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Price and value alignment in the M&A process: IBM's acquisition of Red Hat

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ABSTRACT

Business and financial institutions valuation is performed using different approaches. The most adopted ones are the discounted cash flow method, the comparable companies' analysis, the economic value added approach and the dividend discount model. Each approach presents pros and cons, and, for this reason, it is important to choose the most appropriate method depending on the company under analysis. This thesis aims at providing guidelines concerning the application of the valuation methods and at warning analysts of common problems that they may face in applying them. In addition, this thesis aims at describing the International Business Machines Corporation's acquisition of Red Hat. Specifically, this thesis aims at deriving the share price of Red Hat on 31 December 2019 and at comparing it to the price agreed on 29 October 2018 and subsequently paid by International Business Machines Corporation on 9 July 2019 ($190 per share) in order to understand if it is justified. Therefore, this thesis describes the financial performance of both International Business Machines Corporations and Red Hat between 2015 and 2019 and the valuation model used to derive the value of Red Hat on 31 December 2019. In conclusion, the thesis shows that the price paid by International Business Machines Corporation is justified. In fact, the price of Red Hat on 31 December 2019 resulting from the valuation performed is equal to $199.92 per share.

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INTRODUCTION

Nowadays, M&A operations are always more common. Valuation plays a key role in the M&A process. In fact, buyers make their offers on the basis of the valuation performed on potential targets. Valuation guides the acquiring company in offering a reasonable price to the target company and, therefore, it will help the bidder to successfully close the deal. For this reason, it is important to perform valuation accurately. Valuation is performed by analysts that apply valuation methods using target companies' financial data and forecasting future ones.

This thesis aims at describing the existing valuation models and at discussing the International Business Machines Corporation's acquisition of Red Hat by describing the acquisition process and by evaluating the target company in order to analyse the acquisition premium paid by International Business Machines Corporation (IBM).

The first chapter of this thesis aims at discussing the most important valuation methods, such as the discounted cash flow method, the comparable companies' analysis, the economic value added and the dividend discount model, by describing their application and by listing their advantages and disadvantages. Particular attention will be paid to the practical aspect of the valuation. In fact, for each method will be provided correct practises to be followed in the application process and details to pay attention to. In addition, it will be suggested in which circumstance it is better to use one method or another.

The second chapter will briefly describe the history of International Business Machines Corporation and Red Hat. Then, financial data of the two companies, such as annual revenue, earnings before interest, taxes, depreciation, and amortization, earnings before interest and taxes, net income and return on invested capital from 2015 to 2019 will be described as well as the acquisition process and the rationale behind the International Business Machines Corporation's acquisition of Red Hat.

The third chapter aims at understanding if the price paid by International Business Machines Corporation is justified. In fact, as we will see in Chapter 2, International Business Machines Corporations announced the acquisition of Red Hat on 29 October 2018, when Red Hat share price was equal to $116.82, for a price of $190 per share. The deal was closed on 9 July 2019, when Red Hat share price was $187.71. The alignment between the price paid and the market value of Red Hat shares may be due to the fact that financial markets were biased by the price paid by International Business Machines Corporations. After the acquisition, Red Hat was delisted and, therefore, the share price is no longer available since that day. For this reason, I decided to evaluate Red Hat in order to determine Red Hat share price on 31 December 2019 to understand if the price paid by International Business Corporation was justified 175 days after the closing of the deal. To evaluate Red Hat, I decided to use the discounted cash flows method, and specifically, the weighted average cost of capital method. Each step of the valuation process will be thoroughly described and each assumption made to calculate the weighted average cost of capital and to calculate the needed financial data to find Red Hat's share price, such as revenue, cost of goods sold, earnings before interest, taxes, depreciation, and amortization, earnings before interest and taxes, net working capital and capital invested, will be justified.

1 LITERATURE REVIEW OF BUSINESS VALUATION METHODS

A company's valuation is a process aimed at estimating the value of a company through the application of specific methods.

The valuation process involves professionals, financial institutions, businesses, and academics. Although it is commonly believed that the value of a company can be estimated by analysing the cash flows that the company is expected to generate in the future, in Italy a debate on the concept of value goes on. In fact, through the years different approaches have been adopted and for many years it has been maintained some conceptual distance from the idea that the value of a firm was well connected to future cash flows. For this reason, there has been greater adoption of methods based on the analytical determination of a company's asset value, methods based on the determination of a company's economic performance and mixed methods. The first one, known as *metodo patrimoniale*, assumes that company value is equal to equity adjusted. The second one, known as *metodo reddituale,* is based on the determination of normalized earnings that are then discounted using a rate of return that reflects the risk related to the company that is being evaluated. The last one, known as *metodo misto,* estimates a company's value by summing the goodwill to equity adjusted. The goodwill is estimated by discounting future earnings that the company can generate over the sector's average results.

This chapter aims at illustrating the different situations, within the corporate finance, in which valuation is required and the different existing methods to evaluate a company. The discounted cash flow method, the multiples approach and the economic value added approach will be analysed by describing their implementation process and the problems related to their implementation process. In conclusion, the valuation of banks and insurance companies will be discussed by illustrating the dividend discount model.

1.1 The Objectives of the Valuation Methods

The objective of the valuation process depends on the context in which the valuation is performed and on the type of result needed. The valuation process is typically implemented in merger & acquisition (M&A) operations, in initial public offering (IPO) operations and private equity and venture capital operations. Furthermore, valuation can be performed for internal purposes, such as self-diagnosis. In the following paragraphs, I am going to discuss the main aspects that characterise the different approaches when implementing the valuation process in different contexts.

1.1.1 Merger & Acquisition Operations

The valuation performed in merger & acquisition operations typically involves the implementation of the discounted cash flow model, of the multiple analysis and the precedent transactions analysis. In the first phase of this type of operations, the valuation assumes an instrumental function in the negotiation between the acquiring company and the target company. The prices paid in the deals typically include an acquisition premium. Acquisition premium represents the difference between the estimated value of the company and the effective paid price. Acquisition premiums are paid by the acquirer because of the strategic value that the target company has. The strategic value is composed by the company's stand-alone value and by the value of the expected synergies. Typically, the valuation of the expected synergies is the part of the valuation process which is more exposed to the risk of overestimation. Once the acquiring company gains control over the target company, it will have the right to operate the target company's business and, for this reason, the acquisition premium that the acquirer is willing to pay depends on the strategic interest that the target company has on the acquiring company.

1.1.2 Initial Public Offering Process

The company's preliminary valuation is aimed at contributing to the pricing process of the company's shares that will be sold on the stock exchange. Rationality plays a very

important role in this process, in fact, the success of the process depends on it. In addition, the rationality of the process plays an important role in the perception of the company that creditors, clients, employees, suppliers and, more in general, the financial community have. As for merger & acquisition operations, the valuation performed in the initial public offering process is based on multiple analysis. However, it presents some differences with the valuation performed in mergers & acquisition operations.

- Absence of acquisition premium. In fact, the listing process of a company does not imply the total sale of the company, it only implies the entry of new shareholders to support a new development cycle.
- Absence of potential synergies. In fact, it is not an industrial investment, but it is a financial one.

As said before, in performing the valuation of a company in the listing phase, the multiple analysis plays an important role. In fact, this approach gives the possibility to compare the analysed company to similar companies that are listed on the stock exchange. Institutional investors, such as mutual funds, typically base their investment decisions concerning initial public offerings on the analysis of comparable companies. Multiple analysis is the fastest way to evaluate a company without having its industrial plan. The application of valuation methods permits the identification of the stand-alone value of the analysed company at which it is often applied a discount, known as IPO discount. The valuation of the IPO discount is based on the indications provided by institutional investors. The rationale behind the IPO discount is that, if it was not applied, it would be preferable to acquire shares of another company that has similar characteristics and a similar risk profile to the analysed firm. In fact, in the initial public offering process, are offered shares of a company with no equity story, with a management team that is typically not well-known by the financial community. On the contrary, asymmetric information in listed companies is reduced by the disclosure requirements and by the analysis performed by financial analysts. The size of the IPO discount not only depends on the ability of the company of generating results in the future, on the financial structure, on the corporate governance and on the management track of the record, but it also depends on the economic conjuncture of the stock market and the sector in which the company operates, on the competition of other issuances in the same period, on the

performance of recently listed companies, on the number of floating shares, on the economic context and on the investors' level of trust.

1.1.3 Private Equity and Venture Capital

The preliminary analysis in private equity transactions aims at determining the size of the equity capital contribution in order to achieve a given level of profitability over a limited time horizon of 3 to 5 years. The objective of the valuation is to determine the exit value that will grant to the investors a given internal rate of return. The required internal rate of return typically considers the return on equity that a private equity or venture capital investors wants to achieve, also known as the hurdle rate.

1.1.4 Self-Diagnosis

The valuation process is not only important when dealing with corporate finance transactions, but it is important also when it is needed to support management decisions and it should be implemented both on listed companies and non-listed companies using the valuation methods mentioned above. In this context, valuation plays a crucial role in strategic planning, in the selection process of alternative strategies and to measure the value created. Furthermore, listed companies compare the estimated value to the market value in order to prepare an effective communication strategy that aims at delivering the value created.

1.2 The Application of the Main Valuation Models

Regardless of the valuation method used, a company's valuation process must be undertaken rationally and transparently. For this purpose, each assumption should be justified also considering the business plan of the company.

In the following paragraphs, I will analyse the valuation methods that are commonly used by the financial community, also focusing on practical aspects.

1.2.1 DCF - Discounted Cash Flow Method

In the first part of this paragraph, I am going to discuss the theory behind the discounted cash flow method. Instead, the second part will discuss the implementation problems related to this valuation method.

1.2.1.1 A Theoretical Overview

The discounted cash flow is recognized as the most accredited method by modern business theories that relate the company value to the ability to produce an adequate level of cash flows to meet the investor's remuneration expectations.

Equity value is equal to the sum of the following items:

- The sum of the discounted free cash flows that the company is expected to generate in the future. The discount rate used to discount the free cash flows is the weighted average cost of capital. In general, this method entails the determination of the discounted value of the expected future free cash flows in the projection period and the determination of the terminal value, that is the discounted value of the future free cash flows expected to be realized after the projection period.
- The net financial position
- The market value of activities that the company owns but do not influence free cash flows (surplus assets)

Therefore, the equity value of a company and the enterprise value can be derived through the following formulas:

$$Equity\ Value = \sum_{t=1}^{n} \frac{FCF(t)}{(1+WACC)^t} + PV\ (Terminal\ Value) - Net\ Financial\ Position + Surplus\ Assets$$

$$Enterprise\ Value = \sum_{t=1}^{n} \frac{FCF(t)}{(1+WACC)^t} + PV\ (Terminal\ Value)$$

Where,

FCF = expected Free Cash Flows in the projected period

WACC = Weighted-Average Cost of Capital

n = number of years in the projected period

1.2.1.1.1 Free Cash Flow

Free cash flow is linked to the operating activities of the company. Table 1 shows how to calculate a company's free cash flow.

	EBIT
-	Income Tax
+	Amortization & Depreciation
-	Change in Net Working Capital
-	Capital Invested
=	Free Cash Flow (FCF)

Table 1: Free Cash Flow formula

1.2.1.1.2 Weighted Average Cost of Capital

The discount rate used to discount a company's expected free cash flows is the weighted average cost of capital.

*Weighted Average Cost of Capital = R_e * E/EV + R_d * (1 – Tax Rate) * D/EV*

Where,

R_e = *cost of equity*

E/EV = equity/ enterprise value

R_d * *(1 – Tax Rate) = cost of debt adjusted for tax benefit*

D/EV = debt/ enterprise value

Capital structure is based on the current value of the company's debt and equity. The cost of debt is equal to the risk-free rate plus the spread. The cost of equity is equal to the risk-free rate plus the market risk premium multiplied by the company's beta.

Cost of Equity = R_f + $ß_L$ * *MRP*

Where,

R_f = *risk-free rate*

$ß_L$ = *beta levered*

MRP = Market Risk Premium

The market risk premium is equal to the difference between the market return and the risk-free rate. A company's beta measures the correlation between a company's equity market value and the market. In other words, a company's beta measures the systematic risk of the company.

1.2.1.1.3 Terminal Value

The terminal value represents the value of the future free cash flows expected after the forecasted period. Its value is determined by the expected free cash flow in the first year after the end of the projection period and the expected long-term growth rate of the free cash flow. The terminal value can be estimated by applying two different approaches.

- The first method estimates the terminal value by discounting, using the perpetuity method, the free cash flow in the last year of the projection period incremented by the long-term growth rate "g".

$$Terminal\ Value = \frac{FCF(n) * (1 + g)}{(WACC - g)}$$

- The second method estimates the terminal value by multiplying the expected net income, cash flow, earnings before interest, taxes, depreciation, and amortization, earnings before interest and taxes or other items in the last year of the projection period by a multiple. For example, the terminal value can be estimated by multiplying EBITDA in year "n" by EV/EBITDA derived by performing the comparable companies' analysis. Also in this case, the derived value must be discounted to the base year.

1.2.1.1.4 Net Financial Position

The net financial position is equal to the difference between financial debts, both short-term and long-term, and cash and cash equivalents plus other long-term and short-term financial assets. Financial debts should be expressed at market value.

1.2.1.1.5 Surplus Assets

Surplus assets include all those activities that are owned by the company that does not affect the free cash flow of the company itself. For this reason, the surplus assets should be considered separately.

1.2.1.2 Valuation of Multi-Business Companies

When performing the valuation of a multi-business company, the correct approach, as shown by Table 2, is to measure separately each business unit and then sum the values. In particular, the valuation of each business unit is extremely necessary when business units have different risk profile. Discounted cash flow method is applied separately to each business unit using a weighted average cost of capital that reflects the specific risk profile of the unit. Therefore, it is necessary to estimate a beta for each business unit. The

company's equity is equal to the difference between the sum of the business units' value and the net financial position. Only in specific situations, such as project financing, in which not only operating results and capital invested are available, but also debt level, it is possible to estimate the equity value for each business unit.

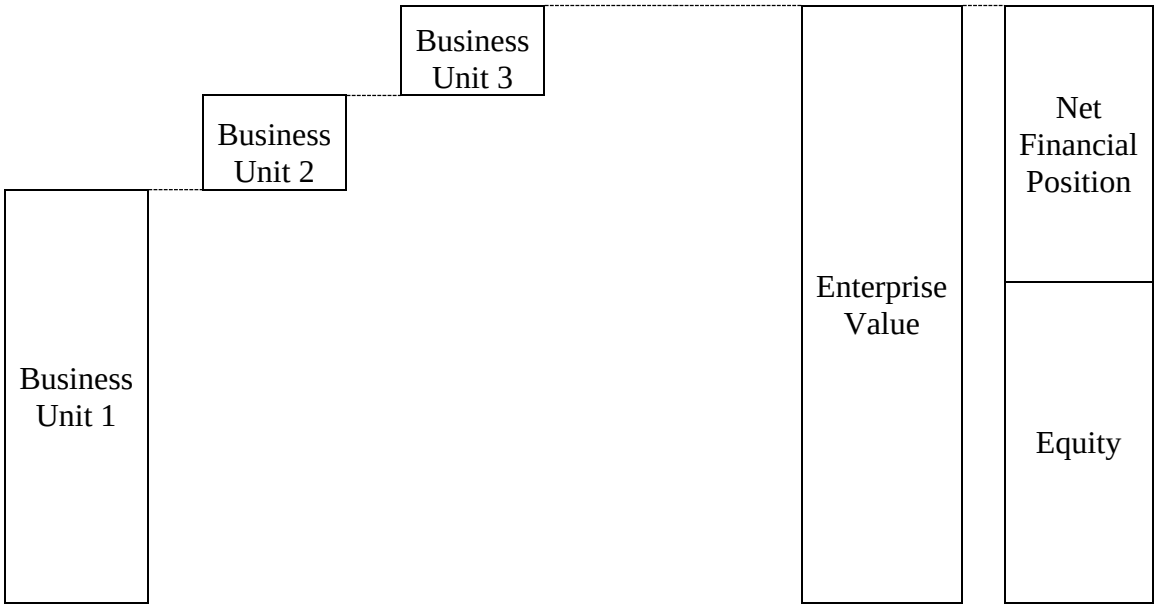

Table 2: Valuation of multi-business companies

From the management point of view, the valuation of a company using the method "sum of the parts" is easier thanks to the availability of information in the business plan. An alternative method is to perform the valuation of each business unit ignoring all the assumption on the debt level and discounting cash flows by using unlevered weighted-average cost of capital. This approach, known as adjusted present value, evaluate each business unit assuming that it is completely financed through equity. Therefore, enterprise value is equal to the net present value of free cash flows of each business units and the associated tax shield.

1.2.1.3 Implementation Problems

If from a theoretical point of view the discounted cash flow method is impeccable, this method presents some problems when it comes to applying it.

1.2.1.3.1 Reliability of the Forecasted Data

The accuracy of the outcome of the discounted cash flow method depends on the inputs and thus on the analyst's ability to forecast realistic free cash flows. Free cash flows in the first years of the forecast are based on data from the business plan of the company, which should be a reliable source of information. The forecasted free cash flows in subsequent years are based on the revenue long-term growth rate and the incidence of the operating margins. These assumptions are based on the "life cycle" of an industry. The application of the discounted cash flow method to cyclical industry presents clear difficulties due to the uncertainty of the economic cycle. For example, the paper industry is highly affected by the economic cycle of its main drivers, such as the price dynamic of cellulose and selling prices. The ability to generate reliable forecasts on the economic cycle plays a key role in the correct estimation of future free cash flows. Similarly to the paper industry, the construction sector is highly sensitive to the economic trend and public spending. It is important to pay attention particularly to those companies that are undertaking a restructuring process. Because of their turnaround strategies and the subsequent investments, their historical data are of little use in forecasting future ones. In addition, these companies typically experience a decline in their operating margins, due to the extraordinary cost associated with the financing of the restructuring process. In this situation, projected data lack credibility and, therefore, it is important to maintain a prudent approach when performing the forecasting. For example, a comparison with similar companies that operate in the same sector and did not undertake a restructuring process may help to understand if the forecast performed is accurate.

