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„Discounted Cash Flow Analysis and Relative Valuation; Their Applicability to S&T AG“

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List of Abbreviations

AG Corporation (ger. Aktiengesellschaft)
APT Arbitrage Pricing Model
APV Adjusted Present Value
CAPEX Capital Expenditures
CAPM Capital Asset Pricing Model
CEE Central and Eastern Europe
CF Cash Flow
CRP Country Risk Premium
D Debt (Value of Debt)
DAX German Stock Index (ger. Deutsche Aktienindex)
DCF Discounted Cash Flow
DDM Dividend Discount Model
Dep Depreciation
Div Dividend
E Equity (Value of Equity)
EBIT Earnings Before Interest and Taxes
EBITA Earnings Before Interest, Taxes and Amortization
EBITDA Earnings Before Interest, Taxes, Depreciation and Amortization
EV Enterprise Value
exch Exchange
FCF Free Cash Flow
FTE Flow to Equity
HML High Minus Low
MCAP Market Capitalization (Market Value of Equity)
MRP Market Risk Premium
MV Market Value
NPV Net Present Value
NWC Noncash (net) Working Capital
PBV Price-to-Book Value
PD Probability of Default
PP&E Property Plant and Equipment
PV  Present Value
R&D  Research and Development
r_A  Cost of Asset
r_d  Cost of Debt
r_E  Cost of Equity
r_f  Cost of Riskless Investment (risk free rate)
r_m  Cost of Investment in Market Portfolio (Market return)
ROE  Return on Equity
ROIC  Return on Invested Capital
SMB  Small Minus Big
t  Period
T_C  Marginal Corporation Tax Rate
TFM  Three Factor Model
TV  Terminal Value
V  Value
VS  Versus
WACC  Weighted Average Cost of Capital
β_E  Equity Beta
β_l  Levered Beta
β_U  Unlevered Beta
1. Introduction

“Value is the defining dimension of measurement in a market economy. People invest in the expectation that when they sell, the value of each investment will have grown by a sufficient amount above its cost to compensate them for the risk they took”.¹

Many investors invest in different corporations in the form of buying their shares. What drives these investors into their „buying decision“? While there can be different reasons for making many of the investors taking into consideration the „buying decision“, the rational investor should focus only on value. But how can value be measured?

This thesis will describe two basic tools for measuring the value of a corporation and the value of each share: Discounted Cash Flow Analysis and Relative Valuation.

The first basic tool, Discounted Cash Flow Analysis, is focused in the intrinsic value. The estimation of the intrinsic value itself requires a fundamental analysis of the company for both, expected cash flows and cost of capital. An insight into the method that should be chosen and into the assumptions which have to be considered for estimating each component required in the estimation of cash flows and cost of capital, will be given in this thesis.

The other basic tool, Relative Valuation, is focused mostly in estimating the value of the company, related to other comparable companies. Important issues, including also the choice of comparable companies’ group, the choice of the comparable multiple etc. will be also discussed in depth.²

At the same time, the thesis will be delimited in describing the estimation of value i.e. for Austrian corporations. In order to make the description more comprehensive, the valuation of an Austrian publicly traded company, „S&T AG“, will be performed and presented in details. The reason for valuing a specific company is based on two essential arguments: (i) it gives a clear picture about how theory can be implemented in practice and (ii) it shows to which extent the theory about valuation is applicable. It is also important to state that it will be assumed the average investor can only use public information. Therefore the valuation of „S&T AG“ will be performed by using only information that is publicly available from the company itself as well as from other sources.

In general the thesis will show how subjective is value itself, since the assumptions; the method; the tool; the group of comparable companies chosen etc. will always create a different point of view about value.

¹ (Koller, Goedhart, & Wessels, 2010) p.3
² Cf. (Damodaran A., 2012)
2. Valuation Overview

2.1. Difference between Price and Value

In valuation it is important to distinguish between price and value. Every publicly traded company has a market price. However the price itself can be considered to be merely an exchange instrument. This means the price is a function of supply and demand, depending thus on market situations, points of view of all investors and so on.\(^3\) On the other hand value is much more subjective. The process of valuation is oriented in the future and this means each investor has to deal with many uncertainties. Depending on preferences, beliefs, individual interests, degree of information etc. each investor would come up with a different maximal price he or she is willing to pay. Logically, if this estimated maximal price of an investor, is higher than the price in the market, then investing would be under conditions reasonable for the investor and vice versa.\(^4\)

2.2. Market Efficiency

In capital markets, market efficiency would be important not only for explaining the difference between value and price, but also for coming up with a decision that would judge whether investing is reasonable or not. For instance a strong efficient market would provide much information about value in the stock price where the latter would be the best indicator of value. However efficiency does not imply that the stock price has to reflect the true value every time, it simply has to be consistent with the investment risk. Random changes in stocks’ prices do not make the market inefficient. On the other hand, if these changes are biased and not random, then the market cannot be considered to be efficient anymore. What does efficiency mean in context of valuation? If the market is efficient it is less probable for an investor to find undervalued stocks. In contrast market inefficiency would create more space for the investor to find undervalued ones. The second approach seems to be more advantageous. But why should an investor buy undervalued stocks? The answer is logical: the investor has to believe that the market has made a mistake and this mistake will be corrected

\(^3\) Cf. (Matschke & Brösel, 2013) p.10-13

\(^4\) Cf. (Matschke & Brösel, 2013) p.18-21
later on. As explained above the mistake consists in undervaluing the stock, but correcting it requires the market to become efficient over time i.e. to understand the situation and to move toward the right direction. If an undervalued stock (no matter to what extent) will never be perceived as undervalued from the market over time, it will most likely not pay off the investment.\(^5\)

As shown above market efficiency should help explaining the results of valuation in general or the results obtained from the valuation of “S&T AG” particularly. Although very important, deeper analysis like tests for efficiency will neither be performed, nor analysed in the following, since it derives much from the main subject. However the issues discussed above should make the understanding and interpretation of the final results obtained from DCF Analysis and Relative Valuation much easier.

\(^5\) Cf. (Damodaran A. , 2012) p.111-113
3. General Analysis of “S&T AG”

In the previous chapters it has already been mentioned that the valuation methods will not only be discussed theoretically, but will also be considered from their implementation point of view. In this chapter, general facts about the “S&T AG” will be introduced first, followed by a discussion of its most important financials, the industry’s overview as well as opportunities and risks the company faces.

3.1. Basic facts about the company

“S&T AG” is an Austrian corporation with headquarters in Linz. It was first founded as “Gericom AG” in 1990. In 2008 it was renamed as “Quanmax”. “S&T System Integration & Technology AG” (another Austrian company) was acquired by “Quanmax” and merged with it in November 2011. The acquisition of “S&T System Integration & Technology AG”) was financed with stock of “Quanmax” in a ratio of 200:259. “S&T System Integration & Technology AG” has ceased to exist as a company since the merger but the conglomerate has been registered as “S&T AG” (i.e. it changed its name from “Quanmax” to “S&T AG”) at that point of time. 

“S&T AG” has approximately 1600 employees and operates currently in 19 countries with 70 branches. Its’ geographical presence is concentrated in Europe, mostly in CEE and in the Balkan region.

The company operates in the technology industry and more precisely in computers and peripherals sector. It has a relatively wide range of products and services. In terms of manufacturing, the company is focused in the development of consumer specific IT solutions. The development includes not only the production, but also their implementation and operation once delivered to the customer. “S&T AG” offers many products under its property ranging from PC and server hardware through mobile solutions, to highly professional security appliances for instance. On the other hand the company also offers several services as for example outsourcing, integration and consulting in the IT sector.

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6 Cf. (FSE, Equities, S&T AG, Company Data)
7 Cf. (S&T, Investor relations, Ad-Hoc Announcements, Merger)
8 Cf. (S&T, about us, fact and figures)
9 Cf. (S&T, about us, company profile)
The products of the company include more specifically: workplace devices, server and storage centre, embedded systems, network and security products, and different software solutions. The services on the other hand have greater variety. They include outsourcing: in data centre and workplace as well as other services: in storage, servers, mobile devices, license management, software development, network and security, ERP implementation, and so on.

To sum up, the products and services discussed above are grouped into three main business areas: IT products, Appliances and Services. As mentioned also before, the IT products which include computer products are offered to both B2B and B2C customers. The appliances on the other hand, which are sold under the brand of SecureGUARD are intended mostly for B2B professionals. Priority has cloud computing upon data security and network infrastructure. The last business area, the services, is concentrated on IT components. Based on revenues the weight of each business area has been presented below in Figure 1.

Figure 1: Business Areas, Breakdown for Revenues (S&T)

As shown on Figure 1 the focus shifted from IT products in 2011 into services in 2012. It is interesting to mention that the shift is not due to negative growth in IT products which in fact had positive growth of 18.06%. The shift was rather a result of the extraordinary growth in

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10 Cf. (S&T, Products)
11 Cf. (S&T, Services)
12 Cf. (S&T, Annual Report 2012) p.28
services that was as high as 318.1% in 2012, influenced mainly by the merger of “Quanmax AG” with the former “S&T AG”.\textsuperscript{13}

It is important to mention that “S&T AG” is also quoted at the Frankfurt Stock Exchange since late 2000 and has a good transparency standard, the Prime Standard. It also uses accounting standards of IFRS with the end of business year in 31.12. It has an executive board that consists in four members: Hannes Niederhauser (CEO), Michael Jeske and Peter Sturz (COOs), and Richard Neuwirth (CFO).\textsuperscript{14}

Another important fact that has to be considered is the shareholder’s structure presented in Figure 2.

**Figure 2: Ownership Structure (S&T)**

![Ownership Structure (S&T)](image)

Source: own representation based on: (S&T, about us, fact and figures)

The shares as shown on the graph are more than the half i.e. 52% free float and the rest belongs to: “Grosso Holding” 17%, “Quanmax M” 28% and “Quanmax Inc.” 3 %.\textsuperscript{15}

Regarding the board of directors “S&T AG” has actually five directors in charge. The number of directors was increased from three to five in the 14-th annual meeting in which the two new members Bernhard Chwatal, Matthias Ehrlich were elected.\textsuperscript{16} Before their duty on “S&T AG” there are no indications that any of these directors had any important connection with the

\textsuperscript{13} Cf. (S&T, Annual Report 2011) p.14 and (S&T, Annual Report 2012) p.28
\textsuperscript{14} Cf. (FSE, Equities, S&T AG, Company Data)
\textsuperscript{15} Cf. (S&T, about us, fact and figures)
\textsuperscript{16} Cf (S&T, Voting 2013) p.2
company.\textsuperscript{17} The other members are the chairman Erhard Grossnig, Rudolf Wieczorek and Bruno Buchberger.\textsuperscript{18}

### 3.2. “S&T AG” financials

The company has a market capitalization of € 100.89 million (01.10.2012) with 39.34 million shares outstanding. Considering these two numbers the share price is approximately € 2.56 which undoubtedly changes every moment.\textsuperscript{19} Each share had net earnings (EPS) of € 0.27 in 2012. It is also important to mention that “S&T AG” does not include dividend payments in their payout policy. Another important fact is the relatively large cash balance the company has. It was approximately € 30 million in late 2012. The positive and negative effects of cash will be discussed in the following chapters.\textsuperscript{20} Regarding the sales and the net income the company had a great sustainable growth in the last four years.

**Figure 3: Sales 2009-2012 (S&T)**

Going back to 2009 (as shown in Figure 3) sales reached only € 60 million. In 2010 they had an increase of 35% compared to the previous year. The increase per year became even greater in 2011 with 90% and reached a peak of 122% in 2012. To summarize, sales grew from € 60 million (2009) to € 340 million (2012).

Source: own representation based on: (FSE, Equities, S&T AG, Key figures)

Net income increased also; from € 3.3 million in 2009 to € 7.7 million in 2012. The change was not so dramatic regarding the net income but it is still worth to mention that it had positive growth each year and approximately doubled in four years. However the positive

\textsuperscript{17} Cf. (S&T, about, board of directors)

\textsuperscript{18} Cf. (S&T, Corporate Governance report 2012)

\textsuperscript{19} Cf. (FSE, Overview S&T AG)

\textsuperscript{20} Cf. (S&T, Annual Report 2012) p.36-37
growth in sales does not correspond to the growth in net margins (an important indication of profitability) which declined each year.  

**Figure 4: Change in Sales, net Income and net Margins (S&T)**

![Figure 4: Change in Sales, net Income and net Margins (S&T)](image)

*Source: own representation based on: (FSE, Equities, S&T AG, Key figures)*

In Figure 4 we can see that the positive change in sales is continuously growing each year. Net income had almost the same increase as sales in 2011, but on 2012, the change, even though in absolute terms positive, was relatively low.  

**Figure 5: net Margins and ROE (S&T)**

![Figure 5: net Margins and ROE (S&T)](image)

*Source: own representation based on: (FSE, Equities, S&T AG, Key figures)*

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21 Cf. (FSE, Equities, S&T AG, Key figures)
22 Cf. (FSE, Equities, S&T AG, Key figures)
In Figure 5 it is shown that the net margins decrease each year, from 5.5% (2009) to 2.27% (2012). The return on equity (ROE), even though not having the same decreasing pattern as net margins, still shows a decrease i.e. from 18.23% (2009) to 12.46% (2012).\(^{23}\)

ROE which measures the rate of return the company had on its past investments is not only depended on net margins, as shown on equation (3.1)

\[
ROE = Net\ Margins \times Asset\ Turnover \times Equity\ Multiplier \ (3.1)
\]

The asset turnover indicates the efficiency rate with which the company is utilizing its assets for generating sales. The equity multiplier, the last term, is the ratio of total assets over total book value of equity.\(^{24}\)

**Figure 6: Asset Turnover and Equity Multiplier (S&T)**

![Graph showing Asset Turnover and Equity Multiplier](image)

**Source:** own representation based on: (FSE, Equities, S&T AG, Key figures)

In Figure 6 it is shown that the equity multiplier has increased from 2.2 (2009) to 3.5 (2012). The asset turnover seems to be negatively correlated with the equity multiplier from 2010. On the other hand, comparing 2012 with 2009 it shows similar values, 1.53 and 1.59 respectively. Having a view of the last two graphs it is evident how declining margins and asset turnover influence return on equity which decreases over time, even with a growing equity multiplier.\(^{25}\)

Summing everything up it can be suggested that even though the increase in sales is impressive, it is not necessarily a result of efficiency. For instance the merger of “Quanmax”

\(^{23}\) Cf. (FSE, Equities, S&T AG, Key figures)

\(^{24}\) Cf. (Berk & De Marzo, 2011) p.32

\(^{25}\) Cf. (FSE, Equities, S&T AG, Key figures)
with “S&T System Integration & Technology AG” in 2011, which was presented briefly in part 3.1, had most likely a great contribution into growth. However growth in general, growth from acquisitions and many other important issues will be discussed in details in the following chapters.  

3.3. Industry Overview

As it was mentioned before “S&T AG” belongs to computer and peripherals sector. The sector includes companies which offer products like computers, storage devices etc. as well as services such as installing and managing a business. It has a diverse customer base including other industry participants, governments of different countries, businesses and consumers. However it is important to distinguish for a certain company as for instance “S&T AG” whether there are only few big players demanding its products and services or rather there is a greater number of customers. This fact is important when it comes to the risk of the company because a loss of a major customer would be more devastating compared to the loss of one or few small customers. Regarding the growth perspective within the industry, forecasts are positive. Governments, businesses or even consumers are becoming more and more computerized. The number of consumers should normally increase because individuals have nowadays greater incentives to stay connected with other people or to use computers more and more frequently for many other things. The growth in the sector should also come from businesses. Being all the time in competition, they will have the incentive to provide always the most efficient solution. This means that updates in computers, servers, storage or additional services will be always highly demanded. It is important also to mention that it is typical for companies in this sector to supply in many countries and therefore be exposed to currency risk. Regarding the pay-out policy this sector is not known for paying dividends what is consistent with the pay-out policy of “S&T AG” discussed before. Also typical for the sector are horizontal mergers since it is almost a necessity for companies to gain from synergies. Concerning possible recessions, this sector has a small inelasticity. Since the solutions that this sector offers, are intended to increase efficiency, the businesses for instance may still buy these products to alternate their savings. Nevertheless the advantage remains limited due to the fact that in case of recession many other issues may be high priority for a

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26 Raw data for calculations from: (FSE, Equities, S&T AG, Key figures)
business, rather than investing for efficiency. However, compared to other industries, this sector has been the best performer during the phase right after recessions which itself is supposed to last four years. This fact is consistent with the argument stated before which suggested that businesses may postpone investments in technology due to higher priority issues. Once businesses overcome these priority issues, they become more willing to invest in this sector.

3.4. Risks and Opportunities

Being a multinational group, “S&T AG” is exposed to many risks and opportunities which indubitably are managed by the company itself. The fact that “S&T AG” is involved in acquisitions makes it carry some strategic, financial and liquidity risk. However the strategic risk is at the same time an opportunity, because acquisitions like the former “S&T” have opened a new era in the process of innovations. Nevertheless innovation on its own is a result of R&D expenses which themselves are risky too. The financial and liquidity risk on the other hand does not represent any problem because the company reports to have flexible debt capacity especially in the short term and furthermore it has a high cash balance. Regarding the market risk, where part of it is also the risk coming from competition, “S&T AG” is conducting market monitoring. The monitoring process does not consist in detecting new trends. It is mostly focused in making good use of manifested trends by using build-to-order production and distribution. At the same time this kind of production is exposed to production and technology risk. The technological progress can make the inventories value less over time. On the other hand mistakes in producing technological items may also represent a risk since the products will be less competitive in the market. In part 3.3 the importance of customer structure was also discussed. From this point of view “S&T AG” does not seem to be exposed too much to demand risk because the customers have a well-diversified structure. Regarding the risk from changes in interest rates, it is reported to be low due to the fact that most of the contracts are not based on fixed interest rates. As mentioned also in 3.3., it is typical in this industry to sell in different countries. In the case of “S&T AG” there is no exception to the rule. In fact the company is making a considerable part of revenues in foreign currency i.e. it is exposed to currency risk. This means that if a certain foreign currency is volatile it will then influence the results of the whole group. The way “S&T AG” manages

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27 Cf. (ValueLine)
28 Cf. (Emsbo-Mattingly, Hofshire, & Betro)
this risk is by issuing appropriate financial derivatives. Apart from the currency risk, being present in many nations increases the legal risk as well. The company manages this risk by using trying to standardize processes, orders and business conditions.\(^{29}\)

The fact that the “S&T AG” operates in the CEE countries makes it exposed also to another kind of risk which the company does not mention on its 2012 annual report: the political risk. Political unrest and government instability are found to be present in these countries and they affect the growth of these countries’ economies. Indirectly that fact implies that “S&T AG” should also be affected. As a matter of fact the company reported that political instability in some of these countries is hindering the performance of “S&T AG” subsidiaries.\(^{30}\) Regarding the management of the political risk, there is no public information how “S&T AG” manages it. However that risk seems to be minimized by itself in the long term because the economies on these countries are being transformed into developed market economies.\(^{31}\)

In terms of opportunities, the business area of appliances in particular, is contributing in achieving growth. Even though this business area is doing great mostly in well established markets, the success in other eastern European markets is also expected. Other opportunity represents also the acquisition of some specific marketing and distribution rights in Russia where expenses are expected to be contrasted positively by the future cash flows. Focusing also in achieving higher margins by repositioning the product portfolio seems also to be a good opportunity for affecting earnings positively.\(^{32}\)

\(^{29}\) Cf. (S&T, Annual Report 2012) p30-33
\(^{30}\) Cf. (S&T, Half-Year Report 2013) p.3
\(^{31}\) Cf. (Gurgul & Lach, 2013) p.198
\(^{32}\) Cf. (S&T, Half-Year Report 2013) p.3
4. Discounted Cash Flow Analysis

In this main chapter the DCF analysis will be discussed in details. It will start with an overview of the most important methods used in DCF valuation. The methods will not only be presented separately, but they will also be compared with each other in order to establish which one would be (i) applicable and (ii) appropriate in the specific case of “S&T AG”. The analysis of the methods will be followed by the estimation of cost of capital together with the forecast of free cash flows. In the end of the chapter the value of the company will be finally estimated where the results will be also challenged with a sensitivity analysis.

