterisk är gap-modellen och ränteswappar.

Det finns inget behov av att införskaffa avancerade Asset and Liability Management verktyg då sparbanker inte har komplexa balansräkningar och har relativt få transaktioner. Vidare har vissa sparbanker valt att hedga majoriteten av sin ränterisk, vilket gör avancerade Asset and Liability Management verktyg onödiga.

Huvudorsaken till att sparbanker har lägre ränterisk än affärsbanker är p.g.a. deras mer restriktiva riskpolicy. Dock är det stora skillnader mellan sparbankerna, som inte kan förklaras av storlek och resurser. De sparbanker med en mer försiktig riskpolicy har en dold filosofi, som genomsyrar banken, där vinster ska genereras genom traditionell bankverksamhet och inte genom spekulationer.

Nyckelord: sparbanker, ränterisk, duration, gap-modellen, ALM, hedging, bankväsende.

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1 Introduction

In this chapter we will account for the sections background, problem discussion, purpose, perspective, delimitations and disposition.

1.1 Background

According to Smithson (1998) the world has become a riskier place. The general agreement is that the financial environment is associated with more risk today than it was in the past. Financial markets have experienced increased growing uncertainty about inflation rates, exchange rates, interest rates and commodity prices. (Smithson 1998)

It's no longer sustainable for a company to rely on its advanced production technology, the cheapest labor supply or the best marketing team, because volatility can put even well managed companies out of business. Unpredictable movements in exchange rates, interest rates and commodity prices convey risks that no longer can be ignored. (Chew 1999) According to Hudson et al (2000) the risks now require increased attention and consideration due to the very volatile nature of interest and exchange rate movements.

The world for financial institutions has also changed rapidly. Not long time ago simple balance sheets and limited competition allowed financial institutions to focus on traditional banking activities, using simple decision tools. During the last 20 years the balance sheets have evolved and have become more complex. The balance sheets contain more unpredictable option-driven behaviors and have generally reduced margins. (Blue & Hedberg 2001)

The common characteristic of financial institutions is their ability to offer fundamental services to investors and borrowers. The financial institutions stand between lender-savers and borrower-spenders and help transfer funds from one to the other. Studies of major developed countries show that businesses usually turn to financial institutions to finance their activities, and not directly from securities markets. Even in the USA and Canada, which have the most developed securities market in the world; loans from

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financial institutions are much more important for corporate finance than security markets are. (Mishkin & Eakins 2003)

According to The Swedish Bankers' Association (2003), reliable and efficient systems for saving, financing, mediating payments, and controlling risk are crucial for the well-being of the Swedish economy. Banks constitute the most important part of financial institutions (Mishkin & Eakins 2003). There are four main types of banks acting on the Swedish market, namely Swedish commercial banks (joint stock banks), foreign banks, savings banks and co-operative banks (The Swedish Bankers' Association 2003).

The legal association form of a savings bank is however different from the other types of banks operating on the Swedish market in the sense that they are kind of "public-spirited" foundations without any private profit interest. In addition to operating in the interest of depositors, they should also look after and care for the developments of the community and area they are operating in (Bergendahl & Lindblom 2003). Ever since the first savings bank was established in Gothenburg in 1820, the most prominent feature has been a strong local affiliation (Forsell 1992 see Bergendahl & Lindblom 2003). This is still a distinguished feature of savings banks, being stated in the Savings Bank Act that half of the meeting representatives (trustees) of a savings bank shall be appointed by the local municipal council or county council (Sparbankslagen 1987:619 Chapter 4; 3§).

The savings bank concept has been successful in Sweden like many other countries. The number of savings banks reached its peak in 1928 when there were 498 savings banks established (Forsell 1992 see Bergendahl & Lindblom 2003). The number of banks has since then declined due to mergers and acquisitions, but the savings banks continued to increase their market share in terms of deposits until the mid of the 1990s. The competition from other banks has there after been strengthened gradually, which resulted in an escalating mergers and acquisitions activity, which created a number of relatively large regional savings banks. Moreover, the cooperation between savings banks has intensified in form of a new holding company, The Swedish Savings Bank Group (SBG). The competitive pressure on savings banks increased with the deregulation of the financial markets during the 1980s and the major savings banks in SBG found it

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necessary to re-organize and convert into a commercial bank, Sparbanken Sverige AB, with the legal status of a public limited company in 1995. In 1997, it entered into a huge merger with the co-operative banks, which resulted in Föreningsparbanken, one of the four big commercial banks in Sweden. However some savings banks were left, or chose to be, outside Föreningsparbanken. Even if these banks are cooperating with Föreningsparbanken in certain areas, for example managing and servicing the nationwide ATM network, they are referring to themselves as being “Independent Savings Banks”. These banks are still operating under the Savings Bank Act of 1987. (Bergendahl & Lindblom 2003)

Although these savings banks have no private profit interest, it does not mean that they can ignore fundamental principles of finance. In contrast, a savings bank has no owners and can therefore not raise additional equity capital from shareholders or members, and is therefore dependent on its capability to generate profits. (Ibid)

After the deregulations of the financial markets in Sweden in the 1980s, most banks took on extensive risks in order to earn sufficient returns in the new competitive environment. However the managers didn't understand how to price risks correctly and also seemed to lack knowledge and awareness on the extent of the risks taken, which resulted in the banking crises in 1991-1993. Due to the banking crises most of the Swedish bank managers, shareholders and other stakeholders realized that banking was associated with risks. (Lindblom 2001)

In order to continue with profitable operations in the early 2000s, banks will have to take and manage higher risks (Hempel & Simonson 1999). Galai et al (1999) define risk as “reduction in firm value due to changes in the business environment”. For bank management, visibility and sensitivity to risks are important because banks are “risk machines” in the sense that they take risks, transform them and embed them in banking products and services (Bessis 2002). According to Saunders (2000), banks are now faced with following fundamental risks: interest rate risk, market risk, credit risk, off-balance sheet risk, technology risk and operational risk, foreign exchange risk, country or sovereign risk, liquidity risk and insolvency risk. These risks are in many ways correlated

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and an effective management of these risks is important for the performance of a bank. (Saunders 2000)

This is supported by Galai et al (1999) who state that recent financial failures in the banking industry confirm the need for various form of risk management. Therefore managers of banks need reliable risk measures in order to be able to direct capital to activities with the best trade-off between risk and return. The managers need mechanisms to monitor positions and create incentives for cautious risk taking by divisions and individuals. Risk management is the process of identifying key risks, acquiring understandable risk measures, choosing which risk to reduce and which to increase and by what means, and finally ascertaining procedures to monitor the resulting risk position. (Galai et al 1999)

1.2 Problem discussion

According to Bessis (2002), there are a large number of risks in the banking industry, of which most are well known. Risks and the management of it are important to banking and with this in mind it is somewhat surprising that risk quantification remained limited until recently. Although risks in capital markets are addressed extensively, the risks in banks remained a challenge for multiple reasons. Risks are less visible and tangible than income, and remain this way until it materializes into losses. Observing and recording losses and their frequencies could help to make them more manageable. However if one lacks links to instrumental risk controls, earning and loss histories are of limited interest because they don't present what actions or steps to take. There have been academic models that present foundations for risk modeling, but they didn't provide any tools for helping decision makers. (Bessis 2002)

Risk models have two major contributions, measuring risk and relating these measures to management controls over risks. These two are both issued by banking risk models which embed the specifics of each major risk. Risk management requires an entire set of models and tools for linking risk management issues with financial views on risks and profitability. (Ibid)

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The standard accounting schedules that show the nature of a bank's asset and liabilities reveal relatively little about the risks that banks are taking in their exposure to movements in rates and prices in the international money markets (Hudson et al 2000). Asset and Liability Management is defined by Moynihan et al (2002) as managing both assets and liabilities simultaneously for the purpose of mitigating interest rate risk, providing liquidity and to enhance the value of the bank. It is the process of planning, organizing and controlling asset and liability mixes, volumes, yields, and rates in order to achieve the targeted interest margin. Asset and Liability Management views the bank as a set of correlations that must be identified, coordinated and managed as an integrated system. The primary management goal is the control of interest income and expenses and the resulting net interest margins on an ongoing basis. (Moynihan et al 2002)

It is the function of the Asset and Liability Management unit to analyze the exposures and make sure that the level of risk taken is consistent with the profitable survival of the bank. Many banks control their market exposures through their Asset and Liability Management Committee (ALCO). The ALCO should contain representatives of Treasury, who will supply much of the analysis and recommendations, and senior representatives of the main business lines, so that the impact of the individual decisions on the bank's overall structure can be properly discussed and understood. This is supported by Funk (1996) who states that as many qualified people as possible should be included in the ALCO meetings in order to achieve better awareness of Asset and Liability Management issues and strategies throughout the company. (Hudson et al 2000)

The ALCO will be concerned with portfolio mix, liquidity management, maturity transformation, interest rate sensitivity, foreign exchange exposure, judicious use of the bank's name and product pricing (Hudson et al 2000). Assumptions regarding long-term expected returns are critical notions in Asset and Liability Management. These assumptions influence the asset side by asset allocation, portfolio management and trading, and the liability side by discounting the future cash flows as well as business decisions related to the fight for market share (Gilles et al 2003). According to Uyemura & Van Deventer (1993) and Bessis (2002), ALCO focuses mainly on managing the interest rate risk and liquidity of the bank. It addresses two types of the interest rate risks

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namely the risk of interest income shifts due to interest rate movements and results from options embedded in banking products. (Bessis 2002)

Interest rate risk is the risk of a decline in earnings due to the movements in interest rates. Banks balance sheet mainly consists of items that generate revenues and costs that are interest rate driven. Since interest rates are unstable, ultimately the earnings will also be unstable (Ibid). The effect of interest rate changes on bank profits and values has been an important issue for the banking industry in recent years. Many have argued that the most important factor behind the U.S. savings and loans crisis¹ was banks' exposure to interest rate risk (Duan et al 1995 see Hasan & Sarkar 2002).

According to Van Son & Hassan (1997) mismanagement of interest rate risk, first manifests itself in reported earnings and, if unchecked, results in liquidity and solvency problems. Furthermore the results of their study suggest that the Net Interest Margins² of small banks are more sensitive to interest rate changes than large banks. Thus, small banks, which engage heavily in term-structure intermediation³ with limited hedging, lack the flexibility of large institutions in managing interest rate risk. Thus, the monitoring of interest rate risk, whether through risk-based capital requirements or a separate measure, should not be ignored by bank managers, especially in smaller institutions without ready access to the sophisticated tools of ALM. Furthermore Van Son & Hassan (1997) suggest that the management of interest rate risk varies with bank size, and larger banks use more sophisticated methods for managing interest rate risk and receive more and closer scrutiny from the market. (Van Son & Hassan 1997)

According to Lindblom (2001) savings banks had lower interest rate risk than commercial banks in Sweden. This indicate that managers in savings banks seem to be more risk averse than the commercial banks. Furthermore Boukrami (2003) states that the responsibility of bank managers is to manage and eliminate risk in a way that maximizes

¹ The crisis during 1980-1994 resulted in 1,617 banks and 1,295 savings and loan institutions to fail or require financial assistance.

² Net Interest Margin = Net Interest Income/earning assets. (Net Interest Income = interest income minus interest expense).

³ Term structure intermediation is when banks purchase assets and sell liabilities of different maturities.

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shareholder value. However since savings banks have no shareholders they don't have to focus on maximizing shareholder value.

This leads us to our inquiry questions that we would like to study in our thesis.

- What are the reasons for savings banks having lower interest rate risk than commercial banks in Sweden?
- In what ways is the management of interest rate risk affected by the fact that savings banks have no shareholders?
- What tools for managing interest rate risk are applied by savings banks and what makes them most suitable?
- What are the trade-offs between benefits and costs for actively managing interest rate risk for savings banks?

1.3 Purpose

The purpose of this thesis is to study how and to what extent interest rate risk is managed in four Swedish savings banks.

1.4 Perspective

This thesis is written from the bank managers' point of view and aims to create knowledge value for managers of savings banks. It's valuable for managers of savings banks to know and implement the different elements of the Asset and Liability Management.

1.5 Disposition

In chapter 2 we will discuss the methodology of our thesis. In chapter 3 we will account for theories relevant for our inquiry questions. After chapter 3 we will present our empirical study, which will be followed by our analysis. Finally the thesis will end with our conclusions.

2 Methodology

In this chapter we will have a brief discussion of methodology to then move on to our scientific approach and then our research approach. This will be followed by our research method, collecting data sources and motives for choosing them. Then follows the section, interviews and question form which will be followed by a brief explanation about how we measured duration. Then follows criticism of our sources, and finally the chapter will end with the section about the validity and reliability of our thesis.

2.1 Methodology discussion

Andersen (1994) states that there is a continuing discussion about what scientific knowledge is, and what methodology to use or not to use. Methodology enables the researcher to better evaluate and incorporate, as well as to produce, new knowledge. (Andersen 1994)

Methodology is characterized by giving tangible and valuable tools for solving a problem within different scientific subjects and projects. One can say that methodology is the technique that gives us knowledge of what methods to use, and also which rules to follow, in order to conduct thorough scientific research. (Ibid)

We believe that it's important to understand the different methodology tools in order to be able to conduct the research needed to answer our inquiry questions. We perceive the value of using appropriate methods, when conducting our research, as guidance throughout the entire work process. Although it doesn't guarantee a high-quality output, it can be helpful during the work process.

2.2 Scientific approach

There are two main approaches when conducting scientific work; positivism and hermeneutics. The basic scientific outlook differs between an exploratory knowledge and an understanding one. However the borderline between the two approaches is often diffused. (Patel & Davidsson 1994)

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Positivism is based on experiments, quantitative measurements, logical reasoning, and scientific rationality. In order for the knowledge to be significant it should be possible to empirically test it. Judgments and estimations should be replaced by measurements, and explanations should come from a cause-effect relation. Positivism is to a large extent based on measurements and logical reasoning about reality. (Ibid)

Hermeneutics is a scientific approach that focuses on understanding, and where interpretation constitutes the primary research method. In the framework for the hermeneutics science tradition no absolute truths are sought. They simply don't exist in the hermeneutics knowledge theory. The scientist instead seeks new and more productive ways to understand occurrence that can be hard to handle in our everyday understanding. Research questions that can be formulated in terms of "what does it mean?" are suitable for the hermeneutics scientific approach. Hermeneutics is about interpreting the meaning in texts, symbols, and experiences. As opposed to positivism, it is more qualitative and based on interpreting reality through people's thoughts, motives, and goals (Ödman 1979; Patel & Davidsson 1994)

After identifying our field of research, we evaluated the different scientific approaches, and drew the conclusion that the hermeneutics approach was best suited for conducting our research. We have tried to grasp and better understand how the different savings banks handle asset and liability questions, and mainly interest rate risk issues, by interviewing appropriate personnel from the different savings banks. We have also studied annual reports from the different savings banks in order to get a better understanding of the bank's financial status and their risk exposure. Since our thesis only concerns a few savings banks, one can also say that our results can not be generalized.

