Ca' Foscari
University
of Venice

DEPARTMENT OF ECONOMICS

Second Cycle Degree programme in

Economics and Finance

Final Thesis

The valuation practices and target price accuracy in pharmaceutical sector. Case study: Recordati.

Supervisor
Ch. Prof. Enrico Maria Cervellati

Assistant supervisor
Ch. Prof. Ugo Rigoni

Graudand
Yauheniya Klemantovich
Matriculation Number 861069

Accademic Year
2016/2017

CONTENTS

I. Introduction

This thesis aims to examine the peculiarities regarding the valuations of pharmaceutical companies in the equity reports issued by sell-side analysts. We want to verify whether the valuation techniques suggested by the theory and those used in practice coincide.

We classify all the valuation techniques in three categories: based on fundamentals of the company (DCF, DDM and so on), on company's market multiples (market ratios approach) and the hybrid ones (e.g., real option). We want to identify the valuation methods that perform better in terms of price accuracy (that is considered a quantitative indicator of the quality of an equity research) and understand the rational standing behind such a choice. Though, we want to find not only the dominant category of valuation methods, but also the prevalent valuation method within each of three categories. Moreover, we wonder whether the usage of only one dominant valuation approach is superior with respect to the case when the target price is obtained as a mix of two or more valuation procedures.

The research in concentrated on Recordati, an international pharmaceutical group headquartered in Milan, dedicated to the research, development, manufacturing and marketing of drugs. It has been listed in the Italian stock market since 1984 and at the moment it is the only pharma company listed in the Italian market. We collected a sample of 54 equity reports on Recordati from 2015 to 2016. To identify the valuation techniques used by analysts the content analysis of each single report was performed. Such an approach permits to sign not only the quantitative information, as target price, earning forecast, etcetera, but also the information of qualitative nature. The content analysis conducted includes reading carefully each sampled report, recording the frequency with which each model appears with a scope of conducting statistical analysis on collected information.

The importance of the equity research is well known. The reports are issued by equity analysts, which principal goal is to give an investment recommendation on the security. Valentine (2011) so defines the five primary areas of the equity research analyst's role:

1) identifying and monitoring critical factors,

2) creating and updating financial forecasts,

3) deriving price targets or a range of targets,

4) making stock recommendations,

5) communicating stock ideas.

We can divide equity analysts in two groups, on the basis of company that employs them and the people for whom they make their recommendations, in sell-side and buy-side analysts. The former group, works for brokerage houses and provides equity reports for their clients. Their profit is based on the brokerage commissions, which takes place every time a client purchases the stocks, generating a higher trading volume. Sell-side equity analysts typically work within one or few industries, in order to develop an expertise, monitoring the companies of interest on on-going basis. The fact that sell-side equity analysts issue reports for their clients, explains the fact that the reports are almost impossible to find in free access, unless one doesn't have an access to the platform, providing analytics, which is usually subject to the payment of the annual fee. However, in Italy, unlike the other countries, regulation 11971 issued by Consob states that all the research reports on the companies listed in the Italian market should be transmitted to the Italian Stock Exchange and to CONSOB on the date the report is issued for an immediate publication (art.69). The exception is made for research that was privately produced for financial institutions and special clients. In the last case, in order to safeguard the interests of this category of investors, the deferment between the date of issue of new report and its publication on-line on the web site of Borsa Italiana is set.

The buy-side equity research analyst typically works for an investment management company that manages pension funds, mutual funds, hedge funds or venture capital funds.[1] They are characterized by a broader focus with respect to the previous group, providing portfolio managers with the best performing securities for the fund.

Equity report is usually structured in a certain way, and should cover the main issues regarding the company to be analyzed. The basic information should contain a brief description of the company and the industry in which it operates, an investment recommendation, information about the liquidity of the stock and main shareholders. The investment summary, apart from the description of the latest and most relevant company's developments, should contain a clear explanation of the investment

[1] https://www.researchoptimus.com/blog/the-role-of-equity-research-analyst/.

recommendations. Explanation of the reasons why the market is mispricing the stock is essential. The final users should be able to make an idea of what are the catalysts that will drive the stock price and what will be the direction of that movement. Business description requires a profound understanding of the company, its strategy and business model, main products or services provided, the geographical area covered by it, key success factors and growth drivers. It is frequent to observe the usage of such instruments as canvass business model, SWOT analysis or BCG matrix.

The third section takes name "industry overview and competitive positioning" and discusses: the main features and trends of the industry; regulation and legal issues if present; whether the industry is fragmented or concentrated in the hands of few big players. Porter's five forces analysis can be a simple way to assess the dimensions such as the treat of new entrance, the bargaining power of suppliers and buyers, treat of substitutes and competitive rivalry.

Industry overview is followed by the financial analysis. It presupposes a careful study of the historical performance, as well as the projections of the future performance. Analyst should be cautious while they carry out a financial analysis, paying attention on the aspects that may distort a firm's financial results. This section provides the output for the valuation, and all the assumptions that stand behind the forecasts must be explained.

Valuation section explains how the implied value of the company was derived. It can be based on the fundamental analysis, as for example DCF or DDM, or on the relative evaluations, using an industry specific multiples. In the last case, the rationale behind the peer selection should be described. In some cases, the final target price can be a weighted average of the prices obtained with two or more models. Montecarlo simulation on target price can be performed, to obtain the probabilities of having a certain price. Varying inputs of the valuations, such as cost of capital for example, sensitivity analysis is obtained, giving the idea of how the price will vary in case of a change in the estimated variables.

The final section lists the investment risks, associated with the company. Typically, the risks are divided in different categories according to their nature, such as strategical, operational, legal or others. The risks are generally difficult to quantify, though they are

object of subjective judgement of the analyst, and usually there is no description of the impact of the certain risk on the target price.

The content of the report will depend also on its type. Usually a distinction between initiating coverage, sector reports, company update and company note is made. All these types of reports differ slightly as they pursue different aims, so the content will vary in the function of the scope of the analyst.

The number of research papers on evaluation techniques is limited, and this is explained mainly by the fact that equity reports are not freely accessible. However, most of the time the papers are concentrated on the market reactions on earnings forecasts, financial analysts impact on stock volatility, or simply the differences between different sectors.

Gleason, Johnson and Li (2006) provide little evidence of that the target price superiority can be traced to the use of more rigorous valuation approach. Also the research by Cavezzali and Rigoni (2011) gains similar result, failing to find a significant differences in the performance of approaches based on the fundamentals of the company compared to those based on market multiples.

The results obtained by Demirakos et al. (2009) are ambiguous and vary in function of how the target price accuracy is measured, describing however the evidence that analysts prefer DCF to PE models when the face a more challenging valuation cases. These are only few papers regarding the target price accuracy, though we'll come back to the analysis of the prior research in these field in the following chapters. This work aims to provide a new empirical evidence, with particular regard to the pharmaceutical sector.

The thesis is structured in the following way: Chapter 2 discusses the prior research on the valuation methods and provides a theoretical framework for the valuation of pharmaceutical companies; Chapter 3 presents the exhaustive description of Recordati, underlying all the relevant characteristics of the company which may affect the way it is evaluated by equity analysts; Chapter 4 produces the research design and hypothesis statement, Chapter 5 reports the data collection and the descriptive analysis of the data, and Chapter 6 comments the empirical results and its interpretation.

II. Theoretical framework of valuation techniques in pharmaceutical sector.

2.1. Prior research coverage

Financial literature dedicates a lot of attention to the description of variety of techniques, which equity analysts can use for the valuation of the companies. Traditionally, we distinguish between valuation methods based on fundamentals of the company and valuation methods based on company's market multiples. It's a common suggestion that multiperiod valuation methods, as DCF, should be preferable to those of single period comparatives. However, the right choice of the valuation approach is not trivial, and is a function of different variables, such as:

1) the industry in which the company operates,
2) overall economic conditions (we expect a less frequent recourse to the market multiples in the periods of, for example markets bubbles, when the market is not efficient, and though multiples are not reliable)
3) broker (the choice of a certain valuation approach can be driven by the expertise and competences of an analyst).

Empirical studies conducted in field of valuation, put in evidence the fact that real life practices and theory do not always coincide. The first serious obstacle in the research regarding the valuation methods is a non disclosure of valuation approaches in equity reports. Bertinetti, Cavezzali and Rigoni (2006) performed a content analysis of more then 4000 reports on companies listed in the Italian market and found out than in 70% of cases it is not possible to individuate the evaluation method used by the analysts. This surprising finding, in their opinion, is explained by the reputation effect: investors trust the recommendation on price because of the reliability of the investment house even in the absence of explicit description of the evaluation technique.

Barker research (1999), based on interviews and surveys, points out that P/E ratio is of primary importance, while DCF models are of little practical application. Bradshow (2002) make a distinction between the valuation techniques used for positive recommendations and negative ones. In first case the recourse to P/E ratio and expected growth are more common, while the deep study of fundamentals is more likely to be used to justify a SELL recommendation.

Some of the research generate rather contradictory results. The paper published by Copeland in 2000 suggests that single period comparative valuation techniques are too simplified, and though lead to less accurate valuations.

Cavezzali (2010) instead states that "methods based on company fundamentals and those based on market multiples lead to similar levels of accuracy", inviting however the usage of combination of different techniques to obtain a target price.

Majority of the studies doesn't focus on specific industries, and even rarer explore the pharmaceutical sector. Two main papers with reference to pharmaceutical sector were published by Papadopoulou (2006) and Demirakos, Strong, Walker (2014). The first one is concentrated on the comparison of banking and pharmaceutical industries, conducting a content analyzes of a total of 141 reports (75 in banking and 66 in pharma sector). It finds out that 11 different valuation methodologies are used for assessment of pharma companies. There is a big contrast between two industries, in particular 47% of reports on pharmaceutical companies doesn't contain valuation by relative models, the number which is much higher than those for banking sector (only in 5.3%). Evaluating the dominant techniques, DCF turns to be slightly preferable to the earning multiples.

The second paper represents a content analysis of UK sell-side analysts' reports across three different industries (beverage, pharmaceutical and electronics). The choice of the valuation methods is driven by the differences in the fundamentals between different sectors, as well as issues regarding accounting (Demirakos), so one size doesn't fit all. It is evident that there arw a substantial differences across industries, including different sales growth, volatility of earnings and very different levels of investment in R&D.

The multiple approach is well suited for companies with uniform and stable revenue growth, like electronics for example, while it is not likely to gain reliable results for pharmaceutical industry. However, we see that in 30 reports out of 38 (Table 1) there is a recourse to earning multiples in pharma industry. Further investigation though emphasize that in 69.2% of cases the multiperiod valuation models where used as a dominant technique for defining a target price of pharmaceutical companies, compared to 23.1% in beverages. Analysis of all sectors gains completely different results: P/E multiples are dominant in 53.4% of cases, with only 20.7% for DCF application. The differences detected underline the importance of analyzing separately each industry to

avoid misguiding conclusions. The results obtained in this research papers evidence that dynamics of different sectors can't be neglected when we want to evaluate a company, and though the need of tailored methodologies arises.

Table 1. Valuation Models Employed in Analysts' Reports on pharmaceutical industry.

	Number of reports (Total=38)	% of total
Single-period Comparative Valuation Models		
Earnings multiples	30	**79.0%**
Sales multiples	16	**42.1%**
Price-to-book value	-	**-**
Price to assets	-	**-**
Price to cash flow	2	**5.3%**
Dividend yield	1	**2.6%**
Enterprise value to R&D	1	**2.6%**
Rating to economic profit	1	**2.6%**
Hybrid Valuation models		
Accounting rate of return	1	**2.6%**
Cash recovery rate	1	**2.6%**
Economic value added	-	**-**
Option pricing models	4	**10.5%**
Multi-period Valuation Models		
DCF	13	**34.2%**
Residual income valuation	-	**1.0%**
Other	5	**13.2%**

Source: **Accounting Horizons, December 2004**

Another consideration regards the large proportion of intangible assets to the total of all the assets in pharma companies. According to Lev (2001) accounting is rather weak in valuing intangible assets, so we expect accounting measures of performance to be less relevant for pharmaceutical companies.

All above listed considerations are not exhaustive. It seems that there is a tendency in application of valuation techniques depending on whether the potential clients are familiar with them.

The interest of the researches doesn't stop on the identification of the prevalent valuation technique, but goes further, trying to explore the reaction of the market to

the earning forecasts or release of the target price (measuring the abnormal returns); evaluate the connection between the accuracy of the target price and the valuation method applied; or even to investigate whether the geographical proximity of financial analysts to the hubs of information can have an impact on forecasting accuracy (Cavezzali, Crepaldi, Rigoni, 2013) and many others.

The aim of this thesis is to measure how well different models perform in terms of predictably of a future stock price of a share. It's not enough to individuate the prevalent method, but to find a measurable and though quantitative indicator of the quality of an equity research. One way to do it is to look at the accuracy of the target price, which however, can be measured in some different ways (look chapter 4 for further details).

Studying the accuracy of the target price is relevant for some reasons. Firstly, the target price is the measure of the potential changes in the value of the underlying security. The awareness of the quality of analyst's research is used to be a valuable information for investors. Secondly, it can be a useful tool to define the determinants of the target prices in order to improve the pricing efficiency.

Bonini, Bianchini, Zanetti, Salvi (2010) in their paper "Target Price Accuracy in Equity Research" find out that equity research is biased, prediction errors are consistent and autocorrelated. The forecast errors are particularly accentuated for large companies and for firms generating losses.

Another important contribute to the research in this field was done by Asquith, Mikhail, Au (2003). Analyzing the information content of equity analyst reports they also measured the accuracy of the target prices contained in it. The accuracy of the target price was related to the achievement of the stock price the target level at any time during the forecast period, which generally equals 12 months. Using the definition of the accuracy described above 54% of price targets were achieved, out of the sample of 1126 full-texts reports. The level of accuracy was negatively associated with the forecasted increase in price: for target prices 0-10% higher than the stock price at the moment of report issue the target price was reached in 74,4% of cases; the range form 10-20% corresponds to 59,6% accurate predictions. Moreover, earning multiples were used in 99% of reports, followed by assets multiples and finally DCF (12% of cases). Accuracy levels in reports where revenues multiples were the prevailing valuation technique slightly overperform those with DCF, with 55,1% and 52,3% respectively.

The paper “Do analysts’ cash flow forecasts improve the accuracy of their target prices?” by Hashim, Strong (2016) described the result of testing three hypothesis: a) whether cash flows forecast have relevance for target price valuations, b) whether target price accuracy increases with the quality of the cash flow forecasts, c)whether the improvement in the accuracy of TP is higher for firms which are more challenging to evaluate. All of them seem to be satisfied, confirming that forecasts are useful for analyst valuations and their quality is reflected in the price accuracy.

Kerl (2011) states that on one hand, target price is negatively related to the analyst specific optimism and stock specific risk, while on other hand they are positively related to the level of detail of the report, company size and reputation of investment bank.

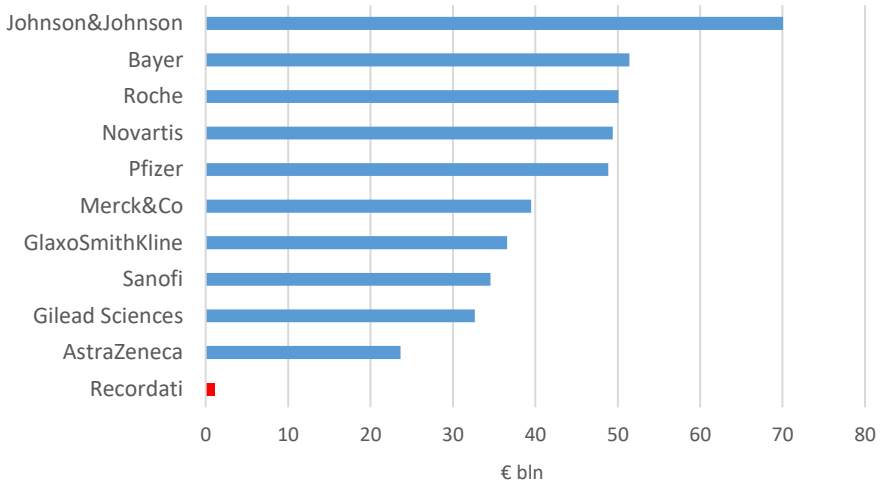
In the following chapters will analyze in more details the theoretical suggestions regarding the choice of the valuation methodology in pharmaceutical industry, deepen the peculiarities characterizing this sector and the rationale behind it.

2.2. Pharmaceutical industry highlights.

The pharmaceutical industry has current worldwide sales amounting to €715.9 bln (at ex-factory prices, 2015), which is expected to reach €1120 bln in 2022 (CAGR of 6.24% in 2016-2022). The new wave of innovative therapies approved by regulators in the last three years and the transformation of the pharmaceutical R&D model, based on more focused clinical development programs, but also closer collaborations among labs and manufacturers, will be the core engines behind this growth trend. Worldwide pharmaceutical R&D expense totaled $149.8 bln in 2015 and is forecasted to reach $182 bln in 2022 (CAGR of 2.8% in 2015-22), with expected productivity advancements. North America (US & Canada) remains the world’s largest market, with a 48.7% share, well ahead of Europe (22.2%) and Japan (8.1%), although emerging economies such as Brazil, China and India are experiencing rapid growth.

The pharmaceutical industry is rather fragmented: the leading 10 players (Table 2) enjoy single digit market share totaling about 30%, and 65% of total prescription revenues derives from the top 20 companies (Source: EvaluatePharma, 2015).

Table 2. Top Pharmaceutical Players by Revenues (2015)



***Source*: personal elaboration**

The competitive landscape is made up of relatively few "big pharmas", competing for R&D resources and operating on large economies of scale, thus concentrating on large markets and market segments. A high consolidation rate is evident: big players tend to acquire small labs and independent biotech companies through M&A, to enlarge their product pipeline. Besides the "big pharmas", there are independent specialty pharmaceutical groups such as Recordati, which are smaller in size and usually concentrate on few, often niche areas. The competitive drivers in this industry generally fall into two categories:

1) access to innovation: pharmaceutical players compete for acquiring the resources and capabilities needed to develop new products, mainly through R&D or M&A activities
2) access to the market: pharmaceutical players compete for delivering their drugs to final customers (patients, hospitals, specialists, pharmacies, etc.), by developing their own marketing and distribution networks or by relying on partnerships and licenses.

Pharmaceutical industry is under a strict control of authorities. All the main steps of drugs production beginning from development and ending up with the launch of a new product should respect strict regulatory requirements. As time passes regulations are getting more rigorous, putting constantly pharmaceuticals companies under pressure. Each country has specific policies and mechanisms. In US the system is centralized and

is regulated by the Food and Drug Administration (FDA). In EU we find multiple agencies such as the European medicines agency (EMA), the Committee for medicinal products for Human Use (CHMP), COMP , etc. One registration process is applied for drugs in the US, while in UE there are 2 routes for authorizing medicines: a centralized route and a national route. Better assessment of all dimensions of pharmaceutical industry is summarized in the Table 3, containing Porter five forces analysis.

Table 3. Porter five forces analysis of pharmaceutical industry.

