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## **Equity valuation in stock market investments**

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**Declaration:**

I hereby declare that I am the sole author of the thesis entitled “Equity valuation in stock market investments “. I duly marked out all quotations. The used literature and sources are stated in the attached list of references.

In Prague on 27<sup>th</sup> of April 2017

Signature

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## **Introduction**

Every day, millions of financial market participants - investors, equity traders, financial advisors, analysts, portfolio managers, state regulators – raise two common essential questions: what is the fair (intrinsic) value of the asset and what is the most appropriate method of its computation. While the final investment outcome clearly differs for each category of market participants, finding the answer to these questions is crucial for achieving desired investment results.

Stock market investment or investment in securities (equities) of publicly traded companies is immediate, the closest related area for application of the fair value concept. Every single equity generally has two meaningful values: intrinsic value, which reflects investor's 'true' or 'real' value' of the asset and market price – price accepted by and reflected on the stock market and considered to be the best available estimate for asset's intrinsic value. The scope of valuation, with all its objectives and limitations, is aimed to determine the appropriate value that, in turn, guides an analyst in selection of a valuation approach.

In greater detail, one group of market participants – equity (research) analysts are particularly concerned with the determination of intrinsic value of the particular stock, as it deemed to be the core of their professional activity. Based on results of analysts' calculations, the other group - equity traders – use value as the target, providing them with a roadmap and the landmarks to navigate within the stock market framework. Same principle holds for many other groups, such as financial advisors and portfolio managers, which cannot succeed in their activities without understanding the conception of intrinsic value and its implication on practice. At the other end of the scale, state regulators ought to examine and follow up inartificial fair/market trade-offs in order to avoid market manipulations and unfair practices, which might destruct the value of the asset.

In general terms, valuation is used to estimate the intrinsic value of the asset based on various inputs or variables related to the company's future cash flows, investment returns or based on comparable methods by reference to values of peers, companies with similar assets and business structure, or, even liquidation estimations when other methods are not applicable. The variety of valuation techniques is large enough to provide an ample room for the analyst either to choose from the existing or even to think out and facilitate his own method of research. One way or another, strong valuation skills is the key element of success in investments.

**Motivation.** My motivation to write the thesis on the given topic is supported by the following arguments. First and foremost, yet I have been examining stock market structure and singularity for several years as well as I possess real trading experience in equities, futures, currencies and bonds. With equities being of the particular interest, I am strongly convinced that robust valuation based on comprehensive financial model is determinant in making a proper and well-timed buy/sell decision. Secondly, valuation framework offers variety of widely used and sophisticated techniques. It is clear that an understanding of the conditions and the limitations for application of either of them requires a certain degree of knowledge, skills, training and workup. What is more, the pace of developments in the financial world has notably speed up nowadays given the context of highly technological markets, existence of advanced analytical tools and numerous tailor-made software solutions. For example, world's leading multinational mass media and information firm Thomson Reuters has launched its innovative 'StarMine Quantitative Models and real-time Elektron analytics platform' (<http://thomsonreuters.com/en/products-services/financial/financial-analytics.html>) offers stock selection tool based on valuation models that build a bridge across geographical regions, industries and markets enabling an investor to achieve higher returns from the combination of investment tactics. Thomson Reuter's main competitor, Bloomberg, has set against its 'Portfolio & Risk Analytics' (<https://www.bloomberg.com/professional/portfolio-risk-analytics/>) solution – the tool, which assists an investor in optimizing his portfolio strategy. The platform claims to help investors to make faster and more accurate decisions through the easier measurement of portfolio's risk and return characteristics. As a result of these improvements, an updated examination of modern methods and approaches within the valuation framework is required. Consequently, this topic will not recede into the background and will preserve its relevancy and particular interest unless and until stock markets exist and as long as the trade-off between intrinsic and market value is valid, measurable and true.

**Research context.** Research context of the Master thesis will encompass the most relevant and up-to-date findings and methodologies of securities valuation, namely those included into CFA Institute research and curriculum framework, researches and publications of leading financial and business schools (NY Stern, Ohio University etc.), extrapolation and interpretation from existing investment business practices. Thus, the paper will be developed in the contemporary equity valuation framework with an emphasis on applied techniques and leading business practices.



**Research aims and objectives.** The main goal of the thesis is to grasp, analyse and represent the means and techniques of equity valuation, used nowadays, as well as to provide comprehensive feedback on the nature and sequence of investments made on stock market based on the accuracy and relevancy of obtained valuation results. Other goals embrace the following scope:

- to make an overview on equity securities and methods of derivation of equity value;
- to distinguish between existing cash flow and alternative valuation techniques;
- to provide a case example of recently traded equity and a step-by-step guide to its valuation;
- to outline implications of the obtained results in practice;
- to reveal factors, which ought to be considered when making investment decision;
- to examine the role of comparable valuation and its application at various stages of valuation modelling/investment decision making.

**Structure of the thesis.** Overall, the thesis consists of three chapters that contain three outlined subchapters. The paper starts from the first – theoretical chapter, which covers the framework of the stock market, available trading instruments, methods and modern approaches to equity valuation. Specifically, the first subchapter describes the universe of equity securities; the second describes the tools and concepts of equity valuation; and the third examines in details free cash flow (DCF) valuation models and its application on practice. The second and the third chapters are case-structured and related to the case of valuation of Ascom AG – swiss-based global solutions provider focused on Healthcare ICT and mobile workflow solutions. This case was selected for 2016 Chartered Financial Analyst (CFA) Challenge in Switzerland representing particular academic interest.

**Research methodology.** The planned research methodology of the thesis includes research of available publications, books, interviews, surveys, analytical reports, business practices. The overall process is aimed to cover all the steps of valuation required to interpret and implement the attained results on practice: the case and its empirical findings will be presented. Quantitative part will be supported by the creation of financial models in Excel, advanced calculations and performance of the regression analysis in case of necessity. Research process suggests examination of both present and historical information as well as making estimates and assumptions in the practical part of the thesis. The last chapter of the thesis will include concrete recommendations and the guidance for making investment on the stock market.

## Chapter 1. Equity and valuation theory

### 1.1. Universe of equity securities

Overall, the world of **financial assets** grasp a variety of instruments, including traditional securities such as stocks and bonds, derivatives and currencies. At the same time, the category of **real assets** comprises real estate, fixed investments, commodities and any other physical tangible assets.

Financial securities are largely represented by debt and equity. **Debt securities** grant an investor a right over a company's debts, while **equity securities** provide an investor with the ownership position in a company (Akram & Ahmad 2010, p.17).

**Publicly traded equities** are those traded on stock exchanges and can be acquired either on one's own account using the means of electronic trading or through stock brokers. In contrast, **private equity** securities are not traded publicly, they are often illiquid, harder to be valued and are not overseen by regulatory authorities.

The market for newly issued equity securities is called the **primary market**, while subsequent trading in already issued stocks occurs on the **secondary market**.

Representing the ownership in a company or a firm, **equity securities** may take form of common stock, preferred stock and warrants (CFA lecture note 2015, ch.8, p.7).

**Common stock** represents a residual claim on company's assets. Thus, dividends on common stock are paid until after interest to debtholders and dividends on preferred stock are paid. Beyond that, in case of company's liquidation, debtholders and preferred stockholders possess the primary claim against company's assets over common stockholders.

**Preferred stock** stands for the equity security that contains embedded dividends schedule, that virtually remains constant over a security's life. While often preferred stock lacks a voting right for a holder on shareholders meetings, dividends on preferred stock are committed to be paid prior to the dividends on common stock.

**Warrants** appear similar to derivative options as far as they provide a holder with a right to buy an equity share in a company (typically common stock) at a fixed price (strike or exercise) before the expiration.

The most typical form of ownership in equity is common stock. Despite companies do not have explicit dividend obligations on common shares, common stockholders carry the voting right on general meetings instead. They can vote on various agenda issues, including potential mergers and acquisitions or the appointment of members of the board of directors. The voting right can be also executed by a **proxy** – delegating someone else to vote in case a direct shareholder cannot attend the general meeting.

**Statutory voting** system grants each share a right of a single vote in the board election procedure. Within **cumulative voting**, each share carries a right to allocate more than one vote to the selected candidate. With that, cumulative voting provides minority shareholders with an opportunity of more proportional representation on the board.

**Callable common shares** provide the company with a right to repurchase its own stock at pre-determined call price. When the company executes this right, investors receive a fixed amount of funds in return for the stock. The callable option becomes valuable for the company when the market price of its shares is greater than the call price. By first calling its shares, the company is still permitted to make a reissuance at a higher price later. At the same time, the company can reduce dividends paid while keeping a dividend-per-share ratio constant.

**Putable common shares** provide a holder with a right to sell the shares back to the company at pre-determined put price. Having this option, a holder can set a market price floor for the share. In normal market conditions, putable shares are trading at a higher price compared to non-putable, and the company is able to raise more capital with their help (CFA Level 1 2015, Reading 50, p.17).

**Preferred shares** combine features of common stock and debt. Typically, preferred shares do not have maturity and might as well embed call or put options. Similarly to debt securities, preferred shares pay fixed recurring interest (dividend) to investors, but they carry no voting rights.

**Cumulative preferred shares** grant a fixed dividend to an investor, while any un-paid dividends of the given period must be paid out prior to a profit distribution to common

shareholders. In contrast, **non-cumulative preferred shares** do not provide for the dividends accumulation benefit.

Preferred shares have a nominal (par) value with a specified % dividend paid in respect to this value. Investors, who possess **participating preferred shares**, receive additional dividends when company's profits are above a prespecified level. Their claims, in case of a company's liquidation, might even exceed the nominal value of the preferred stock. **Non-participating preferred shares**, in contrast, guarantee only the nominal (par) value to an investor in case of company's liquidation, while they also provide a lower participation in company's profits. In practice, participating preference shares are often issued by small and risky companies, which, in this way, are seeking to compensate investors for taking on greater risks.

**Convertible preferred shares** can be converted to common stock at a predetermined conversion ratio. In general, these shares contain a number of advantages:

- The preferred dividend is greater than the common.
- An investor can benefit from higher company's profits by converting into common stock.
- Conversion option is especially valuable when the market price of common stock increases.
- Preferred shares normally carry less risk than common due to a stable dividend paid and the primary claim on company's assets (Quizlet.com 2015, p.12).

Due to high growth potential, convertible preferred shares are widely used in the capital structure of private equity and venture capital firms. Conversion option simply compensates investors for extra risks taken by investing in such companies (CFA Level 1, Reading 50,p.23).

A company may have a dual-class shares, e.g. Class A and Class B. One class may differ from the other by a greater voting power, seniority of claims on company's assets in case of liquidation, higher committed dividends etc. Generally, the information on a company's ownership and capital structure can be found in a company's filing with regulatory authorities, such as European Securities and Markets Authority (ESMA).

## 1.2. Concepts and tools of equity valuation

### 1.2.1. The notion of the value

The main question investors face with when making decision on investing in stock market is ‘what is the **value** of a selected share?’. To answer this question, an investor should be savvy about tools and concepts of equity valuation. **Valuation** is the process of estimation of equity’s (stock’s) intrinsic value based on a set of variables and assumptions, which are implicitly and explicitly related to a future investment return on the stock. The level of valuation skills is the key of success on a stock market.

The context of valuation and its objectives determinate the relevancy of the value notion and explicitly affect investor’s choice of the valuation approach. There are several perspectives of value as the fundamental pillar for the diversity of valuation models. Depending on valuation objectives, an investor may be looking for an intrinsic value, going-concern, liquidation or a fair value of a stock.

A crucial assumption in valuation of publicly traded stocks is the divergence between the market price and the intrinsic value of the stock. The **intrinsic value** of a stock is the value that fully represents all possible investment characteristics and the true nature of the underlying company. For any given investor, a calculated intrinsic value represents only his/her subjective vision of the ‘true’ or ‘real’ value of a stock. With this notion, the **traditional efficient market theory** states that the market price of an asset comes out to be the first-best available approximation of its intrinsic value (CIFA Section 4 2014, p.350).

The notion of the **rational efficient markets** (Grossman and Stiglitz, 1980) indicates that a rational investor will not be willing to incur expenses related to collection of the information about the company except the case if he/she anticipates to make higher returns on the company’s stock compared to simply accepting the market price. Thus, investors should regard the market price with a grain of scepticism. While investors should seek for a potential mispricing, they also should be capable of recognizing discrepancies amid the levels of market efficiency occurring on different markets.

For an active investor, valuation serves as the special tool aimed at finding investment returns that would exceed commensurated investment risks - that is, a positive excess risk-adjusted returns or **alpha**. Any active investor strives to achieve a positive alpha in his/her attempts to

estimate an assets's intrinsic value. Thus, a **mispricing** occurs when there is a discrepancy between the market price of a stock and its intrinsic value.

The idea of mispricing can be illustrated with the expression that breaks down the two likely sources of the potential mispricing (Equation 1):

$$V_E - P = (V - P) + (V_E - V)$$

where:

$V_E$  = estimated value;

$P$  = market price;

$V$  = intrinsic value.

Equation 1 identifies that the difference between the estimated value and the market price of a stock corresponds to the sum of two elements. The first element is the actual mispricing, that is the difference between the fair but not perceivable intrinsic value  $V$  and the market price  $P$ . The second element is the difference between the estimation of the value and the fair but not perceivable intrinsic value, which is called the estimation error of intrinsic value (Stowe, Robinson 2007, p. 15).

To obtain meaningful estimate of the intrinsic value, an investor should combine a sound forecast with the proper valuation model. The quality of the forecast, especially the estimated inputs and variables built into the valuation model, is a critical aspect of the investment success.

Equity valuation is often about dealing with uncertainty. When applying the selected valuation approach, an investor cannot be confident that he has considered all accompanying risks to pricing the asset. Due to existence of alternative risk models, there is no ultimate solution to this issue. Even if an investor works out appropriate risk adjustments, elaborates rigorous forecasts, and applies relevant valuation model, the final success cannot be guaranteed. Short-time market conditions may restrain an investor from reaping benefits of a tempting observed mispricing, while it may take more time for the market price and the intrinsic value to converge than an investor's investment horizon allows. Except for a potential mispricing, many investors seek for an additional **catalyst** (e.g., corporate news or event) that can trigger the market to reevaluate the price of the stock.

There are two different company's value depending on its operational condition. A company is said to have one value under a condition of its immediate liquidation and another value under

a condition of continuing operations. The **going-concern value** of a company is the value under the assumption that a company will be running its business within the observable or projected future. In contrast, a **going-concern assumption** cannot be applied to a company suffering financial distress. Alternatively, the value of a distressed company is roughly its **liquidation value**, that is the value of a company after its assets were entirely sold under the course of liquidation (Stowe, Robinson 2007, p. 18).

**Fair market value** is the value of a stock equal to the price at which it could be sold to a buyer via a mutually beneficial agreement with a seller, assuming a free expression of the will of both parties to the deal. The concept of fair market value additionally implies that both parties to the deal are informed about all crucial aspects of a transferred asset (stock). However, in certain circumstances, a stock may be more valuable for a buyer (e.g., due to potential synergy). In this context, the higher value for a buyer will be called **investment value** of a stock.

#### 1.2.2. The valuation process and the basis for forecasting

Investors use various tools and techniques of equity valuation to deal with a variety of practical issues. Specifically, investors apply valuation concepts to handle the following tasks:

*Stock selection.* Stock selection is the key issue in equity valuation. Investors always strive to pick up those stocks that are under- or overvalued by the market. Upon that, they compare the market price of the selected stock to its estimated intrinsic value or to prices of its peers (comparable stocks).

*Understanding market expectations.* Market prices of stocks display investors' expectations about companies' future performance. Observing available prices, an investor may wish to understand the assumptions and expectations underlying a stock's current market price, that is the assumptions about a company's **fundamentals**. Fundamentals reflect company's financial strength, profitability, growth perspectives etc. With the knowledge of the fundamentals underlying the market price, an investor can understand a fairness of a recent market expectations by comparing them to his own projections. Moreover, market's expectations on fundamentals of one company might be used as the benchmark for another company from the same field or industry.

*Appraising corporate events.* Investors might use valuation tools to estimate the impact of mergers, acquisitions, divestitures, spin-offs and leveraged buyouts on company's value. A **merger** is the transaction in which the combination of two individual companies takes place. An **acquisition** differs from a merger in that the one party in a transaction is known as the acquirer and the other as the acquired. In a **divestiture**, a company disposes of the major segment or line of its business. Under a **spin-off**, a company separates one of its business segments and convey the ownership over it to the principal shareholders. A **leveraged buyout** is an acquisition deal based on the substantial proportion of attracted debt, which is pledged by the assets of the acquired company. Every corporate event has a certain implication on a company's cash flows and the value of its stock.

*Valuating stocks of private companies.* An investor may need to evaluate the equity of a private business within the course of a merger or an acquisition. The absence of market prices for private companies complicates the valuation and allots certain peculiarities to the valuation models. Modified models are used, among others, in valuation of initial public offerings (IPO). **Initial public offering** is the primary issue and the stock exchange registration of the common stock of the company, shares of which have not been publicly traded before. IPOs are usually undertaken by either private or state-owned companies, or by a newly formed entity (CIFA Section 4, p.193).

Overall, the valuation process implies five consecutive steps:

1. *Understanding the business.* The valuation starts from the analysis of company's related industry and its competitive position, and is accompanied by the analysis of company's financial statements, notes and disclosures. This forms the basis for the following forecasts of company's performance.
2. *Forecasting company performance.* At this step, an investor makes projections on company's future sales, earnings, expenses, dividends and other inputs to the valuation model.
3. *Selecting valuation model.* Depending on company's business, investment profile and the overall context of valuation, the appropriate model should be selected.
4. *Transforming forecasts into valuation.* In addition to the quantitative outcome of the valuation model, estimating the value also includes qualitative judgments.
5. *Interpreting valuation outcomes.* Based on the ultimate valuation conclusions, an investor makes an investment decision in respect to a valuated stock, determines the



transaction price and enters a long or a short trading position (CFA Level 2 2015, Equity Valuation, p.87).

To duly forecast company's financial performance, which serves as the ground in the determination of a company's value and affects the investment decision of an investor, it is necessary to get the understanding of the economic and industry environment, in which the company operates, the nature of company's business, its strategy and historical performance.

Since common economic and technological drivers normally impact all companies within the same industry, knowledge of the industry helps investors to get the understanding of the main characteristics of the markets at which a company does its business. After all, industry and competitive analysis should point at key challenges and existing opportunities for a company operating within a specific business environment. Finally, valuation should be supplemented with the **sensitivity analysis**, which shows how changes in valuation inputs will affect the valuation result. Likewise, **frameworks** might be useful in focusing on business related aspects (Pinto, Henry 2010, p.12).

Intrinsic industry profitability is one of the key aspects affecting company's profitability. It is important to make aware of the **industry structure** – economic and technological factors underlying the industry together with the trends affecting the structure. Fundamental market factors – demand and supply – build up a necessary framework for discovering the industry. Porter's (1985, 1998, 2008) five forces describe industry structure and may positively or negatively affect intrinsic industry profitability:

1. *Intra-industry rivalry*. Low rivalry in a fast-growing industry with a few competitors and good brand identification results in increasing intrinsic industry profitability.
2. *New entrants*. High entry costs factor into less new participants and lower competition, thus increasing intrinsic industry profitability.
3. *Substitutes*. Less substitutes or high costs of switching to a substitute make competitors less constrained to raising prices, thus increasing intrinsic industry profitability.
4. *Supplier power*. Larger number of suppliers restrain their power to raise prices, making them incapable of pushing industry profitability downwards.
5. *Buyer power*. Larger number of buyers of a product restrain buyer's bargaining power and make them incapable of pushing industry profitability downwards (Porter 2008, p.8).

The size and the strength of a company's market share is the indication of its relative competitive position within the industry. Company's value can appraise to the extent to which a company can create and maintain its comparative advantage. Porter determines three corporate strategies aimed to outperform average market performance:

1. *Cost leadership*. Aims to be the lowest in terms of costs while offering a comparable and competitive product, priced on the level of the industry average.
2. *Differentiation*. Aims to offer a unique product or service that is highly valued by customers, which allows a company to charge a price premium.
3. *Focus*. Aims to search for a competitive advantage within the industry segment based on either cost leadership (cost focus) or differentiation (differentiation focus) (Porter 1980, p.17).

Company's competitive position is grounded on the accurate strategic direction and the competent execution. Analysis of company's financial statements provides the comparable basis for assessment of the company's recent performance versus its strategic perspectives as well as for the key assumptions on the company's future performance. Historical analysis implies deep study of the annual reports from last 5 or 10 years. This study provides an insight of management's historical approach to deal with challenges, as well as it shows how the management has been reacting to changes in business environment over time. As a rule, publicly traded companies publish copies of their annual reports in the investor relations panel of their websites.

The core elements of financial reporting, helping to evaluate a company's progress in realizing its strategic goals, vary among companies and industries. For mature and developed companies, financial ratio analysis is appropriate. For example, profitability drives for manufacturing companies can be measured in respect to company's declared strategic objectives. A manufacturing company striving to develop a long-term competitive advantage by forming a solid brand recognition is expected to incur large advertising costs, which will result in relatively higher prices for its products. In contrast to the company competing on costs, the company with stronger brand recognition will have higher gross margin and higher relative selling expenses.

Important information on company's historical performance, industry specification and competition is often can be found in the company's mandatory disclosures, filings, press releases, investor relations sections and analysts contacts. However, reported results of different

companies vary in consistency, accuracy and persistence. The **quality of earnings** plays a crucial role in the analysis of financial statements and the evaluation of company's performance, as well as in the accuracy of representation of the reported information within the context of economic reality (Stowe, Robinson 2007, p. 11).

The second step of the valuation process is *forecasting company's performance*. This step can be considered in two dimensions: within the economic environment of an operating company, and a company's related business and the investment profile.

A **top-down forecasting approach** allows to examine company within a larger context, that is, starting from macroeconomic forecasts and coming down to an industry and a company's individual forecasts. Conversely, a **bottom-up forecasting** approach starts from a microlevel and go up to larger-scale forecasts, using consistent assumptions.

In reality, to obtain more precise projections of company's revenues, profits and cash flows, an investor should combine the outcomes of industry and competitive analysis with the outcomes of financial statement analysis. Relying on quantitative tools of forecasting and valuation when making decision, investor should not hesitate to incorporate qualitative assumptions, such as his/her own opinion about managerial integrity and business acumen of the management, or the level of transparency and quality of a company's accounting practices (CIFA Section 4, p.146).

### 1.2.3. Valuation models and their application

At the third step, investor selects a feasible valuation model. Market practitioners use a wide variety of models to derive the value of company's stock; however, in general classification, **absolute** and **relative valuation models** are defined.

Absolute valuation models derive the intrinsic value of a stock and compares it to its current market price. The fundamental and the most relevant absolute valuation model is a **present value** or a **discounted cash flow model**. This model states that the value of a company's common stock is the sum of the discounted expected future cash flows of the underlying company. Present value model can be also applied to dividends in case if a company's dividend pay-out can be reliably predicted. The model applied to dividends is called a **dividend discount model** and is based on the idea that common shareholders have a residual claim over company's

cash flows, thus, they should be concerned only with the cash flows coming to them in the form of dividends (Brav, Grey 2007, p.35).

Depending on the final use of free cash flow and the level of claims on them, discounted cash flow models break down into two categories. The **free cash flow to equity model** adjusts company's cash flows for payments to providers of debt, whereas **free cash flow to the firm model** is applied to cash flows prior to any debt payments.

**Residual income model** is the valuation model based on accrued earnings exceeding the opportunity costs to generate these earnings. **Asset-based valuation model** evaluates company based on the market value of its assets and resources it owns. For a certain group of companies, asset-based valuation can deliver a standalone value estimate, which might be useful as an additional metrics for the investor (Pfeiffer 2004, p.45).