2.3 Research approach

There are two classical approaches when conducting research; deductive and inductive research. When conducting deductive research, existing theories that are known is used by the researcher, and conclusions are then drawn from different observed phenomenon.

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In an inductive research approach, one analyzes the empirical data and can draw general conclusions, and possibly new theories can emerge. (Patel & Davidsson 1994)

When conducting our research, we have considered the different approaches and concluded that the deductive approach was best suited for our research. We started by reading existing theory about risk management in banking in order to get a better understanding about risk management. Then we identified different problem areas regarding risk management in savings banks. To be able to answer our inquiry questions we had to gather and compile relevant existing theories, and based on that gather our empirical data. Finally we analysed the existing theories and compared it to our empirical findings to be able to draw conclusions about the observed phenomenon.

2.4 Research method

There are two main research methods when examining reality; the qualitative and the quantitative approach. The quantitative approach is used in science by treating information in different statistical ways. The approach gives a general understanding for a phenomenon, but doesn't do it in a profound way. The qualitative approach gives more insight than the quantitative approach. The process is often characterized by the person performing the work. The ambition is to try to understand and analyze the entirety. It's hard to generalize and here one tries to answer the question. (Patel & Davidsson 1994)

Andersen (1994) states that qualitative research is often characterized by addressing a problem from the inside and going deep into the organization. Since we only have conducted one or two interviews with each savings bank, we can not say that we have gone deep into the organisations of the savings banks. However this was never our intention. We believe that we have captured the necessary parts of the different savings banks' Asset and Liability Management needed to answer our inquiry questions.

Our ambition in this thesis was to understand and analyze the Asset and Liability Management process, and mainly the interest rate risk management, for the studied savings banks. In order to do this we felt that it was important to conduct personal interviews with representatives from the different savings banks, which constituted our

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empirical data. Since no savings banks present their strategies to deal with asset and liability questions and mainly interest rate risk issues in public, we felt that conducting interviews was the only way we could collect the necessary data. Therefore the qualitative approach was the best research method for conducting our thesis.

2.5 Collecting data sources

We have mainly used books, scientific articles and statistics to get a better understanding of Asset and Liability Management. For finding relevant data we have used databases like Business Source Premier, Science Direct Elsevier, Social Science Research Network, and Emerald Library. We have also searched in the catalogues of different libraries to increase our data. The words that we used during our searches were: Asset and Liability Management, ALM, ALCO, risk management + banking, bank, bank + management, balance sheet + hedging, interest rate risk, duration, convexity, interest rate gap, maturity model etc. We then studied the search hits and chose the litterateur we found relevant for our purpose. Commonly for all the data was that they all handled the asset and liability process within a bank. The majority of our litterateur was in English.

When choosing savings banks to study, our first criterion was that they had to be savings banks with no shareholders, solely because our thesis concerns these types of banks. When choosing which savings banks to study we found out that there are no savings banks in the Gothenburg area, which forced us to look outside the Gothenburg area. Due to limited time and resources we then chose banks that were located geographically closest to Gothenburg. When deciding how many banks to study we were once again limited by our lack of time and resources. We wished to interview as many banks as possible, however in order to finish this thesis in time and in the same time producing a high quality work within the recommended page restrictions, we had to limit the number of banks to study to four banks.

The four savings banks that we have studied are Falkenbergs Sparbank, Nordals Härads Sparbank, Sparbanken Alingsås and Tidaholms Sparbank. After contacting each bank and presenting ourselves and the purpose of our thesis, we were appointed a suitable member

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of the staff, who could answer our questions. Then we called these people and booked personal meetings.

On Falkenberg's Sparbank, we interviewed Bengt Balldin, Treasury Manager. Originally we were appointed Ingela Mattisson, Financial Manager, but she declined due to lack of time, and forwarded our request to Bengt Balldin, who was an equivalent substitute. On Nordals Härads Sparbank, we interviewed Magnus Olsson, Head of Administration. On Sparbanken Alingsås, we interviewed Morgan Svensson, Credit Manager. On Tidaholms Sparbank, we interviewed Kjell Jacobsson, Financial Manager, and Jan Blennow, Operating Manager and future CEO.

Since we were appointed to the above mentioned personnel by the banks, we felt that the information collected at the interviews were relevant and trustworthy. Since information about the Asset and Liability Management in the different savings banks is not available in writing, this was the only way for us to collect the data necessary for our thesis.

2.6 Interviews and question form

According to Holme & Solvang (1997), one of the reasons for conducting a qualitative interview is to create a deeper and better understanding of the study. Therefore the interview should sustain the purpose of the thesis. Patel & Davidsson (1994) points out that between the beginning and the end, the focus of the interview should be on the inquiry.

Lundahl & Skärvad (1999) mention that interviews can be different, depending on their degree of standardization and also on the structure of the questions. A semi-structured interview implies that the prepared questions were asked in the same order to all the respondents. However, follow-up questions should depend on the situations and the answers given. (Lundahl & Skärvad 1999)

We felt that establishing a mutual trust between ourselves and the interview subjects was important in order to yield a higher information value and ultimately resulting in better interviews. This is supported by Holme & Solvang (1997), who state that creating an

Methodology

atmosphere of trust is required in order to conduct a high-quality interview. Before conducting the interviews, we e-mailed the question form to the interview subjects in order to give them an opportunity to prepare themselves for the interviews. We also informed them about the length of the interviews since they pointed out that they were very busy and lacked the time for participating in a longer interview. Taking this into account we knew that we had to receive as much relevant information as possible, since a follow-up interview was out of the question. Therefore, by using an mp3-player for recording the interviews, we assured ourselves that the interviews were rendered as correctly as possible.

According to Patel & Davidsson (1994), it is important that the interview subjects are fully aware of their usefulness for the study. Therefore before starting the interviews, we made sure that the interview subjects understood the purpose of the interviews and what they would be used for; and why their contribution were important for us.

We conducted semi-structured interviews, where we had a standardized question form, which we complemented with follow-up questions during the interviews. The follow-up questions were formed depending on the answers given by the interview subjects, and were an additional way for us to obtain more information.

We structured our interview questions in order to gather relevant information for the purpose of answering our thesis's inquiry questions. Furthermore we had formed the questions in a certain order, which we felt was most appropriate for receiving satisfactory answers from the interview subjects. Therefore the interviews started with general introduction questions about the bank and the interview subjects. The interviews then continued with more intricate questions, following the same structure as the theory chapter in our thesis, regarding our problem area. All of the conducted interviews lasted between 45 to 60 minutes.

2.7 Course of action when calculating duration

For calculating the duration we used the available information in the savings banks' annual reports of 2002. Further there are some assumptions one has to make when

Methodology

calculating duration. When we calculated duration for the four savings banks in our study, we assumed that assets and liabilities are repriced at the mid-points of each period and that no asset and liability is held more than ten years. Furthermore we used the interest rates for the first business day in 2003, namely 2003-01-02.

2.8 Source criticism

When collecting our data sources, the majority of the literature treated Asset and Liability Management from large commercial banks' point of view, and not from savings banks', that we have focused our study on. Neither did we find much literature that focused on Swedish savings banks. However, much of the theory that we used for describing the tools for measuring interest rate risk are also applicable for savings banks, which is shown by our study.

One can also assume that the data collected during our interviews with our informants have been subjective and can sometimes be embellished descriptions of the facts.

2.9 Reliability and validity

The reliability describes the trustworthiness of the collected data. It's a measurement of the frequency of random errors or to which extent the study can be repeated and still give the same results. A study with good reliability is distinguished by the fact that the investigation can't be affected by the one that conducts it or under the circumstances which it's conducted. (Patel & Davidson 1994)

We believe that the reliability in our thesis is good due to the fact that we have used articles that are peer reviewed, which means that they have been audited and thereafter published in a scientific journal. In addition to this we have used books written by renowned authors, which we believe has increased the reliability. Furthermore, our interviews were conducted with the appropriate personnel from the different savings banks, who had in common that they all were involved in the Asset and Liability Management. This helped us to get adequate and satisfactory answers to our questions. However we believe that if we had studied other savings banks than those in our study,

Methodology

we probably would have gotten different results. This is the main reason why we chose to conduct a case study.

Validity means, in which extent that the research succeeds to measure what it was intended to investigate (Patel & Davidsson 1994). According to Eriksson & Wiedersheim-Paul (1997), the validity can be divided into internal and external validity. The internal validity refers to the correspondence of the study's conceptions and definitions which can be found in reality, i.e. the quality of the conclusions that are drawn from the study. The external validity shall treat the study's support in reality, which means if the study as a whole gives possibilities to generalization or not.

We believe that the internal validity is good due to the fact that we have based the theoretical reference in our thesis on relevant literature which treated our inquiry questions. Our results can't be generalized due to the fact that it is a qualitative study and we have only included a few savings banks, therefore the external validity isn't very good.

3 Theory

This chapter begins with the deregulations of the Swedish financial market which will be followed by interest rates and the yield curve. Finally we will account for interest rate risk, models of measuring it and last how to hedge interest rate risk

3.1 Deregulations of the Swedish financial sector and the savings banks

Most of the reforms in the money- and bond market occurred during the 1980s. This was due to an increasing government debt that no longer could be financed with quantitative restrictions. Earlier banks, insurance companies and pension funds were forced to finance the budget deficit with administrative set interest rates and forced transactions. The new monetary policy was reshaped into market conformist who led to new control tools for banks and insurance companies, and new financial tools were encouraged. (Lybeck 1999)

The deregulation of the banking sector started in 1978 when banks were allowed to freely set their interest rates on deposits. In May 1985 the banks were also allowed to set their own lending rates. The lending boom however was mainly due to the liberalization of loan facilities, which led to a severe increase in price, primarily in commercial real estates. In the lending process the banks emphasized exclusively the market value of the securities, not the borrower's repayment ability. When the real estate prices and stocks started to drop in 1989, the borrowers had difficulties to pay back their loans. The price bubble was also aggregated by currency regulations that prohibited excess capital to be moved abroad. (Ibid)

In 1989 all restrictions on capital flows were removed which brought the deregulations into a new phase, and shifted the focus to competition between the financial operators. Sweden's gradually integration with the EU also enhanced the competition, and called for a levelled playing-field. This process bolted however and led to the financial crisis, which during some time seemed to force the large banks to be placed under government rule. (Ibid)

Theory

The deregulations of the financial markets in the 1980s resulted in taking considerable risks in order to obtain higher returns in the new competitive environment for most of the banks. The extensive financial crisis in 1991-1993 was an outcome of the banks' lack of knowledge to price risks appropriately in the initial phase of the deregulation. (Lindblom 2001)

The credit losses grew fast in 1990 and reached a peak of 8% of total lending in 1992 and 1993. However, the differences between the different banks were huge. For example Gota Bank's credit losses reached the level of 20% of total lending for two years in a row. On the other hand the credit losses of Handelsbanken never exceeded the level of 2% of total lending. (Lybeck, 1999)

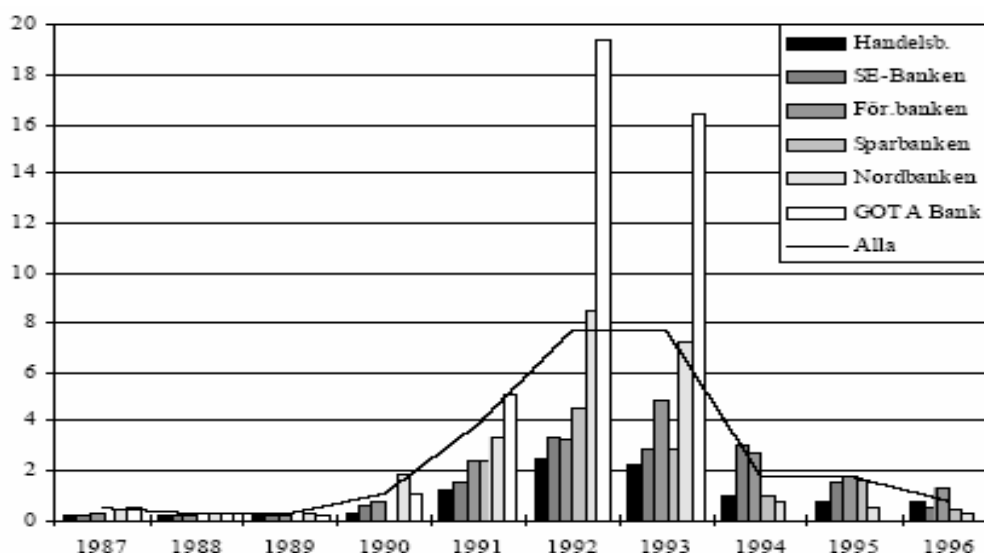


Figure 1: Credit losses for the Swedish banks in percent of total lending. Source: Lybeck 1999. Den svenska finansiella sektorns utveckling i modern tid.

Theory

According to The Swedish Financial Supervisory Authority there are currently 76 savings banks in Sweden. The following figure shows the number of savings banks between the years 1979 and 2001.