Porter five forces analysis
Threat of new entrance: LOW. Pharma is a highly intensive R&D industry (expenditures totalled $149 bln in 2015), also characterized by necessity to follow many regulation issues and standards imposed by the authority (EMA in EU and FDA in US) in order to enter the market, as well as the presence of the economies of scale. Moreover it is a risky business, the approval process is long, with a very low probability of success (9.6% from phase I to approval). Also patent time is limited (20 years with an option of supplementary protection certificate for other 5 years), followed by the entrance of generic drugs after its expiration (on average 50 days if sales greater than $100 mln, 75 days if sales between $25-100 mln, 200 days if sales between $10-25 mln, 150 days if sales under $10 mln.
Bargaining power of suppliers: LOW. The raw materials in the pharmaceutical industry are commodities, available from a large number of suppliers. Also most of the equipment used in manufacturing and research is available from multiple manufacturers.
Bargaining power of buyers: MEDIUM. While hospitals, large clinical centers and top pharma distributors are the biggest and most important buyers, governments and insurance companies are the most powerful price setters. The capacity to negotiate a fair price for reimbursement with the authorities is a key factor for successful launch of a new product. Often the main strategic drugs of pharmaceutical companies are inserted in the reimbursement lists of the countries, where it is present. It guarantees a certain stability, as authorities are more likely to incentivize generic production rather than cutting reimbursement levels. For orphan drugs like, whose demand is inelastic, buyers have no bargaining power.
Threat of substitutes: MEDIUM/HIGH. A new drug which cures a major health conditions and also has a patent protection is likely to have no substitutes for a certain period of time. But as soon as the patent expires, numerous substitutes in form of a generic drugs priced at significant discounts (50%-70%) to their branded counterparts enter the market causing a substantial decrease in the revenues. Drugs for treatment of rarediseases , are less exposed to the treat of new substitutes. In fact, orphan drugs are a niche segment not attractive to the high volume business of generic focused companies.
Competitive rivalry: HIGH. The pharmaceutical industry is rather fragmented. Smaller or earlier stage companies may prove to be significant competitors, particularly through partnerships with large, established players.

Source: **personal elaboration**

The demand for medicines increases as a consequence of a population growth, ageing, higher average life expectancy and sedentary lifestyle, trends that are expected to be persistent in long term run. World population is expected to increase by 16,45% in 15 years, passing from 7.3 billion in 2015 to 8.5 billion in 2030. In 2010 an estimated 524 mln people were aged 65 or older – 8% of the world's population. By 2050 this number is expected to nearly triple to about 1.5 billion, representing 16% of the world's population.[2] Between 2010 and 2050, the number of older people in less developed

[2] WHO

countries is projected to increase more than 250 percent, compared with a 71 percent increase in developed countries. In the last 50 years life expectancy at birth has increased for about 10 years. In 2015 it was 71,5 years worldwide, while in EU-28 it estimation was even higher, reaching out 80,9 years.

Patients tend to be more informed and to have higher expectations than before, pretending to have better quality for the same price or a lower price for the same quality.

In developed countries where patients are covered by the insurance, they are more likely to use ethical drugs rather than generic ones. The situation changes when we talk about emerging markets, where the preference of generic drugs represents the first treatment option, switching to the patented ones only in case of failure.

Cardiovascular and respiratory diseases, cancer and diabetes are the leading causes of mortality worldwide. Cardiovascular diseases killed 17.5 million people in 2012, that is 3 in every 10 deaths. Of these, 7.4 million people died of ischemic heart disease and 6.7 million from stroke. The portion of communicable disease continue to drop, constituting 32% of total in 2014.

A positive trend in healthcare costs in unsustainable, in the near future a shift towards prevention of disease instead of the treatment ones it occurs can be seen. In this scenario a crucial role will be played by pharma.

2.3. Real option valuation in pharma (emerging valuation technique for high-risk investment projects).

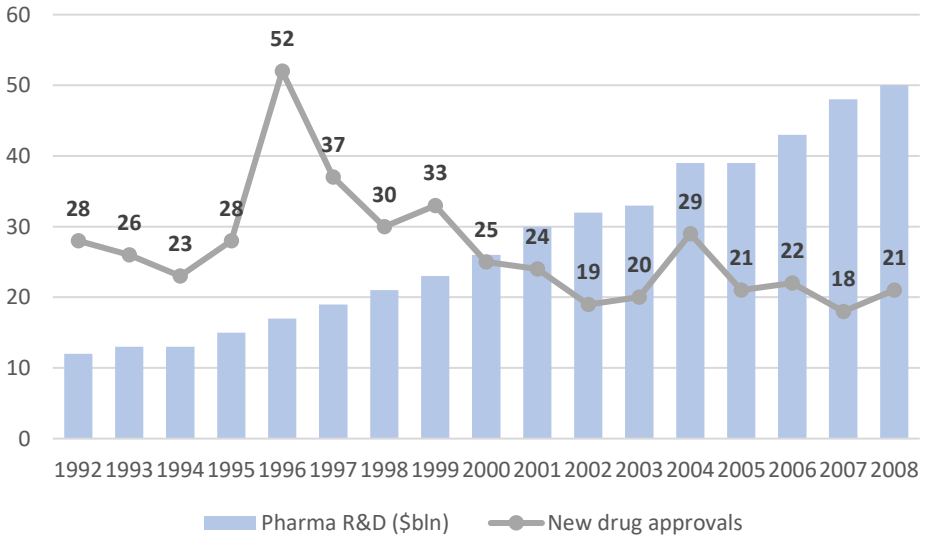
Pharma is used to be a very R&D intensive sector. Worldwide pharmaceutical R&D expenditure totaled $149.8bn in 2015 representing an increase of 4.7% on the previous year. According to EvaluatePharma, R&D spend is expected to grow by 2.8% (2015-22 CAGR) to $182bn in 2022, with an initial period R&D intensity of 19.1% and an ending period intensity of 16.7%. The decomposition by geographical area reveals that the US is the main contributor to the R&D expenditure with $40.737bn, followed by Europe (€30.887bn) and Japan (¥14.953 bn x 100).

In 2015 Pharmaceutical companies spent, on average, about 18% of revenues on research and development (R&D)[3], making the pharmaceutical industry one of the

[3] EvaluatePharma

biggest spenders in this area.[4] The overall average spending on R&D by industrial firms engaged in developing new products is a mere 1.3% of sales revenues. The chemicals sector, one of the larger R&D sectors, spends an average of 2 to 3%. Aerospace and defense firms, although they do a great deal of research and development work, still only dedicate about 4 to 5% of revenues to R&D spending.
A high investment in R&D is not enough to guarantee a successful development and the launch of a new drug. In the Figure 1 we see constantly growing amount of R&D expenditure in pharmaceutical industry, which is not reflected in the number of new drugs approvals, remaining almost flat in the recent years.

Figure 1. Pharma R&D expenditure and the number of new drugs approval



***Source*: EvaluatePharma**

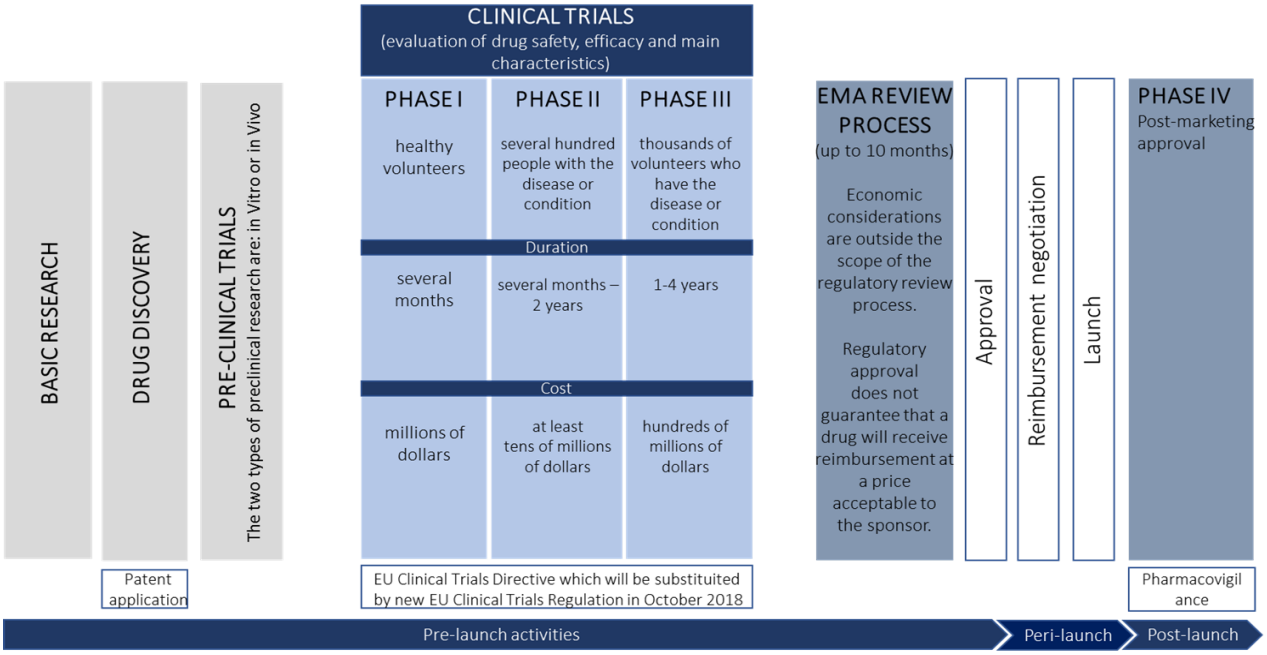
A new drug development is a very long process, consisting of multiple steps (Figure 2), all of which should comply with strict regulation requirements imposed by the competent authorities. Once the drug is discovered, it takes on average 12-13 years to bring the drug to the market. Patent application request is submitted at the moment of a drug discovery, and is valid for 20 years from the date of approval. The longer it takes to pass 3 phases of clinical trials, less time is left for drug to be covered by patent protection and as a consequence less time is left to recover the investment in R&D. The competition imposed by the entrance of generic drugs[5] on the market may have a drastic

[4] Investopedia
[5] Generic drugs are copies of branded pharmaceuticals, containing the same active ingredients and of the same dosage, and having a much lower price w.r.t the original drug.

impact on revenues of companies, who developed and produced the drug, leading to an average of 30% decreases in the first year of patent expiry.

Pre-clinical trials, conducted on animals are followed by 3 phases of trials on humans, all aimed to evaluate the drug candidate safety and efficiency. In case of insertion of new drug in the reimbursement lists, additional 12-16 month are needed for reimbursement negotiations. According to the statistics, the probability of the new drug to pass all the clinical trials equals only 8.7% for primary and specialty care and 25.3% for orphan drugs[6], making the development process extremely risky.

Figure 2. New drug development process.



***Source*: personal elaboration.**

However, the pipeline of a pharma company is essential for long term growth and well-being of the companies. Scherer (2001) find out the presence of the correlation between investment in R&D and gross profits of pharma companies. The limited time of patent protection should be compensated by a constant flow of launches of new products in order to avoid the gaps in pharma revenues. The most effective strategy consists in trying to match the patents expiry with the launces of new products. The pyramidal

[6] Drugs for treatment of rare diseases. According to the definition of rare disease in EU, it's a disease that affects less then 5 persons out of 10 000, while in US it is defined as diseases that affect less then 200 000 of population.

structure of the pipeline (when number of products in the Clinical phase I is higher than the one in the Clinical phase II, and product candidates in Clinical phase II are more w.r.t the third phase) is the most preferred one. Equity analysts should be able to evaluate correctly the company pipeline to arrive at reasonable target price.

Real options can be a suitable tool to capture the underlying value of R&D. According to Ashok Banarjee (2003), application of real options for valuation of research products improves substantially the valuation and performs much better than the cash flow methods.

However, there are very few empirical studies on application of real options techniques used for valuation purposes. One of the most important studies was conducted in 2006 by Hartmann and Hassan, who collected information thanks to the survey based on questionnaire addressed to the investment banks, auditors and consultancies. In the Table 4 we see the summary of the obtained results. The clear dominance of NPV method can be observed in all R&D stages, but also in the company evaluation. However, the usage of real option analysis (ROA) is on its peak during pre-clinic and clinical phase I. ROA has a status of auxiliary method.

The same study reports that in 2004 about 33% of financial analysists have known ROA only be name, and only 11% were able to apply a real option pricing in a correct way.

The results described before are based on 28 questionnaires, and though may not be statistically significant for the whole pharmaceutical sector. Furthermore, it may be the case that 10 years ahead from the latest research the thing could change.

The value of the pharmaceutical company can be seen as a summation of two parts: estimated cash flow deriving from existing products and cash flow from products in pipeline, yet in development. The standard valuation approaches, like DCF, doesn't capture the second components of company's value. Dixit and Pindyck (1995) state that "the conventional NPV-Rule for capital budgeting only yields the same results as real option analysis when market and technology uncertainty tend to zero and the investment that is required for market introduction of the newly developed product is reversible."

We define an option as a right to sell or to buy an asset at a fixed price, called strike price, at a certain time in the future. It is not always the case that the underlying of the

option is a traded financial asset, but it may also be a real asset, like an investment project, and in this case we talk about real options.

Table 4. Evaluation methods in the capital market service section (ENPV – Expected Net Present Value, DCF – Discounted Cash Flow, EVA – Economic Value Added).

		Valuation methods								
		NPV/ENPV/DCF	ROI/ROE/EVA	Internal rate of return	Scoring model	Real option analysis	Net asset value	Capitalised earnings value	Multiples	Other
R&D stages	Research	73%	9%		36%	**9%**			9%	
	Pre-clinic	64%	9%		36%	**27%**				
	Clinical phase I	85%	15%		15%	**23%**				8%
	Clinical phase II	89%	26%	5%	11%	**16%**	11%		11%	5%
	Clinical phase III	87%	22%	4%	9%	**13%**	9%		22%	4%
	Registration	78%	22%	4%	9%	**9%**	13%		26%	
Company valuation	Early biotech	71%	8%	6%	18%	**18%**	6%	6%	53%	6%
	Young biotech	74%	11%	5%	16%	**16%**	5%	5%	47%	11%
	Old biotech	85%	30%		15%	**15%**	10%	20%	75%	5%
	Small/medium pharma	70%	33%	4%	15%	**11%**	11%	15%	85%	7%
	Big Pharma	81%	38%	8%	15%	**8%**	12%	12%	58%	4%

Source: **Application of real options analysis for pharmaceutical R&D project valuation. Empirical results from a survey.(Marcus Hartmann, Ali Hassan, 2006).**

In pharmaceutical industry real options are mainly used for evaluation of drug candidates at the earliest stages of development. Computing an accurate valuation however is very challenging, as there is a lack of information regarding products in pipeline (it is a commercially sensitive information, not always disclosed by pharma companies) and usually it requires strong assumptions.

The value of the option can be defined by two techniques. First, the so called binominal tree, used for a discrete time and Black and Sholes formula for continuous time. It can be shown that as time becomes extremely short, the results provided by two techniques converge.

The price of the option can be obtained from Black and Sholes formula:

$$C = Se^{-yt}N(d_1) - Ke^{-rt}N(d_2)$$

where $d_1 = \frac{\ln\left(\frac{S}{K}\right)+\left(r-y+\frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}, \quad d_2 = d_1 - \sigma\sqrt{t}$

According to the formula option value depends on six variables: the value, volatility and expected dividends of the underlying assets, the strike price and the life of the option and the level of interest rates. It's essential to understand how to interpret this variables in case of pharmaceutical industry.

Value of the underlying asset

The underlying asset is represented by a product in pipeline. Though its value equals the present value of future cash flows generated by the drug ones it is developed. It is common to consider cash flow generation until the patent expiry. The assumptions on market size, the amount of peak sales have to be made. There is likely to be a substantial amount of estimation error in the cash flow estimates and the present value, however. Rather then being viewed as a problem, this uncertainty should be viewed as a reason why the option has its value (Damodaran,2014).

Strike price (exercise price)

Exercise price is defined as a present value of expected costs of all stages of development of the new drug. In absence of company disclosures, for the investment costs of developing and launching drugs the average data for the certain therapeutic segment for phases II, III, and post-clinical can be used.

Time to maturity

The option expires when the right to the product lapse, in other words it is a number of years from the moment of product commercialization until patent expiry. The investments made after the patent expiry are assumed to have a net present value equal to zero, because of the competition deriving from generic drugs.

Volatility

There are some alternative ways to estimate the volatility of product cash flow. If a similar pharmaceuticals has been already developed in the past (for example drugs belonging to the same therapeutic area), the volatility of its cash flows can be used as a proxy of volatility of the product in pipeline. Otherwise, average volatility of a pharma industry can be used as an estimate.

Dividend yield

Dividend yield is nothing else but a cost of delay in launching the product, computed as the reciprocal of time to maturity. If we have 8 years of patent protection starting from the moment of drug commercialization, the annual cost of delay in its development will be 12.5%, as if revenues were evenly distributed over the patent life.

The correct estimation of all above listed variables seem to be an obstacle for the use of real options. However, it is not even in the top 10 reasons of reluctant usage of real option pricing. The main reasons are perception of ROA as complex, lack of transparency and lack of option price knowledge (Hartmann,Hassan, 2006).

2.4. Fundamental analysis: modelling organic and inorganic growth of pharmaceutical companies.

The fundamental analysis, differently from market multiples approach, requires an original estimates of all relevant items. The capability of providing a reasonable estimates derives from a profound understanding of the industry, the positioning of the company in that industry, main trends and strategical issues, the competitive environment, the risks that the company is facing and many others. The collection of all these information is used to be time consuming but it translates in more precise price estimations, especially in cases when there is no perfectly comparable companies, and thought he usage of market multiples doesn't provide a satisfactory results.

Peanman (2001), subdivides the process of fundamental analysis in 5 steps:

1) Understanding the business
2) Analyzing available information (both accounting and not accounting)
3) Measuring and forecasting the value relevant payoffs
4) Conversion of the forecast to a valuation
5) Trading on the valuation

The peculiarity of the pharmaceutical companies is the fact that the majority of them grow not only organically, but also inorganically. When we talk about organic growth we mean the revenues growth deriving from the sales of drugs developed "in-house", though developed internally by the company. Inorganic growth takes place in cases company makes an acquisition, a trend which was very common in the last decade, comprising both large scale and bolt-on acquisitions. There are two main reasons that induce pharma companies for M&A:

1) Need to plump their pipeline, usually acquiring companies with drugs in late stages of development, avoiding this way high risks of failure of drug development but also saving costs for R&D;
2) Geographic expansion.

DCF is widely used method for valuation. To arrive to the cash flow projections a bottom-up approach is used. The first step is to perform a full financial statement forecast, including items such as revenue, profit margins, tax rates, changes in working-capital accounts and capital spending. [7] The starting point is the forecasting of the drug sales. It should be performed product by product (especially in cases when one drug generates a double digit share of revenues), considering the peak sales, the patent expiry and the erosion upon the expiration, fostered by the generic drugs competition, as well as commercial, regulatory and legal issues. Additionally, in case the geographical breakdown is disclosed, it's preferable to add another dimension to the sales forecast, analyzing the dynamics of a single country or geographic area. Rate of population growth, the average life expectancy, leading causes of mortality and the level of awareness of the patients result in pronounced differences across the countries. Different procedures can be applied to obtain the estimation of revenues. One of them may be the Bayesian Model Averaging, allowing to consider different linear models instead of choosing the single best one. Different linear regressions can be estimated considering key macroeconomic regressors such as healthcare expenditure, ageing population, gross domestic product growth and others. This regressors are country specific, and it permits to consider the geographic exposure of the pharmaceutical companies. In case there is a lack of information available an analysis by groups of products can be done.