4.1. The Methods of Discounted Cash Flow

In DCF analysis there are several methods for estimating the value of the company. As we will see in the following, the DCF follows the same principle: a cash flow measure as first input in the numerator (which can have enterprise or equity nature) and its’ corresponding discount rate (the other input) in the denominator. All methods should lead theoretically to the same decision. However, since DCF analysis is driven by assumptions, the methods might differ from each other when it comes to applicability. 33

The following methods will be discussed and compared to each other: the weighted average cost of capital (WACC) method, the adjusted present value (APV) method, the flow-to equity (FTE) method and the dividend discount model (DDM).

4.1.1 Weighted Average Cost of Capital Method

The WACC method uses basically the free cash flows (FCF) in the numerator and the WACC as cost of capital in the denominator (equation 4.1). This method has an enterprise nature which means it values the entire firm and not just the value to the equity holders.

\[ V = \sum_{t=1}^{n} \frac{CF_{to\ Firm\ t}}{(1+WACC)^t} \quad (4.1) \]

In the numerator the CF to firm represent the cash flow after operating expenses, reinvestment needs or taxes. This means these cash flows still contain debt holder portion e.g. interest

33 Cf. (Berk & De Marzo, 2011) p.595ff
expenses as well as payments to equity holders e.g. dividends. The denominator or the
discount factor on the other hand is a market value weighted average, between cost of equity
and cost of debt. The use of WACC method itself works optimally when the company’s
capital structure is stable, so that a constant target ratio can be applied over all periods.
However a changing WACC over periods, even though very complex, cannot be excluded as
an option.

4.1.2. Adjusted Present Value Method

As discussed in the previous part, maintaining a constant WACC over time cannot be always
comfortable. The APV method provides a way of estimating the value of the company in
which the capital structure will not create troubles during the process. In its easiest form the
APV method can be described as following:

\[ V_0^L = V_0^U + PV_{tax \text{ shield}} \quad (4.2) \]

It means the value of the company is equal to the value as if the company was unlevered plus
the present value of the benefits that interest expenses create in term of taxes. If the company
is considered to be all equity financed then the discount factor will be the cost of assets which
remains constant to changes in capital structure.

The discount factor for the unlevered value can be written as following:

\[ r_A = \frac{E}{V} r_E + \frac{D}{V} r_D \quad (4.3) \]

In equation 4.3 it is obvious that taxes are not taken into account. By keeping the overall risk
of the firm unchanged the cost of assets (\(r_A\)) will also remain unchanged unrelated to the fact
that the firm will be all equity or debt financed. However the discount factor for the tax shield
should not be confused with the cost of assets discounted above. The tax shield has to be
discounted back by using cost of debt instead.

By taking into account only the unlevered firm value and the present value of the tax shield,
the APV method seems to be the perfect solution. Nevertheless as mentioned at the beginning

34 Cf. (Damodaran A., 2011) p.597-598
35 Cf. (Koller, Goedhart, & Wessels, 2010)p.119
36 Cf. (Koller, Goedhart, & Wessels, 2010) p.119-123
37 Cf. (Berk & De Marzo, 2011) p.601-602
the equation 4.2 is the simplest form of this method. It ignores totally the disadvantages of
debt such as bankruptcy costs which are very complex and moreover are present all the time
in most companies.\(^{38}\)

### 4.1.3. Flow-to-Equity Method

The WACC method and the APV method discussed above are used to value the entire
business. In most of the cases, what an investor needs is simply the equity value or the
implied price per share. As a matter of fact it is still possible to come to the equity value once
the enterprise value has been estimated. However the FTE method does not need that extra
step to be done.

\[
E = \sum_{t=1}^{N} \frac{CF \text{ to Equity}}{(1 + r_E)^t} \quad (4.4)
\]

As shown in the equation (4.4), the cash flows to equity for each period have to be discounted
with the cost of equity. In this method the cash flows are free from any non-equity claim.
Therefore the value obtained is the equity value of the company.\(^{39}\)

Even though theoretically the method should show same results as the previous two methods
it is perhaps unlikely to happen when it comes to its’ implementation. In the WACC method
for instance the capital structure is incorporated in the cost of capital. On the other hand the
capital structure in FTE method is embedded in its’ cash flows. For this reason it is very
difficult to perform an accurate forecast for these cash flows. \(^{40}\)

### 4.1.4. Dividend Discount Model

Another way of valuing the equity of the company is referring to the dividend payments the
company pays out. DDM shows that the value of a stock is equal to the value of its expected
dividends.

\[
P_0 = \sum_{t=1}^{N} \frac{Div_t}{(1 + r_E)^t} \quad (4.5)
\]

---

\(^{38}\) Cf (Berk & De Marzo, 2011) p.513-514  
\(^{39}\) Cf. (Damodaran A., 2012) p.12-13  
\(^{40}\) Cf. (Koller, Goedhart, & Wessels, 2010) p.125
In the equation (4.5) \( P_0 \) represents the implied price for the stock. This implied price is the sum of each year’s dividends \((\text{Div}_n)\) discounted back to its’ cost of equity \((r_E)\). 41

Having just the price of one share it should not be a problem to come to the equity value, since the number of shares outstanding is in general known. Hence the equity value can be easily calculated by multiplying \( P_0 \) to the number of shares. 42

In practice DDM is generally used to estimate the value of financial services companies where the other methods are not applicable. However, even though relatively easy to estimate, DDM still shows some concerns. In many cases companies do not pay out the maximum they are able to pay. This would be for instance the case where the company’s estimated equity is less than it should be if the maximal dividend capacity was paid out. 43

4.1.5. Comparing the Methods

Having an overview of the methods discussed above, it might seem difficult to decide which one would be more appropriate for valuing “S&T AG”. However since the last dividend payment for “S&T AG” was made in 200344 the last model i.e. the DDM can be easily crossed out. By including no dividends in the pay-out policy, it would be unnecessary to discuss about the disadvantages of this method compared to others because it will be first of all inapplicable.

Regarding the FTE method, even though applicable in the case of “S&T AG”, it will also be dismissed due to the problems in its implementation discussed in 3.1.3., which states that the capital structure has to be incorporated in its cash flows rather than on cost of capital.

In the end the choice remains to be made between the WACC and APV method. On one side is the WACC method (see 4.1.1) which works optimally with a stable capital structure. In regards to this issue, the company seems to have planned some changes for moving toward a good capital structure. 45 Whether changes in capital structure will only be considered in short term or they will last longer, needs a deeper analysis.

41 Cf. (Berk & De Marzo, 2011) p.526
42 Cf. (Berk & De Marzo, 2011) p.25
43 Cf. (Damodaran A., 2010) p.455
44 Cf. (FSE, Equities, S&T AG, Company Data)
45 Cf. (S&T, Investor relations, Ad hoc announcements, Capital structure)
On the other side is the APV method (see 4.1.2) which faces no problems regarding the capital structure. However the estimation of bankruptcy costs would not be easy for “S&T AG” which has a wide range of products (see 3.1).

Considering the advantages and disadvantages, at this point of time it is still difficult to determine which method would be more appropriate. For this reason both WACC and APV method will be discussed more in depth in the following chapters.

### 4.2. Cost of Capital

Depending on the method used (see 4.1) the cost of capital can be a weighted average cost of capital (WACC), cost of assets \( r_A \) or just cost of equity \( r_E \).

By considering a company which has a notable portion of preferred stock the \( r_{WACC} \) formula would be:

\[
WACC = \frac{E}{V} r_E + \frac{D}{V} r_D (1 - T_c) + \frac{P}{V} r_P \tag{4.6}
\]

In equation (4.6) the value consists of equity \((E)\), debt \((D)\) and preferred stock \((P)\) with each of them having a certain percentage over the total value. These percentages are the weights that will be then multiplied to their corresponding rate of return (respectively to \( r_E, r_D \) and \( r_P \)). The cost of debt on the other hand will be after taxes since interest payments are tax deductible and this way the tax shield will be embedded to the cost of capital.

In those companies where preferred stock does not exist or is negligible the formula can be rewritten:

\[
WACC = \frac{E}{V} r_E + \frac{D}{V} r_D (1 - T_c) \tag{4.7}
\]

The only difference in equation (4.7) is that now the total value consists solely of equity and debt. \(^{46}\)

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\(^{46}\) Cf. (Titman & Martin, 2008) p.123
4.2.1 Cost of Equity

As already discussed in 4.1 the cost of equity is an irreplaceable input in the DCF analysis, no matter which method is used. First the discussion will be focused on the model that will be used for estimating the cost of equity and second, according to the model chosen, its’ components will be analysed one by one.

4.2.1.1. The Model

In order to convert risks into cost of capital it is first important to discuss which of the models would be more appropriate and realistically applicable for estimating the cost of equity. There are many different models and approaches already, each of them having some advantages and disadvantages both in theory and practice. In the following three models will be compared: Capital Asset Pricing Model (CAPM), Arbitrage Pricing theory (APT) and Fama – French Three Factor Model (TFM).

a) Capital Asset Pricing Model

The CAPM has been developed mainly by Sharpe (1964), Lintner (1965) and Black (1972). The model assumes each Investor can invest any part of his capital in a risk-free asset as well as on a given finite set of risky securities. In the market transaction costs and taxes are excluded and the investor can borrow an unlimited amount at the risk-free rate. It further assumes the investors choose among portfolios based only on mean-variance utility of wealth-maximization. The investors are single-period risk averse and have homogenous views about joint probability of distributions. In this model the main result is the linear relation between the systematic risk and the expected security return.48

\[ E(r_E) = r_f + \beta_E [E(r_m) - r_f] \quad (4.8) \]

On the left side of equation (4.8), \( E(r_E) \) represents the expected return on the security. This expected return will be estimated by using the \( r_f \) which is the risk free rate, \( \beta_E \) i.e. the equity- or the levered beta of the security and \( E(r_m) \) the expected return on market portfolio. As we can see here, the expectations of the investor will be driven by the ratios of these three

47 Cf. (Lintner, 1965) p.15
48 Cf. (Black, Jensen, & Scholes, 1972) p.1-2
variables. For instance a $\beta_{E} = 1$ would give a $E(r_{E}) = E(r_{m})$ and on the same time the results will be different for $\beta_{E} \neq 1$.\textsuperscript{49}

The equation can alternatively be expressed as:

$$E(r_{E}) = r_{f} + \beta_{E} \ast MRP \ (4.9)$$

Where: MRP = $[E(r_{m}) - r_{f}]$ i.e. the market expected return above the risk-free rate. Overall as shown on equations (4.8) and (4.9), the estimation of the return on equity needs only three inputs with $\beta_{i}$ representing all market risk that cannot be diversified.\textsuperscript{50}

\textbf{b) Arbitrage Pricing Theory}

An alternative to CAPM has been presented by Ross (1976). The arguments for this theory are based on the restrictiveness of the assumptions that CAPM has. The assumption of homogenous anticipation the investors have in CAPM, will be significantly weakened in APT. In this theory, different factor betas have been used to identify the systematic risk compared to one single beta CAPM uses.\textsuperscript{51}

The cost of equity for APT will be estimated by:

$$E(r_{i}) = r_{f} + \beta_{i}^{F_{1}} (E[r_{F_{1}}] - r_{f}) + \beta_{i}^{F_{2}} (E[r_{F_{2}}] - r_{f}) + ... + \beta_{i}^{F_{N}} (E[r_{F_{N}}] - r_{f}) \ (4.10)$$

In equation (4.10) $\beta_{i}^{F_{1}}, \ldots, \beta_{i}^{F_{N}}$ are the factor betas. These different factor betas represent again the sensitivity to their corresponding excess return of the factor portfolio. In this case CAPM is nothing but a special case of ATP. The reason why APT uses different factors is that one portfolio alone (CAPM) is not necessarily efficient in capturing all the systematic risk. Therefore in APT, each factor captures a different portion of the systematic risk and when added together they should provide a more accurate estimation.\textsuperscript{52}

\textsuperscript{49} Cf. (Damodaran A., 2012) p.68
\textsuperscript{50} Cf. (Damodaran A., 2012) p.68
\textsuperscript{51} Cf. (Ross, 1976)
\textsuperscript{52} Cf. (Berk & De Marzo, 2011) p.435-436
c) Fama – French Three Factor Model

The assumptions of CAPM leave enough space for empirical contradiction. For instance the size of the market equity for a given company seems to be against the efficiency reflected in the CAPM beta. Average returns for small stocks are too high given their beta and vice versa. Other empirical evidences show that book-to-market equity, leverage and many other factors can scale the expected returns. 53

A possible Fama - French multifactor model (the TFM) can be written as:

\[ r_i = r_f(t) + \beta [r_m(t) - r_f(t)] + sSMB(t) + hHML(t) + a + e(t) \]  

In the equation (4.11) the beta is not the same as in CAPM since the whole picture has to be captured by adding all the factors together. SMB (small minus big) stands for a size related risk factor. It is the difference between the average of returns on the three small stock portfolios and the average of returns on three big stock portfolios. By using the same reasoning the HML (high minus low) is estimated the same way as SMB by using instead book-to-market equity. The model is clearly determined by historical data. 54

d) Comparing the models

It is obvious that CAPM is much more time efficient compared to the other models since it requires only a firm specific beta. But in the same time it does not explain differences in returns across stocks. The other model, the APT has an advantage over CAPM and it is due to the fact that the breakdown of systematic risk is clearer. On the other hand the factors are unnamed and merely statistical. Compared to CAPM, TFM seems to have the same advantages as APT. The disadvantage though remains that the factors are unstable and change over time. Compared directly to APT the TFM is more intuitive.

It is true that by ignoring the difficulties associated with the estimation of cost of equity, theoretically TFM or even APT would be better options compared to CAPM. However in practice CAPM seems to be the most effective solution for most industries. An exception is for instance the commodities sector which has nothing to do with “S&T AG”. Nevertheless CAPM cannot lead to realistic results if it will be used as given with all its’ assumptions.

53 Cf. (Fama & French, 1992) 427-429
54 Cf. (Fama & French, 1993) 9ff
Many improvements in the inputs are necessary for making it more valuable than the other models. 55

The argument that CAPM benefits exceed its’ disadvantages, are also supported somehow by its’ wide use in practice among companies. A survey made in 1999 involving 392 CFOs shows that CAPM has been used by 73,5% of companies in estimating cost of equity a result which is approximately twice higher than the second model used. When valuing publicly traded companies CAPM seems to be especially popular. 56

By putting all the parts together, CAPM seems to be more practice oriented than the other models and talking in specific terms it is also applicable to the “S&T AG”. Therefore considering everything discussed above, CAPM seems to be a reasonable decision for estimating the cost of equity. In the following the cost of equity will be estimated by using basically CAPM but in the same time its’ inputs will be modified for being closer to the real-world.

4.2.1.2. Estimating cost of equity for “S&T AG”

a) The risk free rate

When can an asset be considered to be risk free? Damodaran agrees that an asset can be considered as risk free if the returns are first of all certain. Under certainty it can be understood that there is no bankruptcy risk for the issuer of the asset. He further agrees that a private company cannot be default free because no matter how safe it might look it will always carry some risk. On the other hand governments can be safer issuers as their default probability is sometimes negligible. The difference between governments and companies is not a result of better management. It rather stands for the control that governments have in printing the currency, a fact that makes them more flexible. In spite of being default free the risk free rate has to meet a second condition which is having no reinvestment risk. It means that the rate in which the bond will be reinvested after it has reached the maturity has to be predicted today. Since predicting of short term treasury bills or bonds is complicated, the time

55 Cf. (Damodaran A., 2012) p.77
56 Cf. (Graham & Harve, 2001)p.201-203
horizon of the risk free rate should be long term oriented. Therefore in valuation of companies it should start from ten years Treasury bond. Another important aspect is that risk free rate should be consistent with the currency used for cash flows since the inflation risk is embedded on these rates.  

More specifically, Koller et al. agree that in valuing European companies ten-year German bond is recommended. Having higher liquidity and lower credit risks than bonds of other European countries, makes this alternative more adequate than the others.

Based on the arguments above there are not many doubts for the choice of the risk free rate in the case of “S&T AG”.

**Figure 7: German Treasury Bonds**

<table>
<thead>
<tr>
<th>Name</th>
<th>Yield</th>
<th>1 Day</th>
<th>1 Month</th>
<th>1 Year</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany Bund 2 Year Yield</td>
<td>0.22%</td>
<td>-3</td>
<td>+6</td>
<td>+15</td>
<td>11:59:52</td>
</tr>
<tr>
<td>Germany Bund 5 Year Yield</td>
<td>1.00%</td>
<td>-4</td>
<td>+33</td>
<td>+37</td>
<td>11:59:48</td>
</tr>
<tr>
<td>Germany Bund 10 Year Yield</td>
<td>2.00%</td>
<td>-5</td>
<td>+30</td>
<td>+38</td>
<td>11:59:57</td>
</tr>
<tr>
<td>Germany Bund 30 Year Yield</td>
<td>2.75%</td>
<td>-3</td>
<td>+25</td>
<td>+29</td>
<td>11:59:57</td>
</tr>
</tbody>
</table>

**Source:** (Bloomberg) (12.09.2013)

In Figure 7 it can be easily observed that the yield for a ten-year German Eurobond is 2.00%. This rate will be used as the risk free rate during the analysis.

**b) The Market Risk Premium**

As shown in equation 4.9, for a given security the market risk premium (MRP) is the rate of return above the risk free rate. Unfortunately the estimation of MRP is not based in an absolute approach. The different methods for estimating the MRP include: (i) the historical risk premium and (ii) regression analysis for linking current market variables. The first method is based on historical excess returns which are used as a proxy. On the other hand, the second method is focused on ratios such as dividend-to-price ratio.

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57 Cf (Damodaran A., 2012) p.154-156
58 Cf. (Koller, Goedhart, & Wessels, 2010) p.237
59 Cf. (Koller, Goedhart, & Wessels, 2010) p.238
Fama and French suggest that the second method gives results which are closer to reality than the historical risk premium. They agree that they show lower standard errors and aggregate risk aversion. On the same time the MRP estimated through this method tends to be far below than the MRP based on historical estimations.  

In estimating the MRP for “S&T AG” there is concern regarding the second method. As shown above it tends to be far below the historical MRP and will logically imply lower cost of capital which is concerning in showing the company as undervalued (see equation 4.1). Therefore the historical MRP seems to be more convincing. On the other hand, historical risk premiums seem to be also problematic while applied to European markets. Even though economies in many European countries are mature it does not hold for the equity markets. The fact that these markets are dominated by few large companies or that many business remain private, gives much noise to the process of estimating MRP.

