The Debt Maturity Profile and its Implications for Capital Structure

Bachelor thesis

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ABSTRACT

Title:	The Debt Maturity Profile and its Implications for Capital Structure
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Keywords:	capital structure, debt to assets, fixed effects, leverage, maturity profile, refinancing risk, two-way error component model, WACC
Purpose:	The purpose of this thesis is to investigate whether the length of the maturity profile of a firm's debt has any implications for the capital structure.
Theoretical perspectives:	A deductive approach, using econometric methodology to examine the correlation (if any) between the selected variables, and the significance (if any) of that correlation. The output of our econometric model is further analyzed using widely accepted theories on capital structure.
Empirical foundation:	ABB Ltd. annual reports and stock data (1999-2008), Atlas Copco annual reports and stock data (1999-2008), Boliden annual reports and stock data (1999-2008), Electrolux annual reports and stock data (1999-2008), Sandvik annual reports and stock data (1999-2008), SCA annual reports and stock data (1999-2008), Scania annual reports and stock data (1999-2008), Skanska annual reports and stock data (1999-2008), SKF annual reports and stock data (1999-2008), SSAB annual reports and stock data (1999-2008), Swedish Match annual reports and stock data (1999-2008), Tele2 annual reports and stock data (1999-2008), OMX Stockholm 30 Index data (1999-2008)
Conclusion:	The debt maturity profile has a statistically significant positive relationship with the debt to asset percentage of the studied firms. Thus, we draw the conclusion that it has implications for capital structure. It is however our opinion that further research is needed to ascertain the exact properties of this correlation, as well as pinpointing the reasons behind it.

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TABLE OF CONTENTS

1. INTRODUCTION

In this first chapter we aim to introduce the subject as well as provide some background on it. We will also describe our purpose and limitations, as well as the problem as we have formulated it.

1.1. BACKGROUND

The definition of debt maturity profile that will be used throughout this thesis, and indeed the only definition that by our knowledge exists is the following[1]: the volume-weighted average remaining term of a firm's outstanding interest-bearing liabilities. Hence the longer the maturity profile, the longer is the average remaining term of its outstanding debt. A longer average maturity profile thus inherently decreases the refinancing risk for any firm - *ceteris paribus* - as there is more time to manage any foreseeable and unforeseeable cash-flow mismatches or other problems with repayment that are discovered.

Although firms are charged a premium for issuing long term debt in order to lengthen their maturity profile[2], lengthening it could constitute a favorable trade-off if this would allow a firm to raise the gearing-ratio and hence decrease its financing costs, which in turn would return a higher intrinsic DCF-value.

There has however to our knowledge been little research into exactly what implications the maturity profile does carry with itself. Thus after having briefly reviewed the subject we set off to try and answer the question on what implications the debt maturity profile carries for the capital structure of a firm.

1.2. PROBLEM

With refinancing risk and leverage both increasingly becoming debated issues, their importance made apparent not the least by last year's collapse of the American bulge-bracket investment bank Lehman Brothers, all factors that could potentially affect them are of interest. Maturity profile inherently affects both, due to it being the remaining term before liabilities are to be refinanced, and thus constitutes a prime target for a thesis.

[1] It should however be noted that while we have been unable to locate an academic reference for this definition the annual reports does use the same and seemingly universal definition.
[2] This due to the properties of interest rates and the yield curve, more on which can be found in Asgharian & Nordén (2007)

Capital structure and its determinants have been extensively researched over the last few decades, however maturity profile has been given little or no attention as a possible determinant for capital structure, while quite some room has been given to other determinants. Studies have been conducted into volatility by among others Bradley, et al. (1984) Friend and Hasbrouch (1988) and Friend and Lang (1988), profitability by among others Gonedes, et al (1988) and size by among others Clason and Wilhelmsen (1988). There has also been made rather extensive accounts of research conducted into capital structure and its determinants during 1990s, by both Harris & Raviv (1991) and Asgharian (1997). Both of these studies contain summaries of previous studies conducted during the 1980s and 1990s and there are no records of maturity profile being an issue.

While recent years have shown increasing interest in the subject of debt maturity profile, with papers such as the one by Almeida et al. (2009) published very recently, academic research remains scarce. This is our main motivation for pursuing the question of the importance of maturity profile when a firm selects its leverage.

1.3. PURPOSE

The purpose of this thesis is to investigate the role of the debt maturity profile as a determinant for the level of leverage a firm uses.

1.4. LIMITATIONS

Our restrictions in terms of data gathering have been set not mainly by our own ambition or time available, but by the availability of data for public use. Debt portfolios and their exact composition are not always data firms are so willing to discover, and while the laws and principles governing accounting forces firms to disclose their long-term versus short-term debt, there are no obligations to publish the average reaming term of debt. Data gathering tools such as Reuters does allow for extensive current information on the outstanding debt of firms, however historical data is very scarce, and in many cases even unavailable without dissecting the individual annual reports. The choice of the firms constituting OMXS30 was made after a brief initial screening. The screening pointed towards that at least a number of them report their average remaining debt terms annually, or provide detailed enough information for it to be manually computed, and this back to the year of 1999.

We have restricted ourselves to analyzing the impact of the maturity profile on capital structure together with a number of other control variables, the latter by which we have restricted ourselves to using the following explanatory variables.

- Standard deviation – as a measure of risk
- Operating income growth – as a measure of growth
- Dividend yield – as a comparable measure of dividend paid
- Market value – as a measure of size
- Net margin – as a measure of profitability

2. METHOD

This chapter contains a description of our approach, general method as well as data description. Attention will be given to both sample selection and the selection of variables.

2.1. APPROACH

As we use empirical data collected from authentic and original sources coupled with an already existing theoretical framework, we have found a deductive approach to be the most fitting for this thesis. According to among others Patel and Davidson (1991), a deductive approach is very common in scientific theses because in most cases, the theoretical framework already exists.

2.2. GENERAL METHOD

Our very first step was to collect debt portfolio data from the firm's annual reports, where possible we took the average remaining term directly from the report. However in many cases we had to calculate the average remaining term ourselves. This was calculated as a simple volume-weighted average remaining term, using the data available in the annual report. If data was deemed unreliable, that firm was excluded.

The second step was also collection of data, namely the data necessary for our explanatory variables. This data was collected using ThomsonReuters Datastream Advance and exported into Excel for further processing.

All data was fed into a panel data sheet constructed in MS Excel, which in turn was processed using the widely known econometrics-software EViews 6.0, developed by Quantivative Micro Software. The choice of EViews as our primary analytical tool was based primarily on the fact that while Excel with VBA is a very powerful tool, the ratio of programming input to processed data output for just one study is very high. That is, one has to do an extensive amount of programming to handle panel data econometrics in a fixed-effects model, and the payoff for just one study would be zero if not negative. (Should one want to have a flexible model for multiple future uses we would however recommend programming one) This would increase the risk of human errors as opposed to the EViews software, which has a set mode for advance panel data studies included.

The accuracy of the output produced by our econometrical model has finally been tested using econometric methods for significance testing. The resulting final output has then been dissected and discussed using theory within the area of capital structure.

