

# **The Impact of Public – Private Capital Leverage on the Performance of Multi-Asset Renewal Funds**

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<p>The Research Institute of the Finnish Economy (ETLA) took on a 2.5-year project to find out how much value potential small and innovative companies in Finland have in a few particular fields. A second question followed and became the more important one, that is how to help them increase and bring value to the real economy.</p> <p>The financial crisis of 2008 had a huge impact on all aspects of world economy. Access to finance, especially for small and medium-sized enterprises (SMEs), became extremely difficult and very expensive. Without it, companies cannot grow and develop their products and services, and thus economy cannot grow either. That is why a new investment vehicle was proposed – Multi-Asset Renewal Fund (MARF). MARF would invest in innovative clean-tech companies in Finland, thus supporting the real economy. However, also investing in the financial markets would make the fund more profitable, which is in the interest of investors.</p> <p>The purpose of the thesis was to research how accessible financing is for SMEs, what the main sources of investment are, and how more investments into small companies and the real economy can be encouraged from the private sector by using MARF. First, the theoretical part of the research was conducted through a desktop-study. In order to understand the structure of MARF, the asset classes and risk-return profile, and guarantee schemes were introduced and explained. The empirical part of the thesis was conducted by creating multiple scenarios with variable assumptions. The calculations included the financial ratios of chosen Finnish SMEs, how much of investments they could receive according to the assumptions on their risk profile, and how high those amounts could possibly become if the guarantee was applied.</p> <p>The last part of the thesis presents an analysis of the research and calculations, and discusses the research topic of the paper, that is, how public capital or involvement can catalyse private investments and influence the overall asset allocation of the fund and its performance.</p> <p>As the outcome of the thesis, we can find scenarios of impact the guarantees could make on the SME Debt class and companies it is comprised of.</p>	
<b>Keywords</b> Multi-asset, allocation, guarantee, public-private leverage	

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# 1 Introduction

The world of investments seems to provide endless possibilities. An investor decides if he invests a lot of money in one particular company or small amounts in many enterprises, would it be long-term or short-term investment, how much risk is he willing to take, does he invest directly or with a help of investment or financial advisor, etc. The choice of investments depends as well on the investor's goals, does he care only about the returns or is it as well caring about different causes and searching for the investments supporting them.

This thesis aims to investigate new investment model called Multi-Asset Renewal Fund (MARF) which is developed by Research Institute of the Finnish Economy (ETLA) in collaboration with professor Peter Adriaens from the University of Michigan, and analyse its performance with a use of public – private capital leverage.

In the following chapters, one will find introduction of asset classes and their risks used in the MARF structure, various guarantee schemes that could be applied to MARF, and multiple scenarios of asset allocation and guarantees used in the fund.

## 1.1 Background

The cooperation of professor Adriaens and the Research Institute of the Finnish Economy started in 2013 under the research project "Towards Sustainable Positioning for Value Capture and Investability – A Roadmap for Finnish Cleantech". The aim was to find out value generation potential of the Finnish clean-tech sector, determine how much of current value capture capabilities is retained in Finland, and how could those capabilities be improved by transitioning to ecosystem-based portfolio model from conventional chain-based model (Tekes 2013).

It became clear that small and medium-sized enterprises (SMEs) are the key for the economic growth in Finland. However, since the financial crisis in 2008 and change of the regulatory framework for banks (Basel III) obtaining risk financing by the SMEs became very difficult. At this point the objective of the research project has changed, from only analysing the companies and their value capture capabilities to creating a new investment fund. Industrial renewal fund which will grant possibility for the large institutional investors and pension funds to invest in promising Finnish clean-tech companies.

The Multi-Asset Renewal Fund (MARF) is comprised of four assets classes 1) Climate Bonds, 2) Public Equity, 3) SME Risk Debt, and 4) Private Equity. The performance of the

MARF depends on the asset allocation between companies and between asset classes. Simulations of MARF performance with a use of Monte Carlo method have been already performed by the group of students from University of Michigan. Their results will be taken as starting point for this research. The goal of further analysis, is to determine what kind of impact governmental guarantees would have on the overall performance and the risk – return profile of the renewal fund.

## 1.2 Project objectives

The project objective is to analyse how incorporating public funds (governmental guarantees) into the MARF’s structure would influence its risks and returns. In order to do it, we need to first understand all separate asset classes and their risk – return profiles. Then, it is needed to research different guarantee programs which could be applicable to MARF. Lastly, based on the research outcomes and assumptions when necessary, we need to create multiple scenarios of the impact of guarantee under different conditions.

PT 1. Researching fund components and discovering the relevant factors influencing the performance

PT 2. Analysing existing guarantee programs and deciding on the variables that should be used in the simulation

PT 3. Creating simulations under various conditions and assumptions

PT 4. Creating an analysis of possible outcomes and discussing the results

Table 1 below presents the theoretical framework, project management methods and outcomes for each project task.

Table 1. Overlay matrix

Project Task	Theoretical Framework	Project Management Methods	Outcomes
PT 1. Researching fund components and discovering the relevant factors influencing the performance	Historical performance of multi-asset funds and correlation between asset classes	Quantitative research, benchmarking	Theoretical framework
PT 2. Analysing existing guarantee	Research papers and analysis	Qualitative and quantitative research	Setting up the simulation

programs and deciding on variables that should be used in the simulation			
PT 3. Creating simulations under various conditions and assumptions	Using all gathered data and theories	Statistical methods	Simulation of performance assuming given asset allocation and variables
PT 4. Creating an analysis of possible outcomes and discussing the results	Performance of different types of fund depending on the allocation and portion of the guaranteed debt	Statistical methods	Different versions of fund allocation and overall value of fund assuming different input data

### 1.3 Project scope and demarcation

The final product of the thesis will be simulation of impact that guarantee added to MARF's structure would have. For the purpose of limiting possible outcomes, we need to agree on specific ranges of variables and make some assumptions. That is why, previous research outcomes will be used as an input data in the calculations.

The theory part will be constrained to only relevant asset classes and applicable government programs.

### 1.4 Case company introduction

ETLA, the Research Institute of the Finnish Economy or in Finnish Elinkeinoelämän tutkimuslaitos, is a private economic research organisation in Finland. It employs some 30 researchers. Taloudellinen Tutkimuskeskus (Economic Research Centre), ETLA's ancestor, was established on 1<sup>st</sup> of August, 1946. Finland was recovering after the war, and a lot of statistics and information were missing. Economic Research Centre started out with gathering data, but quickly expanded their research activities. (ETLA 2016.)

In 1971, ETLA was established to continue Economic Research Centre's operations. ETLA conducts research in education economics, labour market, competition, innovation

and productivity, economic growth, public finance, economic policy and business cycle. (ETLA 2016.)

Throughout almost 70 years of existence, ETLA has published over 600 books and 1200 shorter articles. (ETLA 2016.)

### **1.5 International aspect**

During my internship in the Research Institute, I had a chance to work in the international environment. Majority of ETLA's employees are Finnish, but I also cooperated with professors and students from the University of Michigan. Project will be also based on the outcomes of research conducted by international participants of ETLA's project.

### **1.6 Anticipated benefits**

The end result of this project will be simulation of the multi-asset renewal fund performance taking into consideration various guarantee scenarios. The fund is in the phase of fund-raising to run a pilot. Outcomes of the simulations might prove its feasibility and encourage additional investors to commit capital into it.

### **1.7 Key concepts**

**Asset class** is "a broad group of securities or investments that tend to react similarly in different market conditions. Individual asset classes are also generally governed by the same rules and regulations. The three main asset classes are equities (stocks), fixed-income (bonds) and cash equivalents (money market instruments)." (Financial Times Lexicon 2016a.)

**Asset allocation** is a process of diversifying investments among different asset classes to decrease level of risks (Keown, Martin & Petty 2011, 174).

**First-loss guarantee** is "a technique commonly used in the securitization of assets to provide credit enhancement where a third party agrees to indemnify holders for a given amount or percentage of any losses from the asset pool." (Oxford Reference 2016.)

**Impact investments** are the investments into organisations, companies, projects or funds with intention to achieve environmental and/or social impact together with financial returns (Global Impact Investing Network 2016).



**Liquid asset** is an asset easy to sell or convert to cash without losses on its value, e.g. cash, bank notes, treasury notes (Economic Times 2016).

**Multi asset class is** “a combination of asset classes (such as cash, equity or bonds) used as an investment. A multi-asset class investment would contain more than one asset class, thus creating a group or portfolio of assets. The weights and types of classes will vary per the individual investor.” (Investopedia 2016.)

**Risk-return profile – risk should always be rewarded with a higher return than those of risk-free investments (Berk & DeMarzo 2011). Risk – return profile means that investor who wants to get higher return on investment should accept higher risk as well.**

## 2 Access to finance for Small and Medium-sized Enterprises

European Commission defines an enterprise as an entity engaged in economic activity (European Commission 2003). Defining company as micro, small or medium is dependent on the count of employees and company's turnover or total balance sheet.

Table 2. Definition of Small and Medium-sized Enterprises (European Commission 2013)

Category	Number of employees	Turnover	Balance sheet total
<b>Micro</b>	<10	≤ € 2 m	≤ € 2 m
<b>Small</b>	<50	≤ € 10 m	≤ € 10 m
<b>Medium-sized</b>	<250	≤ € 50 m	≤ € 43 m

Small and medium-sized enterprises in Europe play a very important role in economic growth. They constitute for 99,7% of all enterprises in Finland (99,8% in European Union). Around 63% of Finnish workforce is employed in SMEs (average of 67% in EU). (Eurostat 2016).

They have ability to create employment and to innovate. However, those small companies are having the biggest problem in obtaining financing needed to grow.

### 2.1 Bank lending for SMEs and impact of Financial Crisis of 2008

Small and medium-sized enterprises, especially in their growth phases, are very dependent on the external sources of finance. Out of many possibilities, like equity, stocks, leasing etc., bank lending is the most common source of finance for European SMEs. (European Commission 2016). Unfortunately, not all small companies can get the long-term loans to develop, due to being perceived as too risky. SMEs quite often do not have any track records or assets to back up their loan applications. Also, the higher risk company is perceived to have, the higher the costs of loan are, if one is granted.