Moreover the historical MRP alone is not always enough. Doing business in a certain country should not be the same as doing business in another county. However there are arguments against this hypothesis. One argument is that the additional country risk for a riskier country can be diversified. But, at the same time the argument itself has to meet certain criteria. The first criterion is that the marginal investor has to be already diversified. This criterion, if already met, should be followed by a second test i.e. all country risk should be country specific. Country specific, means that across countries there should be low correlations. When tested, the second criterion seems to fail in many circumstances in which markets correlate highly. Other arguments include the possibility that country risk premium has to be reflected in the cash flows. Even though there are some circumstances where particular country risks (e.g. earthquakes) have to be reflected into cash flows there remains still some residual country risk which can be reflected nowhere but in the MRP. Therefore the MRP equation can be written as:

\[
MRP = \text{Base Premium for Mature Equity Markets} + \text{Country Risk Premium} \tag{4.12}
\]

This means that in countries where the default risk is higher, the investor should expect higher premiums.

\[\text{Cf. (Fama & French, 2002)p.657}\]
\[\text{Cf. (Damodaran A., 2012) p.184}\]
“S&T AG” is exposed to the risk of different countries since its operations as mentioned in 3.1., are spread all over Europe. Taking a look at the annual report of 2012 we can see that only € 70,014 thousand or 21% of the total revenues are achieved in Austria. This means that the company is exposed by 79% to the risk of other countries in which it operates. Unfortunately the geographical breakdown 21:79 is the only one offered in the company’s 2012 annual report. However in the annual report 2011 it is stated that approximately 50% of the total revenues comes from emerging markets in Eastern Europe.

<table>
<thead>
<tr>
<th>Country</th>
<th>Population</th>
<th>Breakdown</th>
<th>CRP by Country</th>
<th>CRP by Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td></td>
<td>21%</td>
<td>0%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Germany and Switzerland</td>
<td></td>
<td>29%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Albania</td>
<td>2,832,000</td>
<td>0,44%</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Bosnia</td>
<td>3,840,000</td>
<td>0,60%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>7,284,000</td>
<td>1,13%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Croatia</td>
<td>4,291,000</td>
<td>0,67%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>10,504,000</td>
<td>1,64%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>9,962,000</td>
<td>1,55%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>16,734,000</td>
<td>2,61%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>5,477,000</td>
<td>0,85%</td>
<td>N.A.</td>
<td></td>
</tr>
<tr>
<td>Macedonia</td>
<td>2,057,000</td>
<td>0,32%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Moldova</td>
<td>3,560,000</td>
<td>0,55%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Montenegro</td>
<td>620,000</td>
<td>0,10%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>38,501,000</td>
<td>6,00%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td>19,043,000</td>
<td>2,97%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td>143,056,000</td>
<td>22,29%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Serbia</td>
<td>7,120</td>
<td>0,00%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Slovakia</td>
<td>5,445,000</td>
<td>0,85%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td>2,057,000</td>
<td>0,32%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Ukraine</td>
<td>45,644,000</td>
<td>7,11%</td>
<td>10%</td>
<td></td>
</tr>
</tbody>
</table>

Source: own representation based on: (Nationsonline) and (Damodaran A., Excel file Risk Premium For other Markets, June 2013 Update)

Given the situation it is very difficult to estimate how much revenue comes from each country. For mature markets, like Germany, Switzerland etc. it is not necessary to know the exact breakdown. The only problem remains with countries in Eastern Europe. One

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63 Cf. (S&T, Annual Report 2012) p.89
64 Cf. (S&T, Annual Report 2011) p. 19
65 Data from (S&T, about us, fact and figures)
66 Data from (Nationsonline)
67 Data from (Damodaran A., Excel file Risk Premium For other Markets, June 2013 Update)
A reasonable solution would be to make some assumption regarding the percentages. Even though there are many factors regarding the revenues made in each country it will be assumed that there is a strong correlation between country’s population and revenue. Table 1 represents a possible estimation of the percentages of revenues by country. On the first column we can see the countries in which “S&T AG” operates. As already mentioned above, 50% of the revenues come from Eastern European countries. Therefore the other 50% should logically come from countries that do not belong to Eastern Europe i.e. Austria, Germany and Switzerland. On the second column of Table 1 we can see the breakdown i.e. for Austria 21% and for both Germany and Switzerland 29% (all these three countries together make 50%) which, as shown on the fourth column, have no additional risk. This means that the only portion of country risk comes from the other 50%, the Eastern European countries. Here the breakdown has been calculated based on the assumption made before that the sales should correspond to the population. On the fourth column again we can see the implied breakdown for each Eastern European country which in sum gives 50%. Having also the country risk premium for each country, it is possible to come up with the weighted country risk premium for this region which is 1.91%. The last number, when added to 0.00% which is the country risk for Austria, Germany and Switzerland gives again 1.91%

On the other hand, the base premium for mature equity markets shown in equation 4.12 is 5.75%. Having these two numbers the equation 4.12 can be finally solved:

\[ MRP = 5.75\% + 1.91\% = 7.66\% \]

The MRP of 7.66% will be used for estimating the cost of capital.

c) The Systematic Risk (Beta Factor)

One common way of estimating a stock’s beta is by using historical risk premiums. The method used for this estimation is a linear regression of the stock excess returns against the market excess returns. The slope of the regression would be in this case the systematic risk of the security, or the beta. It shows the sensitivity of the stock or put in a different way it shows at which percentage the stock returns change if the market returns change by 1%. Regarding

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68 Data from (Damodaran A., Excel file Risk Premium For other Markets, June 2013 Update)
the returns, the ones in monthly basis seem to work well if taken for a period of approximately ten years.\textsuperscript{69}

For “S&T AG” 23.07.2009 was the first date in which daily units have been traded.\textsuperscript{70} Monthly returns of S&T AG have been put into regression against the returns of DAX index for a period from Aug.2009 until Sep.2013. The results of the regression with 49 observations are summarized in the scatter plot below.

**Figure 8: Regression Beta S&T vs DAX (monthly returns)**

![Regression Chart](chart.png)

Source: own representation based on data from (Historical Monthly Prices 2009-2013 S&T AG) and (Yahoo-Finance, Historical Monthly Prices 2009-2013 DAX Index)

On the right side of the regression’s equation displayed in Figure 8, the first item is the slope or the beta of the stock, which has a value of 0.2873. This means that given this estimation the sensitivity of “S&T AG” stock’s return is relatively low. For 1% change in the DAX index portfolio the return of “S&T AG” share changes by 0.2873\%.\textsuperscript{71}

Having limited data, another possibility is to estimate beta based on weekly returns. This way the number of observations can be increased from 49 to 114 in the period from 23.05.2011 to 27.07.2013. The results of this second regression are presented below in Figure 8. In this case, beta is much higher compared to the one estimated based in weekly returns. However a beta

\textsuperscript{69} Cf. (Berk & De Marzo, 2011) p.383-385

\textsuperscript{70} Cf. (FSE, Historical Data S&T AG)

\textsuperscript{71} Data for the regression from: (Google-Finance) and (Yahoo-Finance, Historical Monthly Prices 2009-2013 DAX Index)
of 0.759 still means that the returns of “S&T AG” stocks’ are not much sensitive to a change of 1% in the market returns. It is also important to mention that the prices used for both regressions are the adjusted prices for splits and dividends.\textsuperscript{72}

**Figure 9: Regression Beta S&T vs DAX (weekly returns)**

\[ y = 0.7591x - 0.0016 \]
\[ R^2 = 0.2091 \]

As both Figure 8 and Figure 9 make clear, the betas estimated based on regressions can vary much according to the period of estimation or the kind of returns chosen. Additional data about the regressions are presented below on Table 2.

**Table 2: Results of Regression Betas**

<table>
<thead>
<tr>
<th></th>
<th><strong>Weekly Returns</strong></th>
<th><strong>Monthly Returns</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
<td>0.457263</td>
<td>0.112302931</td>
</tr>
<tr>
<td>R Square</td>
<td>0.209089</td>
<td>0.012611948</td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.202028</td>
<td>-0.008396308</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.048624</td>
<td>0.132219089</td>
</tr>
<tr>
<td>Observations</td>
<td>114</td>
<td>49</td>
</tr>
</tbody>
</table>

\textbf{Source: own representation based on data from:} (Historical Monthly Prices 2009-2013 S&T AG), (Yahoo-Finance, Historical Monthly Prices 2009-2013 DAX Index), (Yahoo-Finance, Historical Weekly Prices S&T AG), (Yahoo-Finance, Historical Weekly Returns DAX)

\textsuperscript{72} Data for the regression from: (Yahoo-Finance, Historical Weekly Prices S&T AG) and (Yahoo-Finance, Historical Weekly Returns DAX)
As we can see on Table 2, the monthly returns show a high standard error relative to beta (0.132). Therefore with 95% confidence it can be stated that beta estimated on monthly returns should be between [0.16; 0.42] which is a great change. On the other hand, the standard error of 0.04 doesn’t seem to be a problem when beta has been estimated by using weekly returns.

Additionally there is still another concern: the choice of the market index portfolio. In Frankfurt Stock Exchange the estimated beta is also based on regression with the only change that the index this time is not the whole DAX but rather its technology sector CXPH. The results are still different from the ones showed in Figure 6 or Figure 7. Also in this case, when the period chosen is different, the estimated beta varies as well. The 30 days beta is estimated to be 0.15 and the 250 days beta is 0.09.

Returning again to the regressions, there is still something that can give some additional information about the stock; the Jensen’s alpha. A reformulation of the equation (4.8) can be expressed as:

\[ E(r_E) = r_f (1- \beta_E) + \beta_E E(r_m) \] (4.13)

On the other hand the expected returns from the regressions can be written as:

\[ E(r_E) = a + b E(r_m) \] (4.14)

In both equations (4.13) and (4.14) the only terms that change are \( r_f (1- \beta_E) \) for (4.13) and \( (a) \) for (4.14). Therefore \( (a) \) can be compared to \( r_f (1- \beta_E) \). Their difference is the Jensen’s alpha which when positive shows that the stock did better during the period of the regression than it was expected and vice versa.

For the monthly returns regarding „S&T AG“ Jensen’s alpha is positive (0.0033). In contrast the weekly returns show a negative Jensen’s alpha (-0.0064). Under these conditions, it is difficult to make predictions about the stock performance.

Regarding regression betas in general, Koller et al., recommend the use of monthly betas. They argue that the use of weekly returns for instance, which has a higher frequency, might

---

73 Cf. (FSE, Overview S&T AG)
74 Cf. (Damodaran A., 2012) p.183-185 For more information about Jensen’s alpha see also (Jensen, 1967)
75 Jensen’ alphas calculated based on data from Figures 6,7 and 8
interfere with the truth. The regression based on monthly return should have at least 60 observations thing that was not possible in the case of „S&T AG“ with 49 observations.  

Even though historical data seems to work well for estimating MRP it is still associated with a lot of problems in the case of beta. Therefore, a second approach can be used for making the estimation of beta more precise. This approach consists in deriving the beta from the industry. The logic behind this approach is that companies within the same sector should have similar risk characteristics. Because different companies have different financial leverage ratios betas should be adjusted according to that ratio. An important assumption in this case is that beta of debt is very close to 0 due to the first priority that debt claims have. Another assumption that has to be made is regarding the risk of the tax shields. If tax shields are considered to have the same risk as debt (where debt has no risk) than the equation can be written as:

$$\beta_E = \left[1 + (1-T_c)\frac{D}{E}\right] \beta_U \ (4.15)$$

Equation (4.15) shows the process of levering beta if $\beta_U$ is already known. In case that $\beta_U$ is unknown, it is important to un-lever the betas of each company. Solving for $\beta_U$ the equation can be reformed as:

$$\beta_U = \beta_E / \left[1 + (1-T_c)\frac{D}{E}\right] \ (4.16)$$

The leverage ratio in equation (4.16) is simply the current market leverage ratio of each company. For equation (4.15) the estimation the target ratio has to be used.  

Damodaran argues that the unlevered beta has to be modified according to the operating leverage and amount of cash that companies have. On the one hand, fixed costs tend to increase the risk of the company and on the other hand cash can contribute in reducing it. 

Even though operating leverage reveals great information about the risk of the company, it is still difficult to be calculated by using public information. For estimating the beta of “S&T AG” over 30 companies will be analysed and retrieving all the necessary data regarding fixed and variable costs does not seem realistic. Nonetheless the companies which will be analysed belong to the same industry group and it can be assumed that regarding the operating leverage not much change occurs across companies. All the results are presented below on Table 3.

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76 Cf. (Koller, Goedhart, & Wessels, 2010) p.246  
77 Cf. (Koller, Goedhart, & Wessels, 2010) p.250-253 and p.781  
78 Cf. (Damodaran A., 2012)p.200-201
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Country</th>
<th>D/E</th>
<th>Cash/V</th>
<th>Beta</th>
<th>Marg.Tc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wincor Nixdorf AG</td>
<td>Germany</td>
<td>22.42%</td>
<td>2.89%</td>
<td>1.57</td>
<td>29.55%</td>
</tr>
<tr>
<td>Bull Soctiz Anonyme</td>
<td>France</td>
<td>19.56%</td>
<td>46.79%</td>
<td>1.93</td>
<td>33.33%</td>
</tr>
<tr>
<td>Eurotech SpA</td>
<td>Italy</td>
<td>68.36%</td>
<td>16.01%</td>
<td>1.47</td>
<td>31.40%</td>
</tr>
<tr>
<td>Hyrican InfSysteme AG</td>
<td>Germany</td>
<td>0.00%</td>
<td>90.71%</td>
<td>0.79</td>
<td>29.55%</td>
</tr>
<tr>
<td>Logic Instrument SA</td>
<td>France</td>
<td>21.47%</td>
<td>10.69%</td>
<td>0.42</td>
<td>33.33%</td>
</tr>
<tr>
<td>JLT Mobile Computers AB</td>
<td>Sweden</td>
<td>0.00%</td>
<td>40.05%</td>
<td>1.02</td>
<td>22%</td>
</tr>
<tr>
<td>Endor AG</td>
<td>Germany</td>
<td>0.00%</td>
<td>0.00%</td>
<td>1.10</td>
<td>29.55%</td>
</tr>
<tr>
<td>Seagate Technology PLC</td>
<td>Ireland</td>
<td>24.99%</td>
<td>13.20%</td>
<td>2.99</td>
<td>12.50%</td>
</tr>
<tr>
<td>Gemalto NV</td>
<td>Netherlands</td>
<td>0.28%</td>
<td>5.28%</td>
<td>0.94</td>
<td>25%</td>
</tr>
<tr>
<td>Logitech International</td>
<td>Sweden</td>
<td>0.00%</td>
<td>18.04%</td>
<td>1.72</td>
<td>22%</td>
</tr>
<tr>
<td>Xyratex Ltd.</td>
<td>UK</td>
<td>0.00%</td>
<td>45.40%</td>
<td>2.84</td>
<td>23%</td>
</tr>
<tr>
<td>Archos SA</td>
<td>France</td>
<td>4.02%</td>
<td>11.95%</td>
<td>2.19</td>
<td>33.33%</td>
</tr>
<tr>
<td>Xeikon N.V.</td>
<td>Netherlands</td>
<td>52.45%</td>
<td>13.12%</td>
<td>1.14</td>
<td>25%</td>
</tr>
<tr>
<td>Xaar plc</td>
<td>UK</td>
<td>0.50%</td>
<td>5.87%</td>
<td>1.10</td>
<td>23%</td>
</tr>
<tr>
<td>Guillemeot Corp. SA</td>
<td>France</td>
<td>42.32%</td>
<td>18.29%</td>
<td>0.86</td>
<td>33.33%</td>
</tr>
<tr>
<td>Evolis Card Printer</td>
<td>France</td>
<td>0.04%</td>
<td>14.10%</td>
<td>0.61</td>
<td>33.33%</td>
</tr>
<tr>
<td>Digital Identification S. AG</td>
<td>Germany</td>
<td>46.30%</td>
<td>31.76%</td>
<td>1.64</td>
<td>29.55%</td>
</tr>
<tr>
<td>Concurrent Technologies</td>
<td>UK</td>
<td>0.00%</td>
<td>7.48%</td>
<td>0.65</td>
<td>23%</td>
</tr>
<tr>
<td>Cibox Interactive</td>
<td>France</td>
<td>0.00%</td>
<td>0.00%</td>
<td>2.07</td>
<td>33.33%</td>
</tr>
<tr>
<td>InterCard AG</td>
<td>Germany</td>
<td>40.46%</td>
<td>0.00%</td>
<td>0.46</td>
<td>29.55%</td>
</tr>
<tr>
<td>Thin Film Electronics ASA</td>
<td>Norway</td>
<td>0.00%</td>
<td>2.63%</td>
<td>1.56</td>
<td>28%</td>
</tr>
<tr>
<td>LaCie SA</td>
<td>France</td>
<td>3.18%</td>
<td>42.12%</td>
<td>1.22</td>
<td>33.33%</td>
</tr>
<tr>
<td>MultiQ International AB</td>
<td>Sweden</td>
<td>0.00%</td>
<td>17.96%</td>
<td>0.28</td>
<td>22%</td>
</tr>
<tr>
<td>Feedback plc</td>
<td>UK</td>
<td>16.42%</td>
<td>0.00%</td>
<td>0.85</td>
<td>23%</td>
</tr>
<tr>
<td>Digigram SA</td>
<td>France</td>
<td>57.60%</td>
<td>26.65%</td>
<td>-0.02</td>
<td>33.33%</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>16.81%</td>
<td>19.24%</td>
<td>1.26</td>
<td>27.89%</td>
</tr>
<tr>
<td>S&amp;T AG</td>
<td>Austria</td>
<td>-</td>
<td>21.86%</td>
<td>-</td>
<td>25%</td>
</tr>
</tbody>
</table>

\[ \beta_{\text{unlevered \ S&T \ AG}} = 1.08 \]

Source: own representation based on; for marginal tax rate raw data from: (KPMG) and all the other raw data from: (Damodaran A. , Excel File Updated Data Europe 2013)

The group of comparable companies showed in Table 3 was originally composed by 32 companies. Seven companies have been taken out as outliers regarding capital structure or levered beta. For the remaining 25 companies simple averages have been calculated. Having no outliers in the sample, the simple average was appropriate to be used. The average beta of 1.26 was originally unlevered by using equation (4.16) and respectively the average debt to equity ratio of 16.8% together with the average marginal tax rate of 27.89%. Therefore equation (4.16) can be solved as:
\[ \beta_U = 1.26 / [1 + (1 - 0.2789) 27.89\% ] = 1.12 \]

The second step was to adjust the unlevered beta for cash. Since cash has a beta of zero, then the higher the amount of cash is, the lower the beta will be. In Table 3 the cash over value ratios for “S&T AG” and for the peer group are represented as, 21.86% and 19.24% respectively. The unlevered beta adjusted for cash of S&T AG can be calculated as following:

\[ \beta_{unlevered \, S&T \, AG} = 1.12 \left( \frac{100\% - 21.86\%}{100\% - 19.24\%} \right) = 1.08 \]

The beta of 1.08 is presented also at the bottom of Table 3. The last step remains to lever this beta using equation (4.15). Although the marginal tax rate of “S&T AG” is already known the target capital structure has not been estimated yet. This is due to circularities it creates with other cost of capital components. Therefore it will be calculated in the following chapters where the levered beta can be also solved.79

For the moment only a sensitivity analysis regarding beta as a function of capital structure can be presented below in Figure 10.

Figure 10: Sensitivity Analysis Beta vs D/V ratio (S&T)

![Figure 10: Sensitivity Analysis Beta vs D/V ratio (S&T)](image)

Source: own representation based on the estimated beta of 1.08 and varied for different D/V

As Figure 10 makes clear, levered beta increases as debt to value ratio increases, reflecting this way the increase of systematic risk with the increase in financial leverage.

79 Calculations made analogically to textbook. For more information see: (Damodaran A., 2012)p.199-202
Another interesting finding about betas is their behaviour over time. This fact is very important for “S&T AG” because the valuation will consider not only one period (this issues will be discussed in the coming chapters). Blume shows that betas have a tendency to shift toward the mean of all betas over time. There are companies where the estimated beta can be much higher or lower than one. This means that over time these companies will have the tendency to be more stable. This stability will be attributed to the change in risk characteristics that companies have over time. The attitudes toward risk tend to be less extreme and therefore the betas will follow the same pattern too i.e. to move toward one.\(^\text{80}\)

Summing up, as already mentioned above, the unlevered beta 1.08 will be used in the case of “S&T AG” for calculating the levered beta once the target capital structure will be established. At the same time the Blume theory will be also considered depending on the assumptions about the life of the company which will be discussed in the following chapters.