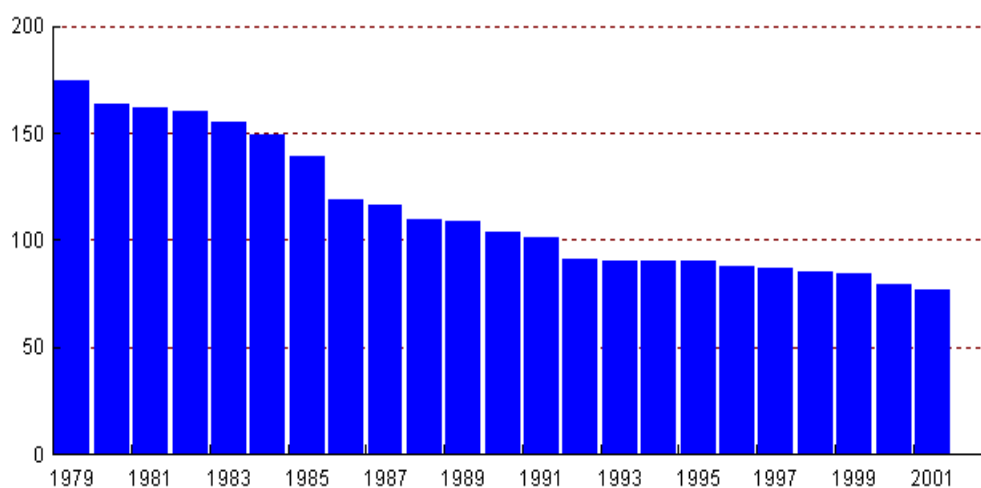


Figure 2: Number of Swedish savings banks (1979-2001). Source: Bank Profitability Statistics (Source OECD).

After all restrictions on capital flows were removed in 1989 and the end of the financial crises in Sweden, the number of savings banks declined from 109 to 90, which is a decline by 17.5%.

3.2 Interest rates and the yield curve

In order to understand interest rate risk, one must understand the nature of interest rates. According to Santomero & Babbal (1997), the prices of credits are referred to as the interest rate in financial markets, and the interest rate is determined by demand and supply. There are however some unique factors affecting the demand and supply, like the fact that interest rate is an “intertemporal” price, which means that the price today for money that is to be returned at some future date. Interest rates can be derived from examining the consumption and savings decision of individuals in a two period world. There will be consumption opportunities for individuals in both periods and they must determine how much to consume in each period. The following are essential components of the two-period economic model of real interest rate determination.

Theory

1. The indifference curve for consumption cross the two periods.
 - Most individuals would require higher consumption opportunity in the future as a reward for giving up consumption today.
2. There are a set of investment opportunities for individuals.
 - By giving up some amount of consumption today, the savings can be invested in productive activities that will generate greater wealth, and thus higher consumption opportunity.
3. A financial market for saving and borrowing.
 - Some individuals could save money by investing it in financial assets or placing it in a financial institution. These funds would then be available to borrowers with investment opportunities in physical capital.

(Santomero & Babbel 1997)

The term structure of interest rates, the yield curve, is the entire range of market interest rates across all maturities, and understanding it is important to assess the interest rate risk of banks due to the following reasons.

- Due to continuous movements of interest rates, banks' interest incomes are at risk.
- Future interest rates of borrowing or lending-investing are unknown if no hedge is contracted before.
- Banks tend to lend long and borrow short. This natural exposure of banks looks beneficial when long-term interest rates are above short-term interest rates. Often, banks effectively lend at higher rates than the cost of their debts, because of a positive spread between long-term rates and short-term rates. The banks' interest income can however be jeopardized, due to the changes of shape and slope of the yield curve.

(Bessis 2002)

Theory

Variable rates change periodically and remain fixed between any two reset dates, which makes the distinction between fixed or variable rates meaningless, unless a time horizon is defined. A variable rate usually refers to a periodically reset market rate, such as the one-month LIBOR, one-year LIBOR or, for the long-term, bond yields. The resets can occur as frequently as one day. (Ibid)

The following figure shows the current Swedish yield curve presented by the Swedish National Debt Office.

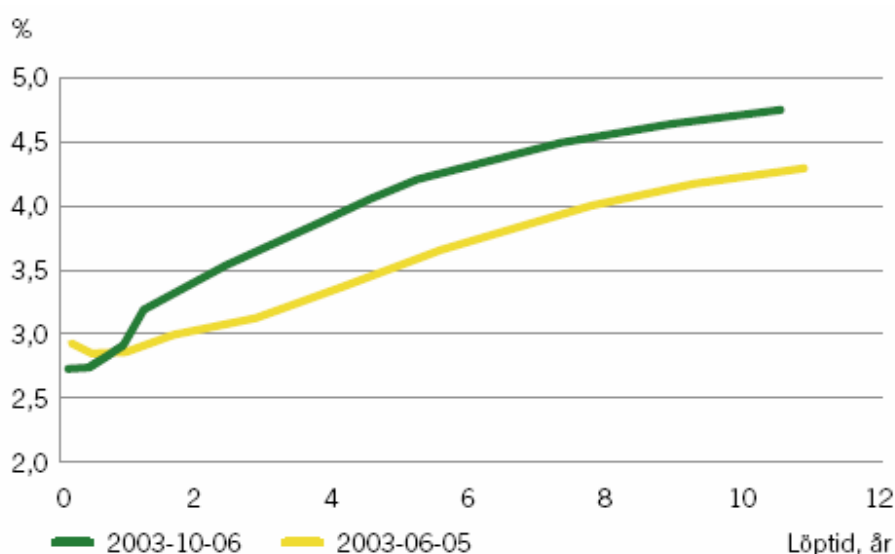


Figure 3: The current Swedish yield curve. (Löptid, år = maturity in years). Source: The Swedish National Debt Office. <http://www.rgk.se/scripts/cgiip.exe/cm/file/streamfile.p?fileid=1214>

3.3 Interest rate risk

Interest rate risk is the risk that evolves when a bank mismatches the maturity of its assets and liabilities. When banks hold longer term assets relative to liabilities, it potentially exposes itself to refinancing risk. This is the risk that the cost of rolling over or reborrowing funds could be more than the return earned on asset investments. There is also a possibility of reinvestment risk, which is that the returns on funds to be reinvested will fall below the cost of funds. In addition to suffering a refinancing or reinvestment risk that occurs when interest rates change, a bank faces market value risk as well.

Theory

Market value of an asset or liability is equal to the discounted future cash flows of that asset or liability. Therefore a rise in interest rates will increase the discount rate on those cash flows and reduce the market value of that asset or liability, and the opposite is true if the interest rates will decrease. Ultimately, when mismatching maturities by holding longer term assets than liabilities, a rise in interest rates will decrease the value of the bank's assets more than the value of its liabilities. (Saunders 2000)

Rate	Change of rates	Lender	Borrower
Existing exposure			
Floating rate	Rate ↑	+	-
	Rate ↓	-	+
Fixed rate	Rate ↑	-	+
	Rate ↓	+	-
+ Gain			
- Loss			

Table 1: Exposure to interest rates. (Own rework) Source: Besis (2002) p 154.

3.4 Models of measuring the interest rate risk

There are several models of measuring the asset and liability gap exposure of a bank. The most important are the gap model and the duration model. (Saunders 2000)

3.4.1 The gap model

The gap model, or repricing model as it's also called, is basically a book value accounting cash flow analysis of the repricing gap between the interest revenues earned on assets and interest expenses paid on liabilities over a certain period. When using the gap model, a bank calculates the gaps in each maturity period by looking at the mean time for assets and liabilities to reprice, also called rate sensitivity of each asset and liability. Simply put, this means how long a bank manager has to wait to change the posted rates on any asset or liability. (Ibid)

Theory

Van Son & Hassan (1997) concluded that small banks⁴ may rely more on the gap model to cope with interest rate risk than larger banks. The use of the gap model would perhaps be more useful for small banks. (Van Son & Hassan 1997)

The main advantage of the gap model is its information value and its simplicity in pointing to a bank's net interest income exposure, or earnings exposure, to interest rate changes in different maturity periods. (Saunders 2000)

$$\Delta NII_i = (GAP_i)\Delta R_i = (RSA_i - RSL_i)\Delta R_i$$

ΔNII_i = Change in net interest income in the i th period

GAP_i = The monetary size of the gap between the book value of assets and liabilities in maturity period i

ΔR_i = The change in the level of interest rates impacting assets and liabilities in the i th period

RSA_i = Rate sensitive assets

RSL_i = Rate sensitive liabilities

A bank manager can also estimate cumulative gaps ($CGAP$) over various repricing categories or periods, by summing up all the gaps.

The gap model has however three weaknesses:

1. It ignores market value effects – The reason for this is that the model uses book value accounting, which means that asset and liability values are reported at their historic values or costs. Thus interest rate changes affect only current interest income or interest cost. Therefore this model doesn't account for the capital loss. This weakness is also confirmed by Hudson et al (2000) who state that it only shows how interest rates will affect the assets and liabilities, and not by how much.

⁴ Banks with less than 300 MUSD in total assets

Theory

2. Overaggregation – The problem of defining periods over a range of maturities is that information regarding the distribution of assets and liabilities within the period is ignored. For example average liabilities may be repriced at the end of the period, while assets may be repriced at the beginning. The shorter the period gaps are calculated the smaller this problem is. The optimum approach would be to calculate one day period gaps. Many large banks have internal systems that can show their repricing gaps on any given day in the future.

3. Problem of runoffs – In reality banks continuously originate and retire loans as it creates and retires deposits. In addition almost all long-term loans pay at least some principal and interest back to the bank each month. As a result of this banks receive a runoff cash flow from its loans that can be reinvested at current market rates. This makes the runoff cash flows rate sensitive. A bank manager can easily deal with this by identifying for each asset and liability item the proportion that will runoff, reprice, or mature. This sensitivity of runoffs to interest rate changes is a further weakness of the repricing model.

(Ibid)

In 1998 the Swedish Financial Supervisory Authority decided that all banks must report their interest rate risk exposure to the authority quarterly.

In order to be able to compile the report the banks must estimate how a change in the existing interest rate level would affect the bank. This report should partly contain the gap model, which is as mentioned earlier, calculating the difference between interest incomes and interest expenses, the net interest income, during a required period of 12 months. (The Swedish Financial Supervisory Authority)

Theory

		Maturities			
		0-1 months	1-3 months	3-6 months	6-12 months
1	Assets				
2	Liabilities				
3	Gap (1-2)				
4	Weights				
5	Change in net interest income (4*3)				

Table 2: The basis for reporting interest rate risk exposure to the Swedish Financial Supervisory Authority. Source: Swedish Financial Supervisory Authority

<http://www.fi.se/finansinsp/ffsshow.asp?from=&ffs=fs9811.htm>

3.4.2 Duration

Duration is a more complete measure of an asset or liability's interest rate sensitivity than the gap model stated above. This is because duration accounts for the time of arrival of all cash flows, as well as the asset or liability's maturity. (Saunders 2000)

According to Hempel & Simonson (1999) matching gaps attempts to stabilize earnings, while matching duration attempts to stabilize the net worth value of the portfolio.

Duration analysis is based on Macaulay's concept of duration. Duration is a useful concept because it provides a good approximation, especially when interest rate changes are small, of the sensitivity of a security's market value to a change in its interest rate. (Mishkin & Eakins 2003)

The higher the duration value, the more sensitive the price of that asset or liability is to changes or shocks in interest rates. By using the following general formula, one can calculate the duration for any fixed income security. (Ibid)

$$D = \frac{\sum_{t=1}^N CF_t \times DF_t \times t}{\sum_{t=1}^N CF_t \times DF_t} = \frac{\sum_{t=1}^N PV_t \times t}{\sum_{t=1}^N PV_t}$$

D = Duration measured in years

Theory

CF_t = Cash flow received on the security at end of period t

N = Last period in which the cash flow is received

DF_t = Discount factor = $1/(1+R)^t$, where R is the yield or current level of interest rates in the market

$\sum_{t=1}^N$ = Summation sign for addition of all terms from $t=1$ to $t=N$

PV_t = Present value of the cash flow at the end of the period t , which equals $CF_t \times DF_t$

The higher the coupon or promised interest payment on the security, the lower is the duration. This is because of the fact that the larger the coupon or promised interest payments, the more quickly cash flows are received by investors and the higher are the present value weights of those cash flows in the duration calculation. (Ibid)

For duration analysis, it's assumed that interest rates for all maturities are the same – in other words the yield curve is assumed to be flat. However the yield curve is not flat and the slope of the yield curve fluctuates and has a tendency to change when the level of interest rate changes. Thus, one must estimate changes in the yield curve and take this information into account when assessing interest rate risk. Due to this fact, a more appropriate duration measure can be derived, by discounting the coupons and principal value of the bond by the discount rates or yields on appropriate maturity zero-coupon bonds. (Mishkin & Eakins 2003; Saunders 2000)

3.4.2.1 Duration and immunizing future payments

For banks offering pension funds and life insurance, there is a problem of structuring the asset investments in order to be able to pay out given cash amounts to policy holders in some future period. Saunders (2000) uses an example of an insurance policy that pays the holder a lump sum at a certain date. The risk for the insurance provider, the bank, is that interest rates on the funds generated from investing the insurance holder's premiums could fall. This would in turn lead to the fact that the accumulated returns on the premiums invested would not meet the promised lump sum. The bank would then be forced to meet its requirements by using own funds. To immunize or protect itself against

Theory

interest rate risk, the bank would have to invest in a zero coupon bond that matures at the same time as the insurance, or in a bond with the same duration. The gains or losses on reinvestment income that results from an interest rate change are exactly counterbalanced by losses or gains from the bond's income on sale. (Saunders 2000)

However, according to Saunders (2000) the immunization of duration is not well understood. This is due to the fact that it is a dynamic problem. In theory, it requires bank managers to rebalance the portfolio constantly to ensure that the duration of the investment exactly matches the investment horizon, in other words matches the duration of the liabilities. Continuous rebalancing of the portfolio is not easy and involves costly transaction fees, which forces bank managers to rebalance at separated intervals, such as quarterly. There is a trade-off between immunizing investments perfectly and the transaction costs of immunization. (Saunders 2000)

3.4.2.2 Immunizing the whole balance sheet

The duration model can also evaluate the overall interest rate exposure, i.e. measure the duration gap for the balance sheet. To estimate the overall duration gap, one has to determine the duration of the assets, D_A , and the duration of the liabilities, D_L . (Saunders 2000; Hempel & Simonson 1999)

This can be calculated as:

$$D_A = X_{1A}D_1^A + X_{2A}D_2^A + \dots + X_{nA}D_n^A$$

$$D_L = X_{1L}D_1^L + X_{2L}D_2^L + \dots + X_{nL}D_n^L$$

$$X_{1j} + X_{2j} + \dots + X_{nj} = 1 \text{ and } j = A, L$$

Duration gap, DG, can be calculated as:

$$DG = D_A - \left(\frac{L}{A} \times D_L \right)$$

Theory

$$\Delta A = \Delta L + \Delta E$$

$$\Delta A = -D_A \times \frac{\Delta R}{1+R} \times A$$

$$\Delta L = -D_L \times \frac{\Delta R}{1+R} \times L$$

$$\Delta E = -D_E \times \frac{\Delta R}{1+R} \times E$$

$$\Delta E = -DG \times \frac{\Delta R}{1+R} \times A$$

ΔA = Change in assets

ΔL = Change in liabilities

ΔE = Change in equity

(Ibid)

3.4.2.3 Duration of equity for 19 savings banks

A study that was performed in 2002 for 19 savings banks by Riskciceron in order to measure the banks' interest rate risk is illustrated by the following figure. The columns represent duration of equity.