In case the company is present in various business segments with pronounced differences in margins or distribution channels having a strong impacts on cost structure it is convenient to perform a valuation by parts. In this case the final price will be given by the sum of prices derived separately for each business segment. To get to separate free cash flows of the two segments, separate assumptions should be made. In particular, modelling G&A expenses and R&D expenses for the two segments taking into

[7] Morningstar Equity Research Methodology, March 6 (2015)

account the different sales and distribution models and the different R&D model and strategy for the two segments.

The differences across business segment lead to different betas characterizing them. Generally pharma business is used to be anticyclical, as demand curve for drugs is rather inelastic, so it not significantly affected by fluctuations in economic cycle. The beta estimation for pharmaceutical industry provided by Damodaran equals 0.8. Thing change when we consider orphan drug segment in particular. Here we talk about beta of around 1.2. Despite the cost of development of orphan drug is lower, the probability of success is higher (25.3% from phase I to approval compared to 8.7% for primary and specialty care) and margins are higher, the problem arises in the phase of patients research. The small number of patients, despite the premium price, creates greater uncertainty in future revenues and though their higher volatility. Clearly different betas lead to different weighted average cost of capital applied as discount rate for the free cash flow.

For the pharmaceutical companies where the M&A activity became a part of expansion strategy, it is essential to model also inorganic growth in order to obtain a reliable target price. In line with the company's M&A strategy, the potential value creation from reinvestment of free cash flow generated over the forecasted years can be estimated. Using the historical acquisition multiples of the company and synergies realized in European specialty pharma/generics acquisitions we derive a value per share from M&A.

2.5. Market ratios: pharma-specific multiples.

According to the research conducted by Giorgia Papadopoulou (2006) on valuation models adopted in sell-side analysts' reports in pharmaceutical industry in UK, 47% of reports did not contain valuation by multiples (Table 5). The most commonly multiples were earning multiples with 43.9% followed be sales multiples (15.1%). We can see that multiple-period valuations are much more popular w.r.t valuation by relative models and hybrid ones. In 40.1% of cases DCF becomes a dominant valuation model, while earning multiples are used as a dominant technique only in 33.3% of cases (Table 6).

Table 5. Valuation Models adopted in sell-side analysts' reports in pharma industry.

Single-period Comparative Valuation Models	
Earnings multiples	**43.9%**
Sales multiples	**15.1%**
Price-to-book value	**-**
Price to assets	**-**
Price to cash flow	**3.0%**
Dividend yield	**-**
Enterprise value to R&D	**1.5%**
Warranted equity valuation	**-**
Hybrid Valuation models	
Accounting rate of return	**1.5%**
Cash recovery rate	**1.5%**
Economic value added	**-**
Option pricing models	**9.0%**
Technology value	**2.0%**
Counting value	**3.0%**
Multi-period Valuation Models	
DCF	**53.0%**
Dividend discount model	**-**
Gordon's growth model	**-**
LEFAC	**-**
Residual income valuation	**1.0%**

***Source*: "An analysis of the valuation practices in the sell-side equity analyst reports regarding the banking and pharmaceutical sectors in UK ", Papadopoulou(2012).**

Table 6. Dominant valuation models.

Single-period Comparative Valuation Models	
Earnings multiples	**33.3%**
Sales multiples	**9.8%**
Price-to-book value	**-**
Dividend yield	**-**
Warranted equity valuation	**-**
Hybrid Valuation models	
Accounting rate of return	**-**
Option pricing models	**9.10%**
Technology value	**3%**
Counting value	**4.50%**
Multi-period Valuation Models	

DCF	**40.10%**
Dividend discount model	**-**
LEFAC	**-**

***Source*: "An analysis of the valuation practices in the sell-side equity analyst reports regarding the banking and pharmaceutical sectors in UK ", Papadopoulou(2012).**

There is a clear evidence of prevalence of earning multiples over other kinds of multiples. How can it be explained? Why multiples like EV/Sales, EV/EBITDA so commonly used in other industries are not suitable for pharmaceutical companies?

There are two mains reasons that negatively affect the recourse to the relative valuation methods. The first one is related to the structural issues of pharma business. The second is due to the heterogeneity of the pharma industry and as a consequence limited comparability of the pharmaceutical companies.

2.5.1. Multiples selection

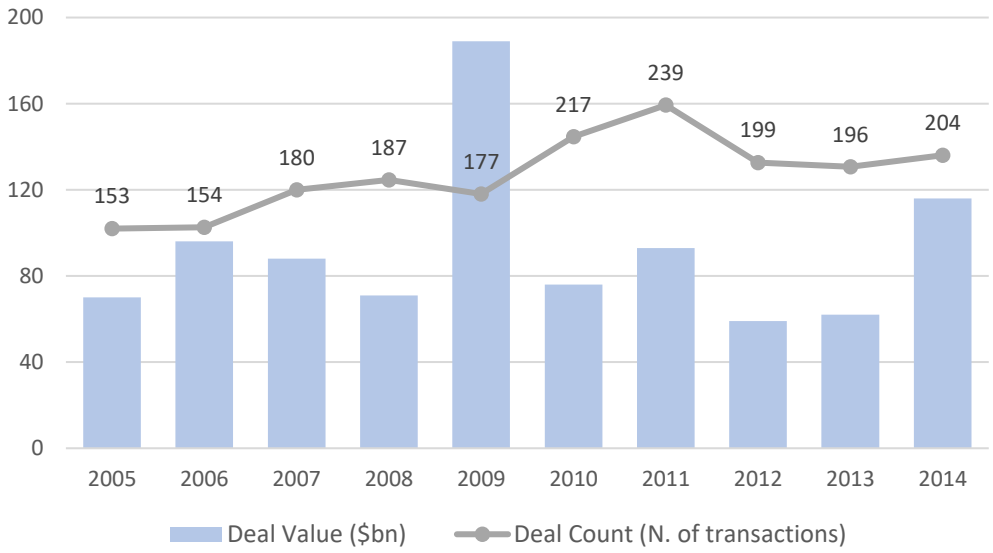
We have already underlined the importance of the pipeline in ensuring a stable revenue growth of pharmaceutical companies. However, internal development of the products in not the only path that can be chosen. Majority of pharma companies frequently use license agreements in order to bolster their pipeline. Usually in-license agreements are obtained at late stages of the development, resulting in lower risk. They presuppose the royalties payment for the drug originator, which is usually expressed as percentage of ex-factory price, and affect the cost structure of the company. Though, the decision on introduction of licensed products represent a tradeoff between having lower margins and saving a substantial amount of money in clinical trials. A company that books substantially all of the sales of the product for which it has rights but pays high royalties doesn't merit the same EV/sales multiple as a company that owns 100% of its assets[8]. Though we expect the limited use of EV/sales multiples in equity reports, subject to the cautious analysis of the comparability of the companies' sales.

Moving forward, seems that EV/EBIT can be a remedy, as it accounts for the differences in margins structure. High levels of amortization and depreciation, however, can distort the multiple. A long track record of large-scale acquisitions usually result in high number

[8] CFA Institute industry guides, "The pharmaceutical industry", Marietta Miemietz, 2013

of intangible assets possessed by the company. In these cases its level of amortization increase substantially, and so the multiple does. M&A operations are not a rare phenomenon in pharma industry, on the contrary, the number of M&A transactions almost doubled from 2005 to 2014 (Figure 3). Though the EV/EBIT multiple should be used with caution, checking carefully the comparability of amortization levels.

Figure 3. Number of pharma M&A deals vs. Total pharma M&A value.



***Source*: EvaluatePharma**

All aspect of operation performance are captured by EV/EBIT multiple. However, we still have to take into consideration different growth perspectives and risk profiles of the companies, as well as taxation levels, which turns out to be below the line.

P/E multiles are generally the most popular metric used to assess relative valuation in pharma industry (Marietta Miemietz, 2013). P/E multiples reflect the market's view of a company's current profitability and future fundamental prospects, with the added advantage of incorporating such nonoperating items as taxes and income from associates. Financial leverage tends to be relatively low in the pharmaceutical industry and is unlikely to distort P/E ratios significantly.

Pharmaceutical companies used to have a low levels of financial leverage. They generate a lot of cash, which is used mainly both for internal financing, but also for M&A transactions. The conservative approach to the financing protects pharma companies from the downgrades by rating agencies, permits to deleverage rather quickly in case

large M&A deals took place and guarantee their solvency in case of unforeseen circumstances.

Table 7. Suitability of Standard Valuation Methodologies for the Pharmaceutical Industry.

Method	Suitability	Commentary
EV/Sales	Low	This multiple does not adequately capture differences in margins that may arise as a result of drug profit sharing between companies.
EV/EBITDA	Medium	This multiple doesn't capture substantial differences "below the line" (e.g., relating to associate income and variations in tax rates).
EV/EBIT	Low	High levels of amortization and depreciation, distort the multiple
P/E	High	This is most widely used multiple; because individual companies' prospects may differ mterially, it requires the user to consider the premium of discount merited by a stock relative to its peer group.

Source: **CFA Institute industry guides, "The pharmaceutical industry", Marietta Miemietz, 2013**

Another important consideration regards the accounting rules. Both GAAP and IFRS, oblige companies to expense the R&D rather than capitalize it. Such a rule creates distortion and inconsistencies when we try to compare different companies. R&D can vary substantially from year to year, depending on the success of the drug development and pipeline strategies of the companies, resulting in pronounced volatility of profits and returns.

If we ignore accounting inconsistencies and use the reported earnings and book values of firms in the computation of multiples, we are likely to find that younger firms or firms

that have R&D with longer gestation periods are overvalued. Their earnings and book value will be understated, leading to much higher PE, EV/EBITDA and book value multiples for these firms.

There are two ways we can incorporate these factors into relative valuation. The first is to capitalize the expenses associated with investing in intangible assets for each firm and to compute consistent measures of earnings and book value to use in multiples. This approach, while yielding the most precision, is also the most time and data intensive. The second is to stick with the reported accounting values for earnings and book value, which controlling for the factors listed above.[9]

2.5.2. Peer group selection

Another challenge in correct application of relative valuation is the selection of peer group. All the literature suggest us the research of companies operating in the same industry with similar growth perspectives, size, business model, geographical breakdown, product portfolio, M&A history and strategic issues regarding R&D investments. But is it feasible to satisfy all this conditions in pharma industry?

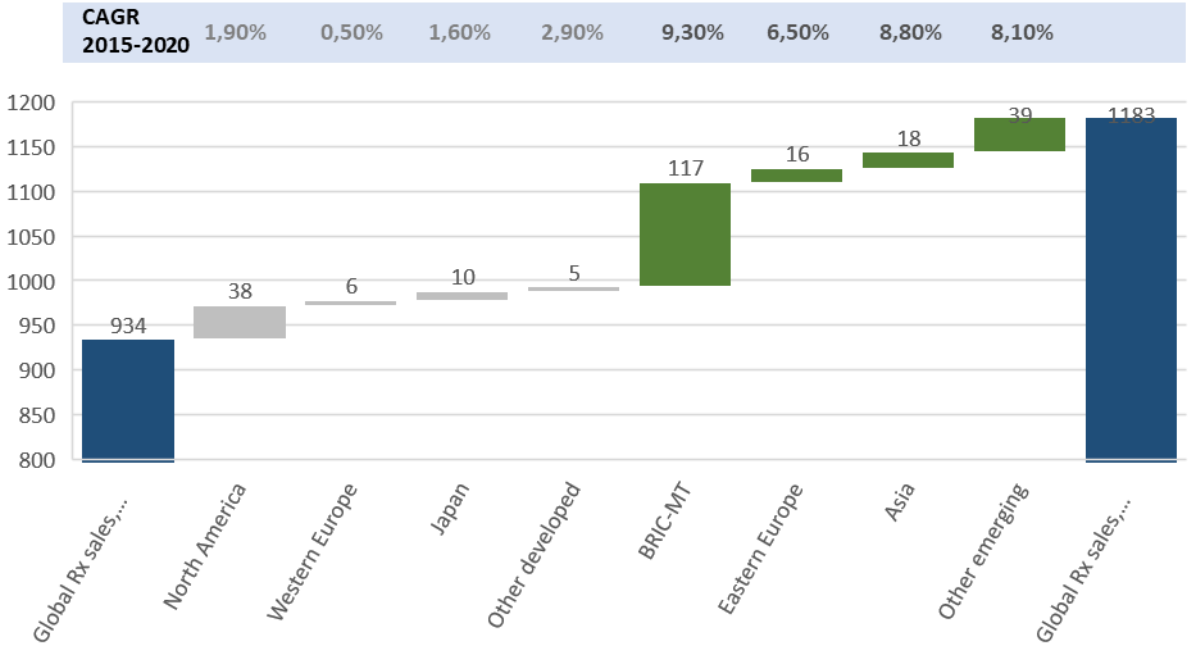
Lets start with business segments and product portfolio. There is a variety of business segments where a company can be engaged: prescription drugs, out of the counter drugs (no need of prescription to purchase it), generics and products for animal health, all of which have very different levels of margins. It is infrequent to find a "pure-payer", indeed in most cases pharma companies diversify their product portfolio, mixing different types of products. In addition usually companies cover different therapeutic areas, like cardiovascular, urology, cancer, gastroenterology and others, each characterized by its own particular dynamics. Companies with fully integrated value chain can be also involved also in the chemical industry. Differences in maturity of the pipeline and patent expiry translate in pronounced differences in expected growth of the companies, but also its risk exposure.

High levels of investment to develop a drug make it problematic to recover the costs sustained commercializing the medicine only in the country where the company is headed. The successful development of the company requires entrance in the new markets and creation of consolidated marketing network. More and more companies

[9] Damodaran, Valuing companies with intangible assets, September 2009

have started recently to enter the emerging markets, characterized by higher growth rates (Figure 4), such as BRICMT economies (Brazil, Russia, India, China, Mexico, and Turkey); countries such as those of Southeast Asia; and finally, Africa. Emerging markets are improving access to healthcare, opening interesting investing opportunities. Emerging markets have now overtaken the EU5 economies (Germany, France, Italy, the UK, and Spain) in pharmaceutical spending, with a total market size of USD 281 billion compared with the EU5's USD 196 billion in 2014.[10] Demand for medicines is growing more rapidly in the emerging economies than the industrialized economies.

Figure 4. Pharma sales growth by region, 2015-20, $ billion.



***Source*: BMI Research 2014; McKinsey analysis**

This expansion inevitably increases risk that pharma companies have to face. Emerging countries are usually characterized by political and economic instability, lack of developed infrastructure, lack of intellectual properties protections, high price pressures, distribution issues and many others. Though the companies operating in emerging markets could face higher risks and uncertainty than the companies operating in countries with more stable and robust economic conditions resulting in reduced comparability of these two groups.

[10] Jan Ascher, Boris Bogdan, Julio Dreszer and Gaobo Zhou. Pharma's next challenge.

III. Recordati – International pharmaceutical group

3.1 Company description

Recordati is an international pharmaceutical group headquartered in Milan, dedicated to the research, development, manufacturing and marketing of drugs. It has been listed in the Italian stock market since 1984. Born as a small Italian pharmaceutical company in 1926, Recordati has been able to reach a considerable geographical expansion, thanks to the successful track record of M&A deals and license agreements. Multiple bolt-on acquisitions[11], made possible by a huge cash flow generation, has allowed not only to reach the new markets, but also to enlarge significantly the product portfolio.

Recordati is present in two different business segments: primary and specialty care and orphan drugs segment. For many years the biggest part of the revenues of the company was generated by its cardiovascular blockbusters (Zanidip and Zanipress), products for the treatment of hypertension and other cardiovascular disorders. Currently Recordati has enlarged its presence also in urology and gastrointestinal therapeutic areas.

Recordati is a fully integrated pharmaceutical company. It operates through two main divisions. Pharmaceuticals, being the company's core business (over 96.5% of sales in 2016 and more than 3000 employees), involves all stages of the value chain: from R&D, to manufacturing and marketing & sales. Moreover, Recordati produces active ingredients and intermediates through its pharmaceutical chemicals division (3.5% of net sales), serving both internal needs for pharma specialties, as well as externally the international pharmaceutical industry, in particular the generic drugs market.

3.1.1 Geographic breakdown

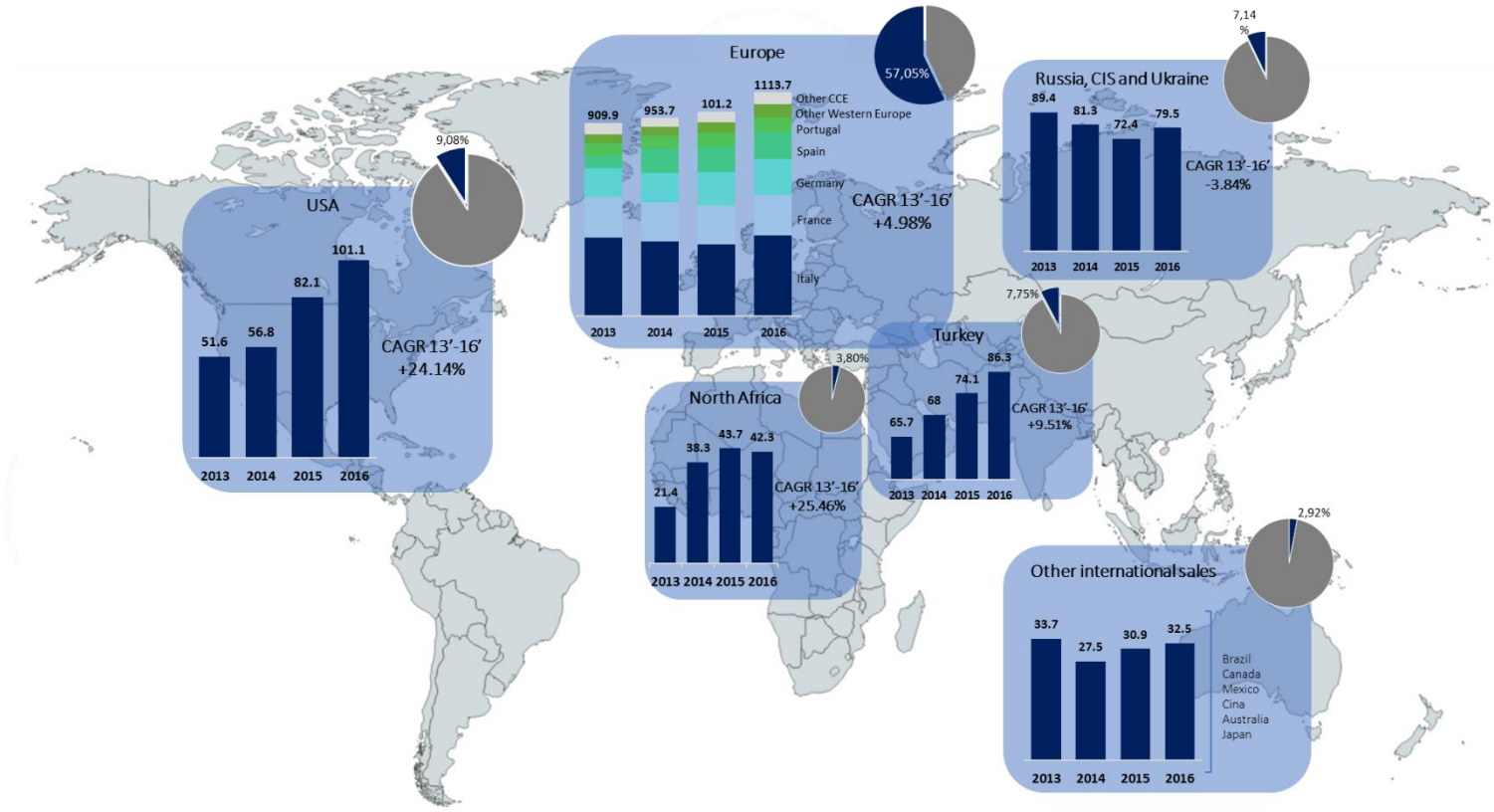
Recordati has operating subsidiaries in main European countries, US, Latin America, Turkey and Tunisia, and a distribution network covering more than 135 countries.