Quite a big impact on SMEs' accessibility to loans had the global financial crisis of 2008. During a housing bubble in the United States, the banks to exploit high prices of real estate and houses, and low interest rates, originated more and more loans. At some point all creditworthy customers already had a mortgage (prime mortgage), that is why banks started lending money to people without line of credit or any down payments (subprime mortgages). Then, banks were creating a portfolio of loans in the form of Collateralized Debt Obligations (CDOs) which were sold then to the investment banks, thus transferring the risks and freeing up capital for new loans. Next, the investment banks were dividing

the CDOs into tranches based on riskiness and selling them to investors. The problem was that more and more loans were have become riskier than investors believed and started to default on payments, causing the housing bubble to burst. When the loans and securities started to fall, the same happened to the institutions and banks that were holding them. Consequently, governments needed to react and save the biggest banks from the bankruptcy. Even though, the situation originated in the States, it had huge impact on the world markets. (Eiteman, Stonehil & Moffett 2010, 106-131.)

Since part of the financial crisis was lack of control over the issued loans, the Basel Committee on Banking Supervision has introduced Basel III, international regulatory framework developed to strengthen risk management, regulation and supervision of banking sector. (Bank for International Settlements 2016a.)

The main points of Basel III are (BIS 2016a):

- Leverage ratio of 3% – capital measure divided by exposure measure
  - o to ensure that bank has sufficient capital in case of financial stress
- Disclosure requirements – summary comparison table, reconciliation requirement, common disclosure template, etc.
- Stricter credit analyses and risk exposure measures

After the financial and economic crisis of 2008 financing accessibility for SMEs has significantly decreased.

## **2.2 Real and financial economy**

As European Commission points out in multiple reports, small and medium-sized enterprises are the backbone of European economy. Investing in actual firms and helping them to develop technologies and opportunities are investments in real economy. Real economy is the part of economy concerned with producing goods and services, whereas the financial economy tackles buying and selling on the financial markets (Financial Times Lexicon 2016b). There are multiple papers debating on the correlation of both economies and the impact of one on another. A lot of economists argue as well into which economy it is better to invest and why.

The interaction of real and financial side of economy got more complicated in the last years than it was initially. Financial economy is shaping the real economy and is being shaped by it. Due to the financialization, which is “the increasing importance of financial markets, institutions and motives in the world economy” (Epstein 2005), the financial

economy strengthened significantly and the real side weakened. Investors more often decide to make money from money rather than on actual products or companies (Collins 2015).

Cecchetti and Kharroubi (2015) claim that strong financial economy is harmful to the real economy's productivity. Their hypothesis is, that finance opt for low productivity industries, since they are the ones which own tangible assets that can be pledged as a collateral. Consequently, the industries based on the innovation, research and development without high number of tangible assets tend to be injured the most, and those are the sectors majority of SMEs sit in.

### **2.3 Funding gap and search for new investors**

The lack of money to fund future operations or development is simply called a funding gap. Because of the above reasons, small and micro companies are not having enough financing opportunities. That is why a lot of national and international organisations are trying to tackle the issue by looking for new investors and sources of capital.

For SMEs to grow and innovate, long-term investments are required. That kind of needs seem to match the long-term obligations of institutional investors, like pension funds, wealth management investors or insurance companies. Pension funds have long-term liabilities that need to be paid when called upon. That is why illiquid credit is well suit for them. They are giving up on liquidity, but gaining on higher risk-adjusted returns and structural protections.

According to Organization for Economic Co-operation and Development (2015), pension funds in OECD countries had USD 25.2 trillion of assets under management in 2014. This is a huge amount of capital that could be channelled as well to the real economy. However, the biggest concern is that pension funds tend to be risk-averse and aim at high return at the same time. We already know that lending money to start-up and small companies bears high risks. Next chapters will discuss a few of concepts and programs which aim at encouraging private investments with a use of public capital and de-risking tools.

### **2.4 Public – Private Capital Leverage**

The word "leverage" has multiple meanings. Let us shortly discuss some of them to have better understanding of the concept. Oxford dictionary gives following definitions:

1. Noun, “power to influence people and get the result you want”
2. Verb, “use something to maximum advantage”
3. Verb, “use credit or borrowed capital to increase the earning potential of shares”

The first two are more general; the third one is tied to finance. Of course, we are interested the most in the financial meaning. However, there is another meaning and use of the concept in the context of this thesis. World Bank Group et al. (2011, 34) refers to the term as “the ability of public financial commitment to mobilize larger multiple of private capital for an investment in a specific project or undertaking”. In other words, to make an investment more attractive for private investors by use of public money. Typically, that kind of arrangements are created by governments or organisations in order to finance socially responsible or environmentally friendly projects. As was pointed out before, small and medium-sized enterprises are a big part of economic growth and job creation, that is why that kind of leverage is considered as part of the structure of multi-asset renewal fund.

As the example of public-private cooperation we can take **blended finance**. It aims at mobilizing private capital flows with a use of development finance and/or philanthropic funds, to finance investments in economic, environmental and social progress. (World Economic Forum 2015.)

For the sake of getting a clear understanding of the concept, let us take a look at some statistics. United Nations in September 2015 established a set of 17 Sustainable Development Goals to be achieved by 2030, among others, end of poverty in the world, gender equality, quality education and decent work and economic growth. To accomplish those objectives, it is estimated that yearly circa \$4,5 trillion is needed. The public resources are insufficient for the purpose and that is why private investments are encouraged. The problem is, those are generally markets or industries with high risks and inadequate returns, that private investors are avoiding. At this point blended finance comes in, to overcome the barriers and risks to private capital. (WEF 2015.)

Multi-asset renewal fund with its four asset classes would use the blended finance in the small and medium-sized enterprises Risk Debt class. Government guarantee would secure private capital by the promise of repaying part of the investment in case of companies' default. Thus, inflow of money towards real economy and growth would be supported.

Another term relevant to this subject and worth understanding are **impact investments**. They are investments into organisations, companies, projects or funds with intention to

achieve environmental and/or social impact together with financial returns (Global Impact Investing Network 2016). The Global Impact Investing Network is a non-profit organization helping to grow impact investing.

Traditionally, investments were divided between donations optimizing social impact and investments optimizing risk-adjusted financial returns (J.P. Morgan 2015). The idea of impact investments is to bring both together in sectors such as clean technology, micro-finance, education or agriculture.

The Global Impact Investing Network characterizes this type of investments by 4 aspects (GIIN 2016):

- Intentionality - investors need to aim at having positive environmental and/or social impact through the investments made.
- Investments with return expectations - they are expecting financial returns on capital, or at least returns of capital invested.
- Range of return expectations and asset classes - impact investments are not limited to specific asset class and their return expectations vary.
- Impact measurement - investors commit to measure and report impact of their investments in order to provide transparency and accountability.

## **2.5 European Union's programs and instruments supporting SMEs**

European Union is running a lot of programs and instruments with intent to minimize effects of the crisis across member states and enhance economic development. The following examples might be relevant to Multi-Asset Renewal Fund structure, if the guarantee would be included.

### **2.5.1 Cohesion Policy: Investing in the real economy**

The financial crisis of 2008 brought along a lot of difficulties for businesses. The most hurt group are the Small and Medium-sized Enterprises. European Union designed multiple programs and instruments with the sole purpose of driving investments into real economy and enabling SMEs to obtain financing needed for development and innovation.

### **2.5.2 Joint European Resources for Micro to Medium Enterprises (JEREMIE)**

Joint initiative of European Commission and European Investment Bank Group (European Investment Bank and European Investment Fund) to increase cohesion in the EU. JEREMIE was launched in the years 2007-2013 to create new SME risk finance initiatives. The idea is to provide SMEs with finance in a sustainable and efficient way, with a use of EU structural funds. In the programming period 2014-2020 European Structural and Investment Funds programs are taking over those goals. (EIF 2016.)

### 2.5.3 European Structural and Investment Funds (ESIFs)

European Structural and Investment Funds are following the JEREMIE program. ESI Funds are used to boost job creation, growth and investments across Europe. The member states receive money from ESI funds to help SMEs become more competitive and innovative, increase amount of employed and paid people, and promote environmentally-friendly economy. There are multiple ESI funds, but one of the most interesting in this case is European Regional Development Fund. It is one of European Union's funds aiming at research and innovation, aid to SMEs, and support of low-carbon economy.

**ESI Financial Instruments** convert the resources available from EU into specific financial products. Under ESI funds companies can obtain loans, guarantees or equity financing. Financial instruments are managed by the managing authority in every member country who oversees use of resources through the fund of funds and/or the financial intermediaries. (EIB 2016.)

That kind of investment brings leverage effect. Use of public money takes away some of the risks of investments, thus encouraging private investors into financing given project or the company.

### 2.5.4 Horizon 2020

Horizon 2020 is the biggest research and innovation programme constructed by European Union to finance new projects. It has over €80 billion of funds available over years 2014-2020. It is aimed to "ensure Europe produces world-class science, removes the barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation" (European Commission 2014).

**Innovation in SMEs** is a program aiming at optimizing research, development and innovation environment for small and medium-sized enterprises. Through facilitating various support services, the goal is to strengthen innovation possibilities of SMEs and increase their value in the market. The SME Instrument under the Horizon 2020 provides multiple services for SMEs like grants for innovation development, free-of-charge business coaching or facilitated access to risk finance. (European Commission 2016.)

### **3 Asset Classes Considered in MARF**

Multi-asset renewal fund is still in its design process. Over the time the asset classes included in the Fund has been changing. The main purpose of the Fund is to provide real economy with the investors that it needs, but as well to make accurate returns from the financial markets. Another important influence on the fund design has the risk profile.

In finance one can find different types of risks. Systematic risk (also called market risk) is defined by Keown, Martin & Petty (2011, 168) as risk common for all companies and stocks, and which cannot be eliminated by diversification. The opposite of those, are the diversifiable risks (or unsystematic), which are result of factors unique to a particular firm. They are called company-unique risks.

Berk and DeMarzo (2011, 309) define diversification as “averaging out of independent risks in a large portfolio”. In pursuance of limiting the risks, it is important to diversify investments between assets, but as well to invest in various not correlated asset classes. If one company defaults due to unsystematic risk, the loss can be balanced out by other successful companies, even in the same asset class. However, if the whole asset class is not performing well, then diversification between asset classes is needed.

That is why the fund is comprised currently of four asset classes, both long-term and short-term investment opportunities with various liquidity levels. You will find the explanations of the asset classes used in the fund below.

#### **3.1 Small and medium-sized enterprises Risk Debt**

Debt finance is the money borrowed from an investor/s to finance business activities or growth, generally at the predetermined interest rate and maturity date, without giving up the ownership (Cambridge Dictionary 2016a). The whole loan (sale of bonds, bills or notes) must be paid back by maturity date.

Lending money to the company is safer than the equity financing. Debt financing might be either secured or unsecured. Majority of investors agree to lend money with a collateral. In case of bankruptcy senior debt is repaid as first liability, before shares etc.