Relative valuation models estimate stock's value related to values of others stocks. The idea behind relative models is that similar stocks should trade at similar prices. Relative valuation is implemented by comparing either price or enterprise multiples. The most popular price multiple is **price-to-earnings ratio (P/E)** – the ratio of a stock's market price to the underlying company's earnings (net income) per share. A stock trading at lower P/E relative to a comparable stock (e.g., in terms of expected growth rate and risk) is said to be *relatively undervalued* and, if it is also undervalued by a discounted cash flow model, this stock can be a good buy opportunity. **EV/EBITDA** multiple is the ratio of **enterprise value** (market value of company's common stock and debt, net of cash) to earnings before interest, tax, depreciation and amortization. This multiple is the most applicable within the group of enterprise multiples (Stowe, Robinson 2007, p. 95).

Some investment strategies are based on relative valuation of the overweighted (underweighted) stocks in relation to their undervaluation (overvaluation) with respect to benchmark weights. Other strategies involve simultaneous sell of an overvalued and buy of an undervalued stock. This more aggressive technique is known as relative spread investment. The typical example is **pairs trading** that applies to a pair of related stocks from the same sector or industry. In pair trading, investor's benefit is not tied to the overall market direction, but rather to the extent that a relatively undervalued stock rises to faster or falls to slower than its relatively overvalued co-pair.

In practice, relative valuation is usually performed in respect to a group of comparable stocks (peers) selected from the same industry, sector or field. One approach of relative valuation may

be useful to estimate a company's value as the sum of values of its independent businesses. This method is known as the **sum-of-the-parts** valuation and it assumes that each business is an individual going concern. The value estimated using this method is known as the **breakup value** or **private market value**. The sum-of-the-parts valuation is appropriate to valuing a company, which owns independent businesses across various industries with distinct valuation features. Additionally, this method is helpful in estimation of value that can be unlocked in a restructuring, such as a spin-off or equity carve-out.

The other important valuation concept is conglomerate discount. **Conglomerate discount** is applied in valuation of companies that operate in multiple, unrelated businesses. The explanation behind the conglomerate discount embraces the following factors:

- 1) Allocation of conglomerate's investment capital across the businesses does not lead to maximization of shareholder value.
- 2) The expansion through acquisitions in unrelated businesses may indicate a poor performance of the principal company.
- 3) Limited synergies with company's core businesses eventually result in a divest of low-synergy segments.
- 4) Break-up value exceeding company's unadjusted going-concern value may trigger such corporate actions as a divestiture or a spin-off (CIFA Section 4, p.118).

In order to select an appropriate valuation model, investor should refer to the range of selection criteria so that the model is:

- Consistent with the investment profile of a valued company.
- Relevant based on the availability and quality of data.
- Consistent with the goal of valuation and an investor's perspective.

Simultaneously, using more than one model in valuation can reveal useful auxiliary perspectives on a company.

Selection of the appropriate model that would be consistent with the investment profile of a valued company grounds on the solid understanding of a company's business. Partly, this understanding comes from the nature of company's assets and the way the company uses them in value creation. As an example, bank possesses a large portion of highly liquid, marketable assets and securities, hence an assets-based relative valuation is more relevant for a bank than for a trading company with a small portion of marketable assets on its balance.

Availability and quality of data may appear as a limiting aspect in model selection. For example, it might be challenging to apply P/E relative valuation to a company with highly volatile or repeatedly negative net income. To the same extent, it will be impossible to apply a simple dividend discount approach to value a company with infrequent or unstable dividends or with a low predictability of profits distribution (Pinto, Henry 2010, p.13).

As a final point in model selection, it is worth mentioning that stock market practitioners often use several models or approaches in stock selection. As alleged by the *Merrill Lynch Institutional Factor Survey (2006)*, interviewed institutional investors responded that they use on average nine valuation determinants in stock selection. There are a number of ways to use multiple factors in stock selection, including **stock screens** and **ranks of attractiveness**.

Finally, transforming forecasts into valuation requires more than simply filling in an excel model with the forecasted variables to obtain the intrinsic value of a stock. Additional important tools used to convert forecasts into valuation are sensitivity analysis and situational adjustments (Pinto, Henry Equity 2010, p.27).

**Sensitivity analysis** is a type of analysis, which allows to examine how changes in inputs to the model affects the valuation outcome. As an example, sensitivity analysis can be used to examine how a change in company's earnings growth rate, or a change in applied discount rate, or the WACC would change the estimated value. In general, sensitivity analysis will vary in dependence on the context of valuation. As another example, a baseline forecast framework can be built to analyze how different competitive responses of a target company to challenges set by its rivals would impact the estimated value of its stock.

**Situational adjustments** are useful because they allow to account for the effect of particular issues on the overall valuation. Such issues may include an illiquidity discount, a lack of marketability discount and control premium. **Illiquidity discount** is relevant for stocks, prices of which have a low depth on the market. These stocks are less liquid and the size of an investor's single order may appear larger than the average trading volume of an illiquid stock. This results into a **blockage factor**, which implicates that the market price of the larger order is usually lower than the price of the smaller order for the particular stock. **Lack of marketability discount** means that investors demand higher return to offset a lack of public market or marketability of a stock. **Control premium** suggests that the value of a stock will be higher for the investment that grants an investor a controlling position (ownership) in a company. The premium arises due to the fact that a controlling ownership position, which is

typically granted by a possession of more than 50 percent of a company's common stock, brings about a control over the board of directors or a control over a company's assets and its capital structure (Damodaran 2008, p.24).

### 1.3. Free cash flow and alternative valuation models

#### 1.3.1. Discounted cash flow models

Discounted cash flow (DCF) valuation obtains the value of a stock from the present value of future cash flows of the underlying company. DCF model can take a shape of dividend discount model (DDM) if discounting refers to company's dividends. Typically, DCF analysis is extended to value company's stock by estimating its free cash flow to the firm (FCFF) and free cash flow to equity (FCFE). While dividends are cash flows directed to stockholders, free cash flows represent the cash flows available for distribution to shareholders (Damodaran 2008, p.27).

Many investors deem free cash flow models as more useful in practice than the DDM since they provide more sound economical basis for valuation. FCFF and FCFE approaches are typically used when one or more of the conditions are true:

- Company does not distribute profits or the amount of dividends paid substantially diverge from the company's pay-out potential.
- Free cash flows coincide with company's profitability within the forecasted period.
- A "control" perspective on valuation is taken. Thus, investor seeks to take a control/discretion over a company's free cash flows. By doing that, he is gaining a right to change its dividend policy.

**Free cash flow to the firm (FCFF)** is the cash flow available to company's suppliers of capital after all operating expenses are paid and investments in fixed (CAPEX) and working capital are made. FCFF equals cash flow from operations (CFO) minus capital expenditures (CAPEX). Company's suppliers of capital are common stockholders, bond- or debtholders and preferred shareholders.

**Free cash flow to equity (FCFE)** is the cash flow available to company's holders of common stock after all operating expenses, interest, and debt principal are paid and required investments in working and fixed capital are made. FCFE equals CFO minus CAPEX and payments to (or plus receipts from) debtholders (Quizlet.com 2015, p.17).

The advantage of FCFF and FCFE over the other cash-flow measures is their direct application in DCF valuation. Other cash-flow or earnings measures, such as CFO, EBITDA or net income do not have this advantage since they either count twice or omit important cash-flow items. For instance, EBITDA is before-tax measure, while the cash flows available to investors must be after-tax. From the perspective of stockholders, EBITDA do not take into account differing capital structures (as reflected in after-tax interest expense or preferred dividends) or the financing of operating assets by debtholders. Likewise, EBITDA does not account for reinvestment of cash flows into capital assets and working capital, which should be made by company to maintain or increase its long-term equity value.

The use of free cash flow valuation appears more challenging than the use of dividend valuation, since in forecasting of free cash flows, an investor is set against the task to integrate company's operating cash flow with its financing and investing cash flows. Because FCFF is the after-tax cash flow attributable to all suppliers of capital to the company, the value of the company is calculated by discounting FCFF at the weighted average cost of capital – WACC. The implicit value of equity is then found by subtracting the value of debt from the total value of the firm. Alternatively, the value of equity can be obtained by directly discounting FCFE at the required rate of return for equity (CFA Level 2 2015, p.93).

Both free cash flow methods should theoretically result in the same equity value if all assumptions and inputs were identical. An investor may prefer one method over the other depending on the characteristics of the valued company. For instance, if the company's capital structure is relatively stable, the use of FCFE is more appropriate and simpler than the use of FCFF. In turn, FCFF should be preferred in two other cases:

*A levered company with negative FCFE.* In this case, FCFF is discounted to find the present value of the company's operating assets (the value of excess cash and marketable securities and of any other important nonoperating assets is added to get the total value). Then, the market value of debt is subtracted to obtain an estimate of the intrinsic value of equity.

*A levered company with a variable capital structure.* In this case, if historical data are used to project the growth rate of free cash flow, FCFF growth may be a more accurate proxy than FCFE



growth, which contains variable amounts of borrowing. Beyond that, looking forward, the required return on equity will be probably more sensitive to changes in financial leverage than to changes in the WACC, which complicates the use of a constant discount rate (Pinto, Henry 2010, p. 36).

When the capital structure is not stable, special DCF methods are used to conduct equity valuation. One example is the **adjusted present value (APV)** approach, which allows to calculate company's value as the sum of:

- 1) The value of the company under a no-debt assumption or the unlevered company's value.
- 2) The NPV of any effects of debt on company's value, such as potential tax benefits arising from the use of debt or a cost of financial distress.

With this approach, under a no-debt assumption FCFF should be discounted at the unlevered cost of equity (Ross, Westerfield, and Jaffe 2005, p.181).

In general terms, the FCFF valuation approach derives company's value as the sum of present values of future free cash flows to firm, which is then discounted at the weighted average cost of capital (Equation 2):

$$\text{Firm value} = \sum_{t=1}^{\infty} \frac{\text{FCFF}_t}{(1 + \text{WACC})^t}$$

Since FCFF is the cash flow available to all suppliers of capital, the WACC must be used to discount FCFF in order to derive the total value of the company's capital. The value of equity equals the total company's value less the market value of its debt (Equation 3):

$$\text{Equity value} = \text{Firm value} - \text{Market value of debt}$$

Dividing by the number of outstanding shares, investor obtains the equity value per share.

The cost of capital is the rate of return that investors require for future cash flows that the company will generate. WACC is dependent on the risk level of these cash flows. WACC stands for the after-tax weighted average cost of debt and equity, where the respective weights are determined in proportion to the company's market values of debt and equity. Alternatively, the weights of debt and equity in company's target capital structure can be used when the target capital structure is known and the D/E weights differ from the market values. The following formula is used to calculate the WACC (Equation 4):

$$WACC = \frac{MV(Debt)}{MV(Debt) + MV(Equity)} r_d (1 - \text{Tax rate}) + \frac{MV(Equity)}{MV(Debt) + MV(Equity)} r$$

MV (Debt) and MV (Equity) are the current market values of debt and equity. The ratios of MV(Debt) and MV(Equity) to the total market value of capital (D+E) determine the weights of each item in the WACC. The notion  $r_d (1 - \text{Tax rate})$  is the after-tax cost of debt, while  $r$  is the cost of equity. Tax rate is typically the marginal corporate income tax rate (Pinto, Henry 2010, p. 41).

The value of equity can be derived by discounting FCFE at the required rate of return on equity,  $r$  (Equation 5):

$$\text{Equity value} = \sum_{t=1}^{\infty} \frac{FCFE_t}{(1 + r)^t}$$

Because FCFE is the cash flow available to common equity holders after all other claims have been satisfied, it must be discounted at the required rate of return on equity in order to obtain the value of company's equity. Division of the total value of equity by the number of outstanding shares gives thee equity value per share.

Single-stage free cash flow model is the valuation model under the assumption that FCFF or FCFE grows at a constant rate. Similar approach used in a private companies valuation is referred to as **capitalized cash flow model**. Assuming that FCFF grows at a constant rate  $g$ , FCFF in the next period is equal to FCFF in the previous (current) period multiplied by  $(1+g)$  (Equation 6):

$$FCFF_t = FCFF_{t-1}(1 + g)$$

The total value of the firm in the single-stage model is equal to (Equation 7):

$$\text{Firm value} = \frac{FCFF_1}{WACC - g} = \frac{FCFF_0(1 + g)}{WACC - g}$$

The value of equity is then found by subtracting the market value of debt from the total value of the firm (Brav, Grey 2007, p.87).

The same conception applies to FCFE, that is FCFE for the next period is found with the following formula (Equation 8):

$$FCFE_t = FCFE_{t-1}(1 + g)$$

The equity value in the single stage valuation model is calculated as (Equation 9):

$$\text{Equity value} = \frac{FCFE_1}{r - g} = \frac{FCFE_0(1 + g)}{r - g}$$

Instead of WACC, the required rate of return on equity is applied to discount FCFE. What is important, the growth rates of FCFF and FCFE does not have to be necessary the same.

Two-stage free cash flow model assumes a long-run sustainable growth in the second stage. In a declining industry, the second-stage growth rate might be something below the growth rate of GDP. In a rising industry with a fast expected growth, the second-stage growth rate might slightly exceed the GDP growth rate.

There are two widely-used approaches of the two-stage FCFF and FCFE models. One approach assumes the constant growth in Stage 1 followed by the drop to the long-run sustainable growth in Stage 2. With the second approach, the growth rate declines in Stage 1 before reaching the sustainable growth in Stage 2 (Stowe, Robinson 2007, p. 56).

In contrast to multistage dividend discount models, the growth rate of FCFF or FCFE in free cash flow models can be the growth rate of sales or net income. If the growth rate of net income is used, then the changes in FCFF or FCFE will additionally depend on investments in operating assets and the sources of financing of these investments. Investments in operating assets would decline when the growth rate in income between Stage 1 and Stage 2 declines. If the growth rate for sales is used, FCFF and FCFE will be also determined by changes in net profit margin and investments in operating assets (as well as their financing policy).

Generally, the two-stage FCFF valuation model is described by the following expression (Equation 10):

$$\text{Company's value} = \sum_{t=1}^n FCFF_t / (1 + WACC)^t + [FCFF_{n+1} / (WACC - g) / (1 + WACC)^n]$$

The present value of the projected  $n$  years of FCFF determines the first part of the Equation 10. The second part is called **the terminal value**, and it is calculated in respect to FCFF in Year  $n+1$ . The terminal value is determined by the Gordon growth model as  $FCFF_{n+1} / (WACC - g)$  and is discounted at the WACC for  $n$  periods to return the present value. The value of equity is obtained by subtracting the value of debt outstanding from the total value of the company. The value of equity per share can be obtained by dividing the total value of equity by the number of shares outstanding (Raiffeisen Centrobank Concepts and Methods 2016).

Simultaneously, the two-stage FCFE valuation model is described by the following expression (Equation 11):

$$\text{Equity value} = \sum_{t=1}^n \text{FCFE}_t / (1+r)^t + [\text{FCFE}_{n+1} / (r-g) * 1 / (1+r)^n]$$

The first part of Equation 11 is the present value of the projected  $n$  years of FCFE. The second part is the terminal value calculated in respect to the FCFF in Year  $n+1$  as  $\text{FCFE}_{n+1} / (r - g)$  and is discounted at the required rate of return on equity for  $n$  years. The value per share can be obtained by dividing the total value of equity by the number of outstanding shares. In Equation 11, the terminal value of the stock at  $t = n$ ,  $\text{TV}_n$ , is calculated with the constant-growth FCFE model; hence,  $\text{TV}_n = \text{FCFE}_{n+1} / (r - g)$ . Estimation of the terminal value is a crucial step because the present value of the terminal value is a substantial part of the total value of the stock.

Three-stage model is simply an extension of the two-stage model. One typical version of a three-stage model is to project a constant rate of growth in each stage. The growth rates used can be a growth of sales, net income, fixed and working capital investments, or the growth rate of FCFF or FCFE. Another model used in practice is a three-stage model characterized by constant growth rates in Stages 1 and 3 and a declining growth rate in Stage 2. Despite it is unlikely that future FCFF and FCFE will coincide with either of the assumptions of a three-stage growth model, in practice these models serve as useful approximations (Quizlet.com 2016, Free cash flow valuation).

### 1.3.2. Forecasting free cash flow

To forecast free cash flow of the company, investor must have a thorough understanding of company's business and its financial practices. Keeping in mind that FCFF is the cash flow available to all company's suppliers of capital, FCFF can be derived from net income as follows (Equation 12):

$$\text{FCFF} = \text{Net income} + \text{Net noncash charges (NCC)} + \text{Interest expense} \times (1 - \text{Tax rate}) - \text{Investment in fixed capital (FCInv)} - \text{Investment in working capital (WCInv)}$$

Or the shorter form of Equation 12:

$$\text{FCFF} = \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv}$$

The starting point of the equation is net income available to common shareholders. It represents a company's income after depreciation, amortization, interest expense, income taxes and dividends paid to preferred shareholders.

Net noncash charges is typically represented by depreciation and amortization expense since it is a non-cash outflow, which had initially reduced net income. Other noncash charges vary from company to company and can be easily found in a company's statement of cash flows. As an example, restructuring charges may consist of cash outflows and noncash charges. Retirement benefit to laid-off employees can be a cash restructuring charge, but also a noncash item in the form of a write-down in the value of assets (Alex Shapiro 2010, p.10).

After-tax interest expense is added back to obtain FCFF because interest is a cash flow, which belongs to debtholders, while an interest expense net of tax savings was previously subtracted to arrive at net income. Interest is tax deductible for a company-borrower in many countries. That is the reason why the after-tax cost of capital is used in FCFF discounting.

Preferred stock dividends are also added back to net income because they are the cash flows attributable to the specific group of capital providers to the company.

Investments in fixed capital are cash outflows for purchase of fixed assets required for the maintenance of company's current and future operations. Those are mainly the capital expenditures for purchase of property, plant and equipment (PP&E) and intangible assets (e.g., trademarks). In case of the acquisition of another company, a cash purchase amount should be also counted as the capital expenditure. All necessary information on capital expenditures as well as on disposals and acquisitions can be found in company's cash flow statement. At the same time, it could be the case for some companies to purchase fixed assets through an exchange for a stock or a debt, that is non-cash transactions. Such operations are disclosed in the footnotes to financial statements (CIFA Section 4, p.122).

An adjustment for an increase in net working capital is the adjustment for the amount of current assets exceeding current liabilities. Additionally, for valuation purposes, cash and cash equivalents, prepayments and short-term debt (typically, accounts payable and the current portion of long-term debt) are excluded from the working capital. Respective information on the accounts and items used in calculation of working capital can be found in the company's balance sheet and the cash flow statement.

Investors may choose the cash flow from operations as the starting point in calculation of free cash flow, since CFO includes adjustments for noncash expenses and net investments in working capital. To calculate FCFF starting with CFO, appropriate classification of interest paid must be made. Table 1 summarizes IFRS and US GAAP treatment of interest and dividends.

Table 1. IFRS versus US GAAP Treatment of Interest and Dividends

	<b>IFRS</b>	<b>US GAAP</b>
Interest received	Operating or Investing	Operating
Interest paid	Operating or Financing	Operating
Dividends received	Operating or Investing	Operating
Dividends paid	Operating or Financing	Financing

*Source: International Accounting Standards Board (IASB)*

If the after-tax interest expense was subtracted from net income and CFO (under US GAAP), then after-tax interest expense must be added back to arrive at FCFF. In such case, FCFF is computed with the following formula (Equation 13):

$$\text{FCFF} = \text{CFO} + \text{Int} (1 - \text{Tax rate}) - \text{FCInv}$$

Investments in working capital are not reflected in Equation 13 since CFO already incorporates these investments (Kruschwitz, Loeffler 2005, p.136).

To find FCFE from FCFF, the latter must be reduced by the after-tax interest paid to debtholders and increased by net borrowing (new debt attracted less debt redeemed over the reported period) (Equation 14):

$$\text{FCFE} = \text{FCFF} - \text{Int} (1 - \text{Tax rate}) + \text{Net borrowing}$$

Alternatively, FCFF can be found from FCFE with the opposite equation (Equation 15):

$$\text{FCFF} = \text{FCFE} + \text{Int} (1 - \text{Tax rate}) - \text{Net borrowing}.$$

FCFE is the actual amount that company can pay out in the form of dividends. In reality, due to numerous reasons, companies often pay out dividends that are significantly more or are significantly less than FCFE. One reason for that is the discretionary nature of the dividend decision, which belongs to the board of directors. Many companies regulate their dividends by gradually increasing dividends over time to avoid cutbacks. Some companies raise dividends aversely even if their earnings are substantially increasing, while other companies maintain

stable dividend pay-outs even if their profitability is declining. In this light, earnings are much more volatile than dividends (Kruschwitz, Loeffler 2005, p.154).

By subtracting after-tax interest expense and adding net borrowing to previous FCFE equations, calculation of FCFE can also begin with net income and CFO (Equation 16, 17):

$$FCFE = NI + NCC - FCInv - WCInv + \text{Net borrowing}$$

$$FCFE = CFO - FCInv + \text{Net borrowing}$$

EBIT and EBITDA can also serve as a starting point for calculation of FCFF and FCFE. To show the connection between EBIT and FCFF, investor should start from Equation 12 assuming that depreciation (Dep) is the only noncash charge (Equation 18):

$$FCFF = NI + Dep + \text{Int} (1 - \text{Tax rate}) - FCInv - WCInv$$

Net income (NI) can be expressed as (Equation 19):

$$NI = (\text{EBIT} - \text{Int}) (1 - \text{Tax rate}) = \text{EBIT} (1 - \text{Tax rate}) - \text{Int} (1 - \text{Tax rate})$$

Substituting Equation 19 for Equation 12 gives (Equation 20):

$$FCFF = \text{EBIT} (1 - \text{Tax rate}) + Dep - FCInv - WCInv$$

To derive FCFF from EBIT, EBIT must be multiplied by (1 – Tax rate), depreciation must be added back, and fixed capital and working capital investments must be subtracted.

To show the relationship between FCFF and EBITDA, net income must be expressed as (Equation 21):

$$NI = (\text{EBITDA} - Dep - \text{Int}) (1 - \text{Tax rate}) = \text{EBITDA} (1 - \text{Tax rate}) - Dep (1 - \text{Tax rate}) - \text{Int} (1 - \text{Tax rate})$$

Substituting Equation 21 in Equation 12 gives (Equation 22):

$$FCFF = \text{EBITDA} (1 - \text{Tax rate}) + Dep (\text{Tax rate}) - FCInv - WCInv$$

FCFF equals EBITDA times (1 - Tax rate) plus depreciation times the tax rate minus investments in fixed capital and working capital (Raiffeisen Centrobank Concepts and Methods 2016).

Most of the adjustments for noncash charges in FCFF calculation from net income are not required when starting from EBIT or EBITDA since most noncash charges occur after computation of EBIT and EBITDA. An important note is that some of noncash charges, such

as depreciation, are tax deductible. Thus, the taxation effect must be considered in calculation of FCFF. In general, an adjustment for a noncash charge depends on the income statement order where the charge was deducted. Beyond that, the form of any required adjustment depends on tax-deductibility of noncash charge.

In the same way, FCFE can be also calculated from EBIT or EBITDA (Equation 23):

$$FCFE = FCFF - \text{Int} (1 - \text{Tax rate}) + \text{Net borrowing}$$

Derivation of FCFF and FCFE from historical data is usually straightforward. In some cases, historical data are used directly to infer growth of free cash flow in a single-stage valuation model. In other cases, investor should not expect the future free cash flows to be closely related to the past. Thus, an investor should forecast separately each individual component of free cash flow.

One (basic) approach to free cash flow forecasting is to apply a constant growth rate to a free cash flow of a current period. The easiest way is to assume that a historical growth rate can be extended to the future. This method is relevant if company's free cash flow has been historically growing at a constant rate and if there is a strong connection between a free cash flow and the fundamental factors, which is expected to preserve in the future.

