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ANALYSIS OF RYANAIR AND THE CAPITAL ASSET PRICING MODEL

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CONTENT

1. ABSTRACT

The “Analysis of Ryanair and the Capital Asset Pricing Model” is a Final Degree Project that is divided mainly in three parts. First of all, introduces from a theoretical point of view what an asset pricing model is and its main characteristics and uses. It also focuses specifically on the basic Capital Asset Pricing Model with an essay about it, its main alternative models and some known tests that have been done in the past.

The second part is about airlines, a sum up of its history and particularly the description and the main characteristics of the low-cost airlines’ concept nowadays. It also contains a more practical part where the shares evolution of four low-cost airlines in different economic situations is compared from an investor’s point of view.

Finally, in the last part, there is a practical combination of the previous two parts where the Capital Asset Pricing Model is tested whether it works or not with Ryanair’s shares.

2. RESUMEN

Analysis of Ryanair and the Capital Asset Pricing Model es un trabajo de final de grado dividido principalmente en tres partes. La primera parte, básicamente teórica, introduce el concepto del modelo de valoración de activos financieros con sus características y utilidades. Se centra concretamente en el modelo de CAPM (*Capital Asset Pricing Model*) con un ensayo sobre él, los principales modelos alternativos y algunas de las pruebas más conocidas que se han hecho hasta ahora.

La segunda parte se centra en las aerolíneas, un resumen sobre su historia hasta ahora, y específicamente en una descripción y definición de las características principales de las aerolíneas de bajo coste hoy en día. También contiene una parte más práctica donde se analizan, desde el punto de vista de un inversor, la evolución de las acciones de cuatro aerolíneas de bajo coste que se encuentran en diferentes circunstancias económicas.

Finalmente, la última parte, se trata de una combinación práctica de los dos apartados anteriores donde el modelo de CAPM es testado sobre las acciones de Ryanair.

3. INTRODUCTION AND OBJECTIVES

In this moment, when financial assets' diversification is increasing day to day, one of the main ways to predict the future expected prices of the different assets is with the Asset Pricing Models. This Final Degree Project starts with a mainly theoretical part, that introduces what an asset pricing model is, its main characteristics, and due to its importance and usage nowadays for investors and all kind of professionals in the economic sector, it focuses on the basic Capital Asset Pricing Model with an essay about it, its main alternative models and some known tests that have been done in the past.

The second part is about airlines, a sum up of its history and specifically a description of what a low-cost airline is and which the keys for its success are nowadays. It also contains a more practical part where the shares of four low-cost airlines in different economic situations are compared with the main finance ratios to see how profitable, volatile and over/underpriced in the Frankfurt exchange market they are.

Finally, in the last part, all practical, there is a combination of the previous two parts where the Capital Asset Pricing Model is tested whether it works or not with Ryanair's shares.

The reason why I choose this topic is because I am interested in finance and when I was in Ireland as an ERASMUS student, in one of the modules I attended, I had the facilities to obtain some financial information in Bloomberg terminals, so I thought I could use some of that information for my Final Degree Project. Also, I specifically choose the airline sector since I worked as a handling agent at Reus' airport for a summer, what made me more interested about this economic sector.

The objectives I set for this project are, first of all, to understand better what an asset pricing model is and to go deeper into the Capital Asset Pricing Model in a more technical way. Another objective I set is to understand what makes possible the low prices on the low-cost airlines and if despite their level of prices, they were still profitable from the company's point of view and from the investor's' one. And at last, my last and main objective is to try to prove if the Capital Asset Pricing Model is applied to Ryanair's shares or not.

4. INTRODUCTION TO THE ASSET PRICING MODELS

The asset pricing models are models that try to determine the required or expected rate of return on an asset, to be able to, as an investor, adapt your performance in the market according to this result and obtain the maximum profit. The most important factor in this valuation is the risk of payments of the asset under examination. (Knight *et al.* 2005)

4.1. OBJECTIVES OF THE ASSET PRICING MODELS

The main objective of the asset pricing models is to be able to predict the future expected price of the different assets performing in the market, and because of this to be able to invest smartly and get the maximum profit.

Another important objective of these models is to be able to understand why the asset prices change so easily, what factors produce these movements and how sensitive are the asset prices to these factors.

Additional smaller objectives more applicable to investors and firm managers are:

- To assess whether an investment has outperformed or underperformed in the past given its risk.
- To compare the performance of different investments with different underlying risks.
- To estimate the cost of capital for firms.
- To evaluate the performance of a managed portfolio.
- To provide a benchmark return that a project needs to yield to be acceptable to investors.
- To help in firms' capital budgeting decisions.

(Weisbenner, 2017)

4.2. MAIN ASSET PRICING MODELS

The main asset pricing models known and used for professionals are: the Capital Asset Pricing Model with its variations such as the Intertemporal Capital Asset Pricing Model, the International Capital Asset Pricing Model, the Consumption-Based Capital Asset Pricing Model or the Production-based Asset Pricing Model, the Arbitrage Pricing Theory (Krause, 2001), the Fama and French alternative model to the Capital Asset Pricing Model, and other alternative models based on analysing skewness and kurtosis.

Due to its importance and usage nowadays for investors and all kind of professionals in the economic sector, I decided to focus on the basic Capital Asset Pricing Model.

4.3. THE CAPITAL ASSET PRICING MODEL

The Capital Asset Pricing Model, from now on the CAPM model, is an equilibrium model that helps to specify the relationship between expected rates of return when investing in a stock or a portfolio and its covariances with the help of mean-variance analysis. It has been used by investors since it was developed in the 1960s by William Sharpe and John Lintner after a previous static version. This essay is divided into three parts that explain the development of this model, its empirical performance, and the potential alternative models for it. (O'Brien, 2017)

This model focuses on quantifying investors' risks and the reward for bearing them. The idea of such an approach comes from the simple fact that an investor will not invest in a risky security if it offers the same rate of return as a safety one, like a government bond. Because of this, the CAPM model states that the expected return of an asset must be linearly related to the covariance of its returns with the return of the market portfolio, which contains all the risky assets that are being traded within the market. In other words, an investor wants to be rewarded for the market risk, which cannot be diversified, and also for the extra risk that is undertaken by investing in a riskier asset.

In the model's development following assumptions were made: there are no transaction costs, the assets in the market are all tradable and infinitely divisible, there are no taxes, no one can affect the security prices so that there is a perfect competition

situation, investors are only concerned about maximizing the expected returns given the assets' variances, short sales are allowed, there is an unlimited amount of borrowing and loaning available at the risk-free rate, and investors have homogeneous expectations. (O'Brien, 2017a; Shannon, 2017a)

These assumptions imply that investors have the same market views and only differ in risk preferences. Thus, they will all hold the same market portfolio, which is efficiently diversified and has only systematic risks. These differ in amounts, depending on their risk aversion, which means that a risk-averse investor will put part of his money in this efficient portfolio and part in the risk-free asset, while a risk-tolerant investor may put all their money in this portfolio or they may borrow and put in even more (Brealey *et al* 2014). Also, since it is an equilibrium model, every borrower is requested to provide loans. The most essential part in the CAPM model is that shares with higher betas imply a higher risk on the asset, so they should carry higher return on average. In concrete, higher returns are related linearly to the betas. (O'Brien, 2017a)

In more detail, the CAPM model states that the expected return on any security or portfolio should be equal to the return of the risk-free asset and in addition, a risk premium for bearing non-systematic risk. This risk premium is composed of the difference between the expected return on the market, the risk-free asset's rate of return, and the stock's sensitivity to changes in the value of the market portfolio, the beta. The latter is a comparative measure of how the stock performs relative to the market as a whole, and it measures the systematic, non-diversifiable or market risk of the stock.

After the model's development, academics wanted to test if it really worked, and they could do with the help of the time-series approach or the cross-sectional approach.

Considering that the model was based on a probability distribution of future returns whose data was not available, academics used actual realisations of returns as a proxy for expectations, since their averages tend to be correct over long periods of time.

Despite the two methods, most of the tests involve a previous use of time-series regressions to estimate betas and then the use of cross-sectional regressions to test the model. Nevertheless, the problem of sampling errors in the beta estimates can be found in this approach. To reduce it, academics employed the beta of a portfolio composed of many stocks in the regression which made the measurement errors of each individual asset cancel out or at least diminish the error. At the same time, however, since betas are not observable, the shares need to be grouped into the

portfolios according to high or low betas and it may mean that the group with high betas will contain shares with a large sampling error. (O'Brien, 2017b)

In 1972, Sharpe and Cooper were the first ones to realize a simple test of the CAPM of whether shares with higher betas carry higher returns. To test it they used the NYSE from 1939 to 1967 and they constructed different portfolios with different betas. First, they detected the regression of individual asset returns on market returns based on five years. Secondly, once a year they divided all shares into ten categories ranked by their beta, and they formed a portfolio for each category equally weighted. Then, they set an investment strategy consisting on holding shares in one category only over the entire period. For this, they considered that the shares in the portfolio would change over time because shares would move between the distinct categories. Finally, they regressed the portfolio return on its beta. (O'Brien, 2017b)

As a conclusion, shares with higher betas were seen to generate higher returns; more than 95% in the variation in expected return is explained by differences in beta, so it seems like there is a linear relationship between beta and realised average return; the intercept is greater than the riskless rate of return. This also means that the slope is smaller than the market premium. (O'Brien, 2017b)

Also in 1972, Black, Jensen and Scholes tested the CAPM in a more complex way. They used portfolios in cross-section regressions of average returns on betas to reduce the critical errors in variables problem (Fama *et al* 2004). First, they estimated betas based on monthly data of all securities listed on the NYSE from 1926 to 1930. Those betas were used to rank shares and generate ten portfolios according to those estimated betas (from high to low). After this, they calculated the monthly portfolio return for each portfolio for the following year, and the portfolios in the seventh year were ranked according to the betas estimated from data between year two and six, and so on. They repeated that process for the whole period from 1926 to 1966. This resulted in a series of monthly returns for the ten portfolios. Using the 35 years of monthly returns on each of the ten portfolios they could calculate the mean monthly return and estimate for each of the ten portfolios the beta coefficient with the first regression. Then, they regressed the mean portfolio returns against the portfolio betas, obtaining the second regression. They estimated the coefficient for beta by regressing portfolio beta calculated in the first pass against the excess portfolio return. (Shannon, 2017a; O'Brien, 2017b)

The test results indicated the existence of a relationship between the mean excess return and beta that was linear. Since they found negative α_i for large betas and positive α_i for small betas, it was consistent with the zero-beta of the CAPM model. (Shannon, 2017a; O'Brien, 2017b)

Other academics that tested the CAPM model were Fama and MacBeth in 1973. They used a similar methodology to Black, Jensen and Schole; they also used all common stocks traded on the NYSE for the period 1926 to 1968, but they grouped the shares into 20 groups according to (past) beta. (Shannon, 2017a)