2.3. DATA

2.3.1. Sample selection

As our intention was to study the debt maturity profile and its implications on capital structure and we could assume that this data also would be the most hard-to-get, the logical step was to start retrieving this. From here we could then ascertain which explanatory variable data to collect. (It is apparent that it makes no sense to collect explanatory variable data for 30 firms if one would end up with ten in the end.)

Collecting data from annual reports has its inherent limitations. Firms may be reluctant to publish certain information that they are not obliged to or expected to publish, if such information would be to their disadvantage. They may also be eager to publish the same information should it be to their advantage. (This is an actual observation from our work with this thesis where at least one firm had severe inconsistencies with regards to publishing the average remaining debt term under their “Refinancing risk” note. It is not the intention of the authors to point fingers and hence we will refrain from specifying which firm in the text.)

We excluded banks and financials outright as their complex balance sheets would make calculations unnecessarily difficult and time-consuming given our level of knowledge within the area of capital structure. Apart from this self-imposed limitation, our goal was to include as many of the OMXS30 group of firms as we could. Below we will continue with describing the OMXS30 Index in brief, to help motivate the choice of the constituents of this index as the base of our study.

ABB Ltd	Nokia Corporation
Alfa Laval AB	Sandvik AB
ASSA ABLOY AB ser. B	Svenska Cellulosa AB ser. B
Atlas Copco AB ser. A	SCANIA AB ser. B
Atlas Copco AB ser. B	Skandinaviska Enskilda Banken ser. A
AstraZeneca PLC	Securitas AB ser. B
Boliden AB	Svenska Handelsbanken ser. A
Electrolux, AB ser. B	Skanska AB ser. B
Ericsson, Telefonab. L M ser. B	SKF, AB ser. B
Getinge AB ser. B	SSAB AB ser. A
Hennes & Mauritz AB, H & M ser. B	Swedbank AB ser. A
Investor AB ser. B	Swedish Match AB
Lundin Petroleum AB	Tele2 AB ser. B
Modern Times Group MTG AB, ser. B	TeliaSonera AB
Nordea Bank AB	Volvo, AB ser. B

Table 2.1 shows OMXS30 constituents as of H2 2009 and was published by NASDAQ-OMX on June 3 2009.

OMXS30 is an index composed of the 30 most traded stocks on NASDAQ OMX Stockholm and data is available back to 1986 (NASDAQ-OMX, 2009) See table 2.1 above for a list of the constituents as of H2 2009.

In the words of NASDAQ-OMX, the exchange provider:

> *"OMX Stockholm 30 is the Stockholm Stock Exchange's leading share index. The index consists of the 30 most actively traded stocks on the Stockholm Stock Exchange. The limited number of constituents guarantees that all the underlying shares of the index have excellent liquidity, which results in an index that is highly suitable as underlying for derivatives products. In addition OMXS30 is also used for structured products, e.g. warrants, index bonds, exchange traded funds such as XACT OMX and other non-standardized derivatives products. The composition of the OMXS30 index is revised twice a year. The OMXS30 Index is a market weighted price index." (NASDAQ OMX, 2010)*

OMXS30 is the leading Swedish index, and it is designed specifically for its liquidity and to be an underlying index for derivative products. (NASDAQ OMX, 2009) Given this we felt the choice of the OMXS30 constituents natural for anyone who would like to perform a scientific study of a limited amount of firms, which will reflect the Swedish enterprise community as a whole.[3] While we would have used the whole OMXS30 Index less banks in an ideal scenario, real life conditions are seldom ideal and we have been forced to make exclusions based on the

[3] NASDAQ-OMX claims OMXS30 to have a 99.9% correlation with OMX Stockholm All-share index (NASDAQ OMX, 2009) While we have not had the opportunity to examine this claim, we find it plausible.

limitations of available data. In the case of maturity profiles sufficient data to compute reliable numbers could only be found for twelve firms. These are shown below in table 2.2.

Firm	Corresponding share
ABB	ABB
Atlas Copco	ATLAS COPCO 'A'
Boliden	BOLIDEN
Electrolux	ELECTROLUX 'B'
Sandvik	SANDVIK
SCA	SCA 'B'
Scania	SCANIA 'B'
Skanska	SKANSKA 'B'
SKF	SKF 'B'
SSAB	SSAB 'A'
Swedish Match	SWEDISH MATCH
Tele2	TELE2 'B'

Table 2.2 shows the constituents that provided sufficient data. Note that both A and B-shares have been used. We have used whichever share had the most liquidity as per Datastreams information.

2.3.2. Maturity profile data

The maturity profile or average remaining debt term is the average time remaining for a firm's long and short-term interest-bearing liabilities. This is usually expressed in years with a precision of two decimals. It is arithmetically defined as follows

$$T_{VW} = \frac{\sum T_i \cdot Q_i}{\sum Q_i}$$

where T_i is the time remaining in years left for the loan i and Q is the amount due to be paid back (or more likely refinanced) for loan i. In the equation above i represents each individual interest-bearing liability that the firm has in its debt portfolio at the point in time for which the maturity profile is calculated. Both short-term and long-term liabilities are taken into account. This data was collected from the firm's individual annual reports as available on their websites.

2.3.3. Dependent variable data

When choosing the explained variable, capital structure, we were seeking a widely used ratio that would be applicable to virtually any firm. Asgharian (1997) has compiled a number of prominent empirical studies into the determinants of capital structure. Although some of the studies used different leverage ratios, for example that by Bradley et al. (1984) which used debt to average value, the most widely used in the studies was debt to assets. (Asgharian, 1997) A slightly modified summary from Asgharian (1997) of the studies that uses debt to assets can be seen in section 2.3.4.

Debt to assets can be arithmetically expressed as follows.

$$Debt\ to\ Assets = \frac{Short\ Term\ debt + Long\ Term\ debt}{Total\ Assets}$$

The ratio is expressed as a percentage where a higher value indicates a higher leverage for the firm. Swedish firms usually use the Swedish term 'soliditet' in their annual reports, expressing the amount of equity as a percentage of total assets. Thus debt to assets can be calculated by subtracting this number from one. However, in order to avoid calculations that might result in a human error we have retrieved debt to assets data directly from Datastream.

2.3.4. Additional explanatory variables

The additional explanatory variable variables to be used in evaluating the implications of the debt maturity profile have been selected on the basis of their suitability, rather than availability. This as Datastream after an initial screening was shown to include a wide variety of data. Asgharian (1997) has compiled a detailed summary of determinants for capital structure used in economic research. Below we have compiled a table based on the research in Asgharian (1997) where the variables we will be using as explanatory variables are included as determinants for debt to assets in other studies.

	Growth	Profitability	Size	Risk	Dividend
Allen (1993)	*	-			-
Clouse and Speltz (1992)	+				+
Fried and Lang (1988)		-	+	*	
Fried and Lang (1988)[same study]		-	*	- *	
Sharid and Arun (1993)		+		+	

Table 2.3 shows the studies based on the debt to assets leverage ratio and is based on Table 2 in Asgharian (1997).[4] Legend: + (-) means that the variable was shown to have a significant positive (negative) effect on leverage while * means that the variable was taken into account but turned out insignificant.