A more complex approach involves forecasting individual components of free cash flow. One widely-used method is to forecast separately EBIT (1 - Tax rate), net noncash charges, fixed and working capital investments. EBIT can be forecasted directly or as EBIT margin (% of the company's Sales) with respect to historical data, current and expected business and economic conditions. Capital requirements can be forecasted based on historical connections between increases in sales and investments in fixed and working capital (Université du Québec à Montréal 2011, p.17).

FCFF can be derived by first forecasting EBIT (1 - Tax rate) and then subtracting incremental fixed capital and working capital expenditures. To estimate FCInv and WCInv, their historical proportion to sales increases should be multiplied by a forecast of sales increase. Incremental fixed capital expenditures as the proportion of sales increases are calculated as follows (Equation 24):

$$(\text{CAPEX} - \text{Dep expense}) / \text{Increase in sales}$$

Incremental working capital expenditures as the proportion of sales increases is calculated as (Equation 25):



### Increase in working capital / Increase in sales

In contrast to adding back depreciation and subtracting CAPEX when starting from EBIT (1 - Tax rate), this approach simply subtracts net capital expenditures, which exceed depreciation.

When forecasting FCFE, investors often assume that the company uses a “target” debt/equity ratio in its capital structure. In this case, they suggest that financing of: 1) net investments in fixed capital (new fixed capital minus depreciation expense) and 2) increase in working capital, is based on a target debt/equity ratio. This assumption simplifies FCFE computation. Assuming that depreciation is the only noncash charge, FCFE can be computed as follows (Quizlet.com, Free cash flow valuation) (Equation 26):

$$FCFE = NI - (FCInv - Dep) - WCInv + \text{Net borrowing}$$

Since (FCInv – Dep) is the incremental fixed capital expenditure net of depreciation, by holding a target DR, the requirement to forecast net borrowing is eliminated (Equation 27):

$$\text{Net borrowing} = DR (FCInv - Dep) + DR(WCInv)$$

Using Equation 27, there is no need to annually forecast issuance and repayment of debt in order to estimate net borrowing. The formula for FCFE computation takes the following form (Equation 28):

$$FCFE = NI - (FCInv - Dep) - WCInv + (DR) (FCInv - Dep) + (DR)(WCInv)$$

or (Equation 29):

$$FCFE = NI - (1 - DR) (FCInv - Dep) - (1 - DR) (WCInv)$$

Equation 29 shows that FCFE equals net income minus the amount of fixed capital expenditures (net of depreciation) and working capital investments that are financed by equity.

The limitation of this approach is that the only assumed noncash charge is depreciation. However, when the valuated company possesses other substantial noncash charges, this approach will result in less accurate estimate of FCFE than the one based on forecasting individual components of FCFE. In some cases, investor will deal with actual forecasts of the projected components, such as CAPEX. In other cases, to make forecasts, investor must examine historical relationships, such as a share of CAPEX in % of sales (Pinto, Henry 2010, p.57).

### 1.3.3. Auxiliary components of free cash flow valuation

Despite usually high reporting quality of many companies, some may still lack of transparency. For example, in some corporate financial statements, changes in balance sheet accounts (an increase in an asset or a decrease in a liability) differ from changes in the statement of cash flows. Another example, the amount of depreciation expense in the cash flow statement may differ from the amount reported in the income statement.

Events causing dissimilarities between the balance sheet and the cash flow changes include divestitures and acquisitions, or the existence of foreign subsidiaries. For instance, an increase in inventory account can result from a purchase from suppliers (operating activity) or from an acquisition of another company that also holds inventory on its balance (investing activity). Discrepancies may also arise from currency translations of profits of foreign subsidiary.

Because the reported CFO figure can be exposed to cash flows arising from financing or investing activities, investor must adjust CFO used in valuation. The adjusted CFO is then can be used as a starting point in free cash flow calculation (CFA Level 2 2015, p.133).

Most investment professionals give preference to free cash flow valuation models over dividend discount models. This is explained by several reasons. First, many companies do not pay, or pay low, dividends. Applying a DDM in valuation of these companies is complicated since extremely accurate assumptions must be made on initial dividends and their growth rate. Second, because dividend policy is at discretion of the company's board of directors, dividends paid might impair or misrepresent company's long-term profitability. As was already mentioned, companies often pay dividends that are significantly different from their cash flows. Finally, dividends are the cash flows distributed to shareholders, whereas free cash flow to equity is the cash flow available to company's shareholders, which does not alter company's value. If a company under valuation is a target for takeover, free cash flow is the most appropriate for valuation; after a company was taken over, the new owners receive a discretion over the use of free cash flows and distribution of profits.

The formulas for calculation of FCFF and FCFE do not include dividends, issuance of shares and share repurchases, as they represent the uses of cash flows. Thus, transactions between a company and its shareholders do not affect free cash flow. At the same time, changes in leverage or debt financing can either reduce or increase free cash flow to equity through the effect of the interest tax shield. If all valuation inputs were mutually consistent, FCFE and DDM models

would result in very similar valuation of a stock. One scenario could be that FCFE exactly equals annual dividends. If this is true, both cash flows should be discounted at the same required return for equity and would give the same present value (Damodaran 2012, p.235).

Despite FCFE and dividends often differ on practice, the same economic drivers that lead to low (high) dividends, lead to low (high) FCFE. For instance, a fast-growing company with outstanding investment opportunities will, most likely, preserve a high proportion of profits and pay-out low dividends. This company will have high CAPEX and working capital investments, but low FCFE. Oppositely, a mature company with generally low investing activity might have high FCFE and pay high dividends; however, it does not still mean that the size of FCFE and dividends will be the same.

A typical mistake for some market practitioners is to use earnings measures, such as net income, EBIT, EBITDA or CFO, for discounting and valuation purposes. Such mistake may lead to an over- or underestimation of the value of company's stock and the shortcuts can be expensive. A typical shortcut is to use EBITDA as a determinant of the free cash flow to the firm. Equation 30 shows the difference between EBITDA and FCFF:

$$\text{FCFF} = \text{EBITDA} (1 - \text{Tax rate}) + \text{Dep (Tax rate)} - \text{FCInv} - \text{WCInv}$$

Depreciation expense as % of EBITDA differs significantly for various companies and industries, as well as does depreciation tax shield. While FCFF accounts for this difference, EBITDA does not. Moreover, EBITDA does not account for company's investment in fixed and working capital, which makes it a poor proxy of company's free cash flow. Another important aspect is that EBITDA is the before-tax measure, so the discount rate before-tax must be applied to EBITDA, but not the WACC. Eventually, this leads to a failure to capture the after-tax interest effect on the cost of capital (Damodaran 2012, p.242).

Valuation of companies that have preferred stock in their capital structure requires adjustments to the valuation model, so that the preferred stock effect is incorporated. In the equation for calculation of FCFF starting from net income, preferred dividends paid should be added to the cash flow to arrive at FCFF. At the same time, in the calculation of FCFE, if preferred dividends were initially subtracted to arrive at net income, no additional adjustments are required. Any issuance (redemption) of preferred stock must be added into the equation since it increases (decreases) the cash flow available to common shareholders. In general, preferred stock exerts a similar effect on the capital structure as does debt, except for preferred dividends are not tax deductible.

Cash dividends paid on common stock do not influence FCFF or FCFE because they represent a form of use of the available cash. Common shares repurchase also exerts no effect on FCFF or FCFE as being an alternative to cash dividends. Common stock issuance does not affect free cash flow as well. However, the change of leverage does affect FCFE, but not FCFF. In the year of debt issuance, FCFE increases by the amount of new debt issued. Afterwards, FCFE is reduced by the after-tax interest expense (Pinto, Henry 2010, p.94).

Growth in FCFF and FCFE is largely dependent on company's future profitability. Net income is reliant on growth of sales and on changes in profit margins. Sales growth and profit margins are dependent on company's growth stage and industry's profitability. To gauge the sensitivity of the valuation result to changes in each input variable (sales growth, margins, etc.), investor can perform a sensitivity analysis. Impact of certain input variables on stock valuation will be greater than of the others. Based on different growth rates and required rates of return, the value of company and its equity will be changing in dependence on the strength of the impact of the input variable.

The value of a company, which possesses substantial nonoperating assets, such as excess cash, marketable securities or land held for investment, should be calculated as the sum of the values of its operating and nonoperating assets (Equation 31):

$$\text{Value of the company} = \text{Value of operating assets} + \text{Value of nonoperating assets}$$

Generally, investor should account for any omitted asset, which was excluded when projecting company's cash flows. Some companies retain on its balance significant noncurrent investments in stocks and bonds (financial investments), which should be revalued at their current market value (Research Journal of Finance and Accounting Vol.4, No.19, 2013).

## Chapter 2. Valuation practice (case): Ascom Holdings AG

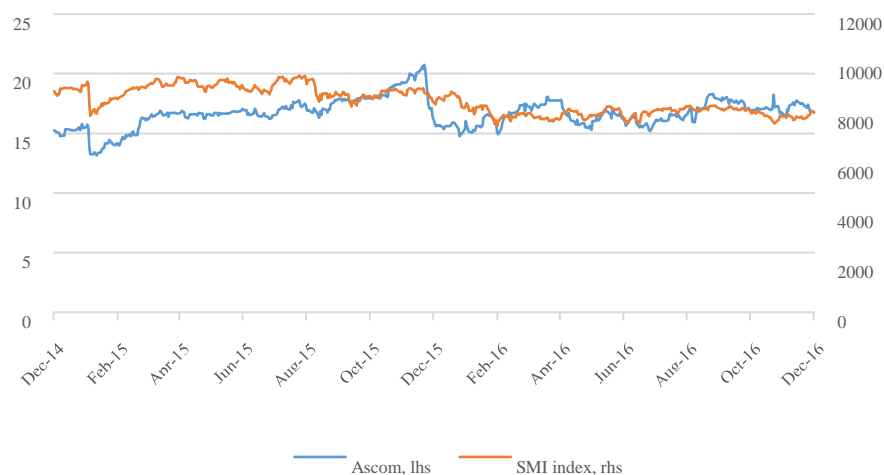
### 2.1. Business, industry and company's analysis

#### 2.1.1. "OneCompany" strategy and Ascom 2020

Ascom Holding AG is a Swiss company that was founded in 1987 by the fusion of Hasler, Autophon and Gfeller and headquartered in Baar, Switzerland. The group positions itself as telecommunication equipment provider, acting in hospitals, industry, or elderly care solutions. It offers wireless onsite communication solutions and is currently migrating from a mixed product/services company towards a solution business.

Driven by its vision to be mission-critical in the healthcare sector, Ascom aims to close the digital information gaps allowing for the best possible wireless solutions for its customers. Being presented in 15 countries worldwide and accounting for a workforce of over 1'300 employees, Ascom achieved sales of CHF 411 million in 2015. Although it is mostly a European company, it has grown significantly in the USA, Pacific region and the Nordic countries over the last years. The company's shares (ASCN) are quoted on the SIX Swiss Exchange since November 2000 (Fig.2.1) (Ascom Annual Report 2015, p.14).

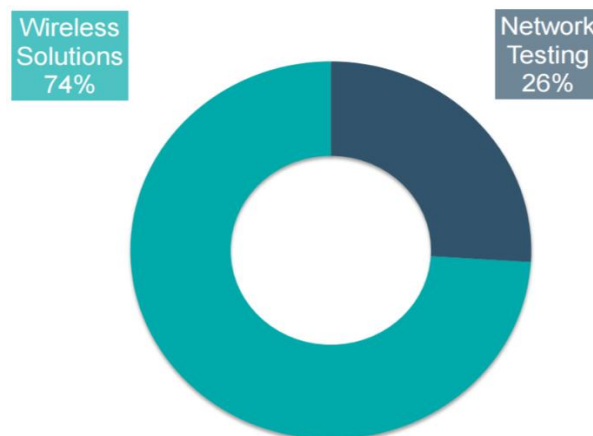
Figure 2.1. 2Y stock performance vs SMI index



Source: Six Swiss Exchange

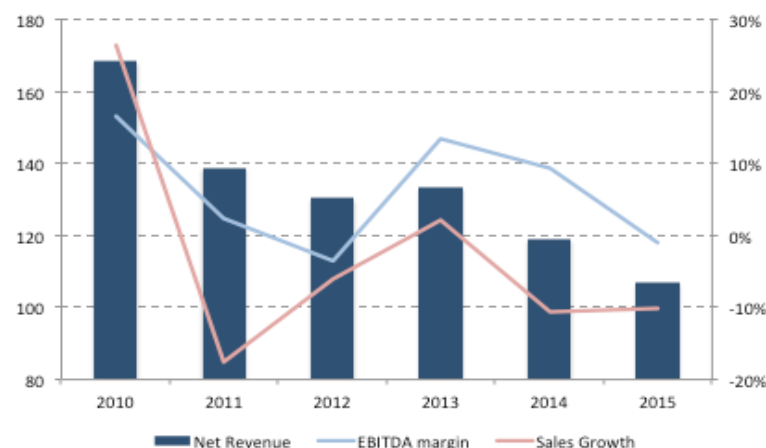
Historically, Ascom was split into 2 divisions acting in different markets (Fig.2.2). Primarily, the company was active in Wireless Solutions (WS) segment, being international market leader in the segment of a high-value and customer-specific on-site wireless communications within the business-to-business framework. The second Ascom's business was represented by the Network Testing (NT) division - global market leader providing solutions to test, monitor and optimize performance for mobile networks. However, due to a dismal performance of NT over the recent years, Ascom's management took a decision to dispose NT division to French InfoVista for a total consideration of CHF 45 million. The deal was closed in the end of September 2016. The general idea was to divest a division that caused the poor results over the last periods: in the 1<sup>st</sup> quarter of 2016 NT brought a net loss of CHF 7.9 million. Moreover, NT's sales growth has been declining and even showed negative paces (-10% yoy in 2015). At once, EBITDA margin deteriorated from 13% in 2013 to -1% in 2015 (Fig.2.3).

Figure 2.2. Ascom's revenue structure 2015



Source: Ascom Annual Reports

Figure 2.3. Falling performance of NT division

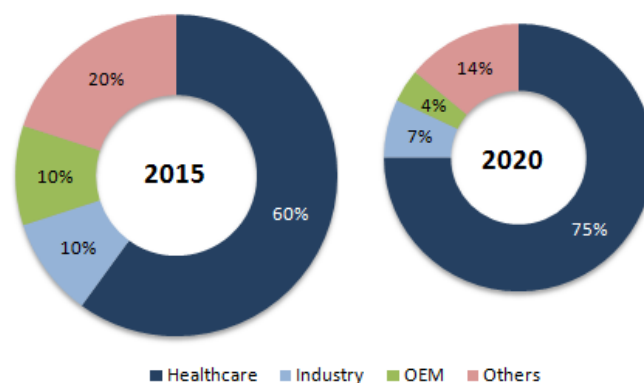


Source: Ascom Annual Reports

Poor results of Network Testing were gradually impairing Ascom's overall financial position. Consequently, Ascom's board of directors approved the strategy called "Ascom 2020", which stipulates a pure focus on Wireless Solutions business. WS segment is deemed as the "group's pearl" by investors since it has been the only business, which has been recently creating the value, and which represents most of the Group's sales. The new, restructured company would comply with what is announced as the "OneCompany" strategy (Ascom Annual Report 2016, p.8).

With the divestment of NT division, the Group was given a free hand to focus on its ambitious "Ascom 2020" strategy that it launched in January 2015, aiming to become a global leader in healthcare ICT workflow solutions by 2020. To achieve this target, Ascom plans to continue its geographical expansion. The company announced to expand its healthcare business to as much as 75% by 2020 (Fig. 2.4). Indeed, being the core driver of Ascom's revenues, healthcare sector represents high growth opportunities: McKinsey & Company estimated the current size of addressable healthcare market for Ascom at USD 3.3 billion with the expected growth of 9% p.a. - to USD 4.7 billion in 2020 (McKinsey & Company 2014, p.40).

Figure 2.4. Revenue targets by sectors



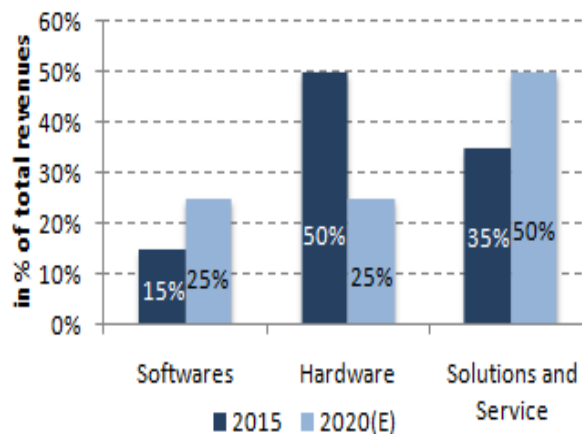
Source: Ascom Annual Reports

Significant economies of scale are expected out of this concentration of activities at one sector. Overall, Ascom expects the strategy to deliver up to CHF 10 million of operational cost savings in 2017 - a substantial 35% of 2015 EBIT. With the divestment of NT and the focus on Wireless Solutions, the company should return to a sustainable growth in 2017, thanks to a double-digit growth in healthcare sector, according to the management's view. At the same time, Ascom's executives are planning to launch several new solutions for the existing markets.

Alongside with the increase in the share of sales coming from the healthcare, Ascom controls two other strategic directions, which should additionally support its ambition to become the

global leader in healthcare workflow intelligence market. Primarily, the company strives to make a shift from telecom products to healthcare workflow solutions. Thus, the general ambition until 2020 is to increase revenues coming from solutions and services from 35% to 50% of total sales (Fig. 2.5).

Figure 2.5. Revenue targets by sectors



Source: Ascom Annual Reports, Ascom 2020

The ultimate goal is to focus on provision of complete solutions to hospitals and to help them to address a number of issues that impact their profitability, such as increasing workflow efficiency, patients' safety and patients' satisfaction. Secondly, Ascom wants to move from a hardware-centric to a software-centric specification. The reason lies in higher implicit margins (up to 80%) from software. It currently accounts for a small part of Ascom's business (about 15%) but the company plans to increase the revenues from connectivity software to 25% of total sales by 2020 (Fig. 2.5). As part of this ambition, Ascom appointed André Neu, who has a profound expertise in IT technologies, as the Senior Vice President of Platform Solutions. Apart from that, Ascom acquired UMS - Italian software firm operating on healthcare market – in order to fulfil its long-term objective to improve the product mix towards higher-margin services and software. As part of this strategy, Ascom also appointed Holger Cordes as its new CEO in early 2016. The new CEO possesses excellent market expertise in the domain of healthcare ICT and software, while his skills and experience should be highly essential to reach the targets in the healthcare business (Ascom Publication 2016).

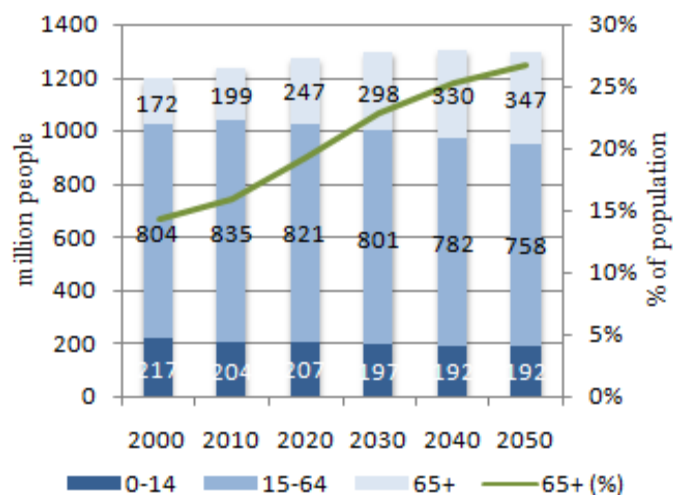


### 2.1.2. HICT industry overview

The healthcare ICT market is mainly composed of public hospitals owned by governments. This peculiarity exerts large impact on the market since clients have a strong bargaining power. Specifically, government policies largely affect the market as governments possess control over spending and state budgets; while they are also able to change the environment by implementing reforms, cutting budgets or increasing expenditures for some specific needs. According to the study conducted by McKinsey Global Institute (MGI), healthcare spending is expected to grow almost twice as fast as the GDP growth in the next 5 years. While in developed countries around 10% of the GDP is spent on healthcare, emerging markets account for only 5 to 6%; however, the growth opportunity is higher on emerging markets: it is expected that it will increase up to 15-20% of GDP until 2025 (McKinsey & Company 2014, p.42).

The rapid growth should be driven by aging population in developed markets (Fig. 2.6) and increasing population in emerging countries. Higher expenditures will force governments to save as much as possible and, according to another analysis of MGI, this provides opportunities to save up to 25% of overall healthcare spending by 2025. Such economy will be reached through improvement of the healthcare treatment procedures, implementation of the best practices in operations for the emerging countries and through more extensive use of new digital technologies.

Figure 2.6. Revenue targets by sectors



Source: US census bureau, UN

Nowadays, digitalization is the main challenge for the industry. The potential and the benefits of digitalization are highly perceived among the main players of the healthcare market. Indeed,

public hospitals operate on tighter budgets and need to constantly reduce costs in response to increasing willingness of governments and health insurers to implement measures for controlling costs. Moreover, even excellent healthcare systems are still accompanied by medical errors or security issues caused by human mistakes (e.g. wrong dosage) or lack of adherence to proper practices (e.g. the use of abbreviations instead of full names). The recent study published in the British Medical Journal revealed that after cancer and heart diseases, medical errors are the 3<sup>rd</sup> most common cause of death in the US. These conclusions obviously vary depending on the type of the healthcare system in effect in certain countries. However, the sector requires fundamental changes in internal processes aimed to reduce costs, while improving the quality of software and medical services (BMJ 2014, p.18).

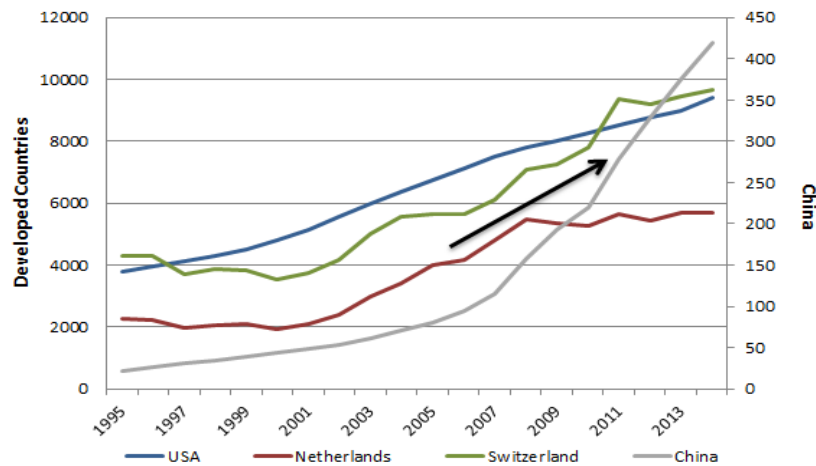
Going further, the healthcare system has not yet embraced all the potential of digital innovations. Even though governments have massively invested in e-health programs in recent years, the results have not come up to expectations regarding efficiency, quality of care or better patient outcomes. The lack of digitalization so far can also be explained by the intrinsic features of the healthcare context. Firstly, hospitals are largely characterized by ad-hoc networks. Up to 50% of the staff timetable cannot be planned and most tasks need to be allocated immediately during the working day. Secondly, medical work is always mission-critical, which means that the failure or disruption of such operations could have a serious impact on patients' health. Eventually, digitalization loses its meaning if it does not support ad-hoc and mission-critical workflows.

Concerning clinical environments, it is also considered as highly mobile. Indeed, nurses can foot it between 7 and 14 kilometres per day. As a result, digitalization could obviously optimize this coverage and provide nurses with additional time for other tasks, which would be very valuable for hospitals. Overall, the healthcare system is still struggling to turn the ambition of digital health into reality. The sector is rather at the pivotal point and there is still an ample room for growth through the digitalization.