First, they estimated individual security betas regressing excess returns on the market returns using monthly returns from 1926 to 1929. Then, they formed 20 portfolios based on ranked beta for individual securities. After this, they estimated the beta of each portfolio by regressing portfolio monthly returns against the market index during the period from 1930 to 1934. Secondly, these portfolio betas were regressed against the portfolio returns for each month during the period from 1935 to 1938, to estimate the ex post Security Market Lines, and for each of the months, they also estimated two additional equations to test for non-linearity and whether residual variance of stocks affect portfolio return. Thirdly, they repeated the previous steps for all the five-year periods that last the test, which resulted in three equations for each month. Finally, for each equation, they computed the mean value for each of the coefficients and tested whether the means were significantly different from zero. (Shannon, 2017a)

Their results indicated that the residual risk or non-market risk had no effect on the expected return of a security, and there was a positive linear relationship between beta and average return. To conclude, the test resulted in favour of CAPM. (Shannon, 2017a; O'Brien, 2017b)

Despite these results, some academics have always wanted to find another model that elaborates on the changes in returns in the market. Therefore, they have been developing a few alternative models to CAPM during all these years. One of them is the Arbitrage Pricing Theory (APT), proposed by Ross in 1976. APT states that the return on a given asset can be broken down into an expected return and an unexpected (surprise or news) component. The news component can be further broken down into general news, that affect many stocks and defines the systematic or market risk, and specific news that only affects a particular asset or a small group and it defines the specific, diversifiable or idiosyncratic risk. (O'Brien, 2017c)

This approach determines asset values based on the law of one price, according to which in competitive markets with no transaction costs securities with identical risk should offer an identical return. It is also based on no arbitrage, so all security returns should be linear with respect to the factors which capture the risk of those securities, and it should be possible to create a risk-free portfolio which consists of several securities. Taken together, they are supposed to have zero risk relative to the factors which drive risk in the market, so firm specific risk has been diversified away. (O'Brien, 2017c)

APT requires that the returns on any stock are linearly related to a set of factors. And one form of testing of the APT uses a method which hypothesises certain index factors and uses these to generate the corresponding sensitivities. However, the most generic form of testing of the APT uses a statistical technique called factor analysis to simultaneously generate the factors and the sensitivity terms. (O'Brien, 2017c)

In 1984, Roll and Ross applied factor analysis to 42 groups of 30 stocks using daily data between 1962 and 1972. In their first-pass regressions, they found that for most groups about five *factors* provide a sufficiently good explanation of returns. In the second-pass regression they found that three factors are sufficient. (O'Brien, 2017d)

In the same year, Dhrymes, Friend and Gultekin showed that one problem in interpreting results from factor analysis is that the number of statistically significant factors appears to increase as more securities are included in the analysis. (O'Brien, 2017d)

Another alternative model to CAPM was developed by Fama and French in 1993, when they found that 25 size and value sorted, monthly time-series returns on US stocks could be explained by a three-factor model in which the factors were the market return, the return on a size portfolio and the return on a value portfolio. (O'Brien, 2017d)

Using the time-series regression on each of the 25 portfolios, they obtained estimates of the three betas for each of them. They saw that small companies tend to provide much higher returns than large companies, in the same way that value companies tend to provide much better returns than growth companies. That is why in their equation they used Small Minus Big (SMB) to measure the additional return investors have historically received by investing in stocks of companies with relatively small market capitalisation. The size premium is computed as the average return for the smallest 30% of stocks minus the average return of the largest 30% of stocks in a month. High Minus Low (HML) is used to measure the value premium provided to investors for

investing in companies with high book-to-market values, they constructed it as the average return for the 50% of stocks with the highest B/M ratio minus the average return of the 50% of stocks with the lowest B/M ratio each month. (O'Brien, 2017d)

The model proved that for the 1963 to 1990 period, size and book-to-market equity captured the cross-sectional variation in average stock returns associated with size, E/P, book-to-market equity, and leverage. (O'Brien, 2017d)

There are some more alternative models to CAPM, some of which are based on analysing skewness and kurtosis, but with what they all agree is that investors prefer odd moments (high mean and positive skewness) and are willing to pay for them, while they dislike even moments (high variance and high kurtosis) and expect to be compensated for them. (O'Brien, 2017d)

Finally, after looking at all these theoretical past models and tests, what remains in the present? Currently, if we look more in deep at the CAPM model, it seems that its characteristics are no more suitable for the current investor's profile, since it is difficult to identify a market portfolio and to estimate the returns and betas, which also depend on the time period and the frequency chosen. Also, some of the initial assumptions do not fit anymore. For example, the assumption of no transaction costs, as nowadays there are commissions and spreads that brokers and intermediate agents receive to do a transaction, or the unlimited amount of borrowing at a risk-free rate, the fact that there are taxes for the benefits obtained, and some big investors can affect the security prices through big movements.

Despite all this, it is still used for many companies and investors to estimate the cost of capital for firms, to evaluate the performance of managed portfolio, or to help in the firms' capital budgeting decisions. After all, it is not that bad, but if all these huge investors and managers use it daily it might be because it is still a really easy model to implement, and since there is no asset pricing model proved to work perfectly nowadays, the CAPM still helps to measure the risk and its relationship with the expected return in a satisfyingly precise way with respect to its alternatives with the extra simplicity value, that is why I decided to focus my Final Degree Project on this model.

5. THE AIRLINE INDUSTRY

5.1. INTRODUCTION TO THE AIRLINE INDUSTRY

The flight's birth was in 1903 in America when airplanes started to be around, but back then flying was a risky endeavour and it did not start to be a commonplace until 1925, when the Air Mail Act allowed the postmaster to contract private airlines to deliver mail. After this, the Secretary of Commerce started to establish airways, certify aircrafts, license pilots, and issue and enforce traffic regulations in the United States. That was the start of the airline's industry development. From then, first commercial airlines started to operate such as Pan American, Western Air Express and Ford Transport Service. (Harris 2013)

In 1938 the American Civil Aeronautics Board (from now on CAB) started to determine the airlines' routes of travel and to regulate prices for passenger fares based on average costs so airlines could not compete with each other by offering lower fares, but by offering the best quality service. If the CAB found an airline's service quality lacking on a certain route, it allowed other carriers to begin operating on that route. This environment produced an advantage on established airlines over start-ups. (Harris 2013)

After the Second World War, in 1944 the United States organized an international convention in Chicago to regulate the expansion of the international air traffic. In this conference there were two main confronted positions: the United States that wanted to establish the "five freedoms of the air[1]" to facilitate the air traffic, and the United Kingdom that was holding a more regulated position through the idea of establishing only the "two freedoms of the air". (Martí 2017)

As a consequence of this convention, the OACI was created, an organization whose main objective is still today to standardize the civil aviation function in a worldwide level

[1] The freedoms of the air or traffic rights are international commercial aviation agreements that grant a country's airlines the privilege to enter and land in another country's airspace (Boeing 2009).

to improve its security and efficiency. And at the same time the IATA was also created to improve the air traffic and the air operations. (Martí 2017)

From then, the air transport started to grow in such a dramatically way that in 1947 eighteen million of people were transported and two years later the number increased until twenty-seven millions. The main airlines in the United States back then were American Airlines, Eastern Airlines, Pan Am, TWA and United Airlines. (Martí 2017)

In Europe the airlines' development was slower due to the partial or complete destruction of the infrastructures and the bad economic situation that suffered the countries after the Second World War. The first airline that started to operate was the BOAC in the United Kingdom, followed in 1946 by the BEA, Air France, KLM, Alitalia and SAS among other ones. In 1955 Lufthansa started again its operations too. (Martí 2017)

Despite all of this, the low-cost concept was not introduced in the United States until 1971 with the airline Southwest Airlines, and in Europe this concept did not appear until the beginning of Ryanair in Ireland in 1993 and EasyJet in the UK in 1995. Their success was at first attributed to the economic framework such as the deregulation that allowed airlines of member states to operate domestically within the European Union, it also helped the low charges at underused airports which increased the passenger numbers going into those airports, and finally another important thing that helped to their success was their direct sales approach using the internet and call centres. (Francis *et al*, 2005)

From then, the air travel has emerged as a crucial means of transportation for products but especially for people, since the airline industry has been mostly increasing until now, when it is in a level of almost 4,000 millions of passengers carried by an airline per year, and it is still growing as it can be observed in the figure 5.1.1. (International Air Transport Association 2017)

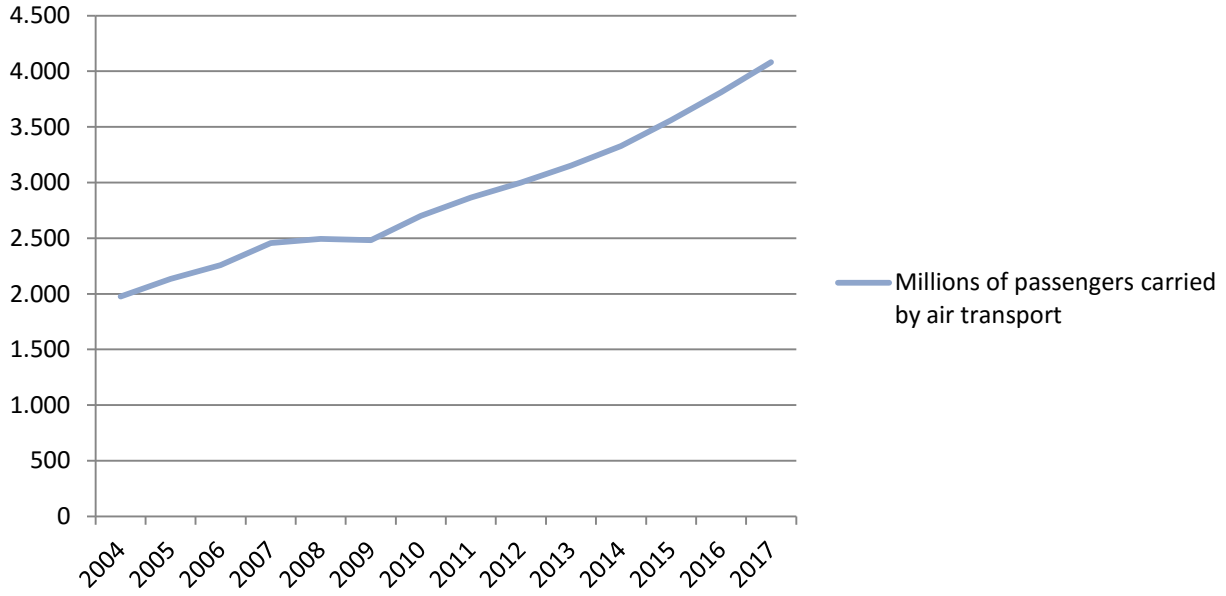


Figure 5.1.1. Adapted from (International Air Transport Association 2017)

If we centre on the European market during this last period, it can be observed that there has been an increase by 3.2% in European flights only from September 2015 to September 2016, but despite this evolution, the increase has not been equally weighted in the entire airline sector. (European Organisation for the Safety of Air Navigation, 2016)