[4] We have intentionally excluded any studies included in Asgharian (1997) that had been using a different leverage ratio than debt to assets.

The choice of explanatory variables in a multiple regression model is important because of the arithmetic properties of a multiple regression model. Informally the effect of the explanatory variables on the partial regression coefficients is explained below. While informal, this clearly underscores the importance of the explanatory variables in any scientific study.

> *"In short, then, a partial regression coefficient reflects the (partial) effect of one explanatory variable on the mean value of the dependent variable when the values of other explanatory variables included in the model are held constant."* Gujarati (2006, pp 211)

Asgharian (1997) was our main point of inspiration for which explanatory variables to chose. However once again, restrictions in our toolset and resources have forced us to make a few shortcuts. For the purpose of simplicity in both performing our econometric analysis and for others to reproduce it - the latter to be considered a requirement in all academic research - we have collected our variable data using datasets available in the widely-used and available Thomson Reuters Datastream Advance. Listed below is a table of which data was used.

Variable in Asgharian (1997)	**Datastream data**
Dividend	Dividend yield
Growth	Operating income growth
Size	Market value(capitalization)
Profitability	Net margin
Risk	Standard deviation

Table 2.4 shows which Datastream data we used for each of the variables.

Below will follow an explanation of each of the variables, their background, usage, and arithmetic properties if applicable.

Dividend - Dividend yield

The dividend yield is defined as follows. (Berk & DeMarzo, 2007, pp 247)

$$Dividend\ Yield = \frac{Annual\ Dividends\ Per\ Share}{Price\ Per\ Share}$$

It is essentially a relative measure of dividend usually express in percentages much like the yield of a bond. The relative property of this variable makes it useful in a study like ours where firms that may have a different leverage in absolute terms are to be compared.

Growth - Operating Income Growth

When selecting a variable reflecting growth availability was a concern and Datastream gave us access to operating income growth as the most top-line growth measure. According to Frasier & Ormiston (2007) operating income (also called operating profit or earnings before interest and taxes, EBIT) provides an overall view of the performance of a firm's operations: sales revenue less expenses for generating those sales. Thus we feel operating income growth to be a fitting growth variable.

Size - Market capitalization

The market capitalization or market value of a firm is defined as follows. (Berk & DeMarzo, 2007, pp 375)

$$Market\ cap. = Price\ Per\ Share \cdot Number\ of\ Shares\ Outstanding$$

One may measure the size of a firm in any number of ways, for example the size of its balance sheet, the number of employees, the collateral value of its assets, the sales it generates or its profit. However only of measure of size is truly universal, and that is the value of the firm as perceived by the investing community, the firm's market capitalization. Seeking variables that would be comparable, market capitalization fits into the study as a measure of size.

Profitability – Net margin

As a measure of profitability we included net margin. Net margin measures the firms profitability after all items including interest, taxes and non-operating items have been considered. (Frasier & Ormiston, 2007) Net margin gives a good sense of the overall profitability of a firm and is easily available. Furthermore it is easy to calculate as one simply has to divide the net profit by the net revenue.

Risk

The standard deviation of returns or volatility σ is a widely used measure of risk for stocks and other financial instruments alike. There are different approaches to calculating volatility and we have used the approach of Hull (2009) which defines the standard deviation as follows: "…*the volatility of a stock price can be defined as the standard deviation of the return provided by the stock in 1 year when the return is expressed using continuous compounding.*" Hull (2009, pp 282)

We have computed the standard deviation for each year separately by compounding all of the daily returns of that year. The formula can be expressed as follows:

$$\sigma = \frac{\sigma_i}{\sqrt{n}}$$

Where σ is the volatility for the year, σ_i is the standard deviation of daily return, n is the number of trading days that year and i represents each individual trading day. More reading on volatility can be found in Hull (2009)

3. CAPITAL STRUCTURE THEORY

In this chapter we will attempt to give a theoretical background of capital structure, this will later serve as the basis of our discussion and conclusions together with the econometric framework in chapter 4.

3.2. BACKGROUND AND THE MODIGLIANI-MILLER THEOREM

The modern theory of capital structure at least partly owes its existence to Franco Modigliani and Merton H. Miller. By now they are both Nobel laureates owed partly to their work on capital structure. Modigliani was awarded the Nobel Price in Economics in 1985 and Miller in 1990.

What is today know as the Modigliani-Miller theorem started with an article titled *The Cost of Capital, Corporation Finance and the Theory of Investment* published by the two in the American Economic Review in 1958. In this article Modigliani and Miller made two propositions which constitute the theorem. Proposition I: "*the average cost of capital, to any firm is completely independent of its capital structure and is equal to the capitalization rate of a pure equity stream of its class*" (Modigliani & Miller, 1958, pp 268-269). Proposition II: "*the expected yield of a share of stock is equal to the appropriate capitalization rate* p_k *for a pure equity stream in the class, plus a premium related to financial risk equal to the debt-to-equity ratio times the spread between* p_k *and* r.*"* (Modigliani & Miller, 1958, pp 271)

These two propositions are compounded together to form Proposition III: *"the cut-off point for investment in the firm will in all cases be* p_k *and will be completely unaffected by the type of security used to finance the investment"* (Modigliani & Miller, 1958, pp 288)

Expressed brief and informally what the propositions above say is that in a perfect market, with no taxes, bankruptcy costs or asymmetric information, the value of any firm is unaffected of its choice of financing. (Modigliani & Miller, 1958)

Modigliani and Miller also undertook studies into the capital structure taking taxes into account, both in their original study in 1958 and in a correcting paper published in 1963. The Modigliani-Miller theorem under the presence of taxes, and more importantly tax deductibility of interest payments, essentially states that the optimal leverage of a firm lies at a debt level of 100%. Because although the cost of equity tends to rise with leverage, debt is cheaper due to its tax deductibility and lowers the weighted average capital cost, WACC. (Modigliani & Miller, 1963) It should be duly noted that we still assume the absence of bankruptcy costs and asymmetric information.

Modigliani and Miller reminds the reader of their 1963 paper that *"the existence of a tax advantage for debt financing-even the larger advantage of the corrected version-does not necessarily mean that corporations should at all times seek to use the maximum possible amount of debt in their capital structures."* (Modigliani & Miller, 1963, pp 442) Despite this their theories have been put to extensive use in promoting increased leverage, and have indeed, in the words of Ruben D. Cohen of Citigroup *"laid down the foundations of modern corporate finance"* (Cohen, 2004, pp 1)

3.1. MORE RECENT RESEARCH

As recent as 1988, Miller published a paper taking into account the thirty years of research that had passed since the famous publication of 1958. It could then, and can to this day, be stated that thanks to the deductibility of interest payments an optimal capital structure does contain debt. (Miller, 1988) In fact, an optimal capital structure might even be 100% debt, although the financial crisis of recent years should give some doubt to the latter proposition.