1.2.1.3.2 Reliability of the Estimated Beta

The estimation of the company's beta is a crucial step in determining the discount rate. When a company is listed, its beta can be easily found on several platforms, such as Thomson Reuters and Bloomberg. Unfortunately, when a company is not listed, its beta cannot be found on financial platforms. In this case, the market does not provide analysts

with a parameter and it can be difficult to derive the beta from similar listed companies. In fact, it is difficult to find one or more companies that have a similar risk profile to the company under analysis. In order to define a reliable beta, analysts must consider the size of the company they are analysing, the firm's competitive positioning and the financing structure. In fact, small firms tend to have a higher beta compared to big firms, leader firms tend to have a smaller beta than the follower companies and a high level of financial leverage corresponds to a higher beta. Table 3 shows levered and unlevered betas by sector as of January 2021.

Industry Name	Average Unlevered Beta	Average Levered Beta
Drugs (Pharmaceutical)	0.84	0.91
Oil/Gas (Production and Exploration)	0.81	1.18
Transportation	0.79	0.91
Telecom. Services	0.42	0.66
Banks (Regional)	0.60	0.64
Investments & Asset Management	0.78	0.93
Brokerage & Investment Banking	0.58	1.13
Retail (Automotive)	0.99	1.30

Table 3: Betas by sector, source: NYU Stern School of Business

In estimating the beta, it can be helpful to consider also parameters of other industries that have similar growth or have similar competition dynamics.

Eventually, it can be difficult to estimate the beta of startups, companies that are undertaking a turnaround process, fast-growing companies and companies that are trying to enter new markets, new segments, or different geographical areas. In these cases, analysts must consider the risk associated with these actions and, therefore, adjust their beta estimation to the new risk profile of the company.

1.2.1.3.3 Time Horizon

The time horizon should coincide with the competitive advantage period. In other words, the last year of the forecasted period should be the one in which the company lose the benefits related to the competitive advantage and starts to perform similarly to its competitors. Typically, the time horizon goes from 4 to 10 years, but it varies according to the company's sector. The economic cycle and the economic cycle's phase in which the sector is are the most relevant factors in determining the length of the time horizon. If

the company is making substantial investments, it is appropriate to extend the length of the time horizon, since returns expected from current investments are likely to be recorded in a long time. Also in the case in which the company under analysis is a startup, a good approach requires the extension of the time horizon. In fact, startups are expected to reach economic and financial stability in a longer period of time than companies that have been operating in the same sector for a longer time. A shorter time horizon is applied to companies that operate in sectors where future trends are difficult to forecast.

1.2.1.3.4 Existence of Surplus Assets

A company's fixed assets that do not generate operating cash flows or that are underused may be underestimated when performing the valuation of a company. In this case, a good approach is to gather these assets in a specific entry that express the liquidation value of the assets. It is appropriate to use this approach when, for example, a company has a big amount of property, plant & equipment or when a company has unconsolidated equity investments in listed or non-listed companies.

1.2.1.3.5 Significant Projects Relating to New Strategic Initiatives

When evaluating companies that are undertaking relevant development projects, such as the launch of new products, the entry in new markets or in a new geographical area, it is important to approach to the forecasting process and to the risk profile determination with a prudential approach. Projected free cash flows must be coherent, reliable and must not include strategic choices not fully outlined since it is not possible to quantify the economic effect that they will produce. When applying the discounted cash flow method, it is important to consider the value related to new projects and initiatives and the incidence that they have on the enterprise value. Therefore, it is important to separate the cash flows generated by new projects from those that are generated by the current operating process and to use different betas in the weighted average cost of capital estimation. In fact, the beta involved in the calculation of the weighted average cost of capital that is used to discount free cash flows generated by new projects should be consistently higher.

1.2.1.3.6 Terminal Value

The terminal value constitutes a big part of the enterprise value. For this reason, it is important to pay particular attention when estimating it. It is important to estimate accurately the free cash flow in the last year of the forecasted period and the long-run growth rate "g". Firstly, it is important to consider that it is unlikely that companies in the industrial sectors can sustain a fixed growth rate for an indefinite period of time. Instead, they are more likely to experience substantial growth rates in the first years and to experience growth rates close to zero in the medium and the long term. In addition, it is also important to consider the medium and long term competition dynamics since they have a negative impact on the performance of a company. In fact, the competitive advantage of a company could be progressively damaged by competitors. For example, incumbent or new entrants, that are attracted by the market profitability, increase competition through pricing strategies, process efficiency and incremental innovation. Another important aspect to be considered is that the sector decline could be accelerated by factors directly linked to technology innovation and regulatory changes. Considering the difficulty in estimating these factors, it is very important to justify transparently all the decisions taken.

1.2.2 Comparable Companies' Analysis

The multiple approach assumes that the value of a company can be derived from the information provided by the market on companies with similar characteristics to the one under analysis. This method is based on the determination of multiples. Multiples are measures of a company financial well-being and are calculated as the ratio between two metrics. Metrics are quantitative tools that measure a company's performance. Generally, the metric at the numerator is larger than the one at the denominator. Multiples are applied to the correspondent values of the company under analysis in order to derive a range of values in the case of a non-listed company or to verify if they are in line with the market values in the case of a listed company. The following paragraphs will outline the different steps in performing the multiple analysis and the problems linked to its application.

1.2.2.1 Implementation Process

The following paragraphs aim at explaining the valuation process performed using the multiples approach.

1.2.2.1.1 Select the Universe of Comparable Companies

In implementing the comparable company's analysis, it is important to properly select the universe of comparable companies. Companies should be selected by considering the following information:

- Sector
- Products and Services
- Customers and end markets
- Distribution channels
- Geography
- Size
- Profitability
- Growth Profile
- Return on investment
- Credit profile

1.2.2.1.2 Select the Relevant Multiples

Commonly, the most used multiples are the followings:

- EV/EBITDA: it is the ratio between enterprise value and earnings before interests, taxes, depreciation, and amortization.
- EV/EBIT: it is the ratio between enterprise value and earnings before interests and taxes.
- Price/Earning: it is the ratio between share price and earning per share
- EV/FCF: it is the ratio between enterprise value and free cash flow
- EV/Sales: it is the ratio between enterprise value and revenue

Multiples involving values that are highly influenced by budget and fiscal policies are the ones more likely to be distorted and may lead to distorted outcomes and for this reason, they tend to be adjusted. Among them, the most influenced is the P/E ratio. EV/ Sales is

typically used to evaluate companies that present negative margins or that are in a turnaround period.

Table 4 shows the most relevant multiples per sector

Valuation Multiple	**Sector**
Enterprise Value/	
Broadcast Cash Flow (BCF)	-Media -Telecommunications
Earnings Before Interest Taxes, Depreciation, Amortization, and Rent Expense (EBITDAR)	-Casinos -Restaurants -Retail
Earnings Before Interest Taxes, Depreciation, Depletion, Amortization, and Exploration Expense (EBITDAX)	-Natural Resources -Oil & Gas
Population (POP)	-Metals & Mining -Natural Resources -Oil & Gas Paper and Forest Products
Reserves	-Metals & Mining -Natural Resources -Oil & Gas
Square Footage	-Real Estate -Retail
Subscriber	-Media -Telecommunications
Equity Value (Price)/	
Book Value (per share)	-Financial Institutions -Homebuilders
Cash Available for Distribution (per share)	-Real Estate
Discretionary Cash Flow (per share)	-Natural Resources
Funds from Operations (FFO) (per share)	-Real Estate
Net Asset Value (NAV) (per share)	-Financial Institutions -Mining -Real Estate

Table 4: Multiples per sector, source: Investment Banking, Joshua Rosenmbaum and Joshua Pear

1.2.2.1.3 Multiples Calculation

Generally, multiples are calculated on the last twelve months (LTM) financial data and the next twelve months (NTM) financial data. Anyway, it is possible to derive them using different time horizons depending on the sector and on the valuation context.

1.2.2.1.4 Identify the Applicable Range of Values

Trading multiples are used to derive a valuation range to be applied to the target company Typically, analysts use the mean and the median values of the relevant multiples. High and low multiples are useful to provide guidance in estimating the correct value of the target.

1.2.2.1.5 Determination of the Target's Value

After having determined the appropriate range of values, multiples are used to derive the value of the target company. Multiples are multiplied for the corresponding target's value in order to determine a range of the target company's values.

1.2.2.2 Implementation Problems

The following paragraphs aim at explaining implementation problems that multiple analysis may presents.

1.2.2.2.1 Selection of Comparable Companies

The first step in performing the multiple analysis is to select the universe of comparable companies. The selection of companies determines the reliability of the estimated target value. The following approaches provide guidance in making a reliable selection of comparable companies:

- Intra-sector comparison at national level
- Intra-sector comparison at international level
- Intersectoral comparison

The first approach implies the research of comparable companies within the target company's sector at the national level. Surely, this is the fastest and easiest solution, and it is the most reliable one. For this reason, if this research produces a reliable sample of

comparable companies, it is not necessary to search for comparable companies applying the remaining approaches. Unfortunately, in the Italian market, this rarely happens because of the scarcity of comparable companies. Intra-sector comparison at the national level should be based on quantitative and qualitative analysis. Quantitative variables include current and future financial data such as the ability to create value (return on capital employed and return on invested capital), which is expressed by operating results and capital turnover. This indicator should not be considered separately, in fact, an analysis based only on the operating margin omits relevant factors concerning the structure of the business model and the invested capital. For example, two companies operating in the same sector may have made different make or buy choices concerning the production process, such as owned stores, franchising, or third-party stores. In this case, an analysis that does not include the relevance of invested capital leads to misleading results in favour of the company with a lower capital turnover. Other relevant quantitative variables are the company's size, financial structure, revenue structure and assets structure. For example, two companies of different size but with similar revenue structure are not evaluated in the same way. In fact, the bigger company is typically more valuable because it is more liquid, and it is perceived to be more solid and less subject to financial risk. Also, if the two companies are comparable in terms of revenue, the company with better growth expectations typically has higher trading multiples. In addition, different changes in the value of the two companies may be due to the different nature of the needs they satisfy. In other words, also if the two companies are comparable in terms of revenue and operate in the same sector, their market values may change differently because they satisfy different customers' needs and therefore are exposed to different financial risk. This difference is explained by considering two utility companies that operate in the energy sector but while one produces energy, the other one distributes it. Quantitative analysis is based also on the asset composition and financing structure, which has a direct impact on the weighted average cost of capital. Qualitative analysis is based on factors such as competitive position, the ability to innovate and the business model. For example, if the company under analysis does not have a relevant market share, it is a correct practice to exclude the leader company in the sector from the sample of comparable companies. The same holds for what concerns the business model. In fact, it is correct to consider only those firms that operate the business with a similar methodology to the one used by

the company under analysis. Even if the business model is not often considered, it constitutes an extremely relevant factor from which many important aspects of a company can be discerned. After having analysed all the necessary quantitative and qualitative information, a good approach, that is rarely used in practice, could be to weight factors according to their relevance for the company under analysis.

The second approach implies the research of comparable companies within the target company's sector at the international level. Intra-sector comparison at the international level is chosen when domestic comparable companies are scarce or absent and thus it is necessary to expand the research to the European market, to the U.S. market and to all financial markets that present a high level of liquidity. Consequently, the research does not include companies that are listed in emerging markets. When the comparison is made at the international level, is important to consider only multiples that are not influenced by the differences in budget policy and tax treatment, such as EV/ EBITDA. In fact, EV/ EBITDA is not influenced by tax treatment and differences in how amortization and depreciation are treated.

The third approach implies the research of comparable companies in different sectors. This approach is applied when domestic and foreign comparable companies are scarce or absent. This approach assumes that the basis for comparability lies in the possibility to attribute to similar companies the same risk profile. Comparability with companies operating in different sectors is possible only if they have a similar entrepreneurial formula and their financial results are influenced by similar drivers. For example, it is possible to compare yachts producers to luxury cars producers. In fact, they have similar clients, buying factors and revenue drivers. Also, an airport company can be compared to a company that manages railway or port stations.

The three approaches are summarized in Table 5.

Approach	Listing market	Quantitative parameters	Qualitative parameters
Intra-sectoral	National	- RoCE, growth, operating margins, turnover - Revenue - Assets - Financial structure	- Competitive position - Innovation - Business model
	International	- Parameter of the intra-sectoral approach at national level - Ratios adjustments	
Intersectoral	National and International	- Business model - Value driver	

Table 5: Comparable companies' selection approaches

1.2.2.2.2 Select the Relevant Multiples

A crucial step in performing multiple analysis is the selection of relevant multiples that will be used to evaluate the target company. Generally, more than one multiple can be useful in evaluating a company. Each of them presents pros and cons and, for this reason, only the multiple that presents the best trade-off between advantages and disadvantages is used. When performing the valuation using the multiples approach, it is essential to select the multiple consciously and to motivate the reasons behind the selection in order to avoid using ratios that could lead to a wrong valuation. In other words, it is essential to use ratios that best summarize the value of a company and its ability to create value. For example, in sectors in which competitors differentiate themselves according to their make or buy strategy, it is good practice to use the ratio Enterprise Value/ Capital Employed (EV/CE) in addition to EV/ EBITDA. In the common practice, multiples that include the company growth, such as PEG (P/E divided by next 3-5 years growth rate), EV/EBITDAG (EV/EBITDA divided by EBITDA next 3-5 years growth rate), are used in addition to P/E and EV/EBITDA so that the analysis includes expectations regarding the company's growth. In addition to traditional multiples, it is possible to use ratios that include non-accounting items, known as business multiples. For example, a company that manages airport spaces, whose revenue is influenced by the number of people that transit in its facilities, can be evaluated by using the multiple EV/ passenger in addition to traditional multiples. Asset Gather companies, whose growth expectations depend on the dimension and the effectiveness of the distribution network, are evaluated using multiples that include the number of financial promoters. Paper and cement sectors are evaluated using multiples that include the production capacity, such as EV/ Tons of capacity.

Production capacity is a determinant factor for the medium and long-term success of the companies that operate in these sectors. In fact, these sectors are characterised by high cyclicality and consequently by highly volatile earnings before interest, taxes, depreciation, and amortization that makes it difficult to highlight profitability potential associated with recent investments and to the quality of existing plants. This approach may lead to subjective and irrational valuation. For this reason, the use of non-accounting items must be done carefully and only when there is a strong connection between the non-accounting item and the ability of the company to create value. Another good approach in the selection of the most appropriate multiple is to find empirical evidence that links the influence of non-accounting items to the target company's value. In order to understand if the market implicitly attributes to a multiple the capacity to estimate the value of a company, it is possible to perform an analysis of the correlation between the multiple and the variable under analysis on a sample of comparable companies. For example, in the luxury sector exists a good correlation between EV/ EBITDA and EBITDA growth.

In conclusion, it is important to highlight, once again, the importance of rationality in performing the valuation using multiples and avoiding the mechanical application of this valuation approach.

1.2.3 EVA – Economic Value Added

Economic Value Added is a valuation method that provides a representation of companies' value under different perspective to the discounted cash flow method. The Economic Value Added method evaluates companies considering the value maximization for shareholders. It measures the value created, that is the residual profit after deducting the cost of capital invested to generate that profit. The economic value added approach is based on the idea that evaluating a company starting from a financial statement has several limits deriving from the prudential nature and the incompleteness of the accounting system that does not completely reflect the performance of a company. This method assumes that a company create value when profits are greater than the total cost

related to the source of financing. The value created or destroyed annually by a company is equal to:

*EVA = NOPAT – (WACC * CE)*

Where,

- *Net Operating Profit After Taxes (NOPAT) is equal to EBIT *(1-Taxes*
- *WACC is the weighted-average cost of capital*
- *CE is the capital employed*

Alternatively, Economic Value Added can be calculated as follows:

*EVA = (NOPAT/CE – WACC) * CE* or *EVA = (RoCE – WACC) * CE*

This method is highly versatile because of its strong correlation with three important areas of managerial decision making:

- Operating decisions
- Investing decisions
- Financing decisions

These three operating levels have a direct impact on the creation of value and thus on EVA. For this reason, EVA is used also for different management purposes, such as:

- Support to strategic planning in the valuation of an alternative strategy, such as capital budgeting and capital allocation
- The structuring of a rewarding based system on the creation of value
- The valuation of corporate finance transactions, such as M&A, IPO and restructuring

After having determined the Economic Value Added, it comes to the calculation of the enterprise value. Market value added (MVA) is the sum of the present values of all future EVAs.

$$Enterprise\ Value = Capital\ Employed + \sum_{t=1}^{\infty} \frac{EVA(t)}{(1+WACC)^t}$$

Consequently, *EV = CE + MVA*

Market Value Added is what connects share price to economic value added. It can be calculated as ex-ante or ex-post. The ex-ante calculation is useful when a company is not listed yet and wants to go public. Market value added ex-ante provides enterprise value to be proposed to the market when a company wants to go public. Market value added ex-post is used when a company is listed, and it is equal to the difference between the enterprise value and the capital employed. In this case, the market value added represents the goodwill that the market attribute to the company.

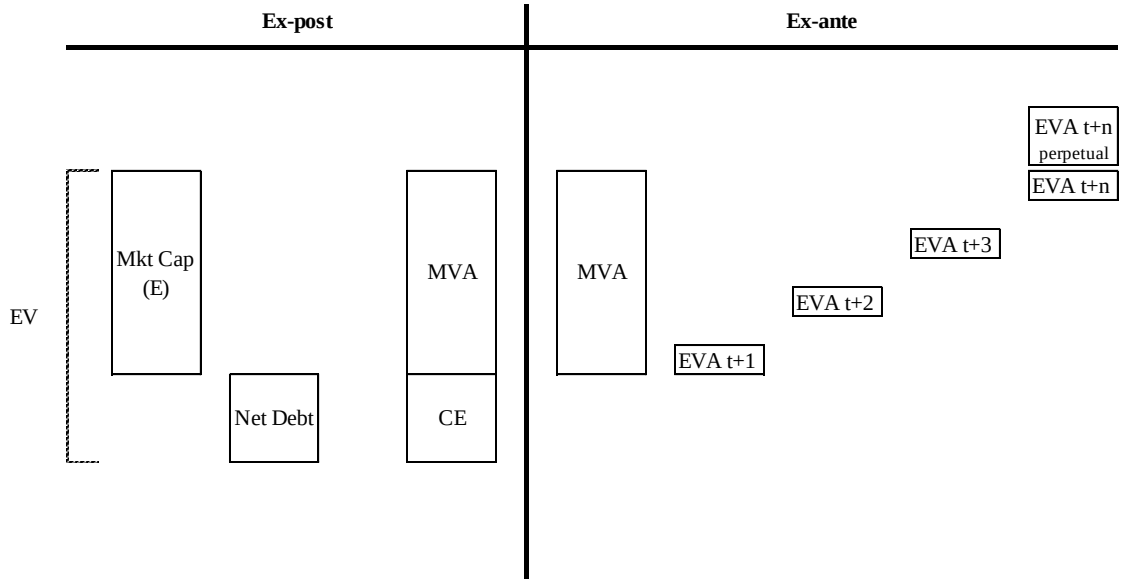

Table 6: Market Value Added

Table 6 describes the relationship between the economic value added, the market value added and the market price.