The low-cost sector has been the strongest market segment and the main driver of growth with an increase of 7.8% on this year period, while the charter one has been the weakest market segment with a reduction of 20%. (European Organisation for the Safety of Air Navigation, 2016)

This is not an isolated fact from 2016, it has been a continuous tendency from the last fifteen years as reflected in the figure 5.1.2. below, which shows how the market share of the low cost airlines in Europe has increase from a 9% in 2002 until its current level of 43% this year. (The Financial Times 2017)

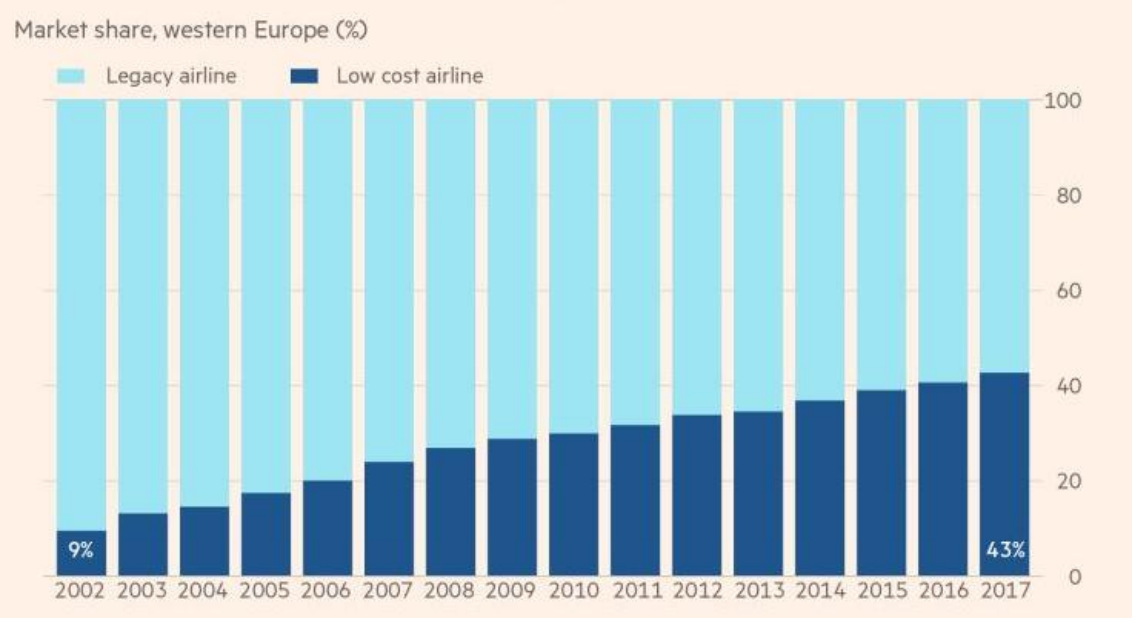


Figure 5.1.2. (The Financial Times 2017)

Taking into account all this information I decided to continue my project focusing on the low-cost airline sector, since it seemed to be at the moment the best segment in aviation when talking about growth expectations, in contrast with the airline flag carriers that seemed to be a little bit stagnated or at least with a lower growth than the low-cost ones.

I also wanted to focus on this sector since I am currently a student with passion for travel so it makes me tend to use low-cost airlines quite often. Because of this and the subject area of my degree I started to be curious about whether the low-cost airlines managed to perform good in the financial market or not despite its prices.

5.2. THE LOW COST SECTOR

"The main goal of a low-cost leader is to contain the costs to the lowest relative to industry rivals, to create a sustainable cost advantage over the competition. The key to this strategy is that cost is not equal to price" (Alamdari *et al.* 2005), this is the main goal followed by low-cost airlines. In concrete, the low cost model consists of:

- Unrestricted fares and low prices
- Networks based on point to point high frequency routes
- A distribution without tickets, only travel agents, call centres and internet
- A fleet highly used with the same type of aircraft
- Secondary airports with short turnaround times
- Highly productivity of the staff with competitive wages and profit sharing

(Alamdari *et al.* 2005)

And despite the low prices, with the use of these strategies the low cost airlines can still obtain a high margin, even higher than the legacy airlines, this can be observed in the figure 5.2.1.

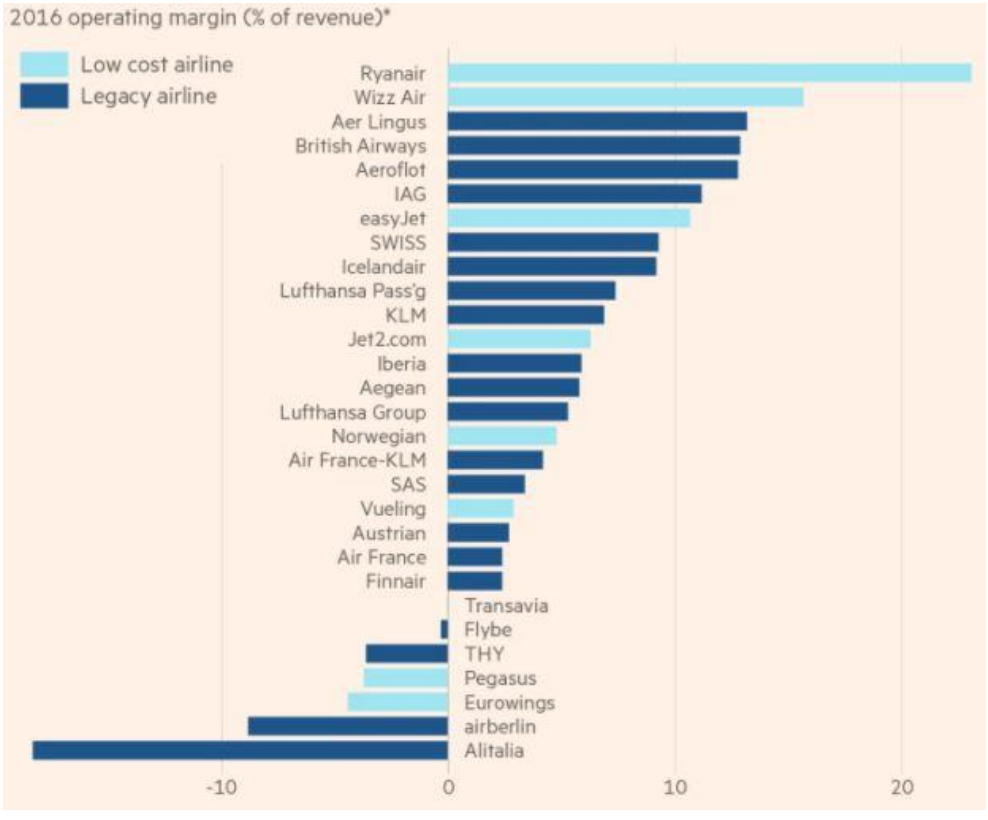


Figure 5.2.1. (The Financial Times 2017)

Taking into account all these parameters and the fact that Wizz Air Holdings plc went public 25.02.2015 (Bloomberg, 2017), so there is no share price information during all the financial period I wanted to study, I decided to centre my comparison between Ryanair, EasyJet, and Norwegian to see if there is a relation between the operating margin and the financial performance in the low cost airline sector, and to see the two faces of the same coin I also added Air Berlin into the comparison.

5.3. FINANCIAL COMPARISONS BETWEEN THE CHOSEN AIRLINES

As I said before, I wanted to focus my study on the low-cost airlines; specifically I wanted to make a comparison between Ryanair, EasyJet, Norwegian and Air Berlin. To do such think I also had to concrete the stock exchange market I was going to use to take the quoting information from, and the market I decided to use is the Frankfurt one since all of these airlines quote in it, it is the tenth largest stock exchange in the world by market capitalisation, and it is located in Europe, which is where the airlines I wanted to study are located in. Therefore because of its importance and size I thought it would give me a more realistic and reliable information.

Consequently, after deciding which airlines' shares I was going to compare and in which market, I chose the length of the study and the indicators I would use for such comparisons. The length chosen was ten years in order to be able to interpret a little bit of the recent tendency in the market and in these companies, so the study would be from 2007 to 2016 both inclusive. And the indicators chosen were:

- Differences in quotation in the Frankfurt stock exchange market, the figure 5.3.1. below shows the last stock price of every of the ten years for the four of the companies studied, with the exception of 2017 when the quotation is taken from the 22nd of December.

	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Ryanair	15,43€	14,59€	15,37€	10,14€	6,48€	4,77€	3,81€	3,85€	3,52€	3,2€
EasyJet	16,47€	11,76€	24,19€	20,92€	18,32€	9,58€	5,08€	5,56€	4,43€	3,1€
Norwegian	17,42€	31,2€	33,87€	30,61€	22,12€	19,72€	7,06€	15,04€	13,63€	3,59€
Air Berlin	0,04€	0,59€	0,92€	1,11€	1,65€	1,54€	2,5€	3,72€	3,76€	4,89€

Figure 5.3.1. Adapted from (Morningstar, Inc. 2017)

As it can be observed, Ryanair's quotation has been increasing over these last years, specifically the quotation has been multiplied by five in only ten years. Almost the same has happened to EasyJet and Norwegian.

The three companies have had a growing tendency in these ten years with the exception of two points where the tendency line has been broken, in 2010 and in 2015. I cannot give any explanation for these two declines, since I could not find any financial data from the general tendency of the Frankfurt stock exchange market to compare it with the data from the table 5.3.1.

When looking at Air Berlin's shares, it is obvious that its quotation has been continuously reducing over these years due to the company's problems of economic loses and insolvencies, which lead to a final bankruptcy and insolvency situation in 2017. Despite this, its quotation in this year is 0,04€ instead of 0€ because of its absorption by such a profitable airline as Lufthansa which gave the investors some hope of recovery for Air Berlin.

- The Dividend Yield (DY), it indicates how much a company pays out in dividends each year in relation to its share price. It is computed as the division of the dividends per share expressed in euros, by the last price of the stock in that year also expressed in euros.
  In the case of EasyJet whose dividends are published in British pounds, the conversion I made was based on the exchange between British pounds and euros available on the 22nd of December, which was of 1,13074 €/GBP (XE Money Transfer 2017).

	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Ryanair	0,00	0,00	0,03	0,00	0,00	0,07	0,00	0,07	0,00	0,00
EasyJet	0,04	0,05	0,02	0,02	0,01	0,02	0,00	0,00	0,00	0,00
Norwegian	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Air Berlin	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Figure 5.3.2. Adapted from (Morningstar, Inc. 2017)

As shown above, only Ryanair and EasyJet have paid dividends to their shareholders during this last period, despite that, Ryanair's distribution of dividends has been irregular over time while EasyJet has provided a continuous payment of them every year.
Particularly, when analysing this ratio from the point of view of an investor, it is more profitable to invest in EasyJet's shares than in Ryanair's ones, because of the positive ratio every year from 2012 until now that indicates a positive yield obtained by the investor when only taking into account the dividend payout.