### 4.2.2. Cost of debt

Having all the components for estimating the cost of equity is still the cost of debt that has to be estimated. There are different methods for estimating the cost of debt depending on the kind of debt the company has. One way of estimating the cost of debt is by solving for its yield to maturity. Even though this method is relatively simple to implement there are some important conditions that have to be met. First of all the company should have a bond. The estimation of yield to maturity requires the bond to be liquid, option free and long term.\(^\text{81}\)

Regarding “S&T AG” it has a bond from May 2013. The bond has a total volume of € 15 million and a coupon of 7.25% p.a. This means that the first condition i.e. that the company has a bond is met. The only problem is the five years duration of the bond.\(^\text{82}\) Even though time is relative, in part 4.2.1.2.a. it was explained why the risk free rate should have a minimum duration of ten years. Based on the same logic as for the risk free rate, the duration of the bond should have been at least ten years for calling it long term.

Another way for estimating the cost of debt is based on default spreads and ratings. In fact, the company has already been rated from “Creditreform” with a rating of BBB-.\(^\text{83}\) Having

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\(^{80}\) Cf. (Blume, 1975) p.794-795  
\(^{81}\) Cf. (Koller, Goedhart, & Wessels, 2010) p.257-258  
\(^{82}\) Cf. (S&T, Bond, Eckdaten)  
\(^{83}\) Cf. (FSE, S&T AG, Bond)
only the rating it is still difficult to estimate the default spread of the company. “Creditreform” has a very complex systematic for rating companies. Under these conditions, one way out would be to find a link between company’s ratios and ratings. Interest coverage for instance would be a good proxy for coming up with a rating which would finally lead to an implied default spread. The risk free rate from 4.2.1.2.a. can then be added to the estimated default spread and their sum will be the pre-tax cost of debt. The ratings on the other hand seem to vary across low market capitalization and high market capitalization firms. “S&T AG” with a market capitalization of € 90 million (see 3.2) falls into the category of low market capitalization firms.

On the other hand the interest coverage ratio can be defined as:

\[
\text{Interest Coverage Ratio} = \frac{EBIT}{\text{Interest Expense}} \quad (4.17)
\]

In equation (4.17) it is clear that earnings before interest and taxes and the interest paid on debt will determine the ratio.

For “S&T AG” EBIT was € 11.148 thousand in 2012. On the other hand the interest expense is € 1974 thousand. Nevertheless in 2012 there was no bond yet because as explained above it was first issued in May 2013. For this reason the yearly coupon payments should be also included in the interest expense in order to estimate the rating. As mentioned above the coupon interest rate of 7.75% for a volume of € 15 million can be translated as € 1088 thousand additional interest expense p.a. Summing up the total interest expense is € 3062 thousand. Having both interest expense and EBIT the interest coverage ratio can be calculated:

\[
\text{Interest Coverage Ratio} = \frac{11148}{3062} = 3.64
\]

The link between interest coverage ratios and ratings can be found on next page in Table 4. The data is from U.S. small capitalization companies. It will be assumed that the ratings and default spreads do not change also for European companies.

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84 Cf. (Creditreform)
85 Cf. (Damodaran A., 2012) p.211-213
86 Cf. (Financeformulas)
87 Cf. (S&T, Annual Report 2012) p. 37
88 Cf. (Damodaran A., Updated Data, Ratings, Interest coverages and default spreads)
Hence, the interest coverage of 3.64 corresponds to a rating of BB+ that has a default spread of 3.39%. With the risk free rate of 2% that was calculated 4.2.1.2.a. the pre-tax cost of debt is 5.39%. Same logic was used to estimate the rest in the last column.

Table 4: Interest Coverage Ratios and Ratings

<table>
<thead>
<tr>
<th>greater than</th>
<th>≤ to</th>
<th>Rating is</th>
<th>Adjusted Spread\textsuperscript{1)}</th>
<th>Cost of debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5</td>
<td>100000</td>
<td>AAA</td>
<td>0.81%</td>
<td>2.81%</td>
</tr>
<tr>
<td>9.5</td>
<td>12.499999</td>
<td>AA</td>
<td>1.41%</td>
<td>3.41%</td>
</tr>
<tr>
<td>7.5</td>
<td>9.499999</td>
<td>A+</td>
<td>1.71%</td>
<td>3.71%</td>
</tr>
<tr>
<td>6</td>
<td>7.499999</td>
<td>A</td>
<td>2.01%</td>
<td>4.01%</td>
</tr>
<tr>
<td>4.5</td>
<td>5.999999</td>
<td>A-</td>
<td>2.62%</td>
<td>4.62%</td>
</tr>
<tr>
<td>4</td>
<td>4.499999</td>
<td>BBB</td>
<td>3.23%</td>
<td>5.23%</td>
</tr>
<tr>
<td>3.5</td>
<td>3.999999</td>
<td>BB+</td>
<td>3.39%</td>
<td>5.39%</td>
</tr>
<tr>
<td>3</td>
<td>3.499999</td>
<td>BB</td>
<td>4.05%</td>
<td>6.05%</td>
</tr>
<tr>
<td>2.5</td>
<td>2.999999</td>
<td>B+</td>
<td>5.58%</td>
<td>7.58%</td>
</tr>
<tr>
<td>2</td>
<td>2.499999</td>
<td>B</td>
<td>6.61%</td>
<td>8.61%</td>
</tr>
<tr>
<td>1.5</td>
<td>1.999999</td>
<td>B-</td>
<td>7.38%</td>
<td>9.38%</td>
</tr>
<tr>
<td>1.25</td>
<td>1.499999</td>
<td>CCC</td>
<td>8.94%</td>
<td>10.94%</td>
</tr>
<tr>
<td>0.8</td>
<td>1.249999</td>
<td>CC</td>
<td>9.75%</td>
<td>11.75%</td>
</tr>
<tr>
<td>0.5</td>
<td>0.799999</td>
<td>C</td>
<td>10.84%</td>
<td>12.84%</td>
</tr>
<tr>
<td>-100000</td>
<td>0.499999</td>
<td>D</td>
<td>12.52%</td>
<td>14.52%</td>
</tr>
</tbody>
</table>

\textbf{Source} (Damodaran A., Updated Data, Ratings, Interest coverages and default spreads)

\textsuperscript{1)} Original spreads adjusted for consistency with „S&T AG“, according to ratings and interest coverage

In equation (4.7) the cost of debt has been multiplied with \((1 – T_c)\) to reflect the tax shield. The marginal tax rate for “S&T AG” is the Austrian corporate tax rate which according to Austrian KStG § 22 (1)\textsuperscript{89} is 25% (2013). Therefore the after-tax cost of debt is: 5% \((1 – 0.25) = 3.75\%\).

4.2.3 Capital structure

4.2.3.1 Introduction

After having all the other components for estimating the cost of capital, to determine their corresponding weights is still required. It is very important not only to estimate the weights

\textsuperscript{89} Cf. (RIS)
but also to discuss about the importance of leverage’s choice. In fact, in perfect capital markets Modigliani and Miller have shown that capital structure does not matter. In Proposition 1 they explain that firm value remains unaffected from changes in capital structure.\footnote{Cf. (Modigliani & Miller, 1958) p.267-268} However when applied to real world the Modigliani and Miller theory faces many objections. A minor objection is for instance the limitation on individual borrowing. Beside that the bankruptcy seems to be an even greater concern. The concern with bankruptcy consists mostly in (i) the increase of the nominal interest rates which firm has to pay on its bonds and (ii) except few exceptions it is very difficult for individuals to replicate the same patterns of returns.\footnote{Cf. (Stiglitz, 1969) p.786-788} Another important role is being played also by taxes as the interest on debt can create a tax shields under the presence of taxes. In real world situations taxes are found to affect corporate financial decisions. Regarding capital structure in particular there is evidence that debt is being used more intensively from those companies which have a higher marginal tax rate. This fact is supported by other evidence and arguments which indicate that the tax shield increases firm value.\footnote{Cf. (Graham J. R., 2003) p.1119}

All the factors discussed above affect the choice for the capital structure. For estimating the capital structure in valuation, it is recommended to use optimal weights and not use the current capital structure which itself is relatively easy to estimate. The reason behind that is that current capital structures are in many cases deceptive. They act mostly in short term while it is assumed that the management will correct mistakes at some point of time by switching to the optimal one. This means that using current capital structures may lead to miscalculation of the company because by doing that the changes in tax shield will not be captured correctly. On the other hand the assumptions regarding the capital structure have to be realistic. This means that it is also important to make assumptions about the time it will take for the company to move toward the optimal. If it can be assumed that the change can be immediate than a constant WACC can be used through the periods, otherwise different WACCs have to be estimated until it can finally be assumed that the complete switch to the optimal has been achieved.\footnote{Cf. (Koller, Goedhart, & Wessels, 2010)p.262} The current capital structure for “S&T AG” consists in 63.76% equity and 36.24% debt.\footnote{For more information about the estimation of the current capital structure see Table 17 and (FSE, Equities, S&T AG, Company Data)
From another point of view it is also important to make clear whether the capital structures are similar across countries. This concern is related to the use of different sources of information which use data from different countries. However in a study across G-7 countries it has been shown that at aggregate level, leverage shows many similarities.\(^{95}\)

In the following different methods about the estimation of the optimal structure will be presented. A discussion regarding the pecking order theory will be followed by discussions about the static trade of theory, capital structure by sector etc. until the choice of the capital structure will be established.

### 4.2.3.2 The Pecking Order Theory

The pecking order theory is a theory (or hypothesis) in corporate finance which tries to explain the choice of capital structure. The first implication of the theory is that firms prefer internal finance as the first choice for financing a new project. Internal finance is more specifically retained earnings. If financing by internal finance is no longer possible, then external finance comes into play. Even inside internal finance the choice follows an order. Whenever it is possible, debt is the first source. It has to be issued before equity because it is considered to be the safest option. If issuing debt is no longer possible then issuing equity would be the last option. However before issuing equity other options like hybrids or convertibles have to be considered. \(^{96}\) The theory is summarized below in Figure 11.

---

**Figure 11: The Pecking Order Theory**

1. Retained Earnings (internal finance)
2. Debt (external finance)
3. Equity (external finance)

*Source: own representation based on: (Myers, 1984) p.581*

---

\(^{95}\) Cf. (Rajan & Zingales, 1995) p.1458

\(^{96}\) Cf. (Myers, 1984) p.581
The reason why internal financing is considered as the first choice consists in asymmetric information. In this case if the firm may choose not to issue external finance and this way it might reject a positive NPV-investment, thing that could have been easily avoided if enough retained earnings were available. On the other hand, when the decision is about external financing, debt has to be issued first because its costs are generally lower than the cost of equity. Therefore investors, who know that equity has to be issued when the company is overpriced, will have the incentives not to inject new equity until the company will run out of its debt capacity. However the pecking order has been proven not to be always strict. Frank and Goyal (2002) have tested the pecking order theory. They conclude that on average internal financing cannot cover investment expenditures. On the other hand when external finance was unavoidable, on magnitude, a dominance of equity over debt has been shown. Moreover small firms which are supposed to be more rigorous in following the pecking order are found not to follow it. Other studies have also shown evidence against the pecking order suggesting that external financing was issued also in the cases when internal financing was available.

In fact the pecking order does not seem to work properly also in the case of “S&T AG”. Even though the company had liquid funds of € 29.929 thousand at end 2012 it still issued € 15.000 thousand of debt in mid-2013. This fact is not consistent with the pecking order theory. However as mentioned on the previous page, it can indirectly reveal some indications about management information. The fact that debt and not equity was issued, indicates that at least, it is hard to assume that managers think that the company is overpriced.

4.2.3.3 The Trade-off Theory

a) Introduction

As discussed in 4.2.3.1 for many reasons the amount of debt issued by a company contributes much in determining the firm value. In situations different from perfect capital markets,
imperfections like taxes or financial distress costs can make a difference. Therefore the trade-off theory suggests that the tax advantage will be offset by disadvantages of financial distress costs since both of them increase with increasing leverage.\textsuperscript{103} This means that the optimal capital structure is the point in which the levered firm value is the greatest considering only the present value of tax advantage and financial distress costs. Figure 12 shows that with no leverage there is no tax advantage or financial distress costs. By increasing the leverage the present value of tax advantage starts to increase and it results to an increase in the value of the levered firm. However the increase in the value of levered firm is only temporary because the tax advantage benefits will be tackled by the costs of financial distress. Therefore firms have the incentive to swap equity with debt and vice versa until the optimal point can be reached.\textsuperscript{104}

\textbf{Figure 12: The Static Trade-off Theory}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{static_trade-off_theory}
\caption{The Static Trade-off Theory}
\end{figure}

\textit{Source} (Myers, 1984) p.577

\textit{b) Estimating the Tax Shield and the Bankruptcy Cost}

The tax advantage for “S&T AG” is relatively easy to estimate since the tax rate has already been determined before. However it has to be mentioned that the tax shield can be achieved

\textsuperscript{103} Cf. (Litzenberger & Kraus, 1973)p.918

\textsuperscript{104} Cf. (Myers, 1984) p.577
only if there are positive earnings before taxes, so that the interest expense can be deducted from these earnings making thus the company pay less taxes. With negative earnings the tax advantage remains limited. Even if negative earnings are casual, still the present value of tax shield in this case should be different from the present value of tax shield with no negative earnings. For instance this year the company makes negative earnings before taxes. That means that the tax shield from interest expenses of the current year has to be claimed (depending on carry back laws) in the future when enough positive earnings will be achieved, making this way the total present value of tax shield lower.  

Regarding the financial distress costs of “S&T AG” they are much more complicated to estimate. Assuming that there is a probability of default for the company there are two kinds of costs associated with it: direct and indirect bankruptcy costs. The direct costs include any kind of additional cost that emerges with the bankruptcy as for instance lawyer’s and accountant’s fee, and any other fee spent for managing the bankruptcy. The indirect costs on the other hand have to do with the inability to issue additional debt, loss of sales only because of the fact that the company is very likely to be bankrupt etc. Another more complicated example of indirect bankruptcy costs is the management of the company from a trustee whose decisions are not likely to be optimal compared with the ones of the expulsed manager (if he was still in charge).

The fact that the bankruptcy components have been identified does not solve the problem of estimating the bankruptcy costs since it is relatively difficult to convert them into numbers. Andrade and Kaplan (1998) have brought evidence from highly levered transactions that became distressed. They explain that the bankruptcy cost (direct and indirect) ranges mostly between 10 to 20 percent of the firm value where the most conservative estimates are up to 23 percent. Altman (1984) has also estimated the direct and indirect cost of bankruptcy. Relative to firm value the direct cost was estimated as high as 6.2 percent and the indirect cost 10.5 percent. Both direct and indirect cost represents 16.7 percent of firm value in case of certain bankruptcy.

---

105 Cf. (Graham J. R., 2000)p.1937-1938  
107 Cf. (Andrade & Kaplan, 1998)p.1444-1445  
108 Cf. (Altman, 1984)p.1078
c) Estimating the Probability of Bankruptcy

Because in the case of “S&T AG” the bankruptcy is not certain, but still likely to happen, its probability has to be estimated. One method for estimating the probability of bankruptcy is the Altman Z-Score. The Z-score can be estimated by using a logistic – regression. Altman (1968) defines the Z-Score as:

\[ Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5 \] (4.18)

The explanation of the variables is summarized in Table 5.

Moreover the Z-Score of “S&T AG” has also been estimated and presented on the table.

\begin{table}
\centering
\begin{tabular}{|l|l|c|c|}
\hline
Variable & Definition & Variable Values & Coefficients \\
\hline
X1 & Working Capital / Total Assets & 0.16 & 1.20 \\
X2 & Retained Earnings /Total Assets & 0.11 & 1.40 \\
X3 & EBIT/Total Assets & 0.06 & 3.30 \\
X4 & MV Equity11 /BV Total Liabilities & 0.78 & 0.60 \\
X5 & Sales / Total Assets & 1.71 & 1.00 \\
\hline
\end{tabular}
\end{table}

The total Z-Score for “S&T AG” represented in Table 5 can be transformed into a bankruptcy probability. A Z-Score between 1.8 and 2.99 is defined as the grey zone. “S&T AG” however albeit on the grey zone is very close to the safe zone which starts from Z higher than 2.99 and far from the distress zone which starts from Z lower than 1.8. 110

Having the Z-Score it is possible to come up with the probability of default by solving the equation below:

\[ PD = \frac{1}{1 + \exp(Z - \text{Score})} \] (4.19)

---

109 Cf. (Altman, 1968) p.594-596
110 Cf. (Altman, Altman Credit Scoring Models) p.8
By solving the equation (4.19) using the actual Z-Score of “S&T AG” of 2.73 an actual probability of default of 6.12 percent will be implied. \(^{111}\)

Another method (also from Altman) for estimating the probability of default is by referring to the credit ratings. Damodaran was based in a study of Altman for extracting and extrapolating all the results. The estimated default rates over 10 years for the period 1999 to 2008 are summarized in Table 6. \(^{112}\)

### Table 6: Ratings and Probability of Default

<table>
<thead>
<tr>
<th>Rating</th>
<th>Probability of default</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>0.07%</td>
</tr>
<tr>
<td>AA</td>
<td>0.51%</td>
</tr>
<tr>
<td>A+</td>
<td>0.60%</td>
</tr>
<tr>
<td>A</td>
<td>0.66%</td>
</tr>
<tr>
<td>A-</td>
<td>2.50%</td>
</tr>
<tr>
<td>BBB</td>
<td>7.54%</td>
</tr>
<tr>
<td>BB+</td>
<td>10.00%</td>
</tr>
<tr>
<td>BB</td>
<td>16.63%</td>
</tr>
<tr>
<td>B+</td>
<td>25.00%</td>
</tr>
<tr>
<td>B</td>
<td>36.80%</td>
</tr>
<tr>
<td>B-</td>
<td>45.00%</td>
</tr>
<tr>
<td>CCC</td>
<td>59.01%</td>
</tr>
<tr>
<td>CC</td>
<td>70.00%</td>
</tr>
<tr>
<td>C</td>
<td>85.00%</td>
</tr>
<tr>
<td>D</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

**Source:** (Damodaran A., 2012) p.399

For “S&T AG” a rating of BB+ has already been estimated in 4.2.2. Based on Table 6 the corresponding probability of default is 10 percent.