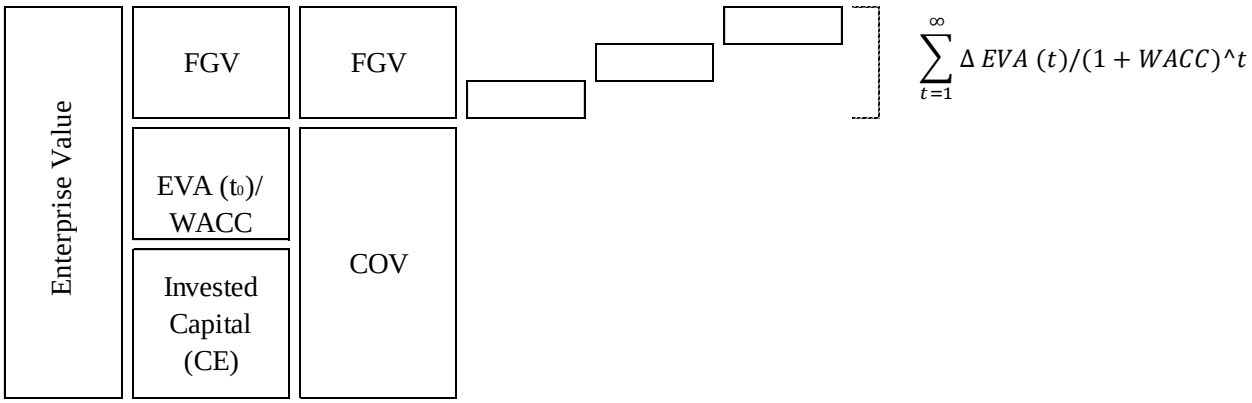

Table 7: Enterprise Value: COV and FVG

As shown by table 7, EVA splits the enterprise value into two parts:

- Current Operations Value (COV)
- Future Growth Value (FGV)

Current operations value is the value of a company in the case in which the last year's result will be constant in the future. In this case, capital employed is summed to performance value, derived by applying the perpetuity formula to the last year economic value added.

Future growth value represents the future creation of value. It is determined by the medium and long-term growth expectations of the economic value added. It is equal to the present value of future incremental economic value added. It includes improvements and worsening of the current situation in term of value creation.

This approach provides a different representation of the enterprise value with respect to traditional approaches, such as the discounted cash flow method. In fact, the discounted cash flow method is based only on future expectations and the terminal value plays a key role in the calculation of the enterprise value. On the contrary, the economic value added approach determines a big portion of enterprise value based on current and future performance and medium-term growth expectations. Therefore, this approach reduces the influence of the area outside management control and, instead, the resulting value reflects not only the company's future achievements but also the company's current performance.

1.2.4 Valuation of Banks and Insurance Companies

The dividend discount model (DDM) is mainly used for the valuation of banks. According to this approach, the value of a bank is equal to discounted future cash flows available for shareholders. This model assumes that discounted future cash flows available for shareholders are equal to dividends distributed maintaining an adequate capital structure and considering the necessity to sustain the expected growth. The dividend discount model formula is the following:

$$V = \sum_{t=1}^{n} \frac{DIV(t)}{(1+Re)^t} + V_t$$

Where,

V = bank's value

DIV(t) = dividend paid at time t

R_e *= cost of equity*

V_t *= Terminal Value*

Insurance companies, instead, are evaluated on the basis of the income stream deriving from the portfolio of insurance policies. The embedded value is equal to the sum of the value of the income stream and the market value of equity adjusted and it is defined as the value of the company in the case in which it would stop immediately to sell new insurance policies.

2 IBM AND RED HAT: AN OVERVIEW

International Business Machines Corporation and Red Hat are two companies operating in the technology sector. As we will see later in Paragraph 2.3, International Business Machines Corporation acquired Red Hat on 9 July 2019 for $34bn. This chapter provides an overview of both International Business Machines Corporation and Red Hat, starting from the analysis of their annual revenue, gross profit, earnings before interest, taxes, depreciation, and amortization, earnings before interest and taxes, net income and return on invested capital from 2015 to 2018. As shown by the Figures in the following paragraphs, all International Business Machines Corporation's listed items present a downward sloping trendline. In addition, while annual revenue, gross profit, earnings before interest, taxes, depreciation, and amortization, earnings before interest and taxes and return on invested capital reached the lowest values on 31 December 2017 but recovered in 2018, net income experienced a continuous decrease from 2015 to 2018. As shown by the Figures in the following paragraphs, all Red Hat's listed items present an upward sloping trendline. In addition, while annual revenue, gross profit, earnings before interest and taxes and net income reached the highest values on 31 December 2018, the return on invested capital reached the peak on 31 December 2017. A comparison between these values and the corresponding values in 2019 will be made. Furthermore, this chapter shows from which segment and from which geographic area the two companies annual revenue comes from. Then, it describes the terms of the deal and the market reaction on the announcement date and on the closing date. Therefore, it shows how International Business Machines Corporation financed the acquisition, it depicts the purchase price allocation and it illustrates the change in International Business Machines Corporation and Red Hat share price on the day of the announcement and on the date in which the deal was closed. In conclusion, this chapter explains the rationale behind the International Business Machines Corporation's acquisition of Red Hat.

2.1 The Acquirer: International Business Machines Corporation

The following paragraphs provide a brief introduction to International Business Machines Corporation by highlighting the main events in its history and by providing an overview of the Company's financial performance from 2015 to 2019.

2.1.1 IBM's History

"International Business Machines Corporation[1], nicknamed "Big Blue", is a multinational computer technology and IT consulting corporation. In 1911, Charles F. Flint organized the merger among Hollerith's Tabulating Machine Company, Computing Scale of America and International Time Recording Company. The resulting company was named Computing-Tabulating-Recording Company (C-T-R). After the World War I, C-T-R introduced new products to meet the new needs of customers. In 1920, IBM introduced the lock autograph recorder and launched the Electric Accounting Machine. In 1924, the Carrol Rotary Press was developed to produce cards at high speed. On February 14, 1924, C-T-R's name was changed to International Business Machines Corporation. During the Great Depression of the 1930s, IBM managed to grow while the rest of the U.S. economy floundered. IBM was one of the first corporations to provide group life insurance in 1934, survivor benefits in 1935 and paid vacations in 1937. During World War II, IBM's product line expanded to include bombsights, rifles and engine part and all IBM facilities were placed at the disposal of the U.S. government. In 1944, the Automatic Sequence Controlled Calculator, the first machine that could execute long computations automatically, was completed. In 1948, IBM introduced the Selective Sequence Electronic Calculator, the first large-scale digital calculating machine. During the 1950s, IBM introduced IBM701 and IBM 7090. In 1957, IBM introduced FORTRAN, one of the most widely used computer languages for technical work. In 1969, IBM's marketers unbundled the components and offered them for sale individually. In 1971, the

[1]IBM Archives. Chronological History of IBM.
https://www.ibm.com/ibm/history/history/history_intro.html

floppy disk was introduced and in 1973, Frank T. Cary took over the company. In the same year, bank customers began making withdrawals, transfers, and other account inquiries via the IBM 3614 Consumer Transaction Facility. In 1981, John R. Opel became CEO of the company and this coincided with a new era in computing. In fact, IBM entered in the houses of its customers thanks to the IBM Personal Computer (PC). In 1997, Deep Blue defeated World Chess Champion Garry Kasparov in a six-game match in New York. Nowadays, IBM is headquartered in Armonk, New York, United States."

2.1.2 IBM's Historical Financial Performance

This paragraph illustrates International Business Machines Corporation's financial performance from 2015 to 2018. Specifically, I am going to discuss the company's annual revenue, gross profit, earnings before interest, taxes, depreciation and amortization, earnings before interest and taxes, net income and return on invested capital between 31 December 2015 and 31 December 2018.

2.1.2.1 Annual Revenue

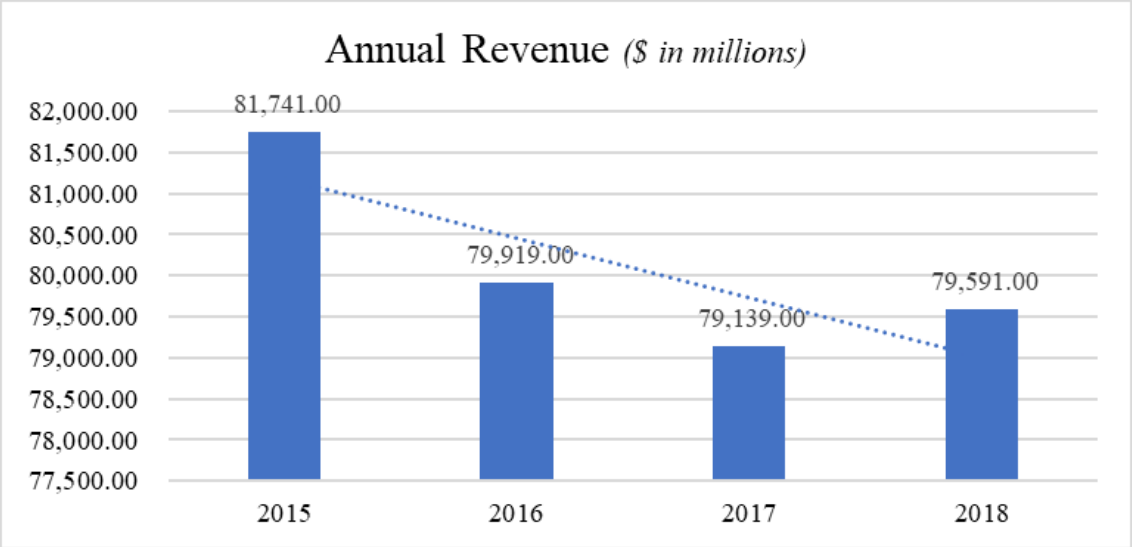

Figure 1: Annual Revenue, source: Thomson Reuters

As shown by Figure 1, International Business Machines Corporation's annual revenue was equal to $81,741.00 million in 2015, to $79,919.00 million in 2016, to $79,139.00

million in 2017 and to $79,591.00 million in 2018. In other words, International Business Machines Corporation's annual revenue decreased by 2.63% in the period.

2.1.2.2 Gross Profit

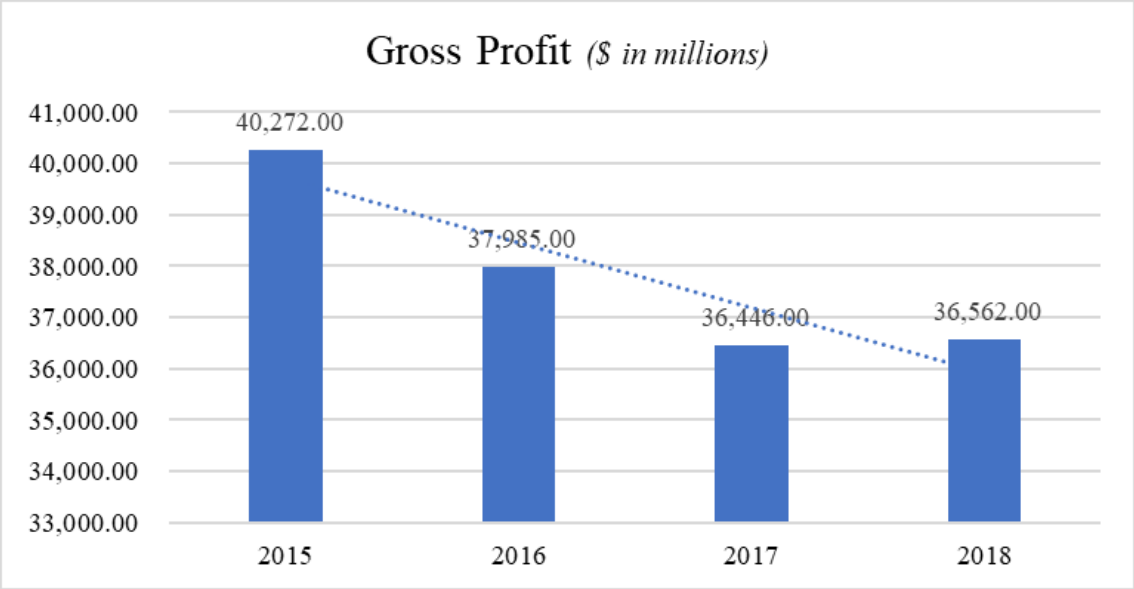

Figure 2: Gross Profit, source: Thomson Reuters

As shown by Figure 2, International Business Machines Corporation experienced a reduction in the gross profit between 2015 and 2018. In fact, the gross profit was equal to $40,272.00 million in 2015, to $37,985.00 million in 2016, to $36,446.00 million in 2017 and to $36,562 million in 2018. Thus, International Business Machines Corporation's gross profit decreased by 9.21% in the period.

2.1.2.3 EBITDA

As shown by Figure 3, International Business Machines Corporation experienced a reduction in the earnings before interest, taxes, depreciation, and amortization between 2015 and 2018. In fact, the earnings before interest, taxes, depreciation and amortization were equal to $20,309.00 million in 2015, to $18,239.00 million in 2016, to $16,519.00 million in 2017 and to $19,962.00 million in 2018. Thus, International Business Machines

Corporation's earnings before interest, taxes, depreciation, and amortization decreased by 16.48% in the period.

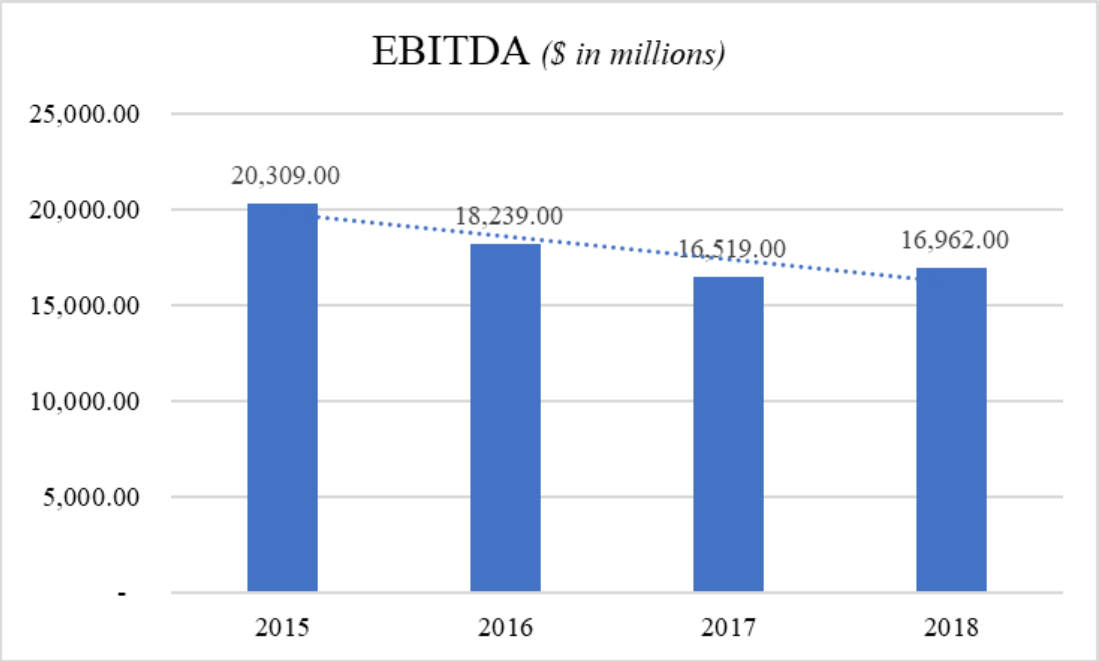

Figure 3: EBITDA, source: Thomson Reuters

2.1.2.4 EBIT

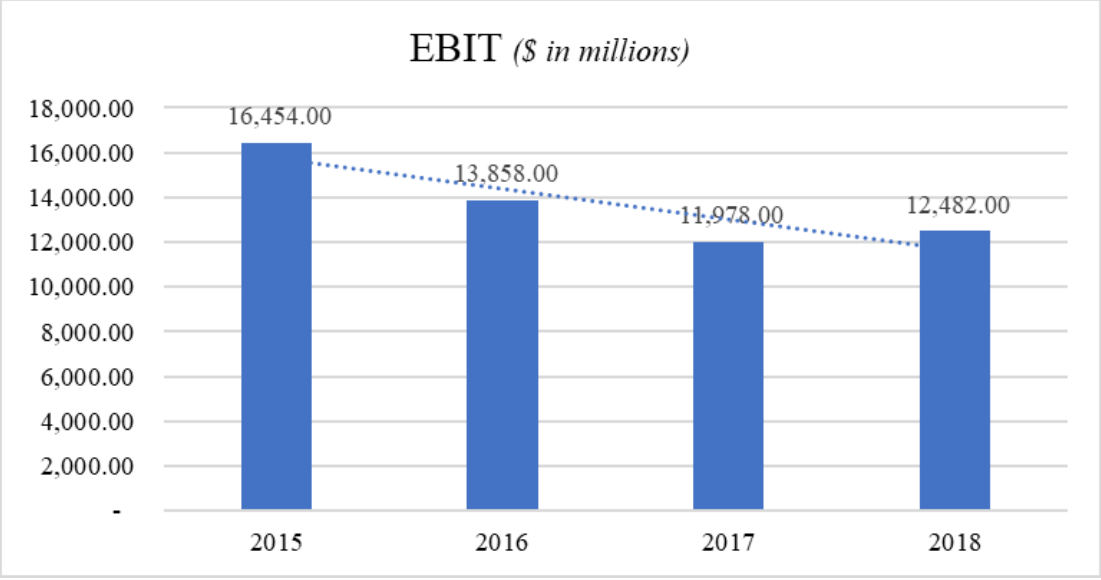

Figure 4: EBIT, source: Thomson Reuters

As shown by figure 4, International Business Machines Corporation's earnings before interest and taxes decrease from 2015 to 2018. Te earnings before interest and taxes were equal to $16,454.00 in 2015, to $13,858.00 million in 2016, to $11,978.00 million in 2017 and to $12,482.00 million in 2018. Thus, International Business Machines Corporation's earnings before interest and taxes decreased by 24.12% in the period.