Nonetheless, this type of financing bears its risks, which are important for the potential investors. One of them is liquidity risk. Liquidity is the ability to sell an asset immediately at



asset's fair market value/ true value (Eiteman & al. 2010, 110). The capital in debt financing is locked for specific period, depending on the contractual agreements. It means that liquidity is limited over the period of loan. If an investor decides to put their capital in that kind of investment there is no ready market to sell it immediately without losing return or sometimes even some part of principal on transaction.

One of the most common risks in investments is possibility of default. The lender has an agreement with a borrowing company with repayment schedule and terms of interest rates. If the borrower fails to meet its obligations (defaults), debt holders are given some rights to company's assets and may even put the company into bankruptcy to retrieve at least some part or the whole loan. (Berk & DeMarzo 2011, 510). Higher interest rates, so called risk premiums, are placed to compensate for the risks.

The other risk to consider is lack of independent credit rating on SMEs. Depending on the country, not every private company needs to publish their financial statements. Rating agencies are providing assessments on credit worthiness of big public companies. Small private companies quite often are missing that kind of analysis. Therefore, it is more difficult to analyse the risks of investment in the particular firm.

Last, but not least in small and medium-sized enterprises quite a big role plays human factor. If the company has only few employees managed by an owner without experience even the best business idea might not succeed. This is a risk factor quite difficult to assess and eliminate. Only the thorough qualitative research could give some answer and not all of investors are willing to conduct or pay for it.

### **3.2 Private and public equity**

Equity finance is the capital that company obtain by selling the shares instead of taking loans (Cambridge Dictionary 2016b). The MARF would include two separate asset classes based on equities: private and public. Private equity funding is provided by investors to privately owned companies in contrast to publicly traded companies.

Growth equity (or growth capital) is the asset class lying in between venture capital and private equity. Entities invest in mature companies with proven business models which did not need the financing so far. Generally, these are minority investments, without change in the control of the company. The companies decide for that kind of financing usually to expand the operations, develop new products or enter new markets. (Mooradian & Auerbach 2013.) Institutional investors like wealth or pension funds typically receive some safeguards for investment, but there are still risks like in almost all types of investments. Since

this thesis is focusing mainly on the risk debt asset class and its risk mitigation, I will introduce just shortly risks of the remaining classes.

Due to the fact, that equity investments are long-term ones like the debt investments, some of the risks are alike. To name a few: liquidity risk, default and bankruptcy risks, lack of proper assessment of value of a company and investment.

Share price is dependent on demand and supply fluctuations. These on the other hand are based on expectations of company's future earnings. Equity risks generally differ depending on the, for example, industry of issuer, economic cycle or changes in legislation. Also, foreign investments bear additional risks like exchange risk, when currency differs, political risks or counterparty risks. (Finanssivalvonta 2015.)

### **3.3 Bonds**

A bond is "a security sold by governments and corporations to raise money from investors today in exchange for the promised future payment (Berk & DeMarzo 2011). Bonds are "issued in series, with the same issue price, interest (coupon), maturity and repayment conditions" (Novello 2000, 88).

Bonds as all investments have their risks. Liquidity and default risks explained before, are also applicable to this asset class. However, there are different risks as well. One of them is interest rate risk. When the interest rate falls, the bond price rises, and vice versa. The interest rate is set at the date of issuance of the bond. If the interest rates are higher over the time, investors prefer to buy higher yield bonds. In that case the price of lower yield bonds is falling since the investors try to get rid of them. (Finra 2016.)

In case of callable bonds, there is a risk that the bond will be called by the issuing company sooner than expected (call risk), which means it will need to be redeemed and reinvested. There is a big chance that new bonds will be issued at the lower interest rate. Investor might be left with a cash without possibility to invest it at a comparable interest rate. However, callable bonds are usually issued with higher yield to compensate for the risk than similar non-callable bonds. (Finra 2016.)

Considering the fact, that the interest rate in majority of cases is set when the bond is issued, high inflation over the time of holding the bond might hinder the returns. If the infla-

tion is higher than the interest rate on the bond, the returns might be negative – decreased purchasing power. That kind of risk is called inflation or purchasing power risk. (Finra 2016.)

The companies are rated by rating agencies in terms of their ability to operate and repay debts and obligations. The bonds issued by an entity follow its rating. The range starts in the 'AAA' class proving high credit quality, going to 'D' for companies in default. Companies with lower credit rating typically get loans with higher interest rates. However, rating agencies may have different criteria of their grades and rating of the same bond can be different, or some of companies might not have a rating at all.

Multi-Asset Renewal Fund is meant to help economic development in a sustainable way. That is why climate bonds are considered as an investment class.

Climate bonds are issued to finance projects addressing sustainability and climate. Green bonds are used in financing environmental projects. However, majority of green bonds so far were financing climate projects anyway.

Green bond market is relatively new one, it began in 2007 with European Investment Bank issuing the first "Climate Awareness Bond" ([cityminded.org](http://cityminded.org)). The market expanded in 2013 when the International Finance Corporation's \$1 billion of green bonds were sold within an hour, and is rapidly growing. Green bonds were first issued by supranationals like European Investment Bank (EIB), International Finance Corporation (IFC), International Bank for Reconstruction and Development (IBRD). After that, other international organizations have followed, and finally corporations.

Considering the fact, that green bonds are relatively new in the financial market, the criteria of "greenness" are still blurry. The Green Bond Principles (GBP) created by Green Bond Principles Executive Committee with help of the International Capital Market Association (ICMA), aim at giving the guidelines of transparency and integrity in the Green Bond Market. Green Bonds are defined by GBP Executive Committee (2015) as "any type of bond instruments where the proceeds will be exclusively applied to finance or re-finance in part or in full new and/or existing eligible Green Projects and which follows the 4 Green Bond Principles." Green Project is defined in the same document as "projects and activities that will promote progress on environmentally sustainable activities".

There are four components of Green Bond Principles (ICMA 2015):

1. **Use of Proceeds.** The eligible green projects address key environmental issues like climate change, pollution, biodiversity conservation, natural resources depletion. GBP lists few categories of the projects like sustainable waste management, clean transportation, sustainable land use (agriculture), renewable energy.
2. **Process for Project Evaluation and Selection.** Following the transparency and disclosure principles the issuer of green bond should present the process of determining if the project fits the criteria given in the Green Bond Principles and the criteria used in that specific case. Issuer should introduce the environmental sustainability objectives as well. Second party review is recommended.
3. **Management of Proceeds.** The proceeds from green bonds should be directed to the sub-account or sub-portfolio to be able to track in appropriate manner their link to operations and investments in the green projects. Auditors or third party should verify the internal tracking methods and allocation of funds from the proceeds.
4. **Reporting.** Issuers should report the use of proceeds, temporary investment of unallocated proceeds, list of the projects to which proceeds from Green Bonds were allocated. The use of qualitative and quantitative performance measures of environmentally sustainable impact of the specific investment is recommended.

Green bonds bear the risks of regular bonds. However, there are some additional ones specific to them.

One of the main risks that come to mind when thinking of green or climate bonds is that there is not that much historical data available. Consequently, it is more difficult to estimate the risks and returns than with regular government or corporate bonds. Green bonds are in the market just for few years now, and so far there are not that many ready definitions and principles in use to label the bond as 'green'. There are a lot of bonds issued to finance environmental projects, but they are not sold in the market as green ones. (Ludvigsen 2015.)

The other great risk is so called 'greenwashing'. The idea is that corporations might claim purposefully to be green and clean, whereas in reality, they cannot give any evidence for that. It is connected as well with the previous point, that is lack of specific rules and standards worldwide. Some projects might be green, but they might bring side effects which are not environmentally friendly anymore. (Krimphoff 2016.)

## 4 Guarantees

Public guarantees and guarantee schemes are used to catalyse private sector investments in projects or asset classes which would not be in the investors' interest otherwise. Guarantees can be used in many different forms and for many different purposes. However, the main goal of public guarantees is to drive investments in projects supporting economic growth and innovation. In chapter 4, several of guarantee schemes are introduced to get basic understanding of how they could be applied to MARF's structure and what are the eligibility criteria.

### 4.1 The Global Impact Investing Network

According to the GIIN webpage, the interest in impact investing rises from various investor types, among others, pension funds and wealth managers that MARF is targeting as well. One of the biggest issues is that impact investments are often seen as having high financial risks. In order to encourage additional inflow of capital, credit enhancement tools are used. One of them, proposed by the GIIN is **Catalytic First-Loss Capital (CFLC)**. The idea is to improve the risk-return profile of investment, mobilize more risk-averse sources of commercial capital and stimulate the activity in markets.

The Global Impact Investing Network in their report "Catalytic First-Loss Capital" (2013) lists three main features of the tool. (1) It requires finding a Provider, who will bear the first losses, generally amount agreed beforehand. (2) The tool is catalytic, due to improving risk-return profile it catalyses presence of investors that would not participate otherwise. (3) It helps to channel capital towards specific purposes and outcomes.

CFLC uses different instruments to serve the purpose, e.g. equity, grants, subordinated debt and guarantees. Especially, the last tool is interesting in the project, since MARF will most probably use government's (or other institution's) guarantee on the SME Risk Debt asset class to cover the first-loss if portfolio companies default.

Main characteristics of the guarantee:

- Guarantee equal to 5% of outstanding balance on the investor notes
- Cash reserve equal to one quarterly payment on notes
- Depending on the amount of the loan, costs of guarantee are 0%, 0,25%, 3%, 3,5% of the guaranteed value

## 4.2 European Investment Fund

European Investment Fund is a provider of risk finance to small and medium-sized enterprises in Europe. It is supported by the European Union, European Commission and European Investment Bank. The objective is to increase access of SMEs to financing for growth, innovation and expansions purposes. By doing so, EIF helps in stimulating regional development and job creation, as well as achieving appropriate returns for the shareholders.

One of the instruments used by EIF is **InnovFin SME Guarantee Facility**. The initiative uses eligible banks, leasing facilities, guarantee institutions etc. as financial intermediaries. The instrument covers portion of the losses on the loans etc. (between EUR 25 000 and EUR 7,5 million) incurred by above mentioned intermediaries. Existence of that kind of programs proves the need for alternative financing for Small and Medium-Sized Enterprises. (EIF 2014a.)

Main characteristics of the guarantee:

- Transaction between EUR 25000 and EUR 7,5 million
- Up to 50% of the defaulted amount guarantee rate on a loan by loan basis
- Guarantee Fee Percentage: 0,5% per annum with respect to SME transaction, 0,8% per annum with respect to small mid-cap transaction

## 4.3 Competitiveness of Enterprises and Small and Medium-sized Enterprises

Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME) is the European Union programme for 2014-2020. The purpose of initiative is to improve SMEs' access to finance (loans and equity finance) in different stages of their lifecycle by providing guarantees. Cooperation can be obtained through specific eligible financial intermediaries in the member countries.