In the years since the global financial crisis of 2008, the urge to reduce inefficiency and implement cost cutting in various sectors has emerged among governments. Despite its vital role, the healthcare sector has not become an exemption. Because of the awareness of rising costs in healthcare industry, healthcare budgets face strong constraints when it comes to new investments (Fig. 2.7). This exerts pressure on prices as well as on margins for any supplier of medical devices due to the strong bargaining power of public institutions. Some constraints turn

into opportunities for certain market players, as hospitals may be willing to invest in cost saving facilities and solutions even if they are not cheap to implement. This can be possible through the technological progress in terms of digitalization and optimization of existing processes (BMJ 2014, p.22).

Figure 2.7. Healthcare spending per capita



Source: World Health Organization

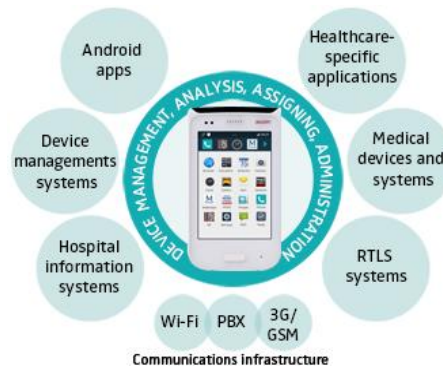
New technologies in the healthcare sector appear mainly in the form of software and solutions, as they help to reduce costs and improve quality of treatment: two aspects that are becoming most important within the healthcare system. Healthcare ICT market helps to reach both objectives as digitalization is expected to reduce industry's costs by 7 to 11%. However, hospitals are often reluctant to invest in digitalization, even though the potential benefits are significant. This is particularly the case for the emerging markets, where the cost of labour is still cheap. Hospitals in emerging countries often prefer to hire more nurses or employees rather than invest in costly solutions that could improve hospital's workflow (McKinsey & Company 2014, p.42).

### 2.1.3. Ascom's competitive position

At the same time, digitalization relates more to developed countries where the core fields are healthcare ICT and workflow solutions. The latter is used to improve the experience of patients and the workflow of nurses and hospitals' staff. Workflow solutions bring about significant improvements in highly mobile and mission-critical environment. The implementation requires hardware and software technologies that are adapted to the peculiarities of the healthcare segment. Smartphones and pagers must be robust enough and have longer battery life to endure

an entire shift. As the procedures are not everywhere the same, the software should be adapted to every hospital to consider these specificities (Fig. 2.8). Smartphones producers and application engineers have already tried to penetrate this interesting and fast-growing market, which is estimated to reach USD 4.7 billion by 2020. Up until now, both groups have failed as they did not properly adapt their hardware and software to the needs of the healthcare industry (McKinsey & Company 2014, p.44).

Figure 2.8. Communication infrastructure



Source: Ascom Investors Relations presentation

With that, they have more chances to enter the market in the future through the acquisition of narrowly-specialized firms that are already active on the market. This path will essentially provide new entries with the client's base, knowledge of the needs of the industry and the product lines, which then become the target for further improvements.

While the HICT sector is filled up by only few competitors, Ascom's competitive position is very strong since it provides the full range of products and services that jointly bridge the gap in hospitals' workflow. Moreover, Ascom is the only company in the sector that offers hardware, software and workflow solutions for its clients, being the leader in the healthcare ICT. The company has achieved this status through several acquisitions in the field that helped it to get the possession of the new competences in domain. A good example is the recent acquisition of UMS - Italian medical software firm, which serves as an integral provider of solutions for medical appliances and digital medical records for life-critical patient care (Ascom Annual Report 2015, p.40).

Ascom has fairly strong expertise within the healthcare sector. In contrast to its bigger competitors (Voalte Inc., Vocera Communications, Inc. and Extension Healthcare), which offer comparable products, Ascom's products are focused to fit with the needs of the healthcare sector. For example, Ascom's new product – Myco is akin to a smartphone, but has a feature

of the high impact-resistance and has a longer battery life allowing the device to function during the entire shift of a nurse. Various software and applications can be installed on Myco making this flexibility extremely important for hospitals, while the explicit advantages of Ascom's products make them more relevant and demanded within Ascom's core clients' segment (Ascom Investors Presentation 2016, p.9).

## 2.2. Valuation assumptions and estimates

### 2.2.1. Recent performance

Valuation process starts from the examination of company's operations and financials. Knowing the history of a company's business activity, changes in sales, costs and other components, an investor can apply projections to a determined forecasting horizon. As it was mentioned in the previous section, historically Ascom has had two core operational divisions – Wireless Solutions (WS) and Network Testing (NT). With the latter being disposed of in the end of September 2016, the main focus should pass on to the projections of WS future performance. At the same time, NT business yet had its effect on the general performance of the company in 2016. Thus, aiming to dress up the current valuation, the starting date for the projections is set on the 30th of September 2016 – the closure day for the disposal deal of Network Testing division to French-based InfoVista. As such, 9 months of operations of NT division in 2016 must be incorporated to Ascom's overall valuation. Generally, forecasted period (horizon) is determined as 5 years – from 2017F to 2021F with 2021F being the terminal year. The horizon of that length is usually considered optimal by market practitioners.

At the first step, the potential effect of NT division in 2016 must be determined. Ascom has fully disposed of NT Division as of the 30<sup>th</sup> of September 2016. According to the publicly posted announcement, the resulting effect of the operation would have been the extraordinary loss of CHF 145.1 million connected with the transformation of goodwill and accounting differences between Swiss GAAP and IFRS (Ascom Announcement 2016).

Overall, Network Testing division operated under severe market conditions during the 1<sup>st</sup> half of 2016 as telecom market experienced consolidation and increased price pressure from the large players. As a result, NT's revenues fell to CHF 35.2 million from CHF 54.6 million in the 1<sup>st</sup> half of 2015. Impacted by still large functional costs together with the declining volume of

sales and gross margin, the division brought CHF 7.9 million of losses on EBITDA level. However, considering the reserve of the incoming orders and some delayed backlog extended from the end of 2015, the projections to end up nine months of 2016 might appear a bit more optimistic with net revenues of CHF 53.2 million and operating loss of CHF 17.3 million on EBITDA level (Table 2.1) (Ascom Half-Year Report 2016, p.10).

Table 2.1. Projections of NT division 9M2016 performance

CHFm	Network Testing			
	1H2015	2015	1H2016	3Q2016
Incoming orders	50	101.1	43	65.0
Order backlog	25.3	17.7	23.9	20.1
<i>book-to-bill ratio</i>	<i>0.92</i>	<i>0.94</i>	<i>1.22</i>	<i>1.22</i>
<b>Net revenue</b>	<b>54.6</b>	<b>107</b>	<b>35.2</b>	<b>53.2</b>
<b>Gross profit/(loss)</b>	<b>29.5</b>	<b>53.6</b>	<b>15.9</b>	<b>25.3</b>
<i>SG&amp;A expenses</i>	<i>-34</i>	<i>-64.5</i>	<i>-29.8</i>	<i>-42.5</i>
<b>Operating result (EBITDA)</b>	<b>-4.5</b>	<b>-10.9</b>	<b>-13.9</b>	<b>-17.3</b>

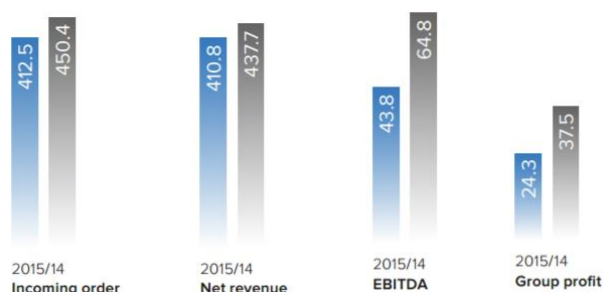
Source: Ascom Financial Statements, Author's projections

At the second step, estimates and projections on the core business division – Wireless Solutions can be worked out. This process is far more complicated than simply projecting financials of the division that has been sold out during the reporting year. An investor must look carefully on both, the backstory and the recent tendencies of the company's business.

In a nutshell, 2015 was a year of the strategical importance for Ascom. Right after the approval of 2020 Strategy, the company has engaged into the process to transform the structure into OneCompany that would fully specialize on IT and wireless technologies on the healthcare market. Throughout 2015, Ascom was largely investing into software and solution services, which should help to bolster marketing and sales and technology facilities. Driven by the successful performance of Wireless Solutions Division, Ascom's total net revenues increased by 1.5% in 2015 with EBITDA margin of robust 11.6%. As of the last balance date of 2015, Ascom had a net cash position of CHF 37.3 million and showed the equity ratio of 40.7%. Net profit generated by Ascom in 2015 amounted to CHF 24.3 million, though less than CHF 37.5 million of the previous year. Despite some decline, the dividend proposed by Ascom's Board of Directors remained unchanged at CHF 0.45 per share, representing a dividend yield of nearly 3%. Moreover, WS division, which by that time accounted for 75% of Ascom's sales, gained even more ground in the course of the transformation into the global leader providing ICT solutions on the healthcare market. The division managed to demonstrate outstanding results with a 3.7% yoy revenue growth in 2015, which proves its robust business position. Even

though WS division carried large (CHF 6 million) investment expenditures (as part of the previously announced investment program), EBITDA margin reached ambitious 15.0% (Fig. 2.9) (Ascom Annual Report 2015, p.18).

Figure 2.9. Summary of key figures in CHFm



Source: Ascom 2015 Annual Report

Further, the actual results from the 1<sup>st</sup> half of 2016 mismatched with overoptimistic expectations of the Ascom's management. Apart from consolidated net loss of CHF 5.6 mio, largely caused by detrimental effect of NT division (EBIT of CHF -13.9 mio), 1H statements revealed yet another disappointing aspect. Revenues in constant currencies generated by Wireless Solutions were slightly weaker as compared to 1H2015, despite no significant currency impact on Ascom's operations so far in 2016. WS ended up 1H2016 with net revenues of CHF 146.5 mio ag CHF 147.1 mio in 1H2015 and the volume of incoming orders of CHF 158.3 mio ag CHF 160.0 mio in 1H2015. At the same time, backlog of incoming orders increased by 10%, while a book-to-bill ratio deteriorated to 1.081 from 1.025 in 1H2015. Despite a 6.8% upturn in the core healthcare segment, overall picture seems to mismatch overoptimistic management's expectations of a double-digit organic growth within the projected horizon (Table 2.2) (Ascom Half-Year Report 2016, p.14).

Table 2.2. Key figures by segment

CHFm 1st half-year	Wireless Solutions		Network Testing		Corporate and other		Consolidation		Total Ascom	
	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015
Incoming orders	158.3	160.0	43.0	50.0	–	–	(0.4)	(0.1)	200.9	209.9
Order backlog	131.6	119.5	23.9	25.3	–	–	–	–	155.5	144.8
Net revenue	146.5	147.1	35.2	54.6	–	–	(0.4)	(0.1)	181.3	201.6
Gross profit/(loss)	72.2	75.2	15.9	29.5	(0.1)	–	(0.4)	(0.2)	87.6	104.5
Operating result (EBIT)	11.1	18.4	(13.9)	(4.5)	(1.6)	(1.2)	–	–	(4.4)	12.7
EBITDA	14.6	21.2	(7.9)	0.4	(1.5)	(1.1)	–	–	5.2	20.5
Group profit/(loss) for the period									(5.6)	11.4

Source: Ascom Financial Statements

Resting upon the robust order backlog and efficient sales channel, WS division acquired several important orders in the 1<sup>st</sup> half of 2016. First order of CHF 1.8 million arrived from a major Nordic hospital, which demanded Ascom Myco smartphones in the amount of 2,000 devices alongside with the servicing contract. On top of that, WS division received two big orders in the US, including 1,500 Ascom Myco devices. Finally, a large order came from a newly built hospital in Queensland, Australia. The specified orders were of a greater importance because they include complex solutions that bring longer returns in comparison to standard product lines. This tendency exerts a great effect on the short-term profitability allowing Ascom to succeed in reaching the expected payback period from the investments of the previous years. Apart from the healthcare, Wireless Solutions was able to gain important projects in the industry segment, namely in Germany. Secure establishments business remained at the level of the previous year, while retail business operated under the market pressure, typically in the UK. With the acquisition of Italian medical firm UMS, WS division managed to not only acquire a share on the Italian market, but also approached new software and medical integration facilities. Finally, the division has launched the new product – DECT handset possessing selective outstanding featuring, such as “wideband audio”, extended bandwidth, and the new interface allowing to connect to third-party systems (Ascom Half-Year Report 2016, p.19).

#### 2.2.2. Revenues and growth assumptions

Our assumptions of future revenues are built upon the analysis of the following sources of sales: 1) incoming orders based on segment-wise clients’ base division; 2) incoming orders with respect to geographical footprint; 3) potential for internal revenue generation from the accumulated order backlog. In general, we forecast Ascom WS’s revenues to decline by 2.7% in 2016, but return to a 4.5-3.5% diminishing growth in 2017-2020 and to 2.5% in terminal. While we assume that the annual volumes of incoming orders will be rising at a slower pace (3-2% diminishing in 2017-2020 and 1% in terminal), we deem that the higher growth in net revenues will stem from the structural shifts in revenue generation facilities. More specifically, one growth aspect belongs to a rapidly rising share of the healthcare segment, which we expect to reach 71% by 2020, while the other is related to a gradual improvement of a book-to-bill ratio from estimated 1.07 in 2016 to 1.00 in terminal (Table 2.3, Fig 2.10).

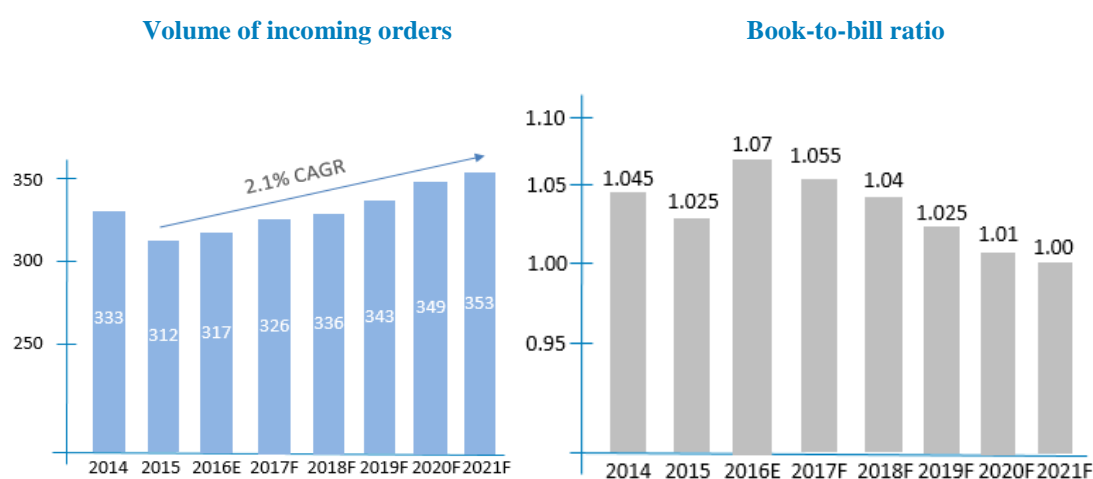


Table 2.3. Revenues and costs assumptions for WS division

CHFm	Wireless Solutions/OneCompany									
	2012	2013	2014	2015	2016E	2017F	2018F	2019F	2020F	2021F
Incoming orders	296.1	318.7	333.3	311.8	316.6	326.1	335.9	342.6	349.5	352.9
Order backlog	89.7	102.6	117.7	117.5	138.2	155.2	168.1	176.5	179.9	178.2
book-to-bill ratio	0.995	1.041	1.045	1.025	1.07	1.06	1.04	1.03	1.01	1.00
<b>Net revenue</b>	<b>297.7</b>	<b>306.1</b>	<b>318.9</b>	<b>304.2</b>	<b>295.9</b>	<b>309.1</b>	<b>323.0</b>	<b>334.2</b>	<b>346.0</b>	<b>354.7</b>
growth rate, %	1.1%	2.8%	4.2%	-4.6%	-2.7%	4.5%	4.5%	3.5%	3.5%	2.5%
Cost of goods sold	-146.0	-150.9	-155.5	-150.6	-149.4	-153.0	-156.6	-158.8	-160.9	-161.4
<b>Gross profit/(loss)</b>	<b>151.7</b>	<b>155.2</b>	<b>163.4</b>	<b>153.6</b>	<b>146.5</b>	<b>156.1</b>	<b>166.3</b>	<b>175.5</b>	<b>185.1</b>	<b>193.3</b>
as % of revenue	51.0%	50.7%	51.2%	50.5%	49.5%	50.5%	51.5%	52.5%	53.5%	54.5%
Marketing and sales	-69.8	-70.3	-73.9	-70.3	-73.7	-74.2	-77.8	-80.9	-84.1	-86.6
as % of revenue	23.4%	23.0%	23.2%	23.1%	24.9%	24.0%	24.1%	24.2%	24.3%	24.4%
Administration	-11.9	-11.9	-12.3	-12.3	-12.7	-12.1	-12.9	-13.7	-14.5	-15.3
as % of revenue	4.0%	3.9%	3.9%	4.0%	4.3%	3.9%	4.0%	4.1%	4.2%	4.3%
Research and development	-23.2	-21.6	-21.2	-24.00	-26.6	-24.7	-25.5	-26.1	-26.6	-27.0
as % of revenue	7.8%	7.1%	6.6%	7.9%	9.0%	8.0%	7.9%	7.8%	7.7%	7.6%
Other operating income	-1	0	1.7	0	0.0	3.1	3.2	3.3	3.5	3.5
as % of revenue	-0.3%	0.0%	0.5%	0.0%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Other operating expenses	-6.5	-3.4	-7	-8.2	-5.9	-5.6	-5.2	-4.7	-4.2	-3.5
as % of revenue	2.2%	1.1%	2.2%	2.7%	2.0%	1.8%	1.6%	1.4%	1.2%	1.0%
<b>Operating result (EBIT)</b>	<b>39.7</b>	<b>47.1</b>	<b>50.7</b>	<b>38.8</b>	<b>27.5</b>	<b>42.7</b>	<b>48.1</b>	<b>53.5</b>	<b>59.2</b>	<b>64.6</b>
as % of revenue	13.3%	15.4%	15.9%	12.8%	9.3%	13.8%	14.9%	16.0%	17.1%	18.2%

Source: Ascom Financial Statements, Author's projections

Figure 2.10. Sales pipeline and orders management development

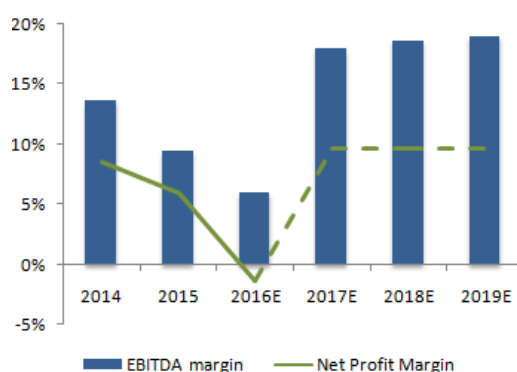


Source: Ascom Financial Statements, Author's projections

**New business structure with the focus on healthcare ICT.** The divest of NT Division is perceived as a clearly positive solution, which helps Ascom to solve two major issues underway a brand-new structure of OneCompany. First, disposing of apparently unprofitable business entails margin improvements: a gradual 3-4% improvement in gross margin by 2020 and more than a double increase of EBITDA margin – from 9.5% in 2015 to 19% in 2020. Second, Ascom

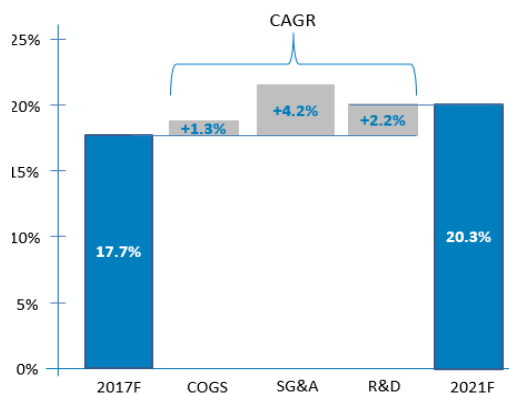
has paved a way for the full-scale retargeting towards its core healthcare ICT business, which is expected to grow by 6.25% CAGR in 2016-2020 and 4% in terminal. The firstlings of the new structure are expected to emerge not earlier than 2H2017 following the final stage of the restructuring. Meanwhile, traditional business lines - hardware and middleware products - will remain the core of organic growth in the long-run, contributing more than 50% of Ascom's revenues. The expansion of a higher-margin software and services, which now contribute about 30-35% to revenues, might appear a long-lasting endeavour, however we assume its share to reach a 50% over the course of 10 years (Fig 2.11, Fig.2.12).

Figure 2.11. EBITDA and Net Profit margins



Source: Ascom Financial Statements, Author's projections

Figure 2.12. Sales pipeline and orders management development



Source: Ascom Financial Statements, Author's projections

**Medium- to long-term perspectives.** Medium-term (3-5 years) forecast is largely based on Ascom's selling flagships – hardware and middleware products – which so far have been the core of WS's revenues. Strong demand for these products should be supported by the growing interest for Ascom Myco on new and existing markets as well as for traditional Nurse Call and Workflow Solutions. Long-term forecast (over 3-5 years) includes the prospects for

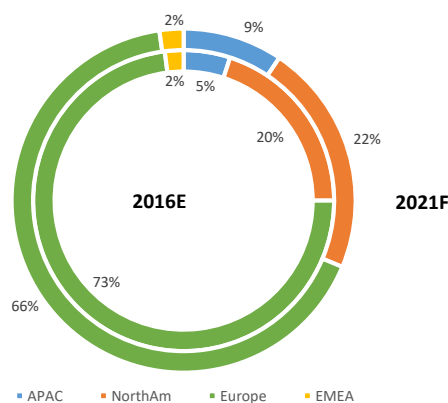
development of higher-margin software products and innovation drivers in addition to existing long-term service contracts. While the company has set a goal to carve out a niche in solution driven software innovations, we think that this process might appear a time-consuming considering the natural rigidity of hospitals towards faster-growing innovations. More importantly, restricted budgets often regulated by the amount of government spending on healthcare and public health services.

**Strong uptrend in healthcare segment.** Healthcare revenues are expected to reach as high as 71% by 2020, from the current 60%, showing 6.25% CAGR growth, which appears a more viable scenario compared to the management's overoptimistic expectations of a double-digit annual growth. In any respect, even lower assumptions involve dedicated focus and additional investments in growth. For that reason, we assume that expansion of healthcare business will come at the cost of (yet smaller) fractional decline of other segments. We should set industry business and OEM to contract both from 10% in 2015 to 7% in 2020, while the combined fractions of hotels&retail, secure establishments and other segments are set to shrink by 5% in a follow-up to the recent tendency.

**Geographical stand.** Traditionally, a lion's share of WS's sales was coming from the established market areas of Western Europe and the USA. However, in the absence of new acquisitions, growth opportunities on traditional markets are gradually fading. In recent years WS has managed to maintain overall flat level of sales in Switzerland, Germany and France, however revenues from Netherlands, Scandinavia and UK have significantly shrunk (Ascom Half-Year Report 2016, p.15). Driven by a low development of the handset market, and the retail and OEM segments struggled in UK, where in 2015 Ascom's WS faced an almost 26% yoy decline. Acquisition of Italian UMS added some value to Ascom's software and solution facilities, however its annual EUR 3-4 mio revenues cannot deem a serious contribution. Mainly securing small contracts in Scandinavia, WS has lost about 23% in revenues in the region with its share contracting to 17% in 2015 from 21% in 2013. A similar tendency is observed in Netherlands, where in the last two years WS has lost about 18% of revenues. In contrast, industry and healthcare businesses remain strong in Germany and France, which account for 20% of the geographical footprint. Showing a general contraction tendency on traditional markets, we can suggest that the growth opportunities for OneCompany will come from the expansion of the geographical footprint and raising share and significance of new and non-traditional markets. Thus, we forecast the share of Middle East and Africa and Asia Pacific to

expand from 1% and 4% in 2015 to 4% and 7% in 2021 respectively, which conforms to CAGR of 31.2% and 11.2% (Fig. 2.13).