2.1.2.5 Net Income

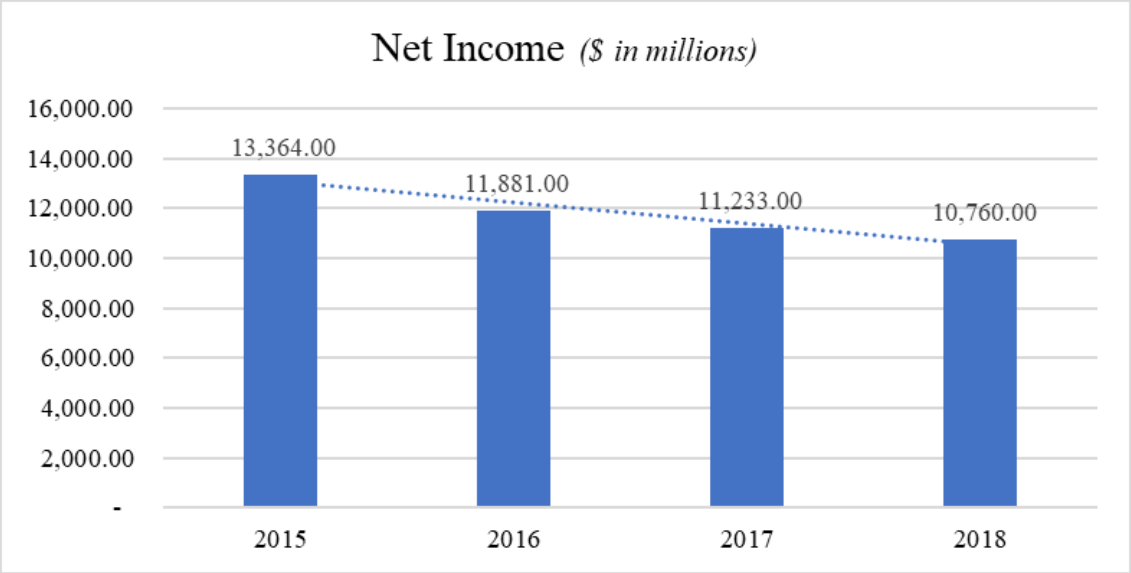

Figure 5: Net Income, source: Thomson Reuters

International Business Machines Corporation's net income follows a different trend from the other elements of the income statement. As shown in figure 5, International Business Machines Corporation's net income experienced its lowest value in 2018, when it was equal to $10,760.00 million. In 2015 it was equal to $13,364.00 million, in 2016 it was equal to $11,881.00 million and in 2017 it was equal to $11,223.00. From 2015 to 2018 IBM's net income decreased by 24.14%.

2.1.2.6 ROIC

As shown by Figure 6, International Business Machines Corporation's return on invested capital decreased from 2015 to 2018. It was equal to 25.50% in 2015, to 21.60% in 2016,

to 10.20% in 2017 and 14.70% in 2018. Thus, from 2015 to 2018, International Business Machines Corporation's return on invested capital decreased by 10.80%.

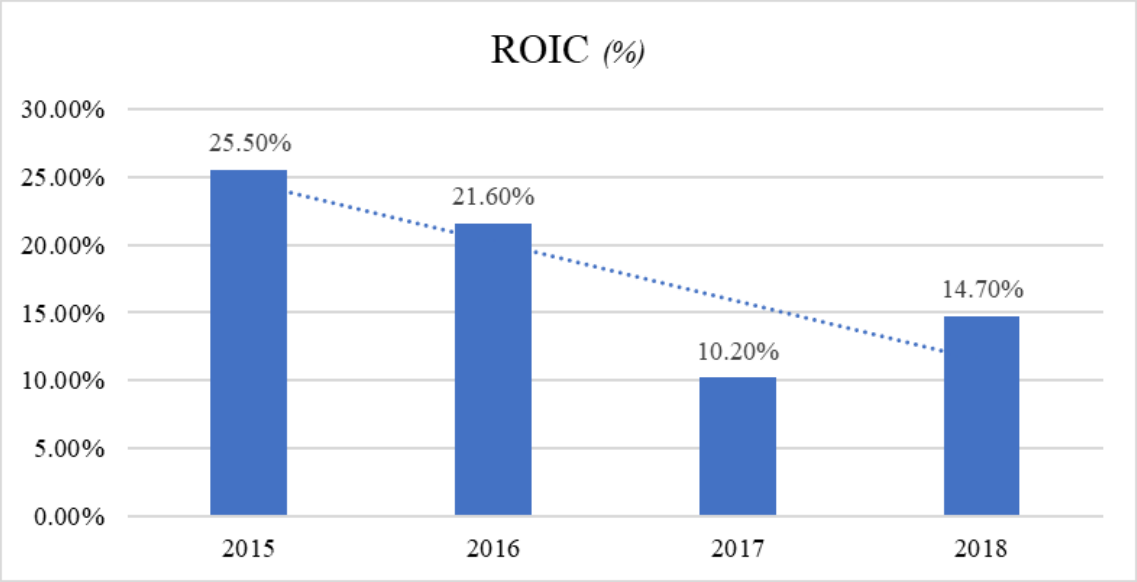

Figure 6: ROIC, source: Thomson Reuters

2.1.3 IBM's Financial Performance in 2019

This paragraph illustrates International Business Machines Corporation's financial performance in 2019, which is the year in which International Business Machines Corporation acquired Red Hat.

2.1.3.1 Financial Summary

Financial Summary *($ in millions)*	
Annual Revenue	77,147.00
Gross Profit	35,682.00
EBITDA	17,221.00
EBIT	11,162.00
Net Income	9,431.00
ROIC	14.70%

Table 8: Financial Summary, Source: Thomson Reuters

As shown by Table 8, in 2019, the annual revenue was equal to $77,147.00 million, the gross profit was equal to $35,682.00 million, the earnings before interest, taxes, depreciation, and amortization were equal to $17,221.00 million, the earnings before interest and taxes were equal to $11,162.00 million, the net income was equal to $9,431.00 million and the return on invested capital was equal to 14.70%. Comparing these values with the ones of 2018, we can see that, from the previous, year annual revenue experienced a decrease of $2,444.00 million, the gross profit experienced a decrease of $880.00 million, the earnings before interest, taxes, depreciation, and amortization experienced an increase of $259 million, the earnings before interest and taxes experienced a decrease of $1,320.00, the net income experienced a decrease of $1,329.00 million and the return on invested capital did not change.

2.1.3.2 IBM's Annual Revenue by Business Segment

Figure 7 shows International Business Machines Corporation's annual revenue by business segment in 2019.

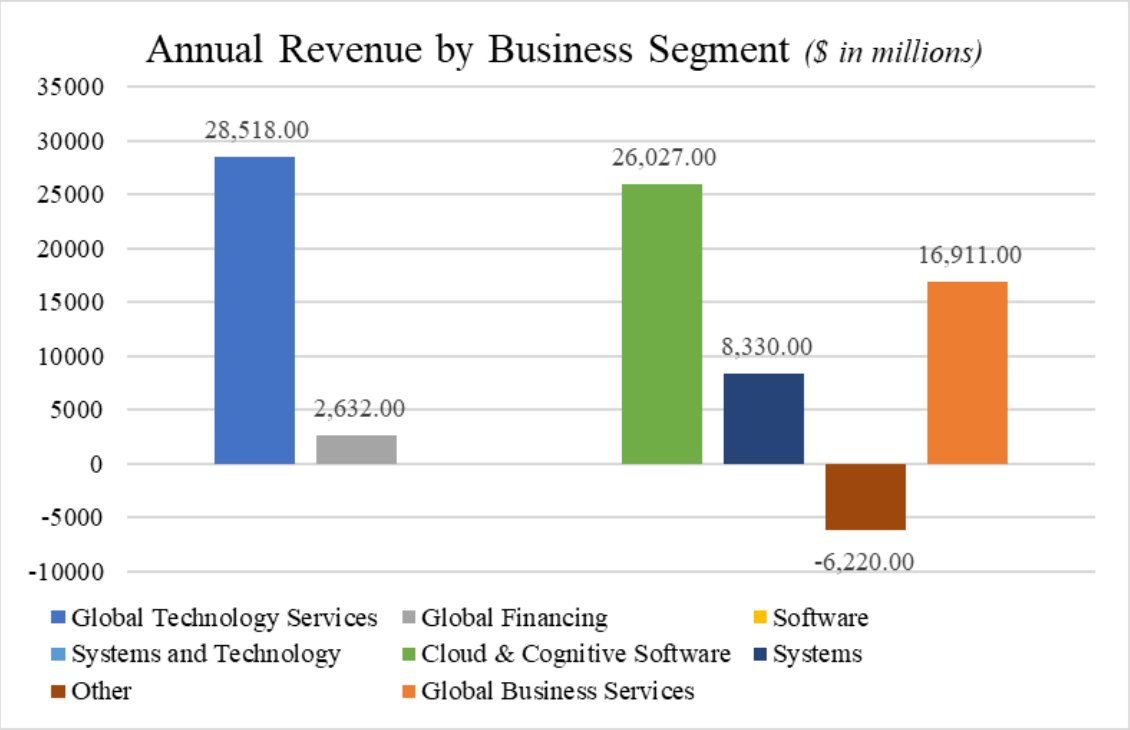

Figure 7: Annual Revenue by business segment, source: Thomson Reuters

The most profitable segments are the Global Technology Services and the Cloud & Cognitive Software. They recorded annual revenue equal to $28,518.00 million and $26,027.00 million, respectively. Global Business Services, Systems and Global Financing segments recorded annual revenue equal to $16,911.00 million, $8,330 million, and $2,632.00 million, respectively. Software segment recorded revenue equal to $0 while the remaining segments, denoted as "other", recorded negative annual revenue equal to -$6,220.00 million. The difference between the sum of the revenue generated by each segment and International Business Machines Corporation's annual revenue is recorded as "other revenue" and is equal to $948 million.

2.1.3.3 IBM's Annual Revenue by Geographic Region

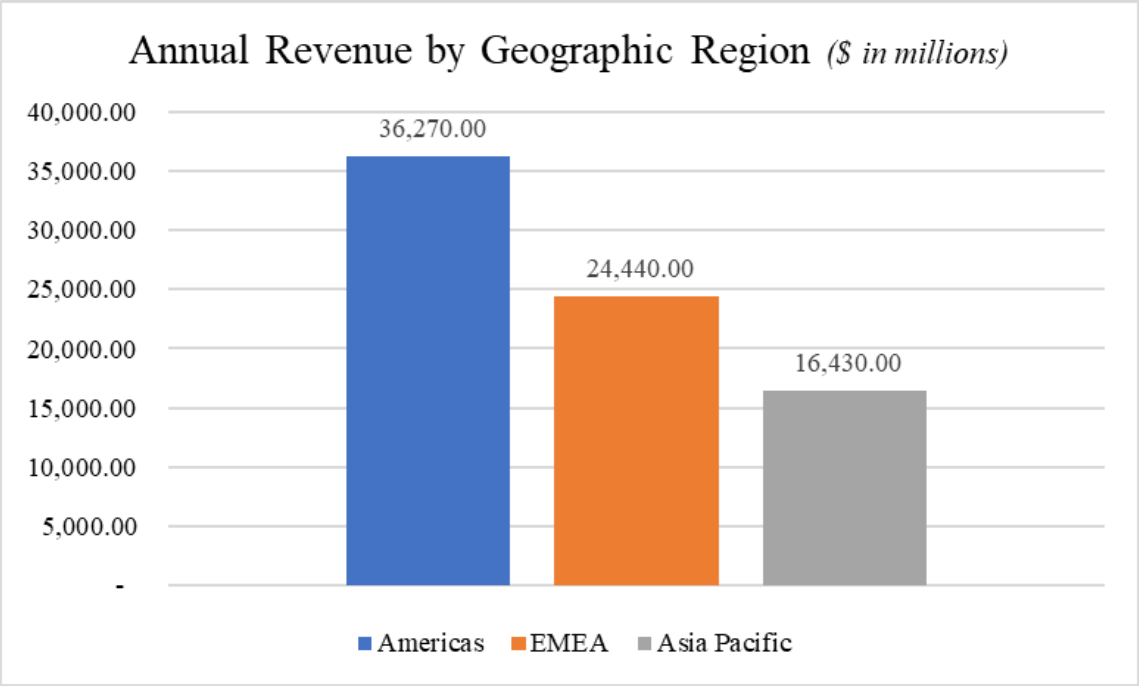

Figure 8: Annual Revenue by geographic region, source: Statista

Figure 8 shows annual revenue by geographic region in 2019. International Business Machines Corporation's annual revenue in the Americas was equal to $36,270.00 million, accounting for almost 50% of the total annual revenue. In Europe, the Middle East and

Africa International Business Machines Corporation's annual revenue was equal to $24,440.00 million, accounting for almost 33% of the total annual revenue. In the Asia Pacific annual revenue was equal to $16,430.00 million, accounting for more than 20% of the total annual revenue.

2.2 The Target: Red Hat

The following paragraphs provide a brief introduction to Red Hat by highlighting the main events in its history and by providing an overview of the Company's financial performance from 2015 to 2019.

2.2.1 Red Hat's History

"Red Hat, Inc.[2] is a US multinational company dedicated to software development and support of free and open-source software. In 1993 Bob Young took over the ACC Corporation, a company dedicated to the catalogue sale of accessories and books in the field of Linux and UNIX software and the distribution of the New York UNIX periodical. The following year, Marc Ewing creates a Linux distribution called Red Hat Linux. The name derives from the fact that when he was attending university, Ewing often wore a red lacrosse hat from Cornell University that had been given to him by his grandfather. This version of the operating system was released in October and became known as the "Halloween version". Subsequently, in 1995, Young buys Ewing's business, founding Red Hat Software, in which Young serves as CEO. In February 2000, InfoWorld awarded Red Hat its fourth consecutive "Operating System Product of the Year" award for Red Hat Linux 6.1. In the same month, in 2002, Red Hat moved its headquarters from Durham to the Centennial Campus of the State University of North Carolina in Raleigh, North Carolina; during the following month, it began offering Red Hat Linux Advanced Server, later renamed Red Hat Enterprise Linux (RHEL) for which Dell, IBM, HP, and Oracle Corporation announce their support. Red Hat enters the market on August 11, 1999, and takes eighth place for first-day earnings in Wall Street history. Matthew Szulik succeeds Bob Young as CEO in December of that year. Red Hat shares eventually joined the NASDAQ-100 on December 19, 2005. On July 27, 2009, he took over from CIT Group in the Standard and Poor's 500 stock index, an index of the 500 most important American companies on an economic level. This event is considered a milestone for Linux. In

[2]IBM Archives. Chronological History of IBM.
https://www.ibm.com/ibm/history/history/history_intro.html

October 2018, it was acquired by IBM for 34 billion dollars (190 dollars per share, over 70 dollars above the last valuation of the stock); this is the largest acquisition in IBM history that can thus improve its cloud offering and aim for leadership in the sector. Currently, Red Hat has a head office in Raleigh, North Carolina, United States."

2.2.2 Red Hat's Historical Financial Performance

In this paragraph, I am going to illustrate Red Hat's financial performance from 2015 to 2018. Specifically, I am going to discuss the company's annual revenue, the gross profit, the earnings before interest, taxes, depreciation, and amortization, the earnings before interest and taxes, the net income and the return on invested capital between 2015 and 2018.

2.2.2.1 Annual Revenue

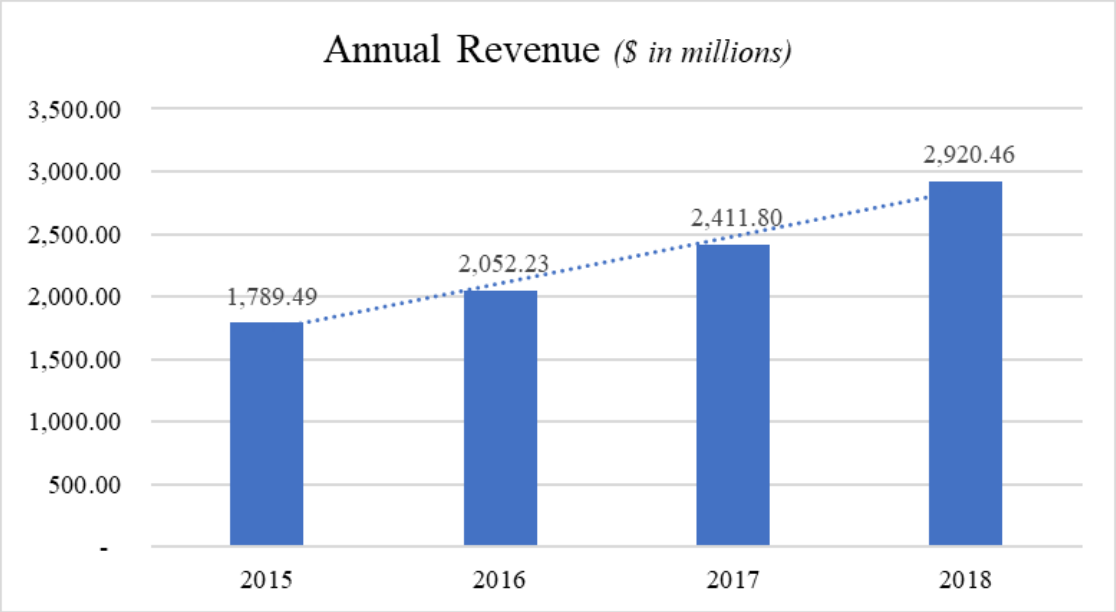

Figure 9: Annual revenue, source: Thomson Reuters

As shown by Figure 9, Red Hat's annual revenue increased by 63.20% from 2015 to 2018. Red Hat's annual revenue was equal to $1,789.46 million in 2015, to $2,052.23 million in 2016, to $2,411.70 in 2017 and to $2,920.46 in 2018.

2.2.2.2 Gross Profit

As shown by Figure 10, Red Hat's gross profit increased by 64.13% from 2015 to 2018. It was equal to $1,516.29 million in 2015, to $1,742.60 in 2016, to $2,057.43 million in 2017 and to $2,488,66 in 2018.

