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Comparing the risk/return -profile of index-linked bonds and their reference indices from a private investor's point of view

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Abstract:
Index-linked bonds are capital guaranteed structured investment products, which are tailor-made to meet the investor's needs and risk tolerance. The structure of an index-linked bond is complex; it consists of a zero-coupon bond and an equity option tied to a reference index. The return of an index-linked bond is determined by the development of the reference index, participation coefficient, averaging and valuation days, which all are defined and specified in the loan terms of the index-linked bond. Due to the complex structure of an index-linked bond the evaluation of risks and performance indicators is challenging as well as understanding the actual formation of the return.

The purpose of this Bachelor Thesis is to investigate the risk/return profile of index-linked bonds and compare it to the underlying reference indices. The sample in the empirical part consists of six index-linked bonds, four issued by Nordea and two by OP-Pohjola. These bonds are processed and evaluated case by case on a yearly basis, from a private investor's point of view. The variables the author has computed are return, volatility and Sharpe ratio, all of which are presented on an annual level. The raw data for the empirical part of the Bachelor thesis has been gathered from Nordea Markets, Bloomberg Professional and AdEconomics. In order to be able to evaluate and observe the performance of both, index-linked bonds and reference indices and especially analyze the numerical data, the author has utilized quantitative research methods.

Depending on the market conditions, during an upbeat the indices clearly outperformed the index-linked bonds and vice versa.

Keywords:	Index-linked bond, capital guarantee, reference index, volatility, Sharpe ratio
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Tiivistelmä:
Indeksilainat ovat pääomaturvattuja strukturoituja sijoitustuotteita, jotka ovat räätälöity vastaamaan yksityisen sijoittajan tarpeita ja riskinsietokykyä. Suosio etenkin piensijoittajien keskuudessa on ollut nousujohteinen viimevuosikymmenellä. Indeksilainojen rakenne on tyypillisesti hyvin monimutkainen; ne koostuvat nolla-kuponki lainasta ja optio-osasta joka on sidottu tiettyyn viiteindeksiin. Tuotto näille sijoitustuotteille määräytyy viiteindeksin kehityksen, tuottokertoimen, keskiarvostuksen ja arvostuspäivien perusteella, jotka kaikki ovat erikseen määritelty indeksilainojen lainaehdoissa. Indeksilainojen monimutkaisen rakenteen vuoksi lainan riskin ja tunnuslukujen määrittäminen sekä arviointi on hankalaa. Etenkin tuoton määritys ja sen muodostumisen perinpohjainen ymmärtäminen voi olla yksityissijoittajalle haastavaa.
Tämän opinnäytetyön tarkoituksena on tutkia indeksilainojen riski/tuotto –profiilia ja verrata sitä viiteindeksin tuottoon ja riskiin samalla aikavälillä. Opinnäytetyön empiirisessä osiossa on käsitelty otantaa, joka muodostuu kuudesta eri indeksi-lainasta, joista neljä on Nordean ja kaksi OP-Pohjolan liikkeeseen laskemaa. Kirjoittaja käsittelee ja analysoi indeksilainoja vuotuisella tasolla tapauskohtaisesti. Riskien arvioimista varten kirjoittaja on laskenut volatiliteetin ja Sharpen luvun sekä viiteindekseille että indeksilainoille; lisäksi molemmille tuotteille on määritetty tuottoprosentti. Kaikki tunnusluvut on esitetty annualisoituina lukuina. Opinnäytetyön empiirisen osion aineisto on kerätty Nordea Marketsilta, Bloomberg Professionalista ja AdEconomicsilta. Tutkimusmenetelmänä opinnäytetyön tekemiseen on käytetty määrällistä tutkimusta tiedon numeerisen luonteen vuoksi.
Tutkimustulosten perusteella on selvää, että markkinoiden nousususuhdanteessa indeksit tuottavat paremmin kuin niihin sidotut lainat, kun taas laskusuhdanteen vallitessa indeksilaina säilyttää arvonsa sijoittajalle suotuisammin.

Avainsanat:	Indeksilaina, pääomaturva, viiteindeksi, volatiliteetti, Sharpin luku
Sivumäärä:	
Kieli:	Englanti
Hyväksymispäivämäärä:	

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1 INTRODUCTION

The comprehensive variety of different investment products is growing all the time. Funds, stocks, bonds, ETFs, accounts, deposits, derivatives and certificates of deposit are only a short list of the possible alternatives. In the current era of low interest rates, investors are seeking investment products that have the potential to generate higher returns than standard deposits without taking considerably higher risks. The recent fluctuations at the stock market as well as the "need of safety" among investors are reasons behind the popularity of index-linked bonds as the issuers almost always promise a capital guarantee to the investment. (Heiskanen 2006)

A structured investment product is a concept covering several investment products. Index-linked bond is the most typical structured product in the current markets. (Ålandsbanken 2012a) An index-linked bond is a type of investment, which is figuratively speaking tailor made to meet the investor´s needs and risk tolerance. The bonds are composited in such a way that by investing in them, the investor attains a share in a particular market or index development. (FIM 2012) An infinitude of structured investments can be created through different combinations of components to meet an investor's goals, horizons, risk–return profile, or directional viewpoint on a market or sector. (Pizzani 2009) Typical features of index-linked bonds that distinguish them from the other structured investments include: capital guarantee, comprehensive diversification, cost-efficiency, a non-linear yield profile and varying underlying asset types. (FIM 2012)

The markets of structured investment products are very interesting, since the possibilities of constructing different kinds of products are extensive. (Järvinen & Parviainen 2011, 20) The potential performance of each index-linked bond is tied to a so-called underlying, such as commodity (oil, gold et cetera), interest rates, currency, real estate, funds, currencies, domestic or foreign index, inflation, one single stock or a basket of stocks or even combinations of these; the only requirement is that the instrument must be traded in some part of the world. (Pizzani 2009; FIM 2012) In addition, specific investment strategies, such as market-neutral long–short strategies, can be seen as underlying. (Pizzani 2009) Thus, the list of structured products is practically infinite (Struc-

tured Investments 2012), as the products can be also altered based on inter alia maturity, level of risk and the reference market of the underlying commodity of the product. (Järvinen & Parviainen 2011, 20)

The market environment of structured products, especially index-linked bonds, has lived strongly in this millennium. Supply has diversified, knowledge and needs of investors has developed, regulation has intensified and the actual construction of structured products has become more complex. (Järvinen & Parviainen 2011, 18) Particularly index-linked bonds have become an important element for both, private individuals as well as institutional investors and their investment portfolios. (Suomen Strukturoitujen Sijoitustuotteiden yhdistys ry 2012a) Different kinds of themes control the markets of structured investment products. In the past years the vastest themes have been the emerging markets, crude materials and the change of the climate. (Järvinen & Parviainen 2011, 21)

The possible profit an investor can gain is based on the composition of capital guaranteed index-linked bonds. (Handelsbanken 2012) Hence, the risk and the possibility of return are linked together. (Sijoitukset: Edes pääomaturva ei ole pomminvarma 2009) Index-linked bonds offer the investors interesting return profiles (Suomen Strukturoitujen Sijoitustuotteiden yhdistys ry 2012a), as capital guarantee makes investments in the high-risk instruments possible with considerably lower risk of losing the nominal amount invested. In other words, the purpose of the capital guarantee is to ensure that the investor does not lose the initial investment. (FIM 2012) The concept of capital guarantee is sure to please the Finnish investor; according to a barometer conducted by Osuuspankki (2008) the Finnish investors appreciate the most (after the reliability of banks) close to zero risk of investment products and their overall safety. However, even with the capital guarantee, an investment is never totally risk-free.

Finnish structured investment products' Association (SSS Association) published the first half (H1) of 2012 sales volumes of structured investment products in Finland. The total sales volume was approximately 1,453 billion Euros, and a total of 256 structured investment products were issued. The figures in the table (Table 1) below do not include the structured investment products with a maturity of less than 12 months. The total

sales volume increased by approximately 5, 5 percent compared to the previous year's first half. Especially interest and currency as underlying has increased the popularity, whereas commodities, other underlying and equity have decreased significantly. (Suomen Strukturoitujen Sijoitustuotteiden yhdistys 2012b)

Table 1 Structured investment products' sales volume development in Finland (Suomen Strukturoitujen Sijoitustuotteiden yhdistys 2012b)

Sales volume	2012 H1 (Billion€)	2011 H1 (Billion€)	2010 H1 (Billion€)	2009 H1 (Billion€)	Growth (%)
Total sales volume	1453,2	1377,7	1140,6	905,7	5,50 %
Equity	624,6	708,4	839,1	635,5	-11,80 %
Interest	406,8	225,8	137,1	99,0	80,20 %
Credit risk	364,4	287,9	98,4	95,2	26,60 %
Commodity	14,6	111,1	29,7	7,4	-86,90 %
Currency	37,1	18,7	6,8	1,3	98,40 %
Other	5,7	25,8	29,4	67,3	-77,90 %

1.1 Research questions and objectives

The popularity of capital guaranteed structured investment products, especially index-linked bonds has been constantly rising in the past decades both in Finland and world-wide. (Sijoitukset: Edes pääomaturva ei ole pomminvarma 2009) The author conducted this research due to a personal interest towards investing and a desire to better understand the complex concept of the index-linked bonds. In addition, the equivocal media visibility, critique towards structured investment products and relatively high prices of capital guarantee provided inspiration for further research.

The first idea of a research question was solely to compare the risks and returns of the index-linked bonds and straight investments to the same underlying. However, due to the abnormal market conditions and the global financial crisis in 2008-2009 the accuracy and validity of the results of such a research would have been poor. Thus, the author decided to take an annual approach and compare the overall performance of the index-linked bonds and the specific reference index in question on a yearly basis from issuance to maturity. The aim of the research is to investigate the differences of risks and

returns on index-linked bonds and straight investments to the same underlying index. In other words, the main research problem is to find out in which kind of market conditions do index-linked bonds outperform straight investments to the same underlying index and vice versa. As there is no comprehensive research available related to this topic, one of the objectives of this thesis is also to provide investors information and understanding among the complex world of structured investment products and the formation of return when it comes to index-linked bonds.

1.2 Motivation of the research question

In practice, the yield of an index-linked bond rarely outperforms the returns of corresponding stock index, since the one investing in index-linked bond seldom or never can fully benefit from the increases in the market. Even if the underlying of an index-linked bond deteriorates only provisionally, it often reduces the yield considerably due to the averaging. Also additional limits and restrictions reduce the returns of index-linked bonds. (Heiskanen 2006) However, due to the financial crisis in 2008-2009 and global economic recession several investors benefited significantly from the capital guarantee that the index-linked bonds provided, as the markets figuratively speaking plunged heavily. Figure 1 below demonstrates the dive of OMX Helsinki 25 index, which began in summer 2008 and ended in spring 2009.

Figure 1 OMX Helsinki 25 7/2008-1/2013 (Kauppalehti 2013)

Even though the popularity of index-linked bonds among both, issuers and investors is constantly growing, there is not abundantly of research among this particular area. Index-linked bonds as a concept are relatively familiar to the investors, though understanding its actual structure; pricing, formation of the return and other principles can be surprisingly hard, let alone the comparison of these products. Thus, this Bachelor Thesis can be seen as a comprehensive guide to these investment products, especially index-linked bonds. During the conduction of the Thesis, no similar study comparing the annual returns and risks product to the reference index and their risks and returns was found.

1.3 The scope and limitations

Structured investment product is a concept, covering several different types of investment instruments. In the theoretical and the empirical part, the main focus is on the index-linked bonds.

Nordea and OP-Pohjola issued the index-linked bonds that are analyzed in the empirical part of the Bachelor Thesis, as these issuers were the only ones providing sufficient information of already matured index-linked bonds. The index-linked bonds were issued in 2006-2007 and matured 2011-2012. The author selected seven bonds, from this time frame, that differed from each other and were tied to different indices as extensively as possible.

This research is done from a private investor´s point of view, not from institutional perspective. As a structured investment product can be capital guaranteed, partially guaranteed or a product with a very high risk (RVM Yhtiöt Oy 2011); this study is limited only to the fully capital guaranteed products. Since data and time are available in limited quantities, the aim of the study is not to make a generalizing research of the Finnish index-linked bond market. An investor`s decision to invest depends on the investment strategy and the risk tolerance. As the aim of the study is to compare the returns of index-linked bonds and straight investments to same underlying index, different investing strategies are not taken into consideration. In addition, this research is not an investment advice.