Figure 2.13. Region-wise revenue projection

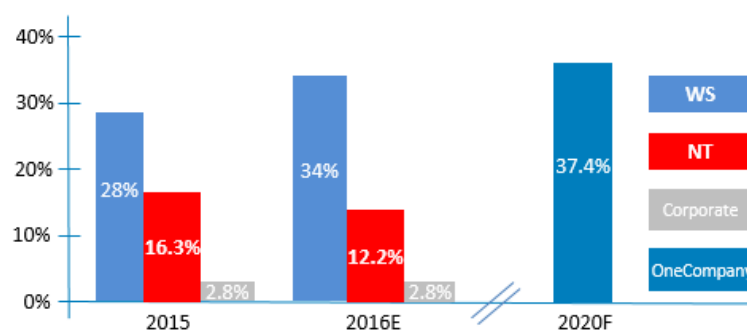


Source: Ascom Financial Statements/Author's projections

This expansion shall be driven by the secured complex solution contracts with large hospitals in Australia (Queensland), Singapore and New Zealand as well as by recent lighthouse wins (Ascom Announcement 2016). Only the US market appears to preserve its growth prospects among WS's traditional markets. Thus, we project US market to grow approx. 2% CAGR in 2016-2021 supported by larger hospitals' spending and a strong interest in Myco, Nurse Call and digitalized workflow solutions. The short-term risk for US concerns the lower growth with Ascom's distribution partner Tyco and higher growth investments affecting profitability.

**Improved cost structure and lower cost base.** While OneCompany structuring is verging to a close, Ascom may still face unexpected expenses beyond initially planned CHF 10 mio. So far, 2016 has been a challenging year, negatively impacted by three factors: 1) loss-making and cost inefficient NT division, estimated to bring about CHF -11 mio on the EBITDA level; 2) extraordinary expenses have already exceeded CHF 13 mio, including CHF 10 mio of direct restructuring costs, one-time costs associated with the substitution of CEO and additional costs related to the disposal of NT division; 3) lower performance of WS reflected in -2.7% yoy decline in expected revenues, 2.0% yoy increase of SG&A and 1.1% increase in R&D. Being inevitable during the transition period, these temporal impacts should eventually reduce Ascom's new structure to a lower cost base as soon as in 2H2017. The key reduction of approx. CHF 10 mio will come from the corporate level, namely the reduction in overheads and administrative staff, since OneCompany will be managed by the single head office, while company's operations and bookkeeping will be consolidated (Fig.2.14).

Figure 2.14. Operating costs in % of Sales and the cost centers

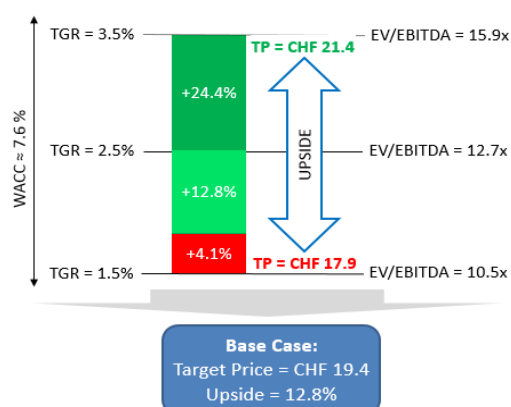


Source: Ascom Financial Statements/Author's projections

## 2.3. Valuation process and outcomes

Overall, we based our valuation model on the assumption of a 4.5% growth in net revenues in 2017 and 2018, a 3.5% in 2019 and 2020 and a 2.5% in terminal. Indeed, a stronger 6.25% CAGR growth in healthcare business may be anticipated as it is driven by the high demand for traditional Myco, Nurse Call and workflow solutions. The share of the healthcare segment is, thus, projected to increase from the current 60% to up to 71% of total revenues by 2020. However, we should also assume that the superior growth in healthcare shall be accompanied by a contraction of other segments, which seems inevitable within the context of OneCompany's strategy to become a healthcare ICT leader. Our base case assumptions for 2017-2021 also include a gradually increasing gross profit margin of 50.5-54.5%, SG&A and R&D expenses varying around 27% and 8% of revenues respectively, tax rate of 24%, variable 3-6% CAPEX and the WACC of  $\approx 7.5$ -7.6%. As we shall see later, DCF-based perpetuity method and exit multiple method yielded the equity values corresponding to EV/EBITDA multiple range of 12.7x-13.8x, with the upside potential depicted at Figure 2.15:

Figure 2.15. Upside scenarios



Source: Ascom Financial Statements/Author's projections

Step-by-step DCF valuation process starts from the projection of the key parameters of the DCF model (Table 2.4):

Table 2.4. Projection of the DCF components

Valuation component	Projected Period					
	2016E	2017F	2018F	2019F	2020F	2021F
EBITDA	20.6	54.8	62.5	69.2	66.1	72.1
Unlevered Free Cash Flow	23.8	33.0	31.9	36.3	39.7	45.6
WACC	7.5%	7.5%	7.5%	7.6%	7.6%	7.6%
Period	1.0	2.0	3.0	4.0	5.0	6.0
Discount Factor	93.0%	86.5%	80.5%	74.8%	69.5%	64.6%
<b>Discounted Free Cash Flow</b>	<b>22.1</b>	<b>28.6</b>	<b>25.6</b>	<b>27.2</b>	<b>27.6</b>	<b>29.5</b>

Source: Ascom Financial Statements, Reuters, Author's projections

EBITDA is easily derived from the Income Statement, while unlevered cash flow is calculated from the Cash Flow Statement as the Cash Flow from Operations + After Tax Net Interest Expense / (Income) - Capital Expenditures. Unlevered cash flow is the key component of DCF model since it must be discounted at WACC to arrive at the discounted cash flow that we require. Discounting period is simply the order number of the year from which we are discounting unlevered cash flow. For example, if we are in 2016 and we want to discount 2016 projected cash flow, the discount period will be 1; in the same fashion, it will be 2 for the 2017's cash flow, 3 for the 2018's and so on. Discount factor is then calculated using the formula (Pinto Henry 2010, P.81):

$$DF = \frac{Cash\ Flow}{(1 + WACC)^{period}}$$

The calculation of the weighted average cost of capital or WACC on practice is a bit more complicated due to the variety of factors affecting company's value and certain peculiarities of the investment environment. The influence of both components, equity and debt, on WACC is formatted in Table 2.5.

Table 2.5. WACC calculation components

Capitalization Component	Projected Period					
	2016E	2017F	2018F	2019F	2020F	2021F
Total Equity (Market Value)	724	779	839	903	971	1045
Total Debt (Book Value)	25	20	15	10	5	0
Equity Weight	96.7%	97.5%	98.2%	98.9%	99.5%	100.0%
Debt Weight	3.3%	2.5%	1.8%	1.1%	0.5%	0.0%
<b>WACC</b>	<b>7.5%</b>	<b>7.5%</b>	<b>7.5%</b>	<b>7.6%</b>	<b>7.6%</b>	<b>7.6%</b>

Source: Ascom Financial Statements, Author's projections

We consider the current target capital structure for the calculation of WACC and assume gradual repayment of existing debt by 2021. Cost of equity incorporates risk-free rate, equal to a recent yield on Swiss government bonds with 10Y maturity, country premium, equal to the rate of 10Y Swiss CDS (Credit Default Spread) and implied equity risk premium derived from the dividend model. Calculated cost of equity stands at 7.6% throughout the projected period, while the after-tax cost of debt remains constant 3%. Following the repayment of debt, our WACC is slightly increasing from 7.5% in 2016-2018 to 7.5% in 2019-terminal (Brealey, Richard 2009, p.85).

In Ascom's case, the relevant method to derive WACC will incorporate three main steps:

- 1) Cost of equity is obtained using the combination of Implied equity risk and Dividend models. To come up with the risk-free component of the Cost of Equity we need the risk-free rate – 10 years' Swiss government bonds and the credit default spread of Switzerland. To obtain the second part of the Cost of Equity – equity risk premium, we need the earnings growth rate, dividends per share paid-out in the current year and the current price of Ascom's stock. The overall calculation is summarized in Table 2.6:

Table 2.6. Calculation of the Cost of Equity

Cost of Equity Component	Projected Period					
	2016E	2017F	2018F	2019F	2020F	2021F
10Y Swiss Government Bonds/ Risk-free Rate	(0.1%)	(0.1%)	(0.1%)	(0.1%)	(0.1%)	(0.1%)
10Y Sovereign CDS	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%
<b>Implied Equity Risk Premium:</b>	<b>7.4%</b>	<b>7.4%</b>	<b>7.4%</b>	<b>7.4%</b>	<b>7.4%</b>	<b>7.4%</b>
Earnings growth rate	-	4.5%	4.5%	3.5%	3.5%	2.5%
DPS	0.45	0.49	0.54	0.60	0.65	0.72
<b>Stock Price, CHF</b>	<b>17.2</b>					
<b>Cost of Equity</b>	<b>7.6%</b>	<b>7.6%</b>	<b>7.6%</b>	<b>7.6%</b>	<b>7.6%</b>	<b>7.6%</b>

Source: Ascom Financial Statements, Reuters, Author's projections

2) The Cost of Debt is calculated using the current (not market) values, proportions and costs of the short- and long-term company's debts, and is adjusted with the effective corporate tax rate used by the company. The calculation is summarized in Table 2.7:

Table 2.7. Calculation of the Cost of Debt

Cost of Debt Component	Projected Period					
	2016E	2017F	2018F	2019F	2020F	2021F
Weighted Average Cost of Debt	4.2%	4.0%	4.0%	4.0%	4.0%	4.0%
Effective Tax Rate	24.0%	24.0%	24.0%	24.0%	24.0%	24.0%
<b>After Tax Cost of Debt</b>	<b>3.2%</b>	<b>3.0%</b>	<b>3.0%</b>	<b>3.0%</b>	<b>3.0%</b>	<b>3.0%</b>

Source: Ascom Financial Statements, Author's projections

3) At the third step, the proportions or weights of debt and equity in the capital structure of the company must be determined. Total capitalization, in our case, is the sum of the market value of equity and of the book value of debt. Equity and debt weights, thus, are the respective proportions of both values to the total capitalization of the company. The final action in deriving WACC is to multiply the equity weight by the cost of equity and the debt weight by the after-tax cost of debt, and sum up these two values (Table 2.8) (Jacobs, van Vuuren, 2014):

Table 2.8. WACC final calculation

WACC component	Projected Period					
	2016E	2017F	2018F	2019F	2020F	2021F
Cost of Equity	7.6%	7.6%	7.6%	7.6%	7.6%	7.6%
After-tax cost of Debt	3.2%	3.0%	3.0%	3.0%	3.0%	3.0%
<b>WACC</b>	<b>7.5%</b>	<b>7.5%</b>	<b>7.5%</b>	<b>7.6%</b>	<b>7.6%</b>	<b>7.6%</b>

Source: Ascom Financial Statements, Author's projections



At that point, the issue of how to find the Equity Value must be resolved. On practice, two methods are more often used in order to work the value of a company's equity – Perpetuity Method and Exit Multiple Method. The simple average of two methods is considered as the final target price of the stock. The perpetuity growth method grounds on the idea that the company is the ongoing concern and is supposed to generate free cash flow to firm at a steady rate indefinitely. The terminal value under this method can be calculated with the formula (Brealey, Richard 2009, p.88):

$$TV = \frac{FCFn \times (1 + g)}{WACC - g}$$

Discounted cash flows form the basis for the calculations under each specified method (Table 2.9):

Table 2.9. Discounted cash flows

	Projected Period					
	2016E	2017F	2018F	2019F	2020F	2021F
<b>Discounted Free Cash Flow</b>	<b>22.1</b>	<b>28.6</b>	<b>25.6</b>	<b>27.2</b>	<b>27.6</b>	<b>29.5</b>

Source: Ascom Financial Statements, Author's projections

In our valuation model, we assume that the perpetuity growth or the growth of sales in terminal in 2.5%. With the projected EBITDA of CHF 72.1 mio in the terminal year, the perpetuity valuation implies the corresponding EV/EBITDA multiple of 12.7x. This implied figure is crucial for the valuation since we will be comparing it to the multiple taken from the market comparable peers in the second method – Exit Multiple. In case if EV/EBITDA multiple taken out of the market does not differ greatly from the one generated under the Perpetuity Method, we can deem it as reliable and use it for the market valuation. The calculation of the equity value and the target price of Ascom's stock under the Perpetuity Method is presented in the Table 2.10:

Table 2.10. Equity Value under the Perpetuity Method

Component	Value	Notes
<b>Perpetuity growth rate</b>	<b>2.5%</b>	Initially projected terminal growth rate of sales
<i>Corresponding terminal EV/EBITDA multiple</i>	<i>12.7x</i>	EV/EBITDA multiple derived from the assumptions to the terminal CF value
Present Value of Forecast Period Free Cash Flows, CHFm	161	21% of total enterprise value

PV of Terminal Value based on perpetuity growth rate of 2.5%, CHFm	592	<i>79% of total enterprise value</i>
<b>Enterprise Value, CHFm</b>	<b>753</b>	Sum of both present values
- Net Debt, CHFm	-111	From the Balance Sheet
- Pension deficit/Other, CHFm	30	Including provisions
<b>Equity Value, CHFm</b>	<b>672</b>	
<b>Equity Value per Share, CHF</b>	<b>18.66</b>	36 mio of shares outstanding

Source: Ascom Financial Statements/Author's projections

As one can see, based on the assumption of 2.5% terminal growth rate, the Perpetuity Method produced the total Equity Value of Ascom of CHF 672 million. Considering that Ascom has 36 million of common shares outstanding, this gives an equity value per share of CHF 18.66.

The interim value is the Enterprise Value (EV) of the company. The enterprise value covers only the continuing operations of a firm. It strives to capture the value of a firm's business rather than to gauge the value of a firm. Serving as an alternative to market capitalization, enterprise value is regarded as the price of a company's business less its liabilities and debts. However, enterprise value is deemed as more precise estimate of the purchase price of a company than market cap. In our model, we start from the calculation of the present values of future discounted cash flows and of the terminal value. This gives us the required Enterprise Value of the company, which is CHF 753 mio. Then, all (long-term) debt obligations that the company holds on its balance must be added to the Enterprise Value, while the cash and prepayments must be subtracted to obtain the pure Equity Value (Agudelo, Castano, 2008).

The exit multiple method is based on the assumption that multiples of similar publicly traded companies serve as the basis for a fair valuation of the company's equity. Typically, enterprise value or price multiples are used in the multiple valuation. For example, knowing that the similar company is trading at 10x multiple on its EV/EBITDA, then the terminal value of the equity of the company being valued under this method will ground on 10x EBITDA multiple.

Since Ascom possessed two different businesses in 2016 (Wireless Solutions and Network Testing), peers from both industries must be taken into account when deriving the relevant EV/EBITDA multiple. While the detailed description of the relative valuation process will be provided in Chapter 3, here we will refer only to the aspects related to the exit multiple method. Specifically, the mean EV/EBITDA multiple for 2016 from the peers' group of the Wireless Solutions sector was 14.9x, while the mean multiple from the peers' group of the Network Testing sector was 11.5x. Considering that WS brought about ~75% of Ascom's revenues and

NT ~25%, the respective proportions should be applied in the derivation of the final EV/EBITDA multiple. Overall, the calculation of the equity value and the target price of Ascom's stock under the Exit Multiple Method is presented in the Table 2.11:

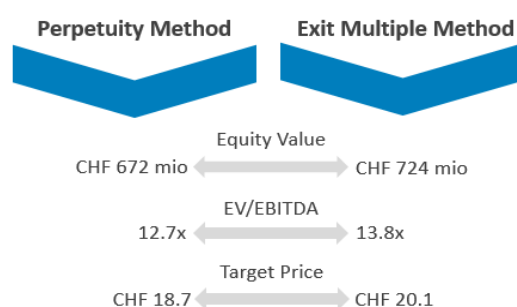
Table 2.11. Equity Value under the Exit Multiple Method

Component	Value	Notes
<b>EV/EBITDA multiple</b>	<b>13.8x</b>	Taken from the set of the market peers in respective proportions for WS and NT
<i>Corresponding perpetuity growth rate</i>	2.9%	The growth rate derived from the assumptions of the terminal CF
Present Value of Forecast Period Free Cash Flows, CHFm	161	21% of total enterprise value
PV of Terminal Value based on 2016 exit EV/EBITDA multiple of 13.8x, CHFm	592	79% of total enterprise value
<b>Enterprise Value, CHFm</b>	<b>805</b>	Sum of both present values
- Net Debt, CHFm	-111	From the Balance Sheet
- Pension deficit/Other, CHFm	30	Including provisions
<b>Equity Value, CHFm</b>	<b>724</b>	
<b>Equity Value per Share, CHF</b>	<b>20.11</b>	36 mio of shares outstanding

Source: Ascom Financial Statements/Author's projections

As one can see, based on the exit 2016 EV/EBITDA multiple of 13.8x, the Exit Multiple Method produced the total Equity Value of Ascom of CHF 724 million, which is CHF 52 mio higher than the equity value under the Perpetuity Method. Considering that Ascom has 36 million of common shares outstanding, this result gives an equity value per share of CHF 20.11. Provided that there is no large discrepancy in the implied corresponding growth rate (2.5% vs 2.9%) as well as in the exit multiple (12.7x vs 13.8x), the outcomes of both methods can be treated reliable and accurate (Figure 2.16).

Figure 2.16. Outcomes of the valuation methods



Source: Author's projections

As the result, we used 2 methods to estimate the intrinsic value of Ascom's stock: Exit Multiple and Perpetuity Method. The output of both models showed comparable results. Exit Multiple Method produced an equity value of CHF 724.0 mio or CHF 20.1 per share and is based on 13.8x EV/EBITDA multiple derived from a set of Ascom's peers with a relevant % overweight towards WS related peer group. Under Perpetuity Method, which is based on 2.5% terminal growth rate, the equity value made up CHF 671.6 mio or CHF 18.7 per share, which in turn corresponds to EV/EBITDA multiple of 12.7x. Ultimately, DCF-based approach yields up average target price of 19.40. This price is claimed to be the target price of the Ascom's stock for the upcoming 12 months based on the underlying assumptions and estimates of the given valuation model.

## Chapter 3. Implication of valuation results

### 3.1. Practical interpretation of valuation results

#### 3.1.1. Key clarifying aspects of the valuation

Having summarized the overall valuation process, we can come over to the practical implementation of the obtained results. There are several important aspects stemming from the valuation process. Primarily, the practical implication and interpretation of the valuation results requires a portion of intuition as well as the long-term vision from an investor. While Ascom's stock is supported by a fairly strong valuation, we should put into the context of positive and negative interpretations each of the story-related events together with their perspective impact on the company's value.

#### **Full divest of Network Testing division in 3Q2016 opens the way for a pure wireless focus.**

As of 30/09/2016 Ascom has fully divested a detriment NT division to French InfoVista for a total consideration of USD 45 mio. The deal was structured on a cash/debt basis: Ascom received USD 30 mio in cash upon closing in 2016, while the remaining USD 15 mio were settled on its balance in the form of subordinated vendor notes with 7 years to maturity and the annual coupon of 4%. The impact on the company's value is obviously positive (Table 3.1).

Table 3.1. The divest of NT division to InfoVista

Cash reimbursement	USD mio	USDCHF average rate	CHF mio
30.09.2016	30	1.012	30.36

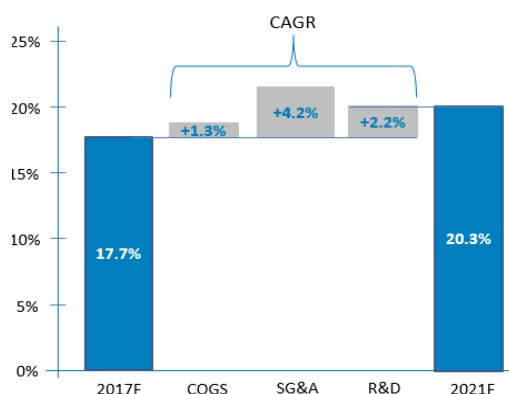
Notes reimbursement	Notional Value, USD mio	USDCHF forecast	Interest received, 4%, CHF
30.09.2016	15	1	
30.09.2017	15	1	0.60
30.09.2018	15	1	0.60
30.09.2019	15	1	0.60
30.09.2020	15	1	0.60
30.09.2021	15	1	0.60
30.09.2022	15	1	0.60
30.09.2023	0	1	0.60

Source: Ascom's press release

**Major transformations were set to finalize by the end of 2016.** The company is on the right track towards a target restructuring into OneCompany with a pure focus on Healthcare ICT,

software and mobile workflow solutions. On the negative side, overall weak performance in 2016 is expected as affected by large one-off restructuring expenses (>CHF 13 mio) and 9M losses of NT division of CHF -10.9 mio on EBITDA level. However, further significant improvements in P&L and overall performance are perceived in the afteryears reflected in EBIT and Net Income margins increases from 2.3% and -1.5% in 2016E to 17.4% and 13.2% in 2021F. New structure should enable Ascom to achieve essentially lower cost base with a 5% average reduction in SG&A and 3-4% lower R&D requirements (Fig.3.1).

Figure 3.1. Operational costs structure



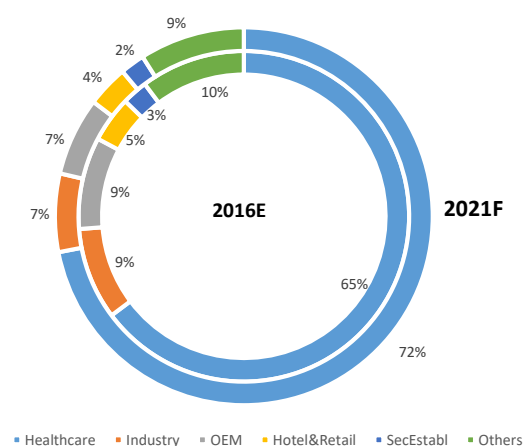
Source: Author's projections

**Strong commitment to shareholders reflected in lavish distribution of profits.** Against the decline of net income in 2015 and the cost-intensive restructuring process in 2016, Ascom has managed to maintain a stable CHF 0.45 dividend per share in follow-up of 2015. As the result, the increased pay-out ratio hit a record 67% of 2015 EPS of CHF 0.69, while the declared commitment resided in the range of 35-50%. Supported by the forecast of the raising FCFE of CHF 0.8-1.1 per share in 2016-2021 and the absence of major acquisition plans so far, we expect Ascom to extend lavish distribution of free cash flows as consistent with the recent company's announcement (Ascom Investors Presentation 2016, p.9).

**Shares repurchase.** As an alternative to dividends pay-out, Ascom may potentially use its cash or leverage to buy back the outstanding shares. In case of using all cash, Ascom will be able to buy back around 20% of its stock. With that, the company's intrinsic equity value will go up to CHF 756.4 mio or CHF 20.7 per share implying an upside of 21.7% to a current market price. Sub-optimal capital structure will substantially remain the same (D/E of ~3%) due to a still negligible proportion of debt. If 2x EBITDA leverage is used in the buyback, equity value will stay lower at CHF 721 mio or CHF 20.0 per share (17.6% upside), while the capital structure will shift to a Debt/Equity level of ~10%.