### **Capped Direct Guarantee under COSME Loan Guarantee Facility**

The objective of the instrument is to enhance access to finance to SMEs in European Union. The emphasis is put on start-up and growth phases of the enterprises, especially those who are perceived as risky, do not have track records or available collateral, and therefore are refused financing from the banks. (EIF 2014b.)

Main characteristics of the guarantee:

- Up to 50% of transactions value
- Financial intermediary retaining minimum of 20% exposure to every intermediary transaction
- Guarantee Cap Rate: percentage of the portion of Actual Portfolio Volume covered by guarantee, up to 20%
- Guarantee Cap Amount: Actual Portfolio Volume x Guarantee Rate x Guarantee Cap Rate
- Guarantee free of charge
- Guarantee paid upon default of particular transaction

#### 4.4 European Investment Bank

**The First Loss Portfolio Guarantee instrument** in Malta is an example of a program for SMEs and its results. The Guarantee of EUR 12 million (funded from European Regional Development Fund and national public funding) was used to build up portfolio of over EUR 60 million. As an outcome around 760 projects were supported in 650 SMEs, which most probably would not get needed finance otherwise. (EIB 2016.)

Main characteristics of the guarantee:

- Guarantee of 75% of each loan in the portfolio
- Up to a total portfolio cap of 23%
- EU leverage 6,1 times
- ESIF programme Multiplier – 5,2 times

**The First Loss Portfolio Guarantee instrument** in Bulgaria is a second case study using the same type of investment tool. In Bulgarian case EUR 60 million of public funds attracted additional EUR 301 million of private funds. There were almost 4000 recipients and approximately 78 000 jobs supported. (EIB 2015.)

Main characteristics of the guarantee:

- Guarantee 80% of eligible SME loans
- Up to guarantee cap calculated as percentage of portfolio
- EU Leverage 5,9 times (effect of European Regional Development Fund)
- ESIF Multiplier – 5 times

## 5 Multi-Asset Renewal Fund's Structure

Creating a new investment vehicle requires conducting research, but as well making some assumptions. After choosing asset classes to be included in the fund next step was to determine asset allocation between them. The decisions have been made based on the risk level of asset classes and expected rate of returns.

### 5.1 Asset Allocation in Multi-Asset Renewal Fund

In order to simulate MARF's performance Initial Asset Allocation was decided to be following: Climate Bonds would make 40% of the whole fund, SME Risk Debt 35%, Public Equity 15% and Private Equity 10% (Figure 1).

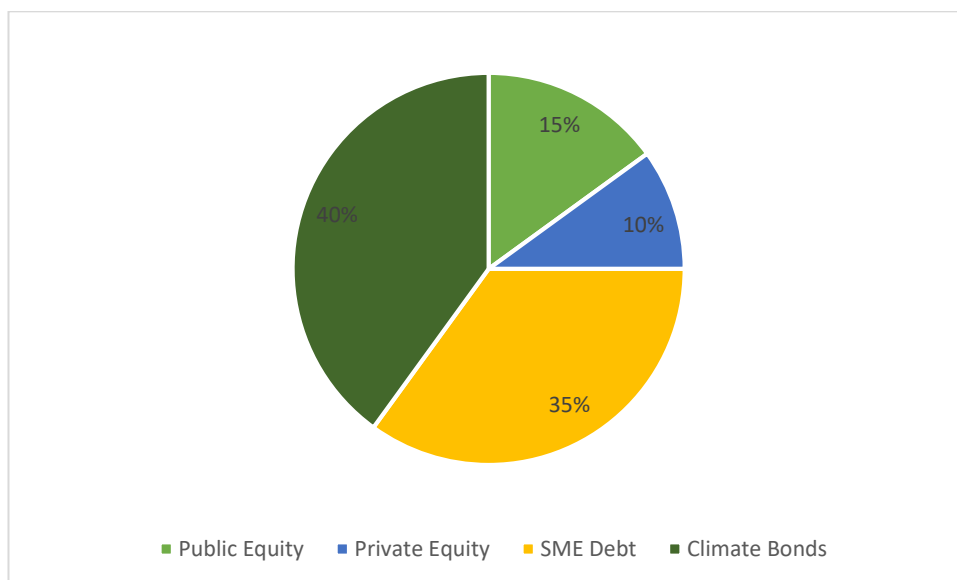


Figure 1. Initial Asset Allocation Portfolio

The group of students from Ross School of Business in Michigan has created a risk rating for the separate asset classes as well as for the whole fund. The next step was to estimate expected returns of the fund, keeping the allocation decisions. The calculations performed by the team resulted in expected return of 6% per year. The result was satisfying; however, it was questioned that maybe the result might be better if the allocation is adjusted. Therefore, as the final step of their work, the optimization of the MARF with a use of Monte Carlo simulations has been prepared. Sharpe Ratio has been chosen as the measure of comparison between different portfolios.

Sharpe Measure calculates the ratio of reward-to-volatility provided by a portfolio. Estimation of overall portfolio's performance is based on two measures: expected rate of return



of given investment and predicted volatility expressed as standard deviation of a return. (Sharpe 1966, 119-138.)

Sharpe Ratio calculates the excess return of portfolio or an asset above the risk-free rate of return per unit risk. The higher the Sharpe Ratio, the better performance of the portfolio. As well the steeper the line combined with risk-free investment, the higher the expected returns per any level of volatility. (Berk & DeMarzo 2011, 351.)

The formula is as follows:

$$\text{Sharpe Ratio} = \frac{\text{Portfolio Excess Return}}{\text{Portfolio Volatility}} = \frac{E[R_p] - r_f}{SD(R_p)}$$

Where:

$E[R_p]$  = Expected Return of Portfolio

$r_f$  = Risk-free Rate

$SD(R_p)$  = Portfolio Standard Deviation

In the case of MARF, we are looking at ex-ante Sharpe ratio formula since we do not have specific historical returns. Also, there are 4 separate designs of allocation between asset classes taken into consideration.

Depending on the target returns and the risk level that investors are willing to take, 3 scenarios were presented: Minimum Volatility Portfolio, Maximum Sharpe Ratio Portfolio and The Highest Risk Portfolio.

Table 3. Allocation percentage between asset classes in different scenarios

	Public Equity	Private Equity	SME Debt	Climate Bonds
Initial Asset Allocation Portfolio	15%	10%	35%	40%
Minimum Volatility Portfolio	12%	10%	33%	45%
Maximum Sharpe Ratio Portfolio	19%	10%	26%	45%
The Highest Risk Portfolio	20%	21%	40%	19%

**Minimum Volatility Portfolio** (Figure 2) assumes the highest allocation (45%) in the liquid class which are Climate Bonds. As presented before, liquid assets bear lower risks, because it is easier to buy and sell them immediately. Therefore, this asset class is expected to bring lower returns as well. This scenario allocates only 22% to Public and Private Equity classes together, which can earn the highest returns but while taking the highest risks. This portfolio is expected to bring 7.70% returns.

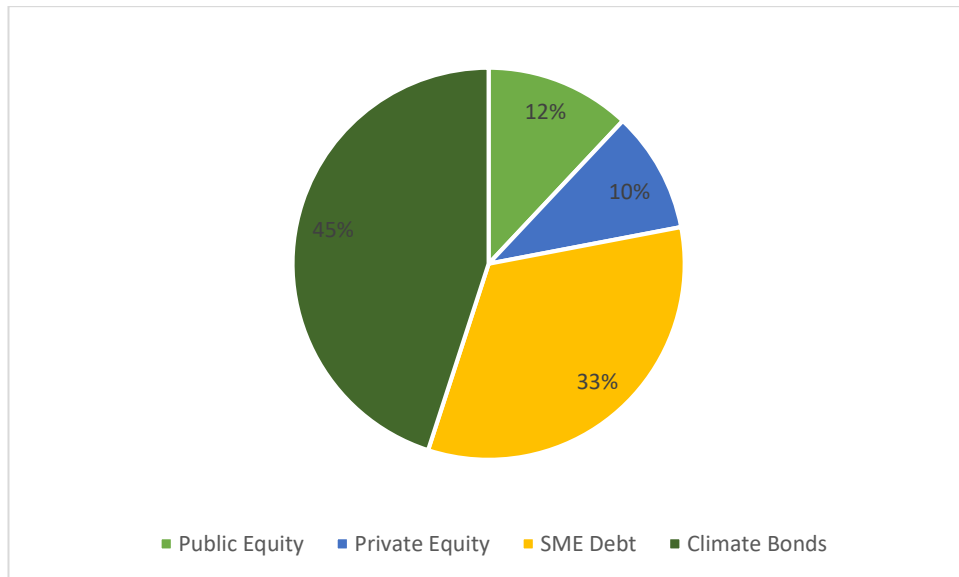


Figure 2. Minimum Volatility Portfolio Asset Allocation

**Maximum Sharpe Ratio Portfolio** (Figure 3) presents the estimated highest risk-adjusted returns. The second scenario keeps as high allocation to bonds and as low allocation to private equity (10%) as the first one, but there are changes between remaining two asset classes. 7% percent of invested money would be moved to riskier Public Equity assets from SME Debt class. Within that allocation of fund between asset classes, MARF according to estimations should reach returns at the level of 10.50%.

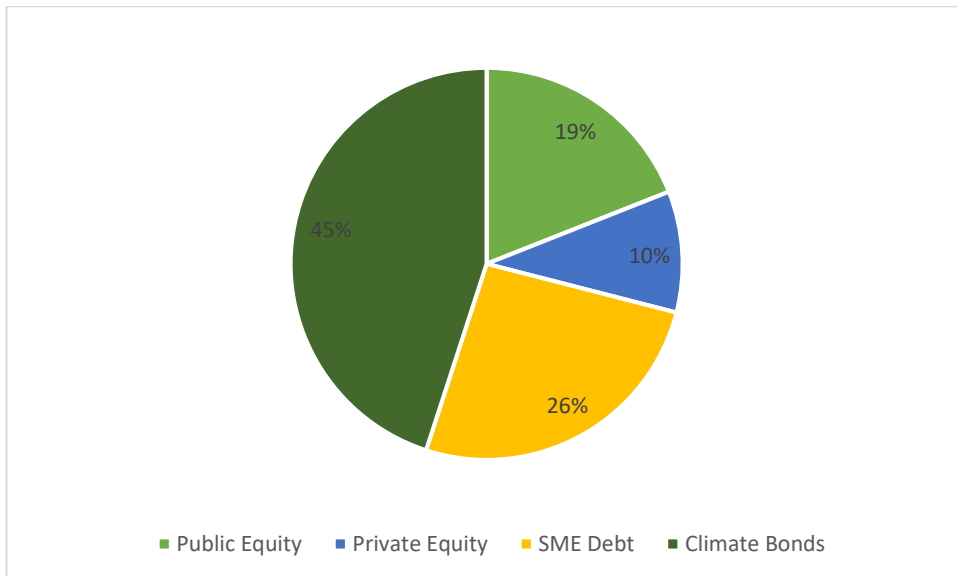


Figure 3. Maximum Sharpe Ratio Portfolio Asset Allocation

**The Highest Risk Portfolio** (Figure 4) illustrates quite a big shift from less risky assets to risky long-term illiquid asset classes (Private Equity – 21%, Public Equity – 20% and SME Debt – 40%). Third scenario assumes that only 1/5 of the fund would be allocated into less risky climate bonds. This scenario assumes that MARF could earn 14% returns, but investors would take much more risk as well.