Authors Berk & DeMarzo (2009) have written several books on the topic of corporate finance, and they have a slightly different view on the implications of capital structure on WACC. They (Berk & DeMarzo) state that *"Leverage increases the risk of equity even when there is no risk that the firm will default. Thus, while debt may be cheaper when considered on its own, it raises the cost of capital for equity." (*Berk & DeMarzo, 2009, pp 431) It is essentially stated that even when the addition of debt lowers the cost of capital *ceteris paribus*, such a situation never occurs because leverage has the inherent property of raising the cost of equity capital. (Berk & DeMarzo, 2009)

Researcher Cohen (2004) further emphasizes MMs theory that under the presence of taxes, debt financing reduces the firms WACC, plotting a simple version of something called the WACC-curve. This is simply a plot with WACC on the X-axis and leverage on the Y-axis, Cohen (2004) shows WACC to decrease when leverage is heightened, though no further analysis into where along the WACC-curve this relationship may reverse is made.

Although Modigliani and Miller (1963) had to prove their proposition of the optimal capital structure under the presence of taxes nearing 100% debt using arbitrage theory one could logically reach the same conclusion without formal proof.

While interest payments to creditors are tax deductible in most, if not all, relevant jurisdictions, dividend payments to shareholders are not. Given the double taxation of corporate profits, once as profit, and once as dividend for the individual investor, we end up with a situation where debt seems far more affordable, even taking the rise in cost of equity into account. The inclusion of additional imperfections such as bankruptcy costs, information costs and other imperfections may however prove this to be skewed. Logically it would also prove to be this way as debt tends to raise the risk of bankruptcy. However for the course of this thesis we will satisfy ourselves with the assumption that firms will seek additional leverage, to the point where the drawbacks in form of risks and lowered creditworthiness outweigh the advantages in form of tax-deductible capital costs.

3.3. WACC

No overview on the theory of optimal capital structure can be complete without including the term weighted average cost of capital, or more commonly WACC. We will therefore attempt to explain WACC in brief for any reader not acquainted with the term.

The term weighted average cost of capital (WACC) is most commonly interpreted as *"The expected return the firm must pay their investors to compensate them for the risk of holding the firm's debt and equity together"* (Berk & DeMarzo, 2009, pp 259).

Put more simply the WACC is a method to calculate the cost of capital of the firm's assets. The formal definition of WACC is;

$$r_{wacc} = \begin{pmatrix} Fraction\ of\ Firm\ Value \\ Financed\ by\ Equity \end{pmatrix} \begin{pmatrix} Equity \\ Cost\ of\ Capital \end{pmatrix} + \begin{pmatrix} Fraction\ of\ Firm\ Value \\ Financed\ by\ Debt \end{pmatrix} \begin{pmatrix} Debt \\ Cost\ of\ Capital \end{pmatrix}$$

$$= \frac{E}{E+D} r_E + \frac{D}{E+D} r_D$$

We can see from the above definition that without debt a firm's WACC equals the unlevered equity cost of capital. (Berk & DeMarzo, 2009) For this thesis the term WACC will be used as a cost variable we assume any firm wants to minimize, and a firm will be seeking to change its capital structure in order to minimize the WACC.

4. ECONOMETRIC FRAMEWORK

Here we will in brief explain the methodology and framework use for the purpose of our econometric analysis of the subject. This theory and framework will later be sued to estimate a model which will be used to process the data and reach conclusions about its correlation.

4.1. PANEL DATA

When building an econometric-model, one of the first steps is to establish what sort of data we are going to work with. There are different types of data, cross-sectional data sets which consists of a sample of individuals, countries or other units, taken at a given point in time. A time series data set consists of observations of a variable or multiple variables over a period of time. The third type is a panel data set which consists of a time series for each cross-sectional variable in the data set. (Wooldridge, 2006)

For the purpose of our econometric analysis of the collected variables we have chosen to work with panel data. As opposed to time series or single cross-section data where one would have to make severe restrictions which would hamper the accuracy and realism of the regression model, a table data allows for a more complicated and realistic model. In a panel data set multiple firms, countries or industries may be observed over a period of time with a number of variables. (Verbeek, 2008) A panel data is hence the only fitting model for the purpose of our test as we have twelve firms observed over a period of ten years and six explanatory variables, for a total of seven variables. Put simply, our data embodies information over both time and space.

Furthermore, there are different kinds of panel data, the main to distinctions are: balanced panel and unbalanced panel. A balanced panel has the same number of time-series observations for each cross-sectional unit and same the other way around.

Unbalanced panel data, on the other hand will have some cross-sectional elements with fewer time series or the other way around. (Brooks, 2008) Due to the fact that we have been lacking observations in Datastream on some explanatory variables for some points in time our panel data will be unbalanced. However Brooks (2008) also states that arithmetically the exact same techniques are used. Furthermore software capable of econometric regression analysis such as EViews will appropriately account for the missing observations. (Brooks, 2008; Wooldridge 2006)

The casual relationship within the panel data set is expressed by

$$\gamma_{it} = \alpha + \beta x_{it} + u_{it} \tag{1}$$

where γ_{it} is the dependant variable, α is the intercept, β is the $K \times 1$ vector of the explanatory variables parameters, x_{it} is the $K \times 1$ vector of the explanatory variables. (Brooks 2008)

This relationship can be estimated by using the OLS-method on a single equation after the data has been pooled. Pooling the data implies that the relationship between the variables of interest is constant over time and cross-sections.

Panel data analysis detect common variation in series over time better than if we were to run regressions independently which is the main benefit of this method.

Regressions on panel data increases the degrees of freedom, which make the explanatory power of those regressions greater than those conducted on individually performed regressions. (Baltagi, 2005; Brooks, 2008).

4.2. THE FIXED EFFECTS MODEL

The multiple regression model in this thesis assignment must be adapted to the panel properties of the sample. The literature suggests the two main types of panel estimator approaches – fixed effects models and random effects models. (Wooldridge, 2002; Brooks, 2008; Verbeek, 2008) Which one to use is an issue of what kind of sample is being analyzed, Verbeek (2008) states that the most common view within econometric research is that the fixed effects model is best used when studying data on large firms or countries. The fact that fixed effects model estimation is the standard when studying the kind of data we are in this thesis, was our main motivation for pursuing the fixed effects model rather than the random effects one.

Furthermore, the complexity of the unrestricted two-way error component model (which we will describe in detail during the course of this chapter) when applying random effects on unbalanced data is such, that many econometric software packages cannot handle the computations, Baltagi (2005) goes so far as to describe it as *"messy"*. (Baltagi 2005, pp 176) EViews is one of these less sophisticated software packages, and thus the choice of estimation model is made simple, fixed effects model estimation is the sole choice we have.