1.4 Structure of the study

The theoretical part of this research first introduces the reader to bonds and options, the building blocks of index-linked bonds, and then the main features of this specific investment product, such as capital guarantee, participation coefficient and averaging. In addition, the author introduces the most common ways of measuring the risks and different performance indicators.

The empirical part of the Bachelor Thesis consists of seven "cases", which each are based on an index-linked bond. In each case, the return per annum of the index-linked bond is compared to the performance of the reference index and a government bond issued by the Bank of Finland. The actual comparison of the risks returns is located in the discussion -section.

2 METHODOLOGY

The validity of the study refers to how well the measurement method used in this study measures the features of the phenomenon that was intended for measuring. (Tilastokeskus 2012b) The material utilized in this study is principally from banks' own websites and brochures, as well as special literature for this particular field, thus the authenticity and validity is high. For determining the performance indicators of reference indices the author has utilized Bloomberg Professional and Nordea Markets provided the price history of the index-linked bonds. Furthermore, as a considerable amount of the information is in numerical form, the author's personal view has not had an impact on the material. On the other hand however, recording the material has required a relative amount of manual work, which exposes to possible mistakes. The data for the empirical part has been checked through several times in order to observe the possible mistakes. All the data and material is available to everyone (except Bloomberg Professional). Hence, the results are available for control and re-calculations.

2.1 Research Methods

In the empirical part of the Degree Thesis, the author has used the quantitative research

methods. This research method is suitable for analyzing quantitative data, especially wide range of numerical material, and it produces a clear picture of the profits to be analyzed. (Tilastokeskus, n.d; Heikkilä 2005, 16) The qualitative point of view was utilized when analyzing the risks of the index-linked bonds. In nature, the research is a deductive comparison study where existing theory of the returns and risks is in a sense tested by the means of the empirical data. The objective of this research is to evaluate the differences in index-linked bond's and reference index's risk/return profile depending on the market conditions.

The conclusions of the study are made within the theoretical framework, to prevent the author's own perceptions and views affecting the results of the research. Still, due to the complex and unique construction of index-linked bonds, the results cannot be generalized.

2.2 Data acquisition

The author utilizes several sources of information to conduct the theoretical part of the Thesis. Majority of the data is available on the Internet, such as articles and journals related to the topic. In addition several books, mainly concerning investing in general as well as guides for specific investment products and capital guarantee, are used. The main source of inspiration and information is a book called *Pääomaturvattu sijoittaminen*, written by Sami Järvinen and Antti Parviainen.

Due to a lack of research and the constant development in this particular field, it was surprisingly hard to find relevant, up to date printed material. The author utilized several libraries in Helsinki area, as well as the library of the University of Lappeenranta. Thus, the emphasis of data is on articles published in different domestic and foreign economical articles. As well as online brochures provided by the issuers of capital guaranteed index-linked bonds.

The data for the empirical part of the Bachelor Thesis has been attained from the issuers of the index-linked bonds, Nordea and OP-Pohjola. The loan terms and the information about returns were provided on the webpages of the issuers. The data for the volatility

of the reference indices were acquired from Bloomberg Professional and the author computed the Sharpe ratio based on the information acquired. As a risk-free rate the author utilized government benchmark bonds issued by the Bank of Finland. (Bank of Finland n.d.)

Nordea Markets provided the author with prices of the index-linked bonds for 2006-2011 issued by Nordea and the author computed an annualized volatility for each bond. OP-Pohjola Markets was not willing to provide similar information, thus the author contacted AdEconomics and Atso Andersin, who was willing to send a report of the performance of index-linked bonds issued in Finland. (AdEconomics 2008) This report represented only the years 2008 and 2010, thus the volatility and Sharpe ratio for bonds Euro-osinko II/2006 and Japani I/2006 has been computed based on those two years only.

3   AN OVERVIEW ON BONDS AND OPTIONS

The main purpose of this section is to familiarize the reader with the bonds and options, the construction blocks of the index-linked bonds, focusing on the features that are important from a private investor's point of view.

3.1 Bonds

A bond is a certificate issued by a debtor promising to repay the borrowed money to the lender, the owner of the certificate, at fixed times. The amount borrowed is called the principal, par value or face value of the security. (La Grandville 2001, 2) The secondary marketable debt securities that have a maturity, the time span until reimbursement, less than a year are known as money market instruments, while the debt securities with maturity over a year are called (long-term) bonds. The issuers of these securities are government, companies, banks and other public institutions, such as municipalities. (Nikkinen, Rothovius & Sahlström 2002, 93)

Money market instruments are used mainly for short-term liquidity control. They are divided based on the issuers into bank's certificates of deposits (CDs), commercial pa-

pers, treasury bills and municipal papers. (Nikkinen, Rothovius & Sahlström 2002, 99) The yield of a money market instrument consists of the difference between the nominal value and the purchase price, when the security is held until the expiration day. Therefore, no interest is paid, thus these instruments are discount securities. Usually trading with the money market instruments involve considerable amounts of money, thus the private investors invest in them through mutual funds. (Nikkinen, Rothovius & Sahlström 2002, 100)

The bonds in turn are not discount securities, and they are classified in obligations, debentures, corporate bonds and capital loans. (Nikkinen, Rothovius & Sahlström 2002, 106) When the interest rates move up, a bond's price goes down and vice versa. (La Grandville 2001, 25) A coupon refers to a cash flow to be received at regular intervals, yearly, twice a year or on a quarterly basis, by the lender. If no coupons are paid, the bond is called a zero-coupon bond. (La Grandville 2001, 2)

The Figure 2 below demonstrates the issued bonds in Finland during the past decade. Especially issuance among the government and financial institutions has been increasing each year, excluding the financial crisis of 2007-2008.
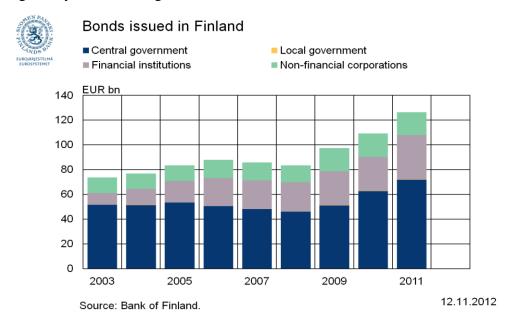

Figure 2 Bonds issued in Finland 2003-2011 (Bank of Finland 2012)

3.2 Options

Options are traded both on the exchanges and in the over-the-counter (OTC) market. (Hull 2009, 7) An option gives the owner a right to buy (call-option) or sell (put-option) the underlying asset of the option at a predetermined price, strike price. Thus, an option is a right that the owner is entitled to leave unused, in other words it is not an obligation. (Nikkinen, Rothovius & Sahlström 2002, 179; Arvopaperi, n.d.) This is what distinguishes the options from forwards and futures, where the holder is obliged to buy or sell the underlying asset. (Hull 2009, 8) The owner can utilize the right of the option either on the expiration date or during the time to maturity, depending on the type of an option; European or American option. (Nikkinen, Rothovius & Sahlström 2002, 180)

The Figure 3 demonstrates the profit profile for a purchased call option. This illustrates the fact that the maximum loss to the investor when buying these instruments is the original premium paid. (Nikkinen, Rothovius & Sahlström 2002, 181) In other words, the owner of an option can lose only the price paid for the option at the date of acquisition. Opportunity to gain a yield in a regular call option is unlimited. (Järvinen & Parviainen 2011, 59)

The price or the premium of the option in the figure is 0,50 monetary units and the strike price is 6,00 monetary units. Thus, it does not bring any profit to the investor until the value of the option exceeds 6,50 monetary units.
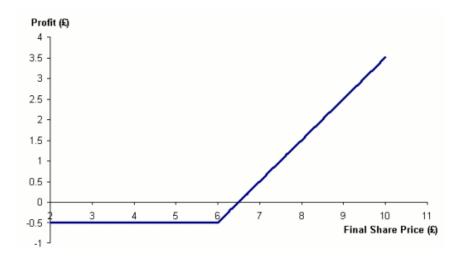

Figure 3 Return profile of a call-option (Dickson 2000)

When should the owner of the call option utilize the right? The holder of a call option should use the right when the underlying security's market price is greater than the strike price. In other words, increase in the underlying market value is benefit to the buyer whereas decrease signifies loss (Niskanen & Niskanen 2007, 240–243.)

The equity option of an index-linked bond can be constructed in many different ways. The simplest way is to buy plain-vanilla call options (also known as European option) with a long maturity at the beginning of the loan period. However, this can be expensive to the investor due to the long running time, as it tends to increase the value of options. (Tolle et al. 2010, chapter 2) Thus, only a smaller portion of the option can be purchased and the participation rate of the loan, which represents the share that the investor receives incase the development of the underlying is favorable, remains low. (Niskanen & Niskanen 2007, 240-243)

4 INDEX-LINKED BONDS

Structured investment product is a term used for a number of investment products, but in most cases it is referring to index-linked bonds, which are the most common structured investment products. (Ålandsbanken 2012a; Suomen Strukturoitujen Sijoitustuotteiden yhdistys ry, n.d.) Other structured products are for instance certificates, collateralized debt obligations and auto call investments. (Evli Pankki Oyj 2010; Järvinen & Parviainen 2011, 96-97) The return of an index-linked bond is determined based on the development of the index. (Nikkinen, Rothovius & Sahlström 2002, 111) Index-linked bonds can provide a better risk-adjusted return than an investment directly in the particular underlying asset. (Ålandsbanken 2012a)

Depending on the investment product, investment horizon can fluctuate from one to nine years, with exceptions. (Finanssimaailma Oy, n.d.) Investors buy index-linked bonds in order to meet their needs, such as hedging stock or currency positions, which are not readily available in single financial instruments. (Carey 2007) Index-linked bonds help the investor to capture all kinds of global investment opportunities and thus gain higher potential returns. In addition, these investment products help to implement

global allocation, diversify investment risks and optimize the investment portfolio. (HSBC Bank 2012) These investments enable the investor to easily access and invest in such items, which would be difficult, inefficient or expensive with direct investments. (Evli Pankki Oyj, n.d.)

The table below (Table 2) is demonstrating the market shares of ten biggest Finnish structured product sellers last year. (Strukturoitujen Sijoitustuotteiden yhdistys 2012b) OP-Pohjola (Pohjola) and above all Nordea are in perceptible lead compared to the eight other companies. The market share of Nordea (33%) and Pohjola (17%) together is exactly 50 percent.

Table 2 The market shares of ten biggest structured investment product sellers in Finland (Suomen Strukturoitujen Sijoitustuotteiden yhdistys 2012b)

Corporation	Market Share (%)
Nordea	33
Pohjola	17
Sampo	9
SEB	6
Finlandia Group	6
Evli	5
Front Capital	4
Ålandsbanken	3
Kuntarahoitus	3
Handelsbanken	3

The principles of index-linked bonds are roughly similar regardless of the country. However, slight differences can be found, and the most significant difference compared to Finnish index-linked bonds is the issuers. In Finland, banks and other financial institutions sell and issue index-linked bonds. While in other countries index-linked bonds are mainly issued by the government. (Hansen 2004, 128)

Index-linked bonds could be described as a roll-in product to the investment world; when an investor gets used to the idea of possible future returns, greed can be difficult

to keep under control. Next, different funds and eventually direct equity investments may start to sound interesting. (Muukkonen 2011) Besides, structured investment products provide investors an access to several new markets, such as exotic equity, credit, commodity and currency markets. Some commodities, such as energy, metals and agrarian goods are simply out of private investor´s reach without structured products. (Suomen Strukturoitujen Sijoitustuotteiden yhdistys ry 2012; Järvinen & Parviainen 2011, 44) Traditional investment products give the possibility to enter the new markets usually with one or even two years delay time. (Järvinen & Parviainen 2011, 45)

The yield of an index-linked bond is a real yield, which means that it has no built-in compensation for expected inflation (Hansen 2004) Index-linked bonds usually loses in the amount of return when they are compared to a stock fund especially during upbeats, but they do defeat the returns of bond funds. Vice versa, during economic downturns bonds issued by governments usually beat index-linked bonds while stocks lose. (Muukkonen 2011)

4.1 Construction of an index-linked bond

According to Finnish Structured Products Association index-linked bonds are defined as investments made in bonds or deposits, which consists of two different components: a fixed income part with lower risk and a higher risk component of derivatives. This particular combination enables the achievement of attractive yield profiles. (Suomen Strukturoitujen Sijoitustuotteiden yhdistys ry, n.d.)