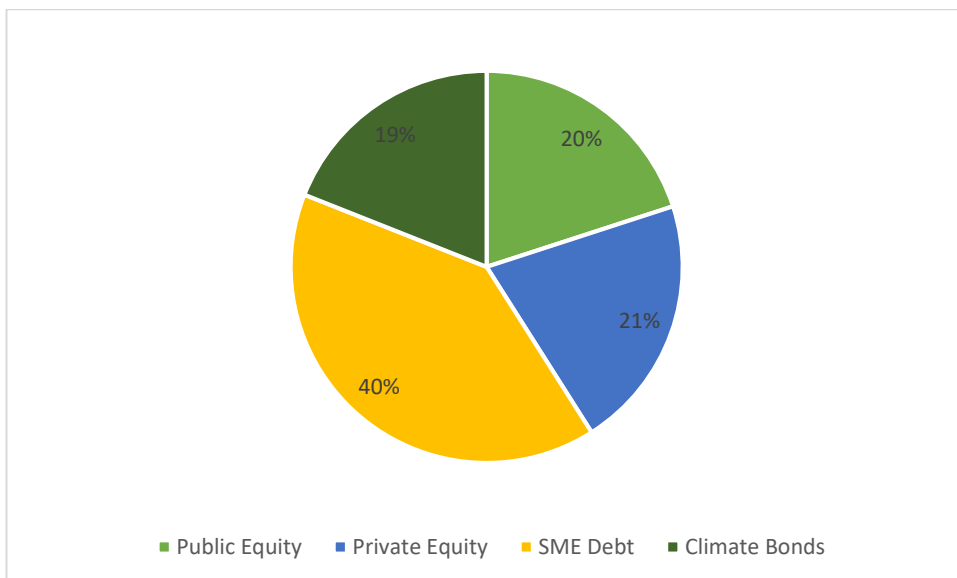


Figure 4. The Highest Risk Portfolio Asset Allocation

Since the project is of the long-lasting nature and there were a lot of participants, some miscommunication happened in the process. Due to lack of some data and calculations, it was decided that next steps, that is investigating the impact of governmental guarantee on the fund, will be researched on the simplified calculations.

As we already know Sharpe ratio is commonly used in finance to estimate reward-to-risk variability. That is why Sharpe ratios of all four scenarios were calculated.

In order to get all necessary data for the formula we are using historical performance of the companies and stocks which could be possibly used in the actual fund. The data has been extracted from Bloomberg database and Asiakastieto registry.

Table 4. Estimated returns of particular asset classes

	Public Equity	Private Equity	SME Debt	Climate Bonds
Expected Returns	6-9%	10-20%	5-8%	2-7%
Expected Average Returns	7,5%	15,0%	6,5%	4,5%

As presented in the Table 4, Public Equity investments are expected to bring returns from 6% to 9% with a mean of 7.5%. Riskier Private Equity class can reach up to 20%, with average of 15%, Debt investment to SME on average would bring 6.5%, while Climate Bonds 4.5%, up to 7%.

Sharpe ratio formula includes mean expected returns, which in this case will be weighted accordingly to asset allocation. The risk-free rate used in the calculations is 10-year Finnish sovereign bond rate from April 2016 (0.41%) which was used in previous simulations. Even though the rate changes over time, for the purpose of consistency the rate was kept. The last part of the formula is standard deviation of returns. The companies from Bloomberg and Asiakastieto which met the criteria that the fund sets, were used as the comparables. Additionally, standard deviation was calculated not only for asset classes separately, but as well for the overall funds.

## 5.2 Simulation of 250M € funds

Based on feedback collected by fund designers from various stakeholders (pensions funds, asset managers, etc.) MARF to be profitable should have at least 250 to 500 million Euros of assets under management (AUM). To compare value of SME Debt class between different fund scenarios, let us assume value of the fund to be 250 million Euros. Monetary value of each of asset classes in all four scenarios is presented in the Table 5.

Table 5. Euro Value of each asset classes in €250 M funds

	Public Equity	Private Equity	SME Debt	Climate Bonds
Initial Asset Allocation Portfolio	€37 500 000,00	€ 25 000 000,00	€ 87 500 000,00	€100 000 000,00
Minimum Volatility Portfolio	€ 30 000 000,00	€ 25 000 000,00	€ 82 500 000,00	€112 500 000,00
Maximum Sharpe Ratio Portfolio	€47 500 000,00	€ 25 000 000,00	€ 65 000 000,00	€112 500 000,00
The Highest Risk Portfolio	€ 50 000 000,00	€ 52 500 000,00	€100 000 000,00	€ 47 500 000,00

Depending on the scenario, the value of SME Debt class would hold between €65M to €100M.

In majority of researched guarantees, guarantor would pay the guarantee amount when the given transaction defaulted. That is why we would like to know how much money could be lost on the investment and how much would be covered by potential guarantee. To obtain this information Expected Loss Given Default was calculated.

Expected Loss (EL) formula is following:

$$EL = PD * LGD * EAD$$

Where:

1. Probability of Default (PD) – likelihood that repayments of loan will not be made and the loan will fall into default, presented as a percentage or a fraction
2. Loss Given Default (LGD) – credit loss if obligor defaults, presented as a percentage or a fraction
3. Exposure at Default (EAD) – estimated extent to which debtor is exposed to obligor in the event of default, presented as a Euro value (Bank for International Settlements 2016b)

Based on Adriaens & Tahvanainen (2016) among Finnish Small and Medium-sized Enterprises over last few years the probability of default equalled circa **2.5%**. This rate will be used in the simulation. Since probability might change in the future as well we will create another scenario with **5% PD**.

Loss Given Default for the formula will be dependent on the rate of guarantee used in the calculations. Different rates will be used as variable in the simulation. To limit possibilities,

3 percentage rates were chosen: **20%**, **50%** and **100%**. The last possibility is highly unlikely; however, it is used just for the matter of comparison.

The last information needed for this calculation is Exposure at Default, which is simply a part of loan that has not been repaid yet. In this case the whole value of SME Debt asset class will be used as EAD.

Firstly, the amount covered by the guarantees was calculated for all four scenarios and for three guarantee rates.

Table 7. Euro amount covered by the guarantee under various conditions

RATE OF GUARANTEE COVERAGE / RECOVERY RATE	Initial Asset Allocation	Minimum Volatility Portfolio	Maximum Sharpe Ratio Portfolio	The Highest Risk Portfolio
	€ 87 500 000,00	€ 82 500 000,00	€ 65 000 000,00	€ 100 000 000,00
20%	€ 17 500 000,00	€ 16 500 000,00	€ 13 000 000,00	€ 20 000 000,00
50%	€ 43 750 000,00	€ 41 250 000,00	€ 32 500 000,00	€ 50 000 000,00
100%	€ 87 500 000,00	€ 82 500 000,00	€ 65 000 000,00	€ 100 000 000,00

In the Table 7 and Figure 5 we can see that amount possibly covered by the guarantees might have huge disproportion within given assumptions. The lowest amount is €13M in the Maximum Sharpe Ratio Portfolio, to compare it with €100M if the whole amount is covered in the Highest Risk Portfolio. Nonetheless, it should be noted that the chances that all the loans would default at the same time are very low.

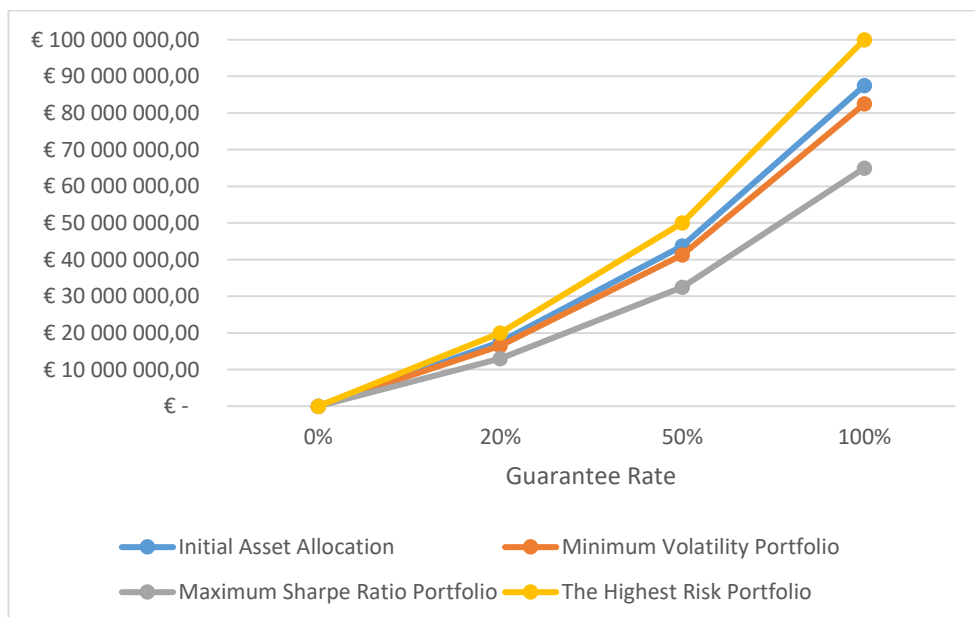


Figure 5. Euro amount covered by the guarantee under various conditions

Having all the information for the formula, Expected Loss was calculated for different variables following the example:

$$PD * LGD * EAD = EL$$

$$2.5\% * 80\% * \text{€}87\,500\,000,00 = \text{€}1\,750\,000,00$$

The results can be found in tables 9 for 2.5% PD calculations and table 10 for 5% PD.