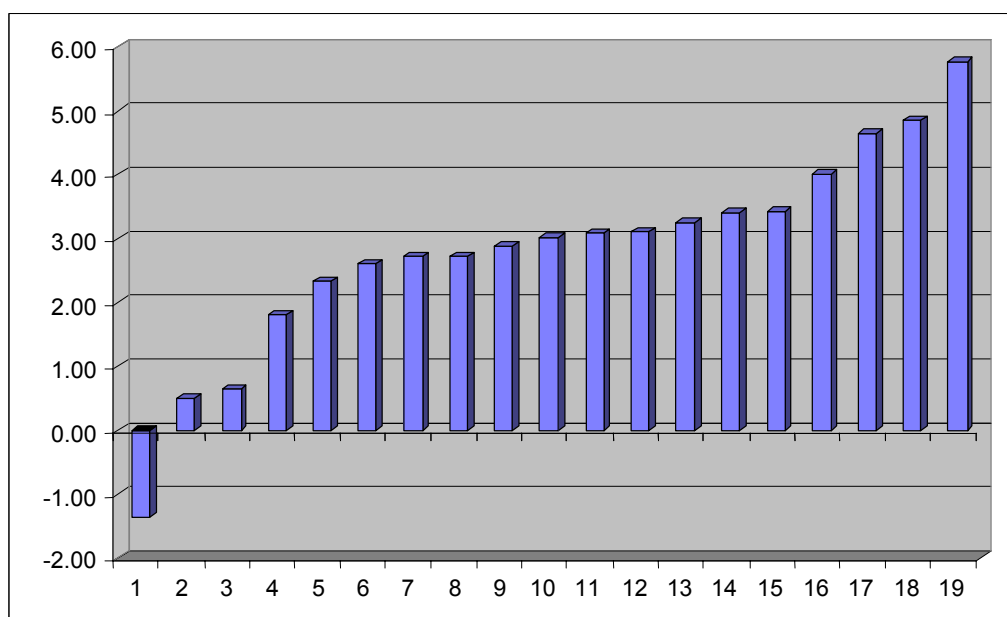


Figure 4: Duration of equity for 19 Swedish savings banks. Source: Riskciceron internal material.

3.4.2.4 Difficulties applying the duration model

A bank can change the D_A and D_L to immunize against interest rate risk, but restructuring the balance sheet can be both time consuming and costly. The growth of purchased funds, asset securitization and loan sales markets has considerably alleviated the speed and lowered the transaction costs. Moreover, banks could still manage risk exposure using the duration model by techniques other than direct portfolio rebalancing. Banks can get many of the same results of direct duration matching by hedging in the market for derivative securities such as futures and forwards, options, caps, floors, collars and swaps. (Saunders 2000; Kyte 2002)

3.4.2.5 The problem of default risk

The duration model assumes that the probability of the bank receiving its promised payments is 1; it assumes no default or delays in the payments of cash flows. In reality banks experience problems with receiving payments from borrowers, which can lead to rescheduling and recontracting of payments. These delays ultimately lead to changes in duration. Moreover the uncertainty of future cash flows because of future default risk could be reduced by multiplying the promised cash flows (CF_t) with the probability of payments (p_t) in year t to get the expected cash flows $E(CF_t)$. (Saunders 2000)

$$E(CF_t) = p_t \times CF_t$$

3.4.2.6 Floating-rate loans and bonds

When calculating duration, interest rates on loans or the coupons on bonds are fixed at issue date and don't change until maturity. However many bonds and loans have floating interest rates. The duration of floating rate assets or liabilities are generally the time interval between the purchase of the security and the time when the next coupon or interest payment changes. (Saunders 2000)

3.4.2.7 Convexity

As stated earlier by Mishkin & Eakins (2003), the use of the duration model is beneficial when interest changes are small. This is supported by Saunders (2000) and Hempel & Simonson (1999), who states that although the duration model assumes the relationship between interest rate changes and bond price will be proportional to the duration; this is not the case when precisely calculating the true change in bond prices. With large interest rate increases, duration over-predicts the fall in bond prices, while for large interest rate decreases; it under-predicts the increase in bond prices. I.e. the duration model predicts symmetric effects for interest rate increases and decreases on bond price, when in actuality the capital loss effect when interest rates increase is smaller than the capital gain effect when interest rates decrease. This is because of the bond price-yield relationship is convex rather than linear, which is assumed by the duration model. This convexity is

Theory

therefore a desirable feature for bank managers to capture in a portfolio of assets. (Saunders 2000; Hempel & Simonson 1999)

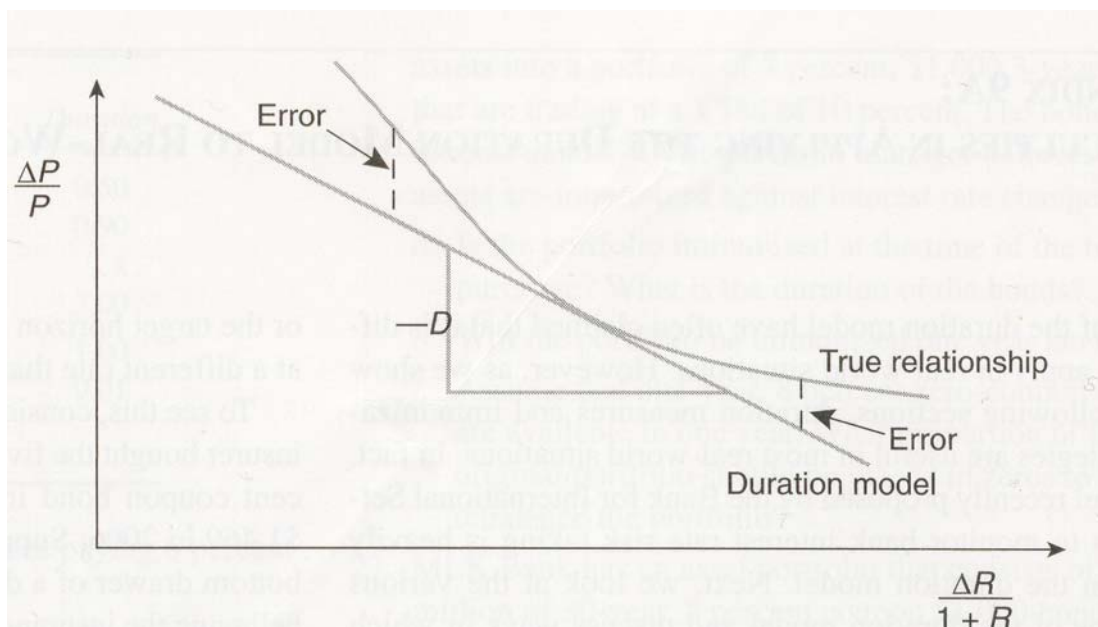


Figure 5: Duration versus True Relationship. Source: Saunders (2000) p 170.

In summary there are three characteristics of convexity:

1. Convexity is desirable – The larger the convexity of a security, the larger the interest rate protection against rate increases and the greater the potential gains after interest rate falls.
2. Convexity and duration – The larger the interest rate changes and the more convexity, the greater the error of using just duration to immunize against interest rate changes.
3. All fixed income securities are convex – As the yield moves towards infinity, the bond price falls asymptotically towards zero. However by definition a bond's price can never be negative therefore zero must be the minimum bond price (see figure 3).

(Saunders 2000)

Theory

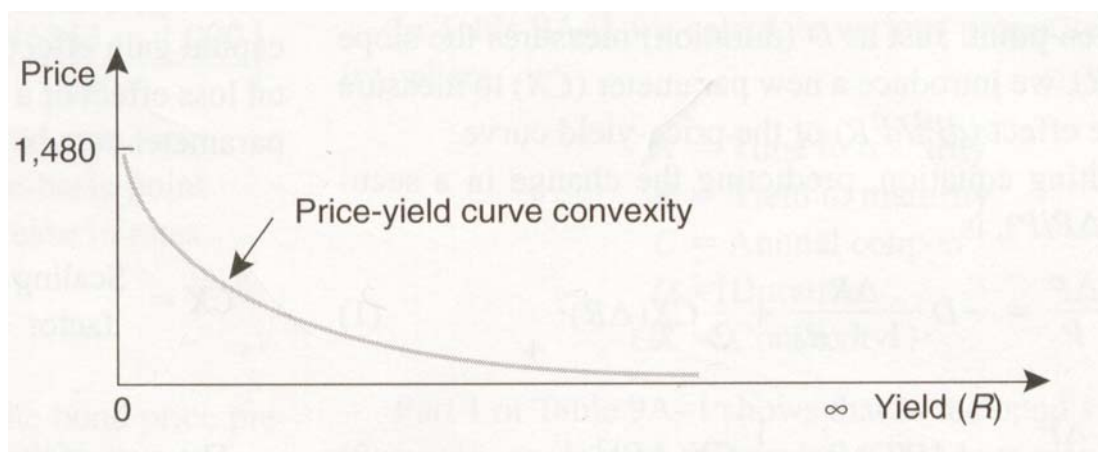


Figure 6: The natural Convexity of Bonds. Source: Saunders (2000) p 171.

Since convexity is a desirable feature for assets, it would be beneficial to calculate convexity and to incorporate it in the duration model to adjust for, or to offset the error in prediction due to its presence. By definition the convexity (CX) parameter equals

$$CX = \text{Scaling factor} \left[\begin{array}{l} \text{The capital loss} \\ \text{from 0.01\% rise in} \\ \text{interest rates} \\ \text{(negative effect)} \end{array} + \begin{array}{l} \text{The capital gain from a} \\ \text{0.01\% decrease in} \\ \text{interest rates (positive} \\ \text{effect)} \end{array} \right]$$

$$CX = 10^8 \left[\frac{\Delta P^-}{P} + \frac{\Delta P^+}{P} \right]$$

The sum of the two terms in the brackets reflects the degree to which the capital gain effect exceeds the capital loss effect, from a small change in interest rates. The scaling factor is used to normalize this measure to account for a larger 1 percent change in interest rates.

Bank managers can, by using the convexity measure, construct a portfolio containing assets with larger convexity than the liabilities.

Theory

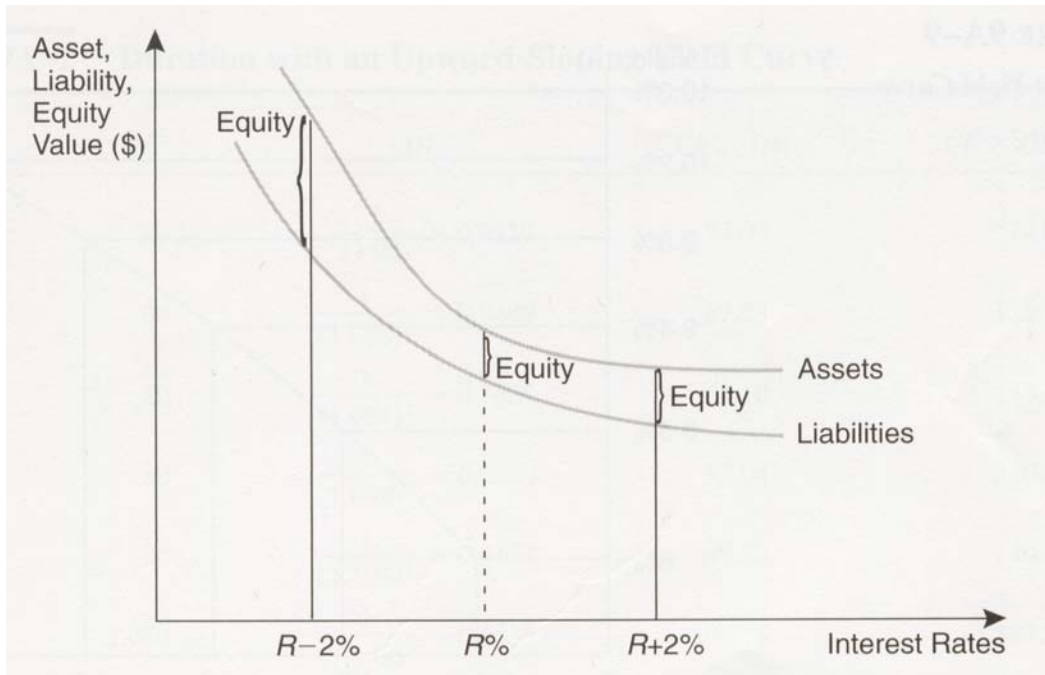


Figure 7: Portfolio with assets more convex than liabilities. Source: Saunders (2000) p 175.

The value for CX can be inserted into the bond price prediction equation with the convexity adjustment

$$\frac{\Delta P}{P} = -MD \times \Delta R + \frac{1}{2} CX (\Delta R)^2$$

$$MD = \text{Modified duration} = \frac{D}{(1+R)}$$

This equation helps reducing the error between predicted value and true value. (Saunders 2000; Hempel & Simonson 1999)

3.5 Hedging interest rate risk

According to Eitemann et al (2001), hedging is in basic terms "the taking of a position, acquiring either a cash flow, an asset, or a contract that will rise or fall in value to offset a fall or rise in the value of the existing position" (see Kyte 2002). Kyte (2002) also states that by eliminating or at least reducing loss, hedging also eliminates or reduces any gain

Theory

that might be obtained from an increase in the value of an existing asset. In other words, there is a trade-off between risk and return that banks have to take into consideration. It is also important to note that hedging can occur on two levels; macro hedging, which is performed on a whole portfolio, and micro hedging, which is on an individual product level. Macro hedging is more commonly practiced. (Kyte 2002)

Hingston (2000) states that there are four basic options for reducing interest rate risk exposure at any financial institution. These are selling assets, extending liabilities, off-balance sheet hedging, and retaining the status quo. In the following sections we will account for the different options for reducing interest rate risk exposure.

According to Van Son & Hassan (1997), small banks have not extensively relied on variable rate pricing of assets and liabilities, or hedging to attempt to immunize their balance sheets to the same degree as large banks.