In the last 10 years the company has increased substantially its international precense, passing from 64.7% of international sales in 2006 to 80.15% in 2016, denoting growing presence worldwide (Figure 5). Internalization is of primary importance, as it makes the company less dependend on the regulatory, reimbursement and healthcare expenditure decisions of a single country, but also makes it easier to recover a huge investments for a new drug development. Through a series of targeted acquisitions and commercial

[11] definition

partnerships, Recordati has strengthened its position in high-potential and less served markets, particularly Central and Eastern Europe (7.1% of sales in 2016), and has been able to exploit the growth of **"**pharmerging" economies, such as Turkey (7.8%), North Africa (3.8%) and Latin America. As far as US (9.1% of revenues), being the largest and most competitive market, Recordati has decided to play exclusively on the rare diseases field, targeting a specific profitable niche. Thus, the Group welcomes global expansion according to a dual strategy: consolidating its primary and specialty care position in key geographies, and further developing the Orphan business on a worldwide basis, evaluating opportunities in Asia-Pacific countries (APAC from now on) for the future to come.

Figure 5. Geografical brakedown.



Source: **Company data, personal elaboration**

3.1.2. Business segments.

Recordati is simultaneously present in two different business segments: primary and specialty care (including OTC) and orphan drugs business. Pronounced differences in the margin structure, distribution channels, probabilities of successful development and

launch of the new drugs require a separate evaluation and analysis of these business segments.

Recordati has been historically devoted to the primary and specialty care segment, developing and commercializing high-value, reimbursable treatments in key therapeutic areas. Leading products are drugs for the treatment of hypertension and other cardiovascular disorders, as well as treatments for disorders of the lower urinary tract such as benign prostatic hyperplasia, gastrointestinal and metabolic treatments. A minor focus is on the out-the-counter segment (16.1% of sales, 2016FY), which is based on larger volumes but lower margins. Since 2007, a specialized business unit is also dedicated to rare diseases**,** in particular treatments for metabolic deficiencies of a genetic nature. Recordati's pharmaceutical sales are gradually shifting away from its historical hypertension blockbusters, like Zanidip, being the only corporate drug in 2007 generating 30% of Recordati revenues. In 2016 the revenues breakdown by products turns to be much more balanced, diversified between different products, both corporate and obtained thanks to the license agreements, from different therapeutic areas.

Two business segments mentioned before have significantly different marginality: orphan drugs EBIT margin of 44.6% in 2016, much higher than those of the primary & specialty segment (25.2%). The acquisition of Orphan Europe in 2007, permitted Recordati to enter the niche market of drugs for rare diseases, and insured an improvement of profitability over the last 10 years (EBITDA margin of 32.17% in 2016, +700 bps since 2007). The share of revenues generated thanks to the orphan drug sales more than doubled in the last 6 years, passing from 8% in 2010 to 16,2% in 2016. This trend is expected to continue, as the company is planning to reach new markets with it treatments for rare diseases.

Moreover, orphan drugs segment is characterized by lower competition deriving from other pharmaceutical companies, and especially from the generic drugs. Firstly, the market exclusivity for orphan drugs is longer than for traditional drugs. Secondly, these business is not based on volumes, as the number of patients is very limited and difficult to discover, making it less attractive for generic drugs producers. For these reason requirements regarding the number of patients participating at the all stages of clinical trials are less strict. The probability of orphan drug to pass from phase I to market launch

is 25,3% (almost three times higher compared to the 8,7% for primary and specialty products).

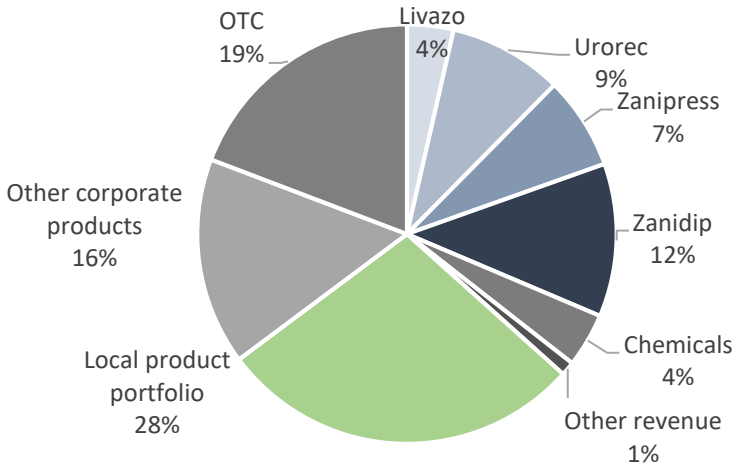
As we previously explained, the orphan drugs segment has a lighter and more flexible commercial and distribution system compared to the primary and specialty care segment. This happens because the orphan drug distribution model is based on a salesforce of field specialists, which are sent from central organizations (namely Orphan Europe in France and Recordati Rare Diseases in the US) directly to cliniques and orphan patients. These field specialists both promote the use of the drug and raise awareness of the treatment and of the orphan disease itself, so that they both engage to develop the market and to create new demand. This constant and close monitoring of patients on the part of the company reduces costs and drug supply time and increases margins. Differently, for the primary and specialty care segment, drugs do not reach patients directly but through the intermediation of large cliniques and hospitals, pharmacies and distribution companies. The fragmentation of the downstream value chain erodes primary and specialty drugs margins, because Recordati must be ready to deal with a plurality of actors and to engage in more structured promotion and marketing campaigns with inevitably increase selling expenses in the IS. Moreover, the final drug price to consumer must be shared (only 65% of price goes to the drug manufacturer, while 10% accounts to the wholesaler and around 20% to the pharmacist). The result is an EBIT margin for the orphan drugs segment that is more than double the EBIT margin for the primary and specialty care segment.

3.1.3. Product portfolio

For many years Zanidip and Zanipress, two products for hypertension developed internally by Recordati, generated a substantial share of its revenues. In 2007 Zanidip (drug available in 101 countries) contributed for 30% of sales of the company, a number that decreased significantly in the following years, primary because of the drug patent expiry, but also thanks to the diversification strategy adopted by Recordati (Figure 6). The margins of the products developed internally are much higher than in the case of products obtained thanks to the license agreements. The decision on introduction of licensed products represent a trade off between having lower margins and saving a substantial amount of money in clinical trials. Licensed products are usually obtained at

late stages of development of the drug, resulting in lower risk. The amount of royalties to be paid is not fixed, but calculated as a % of ex factory price (around 35-45%).

Figure 6. Sales by business (2016).



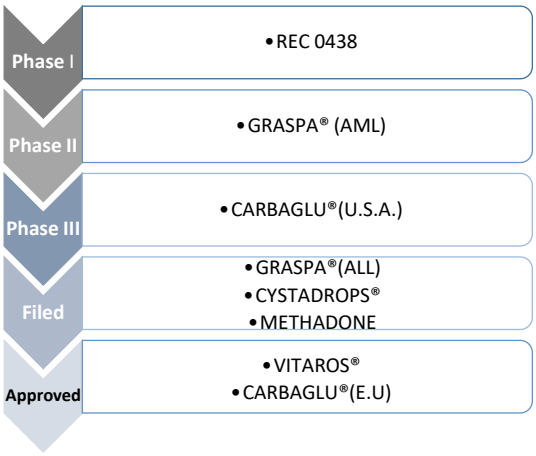
***Source*: Factset**

The share of licensed products is almost 35% in 2016 (65% of total sales for proprietary products respectively). Considering only four main corporate products 60.3% of its revenues derive from proprietary and 39.6% from licensed .

3.1.4. Product pipeline.

Recordati reserves 7.3% of its net revenues (2016FY) to R&D investments and plans to keep the R&D/sales ratio of 8% up to 2019. The introduction in the pipeline of new products, both through the internal discovery programs as well as through alliances, is of great importance for the Group's future growth. In 2015 the product and project evaluation group was consolidated and more than 100 products in development or ready to be launched belonging to different therapeutic areas (urology, rare diseases, metabolism, oncology) were evaluated in order to assess their therapeutic potential. This dynamic activity projected into the future emphasizes that Recordati maintains a high level of attention to all registration and regulatory activities regarding corporate products (silodosin, lercanidipine, pitavastatin, fenticonazole) and drugs for rare diseases (Carbaglu®, Cystadrops®, GRASPA®) following the vast and growing needs for new product registrations, renewals and variations. Current pipeline includes 8 products (Figure 7), several at late pipeline stages (Phase II – III), and balanced between "me-too" (Vitaros®) and high-risk products (Carbaglu®). This ensures a certain degree of confidence for the future, shielding against possible new drug failures.

Figure 7. Product pipeline.

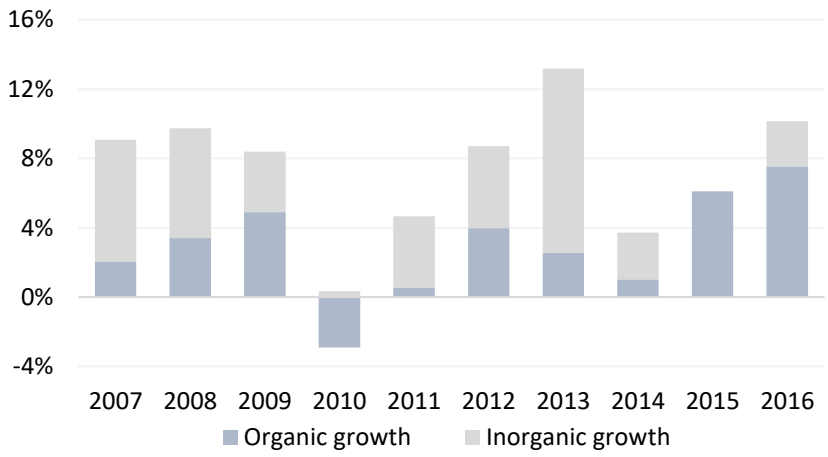


Source: **Company data, personal elaboration**

3.1.5. Mergers and acquisitions track record

Recordati sales growth has always been a combination of organic and inorganic, in the last ten years Recordati grew on average by almost 3% organically and 4.2% through external sources (Figure 8).

Figure 8. Organic vs. inorganic growth.



Source: **Company data, personal elaboration**

Recordati has a long track record of successful acquisitions, started at the beginning of the new millennium with the acquisitions of Doms Adrian and Bouchara, representing the first nucleus of the Group's international growth. Since then, Recordati has performed other 13 acquisitions (Table 8), mainly driven by two rationales:

Table 8. M&A history.

Announcement Date	Target name	Primary care/Orphan	Announced value (€ mln)	Announced value (€ mln)	Target EV/LTM sales	Country
14.07.2016	Pro Farma AG	Primary care	16	14	**1,6x**	Switzerland
31.05.2016	Italchimici	Primary care	145	130	**2,8x**	Italy
09.09.2013	Laboratorios Casen-Fleet	Primary care	123	93	**2,0x**	Spain
24.07.2013	Opalia Pharma	Primary care	49	37	**2,0x**	Tunisia
14.12.2012	Portfolio of products	Orphan	100	78	**2,5x**	USA
16.10.2012	Portfolio of products	Primary care	87	68	**2,7x**	Russia
02.08.2012	Farma-Projekt Sp. zo.o.	Primary care	21	16	**1,5x**	Poland
04.07.2011	Frik Ilac Sanayi & Ticaret	Primary care	130	93	**2,2x**	Turkey
19.01.2009	Herbacos-Bofarma sro	Primary care	25	18	**1,6x**	Czech Republic
29.10.2008	YENI ILAC	Primary care	62	42	**2,8x**	Turkey
28.09.2007	Orphan Europe SARL	Orphan	192	140	**3,4x**	France
28.07.2006	Jaba Farmaceutica SA	Primary care	57	46	**1,2x**	Portugal
17.01.2006	Beniel Pharmaceutical	Primary care	-13	-10		
25.10.2005	Rights to Tenstaten drug	Primary care			**1x**	
17.06.2005	Zanidip selling rights	Primary care	27	22		
18.01.2005	Marketing & sales business	Primary care	85	68		
27.04.2004	Sophartex SA	Primary care	27	22		
29.03.2004	Polfa Kutno (25% stake sold)	Primary care	24	20	**1,7x**	Poland
26.04.2000	Bouchara Recordati SAS	Primary care	102	111		
17.02.2000	Vectorpharma International	Primary care				Italy
12.01.1999	Laboratoires Doms-Adrian	Primary care	33	27		

Source: **Factset**

1) geographical expansion, opening new markets for the pipeline products sales and possibly benefitting from the target company's existing distribution network and license contracts;

2) low-risk product diversification, acquiring late-stage development pipelines, particularly in previously unserved segments.

The careful M&A strategy allowed Recordati the transformation from Italy-focused player to globally diversified company. To this regard, the acquisition of Orphan Europe in 2007 was crucial to develop the Group's position in the high-potential niche of treatments for rare diseases, improving substantially the margin structure of the company, and permitted the entrance in the highly competitive US market .

Recordati has proved to be a careful acquirer, performing due diligence in assessing transactions and targets and not accepting overvalued deals with respect to its budget and cash availabilities, evaluating trade-offs as part of its M&A policy. Historical multiples for Recordati acquisitions are around 2x-3x EV/Sales. We expect Recordati to continues with its M&A strategy, performing higly disciplined acquisitions also in the future.

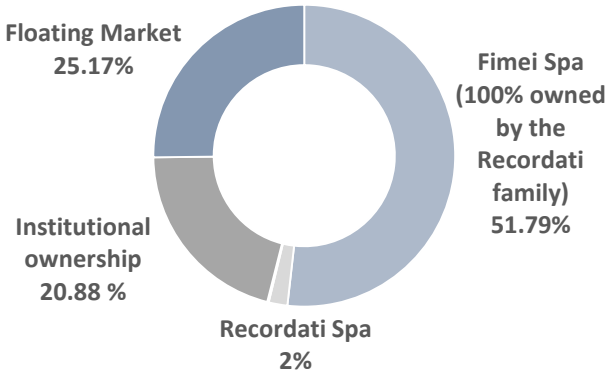
Recordati also leverages on a network of in-license partnerships (international groups exploiting its marketing and distribution capabilities in key countries) and out-license commercial agreements (enabling to find a market for its products in locations that would be otherwise too expensive or too risky to reach).

3.1.6. Shareholder structure

Recordati family (Alberto, Cristina and Andrea, brothers of Giovanni Recordati and III generation of the family) controls the company through Fimei S.p.A. with a 52% stake (Figure 9). The Board of Directors, appointed in April 2014 and composed of ten members was led by Giovanni Recordati (Chairman since 1999 and CEO since 1990). Thanks to his background in chemical engineering and management sciences, Giovanni was able to rise Recordati as an international group in the last decades. Following his disappearance in August 2016, his brother Alberto was named Chairman and Andrea Vice-chairman and CEO. Members of BoD have different professional characteristic from biologic scientific to economics and law training. The BoD has set up two committees with advisory and consulting functions: the Remuneration Committee and the Audit and Risk Committee, both totally made up by outsiders. Recordati complies with main

recommendations of the CG code, currently effective in Italy for listed companies. 5 out of the 9 directors of the BoD are independent, which is more than the minimum requirements of the CG code.

Figure 9. Shareholders structure



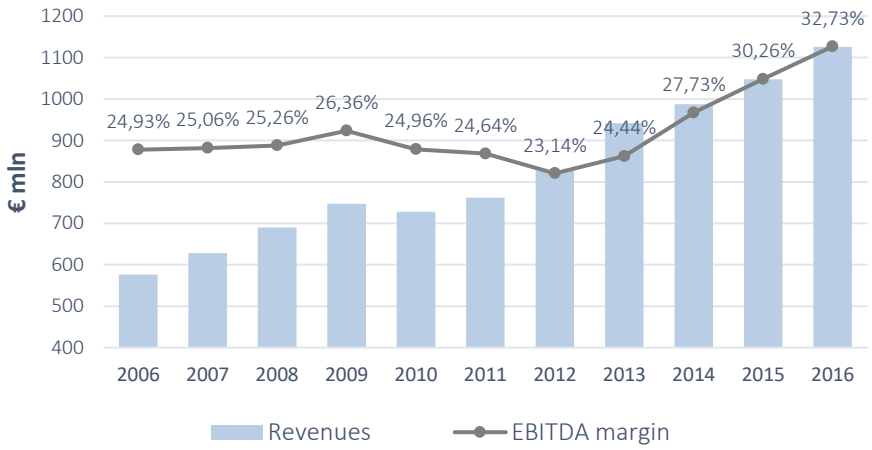
***Source*: Factset**

The fact that the management of the company has always been in the hands of Recordati family can not be ignored when the company is evaluated. On one side, it ensures stability in the decisions making process and guarantees continuity with the past in the main strategic plans. On the other, such a conservatism somehow prevents the company from taking more courageous steps, for instance with acquisition deals, which were typically of an add-on nature. An impact of the family ownership is impossible to quantify in numeric terms, but these considerations must be incorporated in the evaluation process, performing for example the sensitivity analysis.

3.2. Financial analysis

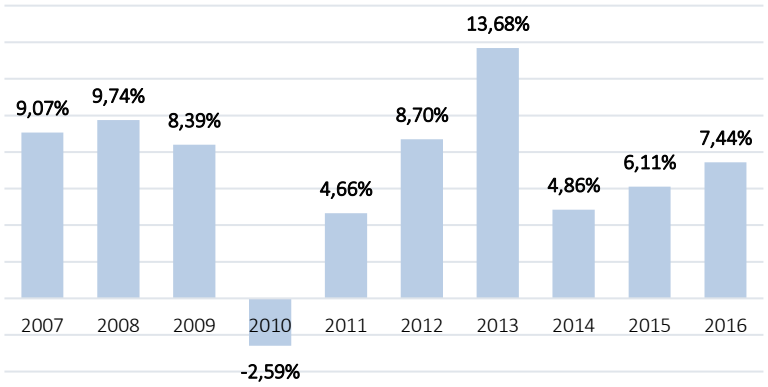
Sales. Main revenue growth drivers have been the development and strengthening of the Group presence in emerging markets, mainly in Central and Eastern Europe; the growth in the orphan drugs market segment overall, which is the segment where Recordati has planned to focus its R&D efforts; the expiry of patents for proprietary products and the ability to face generics competition; the ability to negotiate and renegotiate licensing-out agreements for the distribution and sales of non-proprietary products; the success of its R&D investment and the introduction of new products in the market; the benefits deriving from M&A operations.