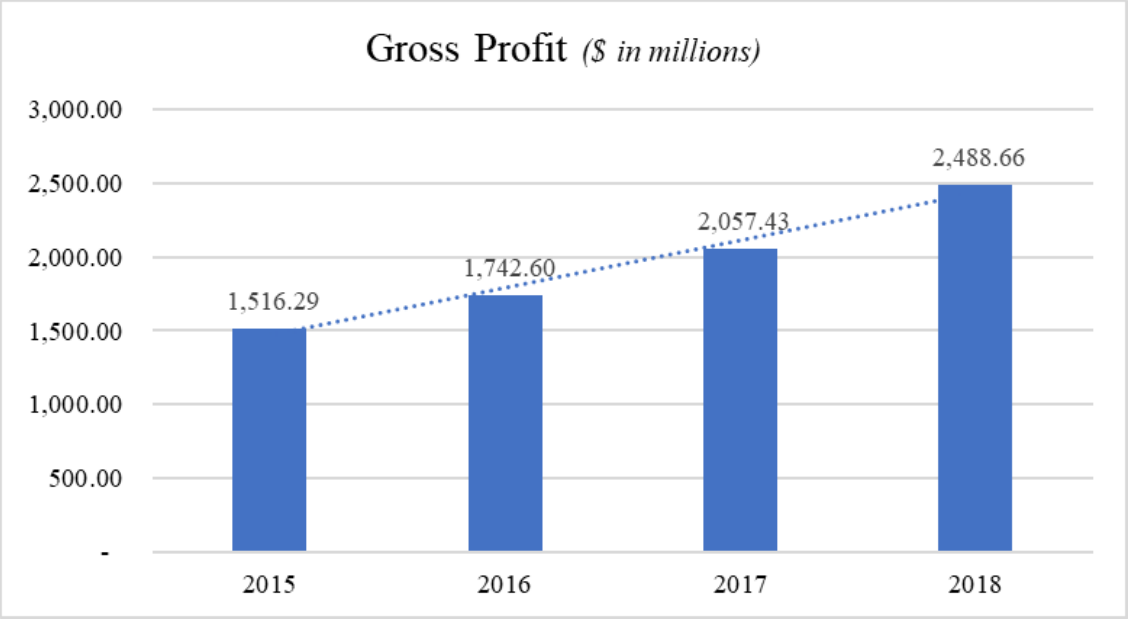

Figure 10: Gross Profit, source: Thomson Reuters

2.2.2.3 EBITDA

As shown by Figure 11, Red Hat's earnings before interest, taxes, depreciation, and amortization increased by 75.59% from 2015 to 2018. It was equal to $326.26 million in 2015, to $ 364.14 million in 2016, to $419.38 million in 2017 and to $572.87 in 2018.

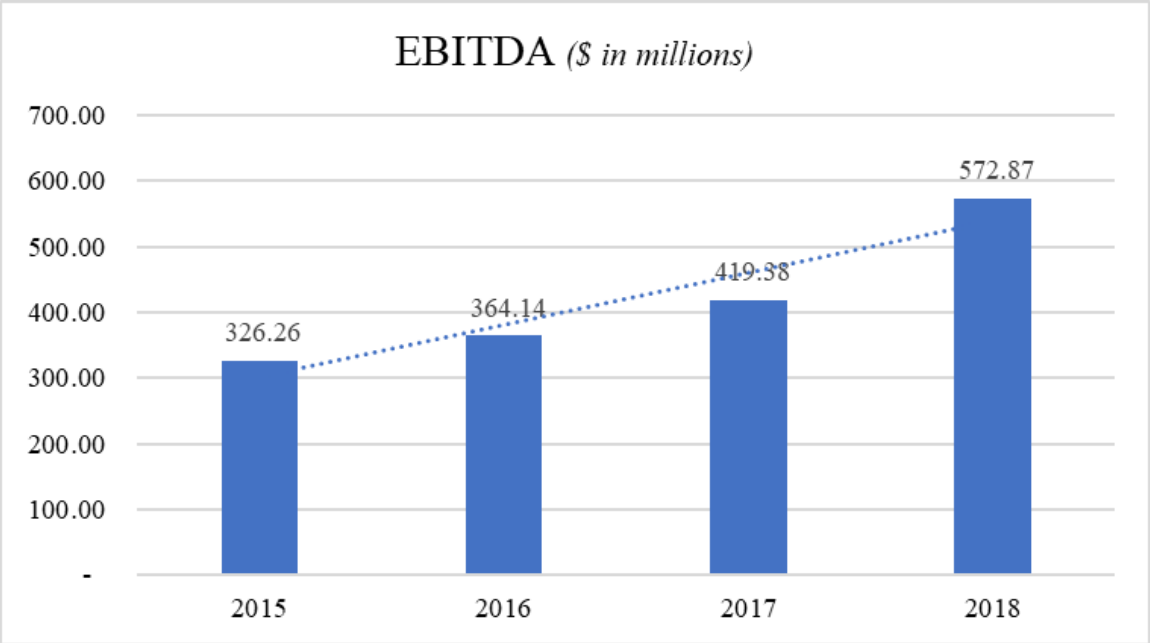

Figure 11: EBITDA, source: Thomson Reuters

2.2.2.4 EBIT

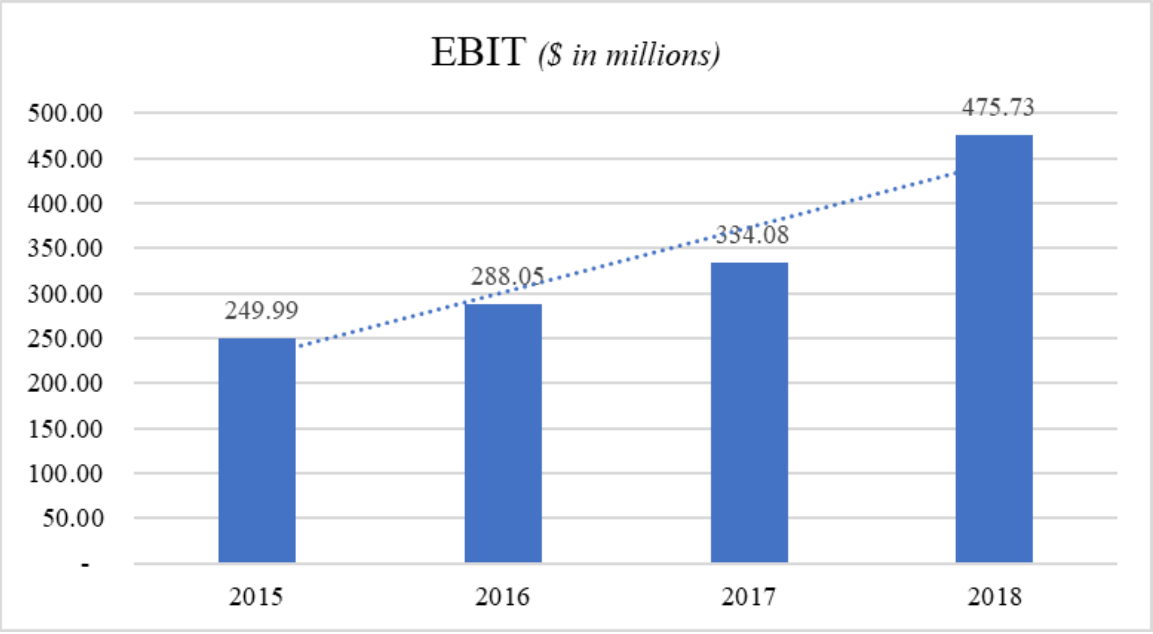

Figure 12: EBIT, source: Thomson Reuters

As shown by figure 12, Red Hat's earnings before interest, taxes increased by 90.30% from 205 to 2018. It was equal to $249.99 million in 2015, to $288.05 million in 2016, to $334.08 million in 2017 and to $475.73 million in 2018.

2.2.2.5 Net Income

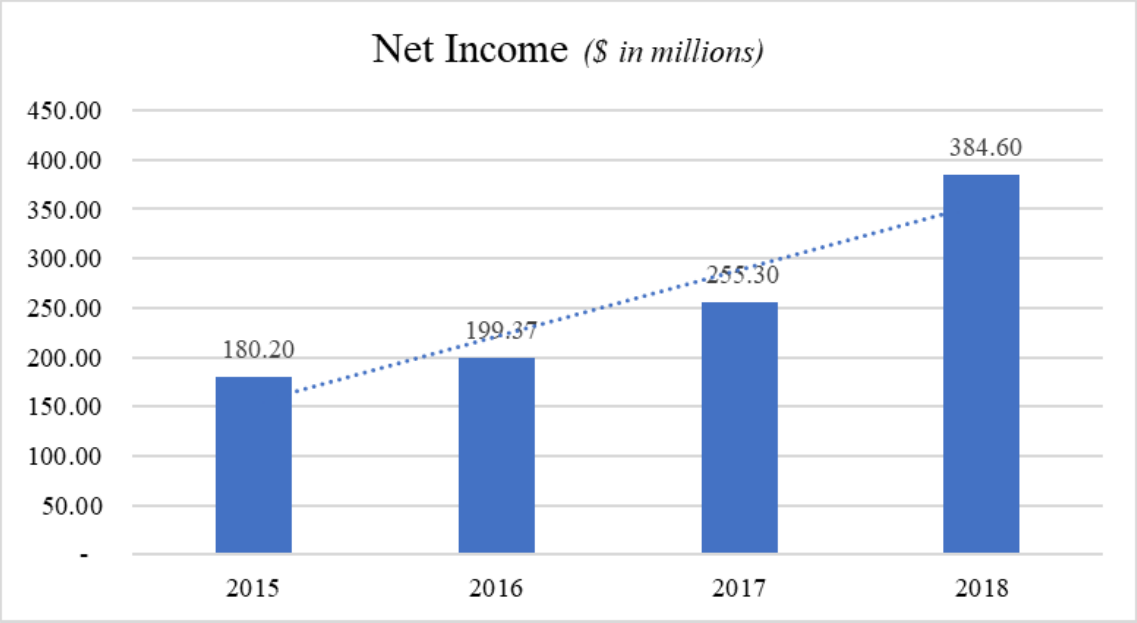

Figure 13: Net Income, source: Thomson Reuters

As shown by Figure 13, Red Hat's net income increased by 113.43% from 2015 to 2018. It was equal to $180.20 million in 2015, to $199.37 million in 2016, to $255.30 million in 2017 and to $384.60 million in 2018.

2.2.2.6 ROIC

As shown by Figure 14, Red Hat's return on invested capital increased by 2.70% from 2015 to 2018. It was equal to 10.60% in 2015, to 10.70% in 2016, to 13.50% in 2017 and to 13.30% in 2018.

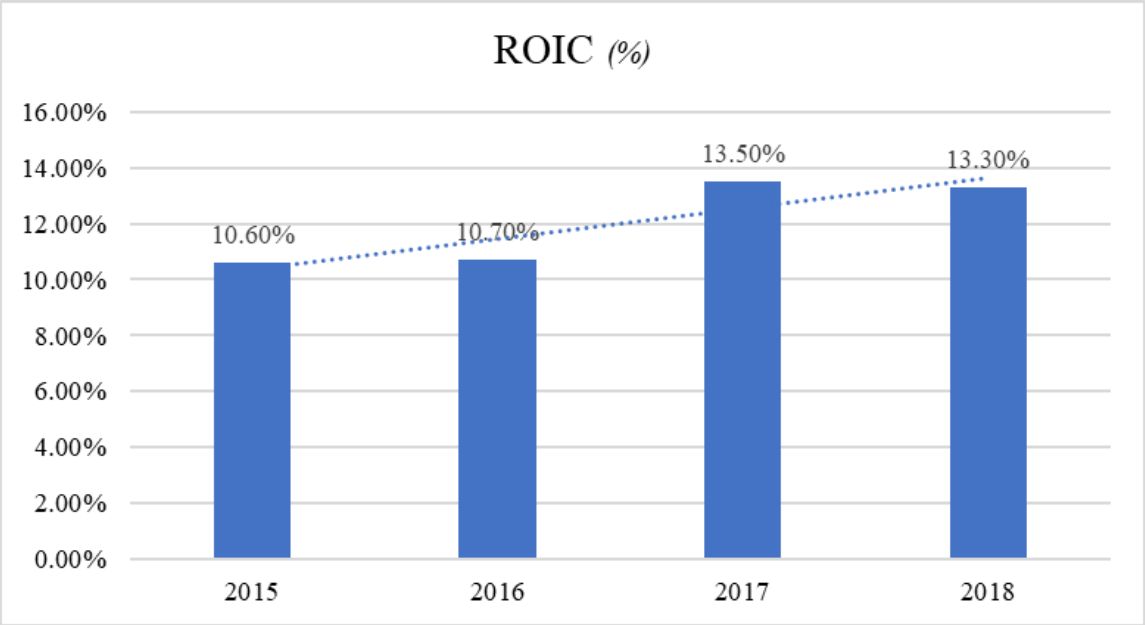

Figure 14: ROIC, source: Thomson Reuters

2.2.3 Red Hat's Financial Performance in 2019

This paragraph illustrates Red Hat's financial performance in 2019, which is the year in which IBM acquired Red Hat.

2.2.3.1 Financial Summary

Financial Summary *($ in millions)*	
Annual Revenue	3,362.07
Gross Profit	2,863.82
EBITDA	621.28
EBIT	512.23
Net Income	445.60
ROIC	21.70%

Table 9: Financial Summary, source: Thomson Reuters

As shown by Table 9, in 2019, the annual revenue was equal to $3,362.07 million, the gross profit was equal to $2,863.82.00 million, the earnings before interest, taxes,

depreciation, and amortization were equal to $621.28 million, the earnings before interest and taxes were equal to $512.23 million, the net income was equal to $445.60 million and the return on invested capital was equal to 21.70%. Comparing these values to the ones of 2018, we can see that, from the previous year, the annual revenue experienced an increase of $441.61 million, the gross profit experienced an increase of $375.16 million, the earnings before interest, taxes, depreciation, and amortization experienced an increase of $48.41 million, the earnings before interest and taxes experienced an increase of $36.50 million, the net income experienced an increase of $61.00 million and the return on invested capital increase by 8.4%.

2.2.3.2 Red Hat Annual Revenue by Business Segment

Figure 13 shows annual revenue by business segment in 2019. The Subscription segment recorded annual revenue equal to $2,949.06 million, accounting for 87.72% of the total annual revenue in 2018. The remaining 12.28% comes from the Training and Services segment, that recorded annual revenue equal to $413.01 million.

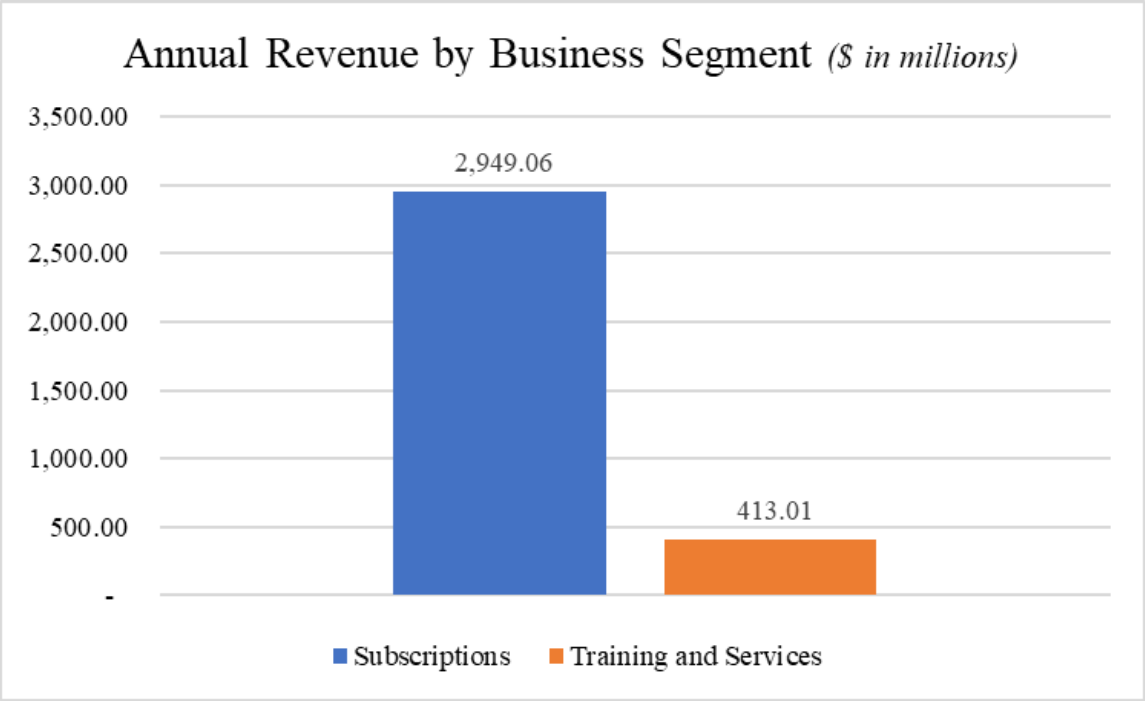

Figure 15: Annual Revenue by Business Segment, source: Statista

2.2.3.3 Red Hat Annual Revenue by Geographic Region

Figure 14 shows the annual revenue by geographic region in 2019. In the Americas, Red Hat's annual revenue was equal to $2,092.33 million, accounting for more than 60% of the total annual revenue. In Europe, the Middle East and Africa, Red Hat's annual revenue was equal to $786.50 million, accounting for almost 25% of the total annual revenue. In the Asia Pacific, Red Hat's annual revenue was equal to $16,430.00 million, accounting for almost 15% of the total annual revenue.