3.5.1 Selling assets

By selling fixed-rate, long-term assets, a bank can reduce its interest rate risk exposure. This option does however rely heavily on the demand for fixed rate, long-term assets. If for example the market was oversaturated with fixed rate, long-term securities, there would mainly be sellers and not buyers on the market; making the bid/ask price spread very wide. The bank could therefore not be able to sell the securities at quoted prices. The prices would have to be negotiated. The reinvestment of the income from the sale would occur at “normal” spreads and therefore reducing the efficiency of the security swap. Even though the interest rate risk exposure would decline, it would not be the best choice, because selling those securities would create a loss that would reduce the amount of capital. (Hingston 2000)

3.5.2 Extending liabilities

By obtaining long-term, fixed-rate liabilities to fund the long-term, fixed rate assets, banks can theoretically reduce interest rate risk. Although the “spread” on the deal will be lower, it helps to lower interest rate risk significantly. This can however only be done at

the time when assets are acquired. In most cases long-term, fixed-rate borrowings cost more than the assets are earning. This would create a loss, but it would be smaller than the option to sell the assets. However the loss would be locked in for some time and if interest rates should suddenly decline sharply, the assets might be called away, leaving the bank with very expensive long-term fixed-rate liabilities. (Ibid)

3.5.3 Retaining the Status Quo

If the board and the management of the bank agree that the “cure” is worse than the “disease”, the bank could decide to pursue no hedging position. During normal business cycle conditions, the assets may well return to “par” within two or three years. If the bank can survive some further decline in value in the assets, doing nothing on purpose can be a possible strategy. (Ibid)

3.5.4 Forwards

A forward contract is when two parties agree to exchange a real or a financial asset on a prearranged date in the future for a pre-specified price. Forward contracts are not negotiable instruments because they are private agreements between two parties. The terms of the contracts are highly customized to meet the specific needs of the participating parties. The forward market uses informal communication networks and major participants include large financial institutions. (Santomero & Babbel 1997)

Saunders (2000) uses an example of a three months forward contract to deliver 20-year bonds, to illustrate how hedging with forward contracts works. The buyer and seller have to agree on a price and quantity at time 0 but the delivery will not occur until three months from now. The agreed upon price is the price that the buyer will have to pay and the seller have to accept, regardless of whatever happens to the price of the bond during the three months that the contract is valid. By using forward contracts the bank immunizes its asset against interest rate risk. (Saunders 2000)

3.5.5 Futures

Future contracts are similar to forward contracts but there are some major differences. The contracts are negotiable instrument and are traded on organized exchanges called futures markets. Future contracts also carry standardized terms, amounts and maturity dates. The price of the futures contracts are adjusted each day as the futures price for the contract changes. Therefore there occur daily cash settlements between the buyer and the seller. Although the standardization removes the flexibility characteristics of informal forward contracting, it results in liquidity that forward contracts lack. Because future contracts are traded in a centralized market, buyers and sellers can trade through brokers without personally searching for trading partners. Another important difference is that buyers or sellers of future contracts who incur losses are subject to settlement procedures where they must pay the counterparty an amount equal to the their losses. Finally futures contracts have the benefit of having a clearing corporation that stands between the parties to guarantee their performance of the contractual positions. (Santomero & Babbel 1997)

According to Saunders (2000) banks hedge interest rate risk either at micro level (microhedging) or at macro level using future contracts.

Microhedging is when a bank uses a future or a forward contract to hedge a particular asset or liability risk. An example of microhedging on the liability side is to lock in a cost of funds to protect the bank from a possible rise in the short-term interest rates by taking a position in future contracts on CDs or T-bills. In microhedging, the main action is to try to choose futures or forward contracts whose underlying deliverable asset or liability is closely matched to the asset or liability positions being hedged. (Ibid)

Macrohedging is to hedge the entire duration gap of a bank by using futures or derivative securities. In macrohedging the whole portfolio is viewed and this allows for individual asset or liability sensitivities or durations to net each other out. This can lead to very different cumulative futures positions than when a bank disregards this netting or portfolio effect and hedges individual asset and liability positions on a one-to-one basis. According to Stoebe (1994) macrohedging provided better hedge performance than microhedging in a number of different interest rate environments. (Ibid)

Theory

3.5.5.1 Routine and Selective hedging

Routine hedging occurs when a bank reduces its interest rate risk to the lowest possible level by selling futures to balance the interest rate risk exposure of its whole balance sheet or cash positions in each asset and liability. However since reducing the risk also reduces return, not all banks are willing to do this. Instead of hedging the whole balance sheet or all cash positions, many banks choose to allow some interest rate risk, as well as credit and foreign exchange risk, to earn higher returns. One option for the bank is to selectively hedge its portfolio. For example, a bank can have expectations regarding the future interest rates before deciding on future positions and therefore selectively hedge only a segment of its balance sheet positions. Alternatively the bank can decide to remain unhedged, or even to overhedge, by selling more futures than required by the bank's cash position. The fully hedged position and the minimum risk strategy becomes one of several choices depending partly on the bank's interest rate expectations, managerial objectives and the return-risk trade-off from hedging. Finally a bank may choose to hedge selectively in order to earn arbitrage profits between a spot asset's price movements and movements in a futures price. (Saunders 2000)

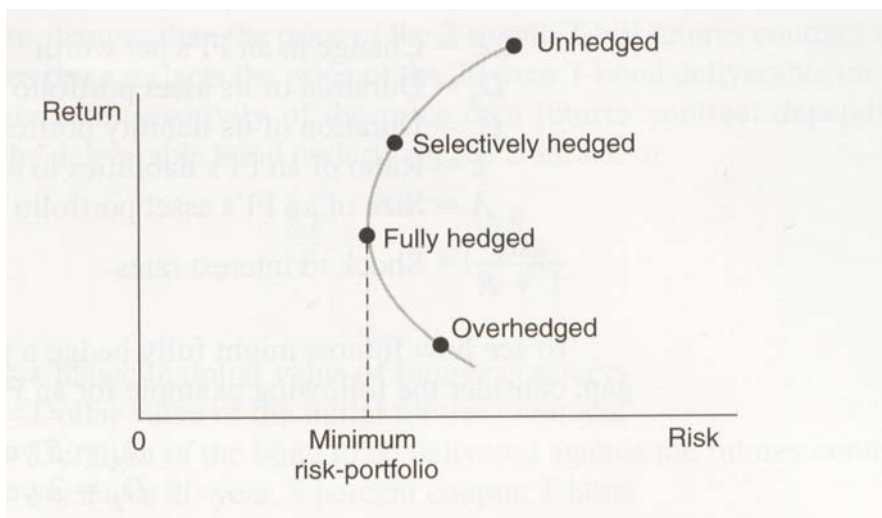


Figure 8: The effects of Hedging on Risk and Return. Source: Saunders (2000) p 563.

3.5.6 Interest rate swaps

Banks usually enter into interest rate swaps because they need to fix the interest structure of their balance sheets, especially their interest rate-sensitivity gaps. One bank may have fixed-rate assets and floating-rate liabilities, and another bank may have floating-rate assets and fixed-rate liabilities. These can then convert the basis of their existing balance sheet by contracting as counterparties in a fixed-for-floating swap. (Hempel & Simonson 1999)

There are two main types of interest rate swaps; coupon swaps and basis swaps. In a coupon swap, one counterparty pays the other the fixed-coupon rate, while the other in return pays the coupon rate on a floating-rate instrument. In a basis swap, the counterparties exchange payments based upon floating-rate indices, but each coupon has a different reference rate, for example LIBOR and T-bill rate. (Santomero & Babbal 1997)

Swaps are useful for tailoring the interest rate risk characteristics of investments toward that which is desired, thus it is a mechanism to reduce interest rate risk. There are three reasons why investors don't simply borrow in the market that exhibits the desired interest rate risk exposure directly. First an investor might issue debt in a particular market because it is under-priced, but might be unable to fund such an attractive price with the desired interest rate risk exposure. A swap then makes it possible to take advantage of the under-priced resources without suffering from the unwanted effects of an adverse movement in interest rates. Second an investor's desired interest rate risk exposure might change over time. It's then very costly to liquidate a position and issue a new one at the desired exposure. A swap is quite inexpensive in situations like this. Finally, and most importantly, it might be the fact that one of the parties is better positioned to acquire one type of funding than the other. For example, conventional wisdom has it that issuers with high credit rating find it cheaper to issue fixed-rate debt, while borrowers with lower credit rating find it cheaper to issue floating-rate debt. With a swap agreement, both parties can take advantage of each other's comparative advantages and thus obtain cheaper funding than if they had not entered into a swap agreement. (Ibid)

3.5.7 Interest rate caps, floors and collars

Caps are private contracts between two parties in which one party protects another against interest rate movements above a pre-specified level. The investor pays a fee for the cap; and in return, the originator gives the investor monetary compensation whenever interest rates rise above the cap, or strike level. The compensation paid to the investor depends primarily on three factors: (1) the degree to which the interest index exceeds the cap level, (2) the length of time of this positive spread, and (3) the size of the contract. If on the determination date, the index is less than the cap rate, no payment will be received by the investor. But the higher the interest index is above the cap level, the larger will the payments be; and the longer this spread is positive, the longer the investor will receive payments. The longer the cap maturity is, the more periodic payments to the investor is possible; and the lower the cap rate is, the more likely it is for the investor to receive payments. (Santomero & Babbel 1997)

Interest rate floors are like caps, due to the fact that they also protect against interest rate movements. However, unlike caps, floors provide protection against falling interest rates. Collars incorporate both caps and floors. Collars confine an investor's floating rate within a band between the floor and cap rates over the life of the agreement. (Santomero & Babbel 1997; Hempel & Simonson 1999)

4 Empirical study

In this chapter we will account for our empirical findings about how four Swedish savings banks manage interest rate risk.

4.1 Falkenbergs Sparbank (FS)

Falkenbergs Sparbank was founded in 1865 and is located in Halland. The main office is located in Falkenberg and the bank has additional six branches in Slöinge, Getinge, Vessigebro, Okome, Ullared and Ätran. The bank's main market is Falkenberg's community, Getinge and its immediate surroundings. The customers of the bank are private consumers, small- and middle-sized companies, farmers, organizations, and the community. In 2002 there were 95 employees in the bank and the total assets were 2,848 MSEK. FS has a market share of about 70% and the competitors of the bank are Nordea, Handelsbanken, and Länsförsäkringar.

For providing a full range of products and services, FS has to rely on Föreningssparbanken AB.

4.1.1 Goals and objectives

The bank wants to have an enduring profitability and the focus on profits is like in a commercial bank. The difference is that the profit stays within the bank and is not paid out with dividends, and the purpose of this is that the bank should be profitable in the long-term. A large share of equity also works as a security for the bank's customers. The bank follows the usual profitability measures as in other banks, like return on equity, return on total assets, solvency etc. and makes comparisons against other commercial and savings banks.

Regarding regulations, FS must follow the same rules as for other banks in terms of reporting interest rate risk exposure to the authorities.

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4.1.2 The yield curve

Since the deposits have increased significantly, FS doesn't feel that it is necessary to take advantage of the yield curve by borrowing short-term and investing long-term. However since the shape of the yield curve currently is flat, the investments have been shortened, because the trade-off between risk and return has lowered. The risk the bank takes on when investing in the long-term is not awarded by satisfactory return.

With its cooperation with Föreningsparbanken, FS gets information continuously about the expectations of how interest rates will change in the future. However FS also makes its own calculations in order to make a better forecast.

4.1.3 Asset and Liability Management

Bengt Balldin is in charge of the Asset and Liability Management of the bank. However every decision that he makes is communicated to an administration, which inspects the decisions. The fact that the bank is relatively small makes the communication between different departments satisfactory. FS has computer applications for the Asset and Liability Management, where they can get information about the current positions in real time and so far they have not run into any problems with the programs. The reason for acquiring these computer applications is that, a few years ago FS engaged in speculating activities which required the application.

FS has an active management of the interest rate risk exposure and to calculate it, FS uses both the duration model and the gap model. However since the structure of the portfolio currently is relatively short-term, the gap model is more interesting for the moment. The duration model comes more into use when the term structure of the portfolio is longer. When using the gap model FS calculates the gaps within the different periods, and also the cumulative gaps.

Mr. Balldin states that the bank currently has a satisfactory level on the interest rate risk exposure and sees no reason to change it, since the interest rate market is stable. However if the interest rate market becomes less stable, FS will probably lower their interest rate

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risk exposure. As seen in the 2002 annual report, the net interest margin risk within a twelve month period, given a change in interest rates of 1% is 3.0 MSEK

4.1.4 Duration

FS uses computer models so that the duration can be calculated in real time. However the duration reports are not made so frequently, but it would be possible for the bank to report these at any time necessary. FS has no level that the duration of equity mustn't exceed. However the board inspects the investing decisions so that the risk of FS will not reach an unsatisfactory level. The convexity of the bonds is not regarded when forming the portfolio.

FS has a maximum level of risk that it can take on, and if some position would reach that level the bank goes out of the position. The policy of the bank is that it must invest in relatively secure bonds, so that there will be no possibility that the bonds that the bank has invested in will fall into the junk bond category.

The off balance sheet instruments that FS uses are interest rate swaps and caps. The bank evaluates each investment and decides whether or not to hedge, and how much of the investment to hedge, depending on the policy on interest rate risk exposure of the bank.

Using the data from the annual report of 2002, we conducted a duration analysis for FS in order to measure the bank's equity exposure to interest rate changes. We calculated the duration of assets to 0.57 years, the duration of liabilities to 0.05 years, and the duration of equity to 4.88 years (see appendix). The interest rate risk of equity can be compared to holding a zero coupon bond with the value of 302.845 MSEK and 4.88 years to maturity. We also found out that if there would be a sudden and sustainable rise in interest rates by 1%, the bank would suffer a loss in equity by 14.251 MSEK. This is a loss of equity by 4.7%.

4.2 Nordals Härads Sparbank (NHS)

Nordals Härads Sparbank was founded in 1870 and is located in central Dalsland. The main office is located in Mellerud, and the bank has additional three branches in Åsensbruk, Högsäter and Bäckefors. NHS has 40 employees and at the end of 2002 the bank had total assets of 1,295 MSEK. NHS mainly serves consumers, small and middle-sized companies, communities and community companies. The main competitors to NHS are Handelsbanken and Länsförsäkringar; however NHS has a market dominating position in the region.