4.2.1. Cross-Section Fixed Effects

Standard fixed effects models are able to capture cross-sectional variation in the panel data sample. This means that the intercept in the regression models will differ cross-sectionally and be static over time. If we vary the effect of the explanatory variables from unit to unit, due to unit specific properties when keeping them the same for each point in time, then the disturbance term in the equation (1) can be decomposed into an individual specific effect μ_i that does not vary over time, and the remaining disturbance v_{it}. Thus, the regression equation can be re-written as

$$\gamma_{it} = \alpha + \beta x_{it} + u_i + v_{it} \tag{2}$$

where u_i is the unobserved heterogeneity in units. (Brooks, 2008; Wooldridge, 2002)

We can estimate a model by using the least squares dummy variable (LSDV) approach, where dummies correspond to cross-sectional units. Suppose a dummy variable D_{1i} takes a value of 1 for all observations on the first unit and 0 otherwise; D_{2i} takes a value of 1 for the all observations on the second unit and 0 otherwise; a variable DN_i takes a value of 1 for all observations on the N^{th} unit and 0 otherwise. The model will then be expressed by:

$$\gamma_{it} = \beta x_{it} + u_1 D1_i + u_2 D2_i + \cdots + u_N DN_i + v_{it} \tag{3}$$

A panel approach must be employed if the null hypothesis of equality for all u is rejected.If the null hypothesis is accepted the proper way is to pool the data and employing the OLS estimation. (Brooks, 2008; Wooldridge, 2002) The pooled OLS is feasible for the estimation of fixed effects models if the condition of strict exogenity

$$(COV(u_{it}, x_{it}) = 0) \tag{4}$$

is not violated. We will however encounter so called heterogeneity bias as a result of the correlation between u_i and x_{it} in the model. We can apply within transformation to remedy this. This transformation involves a procedure of time-demeaning. By subtracting the time-mean observations on all of the variables including the disturbance terms, the technique will modify the original regression into

$$\bar{y}_{it} - \bar{y}_i = \beta(x_{it} - \bar{x}_i) + u_i - u_i + v_{it} - \bar{v}_i \tag{5}$$

which equals

$$\bar{y}_{it} = \beta \bar{x}_{it} + \bar{v}_{it} \tag{6}$$

The term of unobserved heterogeneity in units that is correlated with the explanatory variables, is now eliminated. With this in order can regression (6) now be estimated with pooled OLS. However we will lose degrees of freedom when time-demeaning. (Wooldridge, 2002)

4.2.2. Time-Fixed Effects

We can also apply dummy-variable regressions and the technique of demeaning on time-fixed models, which capture the time-variation. The time-fixed effects model can be written as

$$y_{it} = \alpha + \beta x_{it} + \lambda_t + v_{it} \tag{7}$$

where λ_t is a time-varying intercept that allows for time-specific heterogeneity. (Brooks, 2008)

4.2.3. The Fixed Effects Two-Way Error Component Model

In section 4.2.1 we explain the basic arithmetic behind the cross-section fixed effects model and in section 4.2.2 we explain the basics behind the time-fixed effects model. However the restriction of the former (2) is that it does not allow for the intercept to differ over time, while the restriction of the latter (7) is that it is restricted to the assumption that the intercept is the same across entities (firms for the purpose of this study). Fortunately there is a third, more complex model that may be used. Brooks (2008) refers to this as the two-way error component model and it is the least assumption-restrictive fixed effects model used in econometrics. (Brooks, 2008) This model is obtained by combining (2) and (7) in order to produce (8) below, which is the model estimator we will use in our analysis.

$$y_{it} = \beta x_{it} + u_1 D1_i + u_2 D2_i + \cdots + u_N DN_i + \lambda_1 D1_t + \lambda_2 D2_t + \cdots + \lambda_T DT_t + v_{it} \tag{8}$$

Brooks (2008) also mentions that within transformation (explained in 4.2, above) is more complex in this less restrictive model. Using econometric analysis software we may disregard this warning as the software package will compute all necessary output. Furthermore we will perform what Brooks (2008) refers to as a redundant fixed effects test. This will determine whether the fixed effects are actually purposeful for our study or simply redundant.[5]

4.3. STATISTICAL HYPOTHEIS TESTING

For the purpose of statistical hypothesis testing we have formulated the following hypothesizes regarding our main model. Please note that that for the purpose of model-testing we will also use

[5] For further reading on redundant fixed effects testing please refer to Brooks (2008) and Wooldridge (2006)

the term null-hypothesis H_0in a slightly different context. It will however be noted when we refer to the below null-hypothesis.

4.3.1. Null hypothesis

In statistical hypothesis testing the null hypothesis is assumed to be true until proven otherwise. (Wooldridge, 2006) We will hold this as true unless data can suggest that we reject it at a significance level α of 5%

H_0= There is no significant relationship between maturity profile and debt to assets for the firms in the study.

4.3.2. Alternate hypothesis

This is the alternate hypothesis, we will hold this as false unless data can suggest otherwise at a significance level of 5%

H_1= There is a statistically significant relationship between maturity profile and debt to assets for the firms in the study.

4.3.3. Significance level

The significance level α chosen for this study is 5%, this is the most common statistical significance level chosen according to Verbeek (2008) and Wooldridge (2006).

5. RESULTS AND ANALYSIS

This chapter contains our results, starting with descriptive statistics on our data and ending with a discussion of the output from our estimated model. The results part will start with an unrestricted estimation and proceed further with tests, as has been suggested by Baltagi (2005) and Brooks (2008) .

5.1. DESCRIPTIVE STATISTICS

We begin by showing some brief descriptive statistics of our panel data, these have been computed using EViews software. This software unfortunately has some limitations with regards to analysis of panel data, and this in turn affects what output we could achieve for this section. Basic descriptive statistics are however available and shown below.

	Debt to Assets	Dividend Yield	Growth	Maturity profile	Market Cap.	Net Margin	Volatility
Mean	24.61558	3.100885	25.37903	3.253404	53802.70	7.136018	0.350126
Median	23.24000	2.920000	11.19000	3.104801	40584.33	6.100000	0.326061
Maximum	62.35000	22.47000	738.7400	8.978670	424726.4	49.43000	1.172092
Minimum	3.290000	0.000000	-92.57000	1.340991	3295.170	-8.180000	0.151996
Std. Dev.	12.97323	2.487957	92.73960	1.257239	62995.96	7.637559	0.146284
Sum	2781.560	350.4000	2867.830	367.6346	6079706.	806.3700	39.56427
Sum Sq. Dev.	18850.13	693.2719	963271.0	177.0327	4.44E+11	6533.219	2.396698
Observations	113	113	113	113	113	113	113

Table 5.1. Above shows in brief some descriptive statistics such as mean, median, maximum and minimum for our variables.

In Table 5.1 above we can read that the arithmetic mean for the maturity profile variable is 3.253404. This effectively means that for all firms included in the study the average maturity profile for 1999-2008 was 3.253404 years. We deem this a highly ordinary observation as it implies a balance between short-term debt (maturing in less than one year) and long term debt, (usually maturing in between one and five years, although much longer maturities occur)

Variance gives us how the individual values are spread around the mean value. It's the squared differences between an individual value and its mean value. Standard deviation is simply the positive square root of its variance. A low standard deviation implies that the data is very close to the mean and the other way around. (Gujarati, 2006) Maturity profile has a standard deviation of 1.257239 which when put in reference to its mean of is 3.253404 considerate, but in our opinion not extreme. We have quite few observations due to the limitations in availability of data and a larger set of data would probably reduce this number.