Figure 10. Revenues and EBITDA margin



Source: **Company data, personal elaboration**

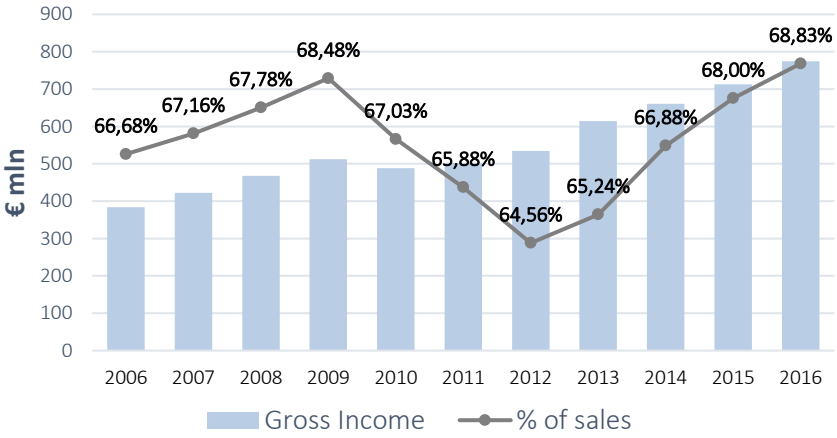
Figure 11. Total revenues growth (%)



Source: **Company data, personal elaboration**

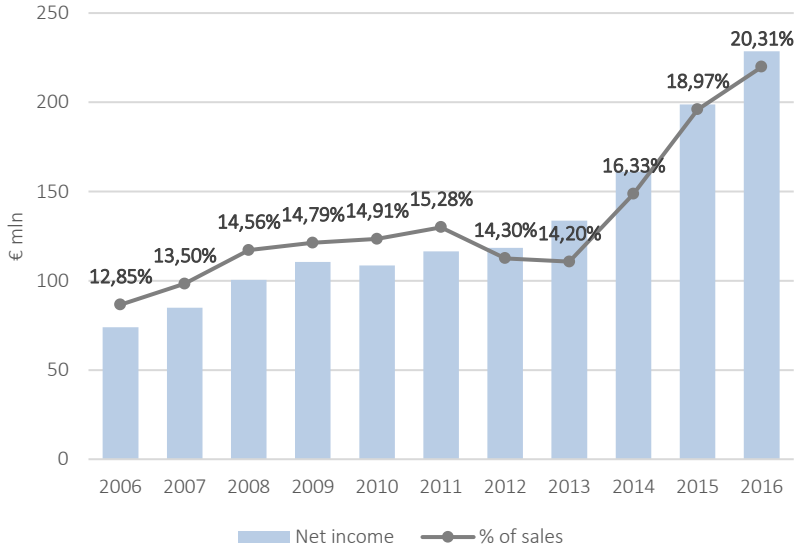
Margins. We can see from Figure 10 that Recordati has been able to sustain a good profitability in terms of EBITDA margins despite the decrease in total revenues in 2010 and the slowdown in the growth rate in 2014. For instance, in 2010 the Group's profitability was more or less in line with 2009 while including considerable expenditures in R&D. The generally positive trends are explained by a sustained growth in sales, particularly international sales, and the shift towards more profitable segments over the period, particularly the treatment of rare diseases, which have positively rewarded the increasing investments in R&D. EBITDA margin slightly decreased in 2010, due to a decrease in sales which squeezed margins, and in 2012, as a result of an increase in direct costs of production (COGS) and R&D investments.

Figure 12. Gross Margin and % of total revenues



***Source*: Company data, personal elaboration**

Figure 13. Net income and % of total revenues.

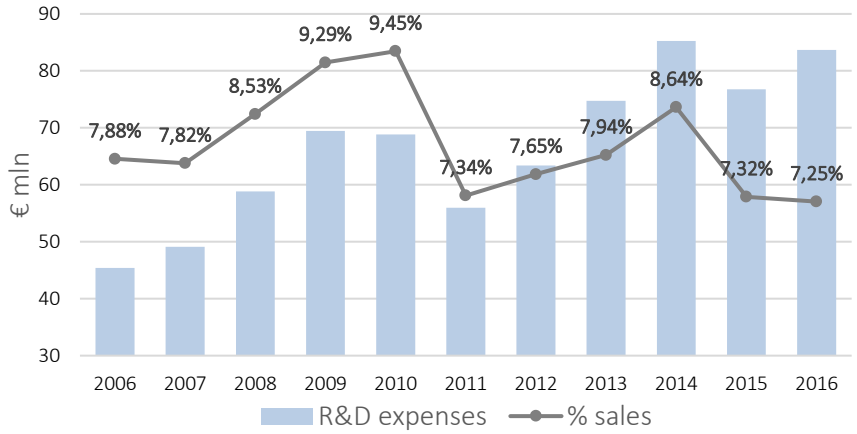


***Source*: Company data, personal elaboration**

We can see from the graphs that 2010 and 2012 were two critical years as far as marginality is concerned, for different reasons. After that, Recordati has been able to constantly improve its profitability up to 2016, showing a very promising trend in recent years. On the cost side, COGS are usually between 31.5% and 35.5% of revenues and, after a peak in 2012 (35.44% of net revenues), Recordati has been able to contain their percentage of sales and decrease their impact on gross margins. Selling expenses have varied between 28% and 33% of total revenues over the last 10 years. After a period of steady decrease, they reached a peak of 30.47% of total revenues in 2011, as a result of

the program of expansion of the existing distribution channels, following the launch of new drugs (Livazo® and Alipza®) and new marketing agreements (Procto-Glyvenol® from Novartis), as well as the penetration in key emerging markets (particularly relevant is the acquisition of Dr. F. Frik Ilac in Turkey). The considerable relevance of this expense item (more than R&D expenses) reveals the importance of marketing and distribution activities for Recordati. G&A expenses range between 4.7% and 6% of total revenues. They tend to be higher in recent years because of the international expansion and the increasing complexity of the business. R&D expenses amount to 8% of total revenues on average. Their trend was fluctuating over the last 10 years, consistently with the development needs along the pipeline. The peak of investment in R&D in relative terms was reached in 2010 (€ 68.84 mln, 9.45% of total revenues), when there were 10 products in pipeline, including many new products and Livazo®/Alipza®, which were launched the year after. Overall operating expenses are declining as a percentage of total revenues, with Recordati trying to exploit the profitable way of orphan drugs that it paved since 2008.

Figure 14. R&D expenses and % of total revenues



Source: **Factset**

Margins differ across the different segments: according to Company disclosures, the Orphan Drugs segment has higher EBIT margin (44.6%) than the Primary Specialty care segment (25.2% or 26.0% excluding non-recurring expenses of € 7.0 mln resulting from the acquisitions of Italchimici S.p.A. and Pro Farma AG in 2015), particularly due to the light commercial structure and flexible business model in place for the Orphan Drugs segment, resulting in lower associated selling expenses. The margins of both segments

have improved over the years, thanks to better synergies and leverage effects in the existing commercial structures. Recordati has Gross Margin and EBITDA Margin in line with the industry, overperforming some competitors and underperforming others in terms of profitability. Values for EBITDA and EBIT (and corresponding margins) are closer to each other, denoting less relevant values for depreciation and amortization for Recordati with respect to other companies. Recordati is also well positioned in terms of EBIT and Net Income margins.

CAPEX. Historical low level of CAPEX, ranging from 1% to 3% of total revenues approximately, and increasing in the last five years, in line with the trend in the pharmaceutical industry. Group's Capital expenditures aim at covering the depreciation figures for the years and at improving the Group's production plants and headquarters. In particular, main investments included € 7.3 mln in 2015 for the Milan production plant and headquarters and € 21.0 mln for the advancement of

activities connected with the construction of a new production plant in Turkey. Other important capital investments were made since 2009 for the improvement of the production plants in Saint Victor (France) and in Campoverde di Aprilia (Latina).

Table 9. Capital expenditure

(€ mln)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Capital Expenditures	6.64	6.171	13.307	7.962	8.237	6.866	11.447	12.325	22.231	31.239
% of sales	*1.15%*	*0.98%*	*1.93%*	*1.07%*	*1.13%*	*0.90%*	*1.38%*	*1.31%*	*2.25%*	*2.98%*

***Source*: Factset**

Table 10. Net working capital

(€ mln)	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Trade receivables	123.418	134.454	137.015	132.621	126.575	141.231	155.36	179.78	179.03	177.22
Inventories	74.67	74.737	83.087	86.627	85.19	108.251	126.39	140.43	141.22	143.09
Other current assets	12.791	28.031	25.087	25.597	29.559	24.509	27.147	30.342	37.243	34.163
Current assets	**210.879**	**237.222**	**245.189**	**244.845**	**241.324**	**273.991**	**308.89**	**350.55**	**357.5**	**354.48**
% change		*12.49%*	*3.36%*	*-0.14%*	*-1.44%*	*13.54%*	*12.74%*	*13.48%*	*1.98%*	*-0.84%*
Trade payables	71.537	80.343	88.598	81.751	93.068	98.678	106.93	107.16	112.54	106.6
Tax payable	22.076	15.762	10.278	12.555	9.691	12.091	9.789	15.951	12.541	14.592
Other current liabilities	49.051	51.29	62.626	70.901	75.569	80.496	74.986	101.12	91.573	102.71
Current liabilities	**142.664**	**147.395**	**161.502**	**165.207**	**178.328**	**191.265**	**191.7**	**224.22**	**216.65**	**223.9**
% change		*3.32%*	*9.57%*	*2.29%*	*7.94%*	*7.25%*	*0.23%*	*16.97%*	*-3.38%*	*3.35%*

Net working capital	**68.215**	**89.827**	**83.687**	**79.638**	**62.996**	**82.726**	**117.19**	**126.32**	**140.85**	**130.58**
% of sales	*11.84%*	*14.29%*	*12.13%*	*10.65%*	*8.65%*	*10.86%*	*14.15%*	*13.42%*	*14.26%*	*12.46%*
% change		*31.68%*	*-6.84%*	*-4.84%*	*-20.90%*	*31.32%*	*41.66%*	*7.79%*	*11.50%*	*-7.29%*

***Source*: Factset**

Cash flows. The Group has always produced positive net cash from operating activities, and the stream has rapidly increased after 2007, hence right after the acquisition of Orphan Europe and the entrance in the highly profitable Orphan Drugs segment. The impact of changes in net working capital on cash flows from operating activities is not linear (negative in 2007, 2011, 2012 and 2014, positive in the other years) and accounts for 8.80% of CFO on average.

Dividends. Recordati paid € 110.8 mln in dividends in 2015, recording +20% in DPS with respect to 2014 figures. Actually, except for the years 2010 and 2012, in which DPS remained constant, Recordati has always approved an increase in dividends per share, in accordance with the yearly results. According to the Group's plans for past years, the intention was to maintain a dividend payout ratio of 50% of net income, this target was met only in 2010-2011-2012 and in 2015, with a peak of almost 80% payout ratio in 2011.The dividend yield (computed on year-end prices) shows a waving trend over the last ten years, reaching 2.50% in 2015.

Table 11. Dividends

(€ mln)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Dividends paid	27.53	36.96	42.22	49.26	54.36	93.14	61.35	64.64	75.40	110.77
Dividends per share	0.185	0.215	0.250	0.275	0.275	0.300	0.300	0.330	0.500	0.600
Dividend/Net Income	37.19%	43.55%	42.04%	44.55%	50.06%	79.99%	51.78%	48.36%	46.77%	55.72%
Dividend Yield	3.18%	3.51%	6.46%	5.29%	3.90%	5.38%	4.34%	3.15%	3.89%	2.49%

***Source:* Factset**

Buybacks. Recordati has authorized and initiated 7 share buyback programs since 2006 (the last one was initiated in November 2016) as per authorization of the Shareholders Meetings, which involve the acquisition of Recordati ordinary shares for the servicing of current and future stock option plans in favor of certain Group employees, and respond to the market practice of constituting a treasury stock of own shares, as allowed by Consob.

At year-end 2015, 3,685,358 shares are held as treasury stock, a decrease of 1,022,312 shares compared to those held in 2014. This change is due to the sale of 1,935,000 shares for an amount of € 11.8 mln, and to the purchase of 912,688 shares for an amount of € 17.7 mln. The total cost incurred for the purchase of the current treasury stock is € 35.1 mln and the average purchase price is € 9.51. Share buybacks employed 12.09% of cash flow from operations available on average, but have been always compensated by sales, given that treasury stocks are held for the mere purpose of stock option compensation.

Table 12. Share buyback.

(€ mln)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Share buyback	10.24	29.86	0.00	0.00	0.00	15.87	0.00	8.83	7.13	17.73
% of CFO	*10.60%*	*32.52%*	*0.00%*	*0.00%*	*0.00%*	*13.07%*	*0.00%*	*5.19%*	*3.98%*	*7.17%*
Sales of Treasury stock	0.00	1.41	0.00	0.00	6.23	15.24	5.64	15.32	13.14	11.75
Change in treasury stock	**10.24**	**28.45**	**0.00**	**0.00**	**-6.23**	**0.64**	**-5.64**	**-6.49**	**-6.01**	**5.98**
Treasury stock	**30.65**	**59.10**	**59.10**	**59.10**	**52.58**	**53.22**	**46.25**	**37.79**	**30.73**	**35.06**
% Treasury stock	*2.45%*	*5.49%*	*5.49%*	*5.49%*	*4.88%*	*4.68%*	*3.93%*	*3.00%*	*2.12%*	*2.01%*

***Source*: Factset**

3.3. Competition environment and peers group.

The pharmaceutical industry is highly competitive and dominated by a number of large, established players, as well as specialty companies marketing products and developing product candidates in the cardiovascular, urology, rare diseases and other therapeutic areas. Many of these companies, particularly large pharmaceutical and life sciences companies, have substantially greater financial, operational and human resources than Recordati. They can spend more on, and may have more expertise in, research and development, regulatory, manufacturing, distribution and sales activities. As a result, Recordati's competitors may possibly obtain regulatory approvals for their product candidates more rapidly and may market their products more effectively. Smaller or earlier stage companies may also prove to be significant competitors, particularly through partnerships with large, established players.

Recordati's continuing ability to grow requires that it competes successfully with other specialty pharmaceutical companies for product and product candidate acquisition and in-licensing opportunities. These competitors include established companies that may

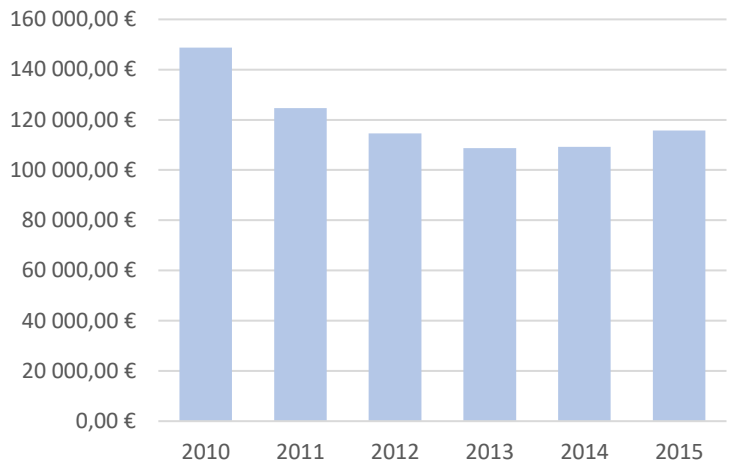
have a competitive advantage over Recordati due to their size and financial resources.

Recordati also faces competition from manufacturers of generic and unbranded drugs, limitedly for the products for which patents have expired. Generic competition often results in decreases in the prices at which branded products can be sold, particularly when there is more than one generic available in the marketplace. Moreover, legislation enacted in many countries allows for, and in a few instances in the absence of specific instructions from the prescribing physician mandates, the dispensing of generic products rather than branded products where a generic version is available. Other companies could also develop products that are similar, but not identical, to the products marketed by Recordati, such as an alternative formulation of its products or an alternative formulation combined with a different delivery technology, and seek for approval by regulatory agencies.

Recordati's products and product candidates may also compete in the future with new products currently under development by others, thus compete at the pipeline level, facing the research and development of rival products and proceeding through the clinical trial phases. Any products developed by Recordati are likely to be in a highly competitive market, and many of its competitors may succeed in developing products more quickly that may render Recordati's products obsolete or noncompetitive. This is particularly the case of the orphan drugs segment, in which Recordati entered in 2007 and which is characterized by a strong innovation component. Given the profitable opportunities deriving from the unmet needs associated with rare diseases, more and more companies are specializing their portfolio on orphan drug treatments as an attempt to overcome the impact of revenue loss due to expiry of patents of blockbuster drugs, which makes it hard to compete in this new segment as well.

Following the expiry of the lercanidipine patent in 2010 in the main European countries, the competition of generics started to hurt the sales of Recordati's big-selling product Zanidip®, recommended for the treatment of hypertension. Nevertheless since 2010 Recordati has been able to contain the reduction of lercanidipine sales and maintain profitability, also thanks to some license and co-marketing agreements in place and to the success of Recordati's own generic version of lercanidipine, which favorably competed against other generics in the assignment of tenders.

Figure 15. Lercanidipine sales.



Source: **company's data**

According to Recordati's strategy announcements, the company will be able to resist and offset generics competition by developing its presence in emerging markets, by supporting the growth of its drugs for the treatment of rare diseases and by increasing the revenues generated by its international licensing-out business. Since there is no expected expiry of Recordati's patent for the next 3 years, we can be convinced that the generics competition will be an issue only for the segment of the cardiovascular therapeutic area, and particularly for lercanidipine-based products.

Since it is quite difficult to find perfectly comparable companies, we selected a number of big global pharmaceutical companies, such as Pfizer, Novartis, Johnson & Johnson, Merck, Roche, Astrazeneca and GSK, whose comparability is limited by their different sizes, business models and product segments' focus. We believe that these global players have critical mass sufficient to justify a market premium relative to the smaller companies. We also compared Recordati with its peers in the European pharmaceutical sector (Lundbeck, Ipsen, Rovi, Almirall, UCB) and with US peers with considerable operations in Europe or showing a similar breakdown in revenues by geography (Shire, Jazz Pharmaceuticals). The peers were chosen after a careful analysis on the companies' business models, product portfolio, M&A history and strategic issues regarding R&D investments (Table 14). However, it is worth to mention that no comparables companies can be found simultaneously present both in primary and specialty care and orphan drugs business.

Table 14. Recordati peers group.

Company	Sales (mln EUR)	Pharma sales margin	Company description
Lundbeck	1,939	100%	Drugs for psychiatric and neurological disorders; engaged in the research, development, production, marketing and sale of pharmaceuticals across the world; many license agreements
Ipsen	1,444	92.7%	The Primary Care in gastroenterology, cognitive disorders, and cardiovascular diseases. The Specialty Care segment covers uro-oncology, endocrinology, and neurology areas. Fully-integrated pharmaceutical company, also involved in the chemical production; long track record of successful acquisitions
LABORATORIOS FARMACEUTICOS ROVI	246	80.1%	Activity on seven therapeutic areas: cardiovascular, steoarticular/ women's health, pain relief, central nervous system, respiratory, imaging diagnostic media products, primary health care and consumer healthcare; fully integrated specialty pharmaceutical company
ALMIRALL	685	100%	Treatments for respiratory, autoimmune, dermatological (38.9% of revenues), and gastrointestinal diseases; long track record of successful acquisitions
Jazz Pharmaceuticals	1.194	100%	Specialty biopharmaceutical company, narcolepsy, oncology, pain and psychiatry. Fully-integrated pharmaceutical company, strong strategy based on M&As and product portfolio diversification
UCB	3,876	98.3%	Research, development, and commercialization of pharmaceutical and biotechnology products. Medicinal products for central nervous system and immunology disorders. Fully-integrated pharmaceutical company; growth through commercial agreements, partnerships, mergers and acquisitions.
Shire	5,786	100%	Biopharmaceutical company, the focus on some key therapeutic areas, particularly cardiovascular, gastrointestinal and rare diseases

***Source*: personal elaboration**

Recordati EV/EBITDA multiple has increased substantially in the last 5 years (10.6x in 2013 to 15.1x in 2017), passing from discount to a premium in comparison with its peers (Table 15). This is explained by the substantial improvement in Recordati EBITDA margin. In 2016 it equals 32.2% of sales, much higher with respect to comparables mean of 26.71% , mainly due to low R&D expense of 7.25% of sales in 2016 against 18.74% average for peers (the result of strategical decision of development through M&A rather than through the investment in R&D).