**Valuation supported by the realistic growth assumptions.** We based our valuation model on the assumption of a 4.5% growth in net revenues in 2017 and 2018, a 3.5% in 2019 and 2020 and a 2.5% in terminal. Indeed, a stronger 6.25% CAGR growth in healthcare business is anticipated as driven by the high demand for traditional Myco, Nurse Call and workflow solutions with HC share rising from the current 60% to up to 71% of total revenues by 2020. However, we should also assume that the superior growth in healthcare shall be accompanied by the contraction of other segments, which seems inevitable within the context of OneCompany's strategy to become a healthcare ICT leader (Fig.3.2).

Figure 3.2. Segment-wise revenue projection



Source: Ascom Financial Statements, Author's projections

**Unlevered free cash flow.** We used the conception of unlevered free cash flow in our DCF model. The underlying forecasts include a gradual CAGR 4.2% increase of operational cash flow under the assumptions of levelled net working capital, negligible interest expense on outstanding debt and volatile CAPEX and depreciation. Simultaneously, assuming a smooth positive variation of EBIT and NI, Ascom's unlevered FCF should double from CHF 23.8 mio in 2016E to CHF 45.6 mio in 2021F.

**Sensitivity analysis.** Considering a negligible share of debt in Ascom's capital structure, the cost of equity exerts the greatest influence on WACC. The sensitivity scenario under Exit Multiple Method considers sensitivity of the equity value to WACC and EV/EBITDA multiple: the lowest value of CHF 619 mio and highest value of CHF 830 mio are obtained with the WACC of 9.6% and 5.6% and EV/EBITDA multiple of 11.8x and 15.8x respectively. The sensitivity scenario under Perpetuity Method considers sensitivity of the equity value to WACC and the growth rate: the lowest value of CHF 399 mio and highest value of CHF 2,933 mio are

obtained with the WACC of 9.6% and 5.6% and the growth rates of 0.5% and 4.5% respectively (Fig.3.3, Fig.3.4).

Figure 3.3. Sensitivity analysis (Exit Multiple Method)

Equity Value		EV/EBITDA				
		11.8x	12.8x	13.8x	14.8x	15.8x
WACC	9.6%	618	663	709	754	799
	8.6%	623	<b>669</b>	<b>715</b>	<b>760</b>	806
	7.6%	628	<b>674</b>	<b>721</b>	<b>767</b>	813
	6.6%	634	<b>680</b>	<b>727</b>	<b>774</b>	820
	5.6%	639	686	733	781	828

Source: Author's projections

Figure 3.4. Sensitivity analysis (Perpetuity Method)

Equity Value		Growth rate				
		0.5%	1.5%	2.5%	3.5%	4.5%
WACC	9.6%	398	441	496	569	670
	8.6%	440	<b>496</b>	<b>569</b>	<b>670</b>	822
	7.6%	495	<b>569</b>	<b>670</b>	<b>822</b>	1,070
	6.6%	569	<b>670</b>	<b>822</b>	<b>1,070</b>	1,556
	5.6%	670	821	1,070	1,556	2,926

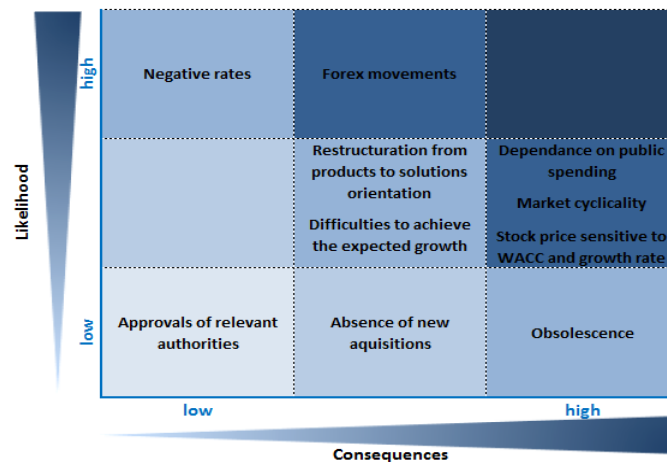
Source: Author's projections

### 3.1.2. Investment risks

On the flip-side, certain risks accompany the overall valuation process since estimates and assumptions may vary depending on the economic, political and business conditions affecting the operating environment. In this regard, investors must be prudent enough to avoid overoptimistic judgments and sentiments towards, in our case, the Ascom's stock. Associated risks for the company include the subgroups of strategic, market and business, financial and currency and other concurrent risks (Fig.3.5).



Figure 3.5. Ascom's Risk Matrix



Source: Ascom, Author's

projections

**Strategic Risks.** Ascom may encounter difficulties to transform from product-oriented to solution-oriented model. The solution-oriented strategy will offer a broader variety of products and services and requires additional resources and more qualified staff, inter alia, software engineers. Furthermore, because of the management's outlook to acquire more of big contracts, the revenue stream might be unstable. It may lead to higher volatility in EBIT and net income in response to the timing lag in revenue generation from long-term projects. The new strategy may take time to result in a strong and steady growth. The risk not to achieve the expected growth can heavily influence Ascom's target price due to the high sensitivity of the price to a change in the growth rate.

**Absence of new acquisitions may throttle growth.** Ascom's vision to grow organically relying on existing markets and operational facilities may appear overoptimistic and may simply fall short of space for the potential expansion.

**Challenging market environment.** In general, hospitals may demonstrate inflexibility and reluctance to invest in digitalization of in-house processes or apply the extended useful lives of medical equipment in service. This fact arises from two main aspects: first, majority of Ascom's customers are public hospitals dependent on governments healthcare spending; so, if the government provides public hospitals with lower financing by either cutting the healthcare budget or by introducing unfavourable legislative changes, hospitals will be inevitably less prone to spend on, inter alia, Ascom's products and services. It can result in price pressure on its products and services and in a decrease in incoming orders. Second, hospitals are extremely cautious in terms of the use of new digital technologies. It seems that today, hospitals are still

not 100% convinced of digital technologies and of their full benefits (McKinsey & Company 2014, p.26).

**Market cyclicalities.** The cyclicalities mainly arise from the peculiarities of budget spending made by hospitals unevenly during the year or during the budget periods. It is particularly true for new technologies, as hospitals get equipped with new machines during the same short period to remain competitive in the field. As the result, there is a tendency for hospitals to incur large one-time capital investments to upgrade or renew existing appliances, which is then followed by months of a full absence of new machines investments. This is only after that period that hospitals tend to buy software. Creating a cyclicalities for each product (BMJ 2014, p.17).

**Financial and currency risks.** Ascom is subject to important currency risks as the company operates in 47 countries around the world while results are reported in Swiss francs. With the help of sensitivity analysis, one can see that the forex movements have a significant impact on Ascom results. For example, revenues are mostly earned in euros, US dollars, British pound and Swedish krona and must be converted into Swiss francs. Foreign transactions are hedged while foreign translations due to investments labelled in foreign currencies are not hedged (Fig.3.6) (Ascom Annual Report 2015, p.18).

Figure 3.6. Forex trends



Source: dailyfx.com

Table 3.2. Foreign currency exposure

	31 Dec 2016	Average 2016	Share of Ccy in Revenues	Average Gain/Loss	End of Year Gain/Loss
<b>EUR</b>	1.050	1.085	43%	0.010	-0.034
<b>GBP</b>	1.280	1.320	7%	-0.156	-0.196
<b>SEK</b>	0.110	0.115	17%	0.000	-0.008
<b>USD</b>	0.975	0.980	19%	0.014	-0.020

Source: dailyfx.com

**Negative interest rates of Swiss franc.** Given the Ascom's financial structure, solid cash flow generation capacity and excess reserves (2015 end-of-year cash equivalents stood at CHF 57.4 million representing 20% of total assets), the company is not able to take advantage of managing disposable cash balances due to persistence of negative interest rates, particularly on Swiss market.

**Obsolescence.** To preserve leading position in its niche on HICT market and to keep responding to rising customers' needs, Ascom needs to maintain high R&D expenses.

**Regulatory risk.** In certain circumstances, the company may require an approval of relevant authorities of the country, where the product is introduced. For example, as was the case with the FDA approval of Cardiomax.

### 3.2. Use of market-based valuation as complement to investment decision

Market-based valuation uses ratios from an industry, peer group, or similar companies to estimate a company's equity value. The following ratios are mostly used on practice: price-to-earnings ratio (P/E), price-to-sales ratio (P/S) or enterprise value-to-sales (EV/S), and enterprise value-to-earnings before interest, tax, depreciation, and amortization (EV/EBITDA), which are also called "multiples." The law of one price is the major concept behind the comparable method: it states that similar assets should trade at a similar price. It suggests for companies that have similar revenues and earnings drivers to be worth about the same.

The prevailing use of the P/E valuation approach is to measure the stock's value by imposing a benchmark multiple to the company's actual or projected earnings. An identical approach is to compare a stock's actual P/E multiple with a benchmark multiple (Morningstar 2007, p.131).

Overall, using any multiple from the market-based valuation involves the following steps:

- Determine and calculate the multiple for the comparison.
- Choose a set of comparable stocks and calculate the benchmark multiple of a set. It is appropriate to calculate a mean or median value for the group of stocks.
- Apply the benchmark multiple, adjusted for fundamental discrepancies, to measure the value of a company's stock.
- Endeavor to explain whether the price deviation is due to fundamental reasons or pricing/market factors.
- Make conclusions about the relative valuation outcomes.

The choice of comparable stocks or multiple benchmarks includes the following:

- a mean or median value of the multiple of a stock's peers' group, including mean historical values of the multiple;
- a mean or median value of the multiple for a stock's industry or market, including mean historical values of the multiple for a stock relative to the industry or market;
- the multiple for a relative equity index, including mean historical values of the multiple for a stock relative to the equity index;
- a mean historical value of the multiple for a stock (Pinto, Henry 2007).

Investors often find that the stock being valued has some significant differences from the median or mean fundamental characteristics of the comparison assets. In applying the relative valuation, investors often attempt to find out whether discrepancies from the benchmark value of the multiple is caused by fundamental factors that influence the multiple. The following relationships for P/E hold, all else being equal:

- If a stock has higher than average (median) expected growth rate, a higher multiple than the benchmark is acknowledged.
- If a stock has higher than average (median) operating or financial risk, a lower multiple than the benchmark is acknowledged.

The use of median values mitigates the effect of outliers on the valuation conclusion. In this instance, the trailing 2016 P/E for Hytera Communications (75.6x) and Extreme Wireless (70.8x) are clearly outliers. Therefore, the use of a median trailing P/E for the group of companies is more appropriate than the use of a mean trailing P/E as the benchmark value of the P/E multiple. Note: When a group includes an odd number of companies, as here, the median value will be the middle value when the values are ranked (in either ascending or descending

order). When the group includes an even number of companies, the median value will be the average of the two middle values.

If we assume no differences in fundamentals among the peer group companies, Ascom appears to be overvalued because its P/E is negative comparing to a median P/E of 16.8x of its peers for the projected year 2016 (Table 3.3).

Table 3.3. P/E Ascom's peers group

Company	P / E			
	2015A	2016E	2017E	2018E
<b>Wireless Solutions related peers</b>				
ASCOM	23.7x	-108.1x	19.2x	16.9x
SIERRA WIRELESS	17.2x	26.4x	18.2x	-
TELIT COMMUNICATIONS PLC	15.3x	13.0x	10.7x	8.1x
NOVATEL WIRELESS INC	-15.9x	-12.9x	0.6x	-
EXTREME WIRELESS INC	70.8x	15.2x	13.0x	10.2x
WIRELESSGATE	26.6x	26.9x	20.2x	16.0x
HYTERA COMMUNICATIONS	75.6x	44.8x	27.7x	18.5x
LOGITECH INC	26.8x	22.8x	19.9x	18.1x
UBLOX HOLDING	34.2x	29.6x	24.4x	20.2x
VOCERA	0.0x	0.0x	0.0x	44.3x
ZEBRA TECHNOLOGIES CORP	12.7x	12.3x	10.7x	9.7x
NETGEAR INC	24.4x	18.4x	17.3x	15.5x
<b>Mean</b>	<b>21.2x</b>	<b>15.2x</b>	<b>13.5x</b>	<b>17.8x</b>
<b>Median</b>	<b>20.8x</b>	<b>16.8x</b>	<b>15.1x</b>	<b>15.8x</b>
<b>Max</b>	<b>70.8x</b>	<b>29.6x</b>	<b>24.4x</b>	<b>44.3x</b>
<b>Min</b>	<b>-15.9x</b>	<b>-12.9x</b>	<b>0.0x</b>	<b>8.1x</b>

Source: Reuters

To confirm this valuation conclusion, we should look at other metrics. In the same fashion, fundamental basis of EV/EBITDA multiple is crucial for understanding. Under constant conditions, reliable EV/EBITDA has the positive relation to the growth rate of FCFF, return on invested capital (ROIC) and the negative relation to the WACC. To our knowledge, ROIC is defined as the operating profit after tax divided by total invested capital. At the same time, ROIC appears more appropriate measure in analysing EV/EBITDA, since EBITDA is supposed to overspread all providers of capital (Keran, Prasad 2015).

Under constant conditions, a value of EV/EBITDA that is lower comparing to peers signifies a relatively undervalued firm. An analyst's recommendations, however, are usually not

completely determined by relative EV/EBITDA; from an investor's perspective, EV/EBITDA is simply one piece of information to consider.

Enterprise multiples differ from price to cash flow multiples in that the numerator is a measure of firm value rather than share price, to match the denominator which is a pre-interest measure of earnings. These multiples thus provide a more appropriate comparison than price to cash flow when companies have significantly different capital structures.

Based on its EV/EBITDA multiple of 12.7, Ascom appears slightly undervalued relative to the other peers' median. However, this lower valuation ratio appears especially attractive given Ascom's high profit margin and rising revenue growth. Compared with peers' median, the enterprise value multiples of Ascom are slightly lower which is inconsistent with it being more profitable than its peers (profit margin of 10.0% versus average 5.7%). The enterprise value multiples of Telit or Zebra are notably lower than those of Ascom, probably reflecting Ascom's recent relatively high revenue growth. Similarly, the enterprise value ratios for Ascom are lower than those for Vocera or Hytera due also to differences in profitability and growth (Table 3.4).

Table 3.4. EV/EBITDA Ascom's peers group

Company	EV/EBITDA			
	2015A	2016E	2017E	2018E
<b>Wireless Solutions related peers</b>				
<b>ASCOM</b>	<b>19.3x</b>	<b>36.6x</b>	<b>13.7x</b>	<b>12.0x</b>
SIERRA WIRELESS	9.6x	9.7x	-	-
TELIT COMMUNICATIONS PLC	7.9x	7.3x	5.9x	4.7x
NOVATEL WIRELESS INC	0.0x	26.9x	13.7x	-
EXTREME WIRELESS INC	9.4x	4.0x	7.3x	6.0x
WIRELESSGATE	14.9x	11.0x	8.7x	7.3x
HYTERA COMMUNICATIONS	-	35.6x	23.6x	18.0x
LOGITECH	11.4x	17.0x	15.3x	14.6x
UBLOX HOLDING	17.5x	14.1x	11.2x	10.2x
VOCERA	28.0x	40.0x	51.2x	23.7x
ZEBRA TECHNOLOGIES CORP	10.6x	10.4x	9.6x	9.2x
NETGEAR INC	7.7x	8.5x	7.9x	6.9x
<b>Mean</b>	<b>11.7x</b>	<b>14.9x</b>	<b>14.5x</b>	<b>10.3x</b>
<b>Median</b>	<b>10.1x</b>	<b>10.7x</b>	<b>9.6x</b>	<b>8.2x</b>
<b>Max</b>	<b>28.0x</b>	<b>40.0x</b>	<b>51.2x</b>	<b>23.7x</b>
<b>Min</b>	<b>0.0x</b>	<b>4.0x</b>	<b>5.9x</b>	<b>4.7x</b>

Source: Reuters

Enterprise value to sales is a major alternative to the price-to-sales ratio. The P/S multiple has the conceptual weakness that it fails to recognize that for a debt-financed company, not all sales belong to a company's equity investors. Some of the proceeds from the company's sales will be used to pay interest and principal to the providers of the company's debt capital. For example, a P/S for a company without debts cannot be compared to a P/S for a company that employs debt heavily. EV/S would be the basis for a valid comparison in such a case. In summary, EV/S is an alternative sales-based ratio that is particularly useful when comparing companies with diverse capital structures (Table 3.5) (Morningstar 2007, p.135).

Table 3.5. EV/S Ascom's peers group

Company	EV/S			
	2015A	2016E	2017E	2018E
<b>Wireless Solutions related peers</b>				
<b>ASCOM</b>	<b>1.8x</b>	<b>2.2x</b>	<b>2.4x</b>	<b>2.3x</b>
<b>SIERRA WIRELESS</b>	<b>0.7x</b>	<b>0.6x</b>	<b>0.5x</b>	<b>-</b>
<b>TELIT COMMUNICATIONS PLC</b>	<b>1.1x</b>	<b>1.1x</b>	<b>0.9x</b>	<b>0.8x</b>
<b>NOVATEL WIRELESS INC</b>	<b>0.7x</b>	<b>0.9x</b>	<b>0.9x</b>	<b>-</b>
<b>EXTREME WIRELESS INC</b>	<b>0.5x</b>	<b>0.6x</b>	<b>0.7x</b>	<b>0.6x</b>
<b>WIRELESSGATE</b>	<b>1.6x</b>	<b>1.4x</b>	<b>1.2x</b>	<b>1.1x</b>
<b>HYTERA COMMUNICATIONS</b>	<b>8.0x</b>	<b>6.4x</b>	<b>5.5x</b>	<b>3.3x</b>
<b>LOGITECH</b>	<b>1.0x</b>	<b>1.8x</b>	<b>1.7x</b>	<b>1.6x</b>
<b>UBLOX HOLDING</b>	<b>4.1x</b>	<b>3.2x</b>	<b>2.7x</b>	<b>2.3x</b>
<b>VOCERA</b>	<b>2.0x</b>	<b>3.0x</b>	<b>2.7x</b>	<b>2.5x</b>
<b>ZEBRA TECHNOLOGIES CORP</b>	<b>1.8x</b>	<b>1.8x</b>	<b>1.7x</b>	<b>1.7x</b>
<b>NETGEAR INC</b>	<b>0.8x</b>	<b>1.1x</b>	<b>1.1x</b>	<b>1.0x</b>
<b>Mean</b>	<b>1.4x</b>	<b>1.5x</b>	<b>1.4x</b>	<b>1.4x</b>
<b>Median</b>	<b>1.1x</b>	<b>1.2x</b>	<b>1.1x</b>	<b>1.4x</b>
<b>Max</b>	<b>4.1x</b>	<b>3.2x</b>	<b>2.7x</b>	<b>2.5x</b>
<b>Min</b>	<b>0.5x</b>	<b>0.6x</b>	<b>0.5x</b>	<b>0.6x</b>

Source: Reuters

### 3.3. Investment decision: how to apply the obtained results to stock market investment

Investors often use several valuation metrics in order to properly select the stock since any chosen and calculated price multiple, momentum indicator, or fundamental supply a unique piece of the information about the stock.

We will examine two valuation outcomes for Ascom. The first is the one obtained from the discounted cash flow method, which is, generally, the preferred methodology. The second is the relative valuation with 3 applied multiples: price to earnings (P/E), EV/EBITDA and EV/Sales DCF target for Ascom is CHF 19.38, which represents a 21% upside to the closing-year 2016 price of CHF 16.0. However, considering the priority of the DCF method, one should expect that other methods applied to evaluate the Ascom's stock may give controversial results.

As such, applying a mid-cycle P/E multiple of 17.3x to FY17 EPS of CHF 0.83, we derive a valuation of CHF 14.40. Importantly, were the stock to reach our DCF target of CHF 19.40 in 12 months, Ascom would be trading on a forward P/E of 23.3x, which seems to be overvalued. The additional factor affecting our investment decision is that at current levels, the stock is offering an attractive dividend yield of 3.0%.

In selecting stocks, institutional investors surveyed in the BofA Merrill Lynch Institutional Factor Surveys from 1989 to 2015 used an average of 9.3 factors in selecting stocks. The survey factors included not only price multiples, momentum indicators, and the DDM but also the fundamentals ROE, debt to equity, projected five-year EPS growth, EPS variability, EPS estimate dispersion, size, beta, foreign exposure, low price, and neglect. Appendix 5 lists the factors classified by percentage of investors indicating that they use that factor in making investment decisions, out of 137 responders in 2015 (Merrill Lynch 2015, p.71).

An issue concerning the use of ratios in investments is **look-ahead bias** - the use of information that was not available when making initial calculations. Investors often use historical data to back test an investment strategy that involves stock selection based on price multiples or other factors. When back testing, an investor should be aware that time lags in the reporting of financial results create the potential for look-ahead bias in such research. For example, if at the beginning of January 2017 Ascom had not reported EPS for the last quarter of 2016, so at that time, Ascom's trailing P/E would be based on EPS for the first, second, and third quarters of 2016 and the last quarter of 2015. Any investment strategy based on a trailing P/E that used



actual EPS for the last quarter of 2016 could be implemented only after the data became available. If an investor assumed that an investment was made in early January 2017 based on full-year 2016 data, the analysis would involve look-ahead bias. To avoid this, an investor should rather calculate the trailing P/E based on the most recent reported EPS. The same principle applies to other multiples calculated on a trailing basis (Hitchner, James 2006, p.115).

The application of a set of criteria to reduce an investment universe to a smaller set of investments is called **screening**. **Stock screens** often include not only criteria based on the valuation measures discussed in this reading but also on fundamental criteria that may explain differences in such measures. Computerized stock screening is an efficient way to narrow a search for investments and is a part of many stock selection disciplines. The limitations to many commercial databases and screening tools usually include lack of control by the user of the calculation of important inputs (such as EPS); the absence of qualitative factors in most databases is another important limitation (Elton, Edwin & Co 2006, p.70).

In Ascom's case, the screens of P/E, EV/EBITDA and EV/S multiples can be designed. Additionally, screening for low P/E or other low multiples stocks may be combined with low expected growth, so that stocks have a PEG of less than 1.0. Screening for stocks with a dividend yield of, for instance, 3.0 percent and a total market capitalization over CHF 500 million can be added. Table shows whether Ascom's stock successively meets each of the five criteria as of September 2016 (Table 3.6).

Table 3.6. Stock Screen

Criterion	Ascom's
P/E < 25.0	20.4
EV/EBITDA < 15.0	12.7
PEG < 1.0	0.51
Dividend yield $\geq$ 2.0%	2.56
Market capitalization < CHF 1 bln	599 mln

Source: Reuters, Author's projections

The screening database indicates that the P/E was 20.4, EV/EBITDA was 12.7, and the dividend yield was 2.56% for Ascom as of the date of the screen. At the same time, S&P's US Style Indices Methodology indicates that the style indices measure growth and value by the following six factors, which S&P standardizes and uses to compute growth and value scores for each company:

- Three Growth Factors.

- Three-year change in EPS over price per share.
- Three-year sales per share growth rate.
- Momentum (12-month percentage price change).
- Three Value Factors.
- Book value to price ratio.
- Earnings to price ratio.
- Sales to price ratio.

Based on the specified market capitalization, Ascom can be characterized as a mid-cap value investment. Although the screen includes a PEG, it should be supplemented by the explicit growth rate criteria and momentum indicators, usually associated with a growth orientation, such as positive earnings surprise (Stowe, Robinson 2007, p. 89).

Certain omissions may arise if profitability criteria or risk measurements are not included in the screen. Those can explain a stock's expected low profitability or high risk may resulting in a low P/E. Another limitation is that the computations of the value indicators taken from the commercial database may not reflect the appropriate adjustments to inputs.

Investors also apply the metrics that we have illustrated in terms of individual stocks to industries and economic sectors. For example, average price multiples and momentum indicators can be used in sector rotation strategies to determine relatively under- or overvalued sectors (Damodaran 2008, p.67).