The return of these investments is either partially or fully based on the performance of a particular underlying asset(s). (OP-Pohjola 2012) Index-linked bonds are designed to provide investors with targeted investments tied to their specific risk profiles, return requirements and market expectations. (Credit Suisse, n.d.) Each structured investment is built to achieve a particular objective, such as attempting to capture an index's upward or downward movement. (Pizzani 2009) Each index-linked bond is also a unique investment product; even the loan terms of same issuer differ from each other. The differences can be in the determination of yields, the underlying instrument, issuing price or the repayment of the capital among other things. (Finanssivalvonta 2010a) In addition to

capital guarantee, another central trait of index-linked bonds is the participation coefficient. (Sampo Pankki, n.d.)

The Figure 4 below is demonstrating the composition of a traditional index-linked bond. The initial investment is divided into two parts, a zero-coupon bond (85%) and equity option (15%). (Pizzani 2009) The proportions of the marked price vary depending on the index-linked bond. (FIM 2012) Banks, banking companies and other issuers ensure with the zero-coupon bond that the investors get back the nominal amount at the maturity date by investing the zero-coupon bond so that the capital grows to 100% (nominal amount of the investment) at the maturity date. (Ålandsbanken 2012b) The derivative part in turn is the one providing possible compensation for the investment in index-linked bond. (FIM 2012) It is usually invested in shares in order to gain possible return. (Ålandsbanken 2012b)
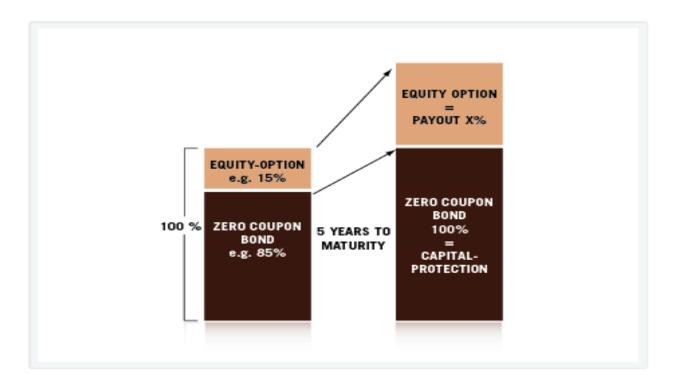

Figure 4 The structure of an index-linked bond with 5-years maturity (without risk premium) (FIM 2012)

As an example, if the yield of an index-linked bond is determined by the development of a stock index, only a portion of the capital invested, or the loan funds collected from

the investor, is actually invested in the stock index. The majority of the capital will be invested as close to risk-free as possible, such as investments in interest and bond funds. (Sijoitukset: Edes pääomaturva ei ole pomminvarma 2009) The author will introduce this comprehensively in the chapter 4.3.

Index-linked bonds are usually issued in two different versions, a conservative and offensive one. By investing in an offensive option the investor will pay a premium, in other words over the par value, which is not capital guaranteed. (Ålandsbanken 2012b) The premium is invested as a larger equity option in underlying commodities and that enables the investor to have the possibility of higher returns. On the other hand, the investment is in greater risk, as the premium is not capital guaranteed; only the nominal value is paid back to the investor at maturity. (Ålandsbanken 2012b)

Figure 5 The construction process of a structured investment product between the operators (Järvinen & Parviainen 2011, 113)

Figure 5 illustrates the process of construction of index-linked bonds and other structured investment products. The issuer sells the investment product to the investor who pays it at the moment of issuance. At the same time, the issuer utilizes a part of the money to acquire a protective put, a hedge against a temporary dip in the stock's value, from the counterparty. (Järvinen & Parviainen 2011, 113; The Options Industry Council, n.d) Thus, the issuer has given money to the counterparty and gets in exchange an option contract. According to the option contract the counterparty is committed to cer-

tain conditions (which are the same to the investor) to pay the issuer the amount in the option contract after a certain period of time. (Järvinen & Parviainen 2011, 113)

4.2 Capital guarantee

The significance of capital guaranteed investment products have risen quite sharply among Finnish investors during the past decade. (Järvinen & Parviainen 2011, 13) Both, the number of banks and institutions offering these investment products and the volume in euros have increased vastly. In addition, the selection of capital guaranteed products on the whole has diversified. (Järvinen & Parviainen 2011, 13)

Investing in capital guaranteed or protected investment products can be described as an investing philosophy or style, whose primary objective is the protection of the investment; gaining a profit is only subsidiary. In other words, the aim of capital protection is to ensure that investors do not lose their initial investment. (Järvinen & Parviainen 2011, 35) However, in practice, at maturity despite capital guarantee the investor will always lose a share chewed away by inflation. (Muukkonen 2011) According to the newest official issue, inflation rate in Finland was 1, 7% in February. (Tilastokeskus 2012a)

As previously demonstrated, capital guaranteed index-linked bonds consists of two different components: a zero coupon bond and an equity option. The zero coupon bond, a certificate of deposit that does not pay interest when expired, is the guarantee that the investor receives at least the invested nominal amount on the maturity date, regardless of the development of the underlying commodity. (Vaihekoski 2005; Ålandsbanken 2012a) Therefore, the loan rate is less than its nominal value, i.e. the interest rate consists of the difference between present value and the nominal value. (Vaihekoski 2005)

The equity option in turn may be linked to underlying components of many different kinds, such as the development of the stock market, exchange rates, interest rates or commodities. If the development of the equity option is favorable, the investor gains profit. (FIM 2012) However, the requirement for the protection of the nominal value is that considerable amount of the invested capital is invested in risk-free items, which

provide the investor only a meager return. (Sijoitukset: Edes pääomaturva ei ole pomminvarma 2009)

Due to the structure of the capital protected products, the principle for the investment is "buy and hold". Firstly because the valuation of the investment during the maturity is very complex, secondly because banks have added all costs and charges into the price of the product and lastly because the secondary market might be limited. (Structured Investments 2012; Järvinen & Parviainen 2011, 14) Above all, the protection feature is only valid on the maturity date. (Järvinen & Parviainen 2011, 14) Therefore, the investor should be prepared to hold the investment for a fixed amount of time, which typically is five years. In theory the investment can be sold during the investment period, but usually with a loss, as the investment is valued at that specific market value. (Sijoitukset: Edes pääomaturva ei ole pomminvarma 2009)

4.3 Price determination of a zero-coupon bond and capital guarantee

The pricing and risk assessment of index-linked bonds and other capital guaranteed structured products is based on interest mathematics and the option theory. (Järvinen & Parviainen 2011, 52) Determination of the price of a zero-coupon bond, which enables the issuer to provide a capital guarantee in the first place, can be computed by the formula for calculating compound interest. (Järvinen & Parviainen 2011, 55) To be able to find out the price (P) of the zero-coupon bond, which also represents the price of capital guarantee, (Alvarez 2012; Järvinen & Parviainen 2011, 51) the formula is

$P=N/(1+r)^{t}$

In order to apply the formula, let us compute the price of capital guarantee, if the interest *(r)* is 2,35 percent per annum and maturity *(t)* is 4,5 years. Nominal value *(N)* is 100. Thus the price *(P)* would be

$P= 100/1,0235^{4,5}$

$=90,075$

This figure (90,075) represents the price of the capital guarantee, in other words the price for a repayment of principal at maturity; it is approximately 90 percent of the

nominal value. Converting this to Euros, assuming that the nominal investing amount is 8 000€, it includes a capital guarantee costing 7 200€ to the investor. (Järvinen & Parviainen 2011, 53) In theory, this implies that the writer of the structured investment product utilizes only ten percent of the initial investment to obtain an equity option and wraps it up with the capital guarantee to one single index-linked bond.

However, also the subscription fee for the loan organizer is subtracted from the ten percent left. Assuming that the subscription fee is two percent, only eight percent is utilized to obtain the equity option. By using the same figures as in previous example: If the initial investment is 8 000 €, zero-coupon bond costs 7 200 €, subscription fee is thus 160 € and the 640 € left (out of 8 000€) is used for acquiring the equity option. (Pohjola Pankki 2012) The fee for the organizer can also be implemented as sales of premium, an amount paid over the par value, which is not capital guaranteed, or as a combination of premium and subscription fee. (Järvinen & Parviainen 2011, 54)

The final sum of 640 € used in the example for acquiring the equity option is only 8% of the initial amount invested. However, a leverage effect is related to derivatives, which in practice means that the value of an equity option increases proportionally more than the underlying stock index value. (Nordea 2013b) On the other hand, the participation coefficient of index-linked bonds evens out the return to the investor. (Järvinen & Parviainen 2011, 128)

The above is a description of the construction of a simplified traditional, fully capital guaranteed index-linked bond. It is noteworthy, that market conditions have a decisive impact on the price of the zero-coupon bond, and thus also on how much the loan writer has money to purchase the equity option. (Järvinen & Parviainen 2011, 55)

Parviainen and Järvinen (2011) draws conclusions from the formula for computing the price of zero-coupon bond; the longer the maturity of loan and the higher the general level of interest rates, the lower is the price of capital guarantee, and the more money is left to the option component. (Järvinen & Parviainen 2011, 55) This is natural, since an investor pays a lower price to compensate the higher price i.e. interest rate related to the repayment of the loan. (Järvinen & Parviainen 2011, 52) On the other hand, the lower the interest rates are and the higher volatility is, the lower is the possible return to the

investor. (Lampinen 2009) However, the construction of a traditional index-linked bond is the most challenging in markets where the interests are low and volatility is high. Thus, the best participation coefficients are obtained in the markets with high interest rates and lower volatility. (Järvinen & Parviainen 2011, 51)

4.4 Price determination of an equity option

Traditional index-linked bond provides the investor with a return of nominal amount, but also an indexed yield calculated by a certain return rate; assuming that the reference index of the loan will increase by the due date. This so-called return share can be made through a tailored call option. (Järvinen & Parviainen 2011, 54) Out of the two components in index-linked bond, pricing the option, the yield potential providing part, is substantially more complex than pricing of a zero-coupon bond. (Järvinen & Parviainen 2011, 58)

Pricing of a European option consists of intrinsic value and time value. The intrinsic value is equal to the difference in the market value of the underlying asset and the strike price. (Hull 2009, 201-202) Time value of an option is based on the thought that on some probability, the option will have value in the future; and the higher this probability is; the higher is the time value of an option. (Hull 2009, 203) Determination of the time value depends primarily on the relation between the price of the underlying asset and strike price. (Järvinen & Parviainen 2011, 60) In addition, factors such as the remaining term to maturity, expected volatility in the price of the underlying asset, risk-free rate and future dividends affect the time value. (Hull 2009, 203-204; Järvinen & Parviainen 2011, 60) The longer the duration, the greater is the time value of the option. (Järvinen & Parviainen 2011, 61) Both, call- and put options are referred to out-of-the-money, at-the-money and in-the-money options. These concepts relate to the relation between purchase prices and strike price of an underlying asset. (Järvinen & Parviainen 2011, 61)

In 1973, Fischer Black and Myron Scholes found a theoretically acceptable solution to option pricing model, which suits for pricing a simple call option of a stock with payout ratio of zero and which can only be exercised at its maturity (T). The formula enables pricing, modeling and risk management of several different option types and underly-

ing. The final insight was that in the perfect market (where the trading, buying and selling is constantly possible) options have to be priced risk neutrally. (Järvinen & Parviainen 2011, 61-62) In practice, the deficiencies of this particular option pricing model are that the returns of underlying do not follow normal distribution and the presumption of continuous trade without costs. Today, information technology, such as Monte Carlo simulation method, is used for the pricing and risk management of options due to complex investment products. (Järvinen & Parviainen 2011, 63)

5 RETURN AND VALUATION OF AN INDEX-LINKED BOND

Return is a broader concept, which refers to all increase in value for the invested assets; being a growth of a tree, increase in the value of a property or for instance dividends. (Järvinen & Parviainen 2011, 80) The return of an index-linked bond differs from common bonds. No coupon is paid to the investor for an index-linked bond, as for bonds usually. In turn, the return to the investor consists of the compensation paid for the favorable performance of the underlying. (Järvinen & Parviainen 2011, 128)

5.1 Return calculations of index-linked bonds

The return of an index-linked bond cannot be determined at the subscription of a loan. Factors affecting the return are the development of underlying during the loan period and the return calculation conditions. (Finanssivalvonta 2010c) The method of calculating the return of index-linked bonds varies among issuers and loan conditions. According to Nordea, the return at the maturity is usually calculated by the following formula:

Participation coefficient x Change in the value of a stock index x Nominal amount,

Where the change in the value of a stock index is the percentage change from the beginning value. *(Final value-Beginning value / Beginning value).* (Nordea 2013c) Beginning value is the official closing value at a specified day after the subscription period. Whereas the final value of an index-linked bond in turn is computed as an average of certain days' closing values from past years. (Nordea 2013c)

The return is not equal to the change in value of the underlying during the loan period. Return to the investor can be zero, if all the requirements in the loan conditions for the payment are not fulfilled despite an increase in the value of the underlying. (Finanssivalvonta 2010c) Figure 6 indicates the distribution of returns of the stock market and index-linked bonds to the investor. The apex of the index-linked bond return distribution is zero, which results from the accumulation of negative outcomes of the investments. Since the investment product is capital guaranteed, the investor gets back the nominal amount.