Table 15. Recordati peers multiples.

	EV/EBITDA			P/E		
	2016	2017E	2018E	2016	2017E	2018E
Lundbeck	14.70	10.70	8.60	25.80	22.40	16.70
Ipsen	13.60	14.40	11.70	22.60	23.10	19.20
Rovi	15.40	18.90	15.20	26.00	29.40	22.10
Almirall	10.20	9.50	7.50	22.90	21.10	16.40
Jazz Pharmaceuticals	9.30	8.80	6.90	10.90	12.10	10.00
UCB	12.40	17.30	14.20	13.40	12.20	10.60
Shire	15.90	11.00	9.30	14.10	11.40	9.90
Recordati	15.70	15.10	15.89	23.70	25.07	25.47
Average ex.REC	13.07	12.94	10.49	19.39	18.81	14.99
Median ex. REC	13.60	11.00	9.30	22.60	21.10	16.40
Premium/discount (REC)	**15.44%**	**48.68%**	**70.85%**	**4.87%**	**18.79%**	**55.30%**

Source: **Factset**

3.4. Investment Risks.

To better analyze the risks to which Recordati is exposed it is convenient to divide all the risk the company is facing in four different categories:

1) Operational risks
2) Financial risks
3) Legal risks
4) Strategic risks

The individuation of the main risks is of primary importance, as it helps to define the preventive measures in order to mitigate the risk.

Interruption of production process is one of the operational risks Recordati is facing. Natural disasters, suspension or withdrawal of marketing authorization, malfunctioning of plants and equipment may negatively affect continuity and regularity of Recordati sales. Recordati has an effective asset protection policy in place (precise plant maintenance plans), insurance policies “All risk property”, which cover direct and indirect damages and has production plants with adequate capacity and flexibility to

handle changed planning requirements (for example, a new manufacturing site in Turkey with 30 milllion packages excess capacity production).

Another risk is supplier disruption. Lack of raw materials may cause inefficiencies in the production process. However the vertically integrated value chain of Recordati ensures manufacturing of active ingredients, while for other raw materials, the company puts in place the strategy of provision from more than one supplier for the same type of product.

Moving forward, we analyze the risks related to the investments in R&D. The low probability of success of the launch of products in pipeline (e.g., 8.7% from Phase I to approval) makes investments in R&D structurally risky. Recordati expense amounts to 7.3% of revenues in 2016 (market average is 18%), and most of its monetary effort is devoted to the rare disease area, which products have a higher probability of success (e.g. 25.3% from phase I to approval). Recordati monitors the intermediate results at a different stage of development, trying to identify products with the highest probability of success and potential return.

Delays in the development process, or in the issue of the necessary authorizations, may result in product launches occurring behind schedule. The announcement of 2 years delay of lercanidipine launch in US in 2012 caused a drastic downside drop of 29.97% of Recordati stock price. Partnerships and acquisition of pharmaceuticals that are already registered and geographical diversification designed to limit dependence on the regulatory authorities of a single country, help to mitigate the risks regarding the timing of new drug launches.

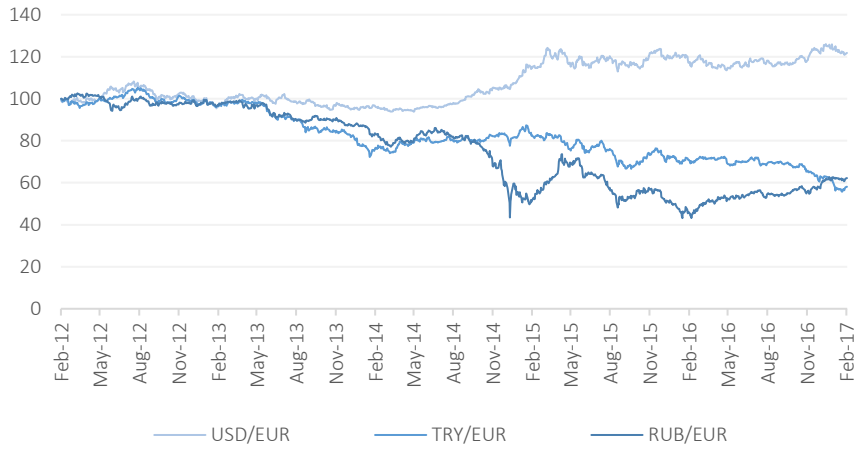
Financial risks are not accentuated and comprise the counterparty and foreign currency risk.

The counterparty risk is relevant since a large slice of Recordati customers is composed of National Healthcare Systems that often have limited funding ability and long payment time. In December 2015 10,92% of receivables were overdue by 90 days. This risk is smoothed out thanks to the large number of customers and wide geographical distribution.

Recordati is an international pharmaceutical group, so it is exposed to foreign currency risk. Main currencies affecting Recordati earnings are USD, RUB and TRY (Figure 16). In 2015 the impact for the full year of the FX could be estimated in 0.4%, which means €3.5

mln approximately. In Turkey Recordati is protected by so called “natural hedging”, both cash inflows and outflows are in the same currency. In other cases Recordati uses forward contracts for hedging purposes.

Figure 16. Exchange rate fluctuation.



Source: **Factset**

The third category we take a look at are strategic risks. Expiry of patent has always been an issue for the pharmaceutical companies, and Recordati is not an exception. The patents for three main RECORDATI products Zanipress®, Urorec® and Livazo® expire in 2017, 2020 and 2021 respectively. The expiry of patent for Zanidip® in 2010 was followed by a 50% reduction of its price, caused by an increased competition from generic pharmaceuticals, the same effect is also expected for aforementioned products. Strategic patenting (sequential filing of multiple patents for multiple attributes of a single product) and line extension (new formulations of the same product, new dosages, etc) may be effective instruments to avert generic competition. Recordati is also diversifying its product portfolio, its “other corporate products” almost doubled in the last 5 years (passing from 8% to 19%). The expected decrease in revenues can be offset thanks to the launch of Cariprazine, Graspa and Fortacin, its new products, in the next two years.

As seen before, inorganic growth plays an important role in the growth of Recordati. Through M&A Recordati pursues two main purposes: enhancing its activity in new geographical commercial areas (e.g. Pro Farma, Frik Ilac) and enlarging its product

portfolio through acquisition of companies with late stage development pipelines (e.g. Orphan Europe, Laboratorios Casen Fleet). However, a pipeline of drugs may be overestimated and post-merger integration can require time and further resources. Till now M&A deals were managed with high attention - historical acquisition costs are, in terms of EBITDA multiple, in the range of 10x-12x for primary care and around 20x for rare disease sector and, in terms of sales multiple, in the range of 1x-3x, with a mean of 2.4x. According to company's disclosures, the same strategy of scrupulous due diligence process and high attention to the price to be paid for the acquisition will be valid in the near future.

A large share of revenues Recordati generates, derives from the sales of the drugs obtained from the partnerships. One of the most important license agreement of Recordati are the one with Kowa and Kissei pharmaceuticals for distribution of Livazo® and Urorec® in Europe, two products which generated 10.4% of its revenues in 2016. The risk arises at contract renewal, as the commercial partner can decide not to renew the partnership. The impact could be very significant due to the size of the contracts.

Recordati presence in Russia, Turkey, Tunisia and other CIS countries exposes it to the risk related to economic and politic instability, fiscal and exchange rate discontinuity. Constant supervision of subsidiaries by top management permits to monitor constantly the current state of affairs, keeping the situation under control.

Conducting a five forces of Porter analysis, the competition rivalry turns out to be the greatest treat pharma companies are facing. Four principal medicines (Zanidip®, Zanipress®, Livazo® and Urorec®) generated 26% of RECORDATI revenues in 2016 make it dependent on small number of strategic drugs and more vulnerable to the market competition. Moreover, three of these drugs are positioned in the same therapeutic area (cardiovascular diseases). The portfolio diversification strategy Recordati is applying helps to reduce the risks associated the market competition.

Legal risks refer to the issues related to the reimbursement, changes in the regulatory framework and pharmacovigilance.

Talking about reimbursement risk we should focus on two different issues. First, is the possibility of reduction on reimbursement levels for drugs that are already included in reimbursement drugs list. Lets analyze for example the Italian market. In Italy three of the four main corporate products (Zanipril, Zanidip, Urorec) are inserted in the class A

and though are fully reimbursed. The likelihood of reduction of reimbursement amounts is rather low, as government prefers to incentive generic competition rather than cutting the reimbursement levels. Another instrument that was introduced in order to keep under control the pharmaceutical expenditure is paybacks.

However, in 2002 the reduction of governmental expenditure by 30% by Italian government caused a critical drop of Recordati share price, which was generating around 40% of total revenues in Italy. But since than the geographical diversification permitted to reduce the exposure of Recordati to the reimbursement and in general regulatory changes in a single country.

The second point, much more important, is the risk that new drug won't be included In the list of reimbursed drugs. The decision on reimbursement is based mainly on the valuation the cost / benefit positive ratio: the product is considered useful for the treatment of diseases for which there doesn't exist a successful therapy, or provide a more appropriate response than drugs already available for the same therapeutic indications. For example, we have seen that fortacin (to be launched this year), being a spray, reduce the collateral effect for the patients. However, this fact does't ensure a positive outcome, as the authority may not be willing to pay more for a low level of improvement in efficiency of the new drug.

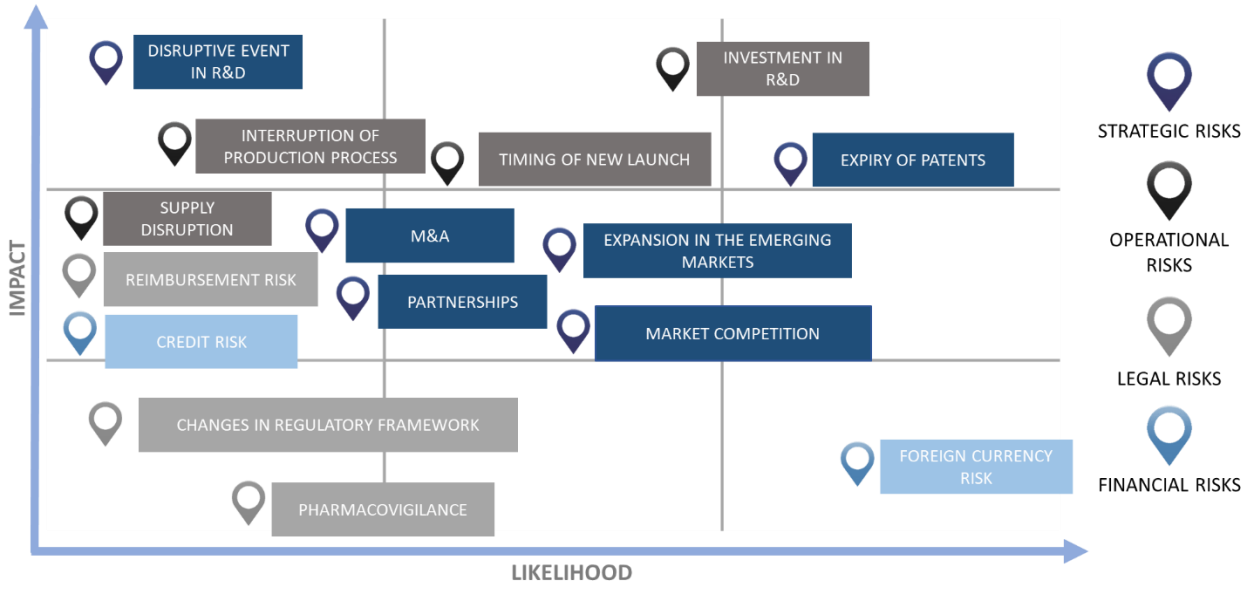
Reimbursement negotiations may seriously affect the timing of market entrance of the product. Since the market approval is obtained, an additional 18-24 month can be needed to obtain reimbursement. The consequences are multiple, starting from substantial delays in the launch of products and in worst case the impossibility of the product to enter a specific market, as the absence of reimbursement makes it not convenient. We have seen from our scenario analysis that a delay in the launch of the new product of one year reduce our target price to 28.5€, so the impact is quite significant. Another example is Livazo case. Despite a long negotiation process with the competent authorities, Livazo was not included in the reimbursement list on Italy and as a consequence it is not present in the Italian market.

The US regulation do not heavily affect Recordati performance, as it sells exclusively orphan drugs. Recordati has a specific organizational unit dedicated to monitoring of changes in regulation, ready to adopt the most appropriate strategies.

Recordati must comply with the EU's recent pharmacovigilance legislation (in effect since July 2012), which includes requirements for conducting pharmacovigilance, or the assessment and monitoring of the safety of medicinal products. Non-compliance with such obligations can lead to the variation, suspension or withdrawal of marketing authorization or imposition of financial penalties or other enforcement measures.

For easier graphical analysis, a risk matrix (Figure 17) is used to have a short summary of all risks mentioned above. The matrix has two dimensions: the impact and the likelihood. The impact measures the possible negative consequences which an event may have on the Recordati performance, while likelihood defines the probability of the event to take place, based on the past frequency and the feature forecast. We see that the most relevant risks are of operational and strategical nature, with investment in R&D in the top of the list, characterized both by a strong impact and high likelihood. Legal risks are all positioned in the bottom left corner of the matrix, indicating their lower relevance w.r.t the other risk groups.

Figure 17. Investment Risks Matrix



Source: **Personal elaboration**

IV. Methodology and Hypothesis statement.

4.1. Classification of the valuation techniques.

Traditionally the distinction between fundamentals-based valuation models and market multiples approach is made. For the reasons explained in the Chapter 2 it seemed reasonable to add another category of valuation techniques – hybrid ones. For more detailed analysis each category was further subdivided in other smaller classes of valuation approaches. Comparative valuation models are divided in earnings multiples (price to earnings), sales multiples , price-to-book value, price-to-assets, price-to-cash flow, dividend yield, enterprise value to R&D. Fundamental-based category comprises discount cash flow model, dividend discount model (DDM), Gordon growth model and Residual Income model. The hybrid models include real options.

4.2. Definition of dependent and independent variables.

The objective of this thesis is to understand whether there is a connection between the valuation techniques used by sell-side analysts and the accuracy of the target price. For this purpose, we will run a multivariable linear regression, where the accuracy of the target price will be the dependent variable and independent variables will be represented by variables related to the valuation method. It is a good practice to add some control variables like volatility, boldness (defined as the absolute value of the difference between the target price and the current price, scaled by the current price), and variables regarding the stability of the company subject to the evaluation (represented by the price to book ratio) in order to track the differences between the companies and difficulty of target price prediction. In our case we have only one company subject to analysis, and though no control variables have been used.

The first question that arises: how should we define the accuracy of the target price? In literature we can find a lot of alternative ways to do it, but we will use the accuracy metrics developed by Demirakos (2009).

Table 16 summarizes four variables which will be used to assess the performance of the target price: two variables for target price accuracy measurement and other two variables to measure the forecast error. The first two variables *met_in* and *met_end* are dummy variables. *Met_in* measures whether the target price is met at any time within 12 months. If this is the case it value is 1, and zero otherwise. The distinction should be

made between positive and negative recommendations, as they have an opposite economic meaning. In former case the actual stock price should have reached o overcome the target price, while in the last case the stock price should have been equal o lower than the target price at any day of the 12 month time span. Then we want to measure whether the target price is met on the last day of 12 months forecast horizon. The second variable, *met_end*, takes a value of 1 if the stock price at the last trading day of 12-month period is lower or equal the target price (for "sell" recommendations) or if it is higher or equal the target price (for "buy" recommendations).

Table 16. Variables for accuracy of the target price measurement.

	Variable	Description	Values
Target price accuracy	**met_in**	measures whether the target price is met at any time within 12 months	1 if YES, 0 otherwise
	met_end	measures whether the target price is met on the last day of 12-month forecast horizon	1 if last price< target price for SELL recommendations, or if last price>target price for BUY recommendations; 0 otherwise
Measure of forecast error	**abs_err**	measures absolute difference between the target price and the stock price on the last day scaled by stock price	|target price - last price|/current price
	miss_err	forecast error of missed target prices	0 if target price is met; otherwise it equals |target price - last price|/current price

Source: **personal elaboration**

The variable denominated as *abs_err* equals the absolute difference between the target price and the stock price of the last day of forecast interval scaled by the current price. Such a variable design creates no problems in the interpretation of the numbers. There is no need in making the distinction between positive and negative recommendations, as we are working with the absolute value of the price differences. However it may be

interesting to see the values without the absolute values in order to understand whether the stock price was over- or underestimated.

And finally, the last variable, *miss_err*, which is very similar to the one discussed before. It measures the forecast error of the missed target price. Though it equals zero when the target price was met at the last day of 12-month period, otherwise it equals the difference between the target price and the stock price of the last day of forecast interval scaled by the current price, such like in the previous case.

Defining all the above variables, we were constantly talking about 12-month forecast horizon. However, in practice it is very rare to see the explicit definition of the forecast period. Moreover, most of the time new reports, containing a target price revision, are issued before the expiry of the initial (implicit or explicit) forecast horizon. To take this fact into account two different options can be adopted : a) we can leave the forecast horizon unchanged, and measure separately the accuracy of the target price on two, partially overlapping time spans (flat accuracy analysis); or b) we can stop the accuracy measurement on the date when the new updated report is issued, and start a new one with a new forecast period.

Recourse to the flat accuracy analysis implies that we treat all the reports as if they are independent and equally meaningful. This assumptions is particularly misguiding in case the report update leads to the transition from one recommendation class to another. As we will see later the majority of our investment recommendations are reiterations, and though they simple repeat the recommendation of previous report. For this reason we opted for flat accuracy analysis in our research, which is not expected to create distortions in the results.

Passing to the description of independent variables (Table 17), we define the first variable named *disclosure.* It indicates whether report disclose the valuation methodology, assuming the value of 1 in case there is a clear description of the valuation approach applied by the analyst and 0 otherwise. The absence of the reference to any of the valuation technique, can be a bad sign for investors, giving the insight that the target price was decided a priori by the broker, without any numerical support. For this reason, we expect more accurate target price performance for the reports with valuation methodology disclosed.

Table 17. Independent variables.

Variable		Description	Values
recom		identifies the report's recommendation type	1 if positive, 0 for negative and neutral recommendations
disclosure		indicates whether report disclose the valuation methodology	1 if it is disclosed, 0 otherwise
primary		defines whether the target price was defined by dominant and unique valuation method o the dominant technique was chosen among other secondary methods	1 if method is the one and only, 0 otherwise
primary_secondary		defines whether target price is derived using one main valuation method or if it was obtained as a weighted average of some models	1 if there is a dominant technique , 0 if weighted average was used
Method category (all of them can assume values of 1, as theoretically analysts can use all possible valuation techniques in one report)	**M1**	indicates the recourse to the fundamental based methods in the report	1 if present, 0 otherwise
	M2	indicates the recourse to relative valuation methods in the report	1 if present, 0 otherwise
	M3	indicates the recourse to the hybrid methods in the report	1 if present, 0 otherwise

Source: **personal elaboration**

The dummy variable *recom* provides us with information about the type of recommendation contained in the report. It equals 1 in case it is positive, and zero if it is negative or neutral. Demirakos (2009) suggests the possibility of classifying negative and neutral recommendations together as they are often viewed by investors as weak negatives. We don't expect any particular relationship between the accuracy of the target price and the analyst's recommendation.