Being a small sized bank, NHS has to rely on its cooperation with Föreningsparbanken AB in order to provide a wide range of products. NHS, as many other savings banks, buys the systems and services they can't provide themselves, like ATMs, stocks and funds etc, from Föreningsparbanken AB.

4.2.1 Goals and objectives

According to Magnus Olsson, Head of Administration, NHS is a well capitalized bank, with a solvency of 15.8%. The large amount of equity is due to the fact that NHS hasn't got any owners to distribute the equity to. With every profitable year the equity increases making it hard to calculate any reasonable profitability measures like return on equity. NHS's board of directors therefore imposes other goals and objectives for the bank to pursue. The most important being, profit in monetary terms and not in any percentage measures. It is also important for the bank to have a large market share and retain good relations with the population of the region, by having high service efficiency. Since NHS is a vital element of the region, the bank feels that it is important that the earned profit is kept within the region. NHS sees it therefore more important to earn money from other parts of Sweden than its own region, mainly Stockholm by investing in the stock and bond market.

NHS has to follow many regulations imposed by the authorities and regarding interest rate risk the bank is obliged to report its interest rate exposure quarterly to the Swedish Financial Supervisory Authority by using the maturity gap model with defined periods.

4.2.2 The yield curve

NHS uses the shape of the yield curve frequently to form its portfolio. However for the moment the shape of the yield curve is flat, making it hard to use the advantages of borrowing short-term and investing long-term. Instead NHS has turned to the credit market in order to earn more profit. Being a small bank makes it possible to invest in lower credit rated bonds that bigger banks avoid. By identifying good investment opportunities among junk bonds NHS has managed to earn additional profit. However due to restrictions, the bank can only invest a maximum amount of 35 MSEK in junk bonds.

NHS doesn't feel that there is a need for the bank to speculate about future interest rates, and instead follows market expectations for deciding what strategies to apply.

4.2.3 Asset and Liability Management

Magnus Olsson stressed that NHS has difficulties attracting educated personnel, since being located on the countryside. The educational level of the region is low and the problem of not having access to high educated labour is a problem in the long run. NHS has no Asset and Liability Committee; it is Magnus Olsson and the Vice President who is in charge of the ALM. Together they manage the different risks that the bank is exposed to and these decisions are not communicated to the rest of the staff, only to the board of the bank. Magnus Olsson states that interest rate risk is an important issue for NHS to handle, since many banks have suffered substantial losses due to poor interest rate risk management. NHS has adopted an active interest rate risk management and frequently supervises the interest rate risks. Concerning different models to determine interest rate risk, NHS feels that the maturity gap model doesn't give adequate information, and the model is only used when the bank has to report its interest rate risk exposure to the Swedish Financial Supervisory Authority. To get more precise and accurate values of the risks NHS instead uses the duration model to calculate the interest rate risks.

4.2.4 Duration

NHS doesn't use advanced computerized ALM models for calculation of the duration, since they feel that the costs exceeds the benefits. Although NHS has access to some computerized ALM models, through their cooperation with Föreningsparbanken, these are not compatible with NHS's own computer systems. In order to be able to use the computerized models NHS has to employ someone with ALM expertise, which they feel there is no need for. Instead NHS uses Microsoft Excel to calculate the duration of assets, liabilities and equity. Every second year NHS acquires a complete analysis of their balance sheet concerning the interest rate risk from an outside company.

NHS's policy is that the duration of equity mustn't exceed five years and the bank has never exceeded this limit. For the moment the yield curve is quite flat and therefore NHS has shortened its duration of equity, due to the fact that the trade-off between risk and return is not favourable. Magnus Olsson stated that NHS should not take on risk, by investing in long-term, at this moment due to the shape of the yield curve. Magnus Olsson feels that the downside when using the duration model is that the same discount rate is used, regardless of the bonds' risks. The bank takes no consideration to bond's convexity when forming the portfolio. NHS finds it unnecessary to measure convexity, since they lack the knowledge of it.

NHS doesn't use off balance sheet instruments to hedge their portfolio. Neither does Magnus Olsson believe that the use of off balance sheet instruments will increase during the following years because of the bank's large funds surplus ($\text{Debt} + \text{Equity} - (\text{Loans} + \text{Earning assets})$). Instead the bank will hedge the balance sheet by trading securities with the desired interest rates. For example if NHS wants to shorten the duration of assets they offer shorter loans. Therefore NHS doesn't need to use off balance sheet instruments.

Magnus Olsson feels that NHS has an average interest rate risk exposure compared to other banks. As seen in the 2002 annual report, the net interest margin risk within a twelve month period, given a change in interest rates of 1% is 2.682 MSEK.

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Using the data from the annual report of 2002, we conducted a duration analysis for NHS in order to measure the bank's equity exposure to interest rate changes. We calculated the duration of assets to 0.77 years, the duration of liabilities to 0.05 years, and the duration of equity to 5.30 years (see appendix). The interest rate risk of equity can be compared to holding a zero coupon bond with the value of 179.290 MSEK and 5.30 years to maturity. We also found out that if there would be a sudden and sustainable rise in interest rates by 1%, the bank would suffer a loss in equity by 9.167 MSEK. This is a loss of equity by 5.11%.

4.3 Sparbanken Alingsås (SA)

Alingsås Sparbank was founded in 1832 and is located in Västra Götalands Län. The main office is located in Alingsås and the bank has additional six branches in Floda, Gråbo, Herrljunga, Ljung, Sollebrunn and Vårgårda. In 2002 the bank had 96 employees and had total assets of 3,738 MSEK. SA main competitors are Handelsbanken, Nordea, SEB and Länsförsäkringar and bank has a market share about 40%.

SA cooperates with Föreningssparbanken AB to be able to provide full range of banking products and services.

4.3.1 Goals and objectives

Sparbanken Alingsås has five main goals that it follows and presents to the board every year. Even though the bank doesn't have any shareholders, these goals are the same as in any other company. The goals are net interest income as opposed to personnel costs, provisions as opposed to personnel costs, business volume through number of staff members, the growth of business volume, and the income per number of staff members. All these measures are compared to other savings banks in order to see how well SA is performing. The goal is to be among the better savings banks regarding these measures. There are of course other measures like, return on equity and return on assets, that are measured, but these are not so good measures for SA because of the fact that the solvency is so high, 17.15%. Since the equity grows with profit, the ROE is not a good measure for SA.

SA is obliged to follow the same rules as for other banks in terms of reporting the bank's interest rate exposure to the authorities.

4.3.2 The yield curve

SA doesn't try to take advantage of the yield curve. This is because their strategy is to not earn profits on speculation and instead try to increase profits through their banking business. Of course they invest longer than they borrow, but the liquid assets have been

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invested on average between 1.5 and 2 years. The bank doesn't really care about the shape of the yield and neither do they speculate about future interest rate levels. Instead SA relies on their collaboration with Swedbank and follows their recommendations about what strategy to apply.

4.3.3 Asset and Liability Management

There are two persons in charge of the Asset and Liability Management in SA, Morgan Svensson and Lennart Andreasson. The questions are discussed between these two and they check with the board about the decisions that they come up with. It isn't really a committee, instead it is an informal discussion group, and in the end the bank follows the strategies that have been recommended by Swedbank. The bank has also some frames, that have been decided by the board, which they have to follow, and if some suggestions should fall outside these frames, then the board has to make the final decision whether or not to go through with the suggestions. Mr. Svensson doesn't think that there are any problems with this strategy. However he believes that the bank could increase its profits by not having such restricted investment policy.

The communication between the asset and liability group and other staff members works in a way that the advisers in the bank has the authorization to decide about loans with the maturity of up to five years. Then it is up to Mr. Svensson to decide whether or not to hedge this position. The policy of the bank is that five years maturity is the maximum maturity of the loans.

SA doesn't use any advanced computer applications to manage the asset and liabilities. The application that they use is Excel.

To calculate the interest rate risk exposure, SA uses the gap model, and through their cooperation with Swedbank they also get the duration of their asset and liabilities. But the bank itself mainly uses the gap model. The gaps on loans and deposits are calculated monthly and reported to the board every six months. But Mr. Svensson calculates them monthly to make sure the bank is in control of its loans and deposits. Mr. Svensson feels that the disadvantage of using this model is that it focuses only on the loans and deposits,

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and not on the entire balance sheet. The bank has a limit of 20 MSEK that they can have on interest rate risk exposure on the whole balance sheet. I.e. if interest rates change by one percent the bank mustn't have an interest rate risk exposure that will result in a decline of over 20 MSEK. Currently this exposure is 5 MSEK. As seen in the 2002 annual report, the net interest margin risk within a twelve month period, given a change in interest rates of 1% is 1.942 MSEK.

Mr. Svensson believes that the interest rate risk level in SA is low and that they actively manage the interest rate risk by using interest rate swaps. SA doesn't think about the convexity of the bonds when they invest.

SA makes a liquidity analysis each year where they compare the liquidity of the bank at the end of the year with that at the beginning of the year. In that analysis the bank also makes a prediction of how the liquidity will change over the year. SA has never had problems with run offs, where the customers pay back their loans earlier than expected, and if some customers does that there won't be any problems for the bank.

Mr. Svensson doesn't think that SA has reached the optimum trade-off between risk and return, for SA to make as much profits as possible. However since the policy of the bank is to not speculate to make larger profits, it's hard to reach this level.

The only off balance sheet derivative that SA uses to hedge the interest rate risk is interest rate swaps. The reason for this is simply that SA has used interest rate swaps for many years, and they feel that it's an instrument that they can handle and manage in a satisfactory way.

SA has regulations about a maximum amount that they can invest in a single company; however these investments must be relatively safe investments. SA doesn't invest in junk bonds in order to achieve higher returns.

SA doesn't have problems with attracting competent staff, due to the closeness to Gothenburg.

4.3.4 Duration

Using the data from the annual report of 2002, we conducted a duration analysis for SA in order to measure the bank's equity exposure to interest rate changes. We calculated the duration of assets to 0.31 years, the duration of liabilities to 0.05 years, and the duration of equity to 1.52 years (see appendix). The interest rate risk of equity can be compared to holding a zero coupon bond with the value of 664.136 MSEK and 1.52 years to maturity. We also found out that if there would be a sudden and sustainable rise in interest rates by 1%, the bank would suffer a loss in equity by 9.729 MSEK. This is a loss of equity by 1.5%.

4.4 Tidaholms Sparbank (TS)

Tidaholms Sparbank was founded in 1902 and the bank is located in the city of Tidaholm and has also a small branch in Brandstorp. TS have 25 employees and at the end of 2002 the bank had total assets of 979 MSEK. TS serves about 13 000 customers and almost 85 % of the inhabitants of Tidaholm have accounts in the bank but about 60-65% have their inflow of money namely their salary in to accounts in TS. TS holds about 50 % share of the corporate market. There are however several competitors to the bank, namely Nordea, Handelsbanken and Länsförsäkringar that act in the same market.

Like other savings banks, TS is dependent of Föreningsparbanken AB to be able to provide full range of banking products and services.

4.4.1 Goals and objectives

TS believe that its role in the community is more than just being a bank which is shared by its customers. They participate in the development of the community and often sponsor different cultural and sporting events which probably wouldn't be possible in the same extent if they would have been a corporation with shareholders. They believe that the close relationship will ultimately pay off in the future.

TS view the customers as their main stakeholders and strive to increase customer value. Although the bank tries to offer its customers the best prices, being able to give high quality service and be available when needed is equally important for the bank to compete with. But to be able to do this, TS has to have sound finances and generate profit, and in order to do this on today's market, they have to maintain a steady growth rate which requires TS to be well-capitalized. This ultimately leads to a trade-off between offered customer value and maintaining profitability. For example two years ago TS decided to increase the interest rate given on deposits which led to a decline in earnings power by 25%. TS felt that this move would be necessary in order to keep market share. Although the bank doesn't need to show profit as their competitors listed on the stock market do, the bank must be just as efficient as their competitors anyway to be able to stay in business.

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TS use ROE as the main measuring tool to determine how profitable the bank has been compared to other savings banks. Parallel to this, the bank uses different market surveys to observe how the customers perceive the bank. This is important and gives the bank an indication whether they will retain or lose customers in the future and thus deciding what strategies to pursue.

As for other banks, TS has to follow the regulations imposed the Swedish Financial Supervisory Authority and to report their interest rate exposure quarterly by using the maturity gap model with defined periods.

4.4.2 The yield curve

Even if TS hasn't got a pronounced strategy regarding the management of the yield curve, they still take it to consideration and invest the surplus of their net deposits long-term in order to gain higher returns. Furthermore TS feels that they currently don't want to invest in bonds maturing in more than 2-3 years because the current risks exceed the premium.

TS doesn't speculate about future interest rates themselves but every month they conduct a phone meeting with Swedbank Markets⁵ chief analysis where the bank receives data and analysis regarding Swedbank Markets' expectations about future interest rates.

4.4.3 Asset and Liability Management

In TS there are two persons in charge of the Asset and Liability Management, namely the MD and the financial manager. Together they form a small committee where they make decisions about the different issues concerning the Asset and Liability Management of TS.

The decisions made by the CEO and the financial manager are not communicated to the rest of the staff.

⁵ Swedbank Markets is FöreningsSparbankens investment bank and is responsible for the banks Investment and Merchant Banking operations as well as for financial institutions.

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TS don't have any computer applications to measure and manage interest rate risk and Mr. Jacobsson feels that bank should have that. Instead TS manually supervise their assets and liabilities piece for piece. The board of the bank has decided that the bank can take on some interest rate risk. Assets are monitored and for example if the interest rate risk of a 2-year bond is greater than the one imposed by the board of the bank, TS hedges that position. Liabilities are also hedged but not fully giving the bank the opportunity to still earn some money on the interest rate risk. Although lacking the computer applications, TS feels that that they manage their interest rate risk in a satisfactory way by hedging it. Interest rate swaps are the only instrument used for hedging.

The only time that TS measures the interest rate risk for the entire bank is when the bank reports it to the Swedish Financial Supervisory Authority.

Mr. Blennow feels that there is a possibility to increase the risks in order to earn more money but that the banks restrictive risk policy prohibits. Neither do they have the time or the knowledge to manage the increased risks. The current net interest margin exposure during the next twelve months is 0.074 MSEK. Mr. Blennow thinks that they should and probably will continue with the same strategies and concentrate on traditionally banking.