- Earnings per share (EPS), it is the amount of earnings per share of the company taking into account its net benefits obtained during each year. It is expressed in euros as the division of the net benefits of the company by its number of shares in that moment.

In the case of Norwegian whose net profits and earnings per share are published in Norwegian crowns, the conversion I made was based on the exchange between Norwegian crowns and euros available on the 22nd of December, which was of 0,10128 €/NOK (XE Money Transfer 2017).

	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Ryanair	1,05€	1,16€	0,62€	0,37€	0,40€	0,39€	0,26€	0,21€	-0,12€	0,26€
EasyJet	0,77€	1,10€	1,38€	1,13€	1,00€	0,61€	0,57€	0,31€	0,18€	0,21€
Norwegian	3,19 €	0,70 €	-3,08 €	0,91 €	1,32 €	0,35 €	0,49 €	1,31 €	0,02 €	0,38 €
Air Berlin	-6,93€	-4,04€	-3,31€	-2,71€	0,06€	-4,94€	-1,14€	-0,13€	-1,27€	0,33€

Figure 5.3.3. Adapted from (Morningstar, Inc. 2017)

Taking into account the table from the Figure 5.3.3. it can be observed a growing tendency in Ryanair's earnings per shares with the exception of 2009 when the company had losses, and 2017 due to its lower profit. The latest may be caused by the quitting of several pilots that lead to numerous flight cancellations which at the same time forced the company to pay important compensations to its customers.

The growing tendency has been caused by the increase of the company's profits but also by the reduction of its outstanding shares that it has been slowly buying back during these last years. (Ryanair 2017c)

When looking at EasyJet's numbers, it can be observed a growing tendency too despite its increase in the number of shares thanks to the even greater increase on its profits until 2015, when its EPS started to decrease a little bit due to its profits decrease.

Norwegian's earnings per share have been more unsteady during this period of time despite its growing tendency line. This has been the result of the even more unsteady net profits of the company.

Finally, it is reflected on the table above the continuously negative earnings per share of Air Berlin which are due to the bad economic situation of the company with losses almost every year.

From an investor point of view, with this information the most interesting airlines to invest would be Ryanair and EasyJet since they seem to be more stable assets when talking about earnings per share.

- The Price Earnings Ratio (PER): it is a widely used stock evaluation that measures the relative attractiveness of a company's stock price compared to the current earnings of the firm. The ratio is given by dividing the Last Stock Price (showed in the figure 5.3.1.) by its Earnings Per Share (figure 5.3.3) for the specified time period studied, normally a year. The results for the companies studied are the following:

	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Ryanair	14,70	12,58	24,79	27,41	16,20	12,23	14,65	18,33	-29,33	12,31
EasyJet	21,39	10,69	17,53	18,51	18,32	15,70	8,91	17,94	24,61	14,76
Norwegian	5,47	44,52	-10,99	33,51	16,81	56,11	14,31	11,52	897,18	9,40
Air Berlin	-0,01	-0,15	-0,28	-0,41	27,50	-0,31	-2,19	-28,62	-2,96	14,82

Figure 5.3.4. Adapted from (Morningstar, Inc. 2017)

These numbers explain how many times the price of the share contains the net benefit of the company, or the number of years that would approximately take for the investor to have its money back.

According to this, in this last year EasyJet is the most expensive share of the four airlines studied, and the cheapest one would be Norwegian, if AirBerlin's result is not taken into account due to its economic situation. It is normal the result of the latest taking into account that its quotation was of almost zero in 2017.

When analysing the evolution during these years, it can be observed that Ryanair and EasyJet have had a mostly growing tendency while Norwegian has had a more unstable one with peaks and troughs. AirBerlin has simply tended to zero as its quotation in the market.

A growing tendency and a high P/E ratio can mean that despite the current benefits of the airlines, investors value its shares in a more positive way, so they think the company is going to continue performing well and sharing profits with them through the dividend policy for example, or at least they will be able to win money through the selling of the shares in the future. In this context, Ryanair and EasyJet seem to be a good investing option.

- Book value per share, the figure 5.3.5. below shows the theoretical value of a share according to the value of the company's equity reflected on its annual balance sheet and its number of outstanding shares. It indicates how much would supposedly receive an investor or shareholder if the company was dissolved, all assets were sold, client debts were collected and all debtors were paid.

	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Ryanair	3,99€	3,13€	3,01€	2,49€	2,29€	2,08€	2,03€	1,98€	1,69€	1,72€
EasyJet	6,72€	5,71€	5,90€	5,36€	5,04€	4,78€	4,96€	4,42€	3,67€	4,17€
Norwegian	11,04€	9,37€	8,70€	9,90€	9,16€	7,59€	6,65€	3,02€	1,59€	1,57€
Air Berlin	-8,85€	-7,40€	-2,69€	-0,05€	1,60€	4,33€	6,75€	4,59€	9,03€	6,77€

Figure 5.3.5. Adapted from (Morningstar, Inc. 2017)

From these book values can be deduced that Norwegian is the airline with the highest share value, followed by EasyJet, Ryanair and finally AirBerlin, which is valued negatively because of its continuous negative results that lead to a negative equity.

The airline company that has had the biggest growing in book value per share in the last ten years is Norwegian, its increase has been of a 603%, and taking into account that its number of shares has been constant or increased during this period, it means that this evolution has been caused by the increase on its equity for positive accumulative results.

The same has happened to Ryanair with almost a 132% of increase, and EasyJet with around a 61% of increase too. Despite these numbers, the growing in EasyJet's shares has been more unsteady and volatile than in Ryanair's.

Finally, if the data from the shares' quotation in the figure 5.3.1. is compared with the one from the previous figure 5.3.5., it seems that despite its real book value, investors value the airlines' shares in a much bigger amount. Specifically, the company with the most overvalued shares is Ryanair with a 387%, followed by EasyJet with a 245% and Norwegian with a 158%. This is an indicator of the positive thinking of investors about the future of the airlines, so if they are willing to pay that many times its theoretical value, it means they think the shares worth it and that they will recover their money invested in the future.

- The Price Sales Ratio (PSR), it compares the share's price to the airline's revenues, hence it is an indicator of how much investors value a euro of the company's sales. It is computed by the division between the stock's quotation times the number of shares, and the airline's sales. The results are the following:

	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Ryanair	2,9	3,4	2,6	1,8	1,4	1,3	1,7	1,7	1,6	2,8
EasyJet	0,9	1,5	1,4	1,4	0,8	0,5	0,6	0,6	0,5	1,5
Norwegian	0,4	0,5	0,5	0,4	0,4	0,2	0,5	0,5	0,2	1,1
Air Berlin	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,5

Figure 5.3.6. Adapted from (Morningstar, Inc. 2017)

According to the results from the PS ratio, the company whose sales are better valued for investors is Ryanair, whose shares' quotation contains almost three times its sales. It is followed by EasyJet, Norwegian and finally Air Berlin, which is in the last place and its price sales ratio indicates that investors do not value at all any possible euro obtained as revenue for the company.

Also, there is a clear decreasing tendency in Air Berlin's PSR as its economic situation was worsening. On the other hand, the other three airlines have experienced three little troughs in 2008, in 2011 and in 2016, while during the rest of the period its price sales ratio has been increasing. This indicates the investors' trust against the future of the airlines and their believing about more future revenues coming from each present sale.

Despite this increasing tendency only Ryanair has finished the ten year period with a higher price sales ratio than at the beginning, EasyJet and Norwegian have experienced an important decrease compared to their ten-year-ago values.

- The volatility, it measures the returns' dispersion of the company's share as an indication for the stock's risk. The way I decided to compute it was as the standard deviation of the shares' returns in the Frankfurt market every day during these ten years, and the returns were calculated at the same time as the logarithmic returns of the shares' daily closing price. The results are reflected in the figure 5.3.7. below.

	Ryanair	EasyJet	Norwegian	Air Berlin
Standard Deviation	0,026	0,030	0,033	0,031

Figure 5.3.7. Adapted from (Yahoo! Finance 2017)

According to these values, the most volatile of the airlines' shares studied is Norwegian, which means that, from the stocks analysed, it is the riskiest asset to invest in followed by Air Berlin, EasyJet and finally Ryanair.

Despite its bad economic performance it is logic the relatively low volatility value of Air Berlin since volatility increases with uncertainty, and the final insolvency situation of the airline in 2017 was predicted by investors much earlier than then, so they started to act in consequence and the company's share price started to decrease continuously without much irregularities from 2008. These price movements together with the ones from the other three airlines are shown in the figure 5.3.8. below.

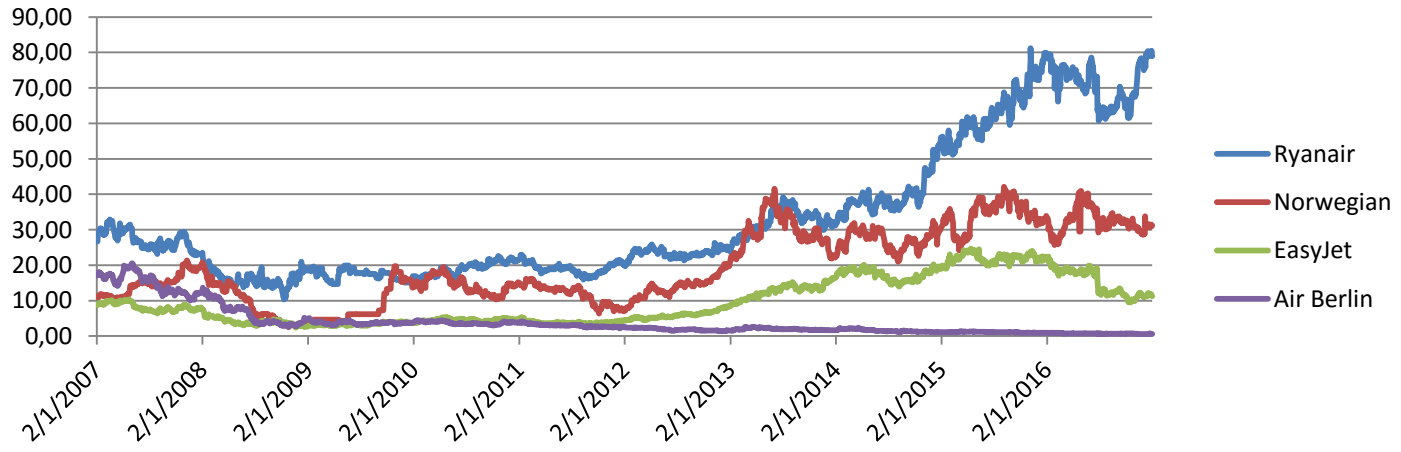


Figure 5.3.8. Adapted from (Yahoo! Finance 2017)

Norwegian's greatest volatility value can be understood when looking at figure 5.3.8, since it is visible the endless pronounced peaks and troughs without a concrete tendency during these ten years, while Ryanair and EasyJet have had an increasing tendency during this period with the exception of the first two years more or less, when the tendency was decreasing. Also, the peaks and troughs of Ryanair and EasyJet are in general softer than in Norwegian's line. In the next figure 5.3.9 are more visible the irregularities in the logarithmic returns of the airlines' shares.