The positive side of index-linked bonds' return obeys normal distribution but without a doubt on a lower level than the market reference. However, lower returns are more probable in the positive side of the distribution, which means that the distribution is thicker from the middle. This results from averaging, lack of dividend yields and the participation coefficient, which usually is fewer than 100 %. The reason for lower level of returns when comparing index-linked bonds to stock market results also from capital guarantee; an index-linked bond simply cannot reach the market return. (Järvinen & Parviainen 2011, 82-83) In addition, index-linked bonds have a negative tail risk, which results from the credit risk or issuer risk. Thus, the magnitude of this risk is directly proportional to the issuer´s financial solidity and capital adequacy. (Järvinen & Parviainen 2011, 83)
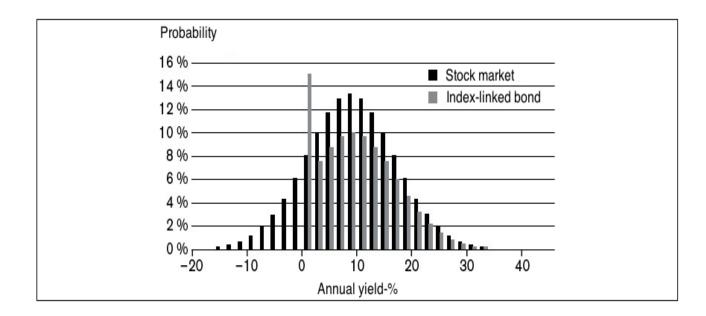
5.2 Participation coefficient

An important element of the index-linked bond is a participation or yield coefficient. It shows what return percentage an investor will receive at the time of redemption of an index-linked bond upon its maturity (in 3–7 years). (Nordea Bank 2012)

The issuer or the writer of the bond computes participation coefficient for the index-linked bond after purchasing the equity option. (Järvinen & Parviainen 2011, 72) Referring to the author's example of the construction of a simplified, fully capital guaranteed index-linked bond (p. 24-26) - there was left 640 € (out of initial 8 000 € invested) for the purchase of an equity option, which is eight percent out of the nominal amount. Let us assume that a particular equity option to an index-linked bond can be purchased from a reliable issuer with a price of 12 percent (proportioned to the nominal amount). Thus, the option can be purchased only by 8/12 percent (as there was only 8 percent left), which is approximately 66,7 percent of the notional amount. The figure is rounded off to the closest even number, in this example to 65 percent. This percentage represents the participation coefficient. (Järvinen & Parviainen 2011, 54)

Let us assume that the participation coefficient is 65%, whereas the linked index grew in price by 50% during the maturity, in which case, at the end of the index-linked bond term (maturity) the investor would be paid 50% x 65% = 32,5% return for the nominal amount invested. (Nordea Bank 2012)

Differences in participation coefficients of index-linked bonds are due to the differences in prices of the equity options, as it is more expensive to invest in for instance to the exotic markets. That in turn results from the typical fluctuations in the underlying commodities' values. The price of the capital guaranteed zero-coupon bond is fixed. (Sampo Pankki 2012) If an investor chooses an index-linked bond without the risk surcharge, a smaller participation coefficient is applied. If an investor chooses index-linked bonds with the risk premium, a greater participation coefficient is applied.

Also the level of volatility impacts the participation coefficient; if volatility is high so is the price of the equity option, which in turn lowers the participation coefficient. (Järvinen & Parviainen 2011, 51) Hence, if volatility is low, the investor receives a bigger part of an equity option with a higher participation coefficient. On the other hand, if volatility is low, so is the probability for high returns as the fluctuations of market are predicted to be only moderate.

5.3 Valuation day and averaging

Development of the underlying, participation coefficient and the method used for computing the final value affect the return of an index-linked bond. (United Bankers Omaisuudenhoito, n.d.) Besides, the timing of valuation days used for the beginning- and final values also impacts the return calculation of an index-linked bond. (Finanssivalvonta 2010c)

A traditional capital guaranteed index-linked bond includes an averaging of the price observations of the underlying at the end of the loan period. (Järvinen & Parviainen 2011, 70) Averaging is preferred for two reasons 1) it lowers the price of equity option, which provides the potential for return and 2) More than one price observation affects the return that the investor possibly receives. However, the writer may face a temptation to lengthen the averaging period in order to lower the price of the option and gain extra profit out of it. (Järvinen & Parviainen 2011, 71)

The impact of averaging depends on how long is the averaging period and whether or not it has started. The longer the averaging period is the smaller is the reaction of whole index-linked bond's value to changes in the underlying´s value. (Järvinen & Parviainen 2011, 49) Besides, the longer the averaging period is the higher is the participation coefficient since the price of equity option decreases. (Järvinen & Parviainen 2011, 51) When reaching the end part of an averaging period the value of index-linked bond does not change considerably even if the market fluctuates heavily. (Järvinen & Parviainen 2011, 50) This phenomenon has both good and bad sides; in marketing materials of in-

dex-linked bonds it is stated that with averaging the investor hedges from the possible last minute drop in markets. On the other hand, it also retains the possibility of greater return from a last minute rapid increase in the markets. (Järvinen & Parviainen 2011, 72)

Table 3 demonstrates how different phenomena affect the value of an index-linked bond. If the value of the reference index increases also the value of the index-linked bond increases. However, due to participation coefficient, averaging and the relation between the beginning value and the end value the increase in value is smaller than the increase of the reference index. (Järvinen & Parviainen 2011, 76) The higher the volatility is, the higher is the probability for high returns as there is a possibility for significant fluctuations of the market. Thus, the value of the index-linked bond increases when volatility increases and vice versa.

As already stated in the introduction, the current level of low interest rates affect positively on the valuation of an index-linked bond and thus increases the value. Hence, an increase in the interest rates means that the overall value of the index-linked bond is affected negatively (Table 3). This situation also refers to interest rate risk; a change in the value due to the interest rate fluctuations. Interest rate risk can be implemented only if the bond is sold before maturity. (Säästöpankki 2012)

Besides, the greater dividends companies pay the lower is the expected development of the prices in relation to the reference market. (Järvinen & Parviainen 2011, 42) As a general rule, the price of a share falls at the same time with the payment of dividends by a tax corrected amount. (Järvinen & Parviainen 2011, 37) Hence, if a lot of dividends are paid for the shares included in the reference index, the value of the index (and index-linked bond) decreases. If the dividend cash flow is descending it affects positively the value of the index-linked bond, as Table 3 indicates.

Table 3 Value of the index-linked bond (Järvinen & Parviainen 2011, 48)

Index basket increases	+
Index basket decreases	-
Volatility of the market increases	+
Volatility of the market decreases	-
Level of interests increases	-
Level of interests decreases	+
Dividend cashflow of the index basket increases	-
Dividend cashflow of the index basket decreases	+

The most important and significant factor in the value formation of an index-linked bond is the changes of the underlying basket. As it is shown in the table above, an increase in the index basket affects the value of the bond positively, and the magnitude of the impact depends on the a) size of the participation coefficient b) the level of the index basket compared to the starting value and c) the method of averaging the observations of an index-linked bond. (Järvinen & Parviainen 2011, 48)

6   RISKS AND EXPECTED RETURNS OF INVESTING

In investing the word risk is related to the possibility of loss, even though the risk also allows the investor to have an opportunity for a greater return. In a nutshell, a risk describes the uncertainty of future returns. (Nordea 2013a) In addition, the word risk indicates that there is a great probability for the realized income to be different to the expected return. The expected return on an investment product depends only on its systematic risk, which is also known as the market risk. (McGraw-Hill 2008) The bigger the deviations and the greater their frequencies are, the bigger is the risk. However, thus also positive fluctuation is considered as a risk. (Järvinen & Parviainen 2011, 80) The most essential risks of investing are interest rate, foreign exchange, re-investment, credit, and inflation risk. (Anderson & Tuhkanen 2004, 36)

6.1 The risks related to capital guaranteed index-linked bonds

Investing is never risk-free. (Evli Pankki Oyj, n.d.) Structured investment products and index-linked bonds have had an equivocal media visibility in the past few years. Not only are they argued to be a great business mainly to the issuers and writers of the products but also the marketing has been questionable. (Finanssivalvonta 2009)

The predecessor of the Financial Supervisory Authority (FSA) conducted an audit related to the marketing materials of index-linked bonds in 2008. After the check-up it became clear that there was varying degrees of deficiencies in almost every marketing material of each index-linked bond. Particular weaknesses were detected in the descriptions of risks. Marketing brochures, advertisements and websites of credit institutions and issuers contained misleading information. (Finanssivalvonta 2009)

Credit risk

In capital guaranteed investment products the risk related to the underlying is similar to the risk of corresponding investment applications in general. (Sijoitukset: Edes pääomaturva ei ole pomminvarma 2009) However, the seller is not responsible for the repayment to the investor at maturity; the issuer is. If the issuer becomes insolvent, the investor may not get back the nominal amount invested. This is known as the issuer risk or credit risk, which is considered to be the most important risk when it comes to capital guarantee and structured investment products. (Taaleritehds, n.d.)

The risk of the issuer to become bankrupted shows in the valuation of the index-linked bond. The weaker the credit rating of the issuer is, the higher is the discount rate for the nominal capital guarantee. (Järvinen & Parvianen 2011, 112) During the investment period, a decline in the issuers' credit rating may reduce the value of the initial investment. On the other hand, an improvement in the issuers' credit rating during the investment period may increase the value of the investment. (Evli Pankki Oyj, n.d.)

In the international markets, arguably the two most influential rating agencies are Standard & Poor´s Corporation (S&P) and Moody´s Investors Service, Inc (Moody´s), which both are based in the United States. (Choudhry 2004, 5) Credit risk, also known

as default risk, appears through the issuer´s bankruptcy and also through the counterparty risk of derivative instruments. (Choudhry 2004, 6) Figure 7 is demonstrating the credit ratings by S&P; AAA is the highest rating, where the probability of bankruptcy (D) is the worst.

	'AAA'	Extremely strong capacity to meet financial commitments. Highest rating
	'AA'	Very strong capacity to meet financial commitments
	'A'	Strong capacity to meet financial commitments, but somewhat susceptible to adverse economic conditions and changes in circumstances
Investment Grade ⬆	'BBB'	Adequate capacity to meet financial commitments, but more subject to adverse economic conditions
	'BBB−'	Considered lowest investment grade by market participants
Speculative Grade ⬇	'BB+'	Considered highest speculative grade by market participants
	'BB'	Less vulnerable in the near-term but faces major ongoing uncertainties to adverse business, financial and economic conditions
	'B'	More vulnerable to adverse business, financial and economic conditions but currently has the capacity to meet financial commitments
	'CCC'	Currently vulnerable and dependent on favorable business, financial and economic conditions to meet financial commitments
	'CC'	Currently highly vulnerable
	'C'	A bankruptcy petition has been filed or similar action taken, but payments of financial commitments are continued
	'D'	Payment default on financial commitments

Ratings from 'AA' to 'CCC' may be modified by the addition of a plus (+) or minus (−) sign to show relative standing within the major rating categories.

Figure 7 Credit rating (Standard & Poor's Corporation, n.d.)