Table 9. Expected Loss with 2.5% PD

EXPECTED LOSS DEPENDING ON THE GUARANTEE RATE	Initial Asset Allocation	Minimum Volatility Portfolio	Maximum Sharpe Ratio Portfolio	The Highest Risk Portfolio
	€ 87 500 000,00	€ 82 500 000,00	€ 65 000 000,00	€ 100 000 000,00
0%	€ 2 187 500,00	€ 2 062 500,00	€ 1 625 000,00	€ 2 500 000,00
20%	€ 1 750 000,00	€ 1 650 000,00	€ 1 300 000,00	€ 2 000 000,00
50%	€ 1 093 750,00	€ 1 031 250,00	€ 812 500,00	€ 1 250 000,00
100%	€ -	€ -	€ -	€ -

Given that 2.5% of all repayment transactions of the loans will fail by SMEs, the fund could lose up to €2.5M without guarantee in the riskiest scenario. However, just 20% of coverage makes already a €500 000 difference. Those would be secured repayments which should also bring additional interest return.

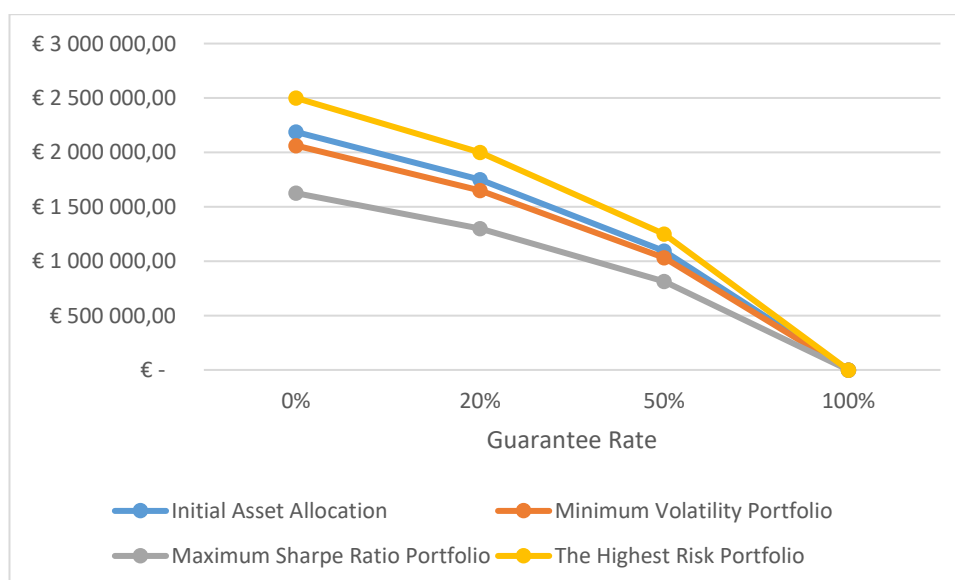


Figure 6. Expected loss given 2,5% default

In case of 5% of companies defaulting on the payment, the fund could secure up to €1M in just the lowest coverage (€5M lost in Highest Risk Portfolio vs. €4M with 20% guarantee).

Table 10. Expected Loss with 5% PD

EXPECTED LOSS DEPENDING ON THE GUARANTEE RATE	Initial Asset Allocation	Minimum Volatility Portfolio	Maximum Sharpe Ratio Portfolio	The Highest Risk Portfolio
	€ 87 500 000,00	€ 82 500 000,00	€ 65 000 000,00	€100 000 000,00
0%	€ 4 375 000,00	€ 4 125 000,00	€ 3 250 000,00	€ 5 000 000,00
20%	€ 3 500 000,00	€ 3 300 000,00	€ 2 600 000,00	€ 4 000 000,00
50%	€ 2 187 500,00	€ 2 062 500,00	€ 1 625 000,00	€ 2 500 000,00
100%	€ -	€ -	€ -	€ -

The results can be found in the table 10 and Figure 7.

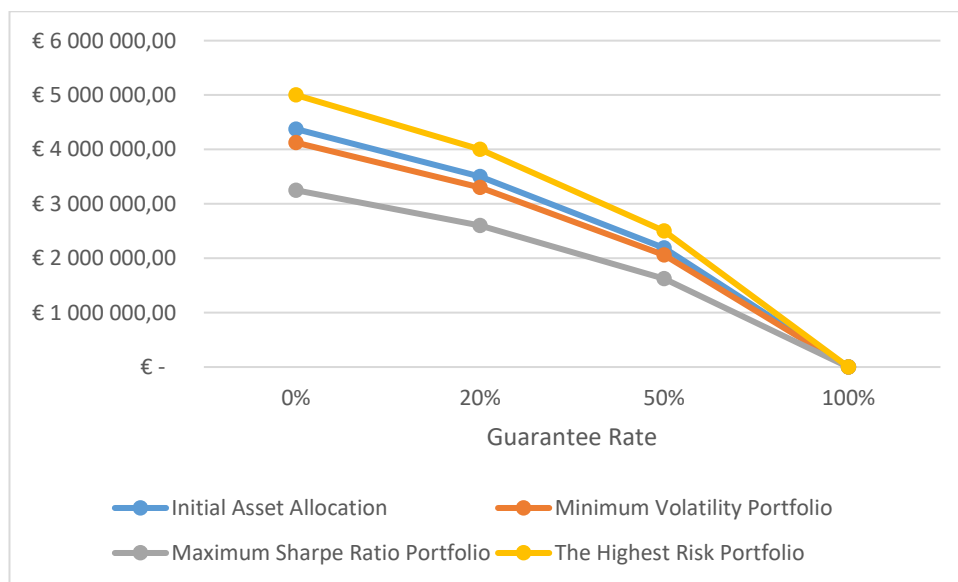


Figure 7. Expected loss given 5% default

### 5.3 Simulation of funds investing in real Finnish SMEs

In the previous chapters, we looked at possible losses or savings assuming, that the whole multi-asset renewal fund would have 250 million euros of assets under management. Let us check how much money could be invested in the actual Finnish small and medium-sized enterprises based on their past performance and results of comparable companies.

The students from Michigan in their project prepared a list of Finnish companies based on the information from two databases, Bloomberg and Asiakastiето. The list included all the



available financial and performance information. Based on those, multiple financial ratios were prepared for each of the companies. The team have based their list of companies on the Monte Carlo simulations and comparable companies, to predict possible returns. It was researched that the most indicative ratios of future performance are the following ones:

- Debt Ratio
- Debt to Equity Ratio
- Short-term Debt to Equity Ratio
- EBIDTA to Interest Ratio
- Cash to Assets Ratio
- Long-term Debt to Total Liabilities Ratio

**Debt Ratio**, also called debt-to-assets ratio, measures how big part of company's assets is financed by the debt. Based on the ratio we can learn the extent of company's leverage. The higher the ratio, the greater the financial risk of company.

The formula for the Debt Ratio includes Total Debt being divided by Total Assets.

Debt Ratio = Total Debt / Total Assets

**Debt to Equity Ratio (D/E Ratio)** is another measure used to assess the riskiness of financial structure of the company.

Debt to Equity = Total liabilities / Shareholders' Equity

The ratio helps to understand how the business is being financed. Ratio measures the proportion of debt financing and equity financing. Total liabilities include all the short-term and long-term liabilities, and leases. The more debt, the more difficult it might be for suppliers or investors to get their repayments.

**Short-term Debt to Equity Ratio** explains how the daily operations of business are being financed. Short-term debt can be comprised of bank loans which should be paid back within 12-month period; accounts payable – including all the outstanding payments due to vendors and stakeholders; employees' salaries which are paid with some delay after finished work; lease payments; or due taxes.

The amount of current liabilities to equity might indicate upcoming financial distress if the cash flows are not sufficient to cover the costs.

**EBIDTA to Interest Ratio** or **EBIDTA coverage**, assesses company's durability. The ratio calculates if the firm is profitable enough to pay the interest expenses. EBIDTA stands for Earning Before Taxes, Depreciation and Amortization.

**Cash to Assets Ratio** indicates the cash flow of the company relative to assets that company owns. If the company has

**Long-term Debt to Total Liabilities Ratio** can indicate the condition of the company. If company depends a lot on long-term loans, investing in the company might not be safe, because of long-lasting commitments to other borrowers.

Table 11. Key financial ratios of the Finnish SMEs chosen through Monte Carlo Simulation

	Debt Ratio	Debt to Equity	Short-term Debt to Equity	EBITDA to Interest	Cash to Assets	Long-term debt to Total Liabilities
<b>SME Debt Companies</b>						
Cadring Oy	0,42	0,71	0,71	0,72	0,24	0
Picodeon Ltd Oy	0,58	1,37	0,17	-45,32	0,17	0,88
Kabus Oy	0,92	11,1	0,78	-27,88	0,05	0,93
Teconer oy	0,24	0,32	0,32	-	0,96	0
E-Bros Oy	0,42	0,71	0,41	-2,25	0,03	0,42
Ajeco Oy	1,74	-2,35	-0,54	6,35	0,08	0,77
Creanex Oy	0,29	0,41	0,41	-	0,49	0
Visedo Oy	0,36	0,57	0,12	-68,31	0,18	0,79
Oceanvolt Oy	0,76	3,17	0,80	-92,75	0,11	0,75
Oceanvolt Oy	0,57	1,32	1,10	0,23	0,26	0,17
DA-Design Oy	0,92	11,40	8,14	2,70	0,18	0,29
<b>Private Equity Companies</b>						
Bravioz Oy						
Ecomond Oy	1,72	-2,40	-1,18	109,00	0,00	0,51
Mobinet Oy	0,82	4,70	4,70	-	0,61	0
Weegos Oy						
iQ Payments Oy						
Coreorient Oy	1,24	-5,25	-3,42	-	0,12	0,35
Anadium Group Oy	0,27	0,38	0,38	-	0,09	0

Based on financial ratios, past performance of the companies and commonly used practices, we made some assumptions on which companies would be considered as safe enough to invest in. In the table 11, we can find companies chosen by the Ross School of Business team alongside their financial ratios mentioned above. Together with professor Adriaens, we set three additional criteria which companies should meet to be considered

as investable. Firstly, their debt ratio should not be higher than 0.6. Second criterion: they are not exceeding value of debt to equity ratio of 0.75; and third: long-term debt to total liabilities is lower than 0.45. From the list of almost 20 companies, only 5 met the set criteria. The result can be seen in table 12.