### 3.4. Lessons learnt from the topic

The academic value of the topic of this paper has certainly not become irrelevant nowadays since many valuation issues that investors face with have transferred yet from the over past century (1980s and 1990s). Such tendency can be explained by the existence of long-present approaches to valuation and by relative reluctance of market participants to tackle the basics of equity valuation in a complex fashion. Complex, in that context, refers to the direction, which rational investors choose when making investment decisions. No other way, they mainly rely on the outcome of the DCF model, namely the expected cash flows from the investment over the determined time horizon, the expected growth of these cash flows and the risk-return characteristics attributable to the expected cash flows.

In the research part, we conducted the valuation of the publicly traded company – Ascom AG. Building the framework of the valuation model, we used the theoretical concepts which refer back to the first chapter of this paper. In order to generalize our findings, we should list the main steps done and concisely draw some implications:

**1. Projections and assumptions.** Here we made projections of inputs and variables, which ultimately result in the main final outcome of financial projections – growth of revenues, costs structure, debt and working capital expenditures, depreciation and CAPEX.

**2. Cash flow calculation.** We used indirect method to build the cash flow statement. Our ultimate goal was to derive unlevered free cash flow to firm using the theoretical basis. Supplementary, we derived free cash flow to equity (FCFE) in order to project yet one important factor affecting the investment decision on the Ascom's stock – dividend pay-out ratio and dividend yield.

**3. Valuation and target price.** We used two approaches to obtain the target price of the valued stock, which is consistent with the practice of valuation. The outcome of both methods was fairly comparable that, given the close correlation of the target price with Reuters consensus on Ascom's stock, attach credibility to our valuation model.

Overall, valuation is subjective and expectational process by its nature. That is why, investors make decisions based on the comparative relevancy of their choice with the alternative option. They virtually consider their risk perception and risk attitude of the expected cash flows from the investment in terms of the present value, encompassing a variety of factors, which affect their sentiment in determining the particular value of an investment. Thus, an investment of a lower risk has higher value than an investment of a higher risk, while in real market conditions there may be temporary discrepancies in, what is deemed, a typical risk-return trade-off.

We have learnt that growth, risk-return, expected cash flows and its present value and alternative opportunities are the pillars of the rational investment decision. Moreover, these conceptions are interconnected with, what is known as, fair market value of a stock – a value grounded on implicit behaviour of stock market participants. Thus, we, as investors, are not able to tackle valuation issues isolated from understanding of the stock market in general. Going further, we can outline the major issues, which pose a particular interest to valuation theory:

**1. CAPM model and discount rates.** A particular issues with discount rates is their relative subjectivity and the existence of various modification of the pure CAPM model. One possible approach to address a discount rate issue is to adjust an obtained discount rate under

CAPM model for a specific equity risk premium, which arises from different perspectives on the identical cash flow streams.

**2. Valuation premiums and discounts.** The essential issue in valuation is how to account for the respective discounts and premiums when necessary. A good examples are a premium for control (controlling interest) and a discount for minority interest. The target price of a stock may be implicitly increased by a certain % of premium in case when the valued company acquires competitive business and obtains a controlling interest over its equity. In its turn, the minority interest discount reduces the fair market value of a stock and may be applied for ownership transfer or tax purposes (Mercer, Harms 2008, p.68).

**3. Income Statement adjustments.** This is a crucial issues in valuation since companies differ in accounting practices and use of accounting treatments. Moreover, a space for the management discretion over company's financial statements create obstacles for an investor seeking to build a unified valuation framework. The proper decision for a rational investor seeking to determine what the business underlying an investment worth would be to use proper reconciliation practices in order to avoid miscomprehension of the reported income figures.

**4. Fundamental adjustments for public companies and transaction multiples.** The next issue in valuation is how to make proper adjustments that would deem to be reliable in respect to real fundamental factors affecting the value of a public company, and, in relation to transaction multiples obtained from a set of public peers or the market. Referring to theory, investors apply several approaches to account for transaction discrepancies, including adjustments to enterprise value or a different treatment of non-cash items that adjusts a company's EBITDA. Moreover, accounting for different growth perspectives and risk characteristics of comparable companies may help to unify the frame of relative valuation and to derive credible transaction multiples.

**5. Discounts for lack of marketability and liquidity.** This type of discount is applied when the marketplace for a stock is absent or liquidity is insufficient. The methods used to measure the discount include the restricted stock, IPO and the option pricing. While it is not the case for the Ascom's stock, the academic importance of this issue is high since holders of minority interests in stocks usually do not have access to the restricted information. In the course of acquisitions, prices of stocks with a low marketability may increase rapidly if the acquiring company is a well-traded public equity. Examining theoretical models may help investors to timely recognize potential discount cutbacks (Mercer, Harms 2008, p.72).

## Conclusion

To conclude, in this paper we tried to grasp all the aspects of valuation of a publicly traded company. In general, stock market investment or investment in securities or equities of publicly traded companies is the most related field to valuation. Applying fair value concept to obtain the intrinsic value of the stock results in investor's understanding of the true, real and fair value of the particular stock. Given that the intrinsic value, from an investor's perspective, is usually different from the market price of the stock or the price prevailing on the stock market at any given moment of time, an investor seeks to exploit this difference and get the investment profit. Despite market price is considered as the best available estimate of a stock's intrinsic value, the valuation serves as a guide to an investor seeking to exploit the investment opportunity.

There is no doubts that the topic will preserve its relevancy and particularity in the observable future as long as stock markets exist and the trade-off between intrinsic and market value can be exploited. Referring back, in the first chapter, we described the universe of equity securities, examined the tools and the concepts of equity valuation and outlined free cash flow (DCF) valuation models and their application on practice. In the second and the third chapters, we used the valuation case of Ascom AG – swiss-based global solutions provider focused on Healthcare ICT and mobile workflow solutions. The case has attracted particular academic and practical interest since it was selected for 2016 Chartered Financial Analyst (CFA) Challenge.

Our DCF-based valuation approach yielded up average target price of 19.40 for the Ascom's stock. To obtain this valuation target, we used 2 methods: Exit Multiple and Perpetuity. The output of both models showed comparable results. EMM produced an equity value of CHF 724.0 mio or CHF 20.1 per share and was based on 13.8x EV/EBITDA multiple derived from a set of Ascom's peers with a relevant % overweight towards WS related peer group. Under Perpetuity Method, which was based on 2.5% terminal growth rate, the equity value made up CHF 671.6 mio or CHF 18.7 per share, which corresponded to EV/EBITDA multiple of 12.7x.

Our target was based on the growth rate of 4.5% in 2017 and 2018, 3.5% in 2019 and 2020, and 2.5% in 2021 and in terminal. DCF-based perpetuity method and exit multiple method yielded the equity values corresponding to EV/EBITDA multiple range of 12.7x-13.8x. Our base case assumptions for 2017-2021 also included a gradually increasing gross profit margin of 50.5-54.5%, SG&A and R&D expenses varying around 27% and 8% of revenues respectively, tax rate of 24%, variable 3-6% CAPEX and the WACC of  $\approx 7.5$ -7.6%.

Announced dividend perspectives make Ascom's stock even more attractive. At the recent conference call the company has determined the distribution of its free cash flows to shareholders at the best available use. In our base case, we assumed the total pay-out to grow by 10% annually, which is aligned with a forward dividend yield of 2.9-3.8% and comprise 65%-74% of the projected FCFE for 2017-2020.

To get the additional insight on market's perspective of Ascom's current pricing, we tried to supplement our DCF outcome with the comparison of 12M forward multiples with a peer group of companies. However, with Ascom's forward P/E of 20.4x ag 17.8x of a peer group and EV/EBITDA of 12.2x ag 14.5x, relative valuation might be interpreted twofold. Thus, we made a conclusion that given Ascom's specific business niche on HICT market and differing perspectives of growth with peer companies, relative valuation cannot serve as truly reliable pricing metrics for Ascom's stock, while the investing decision should heavily rely on fundamental (DCF) value.

The key risks of investing in Ascom's stock are the potential difficulties to transform into solution oriented model, which can appear a long-lasting endeavour, the shortage of the existing capacities for further organic growth, and a possible struggle on hospitals' limitations, reluctance and inflexibility to purchase and adopt new technologies.

We concluded that investors often use several valuation metrics in order to properly select the stock since any chosen and calculated price multiple, momentum indicator, or fundamental supply a unique piece of the information about the stock. While one of the main issues concerning the use of ratios in an investing strategy is **look-ahead bias** - the use of information that was not contemporaneously available in computing a quantity.

In order to reduce an investment universe to a smaller set of investments investors apply a technique a set of criteria called **screening**. **Stock screens** often include not only criteria based on the valuation measures discussed in this reading but also on fundamental criteria that may explain differences in such measures.

Finally, using more than one model in valuation can reveal useful auxiliary perspectives on a company. While the selection of the appropriate model that would be consistent with the investment profile of a valued company must ground on the solid understanding of a company's business.

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# Appendices

## Appendix 1: Sales Forecasts

### 1.1. WS sales forecasts per segment

Sales per segment										
(in CHF million)	2012	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
Healthcare	172	179	188	183	192	204	217	231	244	255
Industry	35	32	29	30	27	26	26	25	24	23
OEM	41	38	38	30	27	26	26	25	24	23
Hotel & Retail	22	19	19	15	13	13	14	13	13	12
Secure Establishments	13	16	16	9	7	8	8	8	8	7
Others	35	35	29	37	30	31	32	32	33	31
<b>Total</b>	<b>297,7</b>	<b>306,1</b>	<b>318,9</b>	<b>304,2</b>	<b>295,9</b>	<b>309,1</b>	<b>323,0</b>	<b>334,2</b>	<b>346,0</b>	<b>354,7</b>

Source: Ascom Annual Reports, Author's assessment

### 1.2. WS growth forecasts per segment

Growth rates										
%yoy	2012	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
Healthcare		3,7%	5,4%	-3,0%	5,0%	6,5%	6,5%	6,5%	5,5%	4,5%
Industry		-9,1%	-10,0%	6,0%	-12,5%	-1,3%	-1,7%	-3,0%	-3,4%	-4,3%
OEM		-7,7%	0,0%	-20,5%	-12,5%	-1,3%	-1,7%	-3,0%	-3,4%	-4,3%
Hotel & Retail		-14,3%	0,0%	-20,5%	-12,5%	-0,2%	2,1%	-1,4%	-3,0%	-5,3%
Secure Establishments		25,0%	0,0%	-42,8%	-18,9%	4,5%	4,5%	-4,8%	-1,0%	-4,5%
Others		0,0%	-18,2%	27,2%	-17,1%	3,8%	2,7%	-2,3%	3,8%	-4,9%
<b>Total</b>		<b>2,8%</b>	<b>4,2%</b>	<b>-4,6%</b>	<b>-2,7%</b>	<b>4,5%</b>	<b>4,5%</b>	<b>3,5%</b>	<b>3,5%</b>	<b>2,5%</b>

Source: Ascom Annual Reports, Author's assessment

### 1.3. WS sales split per segment

Segmental sales split										
as % of sales	2012	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
Healthcare	54%	56%	59%	60%	65%	66%	67%	69%	71%	72%
Industry	11%	10%	9%	10%	9%	9%	8%	8%	7%	7%
OEM	13%	12%	12%	10%	9%	9%	8%	8%	7%	7%
Hotel & Retail	7%	6%	6%	5%	5%	4%	4%	4%	4%	4%
Secure Establishments	4%	5%	5%	3%	3%	3%	3%	2%	2%	2%
Others	11%	11%	9%	12%	10%	10%	10%	9%	9%	9%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Source: Ascom Annual Reports, Author's assessment

### 1.4. WS sales forecasts by region

Sales by region										
(in CHF million)	2012	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
Middle East and Africa				3,0	3,0	4,4	5,9	7,4	8,9	10,4
Asia Pacific	3,0	3,0	13,0	12,2	11,8	12,4	13,0	14,5	16,0	17,5
Americas	48,0	51,0	48,0	57,8	59,2	59,8	60,4	61,8	63,3	64,8
Europe	250,1	254,1	258,3	231,2	221,9	219,2	216,6	212,1	207,7	203,3
<b>Total</b>	<b>297,7</b>	<b>306,1</b>	<b>318,9</b>	<b>304,0</b>	<b>296,0</b>	<b>309,0</b>	<b>323,0</b>	<b>334,2</b>	<b>346,0</b>	<b>354,7</b>

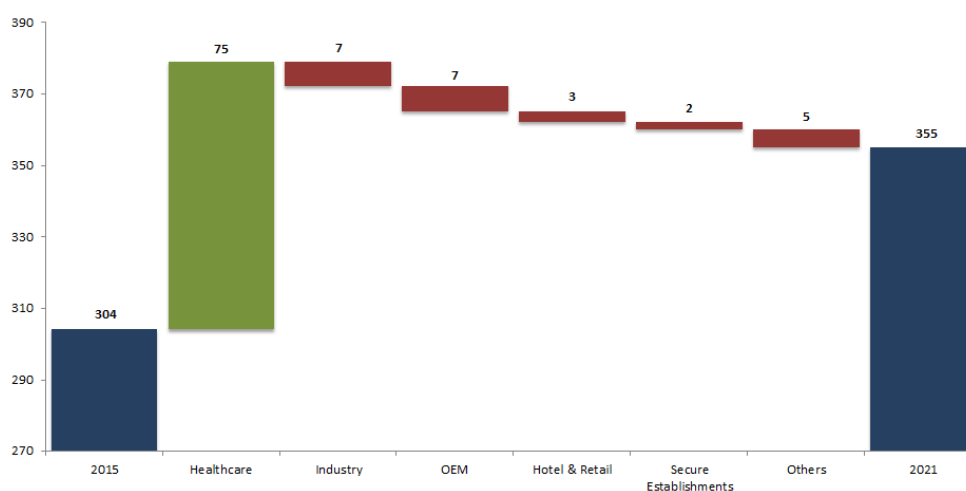
Source: Ascom Annual Reports, Author's assessment

## 1.5. WS sales split by region

Regional sales split										
as % of sales	2012	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
Middle East and Africa	-	-	-	1%	1%	2%	2%	3%	3%	4%
Asia Pacific	1%	1%	4%	4%	4%	4%	4%	5%	5%	6%
Americas	15%	16%	15%	19%	20%	20%	20%	21%	21%	22%
Europe	84%	83%	81%	76%	75%	74%	73%	72%	70%	69%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

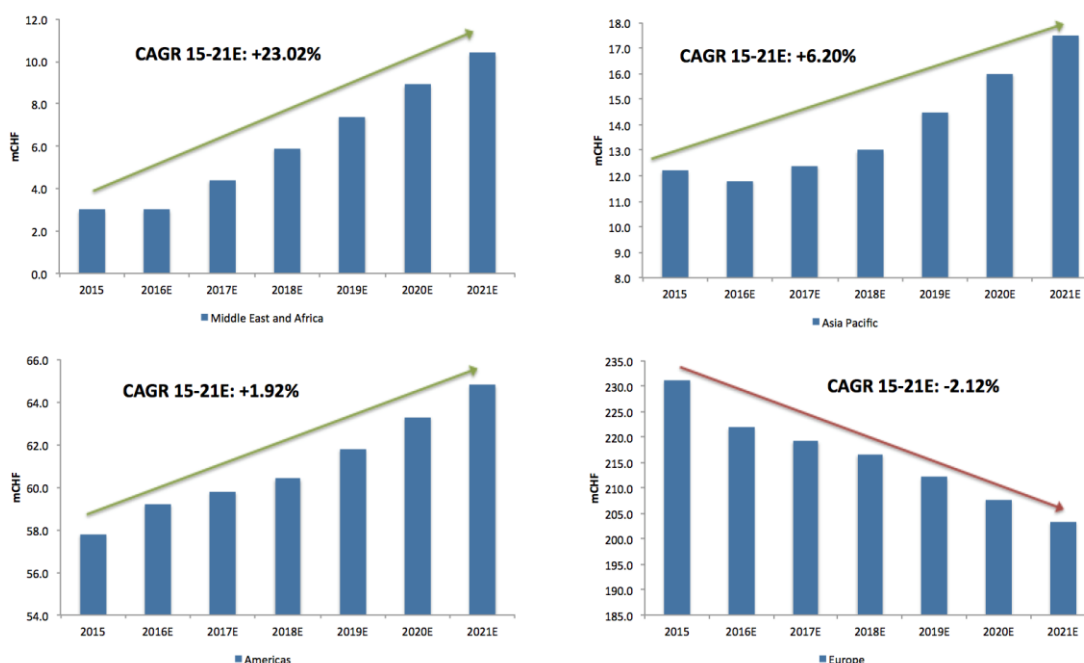
Source: Ascom Annual Reports, Author's assessment

## 1.6. Sales contribution per product group



Source: Ascom Annual Reports, Author's assessment

## 1.7. Forecasts sales in 2015-2021 by region



Source: Ascom Annual Reports, Author's assessment

## Appendix 2: Financial Statements

### 2.1. Income statement projections

(in CHF mn)	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
Revenue	459,7	437,7	410,8	348,7	309,1	323,0	334,2	346,0	354,7
COGS	(232,6)	(210,4)	(204,1)	(177,1)	(153,0)	(156,6)	(158,8)	(160,9)	(161,4)
<b>Gross profit</b>	<b>227,1</b>	<b>227,3</b>	<b>206,7</b>	<b>171,5</b>	<b>156,1</b>	<b>166,3</b>	<b>175,5</b>	<b>185,1</b>	<b>193,3</b>
SG&A	(129,4)	(130,1)	(130,3)	(117,3)	(86,2)	(90,8)	(94,6)	(98,6)	(101,8)
R&D	(41,5)	(40,5)	(43,1)	(39,9)	(24,7)	(25,5)	(26,1)	(26,6)	(27,0)
Other income	3,2	(9,1)	(6,0)	(6,4)	(5,0)	(4,6)	(4,1)	(3,6)	(2,9)
<b>EBITDA</b>	<b>68,3</b>	<b>59,7</b>	<b>39,0</b>	<b>20,6</b>	<b>54,8</b>	<b>62,5</b>	<b>69,2</b>	<b>66,1</b>	<b>72,1</b>
Depreciation	(4,3)	(3,7)	(3,6)	(3,5)	(4,0)	(4,5)	(3,8)	(2,1)	(2,3)
Amortization	(15,7)	(8,4)	(8,1)	(9,1)	(10,7)	(12,5)	(14,7)	(7,6)	(8,2)
<b>EBIT</b>	<b>48,3</b>	<b>47,6</b>	<b>27,3</b>	<b>8,0</b>	<b>40,2</b>	<b>45,5</b>	<b>50,7</b>	<b>56,3</b>	<b>61,6</b>
Interest expense	(6,5)	(3,0)	(2,0)	(1,0)	(0,9)	(0,7)	(0,5)	(0,3)	(0,1)
Interest income	0,5	1,1	6,4	-	0,6	0,6	0,6	0,6	0,6
Other Non Operating (Expense) / Income	-	3,1	0,4	(13,5)	-	-	-	-	-
Net Foreign Exchange (Loss) / Gain	-	-	-	(0,5)	(0,5)	(0,5)	(0,5)	(0,5)	(0,5)
<b>Pre-tax Income</b>	<b>42,3</b>	<b>48,8</b>	<b>32,1</b>	<b>(7,0)</b>	<b>39,4</b>	<b>44,9</b>	<b>50,3</b>	<b>56,1</b>	<b>61,6</b>
Income tax	(4,7)	(11,3)	(7,8)	1,7	(9,5)	(10,8)	(12,1)	(13,5)	(14,8)
<b>Net Income before Extra-ordinary/One-off adjustments</b>	<b>37,6</b>	<b>37,5</b>	<b>24,3</b>	<b>(5,3)</b>	<b>29,9</b>	<b>34,1</b>	<b>38,3</b>	<b>42,6</b>	<b>46,8</b>
Extra-ordinary/One-off adjustments	-	(7,1)	-	(145,0)	-	-	-	-	-
<b>Net Income (Including goodwill)</b>	<b>37,6</b>	<b>30,4</b>	<b>24,3</b>	<b>(150,3)</b>	<b>29,9</b>	<b>34,1</b>	<b>38,3</b>	<b>42,6</b>	<b>46,8</b>

Source: Ascom Annual Reports, Author's assessment

### 2.2. Income statement assumptions

Income Statement - Assumptions	
Revenue	Incremental increase towards perpetual incoming orders growth rate and order backlog
COGS	Related to gross profit margin. Gross profit margin is slowly increasing in time as we expect profitability to improve after the restructuring of the company
<b>Gross profit</b>	<b>Revenues-COGS</b>
SG&A	Related to percentage of sales, increasing by 0.2% a year as of 2017
R&D	Related to percentage sales, we keep the 9% from 1H2016 for 2H2016E, 8% for 2017 and decaying by 0.1% since
Other income	Related to percentage of sales ( 2% in 2016 gradually decaying to 1% in 2021)
<b>EBITDA</b>	<b>Gross profit - SG&amp;A - R&amp;D + Other income</b>
Depreciation	Linear depreciation assuming depreciation period of current CAPEX of 3.6 years and 10 years for future CAPEX
Amortization	Linear amortization assuming amortization period of current intangible of 4 years and 7 years for future intangibles
<b>EBIT</b>	<b>EBITDA - Depreciation - Amortization</b>
Interest income	4% interest on InfoVista loan
Interest expense	Calculated assuming 4% interest on long term debt and 4.5% on short term debt
Other Non Operating (Expense) / Income	CHF 13.5 mio one-off expense related to restructuring
Net Foreign Exchange (Loss) / Gain	Calculated using a constant share of revenue from each currency (Euro, Pound Sterling, US Dollar, Swedish krona) and the average gain/loss of the CHF against these currencies between 2015 and 2016 for the future
<b>Pre-tax Income</b>	<b>EBIT + Interest income - Interest expense + Other Non Operating (Expense) / Income + Net Foreign Exchange (Loss) / Gain</b>
Income tax	Obtained using a tax rate of 24% throughout
<b>net income before Extra-ordinary/One-off adjustments</b>	<b>Pre-tax income - Income tax</b>
Extra-ordinary/One-off adjustments	145 mio CHF Offset of goodwill due to divestment of NT division
<b>Net Income (Including Goodwill)</b>	<b>net income before Extra-ordinary/One-off adjustments - Extra-ordinary/One-off adjustments</b>