Moving forward we have three variables *M1*, *M2, M3* used for identification of the type of valuation technique. All of them are dummy variables, assuming value of 1 in case fundamental analysis/ relative analysis / hybrid methods were used respectively, and 0 otherwise. Theoretically all of this variables can be equal to 1 at the same time, as analyst are free to use any kind of valuation approach (or all of them) in one report.

We are interested not only in the identification of the best performing valuation technique, but also in understanding whether the target prices obtained by the use of only main valuation method (even if checked by other secondary valuation approach) are more or less accurate with respect to the case when the target price is the result of the weighted averaging of different models. The independent dummy variable *primary* defines whether the target price was defined by dominant and unique valuation method (=1) o the dominant technique was chosen among other secondary metods (=0). It makes sense to introduce suddenly another variable called *primary_secondary*, which has a similar meaning: equaling 1 in case target price is derived using one main valuation technique (this comprises either the case when there is a dominant and unique valuation model or when the dominant technique is double checked by another one) and 0 if it was obtained as a weighted average of some models.

4.3. Hypothesis statement.

We want to perform some statistical test on the data collected from the reports that we will analyze. We defined some hypothesis, which will guide us in our analysis, permitting to arrive at the final conclusions.

We have already mentioned the connection existing between the disclosure of valuation techniques and the target price accuracy. We formulate this idea in the hypothesis number one:

H1: Analysts, who describe the valuation method for the estimation of the target price in explicit way obtain more accurate than those analysts who do not.

Every valuation technique is inevitably subject to forecast errors, as it is based on the assumptions, which may not always coincide with reality; or in case of relative valuation in particular, because of the difficulties related to the peers group selection or to the choice of multiples that better fit the company and the industry it operates in. Analyzing the content of equity reports we can identify two different approaches for target price calculation: a) in first case, the target price is obtained using only one dominant valuation method (even if it is later checked by other methods); and b) when target price is the result of weighed average of two or more valuation techniques. We expect the linear combination of different valuation approaches to gain better results with respect to the first case. The mixture of some models permits to overcome estimation errors of

each single valuation technique and though lead to more accurate target price estimation.

H2: Target prices calculated as the weighted average of two or more valuation techniques are more accurate than those derived from one primary valuation approach.

As explained in chapter 3, it is complicated to find perfectly comparable companies for Recordati. Recordati peers operate in different therapeutic areas and no company is present simultaneously in both specialty and primary care segment and orphan drug segment. These segments present pronounced differences in margins and distribution channels, affecting the cost structure of the company. Moreover, due to the accentuated differences in growth rates, different maturities of the pipelines and patent expiration exposure, different product portfolios lead to the low reliability of the market multiples approach. Since relative valuation has a lot of limitations we expect fundamentals-based approaches to perform better in terms of target price accuracy.

H3: In the pharmaceutical industry target prices resulting from fundamentals-based methods are more accurate than those derived from multiples-based methods.

V. Sample selection and descriptive statistics.

5.1. Database and sample selection.

One of the issues that was limiting the research on equity report contents is the fact that they are difficult to find in free access. However, there exist databases summarizing some information, mostly quantitative, contained in the equity reports, such as recommendations or earning forecasts. Such a representation is ignoring some important qualitative aspects which can be useful for our analysis. To identify the valuation techniques the content analysis of each report individually seems to be the most appropriate option. The content analysis can be either classical or theoretically orientated. In first case some computer software is used to determine the presence of certain words or concepts in the text of the report. In the second, the content analysis is conducted manually. Thought the decision to perform a content analysis, reading the full text of the report and scoring all the details by hand, seemed the most appropriate solution for achievement of the purposes of this thesis. The content analysis conducted includes reading carefully each sampled report, recording the frequency with which each model appears and conducting statistical analysis.

Recordati is listed in the Italian Stock Exchange, with Italy being one of the small number of countries which require the compulsory publication of any equity research issued by authorized financial intermediaries. According to the Italian legislation “all non-public information which, if revealed to the market, may affect market prices of financial instruments, must be compulsorily transmitted to the public” (Finance code, Section IV, article 114). Regulation 11971 issued by Consob states that all the research reports on the companies listed in the Italian market should be transmitted to the Italian Stock Exchange and to CONSOB on the date the report is issued for an immediate publication. The exception is made for research that was privately produced for financial institutions and special clients. In the last case, in order to safeguard the interests of this category of investors, the deferment between the date of issue of new report and its publication on-line on the web site of Borsa Italiana is set. However, on the web-site of Italian stock exchange we found out the reports only prior 2014, and though we needed another source of information to obtain the reports from 2015 to 2016.

The reports regarding companies from European countries can be found on platforms like Factset or Investars. However, the sample of reports that can be obtained from these sources can be biased, and limited by reports of only some investment houses. This is due to the fact that participation in this data sources is not mandatory, but the result of the agreements signed between the parties. Though, the reports on Recordati is represented by hand collected population.

We collected 54 reports on Recordati from 2015 to 2016 issued by 7 distinct investment houses. Initial sample contained a larger number of reports, but some of them were excluded due to the absence of specification of the target price or recommendation category, as well as reports that were too short and didn't contain useful information for the purposes of our analysis. The median report length is 7 pages, while the minimum was 4. The maximum number of pages was 33 for the report providing initiating coverage (representing the very first assessment of the company by the investment house), type of report that by definition requires a detailed analysis of all the dimensions of the company.

5.2. Descriptive statistics on reports.

Firstly, we classified all the reports in function of it's recommendation category. It is worth mention that not all of investment houses use the same scale of recommendations. In some cases the three-level scale was observed, including "BUY", "HOLD" or "SELL". In some other cases the larger scale was used adding "strong buy" and "strong sell" options. By analyzing carefully the disclosure appendix contained in every report, we were able to understand how each recommendation category was defined by the investment house and reduce all the recommendations to three different categories: "positive" (meaning that the stock is expected to have a return of at least 10% during the forecasted period), "neutral" (stock price is expected to remain flat or increase by less then 10%) and "negative".

Our sample contains 27 reports with positive recommendation type, which corresponds to 50% of total (Table 18). Another half is represented by neutral recommendations, while no negative recommendations were observed. This is not a surprising result, as it is a known fact that analysts are reluctant on issuing a negative information on companies which they cover.

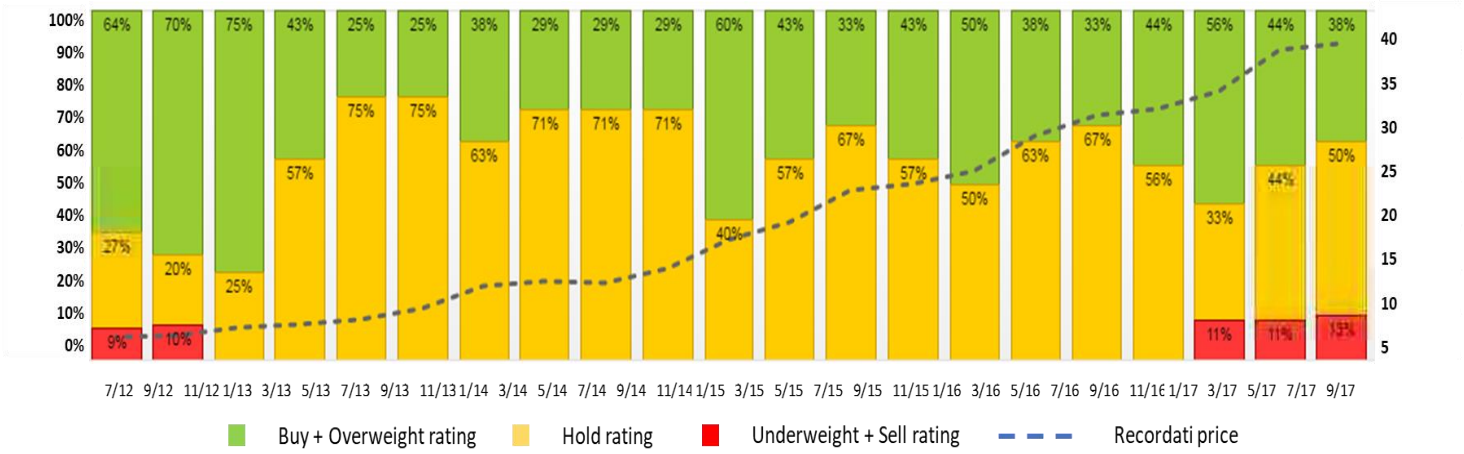
Table 18. Classification of equity reports by recommendation type.

Recomendation type	N reports	% of total
Positive	27	50%
Neutral	27	50%
Negative	0	0%
N/A	0	0%
Total	**54**	100%

Source: **personal elaboration**

Factset permits us the access to the statistics regarding recommendation category over a larger time span. In the Figure 18 we observe the frequency with which equity analysts issue buy, hold or sell recommendations for Recordati over the last 5 years. Also here we see the clear dominance of hold recommendations over the years, with an average of 52.2% . And it confirms one more time the presence of positive bias, as the recourse to the negative recommendation is very rare, and even absent in some years. But if we look at the price trend, it has always been positive, with some slowdowns. Though, it may also confirm the expertise of the analysts in estimation of the target price.

Figure 18. Recommendations on the Recordati stock price over 2012-2017.

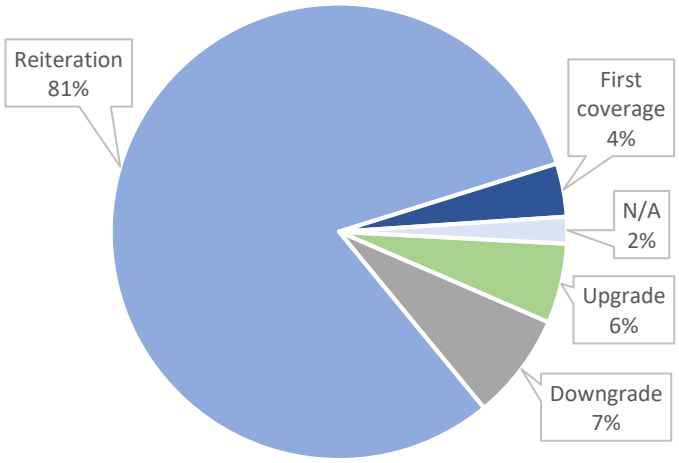


Source: **Factset**

Further we found out that the majority of reports (81% of total) across all recommendation types are reiterations of the previous recommendations. Downgrades and upgrades have a similar share with 7% and 6% respectively (Figure 19). Both

downgrades and upgrades were performed towards the nearest recommendation class: from positive to neutral in the first case, and from neutral to positive, or negative to

Figure 19. Changes in recommendation category.



Source: **personal elaboration**

neutral in the second. Two of the reports were initiating coverage and though with a recommendation issued for the first time.

Table 19 contains some descriptive statistics on the analyzed sample. The average current stock price for reports with a positive recommendation is 21.84 €, while the mean target price is 25.58€. The projected stock price increase, i.e. the percentage the price target is above the current price, varies systematically across recommendation categories. Calculating the expected increase in target price with respect to the current stock price for every report and computing the mean, we obtain the forecasted increase of the stock price by 16.93% in case of positive recommendation, and only by 1.60% for neutral recommendations. 6 out of 27 target (26%) prices in reports with neutral recommendation are lower than the stock prices at the date of issuance of an equity report. Repeating the same procedure described before for reports classified according to the changes in recommendation type we have predicted increase of 8.99% for reiterations, -6.53% for downgrade and 22.27% for upgrades.

We also collected information on the relationship between the company and the investment bank issuing the report. Analysts are required to disclose all the information regarding the presence of conflict of interest which may lead to the biased evaluation

of the company. Almost half of the reports (48.15%) mentioned the presence of conflict of interest due to the share buyback activity, underwriting of the securities or possess

Table 19. Descriptive statistics on analysts' reports.

	Positive recomendation	Neutral recommendation	Negative recommendation	Total
Number of reports	27 50.0%	27 50.0%	0 0.0%	54 100.0%
Mean current stock price (€)	21.84	23.26	-	22.55
Mean target price (€)	25.58	23.59	-	24.58
Target price increase(descrease) w.r.t. current price	16.93%	1.60 %	-	9.26%
Availability of conflict of interest information	8 (out of 27) 29.63%	18 (out of 27) 66.67%	-	26 48.15%

Source: **personal elaboration**

of the equity securities of the analyzed company. For reports with neutral recommendation the availability of conflict of interest information is more common (in 18 reports out of 27) compared to the positive recommendations reports (8 out of 27).

As we are interested in identifying the prevalent valuation techniques used for the assessment of the pharmaceutical companies, we also were interested in the informational depth of each reports in our sample. We identified 8 information categories which we expect to be core of the company evaluation and they are summarized in Table 20. The issues regarding product portfolio were addressed more frequently compared to the other categories, being observed in 18.52% of reports. Pipeline analysis and profound evaluation of past and potential M&A activity was present in 6 reports out of 54. These result are in line with our expectations, and in fact these topics are paramount when we talk about pharmaceutical companies, and in particular about Recordati. M&A activity is on the base of Recordati development strategy, generating the large part of the total revenues (see chapter 3.1.5), while the profound understanding of product portfolio and though the corresponding patent expiries is essential in order to estimate the revenues of future periods.

The target price accuracy has to be measured on a certain time span. Some reports contain an explicit definition of the target price forecasted period (63% of total), which equals 12 months in all the cases, while others don't refer to a certain period of time. For the scope of our regression analysis, we will assume it to be 12 months even in absence of explicit definition.

Table 20. Information categories classification.

Information categories	N reports	% of total
Geographic breakdown analysis	5	9.26%
Business Model Analysis	3	5.56%
Product portfolio analysis	10	18.52%
Pipeline analysis	6	11.11%
Risks analysis	1	1.85%
M&A activity	6	11.11%
Quality of management	0	0.00%
Competition	2	3.70%

Source: **personal elaboration**

Among the models belonging to fundamental-based class only DCF was used. The recourse to DCF evaluation model was observed in 70.37% of reports. The relative evaluation was more frequent: in 94.4% of cases analysts mentioned the recourse to some sort of multiple to evaluate Recordati. The most commonly used multiples are earning multiples (e.g. P/E, EV/EBITDA) with 94.44%; sales multiples - 75.93%; price to book value multiple – 51.85%; price to cash flow multiple (62.96%) and dividend yield (75.93%). No analysts used an alternative valuation methodologies such as real options. Focusing now on the evaluation techniques the first important finding is that in 19 reports (35.19% of total) there is the dominant valuation technique for the target price estimation and it is unique. The DCF approach was dominant in 16.67% of reports, while relative evaluation in 18.52%. In the last case, only price to earnings multiple was used.

In 7 reports(12.96%) there was a dominant valuation technique among other secondary, which were used to double-check the obtained target price. In all of the cases DCF was a dominant methodology, and different kinds of multiples were used to double check the target price obtained from the fundamentals analysis. The weighted average of target prices obtained from different evaluation methodologies was detected in 23 reports (42.59%). In this category we include also the target prices obtained as a sum of the parts. Table 21 puts in evidence three different cases that we observed in the reports.

Table 21. Summary of valuation techniques used in Recordati reports.

	Fundamental-based valuation	Relative valuation	
	DCF	**Earning multiples**	**TOTAL**
Dominant and unique valuation technique	9 16.67%	10 (P/E) 18.52%	**19** 35.19%
Dominant among other secondary valuation techniques	7 (DCF double checked by multiples) 12.96%		**7** 12.96%
Weighted average of two o more valuation techniques			**23** 42.59%
Total of reports with valuation technique disclosed			**49**

organic growth (EV/EBITDA) + inorganic growth (avarage historical M&A multiples)
organic growth (50% DCF + 50% multiples) + inorganic growth (avarage historical M&A multiples)
DCF and multiples (separate evaluation of P&S care (EV/EBIT) and orphan drugs (EV/EBITDA))

Source: **personal elaboration**

In 11 cases the P&S care segment and orphan drugs segment were evaluated separately (using EV/EBIT and EV/EBITDA multiples respectively), obtaining the final target price as the sum of the parts. In 9 reports to the target price obtained from DCF and multiples was added the price from the forecasted inorganic growth. In all of these cases inorganic growth was estimated keeping in consideration the average historical M&A multiples.

In 5 reports out of 54 it was not possible to individuate the valuation technique used by analysts for target price estimation, or in other words the methodology applied was not disclosed.

In addition to the information collected, we also compiled information on income statement, balance sheet and statement on cash flow. The overwhelming majority of reports, more precisely 47 of total, presented Income statement, balance sheet and FCF forecasts.

VI. Results and main conclusions

6.1. Target price achievement

In Chapter 5 we mentioned that the predicted increase of the price equals 16.93% for reports with a positive recommendation and only 1.60% for neutral. Integrating these results with the information on the performance of Recordati stock price helps us to make an idea of the target price accuracy. In Figure 20 we see time series of Recordati stock price of the last 3 years ranging between 18.05€ and 39.07€. We see a positive trend over the period under consideration with a stock growing at a CAGR 2015-2017 of 18.31%. Such a steady growth compared with an average predicted increase in price of 9.26% (for all recommendation types) gives an insight that in most of the cases the target prices will be reached.

Figure 20. Historical data on Recordati stock price.

Source: **Factset**

The results obtained thanks to instruments of the target price accuracy measurement defined in Chapter 4 confirm our expectations. When we use variable *met_in,* and though the target price is considered accurate in case it meets the stock price at any time within 12 month period, we obtain the accuracy in 96.30% of cases or for 52 reports out of 54. It took on average 115 days to achieve 12-month target price. Splitting it

between 2 categories of recommendation types we have an average of 114 days for neutral and 132 for positive (Table 22).

Table 22. Percentage of reports achieving 12-month target price (somewhere in 12 months).

Report recommendation type	Target price achieved	1-3 months	4-6 months	7-9 months	9-12 months	Average days to reach the target price
All recommendations	96.30%	46.15%	26.92%	17.31%	9.62%	115
Neutral recommendation	92.00%	60.00%	28.00%	8.00%	4%	114
Positive recommendation	100.00%	33.33%	25.93%	25.93%	14.81%	132

Source: **personal elaboration**

If we subdivide the sample in function of implicit return, we have 48 reports with positive implicit return and 6 with negative (Table 23). In the first case, 100% of reports achieved the predicted target price, while only 66.67% predictions were accurate in case the target price was lower than the current stock price. The two cases where the TP was not reached refer to the cases of reports with neutral recommendation, where the implicit return was comprised in a range of [-20%; -30%] (target price equaling 14$ and 17$). Clearly this threshold was not reached at any time because the minimum stock price of the last three years was 18.05$.

Table 23. Classification of reports according to the predicted implicit return.

	Predicted increase in price	Target price reached	1-3 months	4-6 months	7-9 months	9-12 months	N reports
Negative implicit return	(20%)-(30%)	0%	0%	0%	0%	0%	2
	(10%)-(20%)	100%	100%	0%	0%	0%	1
	(10%) - 0	100%	66.67%	33.33%	0%	0%	3
Positive implicit return	0-10%	100%	47.62%	28.57%	19.05%	4.76%	21
	10%-20%	100%	47.06%	23.53%	17.65%	11.76%	17
	20-30%	100%	37.50%	37.50%	12.50%	12.50%	8
	30%-40%	100%	0%	50%	0%	50%	2

Source: **personal elaboration**

In we define the accuracy in function of whether the target price was reached at the last day of 12 month period (*met_end*) the percentage of reports with an accurate target price slightly decreases, remaining anyway very high and equals 88.9%. The 11.1% of reports (6 out of 54) with target price not reached had a neutral recommendation type and negative implicit return.