**d) Conclusion**

The optimal capital structure using the trade-off theory is very consistent with the APV-Method presented in 4.1.2. Even though the required components have been estimated the

\(^{111}\) Cf. (Altman, 2010) p.18

\(^{112}\) Cf. (Damodaran A., 2012) p.399
optimal capital structure by using this method cannot be estimated yet because the components as for instance bankruptcy cost etc. are function of the unlevered firm value which will be estimated in the coming chapters. Theoretically the optimal capital structure will be similar to the one presented in Figure 12 i.e. the one that will lead to the highest levered firm value.\footnote{Cf. (Damodaran A., 2012) p.399-403}

4.2.3.4. The lowest WACC as Optimum

As also discussed in the previous part, the optimal capital structure is the one that implies the highest vale. Based on equation (4.1) keeping the cash flows constant the smallest value for the denominator i.e. WACC should imply the lowest value. Unlike the cost of assets \( r_A \) (equation 4.3) used to estimate the value with APV-Method, WACC changes together with capital structure. On the first glance, the cost of debt is generally lower than the cost of equity. But why don’t companies go for 100% debt? The first reason is linked to Table 4. As discussed before, debt will become more costly as the rating becomes worse. For example a D rating on Table 4 would imply a default spread of 12.52\% which means higher cost of debt. This happens because the interest coverage decreases when leverage increases. The second and the most important reason is that cost of equity will increase as well with increasing average because of increasing levered beta. In Figure 10 a huge increase of marginal beta can be observed once leverage ratio increases more than 70\% for example. Bringing into a balance all these factors, an optimal point can be finally estimated.\footnote{Cf. (Damodaran A., 2012) p.402-404}

Figure 13: lowest WACC as optimal Capital Structure (S&T)

\[
\begin{array}{c}
\text{WACC} \\
\text{D/V}
\end{array}
\]

Source: own representation based on raw data from: Table 4, 4.2.1.2. Estimating cost of equity for “S&T AG” and 4.2.2. Cost of debt
As Figure 13 makes clear the optimal i.e. the lowest WACC corresponds to a leverage ratio of 24%. The estimation of WACC involves a sensitivity analysis (by changing D/V) of cost of equity and cost of debt. As mentioned before the sensitivity analysis for cost of equity correlates perfectly with the sensitivity analysis of beta showed in Figure 10 which is relatively easy to estimate. The sensitivity analysis for cost of debt on the other hand is much more complicated. It is based on interest coverage (explained in 4.2.2). Having the predicted interest coverage it is easy to come up with a likely rating and with a default spread for the company by using Table 4. The only concern here is that between interest coverage and likely rating prediction there is circularity. After managing the circularity the pre-tax cost of debt can be calculated the same way as in 4.2.2 for each leverage ratio. For calculating the after-tax cost of debt it is important to mention that the tax benefit can be achieved fully as long as interest expenses are lower than EBIT. In fact at 50 percent leverage the interest expenses become higher than EBIT. Therefore the tax rate has been readjusted after 50 percent leverage. The last concern is linked to the fact that the WACC in Figure 13 shows some kinks which is not typical. The reason is again the way cost of debt is estimated i.e. by using synthetic ratings based on interest coverage. However it should not affect much the optimal WACC since it shows up after the estimated optimal.\footnote{Method applied analogically to textbook. For more information see: (Damodaran A., 2011) p.403-412}

The optimal leverage of 24% is not far from the actual leverage ratio introduced in 4.2.3.1. However it will be assumed that it will take up to five years for the company to come up with the optimal.

4.2.3.5. Industry Based Optimal Capital Structure

Apart from theories discussed above, the capital structure can be also industry related to some extent. In fact when capital structures belonging to specific industries have been analysed there has been shown evidence of the difference across industry means.\footnote{Cf. (Bradley, Jarrell, & Kim, 1983)p.869-870} In addition to the differences across industries, there is also evidence that companies tend to move toward the mean of their corresponding industry over time.\footnote{Cf. (Bowen, Daley, & Huber, 1982) p.19}

The industry average for “S&T AG” has been already estimated and presented in Table 3. Based on the companies analysed it results to be 16.81 percent which is relatively low
compared to the current capital structure or to the WACC optimal capital structure discussed above. However if it can be suggested that there is a tendency to move toward that mean over time, right now, it can be assumed that the tendency can only be reflected in the estimation of the terminal value which will be presented in the following chapters.

4.2.3.6. Capital structure – Conclusions

As discussed in the previous chapters the decision about capital structure is very difficult. In 4.2.3.1 it was explained how that decision should be consistent with reality i.e. with the possible choice of the managers. In fact, as discussed above, there is not a specific method that can be defended at any cost. However surveys from the field show moderate evidence that in general companies remain consistent with the trade-off theory which itself implies an optimal capital structure. In the same time the evidence expands also to the pecking order suggesting that the signals of debt and equity contribute as well to the choice of the target leverage ratio. 118 In 4.2.3.5 it has been shown that the industry in which a company belongs can be a determining factor as well.

4.2.4 Cost of Capital Summary

The cost of capital will depend on the method that will be used and the assumptions about the capital structure. If WACC-Method will be used then the cost of capital can be estimated by using equations regarding cost of capital (4.7), cost of equity (4.8) and levered beta (4.15). For cost of debt the estimation is based on the analysis 4.2.2.

Table 7: Cost of Capital Estimation (S&T)

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Optimal WACC</th>
<th>Industry Average</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Structure (D/V)</td>
<td>24,00%</td>
<td>16,81%</td>
<td>37,10%</td>
</tr>
<tr>
<td>rf</td>
<td>2,00%</td>
<td>2,00%</td>
<td>2,00%</td>
</tr>
<tr>
<td>MRP</td>
<td>7,66%</td>
<td>7,66%</td>
<td>7,66%</td>
</tr>
<tr>
<td>Levered B</td>
<td>1,34</td>
<td>1,25</td>
<td>1,64</td>
</tr>
<tr>
<td>Tc</td>
<td>25,00%</td>
<td>25,00%</td>
<td>25,00%</td>
</tr>
<tr>
<td>rd</td>
<td>2,81%</td>
<td>2,81%</td>
<td>5,39%</td>
</tr>
<tr>
<td><strong>WACC</strong></td>
<td><strong>9,83%</strong></td>
<td><strong>9,97%</strong></td>
<td><strong>10,64%</strong></td>
</tr>
</tbody>
</table>

Source: own representation based raw data from chapter 4.2

118 Cf. (Graham & Harvey, 2002) p.22
In Table 7 the first column shows the estimation of cost of capital based on optimal capital structure and the second column the one based on industry averages. The estimation of WACC on the third column is based on current capital structure. As Table 7 makes clear the WACC is as expected lower at the optimum. However also the cost of capital based on Industry average is lower than the one based on current values.

Regarding the cost of assets, which are consistent with the APV-Method (equation 4.3) they can be easily estimated assuming a D/V equal to zero.$^{119}$ The use of equation (4.3) leads to:

\[ r_A = 100\% r_E + 0\% r_D = r_E \]

Cost of equity (i.e. cost of assets) with no leverage can be calculated using equation (4.4) and the unlevered beta of 1.08 estimated on Table 3 and the rest of the data from previous estimations:

\[ r_A = r_E = 2\% + 1.08 \times 7.66\% = 10.30\% \]

This means that the unlevered firm value discussed in 2.1.2 can be estimated by discounting its corresponding cash flow to the cost of assets with the latter remaining unchanged to changes in capital structure. However the tax shield has to be estimated using the leverage depended cost of debt from Table 4.

---

$^{119}$ As explained to 4.1.2 cost of asset remains unchanged if leverage ratio changes
4.3. Estimating the Free Cash Flows

In this chapter the FCF will be estimated. The estimation of FCF will occur in two stages. The first stage (for the first five years) will be the detailed forecast. Afterwards the second stage will consist in the calculation of the terminal value. In the following, issues regarding adjustments, capital expenditures, depreciation, net working capital, growth rates etc. will be discussed in detail.

4.3.1. Historical Data and Updates

**Figure 14: Historical Income Statement (S&T)**

<table>
<thead>
<tr>
<th>in TEUR</th>
<th>2009¹</th>
<th>2010²</th>
<th>2011³</th>
<th>2012⁴</th>
<th>01.06.2013⁵</th>
<th>01.06.2012⁶</th>
<th>Trailing 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capitalized dev. costs</td>
<td>0</td>
<td>347</td>
<td>705</td>
<td>336</td>
<td>475</td>
<td>151</td>
<td>660</td>
</tr>
<tr>
<td>Other Income</td>
<td>182</td>
<td>282</td>
<td>5.231</td>
<td>6.408</td>
<td>2.557</td>
<td>3.819</td>
<td>5.146</td>
</tr>
<tr>
<td>Personnel expenditure</td>
<td>-3.962</td>
<td>-8.065</td>
<td>-23.375</td>
<td>-71.922</td>
<td>-32.647</td>
<td>-36.120</td>
<td>-68.449</td>
</tr>
<tr>
<td>Other operating expenditures</td>
<td>-5.107</td>
<td>-7.630</td>
<td>-15.573</td>
<td>-34.913</td>
<td>-16.116</td>
<td>-16.912</td>
<td>-34.117</td>
</tr>
<tr>
<td>financial income</td>
<td>95</td>
<td>28</td>
<td>250</td>
<td>587</td>
<td>275</td>
<td>319</td>
<td>543</td>
</tr>
<tr>
<td>financial expenditures</td>
<td>-511</td>
<td>-434</td>
<td>-1.273</td>
<td>-1.974</td>
<td>-1.117</td>
<td>-981</td>
<td>-2.110</td>
</tr>
<tr>
<td>Financial result</td>
<td>-416</td>
<td>-406</td>
<td>-1023</td>
<td>-1387</td>
<td>-842</td>
<td>-662</td>
<td>-1567</td>
</tr>
<tr>
<td>Income taxes</td>
<td>1.888</td>
<td>1.205</td>
<td>-290</td>
<td>-335</td>
<td>-244</td>
<td>-328</td>
<td>-251</td>
</tr>
<tr>
<td>Gains/Losses from currency exch.</td>
<td>0</td>
<td>85</td>
<td>-464</td>
<td>711</td>
<td>-617</td>
<td>-108</td>
<td>202</td>
</tr>
<tr>
<td>Severance Pay</td>
<td>0</td>
<td>0</td>
<td>148</td>
<td>-324</td>
<td>0</td>
<td>-162</td>
<td>-162</td>
</tr>
<tr>
<td>Alteration in unrealized gains/losses</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-110</td>
<td>110</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total consolidated net income</td>
<td>3.251</td>
<td>4.111</td>
<td>7.865</td>
<td>9.703</td>
<td>3.629</td>
<td>3.147</td>
<td>10.185</td>
</tr>
</tbody>
</table>

Source: own representation based on 1) and 2) (S&T, Annual Report 2010) p.18, 3) and 4) (S&T, Annual Report 2012) p.36, 5) and 6) (S&T, Half-Year Report 2013) p.4
Figure 15: Historical Balance Sheet (S&T)

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>30.06.2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Noncurrent Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intangible assets</td>
<td>10.100</td>
<td>20.600</td>
<td>40.903</td>
<td>39.698</td>
<td>45.872</td>
</tr>
<tr>
<td>Financial assets</td>
<td>0</td>
<td>96</td>
<td>4.437</td>
<td>3.819</td>
<td>3.260</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>1.682</td>
<td>2.871</td>
<td>9.166</td>
<td>9.871</td>
<td>9.904</td>
</tr>
<tr>
<td><strong>Current Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventories</td>
<td>5.445</td>
<td>13.205</td>
<td>20.608</td>
<td>23.397</td>
<td>22.172</td>
</tr>
<tr>
<td>Trade accounts receivables</td>
<td>3.091</td>
<td>8.927</td>
<td>85.047</td>
<td>81.935</td>
<td>62.949</td>
</tr>
<tr>
<td>Other receivables and assets</td>
<td>824</td>
<td>1.196</td>
<td>25.872</td>
<td>15.402</td>
<td>16.033</td>
</tr>
<tr>
<td>Liquid funds</td>
<td>15.775</td>
<td>15.172</td>
<td>29.903</td>
<td>29.929</td>
<td>27.970</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
<td>39.130</td>
<td>64.808</td>
<td>227.044</td>
<td>213.976</td>
<td>197.598</td>
</tr>
<tr>
<td><strong>Shareholders' Equity</strong></td>
<td>18.147</td>
<td>33.358</td>
<td>54.574</td>
<td>63.998</td>
<td>67.383</td>
</tr>
<tr>
<td>Contribution to capital incr.</td>
<td>0</td>
<td>0</td>
<td>3114</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Capital reserves</td>
<td>5.331</td>
<td>7.675</td>
<td>12.387</td>
<td>4.767</td>
<td>4.807</td>
</tr>
<tr>
<td>Accumulated results</td>
<td>-919</td>
<td>3.155</td>
<td>10.056</td>
<td>17.804</td>
<td>21.603</td>
</tr>
<tr>
<td>Other reserves</td>
<td>0</td>
<td>-246</td>
<td>-484</td>
<td>-106</td>
<td>-634</td>
</tr>
<tr>
<td>Non-controlling interest</td>
<td>0</td>
<td>574</td>
<td>5.374</td>
<td>2.196</td>
<td>2.270</td>
</tr>
<tr>
<td><strong>Noncurrent Liabilities</strong></td>
<td>3.875</td>
<td>11.072</td>
<td>29.968</td>
<td>15.719</td>
<td>33.635</td>
</tr>
<tr>
<td>Other noncurrent liabilities</td>
<td>0</td>
<td>3.531</td>
<td>3.974</td>
<td>4.547</td>
<td>4.511</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>0</td>
<td>0</td>
<td>1.350</td>
<td>1.198</td>
<td>1.370</td>
</tr>
<tr>
<td><strong>Current liabilities</strong></td>
<td>17.108</td>
<td>20.378</td>
<td>142.502</td>
<td>134.259</td>
<td>96.580</td>
</tr>
<tr>
<td>Short-term Debt</td>
<td>3.524</td>
<td>3.122</td>
<td>34.181</td>
<td>37.823</td>
<td>26.207</td>
</tr>
<tr>
<td>Trade payable</td>
<td>6.087</td>
<td>11.298</td>
<td>60.574</td>
<td>53.689</td>
<td>34.936</td>
</tr>
<tr>
<td>Provisions</td>
<td>1.314</td>
<td>2.695</td>
<td>18.364</td>
<td>17.181</td>
<td>11.468</td>
</tr>
<tr>
<td>Other current liabilities</td>
<td>6.183</td>
<td>3.263</td>
<td>29.383</td>
<td>25.566</td>
<td>23.969</td>
</tr>
<tr>
<td><strong>Total Equity and Liabilities</strong></td>
<td>39.130</td>
<td>64.808</td>
<td>227.044</td>
<td>213.976</td>
<td>197.598</td>
</tr>
</tbody>
</table>

Source: own representation based on 1) and 2) (S&T, Annual Report 2010) p.19, 3) and 4) (S&T, Annual Report 2012) p.37, 5) (S&T, Half-Year Report 2013) p.5
As shown in Figure 14 and Figure 15 the most updated data will come from the last half-year report 2013. The balance sheet shown in Figure 14 did not need any modification since the values for the items in mid-2013 are based on the continuity principle. On the other hand the income statement of 30.06.2013 shows only achievements during first the half of the year. Therefore these numbers have to be converted into yearly numbers. The most reasonable way to convert the values for the period 30.06.2012-30.06.2013 is to take into account income and outcome achieved during the period 30.06.2013-31.12.2012 first. It can be easily calculated by subtracting out values of 31.12.2012 from values of 30.06.2012. Having the values for the second half year 2012, the updated yearly numbers can be calculated by taking numbers from the half-year report 2013 and adding them back to the numbers from the former calculation. The updated results of earnings are shown in the last column in Figure 14 as trailing 2013. 

4.3.2 Adjustments in Operating Leases and R&D

Because of regulations, certain accounting issues like operating lease and R&D are not considered as assets or liabilities. For having a clearer picture of the situation it is important to categorize the value of leased assets as operating assets. Since payments have to occur in the future, the unpaid portion can be considered as debt. On the other hand, R&D expenses cannot be considered merely as expenses because the main aim of R&D is to produce innovations which are crucial for the existence in many industries. However the free cash flow should remain unaffected no matter if R&D or operating lease will be capitalized or not. The reason for capitalization of these expenses is because the perception of value will be different in most cases. 121

The first adjustment regards the operating lease commitments „S&T AG“ has. While lease commitments are shown each year as an expense in the income statement, they have to be considered as debt because of the fact that the company is committed to these payments. 122

The lease commitments of “S&T AG” have to be € 2.539 thousand in 2013 and € 8.817 thousand in total for the next five years including the commitment in 2013. 123 In Table 8 the present value of these lease commitments has been presented.

---

120 Cf. (Damodaran A., 2012)p.230-231
121 Cf. (Koller, Goedhart, & Wessels, 2010) p. 159-160
122 Cf. (Damodaran A., 2012) p. 217
123 Cf. (S&T, Annual Report 2012) p.84
Table 8: Adjustments in Operating Leases (S&T)

<table>
<thead>
<tr>
<th>Year</th>
<th>Year</th>
<th>Commitment</th>
<th>PV Lease Commitments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>1</td>
<td>2.539</td>
<td>2.409</td>
</tr>
<tr>
<td>2014</td>
<td>2</td>
<td>1.570</td>
<td>1.413</td>
</tr>
<tr>
<td>2015</td>
<td>3</td>
<td>1.570</td>
<td>1.341</td>
</tr>
<tr>
<td>2016</td>
<td>4</td>
<td>1.570</td>
<td>1.272</td>
</tr>
<tr>
<td>2017</td>
<td>5</td>
<td>1.570</td>
<td>1.207</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.817</td>
<td>7.642</td>
</tr>
</tbody>
</table>

Source: own representation based on: (S&T, Annual Report 2012) p.84

As Table 8 makes clear, the commitments for the years next to 2013 have been approximated assuming that they will be equal over these four years. Then each year commitment has been discounted back to the cost of debt and their sum gives a present value of € 7.642 thousand.

The other adjustment regards the R&D costs. As also mentioned before, one can expect future benefits from R&D. For this reason it is important to consider them as assets rather than expenses. However this change should not influence the free cash flows but should lead to better estimates of growth for instance. For “S&T AG” which operates in the computers and peripherals sector a relatively short life of five years will be assumed for these assets. Table 9 represents the adjustments in R&D for “S&T AG”. 124

Table 9: Adjustments in R&D (S&T)

<table>
<thead>
<tr>
<th>Year</th>
<th>Year</th>
<th>Current R&amp;D Expense</th>
<th>Book Value Asset</th>
<th>Amortization</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>0</td>
<td>8.6541)</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>-1</td>
<td>7.6152)</td>
<td>80%</td>
<td>1.523</td>
</tr>
<tr>
<td>2010</td>
<td>-2</td>
<td>6.6173)</td>
<td>60%</td>
<td>1.323</td>
</tr>
<tr>
<td>2009</td>
<td>-3</td>
<td>1504)</td>
<td>40%</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: own representation based on: 1) and 2) (S&T, Annual Report 2012) p.30 3) and 4) (S&T, Annual Report 2010) p.30

As shown on Table 9, the R&D has a value of € 18.776 thousand if capitalized. The value of the amortization represented in the last column remains modest compared to the asset value of R&D. The reason behind is that “S&T AG” has not made any in-house production before end-2009. The acquisitions made also in 2010 gave a boost to R&D which continued to grow

ever since\textsuperscript{125}. Because the amortization consist merely in portions of two years (and not five) it is important to project R&D also for the coming years until it can be assumed that these costs are normalized.

Table 10: Projection of R&D Costs (S&T)

<table>
<thead>
<tr>
<th></th>
<th>30.06.2013</th>
<th>30.06.2014</th>
<th>30.06.2015</th>
<th>30.06.2016</th>
<th>30.06.2017</th>
<th>30.06.2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value R&amp;D</td>
<td>18.776</td>
<td>24.004</td>
<td>28.606</td>
<td>32.121</td>
<td>35.361</td>
<td>38.151</td>
</tr>
</tbody>
</table>

Source: own representation based on raw data from Table 9

In Table 10 each year’s R&D expenses, their value and their amortization are calculated using the method presented in Table 9. As we can see the R&D expenses increase from year to year. For this period a historical growth rate in R&D has been assumed until 2015. Afterwards the R&D costs are expected to be more stable and the growth rate from 2016 is assumed to be smaller. At the same time it has also been assumed that this growth will not come from future acquisitions.