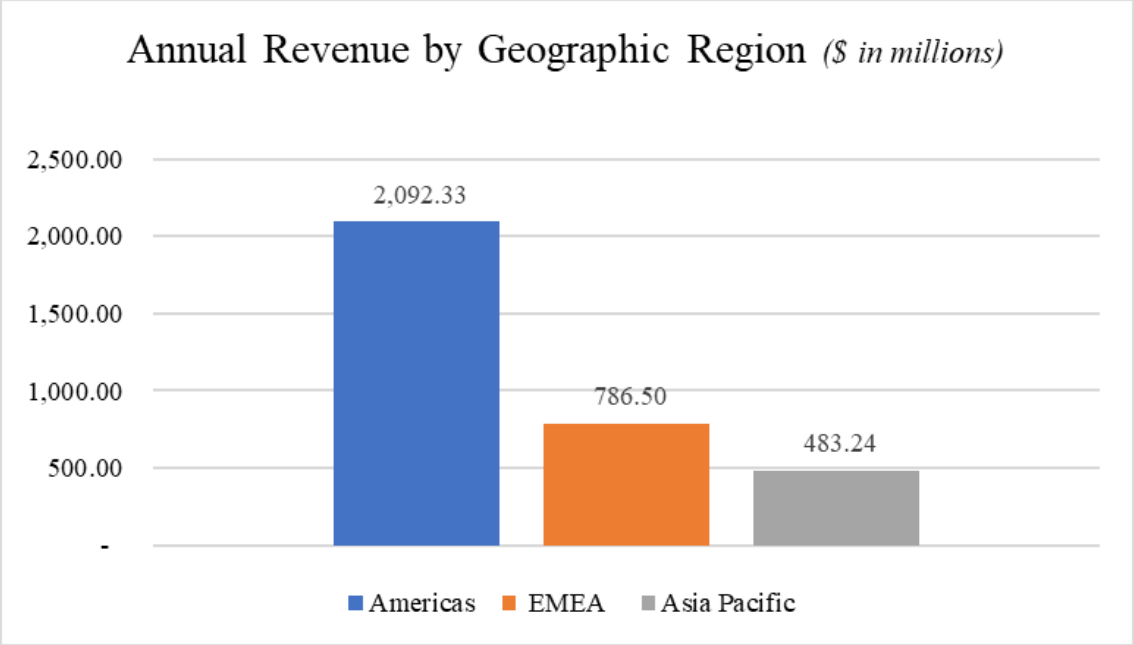

Figure 16: Annual Revenue by Geographical Region, source: 2019 Red Hat Annual Report

2.3 Acquisition History

In this paragraph, I am going to illustrate the terms of the deals and the market reaction on the acquisition day. I will start by analysing the key terms of the deal, the purchase price allocation, the goodwill allocation and the combination of debt and cash used. Afterwards, I am going to analyse the market reaction on the acquisition date and the evolution of the companies' stock prices.

2.3.1 Terms of the Deal

The International Business Machines Corporation's acquisition of Red Hat was closed on July 9, 2019, when International Business Machines Corporation completed the acquisition for an aggregate cost of $35bn after the deal was originally announced on October 28, 2018. Goldman Sachs, J.P. Morgan, and Lazard advised International Business Machines Corporation, while Morgan Stanley and Guggenheim advised Red Hat. As shown by Table 10, International Business Machines Corporation agreed to buy all Red Hat's shares for a price equal to $34bn, $190 per share, to be paid in cash. International Business Machines Corporation accepted to pay a 63% premium for each Red Hat share, in fact, on 28 October 2018, Red Hat share price was equal to $116.82.

Key Terms of the Deal *($ in millions)*	
Cash paid for oustanding Red Hat common stock	33,769.00
Cash paid for Red Hat equity awars	24.00
Cash paid to settle warrants	1,008.00
Cash consideration	34,801.00
Fair value of stock-based compensation awards attributable to pre-combination share units	174.00
Stock issued to holders of vested performance share units	45.00
Settlement of pre-existing relationships	60.00
Total consideration	35,080.00
Method of payment	100% cash
Offered price per share	190.00
Red Hat share price at 28 Oct. 2018	116.68
Premium offered over market price	73.32
Premium offered over market price (%)	63%

Table 10: Key Terms of the Deal, Source: 2019 IBM Annual Report

The acquisition of Red Hat represents the largest acquisition ever for International Business Machines Corporation, as well as one of the biggest acquisitions in the U.S. Tech history after the AOL-Time Warner merger in 2000 ($182bn), the deal between Dell and EMC in 2016 ($67bn) and the JD Uniphase's acquisition of SDL in 200 ($41bn). After the acquisition, Red Hat is included in International Business Machines Corporation's hybrid cloud division. The agreement makes Jim Whitehurst, Red Hat's CEO, a member of International Business Machines Corporation's senior management team that reports to International Business Machines Corporation's CEO Virginia Marie Nicosia, also known as Ginni Rometty. Table 11 shows the purchase price allocation. Specifically, International Business Machines Corporation acquired $40,772.00 million of total asset, including $23,125.00 million of Goodwill, and $5,642.00 million of total liabilities. The difference between these two values gives the total purchase price, which is $35,080.00 million.

Purchase Price Allocation *($ in millions)*		
	Amortization life (in years)	Allocated amount
Current assets*		3,186.00
PPE/ noncurrent assets		939.00
Intangilbe assets		
Goodwill	N/A	23,125.00
Client relationships	10	7,215.00
Completed technology	9	4,571.00
Trademarks	20	1,686.00
Total asset acquired		40,722.00
Current liabilities**		1,378.00
Noncurrent liabilities		4,265.00
Total liabilities assumed		5,642.00
Total purchase price		35,080.00

**includes $2200 million of cash and cash equivalents*

***Includes $485 million of short-term debt related to the convertible notes acquired from Red Hat that were recognized at their fair value on the acquisition date, which was fully settled as of October 1, 2019*

Table 11: Purchase Price Allocation, Source: 2019 IBM Annual Report

Table 12 shows the goodwill allocation. In detail, out of $23,125.00 million, $18,500.00 million were allocated to Cloud & Cognitive software, $3,100 million were allocated to Global technology services, $1,110 million were allocated to Global business services and $400 million were allocated to Systems.

Goodwill Allocation *($ in millions)*	
	Goodwill allocated
Cloud & Cognitive software	18,500.00
Global technology services	3,100.00
Global business services	1,100.00
Systems	400.00
Total	23,100.00

Table 12: Goodwill Allocation, Source: 2019 IBM Annual Report

International Business Machines Corporation financed the acquisition of Red Hat through a combination of cash and debt. In detail, International Business Machines Corporation sold eight different versions of the senior unsecured bonds, with maturities ranging from 2-years to 30-years, for a total of $20bn. The indebtedness was structured as follows:

- $1.5bn of 2-year floating rate notes priced at 3-month LIBOR plus 40 basis points.
- $1.5bn of 2-year year fixed rate notes with a 2.8% coupon.
- $2.75bn of 3-year fixed-rate notes with a 2.85% coupon.
- $3.0bn of 5-year fixed-rate notes with 3.0% coupon.
- $3.0bn of 7-year fixed-rate notes with a 3.3% coupon.
- $3.25bn of 10-year fixed-rate notes with a 3.5% coupon.
- $2.0bn of 20-year fixed-rate notes with a 4.15% coupon.
- $3.0bn of 30-year fixed-rate notes with a 4.25% coupon.

2.3.2 Market Reaction

As shown by Figure 17, on 29 October 2018, International Business Machines Corporation opening stock price was equal to $119.34, decreasing by 4.37% with respect to the closing price on 26 October 2018. During the day, the stock price recorded its peak at $123.95 and its lowest value at $118.3 and closed at 119.34, reporting a gross daily return equal to -4.13% with respect to the closing price on 26 October 2018. On 9 July 2019, International Business Machines Corporation stock price recorded an opening price

equal to $140.61, increasing by 0.03% with respect to the closing price on 8 July 2019. During the day, the stock price recorded its peak at $140.99 and its lowest value at $139.13 and closed at $139.33, recording a daily gross return equal to -0.88% with respect to the closing price of the day before. Overall, between the announcement date and the closing date, the company's stock price recorded a gross return equal to 17.09%.

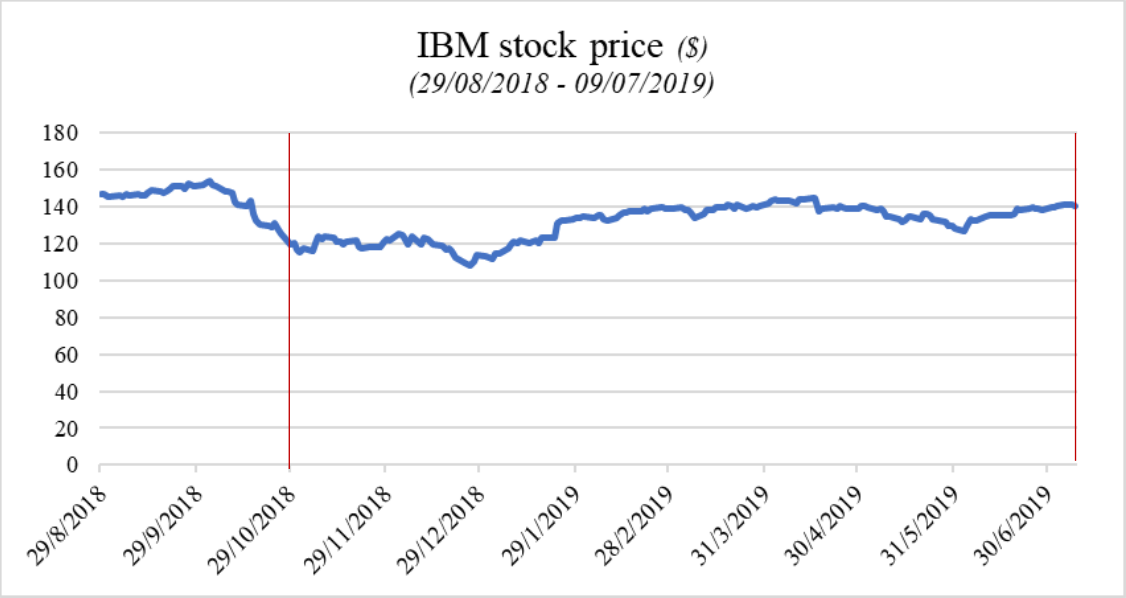

Figure 17: IBM stock price, source: Wharton Research Data Services

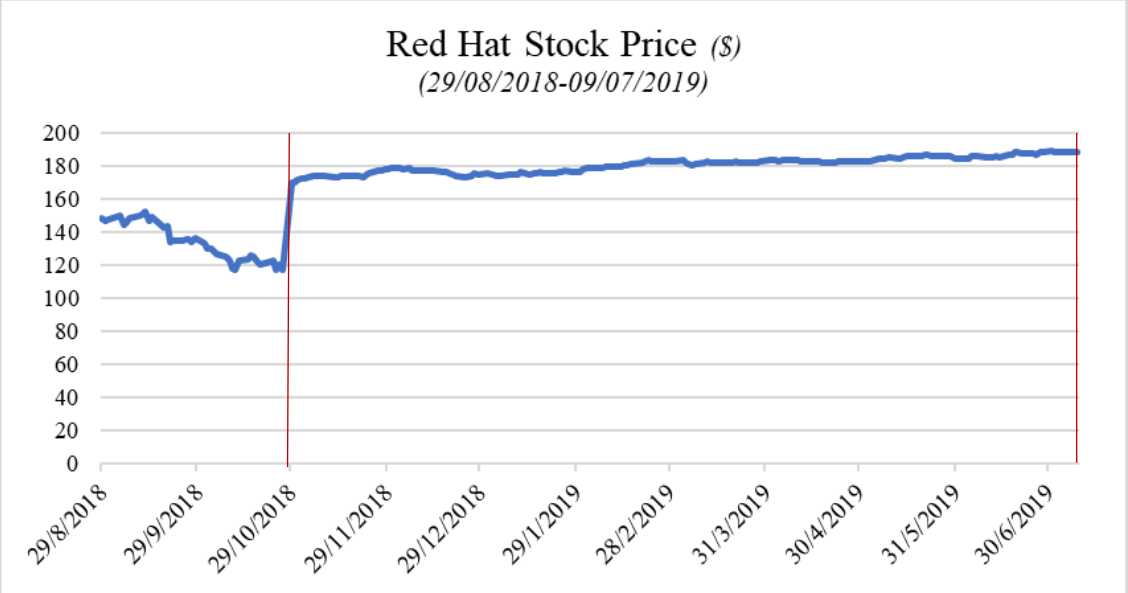

Figure 18: Red Hat stock price, source: Wharton Research Data Services

As shown by Figure 18, on 29 October 2018, Red Hat opening stock price was equal to $174.16, increasing by 49.26% with respect to the closing price on 26 October 2018. During the day, the stock price recorded its peak at $174.48 and its lowest value at $166.1 and closed at $169.63, reporting a gross daily return equal to 45.38% with respect to the closing price on 26 October 2018. On 9 July 2019 Red Hat was delisted. The last closing price recorded by the company was $187.71. Overall, between the announcement date and the closing date, Red Hat stock price recorded a gross return equal to 10.23%.

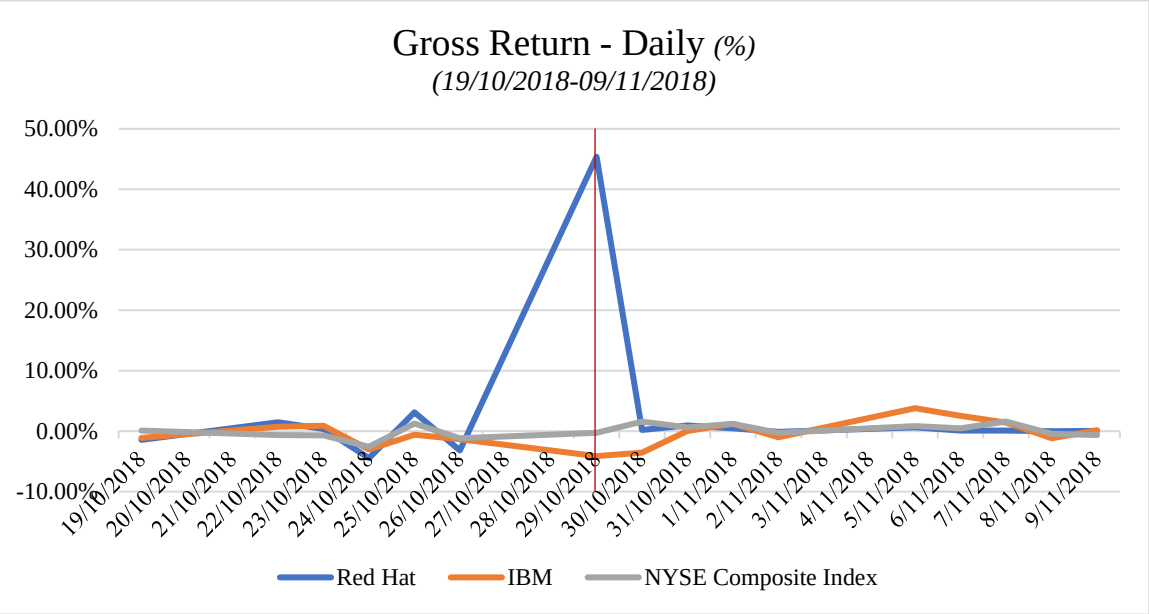

Figure 19: Gross Return - Daily, source: Wharton Research Data Services

Figure 19 shows the gross daily return of International Business Machines Corporation and Red Hat shares compared to the NYSE Composite Index from 19 October 2018 to 9 November 2018. International Business Machines Corporation stock price seems to be negatively correlated with NYSE Composite Index while Red Hat stock price seems to be positively correlated with the NYSE Composite Index.

2.4 The Rationale behind the Acquisition

International Business Machines Corporation acquired Red Hat in order to expand the hybrid cloud service and be able to face competition from its main competitors in the sector, Amazon and Microsoft. This was confirmed in April 2019 by a group of analysts from Nomura Instinet, which, led by Jeffrey Kvall, confirmed that Red Hat products would have expanded International Business Machines Corporation's customer base.

As reported by IBM News Room[3], International Business Machines Corporation's reasons to acquire Red Hat were the following:

1) *"IBM and Red Hat to provide an open approach to cloud, featuring unprecedented security and portability across multiple clouds.*
2) *Deal accelerates IBM's high-value business model, making IBM the #1 hybrid cloud provider in an emerging $1 trillion growth market.*
3) *The acquisition is free cash flow and gross margin accretive within 12 months, accelerate revenue growth and support a solid and growing dividend.*
4) *IBM to maintain Red Hat's open-source innovation legacy, scaling its vast technology portfolio and empowering its widespread developer community.*
5) *Red Hat to operate as a distinct unit within IBM's Hybrid Cloud team."*

In the IBM investor relations[4], financial implications are summarized as follows:

"This transaction accelerates IBM's revenue growth, contributes to its high-value model, and enhances its free cash flow generation. As a standalone business, Red Hat has a strong financial profile, with revenue consistently growing at a double-digit rate. Red Hat is also a high-value business as evidenced by its gross and pre-tax profit margins and strong free cash flow. Red Hat will be reported as part of IBM's Cloud and Cognitive Software segment. The addition of Red Hat will accelerate IBM's revenue growth, expecting to add approximately 200 basis points over the next five years through a

[3]IBM News Room (2018). https://newsroom.ibm.com/2018-10-28-IBM-To-Acquire-Red-Hat-Completely-Changing-The-Cloud-Landscape-And-Becoming-Worlds-1-Hybrid-Cloud-Provider
[4]IBM Investor Relation (2019). https://www.ibm.com/investor/articles/ibm-completes-acquisition-of-red-hat

combination of Red Hat's existing business, continued growth in Red Hat, and cross-selling opportunities across IBM's software and services businesses. The transaction is expected to be accretive to both operating gross profit margin and free cash flow in the first year, and accretive to IBM's operating earnings per share by the end of the second year, with the near-term EPS dilution driven primarily by a non-cash purchase accounting adjustment. In an acquisition, US GAAP requires the buyer at closing to record the acquired deferred revenue balance at fair value. This results in a non-cash adjustment to the deferred revenue balance and a reduction to reported revenue post-closing. The level of adjustment will reflect the margin profile of Red Hat's business, and deferred revenue will be replenished over the subsequent two to three years, given Red Hat's high renewal rates and a stable and growing client base. IBM acquired all of the issued and outstanding common shares of Red Hat for $190 per share in cash, representing a total equity value of approximately $34 billion. The transaction was funded through a combination of debt and cash, with the incremental debt issued earlier this year. The company will continue its disciplined financial policy and is committed to maintaining its strong investment-grade credit ratings, targeting a leverage profile consistent with a mid to high single A credit rating within a couple of years. IBM suspended its share repurchase program at the time of closing. At the same time, the company is maintaining its solid and growing dividend."

3 THE VALUATION OF RED HAT

In this chapter, I will focus on the valuation of Red Hat. I will illustrate the process I followed to get the market share price using the weighted average cost of capital method.