Table 12. Companies meeting three additional criteria

	<b>Debt Ratio</b>	<b>Debt to Equity</b>	<b>Short-term Debt to Equity</b>	<b>EBITDA to Interest</b>	<b>Cash to Assets</b>	<b>Long-term debt to Total Liabilities</b>
Cadring Oy	0,42	0,71	0,71	0,72	0,24	0
Teconer oy	0,24	0,32	0,32	-	0,96	0
E-Bros Oy	0,42	0,71	0,41	-2,25	0,03	0,42
Creanex Oy	0,29	0,41	0,41	-	0,49	0
Anadium Group Oy	0,27	0,38	0,38	-	0,09	0

Then we proceeded with calculations of how much money could be borrowed to the chosen companies not to exceed revised ratios values of 4 for debt to equity and 0.7 of long-term loan to total liabilities.

Table 13. Amount of debt companies could receive without exceed revised ratios criteria

	<b>Mezzanine or Long-term Debt</b>	<b>Revised Debt to Equity</b>	<b>Revised Long-term to Total Liabilities</b>
Cadring Oy	€ 554 800,00	4	0,48
Teconer oy	€ 120 600,00	4	0,69
E-Bros Oy	€ 4 355 449,20	4	0,7
Creanex Oy	€ 433 400,00	4	0,64
Anadium Group Oy	€ 5 800,00	4	0,66
Total	€ 5 470 049,20		

In the table 13 we can find the results of how much money could be invested in the SME Debt and Private Equity classes assuming use of the set criteria. As we can see, the total of investments for all 5 companies is only around 5.5 million euros. It means that, based on the financial ratios, lending more money to the companies would be too risky. The financial ratios would exceed the assumptions and the companies would be financed almost entirely by the given loan.

The problem, as discussed before, is that the fund aims at small and medium-sized enterprises, which might not have steady cash flows yet, or do not have profit. As we already know, the SMEs are the companies which are playing huge part in the innovation and growth of economy. The question is: how to encourage private investors to allocate their

money into riskier companies. That is the reason why governmental guarantees are used in the MARF.

#### 5.4 The value of the funds with actual companies in the SME Debt class

The previous chapter introduces some insights of the Finnish small and medium-sized enterprises ecosystem. We have already calculated the asset allocation euro value in four scenarios for the 250M € fund. Let us present the euro value of funds if the Debt class if the funds would be comprised of the companies and loans calculated in the table 13.

Table 14. Value of the funds assuming the calculated amount of investment in Debt Class

	Public Equity	Private Equity	SME Debt	Climate Bonds	Total
Initial Asset Allocation	€ 2 341 821,09	€ 1 561 214,06	€ 5 464 249,20	€ 6 244 856,23	€ 15 612 140,57
Minimum Volatility	€ 1 986 999,71	€ 1 655 833,09	€ 5 464 249,20	€ 7 451 248,91	€ 16 558 330,91
Maximum Sharpe Ratio	€ 3 993 105,18	€ 2 101 634,31	€ 5 464 249,20	€ 9 457 354,38	€ 21 016 343,08
The Highest Risk	€ 2 732 124,60	€ 2 868 730,83	€ 5 464 249,20	€ 2 595 518,37	€ 13 660 623,00

In the chapter 5.2 we discussed 4 different scenarios of assets allocation and how the 250M € funds would look like. After calculating how much money could be invested in the existing companies in the SME Debt class, while keeping all the assumptions, we can calculate how big the funds would be. The value of Debt class is a sum of investments to the companies from table 13, excluding Anadium Group Oy, which would belong to the Private Equity class.

Looking at the values in table 14 we can clearly see that the amounts in comparison with 250 million fund are not very high. The biggest fund would have ca. 21M €, whereas the smallest one barely 13M €. As mentioned before, the fund between 250 and 500 million AUM could become profitable. Those scenarios are quite far from that level.

Let us make yet another assumption, if governmental guarantee of 20% is applied to the SME Debt class, shall we then increase the investments in this class by 20%. Assuming that, the asset allocation stays constant, all the other asset classes are being increased as well (results to be found in table 15), thus increasing the amount invested to the chosen companies or adding more companies which would not receive the loan otherwise.

Table 15. Value of the funds increased by 20%

	Public Equity	Private Equity	SME Debt	Climate Bonds	Total
Initial Asset Allocation	€ 2 810 185,30	€ 1 873 456,87	€ 6 557 099,04	€ 7 493 827,47	€ 18 734 568,69
Minimum Volatility	€ 2 384 399,65	€ 1 986 999,71	€ 6 557 099,04	€ 8 941 498,69	€ 19 869 997,09
Maximum Sharpe Ratio	€ 4 791 726,22	€ 2 521 961,17	€ 6 557 099,04	€ 11 348 825,26	€ 25 219 611,69
The Highest Risk	€ 3 278 549,52	€ 3 442 477,00	€ 6 557 099,04	€ 3 114 622,04	€ 16 392 747,60

For comparison, let us increase value of SME Debt class as well by 80%. In that case the Debt class would offer almost 10M € (see table 16.) Thus, more companies could receive the financing as well as with higher amounts.

Table 16. Value of the funds increased by 80%

	Public Equity	Private Equity	SME Debt	Climate Bonds	Total
Initial Asset Allocation	€ 4 215 277,95	€2 810 185,30	€ 9 835 648,56	€ 11 240 741,21	€ 28 101 853,03
Minimum Volatility	€ 3 576 599,48	€ 2 980 499,56	€ 9 835 648,56	€ 13 412 248,04	€ 29 804 995,64
Maximum Sharpe Ratio	€ 7 187 589,33	€ 3 782 941,75	€ 9 835 648,56	€ 17 023 237,89	€ 37 829 417,54
The Highest Risk	€ 4 917 824,28	€ 5 163 715,49	€ 9 835 648,56	€ 4 671 933,07	€ 24 589 121,40

## 6 Discussion

In the previous chapters, one could find examples of guarantees and their implications in presented cases. However, the main question of this research is: how does use of public capital and/or guarantees encourage more investments in previously non-investable companies. In this chapter, I would like to discuss few possible ways.

### 6.1 Investing higher amounts in the previously chosen companies

One of the possible outcomes of the guarantee placed in the MARF structure, would be that companies which are getting only limited amount of funding would get higher investments. Since, the guarantee will be covering part of the risks (at least some part of the defaulted payments would be covered with the guarantee) the investors can increase the debt to the company, thus ending up in increased values of financial ratios. The situation which was too risky at first and limiting the investment only to given amount, would shift. The investor could actually allocate more money into one promising company, which consequently would help the company grow. The SME would not need to look for multiple sources of investment and multiple commitments with high interest rates. The company would have one investor with higher amount of investment and at the same or lower interest rate.

Table 17. Investments to chosen SMEs increased by 20%

	<b>Mezzanine or Long-term Debt</b>	<b>Revised Debt to Equity</b>	<b>Revised Long-term to Total Liabilities</b>
Cadring Oy	€ 665 760,00	7,11	0,53
Teconer oy	€ 144 720,00	10,26	0,73
E-Bros Oy	€ 5 226 539,04	7,12	0,73
Creanex Oy	€ 520 080,00	9,23	0,68
Anadium Group Oy	€ 6 960,00	9,58	0,7
Total	€ 6 564 059,04		

In the table 17, we can see the amounts that could be invested into 5 previously eligible companies by 20%. The value of the SME Debt class in this scenario has increased by over 1M €, which is a substantial amount of money for startups and small companies. In that case, we assume that investors with a guarantee of 20% on their return, would invest also 20% higher amounts in the companies.

## **6.2 Investing in the non-investable companies**

As the alternative result of the guarantee, it could be assumed that more SMEs would get the funding. The companies which did not meet the investment criteria before, could become investable with the guarantee mitigating the high risk. It means that assumptions made in the previous chapter (5.3) on the financial ratios values could be increased. That way we could increase the number of the companies which would receive the investments. The use of guarantee would allow the investors or the fund to allocate money to promising enterprises even if their financial ratios were exceeding the set limits. Also, guarantee would allow the SMEs to receive investment without extremely high costs and interest rates. In that case, young and innovative firms can focus on product and service development, rather than e.g. cutting all the costs to be able to make repayments on short-term loans.

## **6.3 Asset allocation shift**

Let us think for a moment, if more companies are getting higher investments, where does the money come from? In case of the scenario with the actual companies, we could assume that investors are just adding up more money, since the fund was relatively small to begin with. However, if we consider 250M € fund, the assumption would be that the fund is not increasing the overall value, but instead fund manager would move the capital from less risky asset classes, like Bonds, to more profitable and now as well more secure SME Debt class.

That is the part where we need the optimization and the simulations. In that case the assumption would be, that the Fund can make higher returns, since the interest rates on the SME Debt class are 2 percentage points higher than on Bonds (and almost triple the rate in case of expected returns on Private Equity versus the bonds).

However, further question which arises is, how much higher the interest rate can go up to. As presented before, the main goal of multi-asset renewal fund is to create returns high enough for Institutional Investors while driving the growth and investments into real economy. Thus, we need to take into consideration that the riskier companies cannot get the investments with extremely high interest rates, because they would not be able to afford making the interest payments.

Given that, the guarantee is improving the credit rating of the company, for example from C-rating to A-rating, we need to consider as well that this is how the debt investment

should be priced. In that sense, the overall expected return on investment percentage is not rising. It would be still the same as if the fund would invest in more trustworthy companies. Nevertheless, if we consider again shifting the funds between the asset classes, the outcome should be higher depending on the asset allocation between the classes and their expected rates of return.

Unfortunately, considering the scope of the thesis the final optimizations and simulations were not performed. However, the research provides a good overview on Finnish SME ecosystem and possible room for improvement.

#### **6.4 Own learning evaluation**

The multi-asset renewal fund project was a combined effort of multiple entities and people coming from various backgrounds, institutions and nationalities. It is worth mentioning that through the timeframe there were dozens (or maybe even hundreds) of stakeholders involved in the design process, to make it reasonable, applicable and doable.

I joined the project myself at the later stage, my internship has ended at the same time as the project ended between professor Adriaens and the Research Institute of the Finnish Economy. It means that I needed to understand over two years of the design process which happened before I learned about a project. Throughout few months of my collaboration with ETLA and all the participants in the project, I learned almost everything that I know about the investment vehicles, asset allocation, business practices and many more related topics. I gained the understanding of how important it is to continuously get feedback on the project, take the stakeholders into account and listen to them very carefully, since they have different perspectives and the insights that a designer of the tool or fund, might be missing.