Credit risk is mainly for the investor and counterparty risk for the seller of the index-linked bond. (Järvinen & Parviainen 2011, 112) If the issuer does not go bankrupted during the loan period and the investor keeps the investment until maturity, the investor does not incur any problems or loss due to the fluctuations in issuers' creditworthiness. (Järvinen & Parviainen 2011, 112) However, the situation changes substantially if the investor will need to liquidate the investment before the maturity date. In this case, the potential loss could be significant if the market is currently in a similar turbulence as in the autumn of 2008 for instance. (Järvinen & Parviainen 2011, 113)

Risk on return

Risk on return refers to the situation when the underlying of the investment develops in undesirable way in the terms of the obligation. As the capital guarantee does not cover the possible premium or subscription fee, an investor can lose in addition to the possible return also the premium and subscription fee if the risk on return becomes realized. (Evli Pankki Oyj, n.d.)

Market risk

Market risk could be seen as all the factors that affect the market value of the loan and/or determination of the final yield. (OP-Pohjola, n.d.) The derivatives that are included in structured investment products, such as options, forms a market risk to the organizer. In order to hedge from the risk, typically back-to-back counter trades are made. (Järvinen & Parviainen 2011, 108)

Liquidity risk

If the index-linked bond is very complex or if the market situation is very exceptional, it may be difficult or even impossible to sell the investment product. (OP-Pohjola, n.d.) This risk is referred to liquidity risk, which can be realized if the investor wants to convert the investment into money between the maturity. (Evli Pankki Oyj, n.d.)

Index-linked bonds are eligible to secondary markets as other bonds. (Finanssivalvonta 2010b) The capital guarantee is only valid on maturity date. Consequently, selling the bond on secondary market at current market price may result as either greater or less than the nominal capital invested. (Evli Pankki Oyj, n.d.) Usually the investor suffers a sales loss when selling the bond at the secondary market. (OP-Pohjola, n.d.) Thus, index-linked bonds include a secondary market risk. (Sampo Pankki 2012)

Interest rate risk in turn consists of the impact the development of interest rate level has on investments' value over the maturity. (Evli Pankki Oyj, n.d.) The value of the index-linked bond changes when the market rate of interest rates. (Sampo Pankki 2012) When the level of interest rates increases, the value of the index-linked bond decreases, hence when the interest rate level declines, the value of the index-linked bond increases. (Säästöpankki, n.d.) However, interest rate risk can become realized, only if the index-linked bond is sold at the secondary market before the maturity. (Sampo Pankki 2012)

The risk related to the structure of an index-linked bond

The risk related to the structure covers also the risk related to the return and the terms and conditions for the calculations of them. The complexity of the terms and conditions of index-linked bonds leads to the situation where it is almost impossible for a private investor to compare the bonds with each other or with completely different investment products. Hence, it is important that the investor understands the determination of return in order to avoid misunderstandings. (OP-Pohjola, n.d.)

The risk/return –profile of an index-linked bond differs significantly from the profile of a straight investment to the same underlying. In straight investments, the value changes in relation to the change in value of the underlying. However, when it comes to index-linked bonds, the relation between the changes is seldom consistent. In situations, where the development of the underlying is negative the difference of the risk/return –profile becomes obvious; the investor who invested in an index-linked bond does not suffer from similar loss of capital as the other investor in case the bond is held until maturity. Another essential difference is related to the return calculation regulations: thanks to averaging, the restrictions of maximum return, participation coefficient or similar, the value of the index-linked bond does not change in relation to the underlying. In addition, the level of interest has a remarkable effect on the value at the secondary market. (OP-Pohjola, n.d.)

6.2 Measurements of investment risks

The risk and expected return can be considered to go hand in hand. In practice, if a private investor is aiming at a greater return than the current market rate is, thus the investor should accept a risk against either to the equity or the return. (Kontkanen 2008, 101) As an example, when investing in shares the capital can vary considerably during the investment period, while the uncertainty in capital guaranteed index-linked bonds is mainly related to the magnitude of the return. For some investors, a probability for a complete loss of capital can sound as too big of a risk, while others consider it to be a small risk if there is a possibility to double the capital. (Hämäläinen 2003, 142) However, no investor is able to predict the future and evaluate probabilities comprehensively

and with absolute certainty. Instead, historical data is used to estimate the expected return and riskiness of investments. (Knüpfer & Puttonen 2009, 133)

As a tool for private investors, there are several different performance indicators and key figures in order to assess and measure both, the valuation of the company and the risks related to investing. Hence, making an investment decision can be facilitated, as it is possible to obtain comparable information to support the actual decision. However, according to Hämäläinen it is worthwhile to utilize more than only one performance indicator in order to obtain more comprehensive picture. (Hämäläinen 2003, 141-142)

The risk profiles of index-linked bonds are not straightforward to measure; most of the performance indicators do not suit for nonlinear investment products. Key figures known as Sharpe ratio and Jensen´s Alpha provide indication of the risk/return ratios of index-linked bonds. However, the ultimate outcome of the measurements should be evaluated critically. (Järvinen & Parviainen 2011, 84) The author will introduce some of the most utilized key figures.

Jensen's Alpha

Jensen's alpha is a risk-adjusted performance indicator measuring the difference between the expected rate of return on for instance a portfolio, and what that portfolio's expected return would be if it were positioned on the security market line. In other words it measures the performance of an investment in relation to a benchmark. A positive alpha indicates that the portfolio has beaten the market, while a negative alpha represents underperformance. (Khan 2012) Structured investment products are commonly tied to indexes, thus Jensen's Alpha is used for measuring whether the structurers have succeeded to choose indexes that as risk-adjusted beat the markets. (Järvinen & Parviainen 2011, 85)

The formula for Jensen's Alpha is:

$$\alpha = E(r_p) - \left[r_f + \beta \big(E(r_b) - r_f \big) \right]$$, Where

α=Jensen´s Alpha
$E(r_p)$= Return on investment
r_f= Risk free rate

β=Beta, the sensitivity of an investment product in relation to the market

$E(r_b)$= Market return

Beta

Beta measures an assets risk in relation to the market, benchmark or other factors. It reflects the sensitivity of an asset compared to the market – as an example; if the beta of a security is 3,0, on average, it will have a move 3,0 times the market return. Thus, if Beta is under one, the investment product reacts to changes in markets with a lower intensity. (Campbell 2011a; Vaihekoski 2005) Beta measures systematic risk, a risk that influences a large number of risks (market risk), and thus cannot be diversified away. (Campbell 2011a; McGraw-Hill 2008)

A security's Beta depends on how close the correlation is between the security's return and overall market return. In addition, also on how volatile the security is compared to the market. Thus, Beta is equal to the correlation multiplied by the ratio of the standard deviations. (McGraw-Hill 2008)

$$\beta_p = \frac{Cov(r_p, r_b)}{Var(r_b)}$$, where

$Cov(r_p, r_b)$ =Covariance of the return of the underlying and the reference index

$Var(r_b)$= The variance of return of the reference index

Figure 8 indicates the linear relationship between assets' expected return and betas posited by the Capital Asset Pricing Model (CAPM). (Campbell 2011b) Since assets with larger Betas have greater systematic risks, they will have also greater returns. (McGraw-Hill 2008)
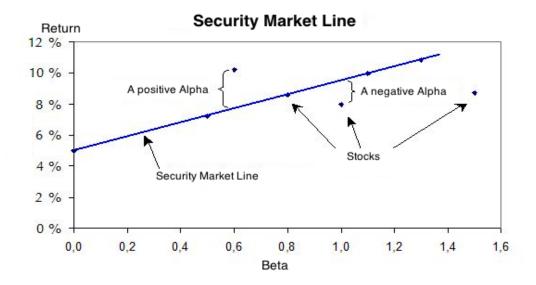
Figure 8 Security Market Line (Vaihekoski 2005)

Volatility

Volatility is the most widely used performance indicator and key figure. (Finanssival-
vonta 2011) It measures the average of fluctuations in the value of an investment prod-
uct; the standard deviation. The greater the volatility the greater is the uncertainty of the
forthcoming return. (Finanssivalvonta 2011; Aktia 2013) Volatility indicates the histori-
cal fluctuations and thus does not predict reliably the future. (Finanssivalvonta 2011)

Figure 9 Volatility (Vaihekoski 2005)

Figure 9 illustrates how the price of a security fluctuates within certain time period. Let us assume that the volatility of a security X is 40% and the expected return is 12%. Thus the range of annual return of the security X is expected to be between -28% to +52%. Volatility is computed by the following formula:

$$\sigma_d^i = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n} \left(r_{d,n}^i - \bar{r}_d^i\right)^2} \quad , \text{where} \quad \bar{r}_d^i = \frac{1}{n}\sum_{t=1}^{n} r_{d,n}^i$$

σ_d=Standard deviation of daily return

n=Number of observations

r_d=Daily return of the security

$\bar{r}_d$=The average of daily returns of the security

Sharpe ratio

According to Järvinen & Parviainen Sharpe ratio is a key figure that how well does the investment product compensate the risk that the investor has taken. The higher the Sharpe ratio is, the better is the return of the investment in relation to the risk. (Järvinen & Parviainen 2011, 85) Sharpe ratio enables the investor to compare the risk-adjusted performance of investments over a given time period. (Standard & Poor's, n.d.)

If the Sharpe ratio is zero it signifies that the investor would have got the same return by investing in a risk-free deposit for the same time period. Thus, if the Sharpe ratio is negative it indicates that the return is even worse than the risk free rate. (FIM, n.d; Lampinen 2004) Sharpe ratio does not apply well for measuring the risk and return of investment products that have nonlinear return profiles or tail risk. (Järvinen & Parviainen 2011, 85) The formula for calculating the Sharpe ratio is the following:

$$S = \frac{r_p - r_f}{\sigma_p} \quad , \text{where}$$

r_p=The return of the investment

r_f= Risk-free rate

σ_p= Volatility of the portfolio

7 EMPIRICAL PART

In the empirical part of the Bachelor Thesis the author will study the performance of seven different index-linked bonds and analyze the risk and return of them. These results will then be compared to the reference index's risk and return as well as to a risk free return, such as the annual return of a convertible note issued by the Bank of Finland, on a yearly basis.

7.1 The selected sample of index-linked bonds

The author limited the issuers to Nordea and OP-Pohjola, which are the only ones providing sufficient information about the matured index-linked bonds and they are also representing half of the market share in Finnish index-linked bonds' market. Next the author narrowed down the issuance and maturity to 2006-2012. Furthermore, the index-linked bonds should be tied to only one single reference index and the sample should represent the global markets as widely as possible. Finally, seven index-linked bonds, all tied to different reference indices provides the basis for the research.

Nordea Markets provided the price history of the index-linked bonds they had issued and the author collected prices for the indices from Bloomberg Professional. This information was the basis for the risk indicator computations. Unfortunately OP-Pohjola Markets did not provide the prices of the index-linked bonds. However Atso Andersin from AdEconomics gave the author a report made of index-linked bonds issued in Finland, which included the prices of the two OP-Pohjola bonds for 2008 and 2010. Thus, the performance comparison of these two bonds is restricted to only two years.

Table 4 is demonstrating all the seven different index-linked bonds selected for the research in a chronologic order. There are two index-linked bonds from OP-Pohjola and five bonds from Nordea, all of them including the offensive "extra" or "plus"-versions. Four of the selected bonds was issued in 2006 and three of them in 2007. All in all, six out of the seven bonds matured in year 2011 and only one of them in 2012. Hence, six of the sample bonds have a maturity of approximately five years and one of them only

four years. In Table 4, also the reference indices to which the index-linked bonds are tied to are listed.

Participation coefficients of the sample (Table 4) varies significantly; lowest percentage (60 percent) was offered in the index-linked bond Latinalainen Amerikka Perus 12/2006, tied to FTSE Latibex Top –index. Respectively, the highest percentage (250 percent) was offered in Euro-osinko II/2006 Plus, the offensive version of the index-linked bond tied to Dow Jones EuroSTOXX Select Dividend 30 -index. The average of all participation coefficients is 123 percent.