4.3.3. Adjustments in Acquisitions

As it has also mentioned before, acquisitions have played an important role in the growth of “S&T AG”. However it has to be reminded that together with increasing the overall value, acquisitions, if funded by stock, will increase the number of shares outstanding and therefore dilute the value per share for the existing shareholders.\textsuperscript{126} For instance a high price per share of € 3.2 (usually the price was lower than € 3) has been observed in 01.09.2010, a time where the merger with the “old” S&T did not take place yet (see 3.1).\textsuperscript{127}

For valuing “S&T AG” a possibility would be to adjust the capital expenditures and amortization for acquisitions and try to make a forecast for the future. However this forecast is very unrealistic if based on the past because it is difficult to predict important details like acquisition costs, synergies, what kind of acquisition, the time in which the acquisition takes place etc. For this reason, adjustments regarding acquisitions will not be considered. This

\textsuperscript{125} Cf. (S&T, Annual Report 2010) p.30
\textsuperscript{126} Cf. (Damodaran A., 2012)p.261-262
\textsuperscript{127} Cf. (Google-Finance)
means that it will be assumed that “S&T AG” will overall pay a fair price for them. Under a fair price it can be understood that acquiring a company will not affect the growth, returns and as a result will not affect the value of “S&T AG”. To remain consistent, it will be assumed that the shareholders of the target company will get any possible synergy or control value. On the other hand historical growth cannot be considered in this case because it would mean that only benefits and not costs would be counted.\textsuperscript{128}

The assumption suggesting that only shareholders of possible target companies will claim the synergies is not unrealistic. A recent study has examined the abnormal returns of the acquirer and of the target on the days surrounding the date of the merger. For the total period i.e. 1973-1998 and 3688 completed mergers, it has been observed that the target companies were the winners of these mergers. In fact, the abnormal returns of the targets increased up to 23.8%. Acquirers, on the other hand, have shown a decrease up to -3.8%. This is to some extent evidence that synergy value shifts toward target companies. The way of financing in the merger i.e. with cash or with stock was not shown to significantly change the situation for the acquirer.\textsuperscript{129}

\textbf{4.3.4. Growth}

In 4.3.3 it has already been assumed that acquisitions will not be taken into account for the ongoing valuation. Therefore it has also been explained why historical growth cannot be taken into account. Industry growths on the other hand would not be appropriate because they cannot capture specific characteristics of the company. However there is a third option of forecasting the growth rates: assessing the fundamentals. In fact, the first condition that has to be met for achieving growth is to reinvest. At the same time is not only quantity that matters but also the quality of these reinvestments. The quantity of the reinvestment can be measured by the reinvestment rate. The quality on the other hand can be assessed by the return on capital. The product of these two measures, which themselves determine how much and how well it has been reinvested, will be good indication for estimating the future expected growth.\textsuperscript{130}

\textsuperscript{128} Cf. (Damodaran A. , 2012) p.262-263
\textsuperscript{129} Cf. (Andrade, Mitchell, & Stafford, 2001) p.109-112
\textsuperscript{130} Cf. (Damodaran A. , 2012) p.290-291
The estimation of the reinvestment rates, ROICs and growth rates are presented below on Table 11. The reinvestment rate is determined by the ratio between the reinvestment and the after tax EBIT. ROIC on the other hand is determined by the ratio between the after tax EBIT again and the total net capital. The estimations of each component have been presented also in Table 11. It is worth to mention that the adjustments presented in 4.3.2 have been considered as well in the estimation of the growth rates.\footnote{For more information see: (Damodaran A., 2012) p.292-293}

Table 11: Forecast of Growth Rates (S&T)

<table>
<thead>
<tr>
<th></th>
<th>30.06.2013</th>
<th>30.06.2014e</th>
<th>30.06.2015e</th>
<th>30.06.2016e</th>
<th>30.06.2017e</th>
<th>30.06.2018e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depreciation adj.</td>
<td>8.399</td>
<td>10.426</td>
<td>14.343</td>
<td>15.744</td>
<td>17.164</td>
<td>15.779</td>
</tr>
<tr>
<td>Change in noncash WC Adj.</td>
<td>6.483</td>
<td>4.348</td>
<td>2.036</td>
<td>2.154</td>
<td>1.645</td>
<td>1.370</td>
</tr>
<tr>
<td>(1-Tc)*EBIT adj.</td>
<td>20.259</td>
<td>18.135</td>
<td>22.153</td>
<td>21.413</td>
<td>22.452</td>
<td>24.711</td>
</tr>
<tr>
<td>Reinvestment rate</td>
<td>58.12%</td>
<td>60.21%</td>
<td>38.07%</td>
<td>33.99%</td>
<td>29.21%</td>
<td>26.80%</td>
</tr>
<tr>
<td>(1-Tc)*EBIT adj.</td>
<td>20.259</td>
<td>18.135</td>
<td>22.153</td>
<td>21.413</td>
<td>22.452</td>
<td>24.711</td>
</tr>
<tr>
<td>Total adj. net Capital adj.</td>
<td>178.690</td>
<td>188.404</td>
<td>201.571</td>
<td>217.634</td>
<td>230.140</td>
<td>241.201</td>
</tr>
<tr>
<td>BV of Capital adj.</td>
<td>202.782</td>
<td>216.374</td>
<td>221.923</td>
<td>237.198</td>
<td>249.460</td>
<td>261.975</td>
</tr>
<tr>
<td>ROIC</td>
<td>11.34%</td>
<td>9.63%</td>
<td>10.99%</td>
<td>9.84%</td>
<td>9.76%</td>
<td>10.50%</td>
</tr>
</tbody>
</table>

Source: own estimations based on raw data from: Figure 14, Figure 15, Table 9, Table 10, (S&T, Half-Year Report 2012) and Table 15, Figure 16 Figure 17.

As Table 11 makes clear, the growth rate is expected to decrease with time. While ROIC is stable over the periods and does not follow a particular pattern the reinvestment rates are expected to decrease. The first reason is that (as shown on the table) the change in non-cash working capital decreases from year to year. The other reason is that the values of CAPEX and depreciation have been adjusted. As mentioned in 4.3.2 “S&T AG” started in-house production in 2010. Since R&D costs were capitalized and their amortization was assumed to last five years, starting from 2010 it takes some time for the adjusted depreciation to catch up. The growth rate after 30.06.2018 will be discussed together with the assumptions about the terminal value.
4.3.5. Capital Expenditures and Depreciation

Capital expenditures (CAPEX) include any investment made in property plant, and equipment (PP&E). These investments will be less valuable over time and therefore their depreciation has to be also estimated. Current or historical CAPEX can be calculated using equation (4.20)

\[
\text{CAPEX}_t = \text{PP&E}_t - \text{PP&E}_{t-1} + \text{Dep}_t \quad (4.20)
\]

After having a basis for PP&E it is recommended to assume that they change proportionally with revenues. Depreciation on the other hand can be assumed to be a fixed percentage of PP&E. \(^{132}\)

Historical CAPEX and depreciation as well as their ratio are presented below on Table 12.

**Table 12: Historical CAPEX and Depreciation (S&T)**

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPEX</td>
<td>1.852</td>
<td>5.607</td>
<td>4.223</td>
<td>3.894</td>
</tr>
<tr>
<td>Depreciation</td>
<td>1.324</td>
<td>2.760</td>
<td>5.406</td>
<td>3.163</td>
</tr>
<tr>
<td>CAPEX/Depreciation</td>
<td>140%</td>
<td>203%</td>
<td>78%</td>
<td>123%</td>
</tr>
</tbody>
</table>

Source: own estimation based on raw data from Figure 14 and Figure 15.

As shown on Table 12, their ratio does not follow a clear pattern. However their average ratio of 123 percent will be considered for future forecasts. On the other hand depreciation can be also forecasted if EBITDA can be projected and a certain EBIT/EBITDA ratio would be assumed. \(^{133}\) By having the forecasts for depreciation and its ratio with CAPEX from Table 12, the latter can be easily estimated.

**Table 13: Forecasted CAPEX and Depreciation (S&T)**

<table>
<thead>
<tr>
<th></th>
<th>30.06.2014e</th>
<th>30.06.2015e</th>
<th>30.06.2016e</th>
<th>30.06.2017e</th>
<th>30.06.2018e</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPEX</td>
<td>7.162</td>
<td>9.563</td>
<td>8.573</td>
<td>8.923</td>
<td>7.219</td>
</tr>
<tr>
<td>Dep. &amp; Amortization</td>
<td>5.818</td>
<td>7.768</td>
<td>6.964</td>
<td>7.249</td>
<td>5.864</td>
</tr>
</tbody>
</table>

Source: own estimation based on data from Figure 17 and Table 12

\(^{132}\) Cf. (Koller, Goedhart, & Wessels, 2010) p.200-201

\(^{133}\) Cf. Figure 14
Table 13 shows the forecasts in CAPEX and depreciation for the period of detailed forecast. It is important to point out that the values do not consider any adjustment discussed 4.3.2 because as mentioned before the adjustments should not affect the value.

4.3.6 Working Capital

Another important input for the estimation of free cash flow is the working capital. There are different definitions about the working capital where the most common one is the difference between current assets and current liabilities. However, in valuing a company, it is recommended that cash and interest bearing debt should be excluded. The reason for excluding cash has to do with the fact that cash is mostly invested in certain securities, like Treasury bills for instance which guarantee a fair return. On the other hand, debt has to be excluded as well because it has already been taken into account when cost of capital has been estimated. As any other component, the non-cash working capital is also industry driven. While industry averages can be used for its estimation there are also other ways it can be estimated. For instance it can be assumed that the working capital will be a fixed percentage of revenues. This makes it change with the same growth rate revenues change. The percentage itself can be estimated either by using the most recent year’s data or by averaging more recent years. For estimating the noncash working capital of “S&T AG”, historical average has been used. The results are presented in Table 14. Then, the estimations for the coming years are presented in Table 15.\(^{134}\)

Table 14: Historical Noncash Working Capital (S&T)

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>30.06.2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory</td>
<td>13.205</td>
<td>20.608</td>
<td>23.397</td>
<td>22.172</td>
</tr>
<tr>
<td>Other Noncash current asset</td>
<td>10.123</td>
<td>110.919</td>
<td>97.337</td>
<td>78.982</td>
</tr>
<tr>
<td>Account Payable</td>
<td>11.298</td>
<td>60.574</td>
<td>53.689</td>
<td>34.936</td>
</tr>
<tr>
<td>Other noninterest bearing current liabilities</td>
<td>5.958</td>
<td>47.747</td>
<td>42.747</td>
<td>35.437</td>
</tr>
<tr>
<td>Revenues</td>
<td>80.715</td>
<td>153.240</td>
<td>339.502</td>
<td>338.821</td>
</tr>
<tr>
<td>WC % Rev</td>
<td>7.52%</td>
<td>15.14%</td>
<td>7.16%</td>
<td>9.08%</td>
</tr>
</tbody>
</table>

**Average** \(9.73\%\)

Source: own estimation based on: raw data from Figure 15, (S&T, Half-Year Report 2012), (A. (Damodaran A., 2012) p.266

\(^{134}\) Cf. (Damodaran A., 2012) p.264-267
The average noncash working capital as percentage of revenues, calculated in Table 14, will be used in Table 15 for the detailed forecast.

**Table 15: Forecast of Change in Noncash Working Capital (S&T)**

<table>
<thead>
<tr>
<th></th>
<th>30.06.2014e</th>
<th>30.06.2015e</th>
<th>30.06.2016e</th>
<th>30.06.2017e</th>
<th>30.06.2018e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noncash Working Capital</td>
<td>35.129</td>
<td>37.165</td>
<td>39.318</td>
<td>40.963</td>
<td>42.333</td>
</tr>
<tr>
<td>Δ Noncash Working Capital</td>
<td>4.348</td>
<td>2.036</td>
<td>2.154</td>
<td>1.645</td>
<td>1.370</td>
</tr>
</tbody>
</table>

Source: own estimation based on data from Table 11 and Table 14

### 4.3.7. Projection of Income Statement and Balance Sheet

Having the growth rates for revenues and all the other components\(^{135}\) it is possible to project the income statement and the balance sheet for the detailed forecast period of five years.

**Figure 16: Projection of Income Statement (S&T)**

<table>
<thead>
<tr>
<th></th>
<th>06.2014e</th>
<th>06.2015e</th>
<th>06.2016e</th>
<th>06.2017e</th>
<th>06.2018e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td>361.145</td>
<td>382.076</td>
<td>404.219</td>
<td>421.130</td>
<td>435.212</td>
</tr>
<tr>
<td>Capitalized development costs</td>
<td>568</td>
<td>544</td>
<td>556</td>
<td>565</td>
<td>572</td>
</tr>
<tr>
<td>Other Income</td>
<td>6.650</td>
<td>6.872</td>
<td>7.240</td>
<td>7.520</td>
<td>7.754</td>
</tr>
<tr>
<td>Expenditures for material</td>
<td>-236.360</td>
<td>-250.123</td>
<td>-264.248</td>
<td>-275.035</td>
<td>-284.018</td>
</tr>
<tr>
<td>Personnel expenditure</td>
<td>-76.472</td>
<td>-81.038</td>
<td>-86.143</td>
<td>-90.042</td>
<td>-93.289</td>
</tr>
<tr>
<td>Other operating expenditure</td>
<td>-37.109</td>
<td>-33.735</td>
<td>-39.573</td>
<td>-41.187</td>
<td>-42.531</td>
</tr>
<tr>
<td>EBITDA</td>
<td>18.422</td>
<td>24.595</td>
<td>22.050</td>
<td>22.950</td>
<td>23.700</td>
</tr>
<tr>
<td>Depreciation</td>
<td>-5.818</td>
<td>-7.768</td>
<td>-6.964</td>
<td>-7.249</td>
<td>-5.864</td>
</tr>
<tr>
<td>EBIT</td>
<td>12.603</td>
<td>16.827</td>
<td>15.085</td>
<td>15.701</td>
<td>17.836</td>
</tr>
<tr>
<td>financial income</td>
<td>688</td>
<td>624</td>
<td>564</td>
<td>408</td>
<td>366</td>
</tr>
<tr>
<td>financial expenditures</td>
<td>-2.502</td>
<td>-2.269</td>
<td>-2.051</td>
<td>-1.484</td>
<td>-1.329</td>
</tr>
<tr>
<td>Financial result</td>
<td>-1.814</td>
<td>-1.645</td>
<td>-1.487</td>
<td>-1.076</td>
<td>-0.964</td>
</tr>
<tr>
<td>Income taxes</td>
<td>-2.697</td>
<td>-3.795</td>
<td>-3.400</td>
<td>-3.656</td>
<td>-4.218</td>
</tr>
<tr>
<td>Total consolidated net Income</td>
<td>8.092</td>
<td>11.386</td>
<td>10.199</td>
<td>10.969</td>
<td>12.654</td>
</tr>
</tbody>
</table>

Source: own estimations based on data from chapter 4.3.

\(^{135}\) Note that if the process is taken as a whole, there is much circularity in it. For instance in order to estimate the growth rate for next year this year’s EBIT is required. The process was done step by step for each year until finally growth rates and projections could be established and presented as a whole.
Figure 16 and Figure 17 represent the forecast for the next five years which have been projected based mainly on the assumptions discussed in this chapter. However these projections are intended to give an overview on the assumptions and are not intended for being used in the process of valuation.
4.3.8. Free Cash Flows and Discount Rates

All the necessary components that are needed for the calculation of the free cash flow have been estimated in 4.3.5, 4.3.6 and 4.3.7. Having all these inputs, it is possible to estimate the free cash flow for the period 30.06.2013 – 30.06.2018 by using equation (4.21).

\[ FCF_t = (1-T_c) \times EBIT_t - CAPEX_t + DEP_t + \Delta NWC_t \] \( (4.21) \)

Below, on Table 16, the process as well as the free cash flows has been presented.

<table>
<thead>
<tr>
<th></th>
<th>30.06.2014</th>
<th>30.06.2015</th>
<th>30.06.2016</th>
<th>30.06.2017</th>
<th>30.06.2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1-Tc)×EBIT</td>
<td>9.452</td>
<td>12.620</td>
<td>11.314</td>
<td>11.776</td>
<td>13.377</td>
</tr>
<tr>
<td>- CAPEX</td>
<td>7.162</td>
<td>9.563</td>
<td>8.573</td>
<td>8.923</td>
<td>7.219</td>
</tr>
<tr>
<td>+ Dep. &amp; Amortization</td>
<td>5.818</td>
<td>7.768</td>
<td>6.964</td>
<td>7.249</td>
<td>5.864</td>
</tr>
<tr>
<td>+/- Increase/Decrease in NWC</td>
<td>4.348</td>
<td>2.036</td>
<td>2.154</td>
<td>1.645</td>
<td>1.370</td>
</tr>
<tr>
<td>= FCF</td>
<td>3.761</td>
<td>8.790</td>
<td>7.551</td>
<td>8.457</td>
<td>10.653</td>
</tr>
</tbody>
</table>

Source: own estimation based on data from chapter 4.3

As Table 16 makes clear, free cash flow is a function of the after-tax EBIT, CAPEX, depreciation and the change in noncash working capital. At the same time it is important to mention that these values have not been discounted back using the cost of capital. The latter can be retrieved by using the data from chapter 4.2. If WACC- method will be used for the valuation “S&T AG” the optimal capital structure discussed in part 4.2.3.4 can be used. At this point it will be assumed that the company will move to the optimal approximately one year after 30.06.2018. Further it will be assumed that change will be gradual over years. This means that over five years “S&T AG” will move from the actual capital structure to the optimal. Maintaining the value of equity constant at € 100.980 thousand137 the optimal WACC of 9.83% discussed in 4.2.3.4 can be achieved only if the value of debt will be € 31.888 thousand. On the other hand the current market value of debt can be presented on Table 17. As Table 17 makes clear in 30.06.2012 the estimated value of debt was € 59.562 thousand. It is also important to mention that the value of the bond has been estimated separately due to the fact that its market value is different from the original € 15.000

136 Cf. (Berk & De Marzo, 2011) p.597
137 Cf. (FSE, Overview S&T AG)
thousand\textsuperscript{138} discussed in 4.2.2. At the same time lease commitments will be taken into account and considered as debt.

Table 17: Market Value of Debt (S&T)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>30.06.2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond</td>
<td>68.640</td>
<td>59.562</td>
</tr>
<tr>
<td>Lease commitments</td>
<td>16.195</td>
<td>16.195</td>
</tr>
<tr>
<td>other Long Term Debt</td>
<td>7.642</td>
<td>7.642</td>
</tr>
<tr>
<td>Short term debt</td>
<td>6.979</td>
<td>9.517</td>
</tr>
<tr>
<td></td>
<td>37.823</td>
<td>26.207</td>
</tr>
</tbody>
</table>

Source: own estimation based on data from (FSE, S&T AG, Bond), 4.3.2 and Figure 15.

The market value of the bond has been estimated by using yield to maturity. The difference in interest rates leads to a different market value for the Bond.\textsuperscript{139} Having all the necessary data it is possible to come up with the change of total debt over years as well as with the changing WACCs which have been presented below on Table 18. As discussed before the value of debt should be € 31.888 thousand for achieving an optimal capital structure. However the WACC in the terminal year is lower than the optimal one estimated before. The reason is that a change in levered beta, which will be discussed in the next chapter, has been assumed.