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# Appendices

## Appendix 1. Financial data of Finnish SMEs (Asiakastieto) with calculations of their financial ratios

Company	Registry#	Revenue	EBIT Margin	EBITDA Margin	EBIT	EBITDA	Interest and other financial expenses	Net profit/loss	PP&E	Fixed Asset Turnover	ROI	Ennakkomaailut ja k/shares in subsidiaries of same corporat/Receivables from same corpor/shares in joint ventur/Receivables from joint ventur/Other stock	
Bold Moves Oy	2179852-8	9688000	4.4	5.5	431000	531000	0	326000	293000	33.1	34.1		
EC-Tools Oy	1009052-3	371000	12.4	15.1	46000	56000	1000	36000	29000	12.8	13.8		
Teikonien Ltd. Oy	0792215-5	25132000	339724.0	522559	829931	373232	7486	522370	0.0	5.0	2201579	11450000	
Space Systems Finland Oy	0730270-6	3758000	13.3	13.7	499000	516000	8000	493000	14000	268.4	269.4		
Protektion Oy	0884048-8	9657795	6.8	6.1	655207	787022	4489	1203	87178	112.2	112.2		
EKE Group	0505889-9	1043795	-36.1	-22.5	-377260	-231318	190510	-1391633	232902	0.4	1.4	27491580	7556169
					16,6								
Teconer Oy	0647342-2	268000	45.5	45.9	122000	123000	0	98000	4000	67.0	68.0		
Pfennering Oy	2439797-2	276000	-4.3	-1.8	-12000	5000	1000	-13000	19000	14.5	15.5		
Craxier Oy	1818868-9	1880000	6.3	6.5	86000	89000	0	87000	9000	151.1	152.1		
Cadwin Oy	1760958-8	2261000	-4.4	0.9	-100000	21000	29000	-128000	48000	47.1	48.1	3000	
Alpco Oy	0167900-8	617600	5.3	27.5	32600	268000	0	25000	23000	47.5	48.5		
0205501-3	5681921	-36.8	-33.3	-208840	-189415	67961	3420	287632	19.8	20.8			
DA-Design	2009047-7	4485681	10.5	16.3	469779	731716	270511	171874	393188	11.5	12.5	26500	
Enrath Oy	1945038-4	8679646	0.0	3.6	82133	311188	31244	1360221	154468	57.3	58.3	54320	
Conestrib Oy (Constrid Oy)	2148858-8	0	#DIV/0!	#DIV/0!	-58000	-58000	1000	-60000	0	#DIV/0!	#DIV/0!		
Tract Oy	2660726-5	0	#DIV/0!	#DIV/0!	0	0	0	0	0	#DIV/0!	#DIV/0!		
MediMobile Nordic Oy	2136420-2	1299000	44.4	-47.3	-837000	-615000	7000	-690000	2000	645.5	650.5		
Inforgita Oy	1731348-4	498000	1.6	1.6	8000	8000	3000	3000	0	#DIV/0!	#DIV/0!		
Correanet Oy	2384885-8	3000	-40.00	26.7	-12000	-8000	0	-12000	0	#DIV/0!	#DIV/0!		
					17,4								
Selnic Oy	1029840-2	11196733	1.9	3.5	20957	391230	245370	-28884	240888	46.5	47.5	4985	403800
ILS Oy	0703321-8	1325000	-7.2	-6.4	-96000	-85000	6000	-103000	72000	18.4	19.4		
Roadcomers Holding Oy	1444431-2	10727	112.3	112.9	12025	12025	9123	9148	0	#DIV/0!	#DIV/0!	2500	
Sabli Oy Ab	087035-0	942228	20.4	20.8	192487	196286	39997	21189	126128	74.5	75.5		
SATEL Oy	0648115-6	14845000	20.8	23.8	3105000	3554000	437000	2236000	1802000	8.3	9.3	101000	
EE Payments Oy	2556532-3	0	#DIV/0!	#DIV/0!	0	0	0	0	0	#DIV/0!	#DIV/0!		
EXP Analytics Oy	2278090-9	0	#DIV/0!	#DIV/0!	0	0	0	0	0	#DIV/0!	#DIV/0!		
Spacemaker Oy	2633004-0	0	#DIV/0!	#DIV/0!	0	0	0	0	0	#DIV/0!	#DIV/0!		
021188193-9	3000	0.0	0.0	0	0	0	0	0	0	#DIV/0!	#DIV/0!		
Componentality Oy	2431649-9	0	#DIV/0!	#DIV/0!	0	0	0	0	0	#DIV/0!	#DIV/0!		
Economix Oy	1746657-7	740500	1.8	26.3	10000	218000	2000	8000	7000	156.4	167.4	307,4	
Mobinet Oy	2199664-4	112000	6.3	6.3	7000	7000	0	5000	0	#DIV/0!	#DIV/0!		
					17,8								
EEK-Elektronikka Oy	0100720-4	8762141	0.0	1.3	3714	110372	6390	-19286	110899	79.0	80.0		
Contiflex Oy	1099971-7	1231350	-0.1	1.5	-863	186004	491778	-17188	43027	295.8	296.8		
M-Master Ltd Oy	0648867-6	254000	-5.5	-1.2	-14000	3000	3000	703000	3000	24.0	25.0		
2424283-2	30000	-19.0	-10.0	-19000	3000	2000	21000	0	#DIV/0!	#DIV/0!			
Tapio Telematics Oy	1305713-8	1094000	-21.8	-0.7	-236000	-104000	15000	-164000	3300	1094.0	1095.0		
Alpio Oy	2475711-0	355000	-48.3	-33.2	-175000	-118000	4000	-179000	0	#DIV/0!	#DIV/0!		
Lumiko Oy	0750742-8	4210000	1.6	4.8	66000	204000	33000	14000	57000	73.9	74.9	333000	
Veponen Oy	1814270-8	1184778	6.3	7.1	7533	8492	692	8415	2879	41.3	42.3		
Hilston Oy (Astarte Oy)	2104886-6	1241830	-40.6	-9.5	-504379	-118061	30419	-134319	355757	3.5	4.5		
Ada Drive Oy	2170406-4	50000	-210.0	-210.0	-116000	-116000	12000	-134000	4000	13.8	14.8		
Fara Oy (Subsidiary of Fara ASA, Norwegian company)	2099713-5	1175000	45.4	45.5	534000	535000	-216000	3000	391.7	392.7			
Finn Marin Oy Ltd	1024278-1	17504000	2.4	5.8	415000	997000	340000	84000	571000	3.0	4.0	560000	
					11,0								
E-Box Oy	1593345-3	1595385	-21.5	-26.7	-323022	-402651	179167	-120278	89821	16.8	17.8	195348	850000
Picodone Ltd Oy	2007808-3	10000	-1610.0	-1130.0	-1651000	-1133000	20000	-1670000	164000	0.1	1.1	533000	
Osamoh Oy	1308440-0	120000	-31.6	-29.4	-443000	-371000	4000	-444000	10000	12.6	13.6		
Osamoh Oy	06300000-8	65300000	7.5	7.5	1610000	1610000	6700000	13900000	10070000	6.0	7.0	7400000	131300000
Nonstopwater Oy Ltd	2106215-8	8000	-2487.5	-1287.5	-199000	-1033000	0	-199000	0	#DIV/0!	#DIV/0!		
Nisipö Oy	1373700-0	1039000	-10.0	16.5	-107000	488000	13000	-188000	28000	3.6	4.6		
					2,5								
Bravite Oy	2300767-6	106000			-46000		3000	-51000					
Elektrabit Wireless Communications Oy	1737565-0	60009498			1708843		81485	1612666				142000	
Elova Oy	0195681-8	29274000			4590000		750000	2862000				13408000	
Teknoware Oy	0149475-1	34844556			3835259		408115	2350003				2199370	
Valmet Automotive Oy	0143991-2	7623207			-3229172		817346	-4403998				864278	
Technovent Oy	1587156-9	878000			42000		18000	26000				100000	
Sunko B. Mobilsoft Oy (Subsidiary of DDS Wireless Intermos)	09596413-2	6056000			402000		1000	375000					
Finara Oy	2300570-2	35566127			2632954		1118546	6020958				9395285	
Metropolia University of Applied Sciences	2094651-1	116576544			1491880		4529	263412				9322667	
Mitrasura Oy	0699979-8	42403159			1180296		161414	1257024				127453000	
Velho Group Oy Ab	0116231-6	43430000			2784000		3383000	514000				14923000	
U-Blox Espoo Oy (Subsidiary of U-Blox Ag, Swiss company)	15323780-1	2945000			273000		670000	-345000				1672000	
Atty Oy	0625258-5	5840000			71000		280000	12000				30000	
Balta-Veneet Oy	0415999-1	20773985			-2263403		143095	-2382950				249158	
SE Mäkinen Logistics Oy	0149928-8	25745000			588000		223419	-166000				85000	
VH Truck Oy (VH Group)	1007202-3	312501000			7635000		117000	4589000				160349	
Sito Oy	2334445-6	26874200			574837		27899	1347263				354160	
Winkki Oy	2558865-6	2880			2880		0	2880				1602500000	
Nokia Oy	0110238-8	1177000000			-840000000		194000000	-560000000				3000000	
HUI Logistics Finland Oy	1637628-4	13932000			1231000		98000	1491000				256800	
Nokia Helsinki Oy	0600006-8	63300000			16100000		6700000	13900000				131300000	
TeliaSonera Finland Oy	1475607-9	125888098			-231617740		1548872305	-2231302403				64615964	
Elova Oy (japani mobile app)	1571814-3	846000			510700		8000	87000				161298947	
Alcoa Transport AB Oy	2251397-6	9457079			1088194		33337	103091				32000	
Siemens CranesHDI	0113902-2	30792000			1560000		27000	1507000					
0624514-0	1881000				2700		1000	1900					
Murata Electronics Oy (Subsidiary of Murata Manufacturing)	01749605-7	54745285			448235		1741151	-1827944				1568779	
Helsingin Taku-City Oy	0838018-9	6023380			116500		4000	-163080				94600	
Tasulinen Yrityspalvelu Oy	0645172-8	2146000			652000		8000	412000				15000	
Transit Finland Oy	0788343-6	6841158			820944		466094	876000				7000	
BBP Finland Oy (Subsidiary of BBP Inc., Canadian company)	1849149-3	26887028			23116467		6029667	14548814				907631	
Pegador Oy (Subsidiary of Coorsteck Inc., US company)	2175488-0	1060000			-16000		13000	-29000				4504113	
Cargotec Oy	1527462-8	117600000			-2160000		10180000	26110000				191600000	
Aban Finland Oy	2588777-4	0			0		0	0				4000000	
ABB Oy	0763463-0	2133194467			39045378		1312821	30757543				11909000	
CGI Suomi Oy	0357603-8	405415000			43337000		1002000	19619000				4000	
Iconos Oy	0997509-9	239286			-1882772		769729	-1074608				22781623	
OPY Oy	1719518-4</												