When examining a models adequacy it is common to search for multicollinearity. In case of perfect multicollinearity we have an exact linear relationship among the explanatory variables included in the model. The assumption of no perfect multicollinearity states that if we encounter an exact linear relationship among the explanatory variables our model will no longer be the most effective one. The practical consequences of this will be that the variances and standard errors of OLS estimators will be large. This will give wider confidence intervals which would lead us to accept a false hypothesis. (Gujarati, 2006)

Baltagi (2005), states that high multicollinearity is less likely when using panel data, as opposed to using only cross-section or time-series data. This is due to the fact that the inclusion of both cross-section and period dimensions adds more information and variability.

When examining a data used in a regression model for multicollinearity we compute a correlation-matrix. Correlation is how strongly related two variables are to each other and is expressed by

$$\rho = \frac{cov(X,Y)}{\sigma_x \sigma_y} \tag{9}$$

where $cov(X,Y)$ is how two variables vary together in absolute value and $\sigma_x \sigma_y$ are the standard deviations for variable x and y respectively.

The correlation coefficient always lies between -1 and $+1$. If the correlation between two variables exceeds ± 0.8 it is common to say that there is a problem of multicollinearity. (Gujarati, 2006) Our data gives us the correlation matrix shown in table 5.2 below.

	Debt to Assets	Dividend Yield	Growth	Maturity Profile	Market Cap.	Net Margin	Volatility
DA	1.000000						
DY	-0.041977	1.000000					
G	-0.025683	-0.117443	1.000000				
MP	0.104886	0.033206	0.093738	1.000000			
MV	-0.166148	-0.280654	-0.011646	0.047700	1.000000		
NM	0.174954	-0.095877	0.121845	0.157774	0.041170	1.000000	
Vol.	0.048727	0.297117	-0.029103	0.171790	-0.067585	-0.134223	1.000000

Table 5.2 above shows us that no correlation exceeds ± 0.8, thus we have no evidence of multicollinearity.

5.2. RESULTS AND ANALYSIS

Having processed the data in EViews as per the framework in chapter 4 and the model described in section 4.2.3, what has been performed is a panel least squares multiples regression with cross-section and period fixed effects. Brooks (2008) refers to this as a two-way error component model. This is equation (8) from section 4.2.3, and it is the model with the least restrictions. The output window of our estimation using this model can be seen below in table 5.3.

Two-way error component model

Dependent Variable: Debt to assets %			
Method: Panel Least Squares			
Sample: 1999-2008			
Periods included: 10			
Cross-sections included: 12			
Total panel (unbalanced) observations: 113			
	Coefficient	Std. Error	Prob.
Maturity profile	**1.885445**	**0.866297**	**0.0323**
Dividend yield	-0.666036	0.433289	0.1279
Operating income growth	0.014072	0.009454	0.1403
Market capitalization	-5.94E-05	2.84E-05	0.0391
Net margin	-0.226148	0.135097	0.0978
Volatility (standard dev.)	-5.899785	11.12177	0.5972
Constant	27.06673	5.781878	0.0000
Effects Specification			
Cross-section fixed (dummy variables)			
Period fixed (dummy variables)			
R-squared	0.706825		
Adjusted R-squared	0.618190		
S.E. of regression	8.016257		
F-statistic	7.974610		
Prob(F-statistic)	0.000000		

Table 5.3 above shows the output of the two-way error component model, equation (8)

Marked in bold in table 5.3 above is the maturity profile or average remaining term of interest bearing liabilities. According to the model it carries a positive coefficient of 1.885445 with the firms leverage measured as debt to assets. We can see in the table that this two-way error component model gives the variable maturity profile a p-value of 0.0323, thus clearly making this variable significant on the 5%-level.

Furthermore we will test for the joint significance of the dummy variables. This is done by performing an F-test. The idea behind an F-test is to compare the unrestricted model (the fixed effects model in this case) with the restricted model (OLS). We reject the null hypothesis of no joint significance when the value of the computed F-statistic exceeds the F-value at our chosen level of significance. When testing for fixed effects in a two-way error component regression model our F-test is

$$F = \frac{(RRSS - URSS)/(N + T - 2)}{URSS/(N-1)(T-1) - K} \tag{10}$$

where N in this case denotes number of firms and T time, i.e. N equals cross-sections and T points in time. K is the number of explanatory variables. (Baltagi, 2005)

EViews gives us an F-statistic of 7.974610 and a probability very close to zero (zero on the sixth decimal) which means that we can reject the null hypothesis on a level of significance less than 1%. Thus, we can conclude that the fixed effects model is the proper one to use.

Furthermore, table 5.3 gives us a R^2-value of 0.70685. The R^2 value is used to measure the model's goodness of fit, in this case it means that our model explains 70.685% of the movements in the dependent variable. This intuitively makes sense as we have included several variables that according to other academic research significantly affects capital structure.

The output in table 5.3 reads that - statistically, and with a significance level of 5% - for every year the maturity profile extends, the firms in the study will chose to increase the debts as a percentage of assets by 1.885445, *ceteris paribus*. More importantly, this also means that we may reject the null-hypothesis H_0 from section 4.3.1 that there is no significant relationship between maturity profile and debt to assets for the firms in the study. Deductively so, our first hypothesis from section 4.3.2, H_1, that there is a statistically significant relationship between maturity profile and debt to assets for the firms in the study can be embraced.

In order to ascertain the necessity of the two-way error component model and thus investigate whether it is redundant for our conclusion above, we will conduct a redundant fixed effects test. (Brooks, 2008)

This test will return the results for three restricted models: one where cross-section fixed effects are restricted, (a period fixed effects model) one where period fixed effects are restricted (a cross-section fixed effects model) and finally a model where both types of fixed-effects are restricted. (an ordinary least squares multiple regression model with zero fixed effects) (Brooks, 2008) Let it be noted that a redundant fixed effects test only returns whether the two-way error component model is redundant. A two-way error component model is unrestricted and therefore inherently never less correct as it allows for fewer assumptions. The results of the redundant fixed effects test are displayed in table 5.4 below.

The model restricting cross-section fixed effects to zero and the model restricting both cross-section and period fixed effects to zero failed as a p-value of 0.0000 in this case indicates that the data set does not support them. (Brooks, 2008) As they both returned p-values of 0.0000 their tables have been excluded to preserve space.

Redundant Fixed Effects Tests

Equation: EQ01
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F (Period fixed)	14.054642	(11,86)	0.0000
Cross-section Chi-sq (Period fixed)	116.253598	11	0.0000
Period F (Cross-section fixed)	**1.985655**	**(9,86)**	**0.0506**
Period Chi-sq (Cross-section fixed)	**21.334559**	**9**	**0.0112**
Cross-Section/Period F (No fixed)	9.127958	(20,86)	0.0000
Cross-Section/Period Chi-sq (No fixed)	128.675804	20	0.0000

Table 5.4 above shows the output of our redundant fixed effects test

Marked in bold in table 5.4 is the period fixed effects restricted test, which is a cross-section fixed effects test. As the p-values of this test do not return 0.0000 we cannot reject the model as non-supported per se. Nonetheless the p-value, albeit with little margin, exceeds 0.0500 for the cross-section fixed effects model thus we fail to reject H_0 , that the cross-section fixed effects model is insignificant, at the 5%-level. We will return to this cross-section fixed effects model in our discussion in section 5.2.