Table 4 Selected index-linked bonds

Name of the index-linked bond	Issuer	(Issuance-Maturity)	Reference Index	Particip%
Japani I/2006 Neutraali	OP-Pohjola	(15.02.2006 - 04.03.2011)	Nikkei Stock Average	100 %
Japani I/2006 Plus	OP-Pohjola	(15.02.2006 - 04.03.2011)	Nikkei Stock Average	200 %
Latinalainen Amerikka Perus 12/2006	Nordea	(13.03.2006 - 07.04.2011)	FTSE Latibex Top	60 %
Latinalainen Amerikka Extra 13/2006	Nordea	(13.03.2006 - 07.04.2011)	FTSE Latibex Top	110 %
Euro-osinko II/2006 Neutraali	OP-Pohjola	(22.03.2006 - 08.04.2011)	DJ EuroSTOXX Select Dividend 30	125 %
Euro-osinko II/2006 Plus	OP-Pohjola	(22.03.2006 - 08.04.2011)	DJ EuroSTOXX Select Dividend 30	250 %
Pohjoismaat Tuotto 16/2006	Nordea	(10.04.2006 - 12.05.2011)	DJ STOXX Nordic 30	65 %
Pohjoismaat Extra 17/2006	Nordea	(10.04.2006 - 12.05.2011)	DJ STOXX Nordic 30	150 %
Intia Perus 4003A	Nordea	(22.01.2007 - 23.02.2012)	S&P CNX Nifty 50	65 %
Intia Extra 4003B	Nordea	(22.01.2007 - 23.02.2012)	S&P CNX Nifty 50	110 %
Suomi Perus 4041A	Nordea	(25.06.2007 - 17.08.2011)	OMX Helsinki 25	90 %
Suomi Extra 4041B	Nordea	(25.06.2007 - 17.08.2011)	OMX Helsinki 25	157 %
Afrikka Perus 4079A	Nordea	(12.11.2007 - 14.12.2011)	UBS African Index	94 %
Afrikka Extra 4079B	Nordea	(12.11.2007 - 14.12.2011)	UBS African Index	169 %

The author screened the data and gathered all the necessary performance indicators. During this procedure the author was not able to track down the UBS African Index, to which Afrikka Perus 4079A and Afrikka Extra 4079B were tied. The Bloomberg ticker for the index (UBCIAFRI) provided by Nordea did not provide any search results. Thus, to ensure the validity of the research results, the author was obliged to ignore the latter index-linked bond and leave it out from the research.

In order to be able to compare the results more efficiently the sample of index-linked bonds were divided into two groups, Group A and Group B. Table 5 provides a clear picture of this particular division. Group A consists of index-linked bonds that were tied to an index that represents European companies and markets. While Group B includes all the other index-linked bonds, providing a picture of the market situation in Asia,

South-America and the emerging markets. This division enables also a slight comparison of market situations between continents as the maturities are close to each other.

Table 5 Division of the sample

Group A	Group B
Euro-osinko II/2006 Neutraali	Japani I/2006 Neutraali
Euro-osinko II/2006 Plus	Japani I/2006 Plus
Pohjoismaat Tuotto 16/2006	Latinalainen Amerikka Perus 12/2006
Pohjoismaat Extra 17/2006	Latinaainen Amerikka Extra 13/2006
Suomi Perus 4041A	Intia Perus 4003A
Suomi Extra 4041B	Intia Extra 4003B

All of the index-linked bonds in the sample have full capital guarantee for the nominal amount. Subscription price for the neutral version was 100 percent and 110 percent for the offensive version in all of the index-linked bonds chosen for this research. The return of all the index-linked bonds were calculated by first determining the change in the value of the reference index with the following formula:

$(A_1-A_0) \div A_0 \times 100\%$, where

A_1= The end value of the reference index
A_0= The beginning value of reference index

The amount of possible return to the investor was computed by the formula:

Nominal amount x Change in value of the reference index x Participation coefficient.

8   RESEARCH RESULTS

In this section, the results of the research are presented. Each index-linked bond is approached as a unique case; first the author shortly introduces the loan terms and the performance of the bond during the loan period. Each case is summarized to a table demonstrating the return per annum of the index-linked bond, compared on an annual basis to the performance of the specific index in question and to both, a 5-year and a 10-year Finnish benchmark government bond, issued by the Bank of Finland.

Table 6 Annualized returns of the index-linked bonds

Name of the index-linked bond	Change of ref. index	Particip	Return	Maturity (days)	Return (p.a.)	Capital guarantee
Japani I/2006 Neutraali	-21,67%	100 %	-21,67 %	1843	-3,91%	100,00 %
Japani I/2006 Plus	-21,67%	200 %	-43,34 %	1843	-7,29%	100,00 %
Latinalainen Amerikka Perus 12/2006	24,05%	60 %	114,43 %	1851	2,66%	100,00 %
Latinalainen Amerikka Extra 13/2006	24,05%	110 %	126,46 %	1851	4,67%	100,00 %
Euro-osinko II/2006 Neutraali	-20,93%	125 %	-26,16 %	1843	-4,64%	100,00 %
Euro-osinko II/2006 Plus	-20,93%	250 %	-52,33 %	1843	-8,57%	100,00 %
Pohjoismaat Tuotto 16/2006	-11,11%	65 %	-7,22 %	1858	0,95%	105,00 %
Pohjoismaat Extra 17/2006	-11,11%	150 %	-16,67 %	1858	-3,03 %	100,00 %
Intia Perus 4003A	26,17%	65 %	117,01 %	1858	3,09%	100,00 %
Intia Extra 4003B	26,17%	110 %	128,79 %	1858	5,02%	100,00 %
Suomi Perus 4041A	-33,80%	90 %	-30,42 %	1514	-6,52 %	100,00 %
Suomi Extra 4041B	-33,80%	157 %	-53,07 %	1514	-10,65 %	100,00 %

In Table 6 above is gathered the sample of the chosen index-linked bonds. Change of reference index -column represents the change in the value of the index (in which the bond is tied to) according to the loan terms determined by the issuer. This value multiplied with the participation coefficient gives the total return to the investor. However, even though the table (Table 6) includes negative returns, thanks to the capital guarantee, in reality the investor gets back the nominal amount invested at the maturity, despite the negative performance of the index-linked bond. Maturity in days allows computing the return per annum, which was defined by the following formula:

Return p.a. = $(1 + \text{Return}^{(360/\text{Maturity (days)})})-1$

As Table 6 also indicates, the per annum returns these index-linked bonds provided to the investor are not remarkable. Only two of the index-linked bonds, Intia 4003A-B and Latinalainen Amerikka 12-13/2006 provided return to the investor. However, as a special feature to the Pohjoismaat Tuotto -version, even though the change in value of the reference index was less than zero at the end of the loan term, a return of 5 percent was paid to the investor, which corresponds to a 0,95 percent return per annum (Table 6). There was no such guaranteed return for the Extra –version of this bond, thus the investor lost the premium paid for the index-linked bond and the return per annum was -3,03%.

Table 7 The performance of the reference indices in 2006-2011

	Nikkei	Select Div	Latibex	Nordic 30	CNX Nifty	OMXH 25
INITIAL INVESTMENT	100,00 €	100,00 €	100,00 €	100,00 €	100,00 €	100,00 €
INDEX 2006	5,28%	33,26 %	22,00 %	20,02 %	39,86 %	25,83 %
	105,28 €	133,26 €	122,00 €	120,02 €	139,86 €	125,83 €
2007	-11,79 %	-2,07 %	32,93 %	2,55 %	51,71 %	2,44 %
	92,87 €	130,50 €	162,17 €	123,08 €	212,18 €	128,90 €
2008	-40,51 %	-57,56 %	-45,36 %	-49,06 %	-52,11 %	-49,47 %
	55,25 €	55,38 €	88,61 €	62,70 €	101,61 €	65,13 €
2009	17,59 %	27,00 %	71,30 %	38,72 %	70,71 %	28,30 %
	64,96 €	70,34 €	151,79 €	86,97 €	173,46 €	83,57 €
2010	-3,64 %	0,75 %	8,33 %	29,80 %	17,25 %	26,45 %
	62,60 €	70,87 €	164,44 €	112,89 €	203,39 €	105,67 €
2011	-18,85 %	-16,24 %	-17,81 %	-17,43 %	-27,35 %	-27,12 %
END VALUE	50,80 €	59,36 €	135,15 €	93,21 €	147,76 €	77,01 €

Table 7 illustrates the price changes in the reference indices year after year during the review period. In order to demonstrate the development of the index, the author has added a hypothetical investment of 100 Euros (Initial investment) to be able to see how the index developed during the years 2006-2011. Thus an end value above one hundred means that the index would have generated return to the investor during the observation period. The data for the values of the indices has been acquired from Yahoo! Finance. (Yahoo! Finance 2013)

According to the table (Table 7), it seems that the Nikkei Stock Average (Nikkei) – index and Dow Jones EuroStoxx Select Dividend 30 (Select Div) –index has anticipated the downturns in the market (2008 and 2011) more than the other indices; this can be detected by looking at the values of the indices in years 2007 and 2010. When comparing the Table 7 to the performance and per annum return of the index-linked bonds in Table 6 it can be detected that the same indices provided return to the investor as well. However, the return from the indices is higher than from the bonds thanks to participation coefficients.

8.1 Group A

Group A consists of three different index-linked bonds, with their offensive versions, one issued by OP-Pohjola and two by Nordea Bank. All of the indices in this group were tied to companies in Europe and the Nordic countries.

Euro-osinko II/2006 Neutraali & Plus

Euro-osinko II/2006 Neutaali & Plus were index-linked bonds, issued by OP-Pohjola, with a maturity of approximately five years (22.03.2006-08.04.2011). The possible return for the investor was tied Dow Jones EuroSTOXX Select Dividend 30 –index, which represents companies that pay the highest dividends in Europe every year. (Stoxx 2013a) According to the loan terms, the percentage change between the beginning value of the index and the average of half-year observations determine the return to the investor. (OP-Pohjola ryhmä 2011a)

Table 8 indicates the return percentages the index-linked bond, reference index and the government bonds provided the investor in years 2008 and 2010. It is clear that the reference index plunged in 2008 during the global economic recession; where as the decrease of the index-linked bond is more discreet. However in 2010, both versions issued of the index-linked bond performed remarkably better than the reference index itself.

Table 8 The performance of Euro-osinko II/2006 Neutraali & Plus

Name of the index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark	10-y benchmark bond
Euro-osinko II/2006 Neutraali	2008	-24,97 %	-57,56 %	3,88 %	4,30 %
	2010	2,45%	0,75 %	1,78 %	3,00 %
Index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark	10-y benchmark bond
Euro-osinko II/2006 Plus	2008	-54,01%	-57,56 %	3,88 %	4,30 %
	2010	2,32%	0,75 %	1,78 %	3,00 %

The volatility of the conservative version of the bond is not significant, and the Sharpe ratio was far below zero in 2008. In 2010, the neutral version provided a bit better return than the return on risk free rate was. The offensive version of the index-linked bond obeys much the same pattern; the volatility is relatively modest in both years of observation, Sharpe ratio was negative in 2008 and marginally over zero in 2010. (Table 9) In both versions, the volatility was multiple times higher in 2008 than it was in 2010.

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Table 9 Euro-osinko II/2006 volatility and Sharpe ratio

	2008	2010
Euro-osinko II/2006 Neutraali		
Volatility p.a.	7,46 %	1,75 %
Sharpe ratio	-3,87	0,38
Euro-osinko II/2006 Plus		
Volatility p.a.	15,34 %	2,31 %
Sharpe ratio	-3,77	0,23
Select Div.		
Volatility p.a.	30,20 %	25,78 %
Sharpe ratio	-2,03	-0,04

Dow Jones EuroSTOXX Select Dividend –index in turn had a higher volatility, but the risk-adjusted return of the reference index was negative in both years of observation. Referring to Table 6, the change of the reference index during the maturity according to the loan terms was -20,93 %. Table 7 in turn indicates that the reference index ''Select Div'' did not develop favorably either, except in the year of issuance; 2006. When comparing the risk/return profile of the index-linked bond and the reference index on a yearly basis, it becomes clear that neither of them were gold mines to the investor.

Pohjoismaat Tuotto 16/2006 & Pohjoismaat Extra 17/2006

Pohjoismaat Tuotto and Extra 16/2006-17/2006 were index-linked bonds, issued by Nordea, with a maturity of approximately five years (10.04.2006-12.5.2011). The possible return for the investor was tied to Dow Jones STOXX Nordic 30 –index, which represents the stock market of the Nordic countries, covering 30 stocks from Denmark, Finland, Sweden, Iceland and Norway. (Stoxx 2013b) According to the loan terms, the return of the index-linked bond was determined based on the average of the performance of the index in years 2009-2011 in predetermined dates. (Nordea 2011b)

As the index-linked bond was issued in the middle of the year 2006, the author decided it is more relevant to compare only ''full years'', as there is no price history for the index-linked bond before the issuance. In year 2007, the return of both versions of the index-linked bonds ended slightly below zero, while the reference index was +2,55% at the end of the year. As all the other bonds and indices, both versions and the reference

index decreased remarkably. The Table 10 below is also demonstrating a few of the downsides of index-linked bonds; between the years 2009-2010, even though the reference index performed well in both years, the return the index-linked bonds generated are only fractions of the index thanks to the participation coefficient. However, when the index decreased again in 2011, the index-linked bonds stayed above zero. This is probably because the loan period ended in the middle of the year (12.05.2011) and that is why the value of the index-linked bond is not comparable to the index, as the figures +1,44% and +1,42% are based on the price history of five months only.