Table 18: Forecasted Discount Rates - WACCs (S&T)

<table>
<thead>
<tr>
<th></th>
<th>July 2014\textsuperscript{e}</th>
<th>July 2015\textsuperscript{e}</th>
<th>July 2016\textsuperscript{e}</th>
<th>July 2017\textsuperscript{e}</th>
<th>July 2018\textsuperscript{e}</th>
<th>Terminal Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Debt</td>
<td>54.176</td>
<td>49.140</td>
<td>44.420</td>
<td>39.988</td>
<td>35.818</td>
<td>31.888</td>
</tr>
<tr>
<td>D/V</td>
<td>34.92%</td>
<td>32.73%</td>
<td>30.55%</td>
<td>28.37%</td>
<td>26.18%</td>
<td>24.00%</td>
</tr>
<tr>
<td>$\beta_{lev}$</td>
<td>1.52</td>
<td>1.48</td>
<td>1.44</td>
<td>1.41</td>
<td>1.37</td>
<td>1.17\textsuperscript{1)}</td>
</tr>
<tr>
<td>MRP</td>
<td>7.66%</td>
<td>7.66%</td>
<td>7.66%</td>
<td>7.66%</td>
<td>7.66%</td>
<td>7.66%</td>
</tr>
<tr>
<td>$T_c$</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>$r_f$</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Pretax $r_d$</td>
<td>4.62%</td>
<td>4.62%</td>
<td>4.62%</td>
<td>3.71%</td>
<td>3.71%</td>
<td>2.81%</td>
</tr>
<tr>
<td>Interest Coverage</td>
<td>4.46</td>
<td>4.91</td>
<td>5.43</td>
<td>7.51</td>
<td>8.39</td>
<td>12.5</td>
</tr>
<tr>
<td>Interest</td>
<td>2.502</td>
<td>2.269</td>
<td>2.051</td>
<td>1.484</td>
<td>1.329</td>
<td>895</td>
</tr>
<tr>
<td>WACC</td>
<td>10.09%</td>
<td>10.10%</td>
<td>10.12%</td>
<td>9.94%</td>
<td>9.97%</td>
<td>8.84%</td>
</tr>
</tbody>
</table>

Source: own estimation based on data from Figure 17, Table 4 and Table 7

\textsuperscript{138} (FSE, S&T AG, Bond)

\textsuperscript{139} Cf. (Koller, Goedhart, & Wessels, 2010) p. 257-258
4.3.9. The Terminal Value

In the last chapter all the inputs for estimating the value during the next five years have been estimated. But what will happen to “S&T AG” after these five years? While there is no clear answer there are still many realistic assumptions that can be considered. The most important assumption has to do with the survival of the company. One possible assumption is the going-concern what means that “S&T AG” is going to exist forever. This assumption does not seem to be realistic or at least it does not appear to be safe at first glance. However, in the sensitivity analysis it will be shown that after a certain period of time the survival of the company will not matter.\(^\text{140}\) It is also clear that with time reinvestment needs are going to decrease. In the case of “S&T AG” it will be assumed that capital expenditures will be equal to the depreciation over time and the only reinvestment excess (which will contribute to growth) will be in R&D and in noncash working capital. Regarding the assumptions for the growth rate in the terminal value there are suggestions that it cannot be too high. The reason is simple. The company is going to be part of the economy over time and this means that it has to grow with the same growth rate the economy does. At the same time, the risk free rate can be considered to be a proxy for the growth rate of the economy.\(^\text{141}\)

Assuming that the company will be a growing perpetuity the terminal value can be estimated by using equation (4.21)

\[
\text{Terminal Value}_n = \frac{\text{Free Cash Flow to Firm}_{n+1}}{(\text{Cost of Capital}_{n+1} - g_n)} \quad (4.21)
\]

Where \(g_n\) represents the stable growth rate required for the estimation of the terminal value.\(^\text{142}\)

By using equation (4.20) the free cash flow can be calculated as following:

\[
13.377 (a-tax \ EBIT) - 5.864 (CAPEX) + 5.864 (Dep.) - 1370 (\Delta NWC) = 12.007
\]

In estimating the cost of capital, basically the optimal capital structure will be assumed at this point of time. However the WACC presented in the last column of Table 17, seems to be lower than the optimal WACC that was showed in Table 7. The reason for this change is that

\(^{140}\) Cf. Table 21
\(^{141}\) Cf. (Damodaran A., 2012) p. 306-321
\(^{142}\) Cf. (Damodaran A., 2012) p.306
\(^{143}\) Assumed to be same as last year
\(^{144}\) Assumed to be equal to depreciation
\(^{145}\) Assumed be same as last year. In fact, since both CAPEX and Depreciation are assumed to be equal they should not affect value no matter how high they are assumed to be.
\(^{146}\) Increase in noncash working capital is assumed to be constant after 2018
the levered beta is assumed to be lower than the levered beta implied from leverage. By using the equation 4.15 the levered beta for the optimal leverage is estimated to be 1.34. However as it was also shown before, Blume suggests that betas should move toward 1 over time.\textsuperscript{147} The average of these two value leads to levered beta equal to 1.17 which has been presented in Table 17. Summing up, WACC of 8.84\% showed in Table 17 will be used for estimating the terminal value. Regarding the growth rate, the risk free rate of 2\% showed in 4.2.1.2.a will be used. By using equation (4.20) the terminal value can be estimated as following:

\[ \text{Terminal Value} = \frac{12.077}{(8.84\% - 2\%)} = 175.565 \]

Having all the necessary information, it is possible to come up with the value and the implied share price.

4.4. Valuation of “S&T AG”

4.4.1. WACC-Method

The enterprise value of “S&T AG” can be estimated by using equation (4.1).

Table 19: Valuation WACC-Method (S&T)

<table>
<thead>
<tr>
<th>FCF</th>
<th>3.761</th>
<th>8.790</th>
<th>7.551</th>
<th>8.457</th>
<th>10.653</th>
<th>175.565</th>
</tr>
</thead>
<tbody>
<tr>
<td>WACC</td>
<td>10.09%</td>
<td>10.10%</td>
<td>10.12%</td>
<td>9.94%</td>
<td>9.97%</td>
<td>8.84%</td>
</tr>
<tr>
<td>PV FCF</td>
<td>3.416</td>
<td>7.251</td>
<td>5.655</td>
<td>5.789</td>
<td>6.625</td>
<td>114.951</td>
</tr>
<tr>
<td>Enterprise Value</td>
<td>30.06.2013</td>
<td>143.687</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: own estimation based on data from Table 16, Table 18 and part 4.3.9

In Table 19 the estimation of the enterprise value has been presented. Having the present value of the free cash flows for each period, it is possible to estimate the total present value of “S&T AG” by building up their sum which gives a total of € 143.687 thousand.

\textsuperscript{147} (Blume, 1975) p.794-795
The enterprise value discussed above represents the total business value. This means that it consists of the market value of equity and market value of debt, less the cash balance (which can be used to pay back debt). Indirectly the market value of equity can be estimated using equation (4.22):\(^{148}\)

\[
\text{Market Value Equity} = \text{Enterprise Value} - \text{Debt} + \text{Cash} \quad (4.22)
\]

Below on Table 20 the equity value as well as the implied share price can be estimated.

### Table 20: Value and Implied Value per Share – WACC (S&T)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Value</td>
<td>143.687</td>
</tr>
<tr>
<td>MV Debt</td>
<td>59.562</td>
</tr>
<tr>
<td>Cash</td>
<td>27.970</td>
</tr>
<tr>
<td>Equity Value</td>
<td>112.096</td>
</tr>
<tr>
<td>Shares Outstanding</td>
<td>39.340</td>
</tr>
<tr>
<td><strong>Implied Value per Share</strong></td>
<td><strong>2.85</strong></td>
</tr>
</tbody>
</table>

Source: own estimation based on data from Table 19, Table 17, Figure 15 and (FSE, Overview S&T AG)

The implied share price € 2.85 is higher than the market price of € 2.64\(^{149}\). The comparison is also shown below on Figure 18.

### Figure 18: Implied Share Value vs Market Price (S&T)

Source: own representation

---

\(^{148}\) Cf. (Berk & De Marzo, 2011) p.27

\(^{149}\) (FSE, Overview S&T AG) (01.10.2013)
Based on the assumptions about risk growth and return, which were discussed all the way through, it can be concluded that “S&T AG” is undervalued in the market. As Figure 18 makes clear the implied share price is higher than the market price. Therefore buying the “S&T AG” shares seems to be reasonable, assuming that the market will correct its mistake over time.

Returning back to Table 19 it can be noticed that the present value of the free cash flows beyond the terminal year is relatively high to the first five years of detailed forecast. In fact, dividing the present value of free cash flow in the terminal year with the enterprise value leads to 80%. This means that the cash flow which will be generated after 30.06.2018 is going to contribute with 80% in the total value. Expressed in another way the decision will be determined by the terminal value rather than by the detailed forecast. In part 4.3.9 the terminal value has been estimated using strong assumptions. Therefore it is reasonable to make a sensitivity analysis for the terminal value by varying growth rates and the years the company is assumed to survive and to estimate the change in the implied value per share.

Table 21: Sensitivity Analysis, Value per Share VS Assumptions in TV (S&T)

<table>
<thead>
<tr>
<th>Growth rate</th>
<th>Nr of Terminal Years</th>
<th>10</th>
<th>30</th>
<th>50</th>
<th>70</th>
<th>90</th>
<th>110</th>
<th>130</th>
<th>150</th>
<th>170</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.50%</td>
<td></td>
<td>1.30</td>
<td>2.32</td>
<td>2.57</td>
<td>2.63</td>
<td>2.65</td>
<td>2.65</td>
<td>2.65</td>
<td>2.65</td>
<td></td>
</tr>
<tr>
<td>1.75%</td>
<td></td>
<td>1.31</td>
<td>2.37</td>
<td>2.65</td>
<td>2.72</td>
<td>2.74</td>
<td>2.74</td>
<td>2.75</td>
<td>2.75</td>
<td></td>
</tr>
<tr>
<td>2.00%</td>
<td></td>
<td>1.32</td>
<td>2.43</td>
<td>2.74</td>
<td>2.82</td>
<td>2.84</td>
<td>2.85</td>
<td>2.85</td>
<td>2.85</td>
<td></td>
</tr>
<tr>
<td>2.25%</td>
<td></td>
<td>1.34</td>
<td>2.49</td>
<td>2.83</td>
<td>2.92</td>
<td>2.95</td>
<td>2.96</td>
<td>2.96</td>
<td>2.96</td>
<td></td>
</tr>
<tr>
<td>2.50%</td>
<td></td>
<td>1.35</td>
<td>2.56</td>
<td>2.92</td>
<td>3.03</td>
<td>3.07</td>
<td>3.08</td>
<td>3.08</td>
<td>3.08</td>
<td></td>
</tr>
</tbody>
</table>

Source: own estimation based on data from 4.3.9. Table 19 and Table 20

As shown on Table 21 the share price is very sensitive to the survival issue at the beginning. As the number of years of surviving increases, the implied price becomes almost insensitive. For instance with a growth rate of 2% and a surviving time of 90 years after 2018, the implied share price is almost the same as the price of € 2.85 showed in Figure 20. This means that if it can be assumed that the company will make it in for the next 95 years it does not matter what will happen later because the high discount rates will make any value achieved afterward disappear. On the other the implied price is very sensitive to small changes in the growth rate of terminal value. For instance ceteris paribus, it does not matter how long the company will
survive. If the growth rate in terminal value is assumed to be less than 1.5% it will be most likely not worth to invest in “S&T AG”.

4.4.2. APV-Method

Again, the enterprise value can be also estimated by using equation (4.2). It has to be added that in this case not only the unlevered firm value and the present value of tax shield will be considered, but also the present value of bankruptcy cost.150

Table 22: Valuation APV-Method (S&T)

<table>
<thead>
<tr>
<th></th>
<th>30.06.2014e</th>
<th>30.06.2015e</th>
<th>30.06.2016e</th>
<th>30.06.2017e</th>
<th>30.06.2018e</th>
<th>Terminal Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCF</td>
<td>3.761</td>
<td>8.790</td>
<td>7.551</td>
<td>8.457</td>
<td>10.653</td>
<td>175.565</td>
</tr>
<tr>
<td>$r_a$</td>
<td>10.30%</td>
<td>10.30%</td>
<td>10.30%</td>
<td>10.30%</td>
<td>10.30%</td>
<td>10.30%</td>
</tr>
<tr>
<td>$PV \text{ Unlevered}$</td>
<td><strong>3.409</strong></td>
<td><strong>7.224</strong></td>
<td><strong>5.627</strong></td>
<td><strong>5.713</strong></td>
<td><strong>6.524</strong></td>
<td><strong>107.518</strong></td>
</tr>
<tr>
<td>Tax Shield</td>
<td>625</td>
<td>518</td>
<td>448</td>
<td>321</td>
<td>277</td>
<td>7.972</td>
</tr>
<tr>
<td>Pre-tax $r_d$</td>
<td>4.62%</td>
<td>4.62%</td>
<td>4.62%</td>
<td>3.71%</td>
<td>3.71%</td>
<td>2.81%</td>
</tr>
<tr>
<td>$PV \text{ Tax Shield}$</td>
<td><strong>598</strong></td>
<td><strong>518</strong></td>
<td><strong>448</strong></td>
<td><strong>321</strong></td>
<td><strong>277</strong></td>
<td><strong>6.942</strong></td>
</tr>
<tr>
<td>PD</td>
<td>6.12%</td>
<td>5.26%</td>
<td>4.60%</td>
<td>4.33%</td>
<td>4.03%</td>
<td>4.03%</td>
</tr>
<tr>
<td>BC%Unlevered</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>$PV \text{ BC}$</td>
<td><strong>-42</strong></td>
<td><strong>-76</strong></td>
<td><strong>-52</strong></td>
<td><strong>-50</strong></td>
<td><strong>-53</strong></td>
<td><strong>-867</strong></td>
</tr>
<tr>
<td>PV Levered</td>
<td>3.966</td>
<td>7.667</td>
<td>6.023</td>
<td>5.984</td>
<td>6.748</td>
<td>113.592</td>
</tr>
<tr>
<td>Enterprise Value 30.06.2013</td>
<td><strong>143.979</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: own estimation based on data from Table 16, Table 18, 4.2.4, Figure 16, Figure 17, 4.2.3.3 b) and c)

Table 22 represents the estimation of the enterprise value using the APV method. The free cash flows, retrieved from Table 15 have been discounted with the cost of assets (discussed in 4.2.4) leading this way to the present value of the company as if it was unlevered. Since “S&T AG” has a degree of leverage, it will provide some benefits in terms of tax shield. The Tax shield has been estimated by multiplying the interest on debt, showed in figure Table 18 with the marginal corporate tax rate, which was earlier assumed to be 25%. The estimated tax shield has been discounted back with the corresponding cost of debt for each period. As mentioned before, issuing debt brings also some disadvantages as for instance bankruptcy

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150 Cf. (Litzenberger & Kraus, 1973) p.918
costs. The bankruptcy costs are a function of the estimated probable costs and the probability of default. The probability of default has been estimated by using the Altman’s Z-Score for each year as discussed earlier. On the other hand the Euro cost of bankruptcy, has been assumed to be 20% of the unlevered value. The assumption is a bit conservative, based on empirical evidence suggesting that they are generally between 10% and 20% of the unlevered firm value with an occasionally maximum of 23%. However based on the products that “S&T AG” offers, the indirect bankruptcy costs should be relatively high.

The levered firm value (or the enterprise value) has been calculated by adding the present value of tax shield to the unlevered firm value and by netting out the bankruptcy cost. As shown on Table 21 the total value is € 143,979 thousand, very close to the value estimated using the WACC method. However there is one last concern that has to be considered. The optimal capital structure has been assumed to be the one used for the WACC method. But as shown on Figure 12, the trade-off theory, suggests that the optimal capital structure is the one that provides the highest value. Varying the capital structure leads to different results. These results are summed up below in Figure 19.

Figure 19: Optimal Capital Structure - Trade-off Theory (S&T)

Source: own estimation and representation based on raw data from chapter 4

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151 Cf. 4.2.3.3 b) and c)
152 Cf. (Andrade & Kaplan, 1998) p.1444-1445
In Figure 19 it is easy to realize that the highest enterprise value belongs to a leverage ratio of 32%, different from the one of 24%, discussed in 4.2.3.4 that would produce the highest value according to the WACC method. The interest tax shields have been estimated based on different synthetic ratings and costs of debt from Table 4. The estimation of bankruptcy costs have been estimated using the 20% of firm value (discussed above) as a baseline. The probability of bankruptcy on the other hand has been estimated by combining the Altman’s Z-Score (until a rating of BBB) and the link between ratings and probability of bankruptcy showed in Table 6 (for ratings starting from BB+).

The pattern of levered firm value in Figure 19 looks different from the one in Figure 12. The reason is again the synthetic link between ratings and cost of debt (or probability of default). Interesting is the fact that after a leverage ratio of 64% the levered firm value remains constant. It can be easily explained by facts that first, the interest tax shield remains constant because interest exceeds EBIT and second, assuming a D rating the probability of default corresponds to 100%.

Having the enterprise values, again, it is easy to come up with the equity value and the implied value per share the same way as in 4.3.10.

Table 23: Value and Implied Value per Share; APV-Method (S&T)

<table>
<thead>
<tr>
<th></th>
<th>Optimal CS (WACC)</th>
<th>Optimal CS (Trade off Theory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Value</td>
<td>143.979</td>
<td>146.453</td>
</tr>
<tr>
<td>MV Debt</td>
<td>59.562</td>
<td>59.562</td>
</tr>
<tr>
<td>Cash</td>
<td>27.970</td>
<td>27.970</td>
</tr>
<tr>
<td>Equity Value</td>
<td>112.388</td>
<td>114.861</td>
</tr>
<tr>
<td>Shares Outstanding</td>
<td>39.340</td>
<td>39.340</td>
</tr>
<tr>
<td><strong>Implied Value per Share</strong></td>
<td><strong>2.86</strong></td>
<td><strong>2.92</strong></td>
</tr>
</tbody>
</table>

Source: own estimation based on data from Table 19, Table 17, Figure 15, (FSE, Overview S&T AG) and Figure 19

Again, the implied values per share showed in Table 23, are higher than the share price of €2.64. The different capital structures implied by different methods have been driven by assumptions. In the APV method, the assumptions about the amounts of bankruptcy cost are a bit dangerous. However, no matter which optimal capital structure will be chosen, in this

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153 Cf. Table 6
154 (FSE, Overview S&T AG) (1.10.2013)
specific case it would not interfere with the decision of investing in “S&T AG”. The company is in both cases undervalued and this can be translated into a buy recommendation.

4.5. DCF Analysis - Conclusions

Discounted cash flow analysis, as shown on this chapter, is very complex and based on many assumptions. For estimating the cost of capital, the most discussed component remains the choice of capital structure. First, it is very difficult to determine which capital structure is the optimal one and second it is also difficult to predict whether this “optimal” capital structure can be ever implemented. For “S&T AG” the optimal estimated capital structure seems to be the one that gives the lowest WACC. The reason why it can be considered to be a better choice than the estimated capital structure using the trade-off theory is due to the fact that the former is more consistent with industry averages. Regarding the estimation of the FCF, it has been shown that adjustments especially in R&D are very important in creating a realistic perception of value creation and growth. In the specific case of “S&T AG”, the most important component in determining its value was the terminal value since it had approximately 80% weight on the total value. It has been shown that the assumption of perpetual life (which is a little non-realistic) is not important as soon as the existence of the company can be guaranteed for a certain period of time (approximately 100 years for “S&T AG”). The assumptions about the growth rates in terminal value are on the other hand very important, because as it has been shown, the implemented value per share is very sensitive to small changes in these rates. Referring to the method chosen, the WACC method, which incorporates most of the assumptions into cost of capital, seems to be more appropriate compared to the APV method. The APV method is “immune” to capital structure choice and therefore the unlevered firm value is easier to be estimated. However the bankruptcy cost remains the greatest challenge in estimating the levered firm value.