The output of the above mentioned cross-section fixed effects can be viewed below in table 5.5. Interestingly the cross-section fixed effects model returns a coefficient of 2.430142 for the maturity profile with a p-value of as little as 0.0068. Thus had the p-value for the model itself been significant at the 5%-level, the model would have strengthened our results of statistically significant positive correlation. This model has returned with a higher F-statistic of 10.1934 as opposed to 7.9746 for the two-way error components model, however at the same it returns a lower coefficient of determination R^2 as well as a lower adjusted coefficient of determination. While the opposing hints of the values of each of these two variables in the two different models could open for further discussion, we will refrain from this and settle with that the cross-section fixed effects model is insignificant, albeit marginally. And had it not been, it would not have contradicted our results in the two-way error component model.

Restricted period fixed effects test equation

Dependent Variable: Debt to assets %			
Method: Panel Least Squares			
Sample: 1999-2008			
Periods included: 10			
Cross-sections included: 12			
Total panel (unbalanced) observations: 113			
	Coefficient	Std. Error	Prob.
Maturity profile	**2.430142**	**0.878745**	**0.0068**
Dividend yield	-0.438553	0.403021	0.2793
Operating income growth	0.007047	0.009234	0.4473
Market capitalization	-1.12E-05	2.36E-05	0.6356
Net margin	-0.187923	0.129364	0.1496
Volatility (standard dev.)	16.17848	7.436259	0.0321
Constant	14.17025	3.866208	0.0004
Effects Specification			
Cross section fixed effects			
R-squared	0.645903		
Adjusted R-squared	0.582538		
S.E. of regression	8.382176		
F-statistic	10.19340		

Table 5.5 above shows the output of our cross-section fixed effects test

Our results in table 5.3 show that there is a statistically significant positive correlation between leverage and maturity profile. And although correlation does not imply causation we would be very surprised if debt affected maturity profile, and not vice-versa. Not necessarily because an already leveraged firm would refrain from elongating its maturity profile, but rather because it is more logical for a firm to increase its leverage after elongating its maturity profile. This reasoning is mainly derived from the fact that it tends to be more expensive to attract long-term financing (or any financing) with a higher leverage, because of the increase in risk. This while the opposite approach, to increase leverage after a longer average maturity profile has been achieved trough issuance of long-term debt, should give a firm a better position to attract relatively cheap financing.

From the theories laid out in chapter 3, especially the Modigliani-Miller theorem under the presence of taxes, we assume that firms prefer a higher leverage. This as long as that leverage does not create negative spillover effects, which may scare of investors and increase its WACC due to increased cost of capital, in both debt and equity financing. The lengthening of the maturity profile is one way of assuring adequate time for maneuvering and mitigating risks if a situation of financial or operational distress occurs. As anyone familiar with the financial arithmetic of options would know, time is the only variable which only goes one way, always. Having time on your side is always an advantage, *ceteris paribus*. However simply increasing the length of the maturity profile is not that simple. As we mentioned briefly in our introduction, the inherent properties on the typical upward-sloping yield curve implies that long-term financing is more expensive than short-term financing. (Hull, 2009)

The above leads us to assume that lengthening in maturity profile does come at a premium price. However given the assumption made in chapter 3 - that the MM theorem under the presence of taxes holds to some extent - a firm would be able to decrease its WACC, *ceteris paribus*, trough a higher leverage. This of course, also applies when the firm lengthens the maturity profile and we take the increased cost of long-term financing as opposed to cheaper short-term financing into account. Thus WACC could be held constant, or even decreased because of tax-deductible debt, even when the firm holds a debt portfolio with a longer maturity profile.

By utilizing a debt portfolio with a longer maturity profile the firm could theoretically compensate (at least in part) for the increased risk that comes with the higher leverage. At the same time the firm would increase its return on shareholder equity, *ceteris paribus*, as a larger part of the firm's capital requirements would be debt-financed.

6. CONCLUSION

Here room is given to the conclusions we have drawn from the analysis of the results in the previous chapter. We will also suggest further studies that might be undertaken on the subject.

6.1. CONCLUSION

From our analysis of the data and the discussion in section 5.2 above, the main conclusion that can be drawn is that the maturity profile does have a statistically significant positive correlation to the leverage of the studied firms.

However, one should be very careful with drawing hasty conclusions from the output of our model, especially given the small amount of firm data that was actually available to us for this study. In order to draw more detailed conclusions assumptions must be made. Should we assume that the studied firms are a reflection of the Swedish enterprise community as a whole, we could argue that our study indicates that maturity profile does have an impact when any Swedish firm, less banks and financials, chooses its leverage.

This assumption is in our opinion not that farfetched, especially given the 99,9% correlation between the OMX Stockholm 30 index and the OMX Stockholm index. (NASDAQ-OMX, 2009)

Going further in making assumptions we could also assume that these firms reflect their respective industries, or at least their peers in Europe and/or the OECD community. Neither would this necessarily be a farfetched assumption, given the world-leading and global scope of some of the firms included. We will however halt our assumptions here and leave it to other research to continue where we left off.

6.2. FURTHER STUDIES

The conclusions that can be drawn from this thesis are interesting, yet literarily one should not jump to conclusions. While we have shown that the maturity profiles of the firms in the study are statistically significantly correlated to their leverage, the observations used have been limited.

Further studies could be extended to encompass more firms, for example all listed firms on NASDAQ OMX Stockholm. Going further in depth in both complexity and data used one could attempt a study containing both more explanatory variables and more data. The very neatly compiled matrix in Asgharian (1997) refers to studies using explanatory variables such as: collateral value of assets, growth, profitability, size, risk, uniqueness of product, requirements of parts and services, market share, dividend, b-share and none debt tax shields for a total of eleven. Including all these and perhaps additional ones coupled with more data the results of an eventual study would weigh far heavier that those of our, very limited one.

On top of this it could be wise to include firms on a pan-European or global scale, this in order to better reflect the general circumstances concerning maturity profiles.

This study has also opened our eyes for further studies into the subject of maturity profiles, so further studies need not to be concentrated only on its implications for the capital structure but could instead attempt to analyze its possible importance for probability of default, or if the variable has any affect on the pricing of a firm in LBOs and/or IPOs.

As with all subjects within finance and financial markets that can be studied using econometric analysis, the possibilities are nearly infinite and the limitations set merely by the imagination and academic skill of the researcher.

We would like to close this thesis by quoting Stewart C. Myers article *The Capital structure Puzzle* in which Mr. Myers actually referred to Fischer Black's *The Dividend Puzzle*. Black closed his work with the following words: "*What should the corporation do about dividend policy? We don't know*". Myers, when writing his paper on capital structure wrote: "*How do firms chose their capital structures? We don't know*" (Myers, 1984, pp 575)

The point is that we did not know in 1984 how firms chose their capital structure, and we do not know today, we are however achieving a somewhat better understanding. Hopefully this thesis can serve as an inspiration for additional research into the rather unexplored area of the debt maturity profile as a determinant.