The weighted average cost of capital method, or WACC method, discounts the future unlevered free cash flows using the after-tax weighted average cost of capital. Since the weighted average cost of capital method discounts cash flows using the after-tax weighted average cost of capital, it automatically includes in the valuation the tax benefit related to debt. As we will see in the following paragraphs, the formula of the free cash flow is the following:

Free Cash Flow = EBIT(1-Tax Rate) + Depreciation & Amortization – Capital Expenditure - Change in Net Working Capital.*

So, in order to forecast the future free cash flows of the company, it is necessary to forecast the values of earnings before interest and taxes of the company and thus the values of the revenue in the next years. In this case, I decided to base the valuation of Red Hat on the four years after the acquisition considering 2020, 2021, 2022 and 2023 and basing my forecast on the trends experienced by the Company in 2017, 2018 and 2019.

The first step I took in constructing the valuation model was to select the comparable companies in order to determine a realistic Red Hat Revenue growth rate. The following paragraph describes the selected comparable companies and describes the selection process.

3.1 Comparable Companies

The selected comparable companies are Microsoft Corporation, Citrix Systems, Inc., VMware, Inc. and Oracle Corporation.

"Microsoft Corporation[5] *is a technology company. The Company develops, licenses, and supports a range of software products, services and devices. The Company's segments include Productivity and Business Processes, Intelligent Cloud and More Personal Computing. The Company's products include operating systems, cross-device productivity applications, server applications, business solution applications, desktop and server management tools, software development tools, video games and training certification of computer system integrators and developers. It also designs, manufactures, and sells devices, including personal computers, tablets, gaming and entertainment consoles, phones, other intelligent devices, and related accessories, that integrate with its cloud-based offerings. It offers an array of services, including cloud-based solutions that provide customers with software, services, platforms, and content, and it provides solution support and consulting services."*

"Citrix Systems, Inc.[6] *offers Enterprise and Service Provider products, which include Workspace Services solutions and Delivery Networking products. The Company's Enterprise and Service Provider products include Cloud Services solutions, and related license updates and maintenance, support and professional services. The Company's NetScaler nCore Technology is an architecture that enables the execution of multiple packet engines in parallel. The Company's workspace services include Application Virtualization and virtual desktop infrastructure (VDI), Enterprise Mobility Management and Citrix Workspace Suite. The Company's NetScaler ADC is a software-defined application delivery controller (ADC) and load balancer. The Company's Cloud Services include ShareFile and Citrix Cloud. It provides various ways for customers to receive upgrades, support and maintenance for products, which include Software Maintenance, Subscription Advantage, Technical Support Services and Hardware Maintenance."*

[5] Reuters (2021). https://www.reuters.com/companies/MSFT.O
[6] Reuters (2021). https://www.reuters.com/companies/CTXS.O

"VMware, Inc.[7] is an information technology (IT) company. The Company is engaged in development and application of virtualization technologies with x86 server-based computing, separating application software from the underlying hardware. The Company offers various products, which allow organizations to manage IT resources across private clouds and multi-cloud, multi-device environments by leveraging synergies across three product categories: Software-Defined Data Center (SDDC), Hybrid Cloud Computing and End-User Computing (EUC). The SDDC is designed to transform and modernize the data center into an on-demand service that addresses application requirements by abstracting, pooling and automating the services that are required from the underlying hardware. The Company provides many storage and availability products to offer data storage and protection options to all applications running on the vSphere platform. Its wholly owned subsidiary include Pivotal Software Inc."

"Oracle Corporation[8] (Oracle) provides products and services that address all aspects of corporate information technology (IT) environments, including application, platform and infrastructure. The Company's businesses include cloud and on-premise software, hardware and services. Its cloud and on-premise software business consists of three segments, including cloud software and on-premise software, which includes Software as a Service (SaaS) and Platform as a Service (PaaS) offerings, cloud infrastructure as a service (IaaS) and software license updates and product support. Its hardware business consists of two segments, including hardware products and hardware support. The Company's services business includes the remainder of the Company's segments. Its services business includes activities, such as consulting services, enhanced support services and education services, among others."

According to the Thomson Reuters platform, these are the four listed companies more suitable to be compared to Red Hat. In fact, Thomson Reuters, thanks to a proprietary algorithm, determines a set of "related companies" selected by a universe of approximately 200,000 public & private companies. The algorithm selects "related companies" on the basis of the following parameters:

- Industry classification

[7] Reuters (2021). https://www.reuters.com/companies/VMW
[8] Reuters (2021). https://www.reuters.com/companies/ORCL.N

- Related industries
- Related geographies
- Related macro-economic indicators
- Related news topics
- Co-occurrence & frequency of “appearances” in new articles

The algorithm suggested seven comparable companies. Four of them are listed companies while three of them are private companies. Since private companies’ data are hard to find and, often, they are not available, I decided to select only public companies in order to have all the relevant data needed in the multiple analysis at disposal. According to this algorithm, Microsoft Corporation has 81% similarity with Red Hat, Citrix Systems, Inc has 75% similarity with Red Hat, Vmware, Inc has 74% similarity with Red Hat and Oracle Corporation has 74% similarity with Red Hat.

3.2 Discounted Cash Flow Analysis

This paragraph describes the process followed in order to forecast Red Hat share price, by illustrating the process through which the annual revenue growth, the earnings before interest and taxes, the terminal value, the weighted average cost of capital.

3.2.1 Income Statement Forecasts

The following paragraphs show the process followed in order to forecast the necessary income statement items between 2020 and 2023, paying particular attention to the annual revenue, which is the starting point in the calculation of the free cash flows.

3.2.1.1 Annual Revenue Forecast

As shown by Table 13, in order to determine the annual revenue yearly growth rate from 2020 to 2023, the average annual revenue yearly growth rates of the comparable companies has been computed.

Firstly, the values of the annual revenue in 2020, 2021, 2022 and 2023 for each comparable company have been collected. In order to do so, data in the "Estimates" section of Thomson Reuters, where the statement view provide reliable forecasts for the annual revenue of any listed company, have been gathered. As shown by Table 6, Microsoft Corporation's annual revenue yearly growth rate is equal to 13.6% in 2020, to 14.8% in 2021, to 11.3% in 2022 and to 12.4% in 2023. Citrix Systems, Inc. annual revenue yearly growth rate is equal to 7.5% in 2020, to 3.5% in 2021, to 8.55 in 2022 and to 8.1% in 2023. Vmware, Inc. annual revenue yearly growth rate is equal to 20.5% in 2020, to 8.3% in 2021, to 10.8% in 2022 and to 6.7% in 2023. Oracle Corp annual revenue yearly growth rate is equal to -1.1% in 2020, to 2.6% in 2021, to 2.5% in 2022 and to 3.3% in 2023.

Secondly, the average of the yearly growth rate for each year has been computed. As shown by Table 13, the annual revenue average annual growth rate is equal to 10.13% in 2020, to 7.31% in 2021, to 8.29% in 2022 and to 7.64% in 2023.

In conclusion, the derived growth rates have been applied to Red Hat's annual revenue, and the annual revenue for the forecasted period has been computed. Red Hat's annual revenue are equal to $3,702.7 million in 2020, to $3,973.5 million in 2021, to $4,302.9 in 2022 and to $4,631.5 million in 2023.

Red Hat INC
Revenue Forecast
($ in millions)

Revenue annual growth projections

			Historical			Forecasts			
			2017 A	2018 A	2019 A	2020 E	2021 E	2022 E	2023 E
Microsoft Corp	(MSFT.O)	Revenue	96,571.0	110,360.0	125,843.0	143,015.0	164,212.0	182,825.0	205,515.0
		growth (%)				*13.6%*	*14.8%*	*11.3%*	*12.4%*
Citrix Systems, Inc.	(CTXS.O)	Revenue	2,824.7	2,973.9	3,010.6	3,236.7	3,351.0	3,636.0	3,930.0
		growth (%)				*7.5%*	*3.5%*	*8.5%*	*8.1%*
Vmware, Inc.	(VMW)	Revenue	512.0	7,922.0	8,974.0	10,811.0	11,707.0	12,968.0	13,840.0
		growth (%)				*20.5%*	*8.3%*	*10.8%*	*6.7%*
Oracle Corp	(ORCL.K)	Revenue	37,792.0	39,878.0	39,506.0	39,068.0	40,091.0	41,111.0	42,480.0
		growth (%)				*(1.1%)*	*2.6%*	*2.5%*	*3.3%*
Revenue Average Annual Growth (%)						**10.13%**	**7.31%**	**8.29%**	**7.64%**
Red Hat, Inc.	(RHT.N)	Revenue	2,411.8	2,920.5	3,362.1	3,702.7	3,973.5	4,302.9	4,631.5

Table 13: Sales growth forecast, source: Thomson Reuters

3.2.1.2 EBIT Forecast

As shown by Table 14, in order to calculate Red Hat earnings before interest and taxes, the cost of goods sold, selling, general & administrative expenses and depreciation & amortization have been subtracted from revenue. This paragraph describes the assumptions made in order to calculate the forecasted values of these items.

Red Hat INC
Discounted Cash Flow Analysis
($ in millions)

	Historical			Forecasts			
Income Statement	2017 A	2018 A	2019 A	2020 E	2021 E	2022 E	2023 E
Sales	**2,411.8**	**2,920.5**	**3,362.1**	**3,702.7**	**3,973.5**	**4,302.9**	**4,631.5**
% growth		*21.1%*	*15.1%*	*10.1%*	*7.3%*	*8.3%*	*7.6%*
COGS	(354.4)	(431.8)	(498.3)	(548.8)	(588.9)	(637.7)	(686.4)
% of sales	*14.7%*	*14.8%*	*14.8%*	*14.8%*	*14.8%*	*14.8%*	*14.8%*
Gross Profit	**2,057.4**	**2,488.7**	**2,863.8**	**3,153.9**	**3,384.6**	**3,665.1**	**3,945.1**
% margin	*85.3%*	*85.2%*	*85.2%*	*85.2%*	*85.2%*	*85.2%*	*85.2%*
SG&A	(1,638.1)	(1,915.8)	(2,242.5)	(2,469.7)	(2,650.3)	(2,870.0)	(3,089.2)
% sales	*67.9%*	*65.6%*	*66.7%*	*66.7%*	*66.7%*	*66.7%*	*66.7%*
EBITDA	**419.3**	**572.9**	**621.3**	**684.2**	**734.3**	**795.1**	**855.9**
% margin	*17.4%*	*19.6%*	*18.5%*	*18.5%*	*18.5%*	*18.5%*	*18.5%*
D&A	(85.3)	(97.1)	(109.1)	(120.2)	(128.9)	(139.6)	(150.3)
% of sales	*3.5%*	*3.3%*	*3.2%*	*3.2%*	*3.2%*	*3.2%*	*3.2%*
EBIT	**334.0**	**475.8**	**512.2**	**564.1**	**605.3**	**655.5**	**705.6**
% margin	*13.8%*	*16.3%*	*15.2%*	*15.2%*	*15.2%*	*15.2%*	*15.2%*

Table 14: Forecasted Income Statement, source: Thomson Reuters

The cost of goods sold was equal to $354.4 million in 2017, to $431.8 million in 2018 and to $498.3 million in 2019. Since the COGS margin was equal to 14.7% in 2017, to 14.8% in 2018 and to 14.8% in 2019, it seems reasonable to keep it equal to 14.8% during the forecasted period. Consequently, the cost of goods sold is equal to $548.8 in 2020, to $588.9 in 2021, to $637.7 in 2022 and to $686.4 million in 2023.

The selling, general & administrative expenses were equal to $1,638.1 million in 2017, to $1,915.8 million in 2018 and to $2,242.5 million in 2019. Since the SG&A margin was equal to 67.9% in 2017, to 65.6% in 2018 and to 66.7% in 2019, it seems reasonable to keep it equal to 66.7% in the forecasted period. Consequently, the selling, general & administrative expenses are equal to $2,469.7 million in 2020, to $2,650.3 million in 2021, to $2,870.0 million in 2022 and to $3,089.2 million in 2023.

The depreciation & amortization was equal to $85.3 million in 2017, to $97.1 million in 2018 and to $109.1 million in 2019. Since the depreciation & amortization margin was equal to 3.5% in 2017, to 3.3% in 208 and to 3.2% in 2019, it seems reasonable to keep it equal to 3.2% in the forecasted period. Consequently, the depreciation & amortization is equal to $120.2 million in 2020, to $128.9 million in 2021, to $139.6 million in 2022 and to $150.3 million in 2023.

In conclusion, the earnings before interest and taxes are expected to be equal to $564.1 million in 2020, to $605.3 million in 2021, to $655.5 million in 2022 and to $705.6 million in 2023.

3.2.1.3 Free Cash Flows Forecast

Free cash flow is the cash generated by the firm invested capital. It is the cash flow available to shareholders and debtholders who provide funds to the firm. Since it is not influenced by financing decision, it should not be calculated by considering the firm's financing decisions. Thus, interest expenses and interest revenues should not be included in the calculation of the free cash flow. From 31 December 2017, after the U.S. tax reform legislation enacted on 22 December 2017, the United States tax rate on corporate income is equal to 21%.

Free Cash Flow = EBIT(1-Tax Rate) + Depreciation & Amortization – Capital Expenditure - Change in Net Working Capital*

In order to calculate the free cash flows in the forecasted period, the capital expenditure and the net working capital have been forecasted. Then, the capital expenditure and the change in net working capital have been subtracted from the after-tax earnings before interest and taxes. This paragraph describes the assumptions made to forecast the capital expenditure and the net working capital.

Capital expenditure was equal to $80.9 million in 2017, to $101.7 million in 2018 and to 71.8% in 2019. Since the capital expenditure margin was equal to 3.4% in 2017, to 3.5%

in 2018 and to 2.1% in 2019, it seems reasonable to keep it equal to 2.1% in the forecasted period. Consequently, capital expenditure is equal to $79.1 million in 2020, to $84.9 million in 2021, to $91.9 million in 2022 and to $98.9 million in 2023.

The net working capital projection implied the forecasting of the company's operating current assets and operating current liabilities. In fact, net working capital is equal to the difference between the two.

The company's operating current assets include loans & receivables and prepaid expenses and other current assets. To forecast loans & receivables, the days of sales outstanding in the historical period have been calculated. Days of sales outstanding reflects the number of days necessary for the company to collect sales.

*Days of Sales Outstanding = Accounts Receivable / Sales * 365*

Since the days of sales outstanding were equal to 96.1 in 2017, to 100.8 in 2018 and to 106.4 in 2019, it seems reasonable to keep the days of sales outstanding equal to 106.4 in the forecasted period. By multiplying days of sales outstanding by revenue and by dividing them by 365, loans & receivables are equal to $1,079.5 million in 2020, to $1,158.5 million in 2021, to $1,254.5 million in 2022 and to $1,350.3 million in 2022. Prepaid expenses and other current assets were equal to $219.7 million in 2017, to $292.5 million in 2018 and to $306.8 million in 2019. Since the prepaid expenses and other current assets margin was equal to 9.1% in 2017, to 10.0% in 2018 and to 9.1% in 2019, it seems reasonable to keep it equal to 9.1% in the forecasted period. Consequently, prepaid expenses and other current assets are equal to $337.9 million in 2020, to $362.6 million in 2021, to $392.6 million in 2022 and to $422.6 million in 2023. The total value of current operating assets is obtained by summing loans & receivables and the prepaid expenses and other current assets. Current operating assets are equal to $1,417.4 million in 2020, to $1,521.1 million in 2021, to 1,647.2 million in 2022 and to $1,773 million in 2023.

The company's operating current liabilities include trade accounts payable & accruals, income tax payable and other current liabilities. In order to forecast trade accounts

payable & accrual, the days of payment outstanding in the historical period have been computed. Days of payment outstanding reflects the number of days necessary for the company to pay a purchase.

*Days of Payment Outstanding = Account Receivable / COGS * 365*

Since the days of payment outstanding were equal to 297.6 in 2017, to 360.9 in 2018 and to 258.0 in 2019, it seems reasonable to keep the days of payment outstanding equal to 258.0 in the forecasted period. As shown by Table 8, by multiplying days of payment outstanding by revenue and dividing them by 365, trade account payable & accruals are equal to $387.9 million in 2020, to $416.2 million in 2021, to $450.8 million in 2022 and to $485.2 million in 2023. Income tax payable was equal to $44.0 million in 2017, to $0.0 million in 2018 and to $57.3 million in 2019. Since the income tax payable margin was equal to 1.8% in 2017, to 0.0% in 2018 and to 1.7% in 2019, it seems reasonable to keep it equal to 0.0% in the forecasted period. Other current liabilities were equal to $1,889.5 million in 2017, to $2,281.6 million in 2018 and to $2,652.1 million in 2019. Since other current liabilities margin was equal to 64.5% in 2017, to 63.5% in 2018 and to 66.7% in 2019, it seems reasonable to keep it equal to 66.7% in the forecasted period. Other current liabilities are equal to $2,469.8 million in 2020, to $2,650.4 million 2021, to 2,870.1 million in 2022 and to $3,089.3 million in 2023. The total value of current operating liabilities is obtained by summing the trade accounts payable, the income tax payable and the other current liabilities. Current operating liabilities are equal to $2,857.6 million in 2020, to $3,066.7 in 2021, to $3,320.9 in 2022 and to $3,574.5 in 2023.

As shown by Table 15, net working capital in the forecasted period is obtained by computing the difference between current operating assets and current operating liabilities. Net working capital is equal to -$1,440.2 million in 2020, to -$1,545.6 million in 2021, to -$3,320.9 million in 2022 and to -$1,801.5 million in 2023. Consequently, the change in net working capital is equal to -$75.1 million between 2019 and 2020, to -$105.4 million between 2020 and 2021, to -$128.1 million between 2021 and 2022 and to -$127.8 million between 2022 and 2023.