Considering the very high percentage of reports reaching the target price it makes more sense to concentrate on variables *abs_err* and *miss_err,* which measure the predictive error. The variable denominated as *abs_err* equals the absolute difference between the target price and the stock price of the last day of forecast interval scaled by the current price. In the Table 24 we see that the average forecast error equals 24.41% (st.dev. = 13.76%). If we take the difference without absolute value we notice that in all of the cases the forecast error has a negative sign. This means that in all of the reports of our sample the target price was underestimated regardless the recommendation issued. The lowest forecast error equals 0.17% and the highest one is 60.92%.

Table 24. Descriptive statistics on target price accuracy *(abs_err*) – by analyst's recommendation type.

	Positive recommendation	Neutral recommendation	
	abs_err	**abs_err**	**TOTAL**
N reports	27	27	54
Mean	16.98%	31.84%	24.41%
St.dev	10.72%	12.50%	13.76%
Median	17.92%	31.26%	23.28%
Min	0.17%	11.51%	0.17%
Max	43.80%	60.92%	60.92%
Skewness	0.5099	0.4611	0.4570
Kurtosis	0.2886	-0.3389	-0.0949

Source: **personal elaboration**

Table 25. Descriptive statistics on target price accuracy

Descriptive statistics on target price accuracy – by level of disclosure of the valuation method used

	N reports	Mean	St.dev	Median	Min	Max
non disloced	5.00	33.03%	16.52%	27.52%	19.36%	60.92%
disclosed	49.00	23.53%	13.33%	22.95%	0.17%	51.73%

And last but not least is the variable miss_err equaling 41.59% with a standard deviation of 12.94.

6.2. Discrepancies in the evaluation between investment houses.

The analysts are not equally capable in estimating the target price. We do not disclose the names of the investment houses, but assign letters for A to H to distinguish them. In Table 26 we see the descriptive statistics on target price accuracy grouped by the investment houses which issued the report. It is evident that there do exist the discrepancies in the accuracy of the target price. The investment house that issued the most accurate estimation of target price ("E") has a forecast error of only 6% versus 42.40% for the worst performer ("A"). Investment house "E" has also the lowest standard deviation of *abs_err*, not considering "F" which issued only one equity report and though its standard deviation is zero. Looking at other variables for accuracy

Table 26. Descriptive statistics on target price accuracy – by investment house.

Investment house	met_in	met_end	Mean abs_err	st.dev abs_err	Mean days to reach the TP
A	83.33%	50.00%	42.40%	13.91%	41
B	85.71%	85.71%	32.51%	11.97%	65.67
C	100%	100%	20%	8.32%	123.69
D	100%	71%	30%	11.67%	46.29
E	100%	100%	6%	6.15%	258.33
F	100%	100%	31%	0%	4.00
G	100%	100%	11%	11.41%	177.80
H	100%	100%	21%	7.12%	155.00

Source: **personal elaboration**

measurement (*met_in* and *met_end*) "A" remains the investment house with the poorest predictive performance of the target price. If we check the valuation techniques applied by "A" and "E" we discover that in first case the P/E was used as dominant and unique valuation model in all of the reports issued by the analyst, while in the second case the discounted cash flow model was used with a double check by multiples.

6.3 Hypothesis testing results

In order to the test our first hypothesis defined in Chapter 4, we run a following regression models:

1) MET_IN= $\alpha + \beta_1 * DISCLOSURE + \varepsilon$
2) MET_OUT= $\alpha + \beta_1 * DISCLOSURE + \varepsilon$
3) ABS_ERR= $\alpha + \beta_1 * DISCLOSURE + \varepsilon$
4) MISS_ERR= $\alpha + \beta_1 * DISCLOSURE + \varepsilon$

We have four different dependent variables, that measure the target price accuracy and one independent variable indicating whether the valuation method used by analysts was disclosed in the text of the reports.

H1: Analysts, who describe the valuation method for the estimation of the target price in explicit way obtain more accurate than those analysts who do not.

Table 27. Hypothesis 1 test results.

Equation		*Coefficients*	*Standard error*	*Stat t*	*p-value*
1)	Intercept	0.8	0.082732	9.669777	3.27E-13
	β_1	0.179592	0.086851	2.067827	0.043648
	R squared	**0,075981**			
2)	Intercept	0.6	0.136909	4.382468	5.72E-05
	β_1	0.318367	0.143725	2.21512	0.031156
	R squared	**0,086224**			
3)	Intercept	0.330278	0.059518	5.5492	9.82E-07
	β_1	-0.09855	0.062481	-1.57729	0.120793
	R squared	**0.045659**			
4)	Intercept	0.18994	0.058581	3.242347	0.002072
	β_1	-0.1584	0.061497	-2.5757	0.012886
	R squared	**0.113146**			

Source: **personal elaboration**

The DISCLOSURE variable is statistically significant at 5% level in 1 of 4 model specifications (Table 27). However all of the models present a very low R-squared, meaning that the independent variable explains only a small proportion of the variance in the dependent variable. In model specification 1) and 2) the coefficient is positive,

indicating the existence of positive relationship of valuation model disclosure and the achievement of the target price in the 12-month period. In model specification 4) the coefficient is negative, and this is explained by the fact that in this case the target price accuracy is represented by forecast error. Though the forecast error decreases in cases the valuation methodology is disclosed. In light of what we said before, we retain the abs_err variable the most reliable measure of the accuracy. In the model specification 3) the DISCLOSURE variable is statistically insignificant, meaning that the presence of a valuation method does not affect the level of accuracy.

For testing the second hypothesis "*H2: Target prices calculated as the weighted average of two or more valuation techniques are more accurate than those derived from one primary valuation approach"* we run a regression using the independent variable PRIMARY_SECONDARY, which equals 1 in case target price is derived using one main valuation technique (this comprises either the case when there is a dominant and unique valuation model or when the dominant technique is double checked by another one) and 0 if it was obtained as a weighted average of some models. We run the following regression models:

1) MET_IN= $\alpha + \beta_1 * PRIMARY\_SECONDARY + \varepsilon$
2) MET_OUT= $\alpha + \beta_1 * PRIMARY\_SECONDARY + \varepsilon$
3) ABS_ERR= $\alpha + \beta_1 * PRIMARY\_SECONDARY + \varepsilon$
4) MISS_ERR= $\alpha + \beta_1 * PRIMARY\_SECONDARY + \varepsilon$

Table 28. Hypothesis 2 test results.

Equation		*Coefficients*	*Standard error*	*Stat t*	*p-value*
1)	Intercept	1	0.029824	33.52969	1.79E-34
	β_1	-0.03846	0.040943	-0.93939	0.352335
	R squared	**0.018429**			
2)	Intercept	0.956522	0.057791	16.55129	3.09E-21
	β_1	-0.07191	0.079337	-0.90634	0.369377
	R squared	**0.017178**			
3)	Intercept	0.207398	0.026969	7.690122	7.42E-10
	β_1	0.04585	0.037024	1.238389	0.221722
	R squared	**0.031599**			
4)	Intercept	0.018974	0.023138	0.820052	0.416326
	β_1	0.023685	0.031764	0.745649	0.459592
	R squared	**0.011691**			

Source: **personal elaboration**

In all model specifications we have the coefficients which are not statistically significant. This means that in our case target prices based on main valuation method and those based on a group of methods provide similar levels of accuracy.

We then substitute the variable PRIMARY_SECONDARY with PRIMARY in the previous equation. The dummy variable PRIMARY defines whether the target price was defined by dominant and unique valuation method (=1) o the dominant technique was chosen among other secondary metods (=0). Though we test another group of equations:

1) MET_IN= $\alpha + \beta_1 * PRIMARY + \varepsilon$
2) MET_OUT= $\alpha + \beta_1 * PRIMARY + \varepsilon$
3) ABS_ERR= $\alpha + \beta_1 * PRIMARY + \varepsilon$
4) MISS_ERR= $\alpha + \beta_1 * PRIMARY + \varepsilon$

Table 29. Hypothesis 2 test results.

Equation		*Coefficients*	*Standard error*	*Stat t*	*p-value*
1)	Intercept	1	0.075094	13.31666	1.41E-12
	β_1	-0.05263	0.087845	-0.59914	0.554691
	R squared	**0.014737**			
2)	Intercept	0.857143	0.125514	6.829082	4.61E-07
	β_1	0.037594	0.146825	0.256046	0.800097
	R squared	**0.002724**			
3)	Intercept	0.187326	0.057565	3.254182	0.003368
	β_1	0.090209	0.067339	1.339625	0.192915
	R squared	**0.069572**			
4)	Intercept	0.038879	0.048576	0.800378	0.431344
	β_1	0.005172	0.056824	0.091026	0.928227
	R squared	**0.000345**			

Source: **personal elaboration**

Also in this case the coefficients are statistically insignificant in all of the equations considered (Table 29). Though we fail to determine the relationship between the target price accuracy and ranking among the valuation methods.

Going forward, we test the third hypothesis, aimed to verify whether the target prices obtained from fundamental-based methods are more accurate compared to those derived from relative methods (multiples), regardless the ranking between the methods. We run a regression with two independent variables M1 and M2, indicating the recourse to DCF in the report (M1=1) and zero otherwise and the usage of multiples approach

(M2=1) and zero otherwise (M2=0). It may happen that both of the variables equal 1 at the same time, as analysts are free to use more than one valuation technique in the equity report.

1) MET_OUT= $\alpha + \beta_1 * M1 + \beta_2 * M2 + \varepsilon$
2) ABS_ERR= $\alpha + \beta_1 * M1 + \beta_2 * M2 + \varepsilon$
3) MISS_ERR= $\alpha + \beta_1 * M1 + \beta_2 * M2 + \varepsilon$
4) MISS_ERR= $\alpha + \beta_1 * M1 + \beta_2 * M2 + \varepsilon$

Table 30. Hypothesis 3 test results.

Equation		*Coefficients*	*Standard error*	*Stat t*	*p-value*
1)	Intercept	0.840244	0.063489	13.23441	4.03E-18
	β_1	0.12622	0.056943	2.216583	0.031138
	β_2	0.039634	0.063327	0.625863	0.534196
	R squared	**0.10686**			
2)	Intercept	0.757317	0.109694	6.903937	7.72E-09
	β_1	0.111585	0.098384	1.134186	0.262019
	β_2	0.064024	0.109413	0.585161	0.56102
	R squared	**0.037233**			
3)	Intercept	0.30855	0.041851	7.372653	1.4E-09
	β_1	-0.14411	0.037536	-3.83942	0.000342
	β_2	0.045693	0.041744	1.094622	0.278825
	R squared	**0.225552**			
4)	Intercept	0.12178	0.046932	2.594833	0.012327
	β_1	-0.06498	0.042093	-1.54373	0.128836
	β_2	-0.03597	0.046812	-0.76837	0.445811
	R squared	**0.065764**			

Source: **personal elaboration**

The results obtained are satisfactory. In regression 1) and 3) we have coefficients that are statistically significant at 5% level in first case and at 1% level in the second case. Also, R-squared values are much higher than in cases that we have seen previously, 0.1086 and 0.2255 respectively. We concentrate on commenting the result of the third regression. The coefficient has a negative sign, which means that application of DCF approach for estimation of target price leads to the decrease in the forecast error.

Conclusions

We analyzed 54 equity reports on Recordati issued during 2015 and 2016. All the reports were equally distributed between positive and neutral recommendations, and no negative recommendation was present. The palette of valuation methods used in these reports was rather restricted. Moreover no recourse to real options approach was observed, in contrast of what was suggested by theory, stating that models different from real options fail capturing the component of company's value related to the products in pipeline. We found out that among the techniques belonging to the fundamental-based class only DCF was used, which was observed in 70.37% of reports. The recourse to relative valuations was more frequent: different kinds of multiples were detected in 94.4% of cases.

In 11 cases the primary and specialty care segment and orphan drugs segment were evaluated separately, obtaining the final target price as the sum of the parts. In 9 reports to the target price obtained from DCF and multiples was added the price from the forecasted inorganic growth. In all of these cases inorganic growth was estimated keeping in consideration the average historical M&A multiples.

Furthermore we defined 4 different variables for measurement of target price accuracy: two monitoring whether the target price was reached in 12-month period, and other two measuring the forecast error. The variables *met_in* and m*et_out* gain a very positive picture of target price accuracy. In 96.3% of cases the target price was reached at any time within forecasted period. Such a high level of target price accuracy is explained by positive and high growth of the stock price over the period under consideration combined with the fact that we had no negative recommendations in our sample. In such a circumstance it is better to focus on the forecast errors of target price. The variable ABS_ERR provides a forecast error of 24.41%. Moreover, in all of the cases this forecast error derives from the strong underestimation of the target price. The forecast error of reports with positive recommendation is half of those with a neutral one.

Once the dependent and independent variables were defined, we run regressions to test the hypothesis. In majority of the cases the determinant coefficient (R-squared) is low, but this is in line with prior literature. The variable related to the disclosure of valuation method applied by analysts DISCLOSED is significant with 3 of 4 dependent

variables. In the first two regressions, where the dependent variable is represented by *met_in* and *met_out* the coefficient is positive, meaning that analysts, who describe the valuation method for the estimation of the target price in explicit way obtain systematically more accurate than those analysts who do not. In the regression on *abs_err* variable we fail to find the relationship between the disclosure of valuation approach and the accuracy. This result can be explained in case analysts base their estimations on very rigorous and precise procedures, but decide not to disclose them as they prefer to keep the data and procedure used private. A good reputation of an investment house may assure strong credibility in front of the investors even in cases when the valuation technique is not explicitly described.

Another issue of our interest was related to the ranking among the valuation methods. We distinguished between the target prices derived as weighted average of more than one valuation model and target price based on one primary valuation approach, defining the variable PRIMARY_SECONDARY. Additionally, we made a distinction between unique and dominant valuation method and dominant valuation technique among other secondary. All the regression performed had the coefficients which are not statistically significant. This result is not in line with our expectations, as we assumed that the mixture of some models permits to overcome estimation errors of each single valuation technique and though lead to more accurate target price estimation.

Lastly, we checked the differences in target price accuracy depending on whether the valuation techniques belong to the fundamental-based class or multiples. In two regression we obtained the coefficients which were statistically significant, with the negative sign, meaning that the forecast errors decrease when the analyst rely on the DCF for target price estimation. It confirms that the application of methods which are more sophisticated and time consuming repays in terms of target price accuracy. No relationship is derived between the dependent variable and the usage of multiples, which may be the consequence of the limited comparability of the pharma companies, due to the accentuated differences in growth rates, different maturities of the pipelines and patent expiration exposure, presence of the companies in very different therapeutic areas and different product portfolios lead to the low reliability of the market multiples approach resulting in bad performance of relative valuation approaches.

We see that the results vary significantly in function of how the target price accuracy is defined. In performing the studies on equity reports and target price accuracy the researcher should be attentive in choosing the right instrument for the accuracy measurement, considering also the variables such as the performance of the stock price over the period of the analysis.

References

ASQUITH P., MIKHAIL M., AU A. (2005): “Information content of equity analyst reports”, in Journal of Financial Economics, 75 , pp. 245-282.

BANARJEE A. (2003): “Real Option Valuation of a Pharmaceutical Company”, Vikalpa.

BERTINETTI G., CAVEZZALI E., RIGONI U. (2006): “The content of reports on Italian stocks. Do evaluation methods matter?”, EFMA Madrid Meetings Working Paper.

BONIN S., BIANCHINI R., SALVI A., ZANETTI L. (2010): “Target price accuracy in equity research”, Working paper.

BRADSHAW M. T. (2002): “The use of target price to justify sell-side analysts’ stock recommendations”, in Accounting Horizons, 16 No 1, pp. 27-41.

CAVEZZALI E., RIGONI U. (2013): “Financial Analysts’ Accuracy: Do valuation methods matter?”, Working paper.

CAVEZZALI E., RIGONI U. (2008): “Properties of equity analysts reports and market reaction”, Working paper.

COOK A.G. (2006): “*Forecasting for the Pharmaceutical Industry. Models for New Product and In-Market forecasting and How To Use Them*”, Gower Publishing Limited, England.

DAMODARAN A. (2000). “The Promise of Real Options,” Journal of Applied Corporate Finance, Vol 13, No 2, pp 29-43.

DAMODARAN A. (2009): “Valuing Companies with intangible assets”, Working paper.

DAMODARAN A. (2010): “Applied corporate finance”, Wiley.

DEMIRAKOS E., STRONG N. and WALKER M: (2004), “What Valuation Models Do Analysts Use?”, Accounting Horizons, 18 (4): 221-240.

DEMIRAKOS E., STRONG N. and WALKER M (2009), “Does valuation model choice affect target price accuracy?”, Working Paper. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1370847

DUGAR, AMITABH, NATHAN S. (1995): The Effect of Investment Banking relationships on Financial Analysts’ Earnings Forecasts and Investment Recommendations, Contemporary Accounting Research, 12 (1): 131-160.

GIMENO R., GONZALEZ C.I. (2008): “Financial Analysts impact on Stock Volatility. A Study on the Pharmaceutical Sector”, Working paper.

GLEASON C., JOHNSON B. and LI H. (2006), "The Earning Forecast Accuracy, Valuation Model Use, and Price Target Performance of Sell-Side Equity Analysts", Working Paper. http://www.nd.edu/~carecob/Paper%20Links/Su'06%20Conf/Gleason%206-06.pdf

GLEASON C., JOHNSON B. and LI H. (2008), "Valuation Model Use and the Price Target Performance of Sell-Side Equity Analysts", Working Paper. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=930720

HASHIM N.A., STRONG N.C. (2016): "Do analysts' cash flow forecasts improve the accuracy of their target prices?", Working paper.

HASSAN A., HARTMANN M. (2005): "Application of real options analysis for pharmaceutical R&D project valuation—Empirical results from a survey", Working paper

KERL A.G. (2011): "Target price accuracy", Official Open Access Journal of VHB

KOLLER T., GOEDHART M., WESSELS D. (2015): "*Valuation measuring and managing the value of companies*", McKinsey & Company, New Jersey.

LÖFQVIST M. (2009): "On the Valuation of 'Big Pharma's' Research Pipelines", Master thesis.

MICHAELY, RONI AND WOMACK K.L. (1999): Conflict of Interest and the Credibility of Underwriter Analyst Recommendations, Review of Financial Studies, 12 (4): 653-686.

MIEMIETZ M. (2013): "CFA INSTITUTE INDUSTRY GUIDES THE PHARMACEUTICAL INDUSTRY", CFA Institute.

MORNINGSTAR (2015): "Equity Research Methodology", Morningstar, Inc.

PAPADOPOULOU G. (2012): "An Analysis of the Valuation Practices in Sell-Side Equity Analyst Reports Regarding the Banking & Pharmaceutical Sectors in United Kingdom", Working paper.

VALENTINE J.J. (2011): **"**Best Practices for Equity Research Analysts: Essentials for Buy-Side and Sell-Side Analysts". McGraw-Hill

Womack, Kent L. (1996): Do Brokerage Analysts' Recommendations Have Investment Value?, Journal of Finance, 51 (1):137-167