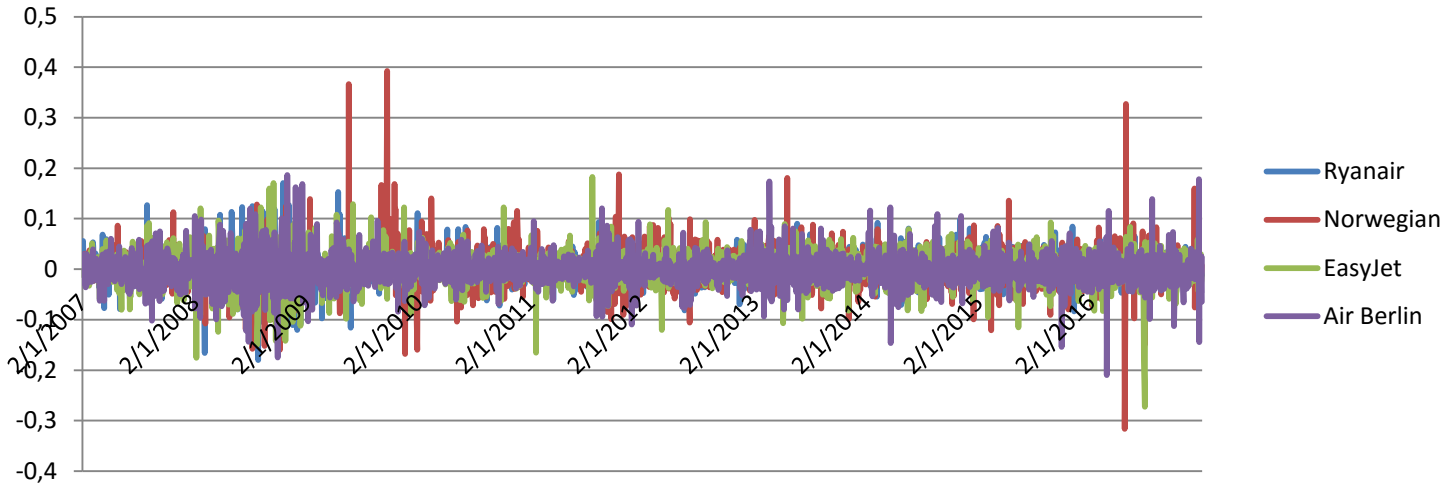


Figure 5.3.9. Adapted from (Yahoo! Finance 2017)

In this figure 5.3.9. can be observed that the most irregular returns come from Norwegian, since the highest bars are maroon. It is followed, as seen in the table from figure 5.3.7, by Air Berlin and EasyJet with the green and purple bars. It is also confirmed that the less volatile share is the Ryanair one since there are barely blue visible peaks (from Ryanair's returns line) in the chart.

Taking into account these results as an investor, it is safer to invest in Ryanair's shares since they have a less risk associated, unless the investor wanted to speculate with the high volatility of Norwegian to try to obtain a higher profit.

6. IRISH MARKET ANALYSIS: RYANAIR'S

After analysing the four different airlines, I decided to focus my forward study in Ryanair since it captured my attention with its results in the previous part: it showed a bigger dividend yield than most of the other companies, followed by a good and growing amount of earnings per share, which combined with its market quotation leaded to a great PE ratio for investors, as well as a good PS ratio and a low volatility. It is also valued positively for investors when comparing its book value to its market quotation, what made the company interesting for me, to analyse a little bit more in deep the reason for this overvaluation.

6.1. RYANAIR'S FRAMEWORK

Ryanair Holdings plc is an Irish company created in 1985 by Tony Ryan and his children Declan and Cathal (Bloomberg, 2017). It provides low fare passenger airline services, carrying about 119 million people per annum to over 200 destinations in 34 countries in Europe and Morocco (Bloomberg, 2017; Ryanair, 2017a). Despite that, Ireland and the United Kingdom represent almost 35% of its overall sales (Bloomberg, 2017).

Ryanair maintains a fleet of over 360 Boeing 737 aircraft, with further 305 Boeing 737's on order (Ryanair, 2017a), expecting to have approximately 126 by March 2019 (Bloomberg, 2017). The purpose of using a single type of aircraft is to reduce the training and maintenance costs, which together with the specialization in short-haul routes between secondary and regional airports (Bloomberg, 2017) minimizes costs, making the company able to offer its competitively low prices. This minimization of costs is also what makes possible the high profit margin that the company has, and its current annual benefits. The net profit evolution of the company together with its revenue evolution during the last ten years is shown in the figure 6.1.1. below.

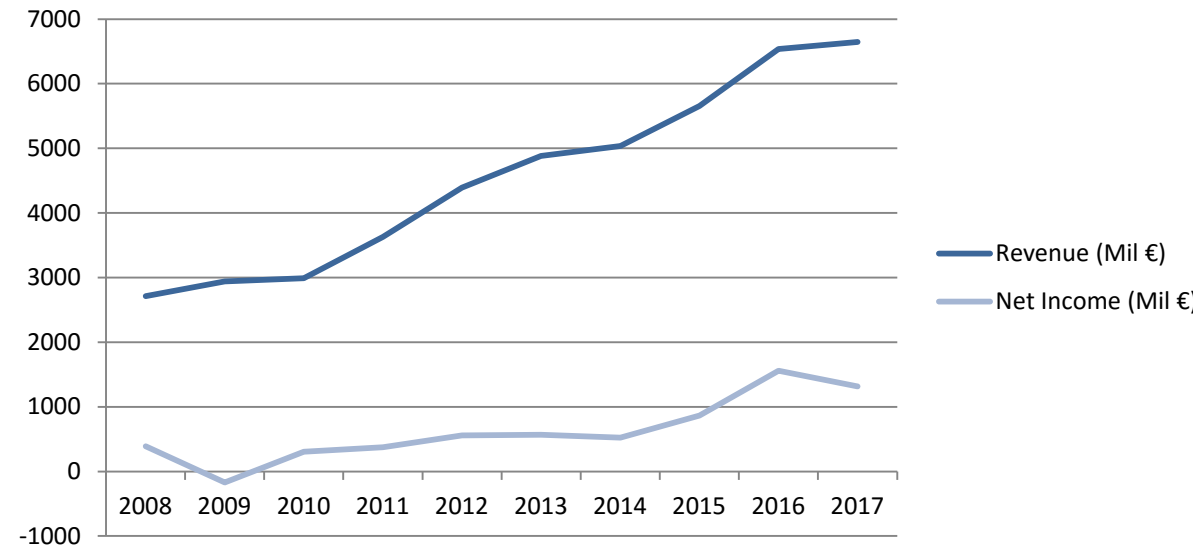


Figure 6.1.1. Adapted from (Morningstar, Inc. 2017)

As observed in the graph, the company's revenue has been increasing during all this period as well as its net profits with only two exceptions, fact that reflects that despite its competitive prices the company can manage to get continuous high profits.

The company's current objective is to reach the 200 million passengers annually by 2024 (Ryanair, 2017a), and it seems realistic looking at its current tendency. The figure 6.1.2. is a chart with Ryanair's evolution of passengers carried from its very beginning in 1985 to this year, 2017.

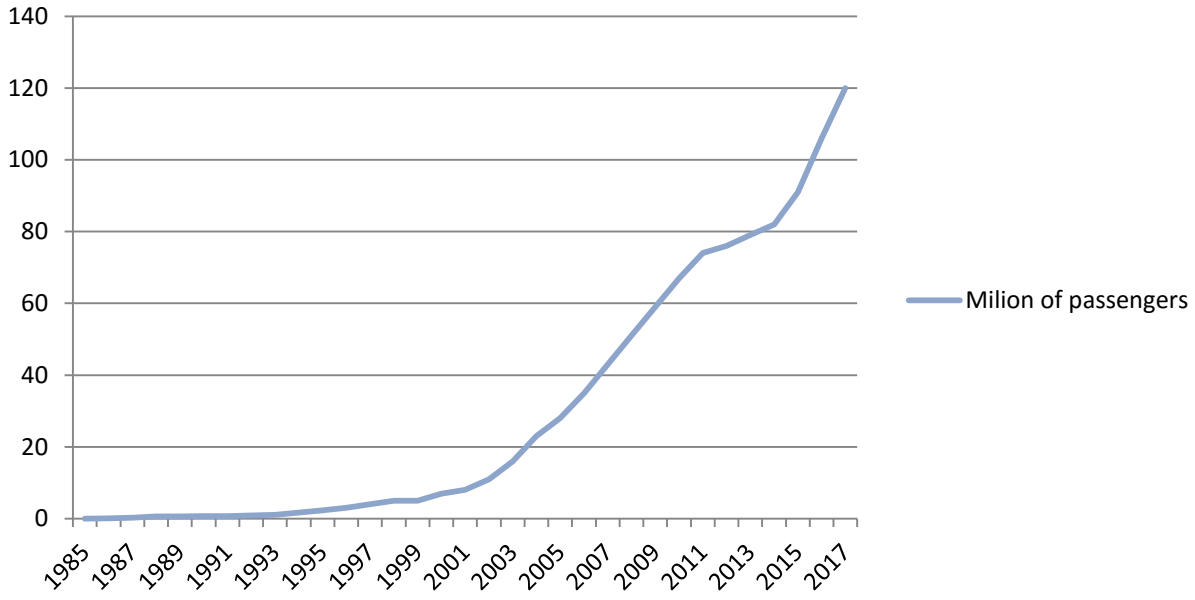


Figure 6.1.2. Adapted from (Ryanair 2017d)

6.2. THE ANALYSIS' PROCESS

Once the company was chosen what I wanted to test was if the Capital Asset Pricing Model was applied to Ryanair's shares as a way to predict its future expected prices and to understand the past ones. To do so, first I studied a little bit what has happened to Ryanair's shares quotation prices during the past, I also chose the market where I wanted to focus my study, and then I compared the main index of that market with the airline's results during this past period.

After comparing the two quotations, I decided to compare the differences in the statistic results of each share when taking different periodicities and when analysing different length periods, to see how can affect to the application of the model the different possible values to take.

Finally, I tested the financial model with the previous values found.