Red Hat INC
Working Capital Projections
($ in millions)

	Historical			Forecasts			
	2017 A	2018 A	2019 A	2020 E	2021 E	2022 E	2023 E
Loans & Receivables	634.8	806.7	980.2	1079.5	1158.5	1254.5	1350.3
Prepaid Expenses and Other Current Assets	219.7	292.5	306.8	337.9	362.6	392.6	422.6
Total operating assets	**854.6**	**1,099.3**	**1,287.0**	**1,417.4**	**1,521.1**	**1,647.2**	**1,773.0**
Trade Accounts Payable & Accruals	289.0	427.0	352.2	387.9	416.2	450.8	485.2
Income Taxes - Payable - Short-Term	44.0	0.0	57.3	0.0	0.0	0.0	0.0
Other Current Liabilities	1556.5	1854.6	2242.6	2469.8	2650.4	2870.1	3089.3
Total operating liabilities	**1,889.5**	**2,281.6**	**2,652.1**	**2,857.6**	**3,066.7**	**3,320.9**	**3,574.5**
Total Net Working Capital	**(1,035.0)**	**(1,182.3)**	**(1,365.1)**	**(1,440.2)**	**(1,545.6)**	**(1,673.7)**	**(1,801.5)**
Change in Net Working Capital		**(147.3)**	**(182.8)**	**(75.1)**	**(105.4)**	**(128.1)**	**(127.8)**

Table 15: Net Working Capital Projections, source: Thomson Reuters

Red Hat INC
Discounted Cash Flow Analysis
($ in millions)

	Historical			Forecasts			
Income Statement	2017 A	2018 A	2019 A	2020 E	2021 E	2022 E	2023 E
EBIT	**334.0**	**475.8**	**512.2**	**564.1**	**605.3**	**655.5**	**705.6**
% margin	*13.8%*	*16.3%*	*15.2%*	*15.2%*	*15.2%*	*15.2%*	*15.2%*
Taxes @ 21%	(70.1)	(99.9)	(107.6)	(118.5)	(127.1)	(137.7)	(148.2)
NOPAT	**263.9**	**375.9**	**404.6**	**445.6**	**478.2**	**517.9**	**557.4**
D&A	85.3	97.1	109.1	120.2	128.9	139.6	150.3
Capex	(80.9)	(101.7)	(71.8)	(79.1)	(84.9)	(91.9)	(98.9)
% of sales	*3.4%*	*3.5%*	*2.1%*	*2.1%*	*2.1%*	*2.1%*	*2.1%*
Change in NWC		147.3	182.8	75.1	105.4	128.1	127.8
Free Cash Flow (FCF)				561.8	627.6	693.7	736.6

Table 16: Free Cash Flow Calculation, source: Thomson Reuters

After having forecasted the necessary items, as shown by Table 16, the company's free cash flows have been derived. The free cash flow equal to $561.8 million in 2020, to $627.6 million in 2021, to $693.7 million in 2022 and to $736.6 million in 2023.

3.2.1.4 Weighted Average Cost of Capital

The weighted average cost of capital is the company's cost of capital. It is a weighted average of the cost of equity and the cost of debt, where the weights are "equity/enterprise value" and "debt/enterprise value". It considers the tax benefit related to debt.

$$WACC = R_e * E/EV + R_d * (1 - Tax\ Rate) * D/EV$$

Where:

WACC = Weighted-Average Cost of Capital

R_e *= cost of equity*

E/EV = Equity/ Enterprise Value

R_d ** (1- Tax Rate) = cost of debt adjusted for tax benefit*

D/EV = Debt/ Enterprise Value

The first step is to determine the target financial structure of the company. To do so, 2020 equity and 2020 debt have been forecasted. The total equity of the company is composed of reserves & retained earnings, common equity and treasury stock. To calculate 2020 reserves & retained earnings, 2020 net income has been added to 2019 reserves & retained earnings. Since 2020 net income is equal to $490.69 million and 2019 reserves & retained earnings are equal to $2,011.45 million, 2020 reserves & retained earnings are equal to $2,502.14 million. Assuming that 2020 common equity is equal to 2019 common equity, it is expected to be equal to $2,791 million in 2020. According to the 2019 Red Hat annual report, 2020 treasury stock is equal to $737.2 million. Consequently, the company's equity is expected to be equal to $4,556.8 million in 2020. The total debt of the company

is composed of short-term debt & current portion of long-term debt and by long-term debt. 2020 short-term debt & current portion of long-term debt and 2020 long-term debt are expected to be equal to their respective values in 2019. Since 2020 short-term debt & current portion of long-term debt is equal to $70.11 million and 2020 long term debt is equal to $231.57 million, 2020 total debt is equal to $301.7 million. Consequently, the debt/equity ratio is equal to 6.62%, the equity/enterprise value ratio is equal to 93.79% and the debt/enterprise value ratio is equal to 6.21%.

Secondly, the cost of equity and the cost of debt have been computed. The cost of equity has been computed by applying the capital asset pricing model. According to the capital asset pricing model, the cost of equity is equal to the risk-free rate plus the beta levered multiplied by the difference between the market return and the risk-free rate.

$R_e = R_f + ß_L * MRP$

Where:

R_e = *cost of equity*

R_f = *risk-free rate*

$ß_L$ = *beta levered*

MRP = market risk premium

Since Red Hat is a U.S. company, its risk-free rate is equal to the 10-year Treasury rate. On 31 December 2019, the 10-year Treasury rate was equal to 1.92%[9]. According to Duff & Phelps[10], the market risk premium was equal to 5%. The beta levered of Red Hat is equal to 0.45. Consequently, the cost of equity is equal to 4.17%.

The cost of debt is equal to the risk-free rate plus the spread.

$R_d = R_f$ + *spread*

[9]https://ycharts.com/indicators/10_year_treasury_rate
[10]https://www.duffandphelps.com/-/media/assets/pdfs/publications/articles/dp-erp-rf-table-2020.pdf?la=en&hash=CEC22C0DD9928B72337F9B7E7536C753B0513063

The appropriate spread has been derived through the interest coverage ratio. The interest coverage ratio is equal to the earnings before interest and taxes divided by interest expense and it represents the ability of a company to repay interest expense through its earnings before interest and taxes. Red Hat interest coverage ratio is equal to 25.82. This entails a spread equal to 0.75%. Therefore, the cost of debt is equal to 2.67%.

Red Hat INC
WACC estimation
($ in millions)

Risk free rate	1.92%	**Cost of Equity**	**4.17%**
Interest Coverage Ratio	25.82		
Spread	0.75%		
Market Risk Premium	5.00%		
60-Month Beta	0.45	**Cost of Debt**	**2.67%**
Target D/E	6.62%		
E/EV	93.79%		
D/EV	6.21%		
Tax rate	21.00%	**WACC**	**4.04%**

Table 17: WACC estimation, source: Thomson Reuters

In conclusion, as shown by table 17, the weighted average cost of capital has been calculated. As shown by Table 17, the weighted average cost of capital is equal to 4.04%.

WACC Sensitivity Analysis

D/E \ Cost of Debt	2.67%	3.17%	3.67%	4.17%	4.67%
6.62%	4.04%	4.07%	4.09%	4.12%	4.14%
16.62%	3.88%	3.93%	3.99%	4.05%	4.10%
26.62%	3.74%	3.82%	3.90%	3.99%	4.07%
36.62%	3.62%	3.72%	3.83%	3.94%	4.04%
46.62%	3.51%	3.64%	3.77%	3.89%	4.02%

D/E \ Cost of Equity	4.17%	4.67%	5.17%	5.67%	6.17%
6.62%	4.04%	4.51%	4.98%	5.45%	5.92%
16.62%	3.88%	4.31%	4.73%	5.16%	5.59%
26.62%	3.74%	4.13%	4.53%	4.92%	5.32%
36.62%	3.62%	3.98%	4.35%	4.72%	5.08%
46.62%	3.51%	3.86%	4.20%	4.54%	4.88%

Table 18: WACC sensitivity analysis

Two sensitivity analysis on the weighted average cost of capital have been performed. The first sensitivity analysis shown by Table 18, aims at evaluating the sensitivity of the weighted average cost of capital to changes in the company's financing structure and in the cost of debt. The second sensitivity analysis shown by Table 18 aims at evaluating the sensitivity of the weighted average cost of capital to changes in the company's financing structure and in the cost of equity. The weighted average cost of capital is negatively correlated to the debt/equity ratio while it has a positive correlation with the cost of debt and the cost of equity. As the debt/equity ratio increases, the weighted average cost of capital decreases. As the cost of debt and the cost of equity increase, the weighted average cost of capital increases.

3.2.1.5 Terminal Value Calculation

Red Hat terminal value is expressed by the following formula:

$$Terminal\ Value = \frac{FCF(2023) * (1 + g)}{(WACC - g)}$$

Where,

FCF = Free Cash Flow

g = Long Term Growth

WACC = Weighted-Average Cost of Capital

In the calculation of the terminal value, long-term growth plays a key role. It is the expected growth of the company after the forecasted period. In this case, it seems reasonable to assume that the long-term growth will be equal to the expected inflation suggested by the U.S. Federal Reserve. According to the Summary of Economic

Projections[11] published by the U.S. Federal Reserve, the long-run U.S. personal consumption expenditures (PCE) inflation is expected to be equal to 2%

Therefore,

$$Terminal\ Value = \frac{736.6 * (1 + 0.02)}{0.0404 - 0.02} = \$36{,}793.9\ million$$

3.2.1.6 Enterprise Value Calculation

The enterprise value is the sum of the present values of the projected free cash flows and the terminal value. "*The terminal value[12] is the value of the company beyond the forecasted period when future cash flows can be estimated"*. The terminal value assumes a business will grow at a set growth rate forever after the forecasted period and it includes a large portion of the total value. In this paragraph, I will show the process I followed to derive Red Hat value.

Being 2019 our base year, or alternatively year 0, 2020 will be year 1, 2021 will be year 2, 2022 will be year 3 and 2023 will be year 4. Consequently, the present value of the projected free cash flows is equal to the following formula:

$$PV(FCFs) = \sum_{t=1}^{4} \frac{FCF(t)}{(1 + WACC)^t}$$

Where:

FCF = expected Free Cash Flows in the projected period

WACC = Weighted Average Cost of Capital

Applying the above formula to the estimated free cash flows, the present value of 2020 free cash flow is equal to $540.0 million, the present value of 2021 free cash flow is equal

[11]Federal Reserve (2021). Summary of Economic Projections. https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20210317.pdf
[12] https://www.investopedia.com/terms/t/terminalvalue.asp

to $579.8 million, the present value of 2022 free cash flow is equal to $615.9 million and the present value of 2023 free cash flow is equal to $628.6 million.

Overall, the present value of the projected free cash flows is equal to $2,364.4 million.

As shown in paragraph 3.2.1.5, the terminal value is equal to $36,793.9 million. The present value of the terminal value is calculated as follows:

$$PV(Terminal\ Value) = \frac{Terminal\ Value}{(1+WACC)^4} = \frac{36{,}793.9}{(1+0.0404)^4} = \$31{,}400.8\ million$$

The enterprise value is equal to the sum of the present value of the projected free cash flows and the present value of the terminal value. Therefore, the enterprise value is equal to:

Enterprise Value = PV(FCFs) + PV(Terminal Value) = 2,364.4 + 31,400.8 = $33,765.2 million

Red Hat INC
Discounted Cash Flow Analysis
($ in millions)

Free Cash Flow (FCF)	561.8	627.6	693.7	736.6	
Terminal Value					36,793.9
PV	540.0	579.8	615.9	628.6	31,400.8

Enterprise Value	33,765.2

Table 19: Enterprise Value

3.2.1.7 Share Price

The share price is equal to the difference between enterprise value and the net financial position, that is the market capitalization, divided by the number of shares outstanding.

$$Share\ Price = \frac{Enterprise\ Value - Net\ Financial\ Position}{Number\ of\ Shares\ Outstanding}$$

Red Hat net financial position is equal to total debt minus cash and cash equivalents. 2019 total debt is equal to $301.7 million and 2019 cash and cash equivalents is equal to $1,883.1 million. Consequently, Red Hat net financial position in 2019 is equal to -$1,581.4 million. According to the 2019 Red Hat Annual Report, the number of shares outstanding in 2019 is equal to 176.8 million.

Red Hat INC
Discounted Cash Flow Analysis
($ in millions)

Free Cash Flow (FCF)			561.8	627.6	693.7	736.6	
Terminal Value							36,793.9
PV			540.0	579.8	615.9	628.6	31,400.8
Enterprise Value	33,765.23						
Net Financial Position	(1,581.4)						
Market Cap	35,346.6						
Common Share Outstanding	176.8						
Share Price	199.92						

Table 20: Red Hat share price

As shown by Table 20, Red Hat share price on 31 December 2019 is equal to $199.92.

CONCLUSION

This thesis has described the different valuation approaches and the International Business Machines Corporation's acquisition of Red Hat. After having highlighted, in the first chapter, that the most adopted valuation method is the discounted cash flow method, also known as DCF, the thesis has described the two companies' financial performance between 2015 and 2019, the history and the rationale of the acquisition and, using the discounted cash flow method, has calculated the share price of Red Hat on 31 December 2019 and compared it to the price agreed on 28 October 2018 and subsequently paid by International Business Machines Corporation on 9 July 2019 to acquire Red Hat.

In the first chapter, the thesis has analysed the most used valuation approaches highlighting the pros and cons of each of them. The first method analysed is the discounted cash flow method. The main problem in the application of the discounted cash flow method is the calculation of the terminal value, that is the value of the company's value after the forecasted period. Terminal value is mainly influenced by long-term growth (g). In determining the long-term growth, it is important to consider that companies are likely to experience consistent growth in the first years and to experience a growth rate close to zero subsequently. In order to estimate accurate long-term growth is important to consider the economic environment in which the company operates and, therefore, the company's sector. Each assumption made must be justified by sufficient documentation and must be described transparently. The second method analysed involves the comparable companies' analysis in order to derive companies' multiples and to use them to evaluate the company under analysis. Therefore, this approach is also known as multiples analysis. The selection process should be performed by considering information concerning the business and financial data of the companies, such as sector, size, profitability and return on investment. Companies should be selected at the national level and should operate in the same sector in which the company under analysis operates (intra-sector comparison at the national level). If there is scarce availability of comparable companies at the national level, it is possible to select companies at the international level

(intra-sector comparison at the international level). If companies within the same sector at the national and international level are not available or if the sample of available companies is too small, analysts can decide to select companies that do not operate in the same sector of the analysed company at the national and international level (intersectoral comparison). The main problem of this approach is represented by the fact that multiples that involve values that are highly influenced by budget and fiscal policies are the ones more likely to provide biased results. The third method analysed is the economic valued added approach, also known as EVA. Differently from the discounted cash flow method, in which short-term and long-term future expectations play a key role, the outcome of the economic value added approach is based on current and future performance and medium-term growth expectations. Therefore, the outcome also reflects the company's current performance. Even if the discounted cash flow method is the most adopted valuation approach, the first chapter leads to the conclusion that each of the described models analyses companies from a different point of view but they all provide valid and reliable results. For what concerns the valuation of banks the dividend discount model is the most adopted approach while for what concerns insurance companies the valuation is performed on the basis of the income stream deriving from the portfolio of insurance policies.

In the second chapter, the thesis has firstly analysed the performance of International Business Machines Corporation and Red Hat between 2015 and 2019 and secondly the terms and the rationale of the deal. Between 2015 and 2019, International Business Machines Corporation annual revenue decreased by 5.62%, the gross profit decreased by 11.40%, the earnings before interest, taxes, depreciation, and amortization decreased by 15.21%, the earnings before interest and taxes decreased by 32.16%, the net income decreased by 29.43% and the return on invested capital decreased by 10.80%. The most profitable segment in 2019 was the Global Technology Services segment that recorded annual revenue equal to $28,158.00 million. The Americas is the region in which International Business Machines Corporation recorded the highest volume of annual revenue, which is $36,270.00 million. Between 2015 and 2019, Red Hat annual revenue increased by 87.88%, the gross profit increased by 88.87%, the earnings before interest, taxes, depreciation, and amortization increased by 90.23%, the earnings before interest and taxes increased 104.90%, the net income increased by 147.28% and the return on

invested capital increased by 11.1%. The most profitable segment in 2019 was the Subscription segment that recorded $2,949.06 million. The Americas is the region in which Red Hat recorded the highest volume of annual revenue, that is $2,092.23 million. In short, while International Business Machines Corporation's analysed data have been experiencing a negative trend, Red Hat analysed data have been experiencing a positive trend between 2015 and 2019. The International Business Machines Corporation's acquisition of Red Hat was closed on July 9, 2019, when International Business Machines Corporation completed the acquisition for an aggregate cost of $35bn after the deal was originally announced on October 28, 2018. International Business Machines Corporation agreed to buy all Red Hat's shares for a price equal to $34bn, $190 per share, to be paid in cash. International Business Machines Corporation accepted to pay a 63% premium for each Red Hat share, in fact, on 28 October 2018, Red Hat share price was equal to $116.82. International Business Machines decided to acquire Red Hat in order to become the #1 hybrid cloud provider in an emerging $1 trillion growth market and because the acquisition was expected to be free cash flow and gross margin accretive in the 12 months after the acquisition.

The third chapter describes the valuation process of Red Hat. Red Hat has been analysed using the discounted cash flow method, and more specifically the weighted average cost of capital method. The valuation process consisted of several steps. The first one consisted in forecasting Red Hat' financial data from 2020 to 2023, using 2019 as the base year, in order to calculate Red Hat free cash flow from 2020 to 2023. The second step consisted in calculating the weighted average cost of capital, that is the discount rate at which future free cash flows are discounted. The third step consisted in calculating the terminal value of Red Hat. The fourth step consisted in discounting the free cash flows and the terminal value and then sum them all to find the enterprise value. The fifth step consisted in determining the net financial position of Red Hat and in subtracting it from the enterprise value in order to find the market capitalization. The last step consisted in dividing the market capitalization by the number of outstanding shares in order to find the share price on 31 December 2019. According to the assumption made and the valuation model performed, Red Hat share price on 31 December 2019 was equal to $199.92. The valuation of Red Hat was aimed at comparing the share price of the company on 31 December 2019 with the price paid on 9 July 2019 by International Business Machines

Corporation in order to understand if it was justified. In fact, after International Business Machines Corporation acquired Red Hat, Red Hat was delisted and therefore the share price was not available anymore. In order to understand if the price paid by International Business Machines Corporation is justified it is necessary to list the main stages of the acquisition process and to describe the evolution of Red Hat share price between the date of the announcement and the date of the closing. In fact, the deal between International Business Machines Corporation and Red Hat was announced on 29 October 2018. On this day, International Business Machines Corporations agreed to buy all Red Hat's shares for a price of $190 per share when Red Hat's share price was equal to $116.82. On 9 July 2019, when the deal was closed, Red Hat's share price was equal to $187.81. On 9 July 2019, Red Hat share price may have been biased by the fact that International Business Machines Corporation was paying $190 per Red Hat share. After 175 days, on 31 December 2019, according to the valuation performed, Red Hat share price was equal to $199.92. Therefore, this thesis leads to the conclusion that the decision of International Business Machines Corporation to pay such a high premium was completely justified since the price paid by the acquiring company is lower than the price of Red Hat on 31 December 2019.

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