Source: Ascom Annual Reports, Author's assessment

### 2.3. Balance sheet projections

(in CHF mn)	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
<b>ASSETS</b>	<b>IFRS</b>	<b>Swiss GAAP</b>	<b>Swiss GAAP</b>						
Cash & Cash Equivalents	58,2	50,2	57,4	73,4	83,6	90,0	99,1	109,6	123,7
Accounts & Notes Receivable	95,5	110,5	101,8	87,9	77,1	79,6	81,5	83,4	84,5
Inventories	24,9	24,8	22,6	20,4	17,2	17,2	17,0	17,2	17,2
Prepaid Expenses + Other Current Assets	42,0	36,9	22,9	20,9	18,5	19,4	20,1	20,8	21,3
<b>Total current assets</b>	<b>220,6</b>	<b>222,4</b>	<b>204,7</b>	<b>202,6</b>	<b>196,4</b>	<b>206,2</b>	<b>217,7</b>	<b>231,0</b>	<b>246,8</b>
Net Property, Plant & Equipment	14,6	15,2	14,4	12,5	13,2	13,6	14,8	16,1	16,1
Net Intangibles / Goodwill	54,1	48,5	40,7	31,9	32,0	32,4	32,8	33,5	33,7
Other Assets	20,0	27,3	26,6	29,1	27,5	28,1	28,5	29,0	29,4
<b>Total non-current assets</b>	<b>88,7</b>	<b>91,0</b>	<b>81,7</b>	<b>73,5</b>	<b>72,7</b>	<b>74,1</b>	<b>76,1</b>	<b>78,6</b>	<b>79,2</b>
<b>Total Assets</b>	<b>309,3</b>	<b>313,4</b>	<b>286,4</b>	<b>276,1</b>	<b>269,1</b>	<b>280,3</b>	<b>293,8</b>	<b>309,5</b>	<b>326,0</b>
<b>LIABILITIES</b>									
Short Term Borrowings	-	-	20,0	-	-	-	-	-	-
Trade payables	24,1	32,9	29,4	25,2	21,4	21,5	21,3	21,2	20,8
Other Current Liabilities	97,4	110,1	83,5	76,7	67,4	69,8	71,5	73,4	74,5
Provisions	8,0	7,1	6,7	8,0	8,0	8,0	8,0	8,0	8,0
<b>Total current liabilities</b>	<b>129,5</b>	<b>150,1</b>	<b>139,6</b>	<b>109,9</b>	<b>96,8</b>	<b>99,2</b>	<b>100,8</b>	<b>102,5</b>	<b>103,3</b>
Long Term Borrowings	61,1	23,1	0,1	25,0	20,0	15,0	10,0	5,0	-
Other Liabilities	27,3	0,5	0,4	7,0	6,2	6,5	6,7	6,9	7,1
Provisions	6,9	31,8	29,6	38,6	38,6	37,5	37,5	37,5	37,5
<b>Total non-current liabilities</b>	<b>95,3</b>	<b>55,4</b>	<b>30,1</b>	<b>70,6</b>	<b>64,8</b>	<b>59,0</b>	<b>54,2</b>	<b>49,4</b>	<b>44,6</b>
Shareholders' Equity	18,2	21,4	30,3	30,3	30,3	30,3	30,3	30,3	30,3
Retained earnings	73,2	86,5	86,4	65,3	77,3	91,8	108,5	127,4	148,2
Minority Interest	-	-	-	-	-	-	-	-	-
<b>Total Liab. &amp; Shareholders' Equity</b>	<b>309,3</b>	<b>313,4</b>	<b>286,4</b>	<b>276,1</b>	<b>269,1</b>	<b>280,3</b>	<b>293,8</b>	<b>309,5</b>	<b>326,0</b>

Source: Ascom Annual Reports, Author's assessment

## 2.4. Balance sheet assumptions

Balance Sheet - Assumptions	
<b>ASSETS</b>	
Cash & Cash Equivalents	Resulting from Cash Flow statement
Accounts & Notes Receivable	Related to Accounts & Notes Receivable as Days of Sales
Inventories	Related to Inventories as Days of COGS
Prepaid Expenses + Other Current Assets	Related to percentage of sales (6%)
<b>Total current assets</b>	<b>Sum of current assets</b>
Net Property, Plant & Equipment	Related to percentage of sales, 25% of PPE sold after NT divestment
Net Intangibles / Goodwill	Related to percentage of sales
Other Assets	Related to percentage of sales (4%) + 15 mn CHF loan to InfoVista related to the NT division sale
<b>Total non-current assets</b>	<b>Sum of non-current assets</b>
<b>Total Assets</b>	<b>Total current + non-current assets</b>
<b>LIABILITIES</b>	
Short Term Borrowings	Total repayment in 2016
Trade payables	Related to Accounts Payable as Days of COGS
Other Current Liabilities	Related to percentage of sales
Provisions	Related to the divestment of NT, amount to CHF 8 mio throughout
<b>Total current liabilities</b>	<b>Sum of current liabilities</b>
Long Term Borrowings	Assuming a drawdown of 20 mn CHF in 2016 and a gradual retirement of 5 mn CHF a year
Other Liabilities	Related to percentage of sales (2%)
Provisions	Additional CHF 9 mio allocated to provisions in 2016 and 2017 then remain constant at CHF 37.5 mio as of 2018
<b>Total non-current liabilities</b>	<b>Sum of non-current liabilities</b>
Shareholders' Equity	Constant across years
Retained earnings	Net income-Dividends-Net Foreign Exchange Loss
Minority Interest	Assumed null
<b>Total Liab. &amp; Shareholders' Equity</b>	<b>Equal to total assets</b>

Source: Ascom Annual Reports, Author's assessment

## 2.5. Cash flow statement projections

(in CHF mn)	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
	IFRS	Swiss GAAP	Swiss GAAP						
<b>Operating Activities</b>									
Net Income:	37.6	37.5	24.3	(5.3)	29.9	34.1	38.3	42.6	46.8
+ Depreciation	4.3	3.7	3.6	3.5	4.0	4.5	3.8	2.1	2.3
+ Amortization	15.7	8.4	8.1	9.1	10.7	12.5	14.7	7.6	8.2
+ Minority Interests	-	-	-	-	-	-	-	-	-
+ Decreases / (Increases) in Working Capital	5.7	4.6	(5.2)	7.2	3.2	(0.9)	(0.7)	(1.2)	(0.9)
<b>Cash Flow from Operations</b>	<b>63.3</b>	<b>54.2</b>	<b>30.8</b>	<b>14.5</b>	<b>47.8</b>	<b>50.2</b>	<b>56.0</b>	<b>51.2</b>	<b>56.4</b>
<b>Investing Activities</b>									
+/- Proceeds/Investment in PP&E	(2.0)	0.9	(4.3)	(5.2)	(4.6)	(4.8)	(5.0)	(3.5)	(2.3)
+/- Proceeds/Investment in Intangibles	(5.8)	(9.2)	(9.0)	(10.5)	(10.8)	(12.9)	(15.0)	(8.3)	(8.5)
+/- Disposals/Acquisitions	(12.2)	1.4	(1.1)	24.3	-	(1.1)	-	-	-
+/- Change in Other Assets	1.6	3.9	1.1	(2.5)	1.6	(0.6)	(0.5)	(0.5)	(0.3)
+/- Change in Other Liabilities	-	-	-	6.6	(0.8)	0.3	0.2	0.2	0.2
<b>Cash Flow from Investing Activities</b>	<b>(18.4)</b>	<b>(3.0)</b>	<b>(13.3)</b>	<b>12.6</b>	<b>(14.7)</b>	<b>(19.1)</b>	<b>(20.3)</b>	<b>(12.0)</b>	<b>(11.0)</b>
<b>Financing Activities</b>									
Issuance / (Retirement) of Short Term Debt	12.7	20.2	30.0	(20.0)	-	-	-	-	-
Issuance / (Retirement) of Long-Term Debt	(55.6)	(60.1)	(33.0)	24.9	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)
Issuance / (Repurchase) of Equity	5.6	2.8	8.7	-	-	-	-	-	-
Dividends <sup>(2)</sup>	(12.2)	(14.0)	(15.8)	(16.1)	(17.7)	(19.5)	(21.4)	(23.6)	(25.9)
<b>Cash Flow from Financing Activities</b>	<b>(49.5)</b>	<b>(51.1)</b>	<b>(10.1)</b>	<b>(11.2)</b>	<b>(22.7)</b>	<b>(24.5)</b>	<b>(26.4)</b>	<b>(28.6)</b>	<b>(30.9)</b>
<b>Cash Balances</b>									
Beginning Cash Balance	63.1	58.2	50.2	57.8	73.4	83.6	90.0	99.1	109.6
Net Change in Cash	(4.6)	0.1	10.3	15.9	10.4	6.6	9.3	10.6	14.4
+/- Foreign currency translation differences on cash and cash equivalents	(0.3)	(0.4)	(2.7)	(0.3)	(0.2)	(0.1)	(0.2)	(0.2)	(0.3)
<b>Ending Cash Balance</b>	<b>58.2</b>	<b>57.9</b>	<b>57.8</b>	<b>73.4</b>	<b>83.6</b>	<b>90.0</b>	<b>99.1</b>	<b>109.6</b>	<b>123.7</b>
<b>Unlevered Free Cash Flow Calculation</b>									
Cash Flow from Operations	63.3	54.2	30.8	14.5	47.8	50.2	56.0	51.2	56.4
+ After Tax Net Interest Expense / (Income)	5.8	2.3	1.5	0.7	0.7	0.5	0.4	0.2	0.1
- Capital Expenditure	(20.0)	(6.9)	(14.4)	8.6	(15.5)	(18.9)	(20.1)	(11.8)	(10.8)
<b>Unlevered Free Cash Flow</b>	<b>49.1</b>	<b>49.6</b>	<b>17.9</b>	<b>23.8</b>	<b>33.0</b>	<b>31.9</b>	<b>36.3</b>	<b>39.7</b>	<b>45.6</b>
FCFE	0.4	7.4	13.4	27.9	27.4	26.3	31.0	34.5	40.5

Source: Ascom Annual Reports, Author's assessment

## 2.6. Cash flow statement assumptions

Cash Flow Statement - Assumptions	
Cash Flow	Cash Flow calculated given assumptions of income statement and balance sheet
CAPEX	The purchase of PPE and intangible are related to a percentage of sales + \$30 mio from NT divestment
Dividends	Dividends are expected to grow 10 % annually

Source: Ascom Annual Reports, Author's assessment

## Appendix 3: Financial Analysis

### 3.1. Profitability ratios

Profitability									
	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
Gross profit margin	49,4%	51,9%	50,3%	49,2%	50,5%	51,5%	52,5%	53,5%	54,5%
EBITDA margin	14,9%	13,6%	9,5%	5,9%	17,7%	19,3%	20,7%	19,1%	20,3%
EBIT margin	10,5%	10,9%	6,6%	2,3%	13,0%	14,1%	15,2%	16,3%	17,4%
Pretax profit margin	9,2%	11,1%	7,8%	-2,0%	12,7%	13,9%	15,1%	16,2%	17,4%
Net profit margin	8,2%	8,6%	5,9%	-1,5%	9,7%	10,6%	11,4%	12,3%	13,2%
Pretax ROA	13,7%	15,6%	11,2%	-2,5%	14,6%	16,0%	17,1%	18,1%	18,9%
ROA	12,2%	12,0%	8,5%	-1,9%	11,1%	12,2%	13,0%	13,8%	14,4%
Pretax ROE	46,3%	45,2%	27,5%	-7,3%	36,6%	36,8%	36,3%	35,6%	34,5%
ROE	41,1%	34,8%	20,8%	-5,6%	27,8%	28,0%	27,6%	27,0%	26,2%
ROIC	33,1%	30,7%	17,1%	5,8%	31,4%	35,2%	38,3%	41,1%	43,9%
EPS (CHF)	1,04	1,04	0,68	-0,15	0,83	0,95	1,06	1,18	1,30

\*Number of outstanding shares: 36mio

Source: Ascom Annual Reports, Author's assessment

### 3.2. Solvency ratios

Solvency									
	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
Debt	61,10	23,10	20,10	25,00	20,00	15,00	10,00	5,00	0,00
Debt ratio	19,8%	7,4%	7,0%	9,1%	7,4%	5,4%	3,4%	1,6%	0,0%
Debt to equity ratio	2,46	1,90	1,45	1,89	1,50	1,30	1,12	0,96	0,83
Net debt / EBITDA	4,2%	-45,4%	-95,6%	-234,9%	-116,0%	-120,1%	-128,8%	-158,3%	-171,6%
Asset to equity	3,61	3,12	2,67	2,65	2,68	2,39	2,20	2,03	1,89
Interest coverage	7,4	15,9	13,7	8,4	44,6	65,0	101,5	187,7	616,1

Source: Ascom Annual Reports, Author's assessment

### 3.3. Efficiency ratios

Liquidity									
	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
Current ratio	1,70	1,48	1,47	1,84	2,03	2,08	2,16	2,25	2,39
Quick ratio	1,51	1,32	1,30	1,66	1,85	1,91	1,99	2,09	2,22
Cash ratio	0,45	0,33	0,41	0,67	0,86	0,91	0,98	1,07	1,20

Source: Ascom Annual Reports, Author's assessment

### 3.4. Dupont decomposition

Dupont Decomposition									
In millions	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
<b>Operating efficiency</b>									
Sales	459,7	437,7	410,8	348,7	309,1	323,0	334,2	346,0	354,7
Net Income	37,6	37,5	24,3	-5,3	29,9	34,1	38,3	42,6	46,8
Profit margin	8,2%	8,6%	5,9%	-1,5%	9,7%	10,6%	11,4%	12,3%	13,2%
<b>Asset use efficiency</b>									
Sales	459,7	437,7	410,8	348,7	309,1	323,0	334,2	346,0	354,7
Average assets	330,0	311,4	299,9	281,2	272,6	274,7	287,0	301,6	317,8
Total asset turnover	1,39	1,41	1,37	1,24	1,13	1,18	1,16	1,15	1,12
<b>Financial leverage</b>									
Average assets	330,0	311,4	299,9	281,2	272,6	274,7	287,0	301,6	317,8
Average equity	91,4	99,7	112,3	106,1	101,6	114,8	130,4	148,3	168,1
Assets / Equity	3,61	3,12	2,67	2,65	2,68	2,39	2,20	2,03	1,89
Return on equity	41,1%	37,6%	21,6%	-5,0%	29,5%	29,7%	29,3%	28,8%	27,8%

\*Total assets 2012: 521.5 - 170.9 (Goodwill) = 350.6 (Reconciliated for Swiss GAAP)

Source: Ascom Annual Reports, Author's assessment



### 3.5. Operating Cycle

Operating cycle									
in millions and days	2013	2014	2015	2016E	2017E	2018E	2019E	2020E	2021E
Cost of goods sold	232,6	210,4	204,1	177,1	153,0	156,6	158,8	160,9	161,4
Average inventory	27,8	24,9	23,7	21,5	18,8	17,2	17,1	17,1	17,2
Inventory turnover	8,4	8,5	8,6	8,2	8,1	9,1	9,3	9,4	9,4
Days in inventory	44	43	42	44	45	40	39	39	39
Net sales	459,7	437,7	410,8	348,7	309,1	323,0	334,2	346,0	354,7
Average receivables	105,0	103,0	106,2	94,8	82,5	78,3	80,6	82,5	84,0
Receivables turnover	4,4	4,2	3,9	3,7	3,7	4,1	4,1	4,2	4,2
Days in accounts receivable	83	86	94	99	97	89	88	87	86
Cost of goods sold	232,6	210,4	204,1	177,1	153,0	156,6	158,8	160,9	161,4
Average payables	23,6	28,5	31,2	27,3	23,3	21,4	21,4	21,2	21,0
Payables turnover	9,9	7,4	6,6	6,5	6,6	7,3	7,4	7,6	7,7
Days in accounts payables	37	49	56	56	56	50	49	48	47
Operating cycle	90	80	81	87	87	79	78	78	78

Source: Ascom Annual Reports, Author's assessment

## Appendix 4: Valuation

### 4.1. Discounted cash-flow method

(in CHF mn)	2016E	2017E	2018E	2019E	2020E	2021E
<b>Operating Activities</b>						
Net Income:	(5.3)	29.9	34.1	38.3	42.6	46.8
+ Depreciation	3.5	4.0	4.5	3.8	2.1	2.3
+ Amortization	9.1	10.7	12.5	14.7	7.6	8.2
+ Minority Interests	-	-	-	-	-	-
+ Decreases / (Increases) in Working Capital	7.2	3.2	(0.9)	(0.7)	(1.2)	(0.9)
<b>Cash Flow from Operations</b>	<b>14.5</b>	<b>47.8</b>	<b>50.2</b>	<b>56.0</b>	<b>51.2</b>	<b>56.4</b>
<b>Investing Activities</b>						
+/- Proceeds/Investment in PP&E	(5.2)	(4.6)	(4.8)	(5.0)	(3.5)	(2.3)
+/- Proceeds/Investment in Intangibles	(10.5)	(10.8)	(12.9)	(15.0)	(8.3)	(8.5)
+/- Disposals/Acquisitions	24.3	-	(1.1)	-	-	-
+/- Change in Other Assets	(2.5)	1.6	(0.6)	(0.5)	(0.5)	(0.3)
+/- Change in Other Liabilities	6.6	(0.8)	0.3	0.2	0.2	0.2
<b>Cash Flow from Investing Activities</b>	<b>12.6</b>	<b>(14.7)</b>	<b>(19.1)</b>	<b>(20.3)</b>	<b>(12.0)</b>	<b>(11.0)</b>
<b>Financing Activities</b>						
Issuance / (Retirement) of Short Term Debt	(20.0)	-	-	-	-	-
Issuance / (Retirement) of Long-Term Debt	24.9	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)
Issuance / (Repurchase) of Equity	-	-	-	-	-	-
Dividends <sup>(2)</sup>	(16.1)	(17.7)	(19.5)	(21.4)	(23.6)	(25.9)
<b>Cash Flow from Financing Activities</b>	<b>(11.2)</b>	<b>(22.7)</b>	<b>(24.5)</b>	<b>(26.4)</b>	<b>(28.6)</b>	<b>(30.9)</b>
<b>Cash Balances</b>						
Beginning Cash Balance	57.8	73.4	83.6	90.0	99.1	109.6
Net Change in Cash	15.9	10.4	6.6	9.3	10.6	14.4
+/- Foreign currency translation differences on cash and cash equivalents	(0.3)	(0.2)	(0.1)	(0.2)	(0.2)	(0.3)
<b>Ending Cash Balance</b>	<b>73.4</b>	<b>83.6</b>	<b>90.0</b>	<b>99.1</b>	<b>109.6</b>	<b>123.7</b>
<b>Unlevered Free Cash Flow Calculation</b>						
Cash Flow from Operations	14.5	47.8	50.2	56.0	51.2	56.4
+ After Tax Net Interest Expense / (Income)	0.7	0.7	0.5	0.4	0.2	0.1
- Capital Expenditure	8.6	(15.5)	(18.9)	(20.1)	(11.8)	(10.8)
<b>Unlevered Free Cash Flow</b>	<b>23.8</b>	<b>33.0</b>	<b>31.9</b>	<b>36.3</b>	<b>39.7</b>	<b>45.6</b>
Discount Factor	93.0%	86.5%	80.5%	74.8%	69.5%	64.6%
<b>Discounted Free Cash Flow</b>	<b>22.1</b>	<b>28.6</b>	<b>25.6</b>	<b>27.2</b>	<b>27.6</b>	<b>29.5</b>

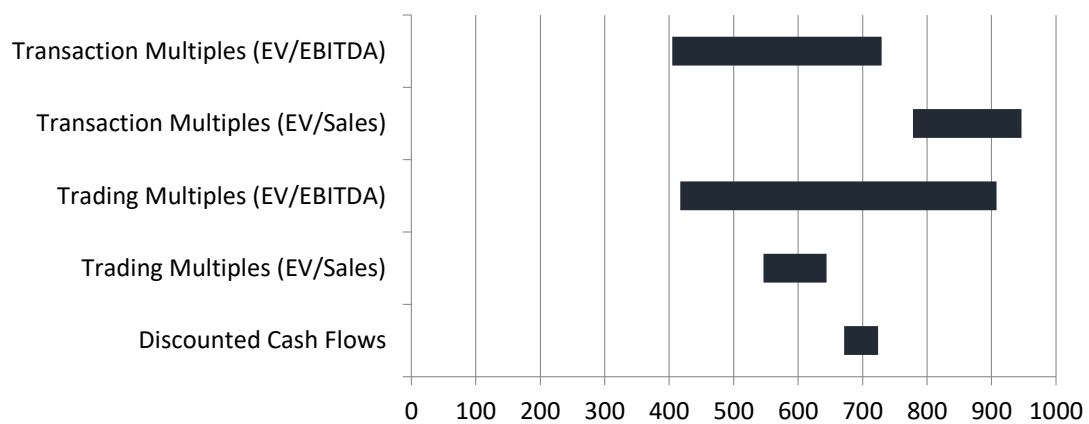
Source: Ascom Annual Reports, Author's assessment

## 4.2. WACC analysis

	2016E	2017E	2018E	2019E	2020E	2021E
<b>Cost of Equity</b>						
10Y Swiss Government Bonds/Risk-free Rate	(0.1%)	(0.1%)	(0.1%)	(0.1%)	(0.1%)	(0.1%)
10Y Sovereign CDS	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%
Implied Equity Risk Premium:	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%
Earnings growth rate	-	4.5%	4.5%	3.5%	3.5%	2.5%
DPS	0.45	0.49	0.54	0.60	0.65	0.72
Stock Price	17.2					
Cost of Equity	7.6%	7.6%	7.6%	7.6%	7.6%	7.6%
<b>Cost of Debt</b>						
Weighted Average Cost of Debt	4.2%	4.0%	4.0%	4.0%	4.0%	4.0%
Effective Tax Rate	24.0%	24.0%	24.0%	24.0%	24.0%	24.0%
After Tax Cost of Debt <sup>(2)</sup>	3.2%	3.0%	3.0%	3.0%	3.0%	3.0%
<b>Capitalization</b>						
Total Equity (Market Value)	724.0	779.2	838.7	902.6	971.4	1 045.5
Total Debt (Book Value)	25.0	20.0	15.0	10.0	5.0	0.0
Equity Weight	96.7%	97.5%	98.2%	98.9%	99.5%	100.0%
Debt Weight	3.3%	2.5%	1.8%	1.1%	0.5%	0.0%
<b>WACC</b>	<b>7.5%</b>	<b>7.5%</b>	<b>7.5%</b>	<b>7.6%</b>	<b>7.6%</b>	<b>7.6%</b>

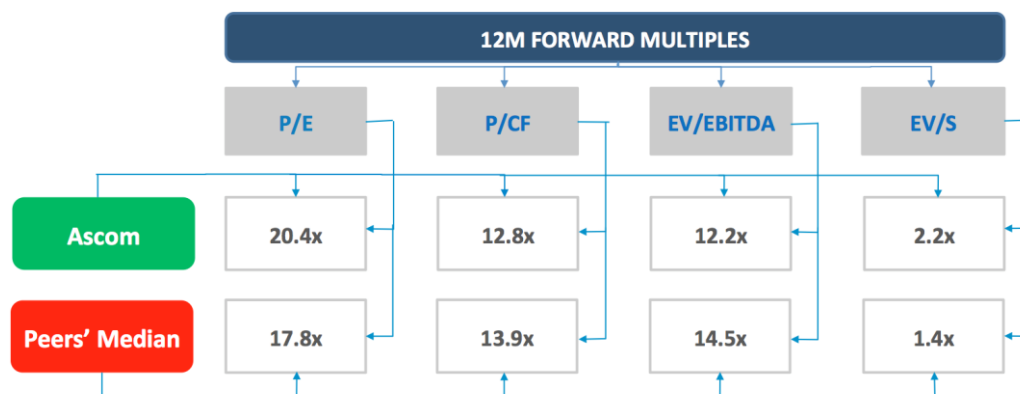
Source: Reuters, Author's assessment

## 4.3. Summary chart of the different methods used for valuation



Source: Author's assessment

## 4.4. Comparative ratios between Ascom and its peers for the valuation



Source: Reuters, Author's assessment

## Appendix 5: Factors in making investment decisions

High (●) >50%; Med (◆) >30%<50%;Low (○) <30%

Factor	Frequency
Size	●
P/B	●
P/FCF	◆
Share Repurchase	◆
Earnings Estimate Revision	◆
Margins	◆
Relative Strength	◆
EPS Momentum	◆
D/E	◆
EPS Variability	◆
DDM/DCF	◆
PEG	◆
Long-Term Price Trend	◆
P/CF	◆
Analyst Neglect	◆
Dividend Growth	◆
Projected 5-Year EPS Growth	◆
Mean Reversion	◆
Normalized P/E	◆
P/S	◆
Net Debt/EBITDA	○
EPS Surprise	○
ROC	○
ROA	○
EPS Estimate Dispersion	○
Analyst Rating Revisions	○
Foreign Exposure	○
Long-term Price Trend/Short-Term Reversal	○
Trading Volume	○
Price Target	○
Ownership	○
Short-Term Price Trend	○
EV/Sales	○
Low Price	○
Altman Z-Score	○
Equity Duration	○

Source: BofA Merrill Lynch Institutional Factor Surveys 2015