4.4.4 Duration

Using the data from the annual report of 2002, we conducted a duration analysis for TS in order to measure the bank's equity exposure to interest rate changes. We calculated the duration of assets to 0.61 years, the duration of liabilities to 0.06 years, and the duration of equity to 3.60 years (see appendix). The interest rate risk of equity can be compared to holding a zero coupon bond with the value of 151.556 MSEK and 3.60 years to maturity. We also found out that if there would be a sudden and sustainable rise in interest rates by 1%, the bank would suffer a loss in equity by 5.269 MSEK. This is a loss of equity by 3.5%.

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4.5 Duration for the four savings banks

The following table illustrates the duration figures that we have calculated for the four savings banks, by using the annual reports of 2002.

	Duration of Assets	Duration of Liabilities	Duration of Equity	Equity Exposure
Falkenbergs Sparbank	0.57	0.05	4.88	-14 251 TSEK (4.7% of total equity)
Nordals Härads Sparbank	0.77	0.05	5.30	-9 167 TSEK (5.11% of total equity)
Sparbanken Alingsås	0.31	0.05	1.52	-9 729 TSEK (1.5% of total equity)
Tidaholms Sparbank	0.61	0.06	3.60	-5 269 TSEK (3.5% of total equity)

Table 3: Duration figures for the four savings banks. Source: Own work.

5 Analysis

In this chapter we will relate the theoretical frame of reference and our problem discussion to our empirical findings in order to create a linkage between the purpose and inquiry questions. We will also discuss own thoughts and standpoints.

Ever since the deregulation of the financial market during the 1980s, savings banks have experienced increased competition. The financial crisis resulted in a decrease in the number of savings banks by 17.5 %. Moreover the increased competition forced some of the savings banks to form Sparbanken Sverige AB, and finally Föreningssparbanken was founded in 1997. We believe that the competition for the savings banks that are now independent has increased since then, and will probably continue to do so. To be able to survive in this competitive environment, the savings banks have to form and maintain strategies that have helped them to be successful so far.

5.1 Goals and objectives

As Forsell (1992) (see Bergendahl & Lindblom 2003) states, all of the four banks in our study stressed the importance of being a strong local force and contributing to the development of their communities, and therefore they perceive themselves as being more than just a bank. Another common consensus is that they believe that funding and participating in local events enhance the customers' perception of the banks, and ultimately will pay off in the future. It is also important that the funds earned, is reinvested and benefits their own communities. The main reason why any savings bank can afford to act as a mainstay in the society is the fact that they don't have any shareholders, and therefore do not need to focus on maximizing shareholders' value. Their competitors, acting nation-wide, can not possibly actively take part of every community they have branches in. This is used as an argument by savings banks when they market themselves as the ones who care about their communities. We believe that this argument helps the savings banks to dominant their local market. However this is not the only reason for being market dominant. All of the four savings banks believe firmly on maximizing customer value in order to sustain and increase their market shares.

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Furthermore, having no shareholders to consider and to distribute earnings to, is a comparative advantage in a sense that it makes it possible for the savings banks to pursue long-term strategies and goals, which may not always be profitable in the short run. Since all the profits are added to the equity, all the savings banks have large share of equity. Therefore they can afford to offer high customer value like better lending and depositing terms etc. This is proven by the fact that all of the savings banks in our study have high market shares. However if the savings banks would no longer offer higher customer value than their competitors, for example in an effort to increase their earnings power, they would probably be worse off and lose their market shares rapidly. Although having a good reputation in their communities, all customers are price sensitive and managers of savings banks cannot strictly rely on good reputation.

The downside of not having any shareholders is, as stated by Bergendahl & Lindblom (2003), that there are no one to turn to when there is a need to raise additional capital. Therefore savings bank must be well-capitalized in order to sustain sound financial state in all business cycles. In today's highly competitive market, being well-capitalized is a necessity in order to maintain and increase market share. Furthermore, acting locally on a small market like the savings banks in our study, conveys higher risks and makes it virtuously imperative to not decrease the branches' earnings power, since the only source of income comes from only a few branches. However their competitors, like the commercial banks, operate nation-wide and are therefore not so dependent on a few branches. These banks could probably afford to have some unprofitable branches and still generate profits elsewhere. This is not possible for the savings banks in our study, since they don't have so many branches that could support less profitable ones.

5.2 The yield curve

Thanks to the cooperation with Föreningsparbanken, all the four savings banks continuously receive forecasts about expected future interest rate levels. However, in an effort to get more accurate forecasts, Falkenberg's Sparbank also make their own analysis. This is not done by the other three savings banks, which are more dependent on the information received from Föreningsparbanken. Knowing the future interest rate levels

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is important for the banks when forming their future strategies. We believe that interest rates constitute the most vital element in banking, and not keeping an eye on future interest rate movements is like driving with your eyes closed. Therefore receiving these forecasts from Föreningsparbanken is of great value for the savings banks, since not all the banks have the resources to conduct their own forecasts. Currently Sweden is experiencing stable interest rates, which reduces the need for interest rate forecasts. However, in a time with highly volatile interest rates, accurate forecasts will be crucial for the banks.

Bessis (2002) states that banks tend to lend long and borrow short in order to take advantage of the yield curve. Usually the banks in our study apply this strategy, however since the yield curve currently is relatively flat, the savings banks feel that the trade-off between risk and return is unfavourable. Because of this reason they have shortened their positions and are avoiding investing in long-term bonds.

Banks, like any other companies are exposed to different risks, however Bessis (2002) resembles banks as “risk machines” in the sense that they take risks, transform them and embed them in banking products and services. Obviously, being able to manage risks is of great importance for banks, since risks are their main source of income. Risk management appears even more important when considering that Galai et al (1999) states that recent financial failures in the banking sector has brought on the need for more reliable risk measures. For example according to Duan et al (1995) (see Hasan & Sarkar 2002) many have argued that the most important factor behind the U.S. savings and loans crisis was banks’ exposure to interest rate risk.

5.3 Asset and Liability Management

For bank managers it is not enough to only use standard accounting schedules when identifying and managing risks that the bank is exposed to. There is a need for additional tools and efforts to assess the risks, and according to the theory it is the responsibility of the Asset and Liability Committee to manage the different risks. None of the savings banks have any formal Asset and Liability Committee, like it is described in the theory;

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however all of the savings banks of course have staff members that are in charge of these issues. These findings are in conflict with the theory where Funk (1996) states that as many people as possible should be involved in ALM issues. The savings banks in our study lack the resources to be able to have employees with specialized skills, who can be in charge of these vital questions. Even a relatively large savings bank as Sparbanken Alingsås, with 96 employees, had only two employees in charge of ALM issues. However one must bear in mind that, in all of the savings banks, the board of directors appoint guidelines and simultaneously evaluates the decisions made, regarding ALM issues. Furthermore as stated by Van Son & Hassan (1997), small banks lack the flexibility of large institutions in managing interest rate risk. Neither can the monitoring of interest rate risk in smaller institutions without sophisticated tools of ALM be ignored. Our findings basically confirm these statements. Only one savings bank, namely Falkenberg's Sparbank, possessed sophisticated ALM tools that could be used at any time. Nordals Härads Sparbank only use Microsoft Excel and feels that there is no need for buying sophisticated ALM tools. Sparbanken Alingsås and Tidaholms Sparbank also use Microsoft Excel to some extent when calculating interest rate risk. All savings banks are however obliged to report their interest rate risk four times a year to the Swedish Financial Supervisory Authority and therefore they are all aware of their interest rate risk to some extent. Although having sophisticated ALM tools is desirable, we believe that it is not always necessary to invest in expensive ALM tools. Besides being a costly investment, one need competent staff members that have the knowledge and skills that are required, to gain from the advantages that such tools convey. The need for sophisticated ALM tools is dependent on to which extent and magnitude interest rate risk is measured.

5.4 Measuring interest rate risk

All of the savings banks of course use the gap model, since the reports to the Swedish Financial Supervisory Authority are based on this model. However there are different opinions regarding which model to use when calculating the interest rate risk among the four savings banks. While Sparbanken Alingsås and Tidaholms Sparbank don't use the duration model, this is the model of choice for Nordals Härads Sparbank when

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calculating their interest rate risk. Falkenbergs Sparbank on the other hand, felt that since the bank's current investment portfolio has short-term maturities, the gap model is satisfactory when calculating their interest rate risk. Our findings are supported by Van Son & Hassan (1997) who states that small banks rely more on the gap model than larger banks. We believe that this is due to the fact that the gap model is simpler to use and that the savings banks are obliged to use the gap model when reporting interest rate risk. Neither do the savings banks have as complex balance sheets as a large commercial bank. A large commercial bank probably uses more sophisticated models to measure interest rate risk than even the duration model. The duration model is on the other hand, as stated by Saunders (2000), a more complete measurement for interest rate risk than the gap model. However, since the duration model is a more complex method, it requires both more time and effort. When using the duration model, there is a trade-off between the input data and the accuracy of the results. One can calculate the duration by using very short-term maturity periods to obtain completely accurate duration figures. However the question is if it is worth the effort, and we believe that in the case of the savings banks in our study, there is no need for such thorough duration measurements.

As mentioned earlier Nordals Härads Sparbank is currently the only savings bank in our study that actively uses the duration model. The reason for this is that the bank feels that the gap model is too simple and the information obtained from the gap model is not sufficient. Even though the theory presents many flaws with the duration model, the savings banks in our study did not take these into consideration. We believe that the shortcomings of the duration model described in the theory are more applicable when studying larger banks, than the ones in our study. Large banks are involved in much more and bigger transactions and must therefore take these shortcomings into consideration when calculating duration. The consequences of not taking these into consideration would affect them significantly.

The convexity of bonds was something that all of the savings banks in our study were unfamiliar with. Therefore they do not take it into consideration when calculating duration. Convexity is only relevant during large interest rate changes and since Sweden has experienced stable interest rates, we believe that it hasn't been necessary for

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managers of savings banks to take it into consideration. As stated by Saunders (2000) the phenomena of convexity conveys the possibility to construct a portfolio containing assets with larger convexity than the liabilities. This is something that the savings banks can take advantage of in the future if interest rates become more volatile.

5.5 Hedging

All of the four savings banks in our study have an active hedging policy; however all of them have adopted different hedging strategies. Sparbanken Alingsås and Tidaholms Sparbank hedge their positions with interest rate swaps in order to reduce their interest rate risk. Falkenbergs Sparbank has a more unrestricted hedging strategy where they do not hedge their positions entirely. They accept more interest rate risk in order to obtain higher returns. Finally Nordals Härads Sparbank does not use any hedging tools. They rely more on matching the assets and the liabilities in order to obtain an optimum level between risk and return.

Interest rate swaps are the most common hedging tool used by the savings banks, because of their simplicity. The savings banks using interest rate swaps emphasized the fact that interest rate swaps can be customized to fit their needs. They also stated that interest rate swaps was the hedging tool that they had been using for a long time and they saw no need for replacing it. We think it's interesting that none of the savings banks are using such hedging tools like forwards and futures since these are common tools, frequently mentioned in the theory. Furthermore only one bank uses caps for hedging purposes. However since all of the savings banks seem to be satisfied with only using interest rate swaps, why change something that works.

5.6 Risk policies

Finally, our findings show that there are great differences between the savings banks in our study regarding interest rate risk policies. We have not found any relations between size and level of risk taking among the savings banks that can explain the level of risk taking as suggested by Van Son & Hassan (1997). The size of the savings banks and the level of risk taking are not correlated as one can believe. The biggest and the smallest

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savings bank, Sparbanken Alingsås and Tidaholms Sparbank regarding total assets, have the same risk averse policy. Falkenbergs Sparbank and Nordals Härads Sparbank were less risk averse. We believe that the reason for the great differences between the savings banks is that at least some savings banks lack the resources and knowledge to manage higher risks in order to earn higher returns. Therefore they adopt a more cautious strategy to manage interest rate risk and are not willing to take on more risk. Furthermore, since we found that acting locally on a small market conveys more risks for savings banks, they try to balance the amount of risk taking by reducing interest rate risk. Therefore they try to focus on traditional banking activities and not on speculations that convey additional risks. Moreover some savings banks are aware of the fact that they haven't obtained an optimum trade-off between risk and return; however they are still satisfied with the current situation. An example of the cautious strategies applied by the savings banks is the current situation with the flat yield curve. None of the savings banks can take advantage of the usually beneficial yield curve and only one savings bank, namely Nordals Härads Sparbank, has overcome this unfavourable situation by shifting their positions towards the credit market instead and taken on more credit risk. The other savings banks have restrictions that prohibit them from this riskier strategy. In our opinion, taking on more credit risk due to the current shape of the yield curve, in spite of the greater risk, is an advantageous strategy as long as it is kept on a reasonable level. The other savings banks could probably also make use of this strategy in order to earn higher returns.

When we calculated the interest rate risk for the four savings banks in our study by using the duration model⁶, we found out that the savings banks' statements regarding their interest rate risk policies corresponded with our results. Sparbanken Alingsås and Tidaholms Sparbank both had low interest rate risk, while Falkenbergs Sparbank and Nordals Härads Sparbank had higher interest rate risk. This is further illustrated when comparing the duration figures for the savings banks with the data in figure 4. Falkenbergs Sparbank and Nordals Härads Sparbank have among the highest duration of

⁶ See table 3.

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equity figures; Tidaholms Sparbank is placed in the middle while Sparbanken Alingsås is placed among the savings banks with the lowest duration of equity.

The managers of savings banks could sometimes be more creative and bold and take on some more risk in order to earn higher returns. We found during our study that some savings banks had great potential of earning higher returns on short-term funds if they would increase their risk taking, by investing them differently.

6 Conclusions

In this chapter we will present our conclusions and answer our inquiry questions. Then follows the section, suggestions for further research, and the chapter will end with our own reflections.

Our inquiry questions are as followed:

- What are the reasons for savings banks having lower interest rate risk than commercial banks in Sweden?
- In what ways is the management of interest rate risk affected by the fact that savings banks have no shareholders?
- What tools for managing interest rate risk are applied by savings banks and what makes them most suitable?
- What are the trade-offs between benefits and costs for actively managing interest rate risk for savings banks?