Table 10 The performance of Pohjoismaat Tuotto 16/2006 & Pohjoismaat Extra 17/2006

Name of the index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark bond	10-y benchmark bond
Pohjoismaat Tuotto 16/2006	2007	-2,21%	2,55 %	4,18 %	4,29 %
	2008	-8,54%	-49,06 %	3,88 %	4,30 %
	2009	5,95%	38,72 %	2,70 %	3,74 %
	2010	2,85%	29,80 %	1,78 %	3,00 %
	2011	1,44%	-17,43 %	2,08 %	3,00 %
Name of the index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark bond	10-y benchmark bond
Pohjoismaat Extra 17/2006	2007	-0,11 %	2,55 %	4,18 %	4,29 %
	2008	-31,13 %	-49,06 %	3,88 %	4,30 %
	2009	4,99 %	38,72 %	2,70 %	3,74 %
	2010	2,70 %	29,80 %	1,78 %	3,00 %
	2011	1,42 %	-17,43 %	2,08 %	3,00 %

The volatility of the offensive version of Pohjoismaat Extra is much higher than the volatility of the neutral version, but the volatility of the reference index is naturally even higher. Sharpe ratios were positive in 2009 and 2010 within both, the bonds and the reference index. Otherwise the risk free rate outperformed the returns of these investment objects. (Table 11)

Table 11 Pohjoismaat Tuotto & Extra volatility and Sharpe ratio

	2007	2008	2009	2010	2011
Pohjoismaat Tuotto 16/2006					
Volatility p.a.	9,26 %	9,73 %	4,74 %	1,46 %	1,37 %
Sharpe ratio	-0,21	-1,28	0,69	0,73	-0,47
Pohjoismaat Extra 17/2006					
Volatility p.a.	20,07 %	22,42 %	11,40 %	1,74 %	1,41 %
Sharpe ratio	-0,21	-1,56	0,20	0,53	-0,47
Nordic 30					
Volatility p.a.	18,51 %	30,20 %	36,67 %	26,65 %	24,24 %
Sharpe ratio	-0,09	-1,75	0,98	1,05	-0,80

Suomi Perus 4041A & Suomi Extra 4041B

Suomi Perus and Extra 4041A-B were index-linked bonds, issued by Nordea, with a maturity of approximately four years (25.06.2007-17.08.2011). The possible return for the investor was tied to OMX Helsinki 25 -index, which is used as a benchmark for the Finnish market. The index includes 25 most traded companies in Helsinki Stock Exchange's Main List, such as Wartsila Oyj Abp, Fortum Oyj and UPM-Kymmene Oyj. (Bloomberg 2013) According to the loan terms, the return was determined by the average value for observations of every three months during the two last years (2010-2011) of the loan period. (Nordea 2011c)

Table 12 The performance of Suomi Perus 4041A & Suomi Extra 4041B

Name of the index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark bond	10-y benchmark bond
Suomi Perus 4041A	2007	-2,16 %	2,44 %	3,59 %	3,78 %
	2008	-8,25 %	-49,47 %	4,18 %	4,29 %
	2009	5,45 %	28,30 %	3,88 %	4,30 %
	2010	3,15 %	26,45 %	2,70 %	3,74 %
	2011	1,56 %	-27,12 %	1,78 %	3,00 %
Name of the index-linked bond	**Year**	**Index-linked bond**	**Reference index**	**5-y benchmark bond**	**10-y benchmark bond**
Suomi Extra 4041B	2007	5,41 %	2,44 %	3,59 %	3,78 %
	2008	-15,53 %	-49,47 %	4,18 %	4,29 %
	2009	5,17 %	28,30 %	3,88 %	4,30 %
	2010	3,14 %	26,45 %	2,70 %	3,74 %
	2011	1,56 %	-27,12 %	1,78 %	3,00 %

Table 12 above demonstrates again the fact that during economic upbeats the index-linked bond is far behind from the reference index when it comes to the return. In contrast, when the market and indices decrease, the response of the values of index-linked bonds is not as vigorous. This same conclusion can be made from the Table 13, as the volatilities of the index-linked bonds are considerably lower, especially in 2010 and 2011; so is the risk as well. Solely based on the Sharpe ratios, the OMX Helsinki 25 index performed better than the bonds tied to its performance.

Table 13 Suomi Perus & Extra volatility and Sharpe ratio

	2008	2009	2010	2011
Suomi Perus 4041A				
Volatility p.a.	9,36 %	4,98 %	1,66 %	2,24 %
Sharpe ratio	-1,30	0,50	0,82	-0,23
Suomi Extra 4041B				
Volatility p.a.	15,64 %	7,91 %	1,82 %	2,23 %
Sharpe ratio	-1,24	0,35	0,75	-0,56
OMXH 25				
Volatility p.a.	28,50 %	34,54 %	26,09 %	26,05 %
Sharpe ratio	-1,87	0,74	0,95	0,96

8.2 Group B

Group B consists of three different index-linked bonds, with their offensive versions, one issued by OP-Pohjola and two by Nordea Bank. All of the indices in this group were tied to companies and their performance in Asia and the Emerging markets in South-America.

Japani I/2006 Neutraali & Plus

Japani I/2006 Neutraali & Plus were index-linked bonds, issued by OP-Pohjola, with a maturity of approximately five years (15.02.2006-04.03.2011). The possible return for the investor was tied to Nikkei Stock Average (Nikkei 225) –index, which is a price-weighted equity index including 225 stocks listed in the first section of the Tokyo Stock Exchange. (Nikkei Indexes 2013) According to the loan terms, the percentage change

between the beginning value of the index and the average of half-year observations determine the return. (OP-Pohjola ryhmä, 2011b)

Table 14 The performance of Japani I/2006 Neutraali & Japani I/2006 Plus

Name of the index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark bond	10-y benchmark bond
Japani I/2006 Neutraali	2008	-2,38%	-40,51 %	3,88 %	4,30 %
	2010	2,51%	-3,64 %	1,78 %	3,00 %
Name of the index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark bond	10-y benchmark bond
Japani I/2006 Plus	2008	-11,42%	-40,51 %	3,88 %	4,30 %
	2010	2,46%	-3,64 %	1,78 %	3,00 %

Japani I/2006 performed surprisingly well in year 2008 (Table 14) compared to the Nikkei Stock Average, and also the volatilities, which are presented in Table 15, are low. However, the risk-adjusted returns of both versions of the index-linked bond are the worst in the whole sample, which means that the risk is simply too big in relation to the return the bonds provided. Despite the fact that the Sharpe ratio of the reference index is also negative, it is almost three times closer to zero than the Sharpe ratios of the index-linked bonds.

Table 15 Japani I/2006 volatility and Sharpe ratio

	2008	2010
Japani I/2006 Neutraali		
Volatility p.a.	1,79 %	1,42 %
Sharpe ratio	-3,50	0,51
Japani I/2006 Plus		
Volatility p.a.	3,71 %	1,24 %
Sharpe ratio	-4,12	0,54
Nikkei Stock Average 225		
Volatility p.a.	31,95 %	23,75 %
Sharpe ratio	-1,39	-0,23

Latinalainen Amerikka Perus 12/2006 & Latinalainen Amerikka Extra 13/2006

Latinalainen Amerikka Perus & Extra 12/2006-13/2006 were index-linked bonds, issued by Nordea, with a maturity of approximately five years (13.03.2006-07.04.2011) The possible return for the investor was tied to FTSE Latibex Top index, which includes 15 biggest and most traded companies from Latibex All Share index. (FTSE 2012) Accord-

ing to the loan terms, the percentage change between the beginning value of the index and the average of half-year observations determine the return. (Nordea 2011a)

Table 16 The performance of Latinalainen Amerikka Perus 12/2006 & Latinalainen Amerikka Extra 13/2006

Name of the index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark bond	10-y benchmark bond
Latinalainen Amerikka Perus 12/2006	2007	7,97%	32,93 %	4,18 %	4,29 %
	2008	-12,69%	-45,36 %	3,88 %	4,30 %
	2009	15,43%	71,30 %	2,70 %	3,74 %
	2010	5,22%	8,33 %	1,78 %	3,00 %
	2011	1,89%	-17,81 %	2,08 %	3,00 %
Name of the index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark bond	10-y benchmark bond
Latinalainen Amerikka Extra 13/2006	2007	16,36%	32,93 %	4,18 %	4,29 %
	2008	-26,23%	-45,36 %	3,88 %	4,30 %
	2009	22,40%	71,30 %	2,70 %	3,74 %
	2010	8,20%	8,33 %	1,78 %	3,00 %
	2011	2,55%	-17,81 %	2,08 %	3,00 %

Despite the low participation coefficients (60% and 110%) both versions of Latinalainen Amerikka performed quite well in comparison to the Latibex index. (Table 16) In years 2007 and 2009 the return of the index is multiple times higher, as also the volatility and Sharpe ratio. In years 2010-2011 the volatilities of both versions of the bonds were significantly lower than the Latibex –indexes, but the risk-adjusted return in 2010-2011 and the overall return in year 2011 outperformed the index. (Table 17)

Table 17 Latinalainen Amerikka 12-13/2006 volatility and Sharpe ratio

	2007	2008	2009	2010	2011
Latin. Am. Perus 12/2006					
Volatility p.a.	11,28 %	15,19 %	10,93 %	4,66 %	3,29 %
Sharpe ratio	0,34	-1,09	1,16	0,74	0,14
Latin. Am. Extra 13/2006					
Volatility p.a.	18,83 %	25,37 %	18,77 %	8,04 %	5,30 %
Sharpe ratio	0,65	-1,19	1,05	0,87	0,09
Latibex					
Volatility p.a.	29,62 %	41,72 %	41,55 %	24,92 %	20,91 %
Sharpe ratio	0,97	-1,18	1,65	0,26	-0,95

Intia Perus 4003A & Intia Extra 4003B

Intia Perus and Intia Extra 4003A-B were index-linked bonds, issued by Nordea, with a maturity of approximately five years (22.01.2007-23.02.2012). The possible return for the investor was tied to well-diversified S&P CNX Nifty 50 index, which includes 50 most remarkable companies in India. (India Index Services & Products Limited 2013) According to the loan terms, the percentage change between the beginning value of the index and the average of half-year observations determine the return. (Nordea 2012)

As Table 18 indicates, the index performed extremely well in years 2007 and 2009. Thanks to that also both versions of the Intia 4003A-B bond ended with a positive return, which still was considerably lower than the performance of the CNX Nifty 50 – index. Similarly to all the other investment objects, years 2008 and 2011were challenging and the index decreased heavily. Still, the overall performance from issuance to maturity was positive and even the index-linked bond provided a return to the investor despite the two economically challenging years.