Returning back to the final decision for “S&T AG” it can be concluded that the company is undervalued in the market. This is due to the fact that the estimated share value is higher than the share price on market. Therefore, based on all discussed assumptions about risk, growth and returns, investing in “S&T AG” would be recommended. However the recommendation makes sense only under the assumption that the market will correct the mistake over time.
5. Relative Valuation

5.1. Introduction

In the previous chapter a fundamental discounted cash flow analysis has been presented. However, a comparison with other companies has not been performed yet. For making the results more plausible it is important to evaluate the “S&T AG” relative to other similar companies in the market. This kind of valuation is known as relative valuation or valuation with multiples. There are few advantages of this method compared to discounted cash flow. It involves first fewer assumptions and therefore is far more efficient in terms of time consumption than DCF. Another advantage is the clear reflection it gives on the market mood. At the same time the advantages have a tendency to be also disadvantages. For instance, even though time efficient, the estimates can be sometimes inconsistent. On the other hand reflecting the market mood, will make the value of the company depended on the market. For example if a company is performing badly, it can still result to be undervalued (according to relative valuation) if compared to other companies which are performing badly too.\textsuperscript{155}

Relative valuation should thus give an overview whether “S&T AG” can create more value than other companies within the sector. Therefore it cannot be viewed as a shortcut to DCF valuation. It should rather be considered as a complement, by providing a useful check to the former. There are few key elements for the analysis. First a peer group needs to be established. The companies chosen as peers should be similar not only in the context of offering similar products, but also in the context of financial ratios. Second the right multiple has to be used. There are many different multiples. Like in DCF some of them have enterprise nature and some others equity nature. It should also be reminded that the multiples themselves have to be consistent. In the following the peer group will be presented. Later on this chapter, a relative valuation using at least one enterprise value multiple and one equity value multiple will be performed. Whenever possible, multiples will be adjusted by using regressions against fundamentals that drive the value.\textsuperscript{156}

Finally the results of the relative valuation will be summed up and compared to the results of DCF valuation.

\textsuperscript{155} Cf. (Damodaran A., 2012) p.453-454
\textsuperscript{156} Cf. (Koller, Goedhart, & Wessels, 2010)p.303-305 and p.322
5.2. The Peer Group

Finding an appropriate peer group for “S&T AG” is relatively difficult. There are many companies which have many similarities but at the same time many of them are not publicly traded. For those companies that have no market price, relative valuation is logically not applicable. On the other hand, there are many publicly traded companies in the sector which have little or no similarities, either in products or in financials. Below, in Figure 20 the peer group for “S&T AG” will be presented.

**Figure 20: Peer Group (S&T)**

As Figure 20 makes clear, there have been chosen nine comparable companies. They belong to the same sector i.e. computers and peripherals. Unfortunately they do not operate majorly on the same markets, but they have many similarities in products and in financials like earnings patterns for instance. ¹⁵⁷

¹⁵⁷ Peer group chosen based on raw data from (Damodaran A., Excel File Updated Data Europe 2013) and (Damodaran A., Excel File Updated Data U.S. Companies 2013)
5.3. Enterprise Value Multiple: EV/EBITA

Now that the peer group is already known, it is important to establish which multiple to use. A high recommended multiple is enterprise value (EV) to EBITA. Compared to other enterprise value multiples like EV to EBITDA or EV to EBIT it seems to lead to better estimates. The reason has to do with the fundamentals of EBITA, EBIT and EBITDA. For instance EBITDA includes both amortization and depreciation. In many cases it is necessary to net out depreciation for determining the true value, since the latter is an accounting equivalent of “savings” for future investments in PPE. On the other hand, EBIT would also not be a good comparable because amortization would cause distortion.\(^{158}\) Below on Table 24 the estimation of EV/EBITA multiple will be presented and then on Table 25 the total value as well as the implied value per share will be presented too.

Table 24: Peer Group EV/EBITA

<table>
<thead>
<tr>
<th>in TEUR</th>
<th>EV</th>
<th>EBITA</th>
<th>EV/EBITA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seegate Technology</td>
<td>11.660.000</td>
<td>1.730.000</td>
<td>6,7</td>
</tr>
<tr>
<td>Lenovo Group Ltd</td>
<td>5.720.000</td>
<td>773.610</td>
<td>7,4</td>
</tr>
<tr>
<td>Wincor Nixdorf AG</td>
<td>1.730.000</td>
<td>111.720</td>
<td>15,5</td>
</tr>
<tr>
<td>Synaptics</td>
<td>896.150</td>
<td>82.770</td>
<td>10,8</td>
</tr>
<tr>
<td>Xaar plc</td>
<td>677.720</td>
<td>20.780</td>
<td>32,6</td>
</tr>
<tr>
<td>Xyratex Ltd.</td>
<td>142.610</td>
<td>18.470</td>
<td>7,7</td>
</tr>
<tr>
<td>Xeikon N.V.</td>
<td>181.970</td>
<td>31.500</td>
<td>5,8</td>
</tr>
<tr>
<td>Evolis</td>
<td>107.060</td>
<td>9.950</td>
<td>10,8</td>
</tr>
<tr>
<td>Gemalto NV</td>
<td>6.860.000</td>
<td>289.170</td>
<td>23,7</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td></td>
<td></td>
<td><strong>10,8</strong></td>
</tr>
</tbody>
</table>

Source: Bloomberg Terminal, 1) own estimation

Table 25: Value and Implied Value per Share; EV/EBITA Multiple (S&T)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EBITA</td>
<td>13.900</td>
</tr>
<tr>
<td>Enterprise Value</td>
<td>150.028</td>
</tr>
<tr>
<td>Debt</td>
<td>59.562</td>
</tr>
<tr>
<td>Cash</td>
<td>27.970</td>
</tr>
<tr>
<td>Equity Value</td>
<td>118.437</td>
</tr>
<tr>
<td>Shares</td>
<td>39.340</td>
</tr>
<tr>
<td><strong>Implied Value per Share</strong></td>
<td><strong>3.01</strong></td>
</tr>
</tbody>
</table>

Source: own estimation based on data from: 1) (S&T, Annual Report 2012) p.27, Table 17, Figure 15 and (FSE, Overview S&T AG)

\(^{158}\) (Koller, Goedhart and Wessels 2010) p.305-311
As mentioned before, the EV/EBITA multiples for each comparable company have been estimated and the median\textsuperscript{159} from Table 24 which is 10.8 will be used as multiple for estimating the enterprise value of “S&T AG”.

Table 25 represents the implementation of the multiple. By multiplying The EBITA of “S&T AG” with the multiple estimated in Table 24, it is possible to come up with an enterprise value of € 150.028 thousand. Knowing the other components, the equity value or the implied value per share can be estimated. As Table 25 makes clear, the implied value per share of 3.01 is higher than the market price of 2.56 presented in Figure 18. What does it mean for “S&T AG”?

Relative valuation makes sense only under an important assumptions regarding market efficiency i.e. if it can be assumed that markets make mistakes on individual stocks and make no mistake on average. Therefore if it can be assumed that these mistakes can be corrected for these individual stocks over time, then investing would be recommended.\textsuperscript{160}

For “S&T AG” this means that market averages would imply a higher price for the company. These results support the DCF valuation, which showed that “S&T AG” was undervalued. At least they indicate that the assumptions used in DCF are not too optimistic. However the results are a function of the peer group. For instance, taking out Wincor, Gemalto and Xaar from the estimation of EBITA multiple, the implied price would be then just 1.93\textsuperscript{161}. This fact shows how depended are the results with the choice of the peer group.

\textbf{5.4. Equity Value Multiple: Price to Book Value (PBV)}

In part 5.3 the implied value per share has been retrieved from the enterprise value. While it is also possible to estimate the equity value directly, it is still important to determine which multiple to use. EV to EBITA represents an earnings multiple. The choice of the multiple in this part will aim to capture another point of view. Therefore the price to book equity value (PBV) will be used. Like every other multiple it has some advantages and disadvantages. The advantages include: it is still useful even with negative earnings; it is a simple benchmark for comparison; and the accounting standards across companies are more or less consistent. However the accounting standards would create a disadvantage if there is wide variation

\textsuperscript{159} Median and not average has been taken because outliers in this case would distort the process.

\textsuperscript{160} Cf. (Damodaran A., 2012) p.466

\textsuperscript{161} Own estimation by using same mechanics as in Table 24 and Table 25
across companies. Another disadvantage would be the low value of intangible assets, as the book value would not carry much information in this case.\textsuperscript{162} The data used for the estimation of PBV for “S&T AG” are summarized below on Table 26.

\begin{table}[h]
\centering
\caption{Peer Group Price-to-Book Value}
\begin{tabular}{lllll}
\hline
 & \textbf{MCAP} & \textbf{BVE} & \textbf{PBV}\textsuperscript{1)} & \textbf{ROE} \\
\hline
Seagate Technology & 11.380.000 & 2.730.000 & 4.2 & 47.00\% \\
Lenovo Group Ltd & 7.930.000 & 2.160.000 & 3.7 & 25.47\% \\
Wincor Nixdorf AG & 1.620.000 & 359.110 & 4.5 & 24.11\% \\
Synaptics & 1.130.000 & 385.400 & 2.9 & 27.47\% \\
Xaar plc & 709.440 & 110.890 & 6.4 & 34.99\% \\
Xyratex Ltd. & 200.160 & 238.180 & 0.8 & -2.23\% \\
Xeikon N.V. & 167.930 & 192.940 & 0.9 & 6.14\% \\
Evolis & 125.830 & 40.370 & 3.1 & 16.62\% \\
Gemalto NV & 6.959.770 & 1.980.000 & 3.5 & 12.06\% \\
\hline
\textbf{Median} & & & 3.5 & \\
\hline
\end{tabular}
\end{table}

\textit{Source: Bloomberg Terminal, 1) own estimation}

The multiple estimated on Table 26, if multiplied to the book value of equity (€ 67.383 thousand\textsuperscript{163}) of “S&T AG” leads to a market value of equity of € 236.854 thousand or an implied share price of € 6.02. In fact, this implied price is much higher than the market price.

The reason why the implied price is so high is because the fundamentals have been ignored. Price-to-book ratio is in fact driven by ROE and the latter will affect the multiple. While there are several approaches for including ROE into the multiple, a reasonable option would be the construction of a regression model. Therefore ROE will be regressed against the PBV by using the data from Table 26 and equation (5.1)

\[ PBV = a + b \text{ROE} \ (5.1) \]

The results of the regression are summarized in Figure 21. These results will be used for re-estimating the implied value of equity estimated above.\textsuperscript{164}

\textsuperscript{162} Cf. (Damodaran A., 2012) p.511-512
\textsuperscript{163} (S&T, Half-Year Report 2013) p.5
\textsuperscript{164} Cf. (Damodaran A., 2012) p.524
The ROE for “S&T AG” estimated in chapter 3, is 12.47%.\textsuperscript{165} Using equation (5.1) which has been solved in Figure 8, it is possible to come up with a better estimate.

Table 27: Value and Implied Value per Share [PBV] (S&T)

<table>
<thead>
<tr>
<th></th>
<th>no regression</th>
<th>regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>BVE</td>
<td>67.383</td>
<td>67.383</td>
</tr>
<tr>
<td>ROE</td>
<td>-</td>
<td>12.47%</td>
</tr>
<tr>
<td>Slope</td>
<td>-</td>
<td>8.93</td>
</tr>
<tr>
<td>Intercept</td>
<td>-</td>
<td>1.43</td>
</tr>
<tr>
<td>Equity Value</td>
<td>236.854</td>
<td>171.676</td>
</tr>
<tr>
<td><strong>Implied Value per Share</strong></td>
<td><strong>6.02</strong></td>
<td><strong>4.36</strong></td>
</tr>
</tbody>
</table>

Table 27 represents the estimation of the implied share price for “S&T AG”, first by using the multiple from Table 26 (no regression) and then by regressing ROE against PBV as explained above. As the table makes clear the implied share price of € 4.36 is much more realistic than €

\textsuperscript{165} Cf. Figure 5 for year 2012
The implied price of € 4.36, when compared to the market price of € 2.64\textsuperscript{166}, suggests that “S&T AG” is relatively undervalued, but the results are again depended on the peer group that has been chosen.

5.5. Relative Valuation – Conclusions

As shown in this chapter, relative valuation is much more time efficient than DCF analysis. It gives at the same time also good indications on how the company is positioned when compared to similar companies. On the other hand this kind of valuation creates a lot of space for choices:

(I) the choice of the peer group will play a crucial role in determining the multiple (as shown in 5.3).

(II) There are many different multiples and the choice of the “right” multiple is questionable. In fact, in part 4.3 the implied value per share for “S&T AG” was € 3.01 by using EV/EBITA and in part 4.4 the implied value per share was € 4.36 using PBV.

(III) Even within the same multiple, there is a lot of space, depending on how far one decides to go with fundamentals. Considering the implied value per share of “S&T AG” that has been estimated using PBV, the initial value per share was € 6.02 which is much higher than € 4.36 (the one estimated when also fundamentals have been taken into account).

The facts presented above, show how easy it is to justify any value. In truth, merits for its popularity can be attributed to the fact that biased valuations are easier to be framed.\textsuperscript{167}

As it was mentioned before, relative valuation should be used as a complement and not as substitute for those companies where DCF is applicable. Regarding “S&T AG” it can be added, that the company was again showed as undervalued according to relative valuation, remaining thus consistent with the results of DCF analysis.

\textsuperscript{166} (FSE, Overview S&T AG) (01.10.2013)
\textsuperscript{167} Cf. (Damodaran A., 2012) p.453
6. Conclusion

Estimating the value of a publicly traded company is a very complex and subjective process. It involves many assumptions depending on the point of view of the investor. In general two basic tools can be used for estimating value: Discounted Cash Flow Analysis and Relative Valuation.

DCF Analysis requires a fundamental analysis of the company. The estimation of value has to go through a long process consisting in the estimation of cost of capital and cash flows. Generally two methods seem to work better: the WACC-method and the APV-method.

The WACC-method involves an easier procedure for estimating the free cash flows but at the same time it requires much more attention for estimating the cost of capital. The cost of capital has to reflect almost all possible risks as for instance default risk, country risk, market risk, systematic risk etc. but also has to reflect the benefits of the tax shield. During the estimation of cost of capital for “S&T AG” two main hurdles have been observed: the systematic risk (beta) and the optimal capital structure. The problem with the former has to do with the fact that the traditional regression betas show a high standard error and therefore they fail in showing consistency with the specific systematic risk of the company. This problem can be solved by deriving the beta from a group of similar companies and adjusting it for cash and leverage. This way the standard error can be minimized. The other hurdle, the optimal capital structure seems to be more complex. In fact, it is difficult to determine: (i) which capital structure is the optimal one (ii) whether the company will ever be at optimum and (iii) how long could it take to move towards the optimum. The optimal capital structure for the WACC-method results to be the one that implies the lowest WACC because it would automatically lead to the highest value. Regarding the estimation of the free cash flows, the WACC-method does not show any particular hurdle.

APV-method on the other hand is to some extent the opposite of the WACC-method. It has an easier procedure for estimating the denominator (cost of capital) and a more complex one for estimating the numerator. The estimation of the cost of capital is relatively easy due to the fact that cost of asset has to be used instead of WACC. While it still has to deal with the issues of systematic risk same as the WACC-method, it is “immune” to changes in capital structure. However, as mentioned before, estimating the numerator is much more complex. In the APV-method not only the free cash flows, but also the tax shield and the bankruptcy cost have to be included in the numerator. On the one hand the estimation of the tax shield does not represent
any problem. On the other hand however, the estimation of bankruptcy cost is very complex. The main problem with the latter consists in the fact that the assumptions regarding direct and especially indirect bankruptcy cost are very “synthetic”. Coming back to the optimal capital structure, APV-method is more consistent with the Trade-off Theory rather than the method with the lowest WACC. This means that the total enterprise value can be maximized once the optimal trade-off between unlevered firm value, tax shield and bankruptcy cost is established. In estimating the optimal capital structure of “S&T AG” variations between the two methods have been observed. This can be explained through the fact that the assumptions differ in each case.

Summing up, the WACC-method seems to work better when it comes to the practice. The reason why APV-method does not fit so well in practice is because of the estimation of bankruptcy cost, as mentioned before. Regarding the value in general, special attention has to be paid to the assumptions of terminal value. In the case of “S&T AG” for instance it reaches up to 80% of the total value.

The estimation of value using Relative Valuation results to be more time efficient since it involves fewer assumptions. However the choice of the peer group and the choice of the “right multiple” seem to be a challenge. The problem with the peer group is linked to the fact that it is difficult to find similar companies in financial ratios, markets in which they operate and products they offer, at the same time. Therefore great variation in value can be observed in the case of “S&T AG” if the peer group will be changed. The difficulties in choosing the “right multiple” vary as well. While it was argued that EV/EBITA works well, other multiples seem to be also useful under one condition. This condition consists in analysing the fundamental determinants of value by running a regression analysis as shown in part 5.4.

Comparing DCF analysis with Relative Valuation it can be concluded that the latter has to be a complement and not a substitute of the former. It should be used as a tool for establishing whether the results and the assumptions of DCF are plausible or not.

In particular, it has been shown that based on the assumptions that were represented in this thesis; “S&T AG” results to be undervalued in the market (by using both tools). Assuming that an investor agrees with all the assumptions, there is still another one that has to be considered: market in/efficiency. This means that markets have to correct their mistakes over time, otherwise undervaluation would not be decisive in investing.
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Yahoo- Finance. „Historical Monthly Prices 2009-2013 DAX Index.
— „Historical Weekly Prices S&T AG."

— „Historical Weekly Returns DAX."

**ValueLine.** Industry Analysis: Computer and Peripherals.
I). Appendix

A). Zusammenfassung


Der Vergleich zwischen den Instrumenten konzentriert sich insbesondere auf die Vor- und Nachteile der DCF Bewertung gegenüber dem Multiplikatoren-Verfahren. Es wird gezeigt, dass der letzte Instrument, obwohl er bezüglich der Zeit, effizienter ist, keinesfalls als Ersatz für die DCF Bewertung dienen soll. Hingegen soll das Multiplikatoren-Verfahren die Plausibilität der Ergebnisse der DCF Bewertung unterstützen.

Im Rahmen der DCF Bewertung, werden die WACC-Methode, APV-Methode, FTE-Methode und DDM-Methode betrachtet. Es ist wichtig zu erwähnen, dass die APV-Methode und insbesondere die WACC-Methode bessere Ergebnisse als die zwei andere Methoden liefern, wenn sie anwendbar sind. Andererseits werden in Rahmen der Multiplikatoren-Verfahren zwei Multiples dargestellt und analysiert: EV/EBITA und das Kurs-Buchwert-Verhältnis (PBV). Es wird gezeigt, dass die Multiples alleine zu Fehlentscheidungen führen können und deshalb ist oft eine Regressionsanalyse notwendig, bei dem auch die grundlegende abhängige Faktoren betrachtet werden sollten.

Innerhalb der Methoden werden die einzelne Modelle und Komponente spezifisch analysiert. Im Hinblick auf die DCF Bewertung, werden die Modelle für die Ermittlung der Eigenkapitalkosten, des systematischen Risikos, des optimalen Verschuldungsgrades, der Fremdkapitalkosten, der Ermittlung der FCF, des Endwertes etc. erklärt.

Schließlich wird der Prozess der Berechnung von dem endgültigen Wert der Aktie und überdies das Entscheidungstreffen über die Investition, dargestellt.
B). CV

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03/2011 – 12/2013 Master of Science (MSc) Business Administration: Managerial Accounting and Corporate Finance University of Vienna

03/2006 – 02/2011 Bachelor of Science (Bakk.rer.soc.oec) Business Administration: Major: Management/Accounting University of Vienna

03/2005 – 02/2006 Preparation Program of the University of Vienna

Emphasis: Mathematics and Physics

Languages

Albanian: Mother tongue
English: Fluent
German: Fluent
Italian: Fluent

Computer Skills

MS Office (Excel, Word, Power point) Excellent Knowledge
SPSS
HTML/Java
Eviews
SAP
Basic knowledge
Basic knowledge
Basic knowledge
Basic knowledge