We found that the level of risk taking in savings banks varies between the different savings banks in our study. The reason for savings banks having low interest rate risk is that they lack the resources and knowledge for managing higher interest rate risk efficiently. Moreover, the level of interest rate risk taking is affected by the fact that the savings banks act in a more limited and riskier markets, and have to balance the level of risk taking within the bank. Furthermore, there is an embedded philosophy within the savings banks stating that the level of risk taking must be low and profits should be earned on traditional banking activities, and not on speculations.

Having no shareholder makes it possible for the savings banks to pursue long-term strategies and they do not need to take on more risks in order to earn higher returns. Neither are they exposed to the same pressure as commercial banks are towards the demands from their shareholders. Instead they focus on earning money on traditional banking activities and not on speculations. At the same time, being a small savings bank

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with no shareholders, is hazardous in the sense that they have no owners to turn to in need and therefore they cannot afford big mistakes. By increasing the risk level, savings banks expose themselves to greater failure probability. Taking these factors into consideration explains why in some cases savings banks have chosen a more risk averse policies regarding interest rate risk.

All the tools available for managing interest rate risk can be applied by savings banks. However there are great differences between savings banks regarding knowledge, resources and needs which have resulted in different utilization levels. The most common model for measuring interest rate risk is the gap model. Since being the model imposed by the authorities for reporting interest rate risk, all savings banks have good knowledge about using this model. The duration model was sparsely used among the savings banks. However Nordals Härads Sparbank considers it to be a much more complete model and therefore applied it recurrently. Furthermore, all of the savings banks have active hedging policies which are exercised to different degrees. Three of the savings banks used off-balance sheet instruments, namely interest rate swaps, for managing their interest rate risk. Interest rate swaps are according to the savings banks the most suitable hedging instrument that matches their needs. Since Nordals Härads Sparbank doesn't use off-balance sheet instruments, they try to match their assets and liabilities in order to achieve the desired interest rate risk level.

The trade-offs between costs and benefits for actively managing interest rate risk is vivid when examining savings banks. Only one bank had expensive and sophisticated ALM tools for assessing interest rate risk. The other banks used Microsoft Excel for measuring and managing interest rate risk. Neither do the savings banks in our study have any ALCOs or employees, whose only task is to monitor and manage interest rate risk. Instead, monitoring and managing interest rate risk is one of many tasks for the staff members in charge of it. We believe that the savings banks don't need sophisticated computer applications or formal ALCOs for the management of their interest rate risks. There is simply no need, since the savings banks do not have complex balance sheets and large number of transactions. Furthermore, those savings banks that have low interest rate

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risks due to restrictive risk policies probably do not have the same needs as banks with higher risk levels that must be managed frequently.

Conclusively, it doesn't seem to be a uniform policy regarding interest rate risk management among the savings banks. Every savings bank in our study has chosen its own path, and pursues goals and strategies that they believe suit them best. Furthermore there is a consensus among the savings banks that they should stick with "tradition", meaning that they follow the strategies that according to them have been successful so far.

6.1 Suggestions for further research

It would be interesting to conduct a study of the most risk averse savings banks in Sweden, in order to examine how an increase in risk taking can benefit the bank in higher returns. In other words, what is the optimal trade-off between risk and return for these banks? Furthermore, what will the trade-offs between costs and benefits be, when increasing the risk level within these savings banks.

Another interesting issue would be to examine if it is possible to construct an investing portfolio with higher convexity for assets than liabilities. How much would the banks then benefit from such a portfolio in times with volatile interest rates?

6.2 Own reflections

Our impressions when writing this thesis were that the savings banks participating in our study were accommodating and helpful. Furthermore they showed great interest in our thesis and looked forward to take part of our results.

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Interview subjects

Balldin, Bengt. Treasury Manager, Falkenbergs Sparbank.

Blennow, Jan. Operating Manager and future CEO, Tidaholms Sparbank.

Jacobsson, Kjell. Financial Manager, Tidaholms Sparbank.

Olsson, Magnus. Head of Administration, Nordals Härads Sparbank.

Svensson, Morgan. Credit Manager, Sparbanken Alingsås.

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Nordals Härads Sparbank annual report 2002

Sparbanken Alingsås annual report 2002

Tidaholms Sparbank annual report 2002

Appendix

Interview questions

I. Information about the bank

- 1) Can you present yourself and what your position is within the bank?
- 2) How would you describe the bank, regarding resources, equity, and the balance sheet?
- 3) Since the bank doesn't have any shareholders, what are the goals of the bank?
- 4) What profitability measures are used?
- 5) What are the requirements from the authorities that the bank has to follow, regarding interest rate risks reports?

II. The yield curve

- 1) Does the bank try to take advantage of the yield curve, by borrowing short-term and investing long-term?
- 2) Does the bank speculate about the shape of the yield curve and how it will change in the future?
- 3) Does the bank speculate about the interest rate levels?
- 4) If yes, who is in charge of these activities?
- 5) If no, how does the bank decide what strategies to follow in the future?

III. Asset and Liability Management (ALM)

- 1) Does the bank have an asset and liability committee?
- 2) If yes, how many staff members are in the committee, who are they, and what degree of education do they have?
- 3) How does communication between the different members in the asset and liability committee work? Is it satisfactory? Any room for improvement?

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- 4) How does the communication between the asset and liability committee and other departments of the bank work? Is it satisfactory? Any room for improvement?
- 5) If no, who is in charge of the Asset and Liability Management?
- 6) Does the bank use any computer applications to control the Asset and Liability Management? Have you encountered any problems or flaws when using the computer applications?

IV. Interest rate risk

- 1) How does the bank calculate the interest rate risk, which models are used and to which extent?
- 2) What are the advantages and disadvantages in the models used, in your opinion?
- 3) Do you consider your interest rate risk being low or high? Have you made any comparison?
- 4) Do you believe that you actively manage interest rate risk?
- 5) Do you consider any changes in strategies regarding your interest rate risk?

V. Interest rate GAP

- 1) What GAP intervals are used besides those imposed by the Swedish Financial Supervisory Authority (Finansinspektionen)?
- 2) What is the shape of the GAPS, are they negative or positive, and why?

VI. Duration

- 1) Which duration models are used and why?
- 2) How often is the duration measured, daily, weekly, yearly etc?
- 3) Which levels of duration does the bank try to achieve, regarding duration of assets, duration of liabilities and duration of equity?
- 4) Does the bank try to adjust the duration of assets, duration of liabilities, and duration of equity?

Appendix

- 5) Does the bank measure convexity?
- 6) Convexity is advantageous for assets and disadvantageous for liabilities; does the bank actively invest in assets with larger convexity, to take advantage of this?

VII. Problem of runoffs

- 1) Does the bank consider it a problem if the loans are paid back sooner than contracted?
- 2) How would this affect the bank and the duration?

VIII. Hedging

- 1) What is the optimal risk and return levels, trade-offs?
- 2) Does the bank have an active hedging policy?
- 3) Does the bank hedge with off balance sheet instruments?
- 4) If no, what are the reasons for not hedging? For how long do you think will this be sustainable?

That concluded our interview. Thank you for your time!

Is it alright if we call you in case we need to ask you some further questions?

Appendix

Duration analysis for Falkenberg's Sparbank

Assets (TSEK)

Maturity:	0-1 months	1-3 months	3-6 months	6-12 months	1-3 years	3-5 years	> 5 years	No interest	Total
Maturity used in years:	0,04	0,17	0,38	0,75	2,00	4,00	7,50	0	
Tot. Amount:	1 716 153	199 344	94 473	115 632	320 316	166 093	13 745	222 254	2 848 010
Interest rate:	3,66%	3,64%	3,61%	3,60%	3,79%	4,14%	4,58%		
Time weighted value:	71 399,36	33 026,77	34 959,98	84 456,91	594 668,58	564 817,03	73 701,90		1 457 031
Present value:	1 713 584,55	198 160,63	93 226,62	112 609,22	297 334,29	141 204,26	9 826,92		2 565 946
Duration of assets:	0,57								

Liabilities (TSEK)

Maturity:	0-1 months	1-3 months	3-6 months	6-12 months	1-3 years	3-5 years	No interest	Total
Maturity used in years:	0,04	0,17	0,38	0,75	2,00	4,00	7,50	0,00
Tot. Amount:	2 375 238	2 151	29 800	476	2 799	4 948	0	129 753
Interest rate:	3,66%	3,64%	3,61%	3,60%	3,79%	4,14%		
Time weighted value:	98 820,13	356,37	11 027,57	347,67	5 196,36	16 826,20	0,00	132 574
Present value:	2 371 683,14	2 138,23	29 406,85	463,56	2 598,18	4 206,55	0,00	2 410 497
Duration of liabilities:	0,05							

Equity (TSEK)

Total equity:	302 845
Total assets:	2 848 010
Total liabilities:	2 545 165
Duration of equity:	4,88
Equity exposure	-14 251

Interest rates 2003-01-02			
Treasury bills		Government bond	
1 month	3,66%	3 years	3,79%
3 month	3,64%	5 years	4,14%
6 month	3,61%	10 years	4,58%
12 month	3,60%		

Appendix

Duration analysis for Nordals Härads Sparbank

Assets (TSEK)

Maturity:	0-1 months	1-3 months	3-6 months	6-12 months	1-3 years	3-5 years	No interest	Total
Maturity used in years:	0,04	0,17	0,38	0,75	2,00	4,00	0	
Tot. Amount:	658 508	67 925	89 661	47 974	255 128	97 984	77 604	1 294 784,00
Interest rate:	3,66%	3,64%	3,61%	3,60%	3,79%	4,14%		
Time weighted value:	27 396,77	11 253,63	33 179,29	35 039,92	473 646,67	333 205,08		913 721,36
Present value:	657 522,45	67 521,78	88 478,10	46 719,89	236 823,33	83 301,27		1 180 366,83

Duration of assets: 0,77

Liabilities (TSEK)

Maturity:	0-1 months	1-3 months	3-6 months	6-12 months	1-3 years	3-5 years	No interest	Total
Maturity used in years:	0,04	0,17	0,38	0,75	2,00	4,00	0,00	
Tot. Amount:	1 067 090	554	1 267	457	1 523	511	44 092	1 115 494
Interest rate:	3,66%	3,64%	3,61%	3,60%	3,79%	4,14%		
Time weighted value:	44 395,54	91,79	468,86	333,79	2 827,46	1 737,71		49 855,14
Present value:	1 065 492,96	550,71	1 250,28	445,05	1 413,73	434,43		1 069 587,16

Duration of liabilities: 0,05

Equity (TSEK)

Total equity:	179 290
Total assets:	1 294 784
Total liabilities:	1 115 494

Duration of equity: 5,30
 Equity exposure -9 167

Interest rates 2003-01-02			
Treasury bills		Government bond	
1 month	3,66%	3 years	3,79%
3 month	3,64%	5 years	4,14%
6 month	3,61%	10 years	4,58%
12 month	3,60%		

Appendix

Duration analysis for Sparbanken Alingsås

Assets (TSEK)

Maturity:	0-1 months	1-3 months	3-6 months	6-12 months	1-3 years	3-5 years	No interest	Total
Maturity used in years:	0,04	0,17	0,38	0,75	2,00	4,00	0	
Tot. Amount:	2 447 423	555 137	48 083	82 345	380 646	36 038	188 217	3 737 889
Interest rate:	3,66%	3,64%	3,61%	3,60%	3,79%	4,14%		
Time weighted value:	101 823,34	91 973,59	17 793,24	60 144,29	706 671,59	122 551,08		1 100 957
Present value:	2 443 760,10	551 841,54	47 448,64	80 192,39	353 335,79	30 637,77		3 507 216

Duration of assets: 0,31

Liabilities (TSEK)

Maturity:	0-1 months	1-3 months	3-6 months	6-12 months	1-3 years	3-5 years	No interest	Total
Maturity used in years:	0,04	0,17	0,38	0,75	2,00	4,00	0,00	
Tot. Amount:	2 958 630	16 654	3 187	8 108	14 908	0	72 266	3 073 753
Interest rate:	3,66%	3,64%	3,61%	3,60%	3,79%	4,14%		
Time weighted value:	123 091,75	2 759,19	1 179,36	5 922,03	27 676,79	0,00		160 629
Present value:	2 954 202,01	16 555,14	3 144,95	7 896,05	13 838,40	0,00		2 995 637

Duration of liabilities: 0,05

Equity (TSEK)

Total equity:	664 136
Total assets:	3 737 889
Total liabilities:	3 073 753

Duration of equity: 1,52

Equity exposure -9 729

Interest rates 2003-01-02			
Treasury bills		Government bond	
1 month	3,66%	3 years	3,79%
3 month	3,64%	5 years	4,14%
6 month	3,61%	10 years	4,58%
12 month	3,60%		

Appendix

Duration analysis for Tidaholms Sparbank

Assets (TSEK)

Maturity:	0-1 months	1-3 months	3-6 months	6-12 months	1-3 years	3-5 years	> 5 years	No interest	Total
Maturity used in years:	0,04	0,17	0,38	0,75	2,00	4,00	7,50	0	
Tot. Amount:	633 249	29 159	21 032	32 011	149 378	37 763	13 760	62 240	978 592
Interest rate:	3,66%	3,64%	3,61%	3,60%	3,79%	4,14%	4,58%		
Time weighted value:	26 345,89	4 830,98	7 782,95	23 380,64	277 321,15	128 417,12	73 782,33		541 861
Present value:	632 301,26	28 985,90	20 754,53	31 174,19	138 660,58	32 104,28	9 837,64		893 818

Duration of assets: **0,61**

Liabilities (TSEK)

Maturity:	0-1 months	1-3 months	3-6 months	6-12 months	1-3 years	3-5 years	No interest	Total
Maturity used in years:	0,04	0,17	0,38	0,75	2,00	4,00	7,50	0,00
Tot. Amount:	809 555	650	5 168	2 034	4 888	144	0	827 036
Interest rate:	3,66%	3,64%	3,61%	3,60%	3,79%	4,14%		
Time weighted value:	33 680,97	107,69	1 912,43	1 485,62	9 074,60	489,69		46 751
Present value:	808 343,39	646,14	5 099,82	1 980,83	4 537,30	122,42		820 730

Duration of liabilities: **0,06**

Equity (TSEK)

Total equity:	151 556
Total assets:	978 592
Total liabilities:	827 036

Duration of equity: **3,60**
Equity exposure: **-5 269**

Interest rates 2003-01-02			
Treasury bills		Government bond	
1 month	3,66%	3 years	3,79%
3 month	3,64%	5 years	4,14%
6 month	3,61%	10 years	4,58%
12 month	3,60%		