Table 18 The performance of Intia Perus 4003A & Intia Extra 4003B

Name of the index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark bond	10-y benchmark bond
Intia Perus 4003A	2007	18,70%	51,71 %	3,59 %	3,78 %
	2008	-29,62%	-52,11 %	4,18 %	4,29 %
	2009	19,73%	70,71 %	3,88 %	4,30 %
	2010	9,22%	17,25 %	2,70 %	3,74 %
	2011	-3,39%	-27,35 %	1,78 %	3,00 %
	2012	2,12%	23,92 %	2,08 %	3,00 %
Name of the index-linked bond	Year	Index-linked bond	Reference index	5-y benchmark bond	10-y benchmark bond
Intia Extra 4003B	2007	43,32%	51,71 %	3,59 %	3,78 %
	2008	-52,83%	-52,11 %	4,18 %	4,29 %
	2009	28,18%	70,71 %	3,88 %	4,30 %
	2010	13,34%	17,25 %	2,70 %	3,74 %
	2011	-6,44%	-27,35 %	1,78 %	3,00 %
	2012	2,97%	23,29 %	2,08 %	3,00 %

The volatility of the index-linked bonds were on average two times lower than the volatility of the index in years 2007-2009 and multiple times higher in 2010-2012. Based on the Sharpe ratios, the bonds provided a better return than the CNX Nifty -index in comparison to the risk. (Table 19)

Table 19 Intia 4003A-B volatility and Sharpe ratio

	2007	2008	2009	2010	2011	2012
Intia Perus 4003A						
Volatility p.a.	15,36 %	18,86 %	14,23 %	7,32 %	4,09 %	2,78 %
Sharpe ratio	0,95	-1,78	1,20	1,02	-1,34	0,45
Intia Extra 4041B						
Volatility p.a.	19,84 %	28,58 %	22,34 %	11,63 %	6,32 %	4,21 %
Sharpe ratio	1,97	-1,98	1,14	0,99	-1,35	0,50
CNX Nifty 50						
Volatility p.a.	33,26 %	34,63 %	38,41 %	24,43 %	18,38 %	20,11 %
Sharpe ratio	1,43	-1,62	1,77	0,63	-1,60	1,15

9 DISCUSSION AND FINDINGS

Based on the research results, it is obvious that the capital guarantee provided by all of the index-linked bonds in the sample rescued the initial investment of several investors. All of the reference indices sunk extremely heavily in year 2008 due to the global economic recession and in 2011 due to the crisis in Europe and especially in Eurozone. In the long run, the emerging markets turned out to be the best environment to invest in during the turbulent years of 2006-2012.

Risk/Return –profile

Depending on the current market conditions, the index-linked bonds outperformed the indices and vice versa. During a downturn and economically challenging years the index-linked bonds performed better on average, where as the indices outperformed multiple times the index-linked bonds in the economic upbeats. Thus, as investment products the index-linked bonds are more defensive than the indices. Obviously, even though the index-linked bond would not provide a return to the investor, the guarantee of getting the nominal amount invested back at the maturity is a significant advantage during a recession.

Another assumption that can be made is based on the volatility of the markets. Based on the research results, the more volatile the markets (index) were the more probable a return was to the investor. However, due to the turbulence and irregularity of the markets in the observation period it seems that the bonds issued by the government would have been the best solution in order for the investor to sleep his/her nights well. Of course, by successful stock picking and prediction of the markets a private investor could have got significant returns by investing in the indices of the emerging markets especially in 2007 or at the end of the year of 2008. In addition, the purchases should have been also sold in the right time in order to gain the massive profits.

Most of the computed Sharpe ratios for both, the bonds and the indices, during the observation period were very close to zero or even negative. Reflecting this to the Security Market Line (SML), it means that such investment objectives are placed below the Security Market Line (negative) or very close to it (close to zero). Thus, the beta of these

investments is higher than it could and should be in relation to the return on investment. In addition, if the Sharpe ratio is negative it indicates that also the Alpha is negative, which implies that the particular investment has underperformed in comparison to the benchmark. On the other hand, the time period chosen for the research was more volatile and turbulent than on average, which provides an explanation to the exceptionally low performance of the investments.

Since index-linked bonds are so defensive as investment products, they would probably serve the private investors best as diversification tools for the portfolios or hedges. Another option could be the utilization as roll-in products for entirely new or exotic markets, were the risk might be vast or even unknown. Obviously they could also be seen as a way of savings in the current era of low interest rates, when the banks do not pay (almost) any interest on deposits. The index-linked bonds would hence provide a probability for the interest paid for the deposit, while the worst-case scenario would be the nominal amount paid back at the maturity, in other words a deposit in the bank without an interest.

The effect of length of the maturity, valuation days and averaging

When comparing the returns per annum, the worst performer of all the index-linked bonds in the sample was Suomi Perus 4041A & Suomi Extra 4041B but this bond had divergent loan terms for the determination of the return compared to the others. Instead of an observation every half a year through out the whole maturity, the return was determined based on the average of the performance during the last two years 2009-2011.

In addition, this bond had a maturity of only four years (1514 days, Table 6) while the others had approximately five years. As the valuation days are frequent and focused in the end part of the loan term, thus the tracking error, which measures how closely a portfolio or in this case an index-inked bond follows the benchmark (Parametric Portfolio Associates 2012), is small and the index-linked bond corresponds to the index. According to the theory, when frequent valuation days in the end part of the loan are combined with a relatively short maturity time the outcome is an expensive equity option and a higher probability for lower returns; as in this case.

The length of the maturity does affect the return of the index-linked bond. As a hypothetical question, what if the loan period would have been a year longer or a year shorter? In case the maturity date would have been instead in year 2010, the results would have been different due to the avoided Euro crisis in 2011. On the other hand, by shortening the loan period the affect of the economic downturn in 2008 would have been more significant due to the decreased number of valuation days.

However, the longer the loan period is, the cheaper is the capital guarantee ($P=N/(1+r)^t$). Which in turn gives the writer of the index-linked bond the option to increase the participation coefficient, as there is more money left for the purchase of the equity option. Sometimes due to the level of interest rates and volatility of the market it is not possible for the loan writer to issue index-linked bonds with shorter maturity. In order to make the equation to work the averaging period has to be lengthened. As an example, especially the emerging markets are naturally so volatile that in order to make the equity option cheap enough the averaging period has to be lengthened to be able to provide even tolerable participation coefficient to the investor.

Almost all of the index-linked bonds that were chosen to the sample of this research had averaging periods, which were extended to the whole loan period. In such cases, the expected return is remarkably lower but in such market conditions it might be even the best solution. The valuation days, averaging and the fact that paid dividends decreases the value of an index-linked bond raised questions about what if the valuation days are right after when the stock goes ex-dividend? Obviously, if the index consists of fifty companies and one of them just paid dividends, the effect to the value of the index is not remarkable. But in theory, this could be possible.

As it was already stated earlier, the more there are valuation days, the smaller is the impact of one single valuation. This provides an advantage to the investor in a situation where the markets come heavily down in the end part of the loan term. On the other hand, it also withholds the possibility for return gained from a last minute upbeat.

Risks and a qualitative point of view

When considering the risks of the index-linked bonds in the sample from a qualitative point of view it is clear that the most important risk, the issuer risk, is not particularly noteworthy with Nordea and OP-Pohjola. The possibility for bankruptcy or insolvency is relatively low between these two banks. On the other hand, credit risk also includes the risk of the counterparty from whom the equity option has been purchased. In addition, if the index-linked bond is liquidated before the maturity, a change in the creditworthiness of the issuer or exceptional market circumstances does affect the value of the index-linked bond. This is the most probable way for credit the risk to be realized in this situation and with the index-linked bonds in the sample.

Besides, the secondary markets of index-linked bonds include the liquidity risk, as it can be very difficult to sell index-linked bonds during the maturity and the interest rate risk, which impacts the value of the bond. However these risks can be realized only if the bond is sold before the maturity and thus it is hard to evaluate the probability for this to happen, as index-linked bonds are instructed to be "buy and hold" investments. The risk on return was realized in almost all of the index-linked bonds in the sample. Only a handful provided a moderate return to the investor, while others matured as unworthy, especially the offensive versions where the investors paid over the par value.

Impact of the global economic recession and Eurozone crisis on the return

In the year 2008, all of the sample indices plunged significantly. The index that decreased the most was Dow Jones EuroSTOXX Select Dividend 30 (-57,56%) and the index with the smallest decrease was Nikkei Stock Average (-40,51%). Still, the average decrease among all of the six indices was -49,01%, which illustrates the stage of how severe the recession was all around the world.

The year 2011 was not as bad as 2008, the biggest decrease was by CNX Nifty 50 Index (-27,35%) and smallest was Dow Jones EuroSTOXX Select Dividend 30 (-16,24%). In this year, the average decrease was -20,8%. When reflecting the economic decreases in years 2008 and 2011 to the fact that the maturity of an index-linked bond is on average five years, and in most cases the return is determined based on the average of observations every half a year, (which means that there is approximately 10-11 valua-

tion days in the loan terms of each bond) it is very probable that the impact is detectable. In this case, when two economically challenging years occurred during the research period 2006-2011 the impact to the outcome was significant. At least four valuation days (out of 10-11) of each index-linked bond ended up far below zero and when considering the recovery time out of these downturns and the fact that the overall return is determined by an average, it seems obvious that the index-linked bonds performed poorly.

All in all, the index-linked bonds in Group A did not provide any return to the investor excluding the neutral version of Pohjoismaat Tuotto index-linked bond, which had a guaranteed return of 5 per cent to the investor. The indices in Group A were tied to top performance companies in Europe and the Nordic countries. Where as Group B invested in companies in Japan, India and South-America. The two index-linked bonds that provided return to the investor in this particular group were tied to Latibex Top and CNX Nifty 50 –index, which were tied to South-American and Indian companies; in other words the emerging markets.

Emerging markets

An interesting observation can be made from the year 2009, a year after the global financial crisis; the emerging markets recovered extremely well and fast from the downshift. Both indices, FTSE Latibex Top (+71,30%) and CNX Nifty 50 (+70,71%) performed remarkably better in comparison to the indices tied to Japanese, European and Nordic companies. The average of the Group A performance in year 2009 was +31,34%, which is a pleasing recovery as such, but when compared to Group B's average of +53,2%, including also the lowest performer in 2009 (Nikkei Average +17,59%) it is clearly lower.

On the other hand, referring to the latter observations; the index-linked bonds tied to the emerging markets, including India, Argentina, Brazil, Chile, Mexico, Panama, Peru, Puerto Rico and Venezuela, had also the lowest participation coefficients. This could be explained by the assumption that the markets expected that the emerging markets had significant potential in them and that the volatility was high, which increased the price of the equity option. Thus, the theory (presented in part 5.2) becomes concrete in this

context. This theory is also confirmed by the observation that the index-linked bond (Euro-osinko II/2006) with the highest participation coefficient (125% & 250%) was tied to the index (DJ Select Dividend 30 -index) with the worst performance during the review period. In addition, as the emerging markets are considered to be more risky than the other markets, capital guaranteed investment products could be seen as desirable roll-in products into such markets. Based on the research and general opinion, the emerging markets, especially BRIC- (Brazil, Russia, India and China) or N11 (Bangladesh, Egypt, Nigeria, Pakistan, Indonesia, Iran, Mexico, Turkey, The Philippines, South-Korea and Vietnam) are very potential investment targets now and in the future.

10 CONCLUSION

The markets of capital guaranteed index-linked bonds and other structured products are still fairly young in Finland. Yet, the development and growth of the market has been quite rapid as there are structured investment products probably for each type of assets and return profiles. Product categories and types have changed vigorously according to the market circumstances. There are different investment products for descending, ascending and neutral market situation, as well as for extremist or slight movements of the market and volatility. The index-lined bonds provide the investor an interesting possibility to take part to the rise of the stock market with a capital guarantee and a non-linear return profile; with most of the traditional investment products this is impossible.

In several researches about investment psychology it has become clear that the preferences of investors among different investment products varies in a similar way than with consumers; one prefers the capital guarantee and is willing to give up a part from the return whereas the other wants to maximize the return without caring about the risks. The Finnish investors are generally shunning the risks, as the barometer conducted by Osuuspankki (2008) indicated. Thus the capital guaranteed index-linked bonds are suitable for the Finnish markets.

The expected return of index-linked bonds is usually between the regular stock investments and fixed-income investments. Index-linked bonds provide the investor with different return profiles and they are cost-effective due to their passive nature, as the in-

vestments do not require active management, trading or other transactions during the maturity. These bonds also provide the investor the possibility to enter entirely new markets, which might otherwise be out of the reach of the investors. On the other hand, coins have always to sides; a descending forward curve and the restrictions of return are obvious negative qualities of the index-linked bonds. Based on the research results, it is obvious that the capital guarantee saved the money of several private investors. However, only a handful of the index-linked bonds chosen for the sample outperformed the benchmark bonds issued by the Bank of Finland. The bonds issued by governments are known for being a close to risk-free investments and they even pay a coupon to the investor; thus, would it be worth for an investor who is afraid to take a considerable risk to invest rather in these benchmark bonds than in index-linked bonds?

An idea for further research is the relation between the volatility of the markets and the participation coefficients provided by the issuers. The higher the participation coefficient is the more tempting does the index-linked bond seem to the private investor. However, a high participation coefficient usually informs of low expectations of the return. Thus, it would be interesting to know if there is a correlation between them.

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