6.3. TRADING VOLUME AND PRICE EVOLUTION

The trading volume and the last daily price evolution of Ryanair's shares in the Irish Stock Exchange Market from the last seventeen years is shown in the graph of the figure 6.3.1. below (from 04.01.2000 to 31.12.2016):

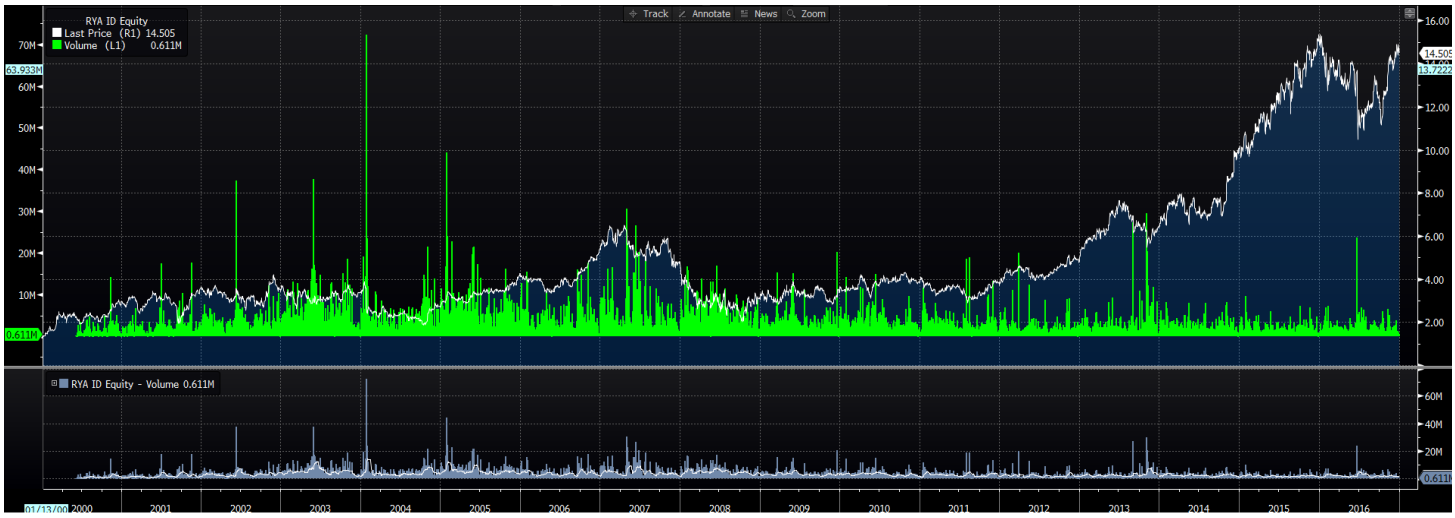


Figure 6.3.1. (Bloomberg, 2017)

Ryanair went public on 1997 (Ryanair, 2017b), explaining why, during 2000 and 2001, its trading volume was still showing a tendency towards slow growth. But despite the fact that this graph starts on Ryanair's third year trading in the stock exchange market, it still can be observed a trading volume on its shares of €0.611 million or more, which together with the continuous increasing tendency of its share price, indicates investors' trust in Ryanair being a good investing decision, have been there since the very start of the company.

What's more, on the 29th May 1997 when Ryanair went public for the first time, its shares were more than 20 times oversubscribed, and the share price surged from a flotation price of €11 to close at €25.5 on that first day of trading (Ryanair, 2017b).

Finally, in the graph, one can also observe a general relation between trading volumes and price changes in the shares. For example, after 2002 when the company was more established in the market and more investors were confident about it, share prices started to become more stable and trading volume increased on a bigger scale. On the other hand, from 2012 prices started to increase rapidly which made it more difficult for new investors to purchase shares. That is reflected in the slightly reduction in the trade volume.

6.4. COMPARISONS WITH THE MARKET

The market I chose is the Irish Stock Exchange one, since it is the market from the country where the company has its headquarters, and it was the first one were the airline started to quote its shares together with the NASDAQ stock exchange. Personally, I also preferred to choose the Irish one because I was living in Ireland as an ERASMUS student for four months and I had the Irish market information available.

So according to the market chosen, the index of this market is the Irish Stock Exchange index (ISEQ). The Figure 6.4.1. below shows the comparison between Ryanair's price evolution and the ISEQ's price evolution in the last seventeen years (from 04.01.2000 to 31.12.2016):

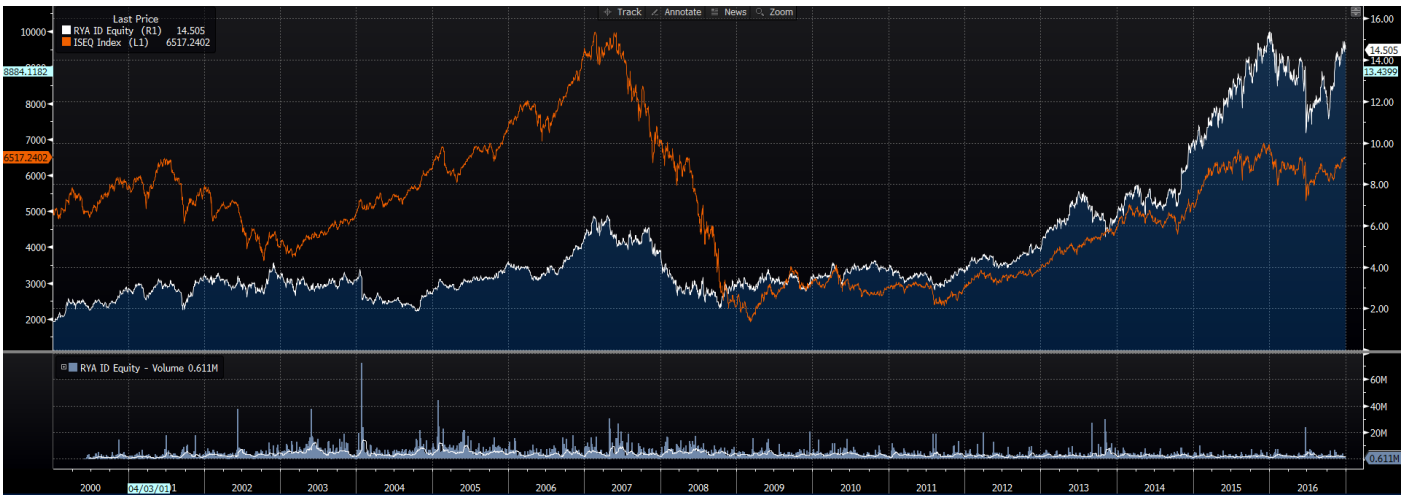


Figure 6.4.1. (Bloomberg, 2017)

The graph is clearly divided into two phases, the first one is from 2000 to 2008 when Ryanair was still getting into the stock exchange market. Despite having similar price fluctuations than the market, the company's share prices were still under the ones of the market index. An example of these similar fluctuations is on September 2001, when because of the terrorist attacks (Ryanair, 2017b) can be observed a drop in share prices and an increase in the traded volume because of investor uncertainty.

On the other hand, the second phase starts in 2008 when the financial crisis produced a huge decline in the ISEQ prices, while Ryanair is less affected by the economic situation. From that moment until now, the company has performed better than the market. This inflection point was due to Ryanair's policy of low fares, especially compared with its competitors. This combined with a bad economic situation when people gave more weight to prices, and a globalised area where people started to have the need to travel even for business, smoothed the financial crisis effects on Ryanair. It also played an important role in this the increase in Ryanair investors' confidence because of the huge victory in 2008 when the European Court of First Instance dismissed the EU Commissions 2004 Charleroi decision, letting free and with the opportunity to grow and develop their traffic to hundreds of Europe's regional airports (Ryanair, 2017b), where the company focuses its business.

6.5. MAIN STATISTICS

In the Figures below (6.5.1., 6.5.2. and 6.5.3.), are shown the return statistics for Ryanair taking into account different periods of time (17 years, 10 years and 5 years respectively) and different periodicities (daily, weekly and monthly prices):

	Mean[2]	Standard deviation	Variance	Skewness	Kurtosis
17 years monthly	0.010472462	0.088986113	0.007918528	-0.076198727	0.925149594
17 years weekly	0.002672398	0.052399087	0.002745664	-0.418621756	7.164974981
17 years daily	0.000553425	0.078301347	0.000613821	-0.764536489	15.40648217

Figure 6.5.1. Adapted from Bloomberg (2017)

	Mean	Standard deviation	Variance	Skewness	Kurtosis
10 years monthly	0.009902401	0.078301347	0.006131101	-0.425823824	0.343288391
10 years weekly	0.002182321	0.048169922	0.002320341	-0.155405805	4.938866741
10 years daily	0.00044952	0.023922582	0.00057229	-0.430117759	8.218060602

Figure 6.5.2. Adapted from Bloomberg (2017)

	Mean	Standard deviation	Variance	Skewness	Kurtosis
5 years monthly	0.019080463	0.066402232	0.004409256	-0.425486234	1.491783146
5 years weekly	0.004063724	0.0383345	0.001469534	0.119568543	0.704037548
5 years daily	0.000852309	0.019345404	0.000374245	-0.651567363	7.358514956

Figure 6.5.3. Adapted from Bloomberg (2017)

First of all, with these numbers the same as in the previous graphs, it can be observed, that there has been an increasing tendency in Ryanair's mean returns; this is proven in the positive difference between the five-year means (8.39% monthly) and the seventeen-year mean returns (6.46% monthly). Despite that, the negative returns during the financial crisis caused a lower mean return in the ten-year period (5.2% monthly). These movements of firstly a decrease and a later increase on returns, and consequently on the means, can be observed independently on the periodicity being

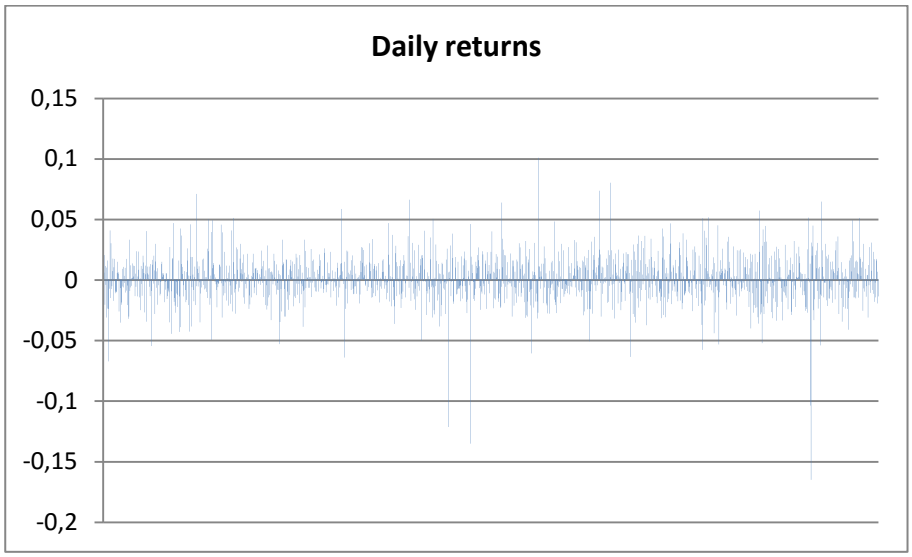
[2] The mean has been done using logarithmic returns.