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8. APPENDIX

Contains data that we felt would have disrupted the thesis readability if included in the text, but we were reluctant to leave out altogether due to its usefulness to some readers.

8.1. FIRM BIOGRAPHIES

We will here include a brief description on each of the twelve firms included in our study.

ABB

ABB was formed in 1988 by a merger of Swedish ASEA and Swiss Brown, Boveri & Cie. Today it is the world's largest provider of power grids and a global leader in automation and power products and systems. The main business units are: Power Products, Power Systems, Automation Products, process Automation and Robotics. ABB is traded on Virt-x in Zürich, Switzerland, NASDAQ OMX Stockholm in Stockholm, Sweden (ticker ABB) and the New York Stock Exchange in New York, United States. (ABB, 2010. www.abb.com)

Atlas Copco

Atlas Copco was founded in 1873. It is a global industrial group active within several industry segments most notably drilling rigs for mining use and other specialized heavy industrial equipment. Historically, Atlas Copco has had a high - and successful - presence in unstable and emerging-market economies. It business is organized into three main segments: Compressors & Generators, Construction & Mining and Industrial Tools. Atlas Copco is traded on NASDAQ OMX Stockholm with two series of shares, A and B. Tickers are ATCO A and ATCO B respectively. (Atlas Copco, 2010. www.atlascopco.com)

Boliden

New Boliden is a mining and smelting company founded in 1931 after gold was discovered in the Boliden mine in 1924. It has since evolved from a small localized mining-company to an international player within the mining and smelting of copper and zinc as well as gold and lead. Despite some environmental controversies the company has enjoyed considerable success in the recent commodities-boom. New Boliden is traded on NASDAQ OMX Stockholm as Boliden. The share ticker is BOL (Boliden, 2010. www.boliden.se)

Electrolux

Founded in 1910 as Elektromekaniska AB and gaining its modern name after a merger with Lux AB in 1919 Electrolux is today the second-largest home appliance manufacturer in the world. The group has two main business areas: Consumer Durables and Professional Products. The product portfolio contains a number of well-known brands such as AEG, Elektro-Helios, Kelvinator, White-Westinghouse and Zanussi. Electrolux is traded on NASDAQ OMX Stockholm. Series A and B have tickers ELUX A and ELUX B respectively. (Electrolux, 2010. www.electrolux.com)

Sandvik

Swedish Entrepreneur Göran Fredrik Göransson founded Sandvik in Sandviken in 1862 and the company has since grown to become a global leader in industrial tooling and metallurgy. The most notable of its products being its metal cutting tools under the brand Coromant. Sandviks business areas are: Sandvik Material Technology, Sandvik Tooling and Sandvik Mining and Construction. A notable product area is the recently added MedTech under Material technology which provides both manufacturing and consultancy services within medical inplants. Sandvik is traded on NASDAQ OMX Stockholm with the ticker SAND.

Svenska Cellulosa Aktiebolaget

SCA is a Industrivärden-controlled paper company active within both pulp and paper and consumer goods. Founded by famous Swedish industrialist Ivar Kreuger in 1929 it was taken over by Handelsbanken in 1932 when Kreuger went bankrupt. As the continent of Europes largest owner of forest land, making SCA is a leading player in the paper industry worldwide. Its current business areas are: Personal Care, Tissue, Packaging and Forest Products. SCA series A and B are both traded on OMX Stockholm. The tickers ate SCA A and SCA B respectively. (SCA, 2010. www.sca.com)

Scania

Headquartered in Södertälje where it was founded as Vagnsfabriksaktiebolaget i Södertälje in 1891, Scania is a global producer of trucks and other commercial heavy vehicles. Scania also manufactures diesel engines for agricultural, industrial and marine applications. Its main shareholder is German automotive conglomerate Volkswagen AG. Volkswagen controls approximately 70% of the votes since Wallenberg-controlled Investor divested its holding in

Scania in 2008. Scania series A and B are traded on NASDAQ OMX Stockholm with tickers SCV A and SCV B respectively (Scania, 2010. www.scania.com)

Skanska

Skanska, founded as Aktiebolaget Skånska Cementgjuteriet more than a century ago, is currently Sweden's largest construction company. Skanska has been active in the international construction market since the 1950s and is among a few foreign construction companies to rank as a top player in the US markets. With notable projects such as 30 St Mary Axe on its list of merits and projects such as Heron Tower and the Renovations of Madison Square Garden underway, Skanska has considerable foreign presence. Skanska series B is traded on NASDAQ OMX Stockholm as SKA B (Skanska, 2010. www.skanska.com)

SKF

SKF was founded in 1907 around the patents of a Swedish engineer who had invented a self-aligning ball-bearing. It grew from less than 500 employees in 1910 to over 20'000 in 1930. SKF executives were also responsible for founding AB Volvo, a company that was to become a world leader in heavy commercial vehicles. Volvo was divested by SKF in 1926 and SKF is today the largest manufacturer of ball bearings in the world. SKF is headquartered in Gothenburg, Sweden and has 150-some subsidiaries. Business areas include: Seals, Bearings & Units, Lubrication Systems, Mechatronics and Services. SKF series A and B are traded on NASDAQ OMX Stockholm as SKF A and SKF B (SKF, 2010. www.skf.com)

SSAB

SSAB is a world-leader in manufacturing of high-tensile steel products. The company was formed in 1978 by a merger of several centuries-old Swedish steel-mills. SSAB is currently organized into three divisions: SSAb Strip Products, SSAB Plate and SSAB North America. The company also has two additional subsidiaries, Plannja which is a construction steel manufacturer and Tibnor, a steel trading company. It largest shareholder is Handelsbanken-controlled Investment company Industrivärden. Series A and B shares are both traded on NASDAQ OMX Stockholm. Tickers are SSAB A and SSAB B. (SSAB, 2010. www.ssab.com)

Swedish Match

Another company founded by industrialist Ivar Kreuger when his empire was yet to fall. Swedish Match was founded as Svenska Tändsticksaktibolaget in 1917 and got its current name in 1980. The company has a major presence in both the United States and Southeast Asia and is a global manufacturer of snus, tobacco, chewing tobacco, cigars, matches and lighters. Swedish Match shares are traded on NASDAQ OMX Stockholm with the ticker SWMA (Swedish Match, 2010. www.swedishmatch.com)

Tele2

Tele2 is a leading Swedish telecommunications provider with over 24 million customers in Europe. It was founded by Stenbeck-controlled investment company Industriförvaltnings AB Kinnevik in 1981. Then named Comvik, but after a series of mergers and deregulations of Swedish fixed and mobile telecommunication networks it took its current form. Tele2 offers mobile phone, landline and broadband services in Northern and Eastern Europe. Both series A and B are floated on NASDAQ OMX Stockholm and tickers are TEL2 A and TEL2 B (Tele 2, 2010. www.tele2.com)