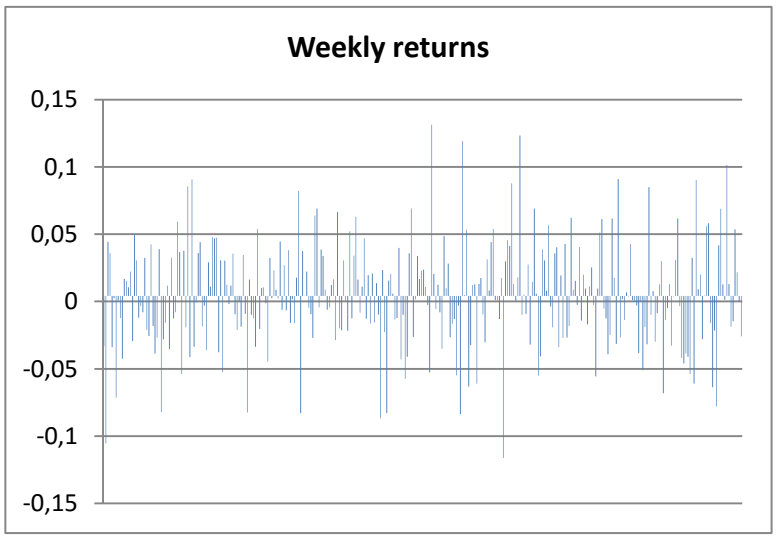
looked at, but of course the mean is higher when looking at monthly data, because it indicates the mean of monthly returns, than when looking at daily data, since it is showing the mean of daily returns, which is about thirty times smaller. These different frequencies also implicate that differences between means in the different studied periods are larger, the bigger the scale is, when looking at monthly data (-0.13 and 0.32 [3]). When looking at daily data the changes are smaller (-0.03 and 0.17 [4]).

In general, it can be observed that the overall Ryanair's risk during the last seventeen years has been 8.9% monthly, which is the degree to which this security has been fluctuating in relation to its mean return of 1.05% (King, 2017). The standard deviation data also indicates that at the beginning of the company quoting in the market (shown in the seventeen-year data), as predicted, there was a larger spread between returns, so a higher volatility than during the latest years (shown in the five-year data), when the company got more stable and investors could see the tendency on increasing company's net profits, which made them feel more confident about investing in Ryanair's shares. In this case, the difference in periodicity between for example the monthly and the daily data modify the standard deviation result reducing it, since the more data is collected, the closer the values are, and the smaller the deviation between them is.

Looking at the skewness values, Ryanair is clearly negatively skewed, which would mean a greater chance for investors to get negative outcomes. There is only one exception of the company being positively skewed, and that is when looking at the five-year period with weekly returns. To look into more detail, here are the three graphs in the Figure 6.5.4. with all Ryanair's returns in the last five-year period and the different periodicities:

[3] Difference between the ten-year monthly mean and the seventeen-year monthly mean; and between the five-year monthly mean and the ten-year monthly mean.
[4] Difference between the ten-year daily mean and the seventeen-year daily mean; and between the five-year daily mean and the ten-year daily mean.





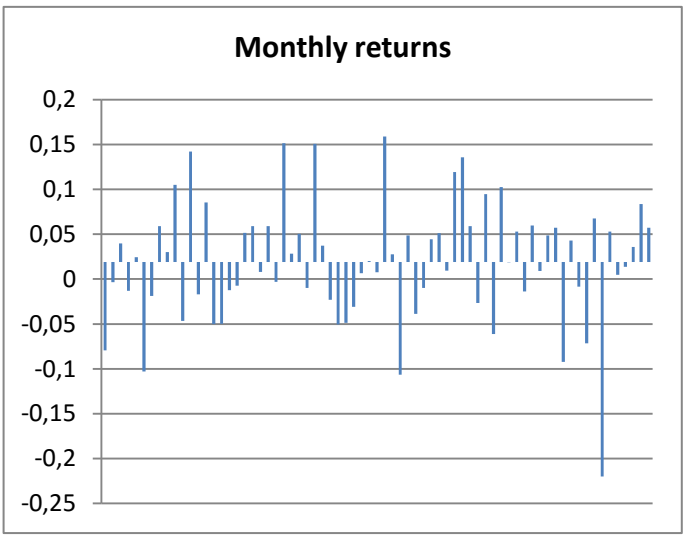


Figure 6.5.4. Adapted from Bloomberg (2017)

With the daily graph, it seems the distribution is pretty well normally distributed since all the returns are near the mean, except for the four troughs that exceed the highest peak. These four big negative returns could be the reason of the negative skewedness in the daily periodicity case. When looking at the monthly graph, there is also a big negative trough that could explain the reason of its skewedness. To sum up, in general Ryanair tends to have big troughs that produce left tails in the company returns' distribution. On the other hand, in the weekly graph there are higher peaks than lower troughs, which could explain the unexpected change into a positive skewed distribution only in this periodicity.

The last statistic is the kurtosis, and all the results in the above table gave a positive kurtosis, what indicates that Ryanair returns' distribution is leptokurtic. This means that, as seen in the previous graphs, and with the skewed results, all returns are concentrated around the mean, except for a few high peaks and deep troughs, which are the cause of the flatter and longer tails in the distribution, specially the left one according to the skewed results.

When comparing the kurtosis results among the different periodicities it can be observed that the daily results are always higher than the monthly ones. The reason of this is that when taking all the daily data it is easier to observe that all the returns are around the mean except for the few exceptions, what increases the perception of a steeper distribution, while when taking the monthly data, there are almost the same exceptions but less return points around the mean as a percentage, which decreases the peak perception but increases the one for longer tails.

Shown in the Figures 6.5.5., 6.5.6. and 6.5.7 below; are the same return statistics as in the previous table, but for the ISEQ index, for comparative purposes:

	Mean[1]	Standard deviation	Variance	Skewness	Kurtosis
17 years monthly	0.001401938	0.05914368	0.003497975	-0.950462413	1.855639767
17 years weekly	0.000318749	0.031599615	0.000998536	-1.734250757	14.10196668
17 years daily	6.43538E-05	0.014091121	0.00019856	-0.675025546	7.933297659

Figure 6.5.5. Adapted from Bloomberg (2017)

	Mean	Standard deviation	Variance	Skewness	Kurtosis
10 years monthly	-0.001135371	0.062149646	0.003862579	-0.946766636	2.169241486
10 years weekly	-0.000241908	0.034780643	0.001209693	-1.78744794	13.97148844
10 years daily	-4.69841E-05	0.015695937	0.000246362	-0.646023503	7.254511227

Figure 6.5.6. Adapted from Bloomberg (2017)

	Mean	Standard deviation	Variance	Skewness	Kurtosis
5 years monthly	0.011635866	0.041914426	0.001756819	-0.654798028	1,567665045
5 years weekly	0.002627713	0.02333669	0.000544601	-0.517376303	1,842108666
5 years daily	0.000535222	0.011726942	0.000137521	-0.863868905	6.603341564

Figure 6.5.7. Adapted from Bloomberg (2017)

From the previous values, it can be observed that there is the same tendency in the market than in Ryanair; there is a decrease during the financial crisis in returns shows a decrease between the seventeen-year mean returns and the ten-year mean returns, and a later increase to even higher mean returns than the first ones in the five-year mean.

When comparing this data with the one from the Ryanair's table, it strengthens the comments on the price evolution comparison graph between the market and the company done in part 6.4. It can be observed that, while the seventeen-year mean is bigger in the market, the ten- and the five-year mean is higher in Ryanair, so as it was shown in the graph, at first the market performs better as an average than Ryanair, but then, during the financial crisis, the company started outperforming the market.

Despite having lower returns at the beginning and higher during more recent years, Ryanair has always had greater total risk compared to its own mean than the market. This is shown by the higher standard deviation in the company than in the ISEQ index, independently of the data frequency or time period observed. Since the market index is based on the performance of different companies from different economic sectors such as banks, hotels or airlines, unsystematic risk is probably reduced through this diversification, so the standard deviation, as the sum of unsystematic and systematic risk, is lower in the ISEQ index than in Ryanair.

Looking at the skewed data from the market and comparing it with the one from Ryanair, it can easily be noticed that the ISEQ index has always a greater negative skewedness, independently of the time period or periodicity compared. The reason of this could be that, since the market is formed by multiple companies, it is more likely to have a greater amount of extreme returns, and if most of the companies that form the index have a negative distribution such as Ryanair, this would magnify the overall skewedness in the market.

Finally, the kurtosis results for the market are clearly greater than in Ryanair. This can also be explained for the same reason as the skewness, since the market is formed by multiple companies it is more likely to have a greater amount of extreme returns but also a big concentration of returns around the market mean, which increases the long tails and the peakness of the distribution. It can also be observed in either the Ryanair results, or in the market ones, the monthly kurtosis is always the smallest one. An explanation to this could be that when doing a general overview with the monthly periodicity, a lot of information is lost so it tends to seem more like a normal curved distribution, despite not being one.

6.6. LINEAR REGRESSIONS AND BETA ANALYSIS

The figure 6.6.1. contains some graphs that show the daily, weekly and monthly stock price evolution of Ryanair from 01.01.2000 to 31.12.2016 compared to its market index, the ISEQ Index:

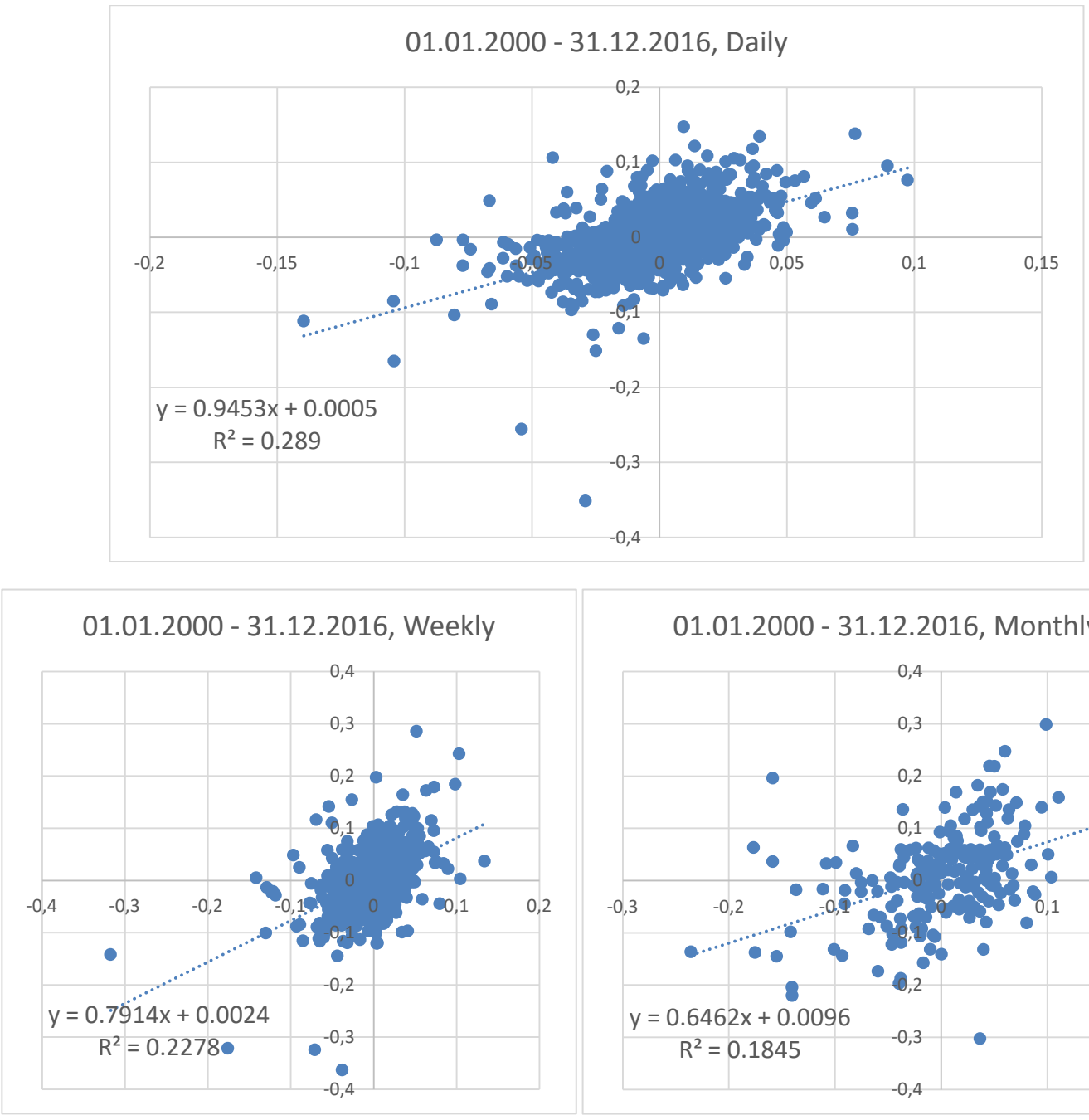


Figure 6.6.1. Adapted from Bloomberg (2017)

Without looking at any number, in the first scatter plot, the one from the monthly returns, it can be observed that all the points seem to cluster together in quite a straight line or similar to one, with only a few exceptions, which indicates that there is a strong linear correlation between the company and the market returns. In the scatter plot with the weekly returns, this relation seems to be slightly fainter, but if it is compared with the graph from the same period of time, but with monthly return data, then the two variables' linear relation seems harder to identify.

Since the Figure 6.6.1. can seem inaccurate, depending on the size they are presented, the beta is used to check on the slope of each linear regression. The beta is the coefficient of the regression that tries to explain how a change in the market's returns affects Ryanair's returns. It also tries to measure the systematic or market risk of the stock.

Taking into account that the beta is computed according to past data, and that this data is always updated with new returns in the market, the beta is not stable and changes according to the time period selected (Shannon, 2017b). To identify these differences, in the table below contained in the Figure 6.6.2. there are the different Ryanair's betas depending on the amount of time and the periodicity studied:

	Daily	Weekly	Monthly
17 years	0.945269399	0.791438826	0.646206818
10 years	0.910445835	0.699136964	0.51990316
5 years	1.08069001	0.922941367	0.839006333

Figure 6.6.2. Adapted from Bloomberg (2017)

All the values above, with only one exception, are below one. This indicates that in general, Ryanair's shares are less volatile than the market as a whole. These results show that there is also a trend, since as the amount of data increases with higher periodicity, beta too, increases towards one. This means that, when looking at daily instead of monthly returns, the beta results indicate that there is a higher sensitivity of Ryanair's shares to the market, tending to equalize its volatilities, associating more systematic risk to the company's stocks.

Also, whilst focusing in the daily returns, when more data is used, it can be observed that during the seventeen-, ten- or five-year periods, all of them tend to have a beta equal to one.

In conclusion, just looking at the beta results, Ryanair seems to have a lower or equal volatility than the market, but since beta is only an estimation it should be taken into account the proportion by which the company's returns are actually explained by the market. This is shown by the coefficient of determination, or R-squared. In the next table from the Figure 6.6.3. the different values of R-squared associated to each of the betas above is shown:

	Daily	Weekly	Monthly
17 years	0.289041614	0.227798488	0.18446556
10 years	0.356834323	0.254828416	0.170287895
5 years	0.429157045	0.31568005	0.280473722

Figure 6.6.3. Adapted from Bloomberg (2017)

The above results indicate that the betas found before explaining the changes in Ryanair's shares are between a seventeen and a forty-three percent, which are quite high values considering the current market situation. Also, it can be observed that the percentage in Ryanair's volatility that can be explained by the market being higher when looking at daily data, than when looking at the monthly one, in the same way that that it is higher when looking at a shorter period of time such as the five-year period.

According to this, the highest R-squared is found when looking at the five-year period with the daily data. It makes sense, since it is considering the greatest and more exact quantity of data possible and the shortest period of time studied, when changes that alter unequally the trend in market are less likely to happen. These effects of alterations can be reflected at the ten- and seventeen-year periods when a big crash such as the financial crisis occurred and altered the common linear tendency of the market in a different way among the different companies performing in the ISEQ index, which reduced the amount of changes in the company's shares that could be explained by the market changes.

6.7. TESTING THE CAPM MODEL

In this final part, the CAMP model is tested to see how well it would perform in Ryanair's shares during the last year (2016).

First of all, the equation described by the CAMP model, tries to explain the company's returns according to the ones from the market. The formula used is the following one:

$$E(R_i) = R_f + \left[E(R_m) - R_f\right] * \beta_i$$

The specific data needed from Ryanair and its market index is:

- The risk-free rate of return (R_f) which is considered the return associated with the three-month treasury bonds. In the 31.12.2016 it was approximately of 0.65% (Bloomberg, 2017).

- The weekly return of the ISEQ index, considered the market (R_m), during last year was of -4.0408% (Bloomberg, 2017).

- The beta of Ryanair during 2016 considering a weekly periodicity was of 1.241 (Bloomberg, 2017).

Taking into account all the previous data, the first equation will end as:

$$E(R_i) = 0.65 + [(-4.0408) - 0.65] * 1.241 = -5.1713$$

So the expected weekly return to Ryanair's shares during 2016 according to the CAPM model is -5.1713%.

To test the model, it is checked against Bloomberg which was the actual total return and the result is -3.3644%, so there is a difference between the predicted by CAPM and the current one of 1.8069%. Despite not being a huge difference, the test has proven against the CAPM model.

The difference in these results could be because of the non-completely explanation of beta for the company's market risk, as the R-squared indicates.

6.8. SUMMARY OF THE PRACTICAL WORK DONE

According to all the results seen in the previous parts, a few comments can be added. First of all, there were several beta computations, but considering that Ryanair is a company that has been in the market for a while, is in a situation were no structural changes were expected, and that the longer the estimation period taken the more accurate the beta tends to be (as seen with the R-square), it seems logical to use a long-run beta for analytical purposes, such as the seven-teen one, for example. And when taking into consideration the periodicity, it should probably be used the daily one since more information is included, it tends to be more precise.

Another point for comment is that the standard deviation's results showed that Ryanair has a higher volatility and risk than the market, but when analysing the betas they showed that the company had a lower risk than the ISEQ index. This is because the standard deviation shows the total risk, the systematic and the non-systematic one, while the beta tries to measure only the systematic or market risk. According to this, Ryanair would have a systematic risk equal to beta, and a non-systematic risk that could be estimated as the difference between the standard deviation and the beta. Despite that, it always has to be taken into account that beta is not completely reliable since it is only an estimation and its degree of precision, as shown with the R-squared, is only between seventeen and a forty-three percent.

In conclusion, it can be determined that Ryanair's shares offer a higher return than the market shares and also higher than the one from some of its competitors, and despite it seems it also has a constant growth tendency, it is observable with the standard deviation and the skewed results that it has a higher volatility associated and the possibility of some sudden negative outcomes, this of course isn't liked by investors. So it isn't surprising Ryanair shares' characteristics since the basis of every investment is that higher risk and negative skewness has to be rewarded with higher returns or nobody would invest in that stock.

7. CONCLUSIONS

Once I have finished the entire project, I can say I understand why the Capital Asset Pricing Model is still used nowadays for that amount of investors and economists. Not only because of its mathematical "simplicity", but because despite the constant evolution of financial assets, which are getting more and more complex day to day, and the increase in the difficulty to predict investors' decisions, the CAPM model is still capable of explaining in a more or less accurate way the relation between the assets' returns and their associated risk. This has been proven in the past but I have also been able to test it in my project with Ryanair's shares.

As seen in the previous parts, it is confirmed that there is a positive relation between the market risk and the expected returns as the CAPM model says, at least in the case of Ryanair's shares quoting in the Irish market. On the other hand, it has its limitations such as the beta. One of the problems with it, is that depending on the amount of time and the periodicity taken it gives a result or another, and these differences can affect quite a few to the final result, so one of the things I have learned during this project is that it is important to know the company's economic and financial history and its current situation in the market in order to choose the best amount of time and periodicity to study, which will result in the best beta possible. Despite this, another problem with the beta is that regardless of having chosen the best one, it still cannot explain the entire share's returns; normally it explains half of them maximum. So as an investor, the CAPM model can be trusted to get a general idea of the financial asset, but not a hundred percent due to its imperfect fittings.

With respect to Ryanair's shares, it has been shown in the assessment that in the Irish market it is a good financial asset to invest in for an investor not afraid of risk, since it has proved that it offers a higher amount of returns than the average in the market, in order to reward its higher risk. However, when comparing it within the Frankfurt market with respect to the other low-cost airlines' shares, it has confirmed to be more profitable than most of them and at the same time less volatile, so it would be a valuable asset to invest in from an investor's point of view.

To sum up, investors observe these reasons for Ryanair's shares as a good investing decision and at the same time they observe the good economic situation of the company. This makes them willing to pay more for the same share, which explains the overvaluation of the shares in the market quotation with respect to its real book value.

From a personal point of view, I can state that I have been able to accomplish the initial objectives set and what's more, I think I have accomplished a few more such as knowing a little bit more about the airline's industry history, being able to find the proper and reliable source of financial information besides Bloomberg, getting over the language barrier, in concrete the technical vocabulary and expressions, or improving my maths knowledge with regressions and other computations that were involved specially from part 6.5. to part 6.7.

So when analysing the whole work done, I feel satisfied with all I have learned during these months, not only in a learning level but in an organizational one too, since I have had to plan carefully the timings in order to be able to finish the project on time without having to take away any of the parts I wanted to cover at the beginning. I have also gained personal experience with the dealing of difficulties such as not finding the information I wanted, deciding what source of information was reliable and which one not, or trying to find the time to do the project to not fall behind the plan.

Now, with the personal experience I have gained during this task, if I had to start it over again, I would definitely change some things during the process, such as defining the exactly idea for the project earlier to be able to obtain more information from Bloomberg and less from Yahoo Finance, which is less accurate and there is less information available; or starting first with some statistic knowledge, because at the beginning I had some problems to understand the analytical results from the Figure 6.5.1. until the end. And precisely because of this, I think it can be stated that I have learned enough from this project.

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