THE PROBLEM OF INTRODUCING RISK IN INVESTMENT SELECTION CRITERIA:

PRACTICAL APPLICATION FLIGHT ROUTES FROM CASTELLON AIRPORT.

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ABSTRACT: In this paper we deal with the problem of how to introduce the risk in the investment selection criteria. It goes from simple criteria- that do not take into account the risk- to more complex selection criteria which take into account the uncertainty (risk). We explain the different criteria that exist which serve to decide whether to make an investment project or not. We analyse what we consider the most appropriate and how it has an effect upon the existing variables of the models.

After looking how to introduce the risk on these criteria, we will conduct a case study in which we simulate how these methods work in the business world. We base ourselves on a “low-cost” airline that wants to analyse whether it is feasible create flight routes joining Castellon Airport to other airports in the world or not.

KEYWORDS: Cost of capital; Discount rates; Net Present Value; Project Valuation.

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1. INTRODUCTION

In the business world, occasions of certainty are seldom achieved because we practically never know what will happen in the future, so it is common to find situations of uncertainty. This is why we can not apply a criterion for selecting investments if we do not take a step forward and perform more complex models that take into account the risk of financial transactions, thus bringing the models closer to the real business world.

Due to the importance of investment selection criteria, in this paper we will analyse these criteria, particularly those criteria that take into account the uncertainty (risk).

According to Aguer (2004), the investment selection criteria are important for companies because they help them to evaluate what options they have to invest. In fact, in recent years, business owners and managers have the need to use rational criteria to help them when making decisions about where to invest in.

The key to accept an investment project is the profitability. If it is higher than the profitability offered by the market then the project is feasible. The criteria for selecting investments appear when we want to know the profitability of our project, as they are based on showing the profitability that our project can give us.

The methods of valuation and investment selection are based on two variables: net cash flows and the cost of capital investment. Some models also take into account the time value of money, being this the difference between a static, which does not take into account the time value of money, and a dynamic model.

As Brealey, Myers and Allen (2006) tell us that we must know how risk arises in investments, their relationship with the capital cost of the project and how the CEO (Chief Executive Officer) of a company can face the risk in the practice if we want to use these decision models.

Therefore, the aim of this paper is to analyse the necessary requirements to develop selection criteria for investment under uncertainty conditions. Consequently, we will be able to change from criteria with certainty (no risk) where we assume that our data are 100% reliable, although this situation rarely happens in reality, to criteria with total uncertainty where we estimate our variables but without having a confidence level of 100%.

The essay is totally focused on the selection criteria of investment projects and not on the financial planning company. Thus, we will not consider the tasks that a CFO should

carry out, such as liquidity problems, possible sources of funding, the working capital of the company, its dividend policy or its financial costs, among others.

Then we explain the structure that we follow to reach the objective of the work. We sometimes rely on different works and authors that will be mentioned. At the same time, we will carry out a practical application with a spreadsheet Microsoft Excel. After that, in the last chapter, we will see the results of changing from an analysis that does not consider the risk to an analysis that takes it into account in the practical application. This application will be based on the costs of an airline that plans to open flight routes from the airport in Castellón.

The first item that we will analyse is the problems that may cause investments (chapter 2), thus we will observe common problems for evaluating investment projects. These problems will range from a lack of historical data until political problems that may arise in the country where the possible investment will be made.

In the chapter 3, we will begin to study the classical models of investment selection, which are divided into two types: static models and dynamic models. The difference between these models is that the dynamic models take into account the time value of money and the static models does not consider it.

Afterwards, in chapter 4 we will compare the net present value model, hereafter NPV, with the methods used by the different companies. We will use this comparison as an explanation of why we will base on the NPV criterion in the rest of this work.

When we have decided that the NPV will be the criteria to be used to explain how to change from selection criteria for investments without considering the risk to criteria that take into account the uncertainty, we will analyse in chapter 5 the variables to consider in the NPV: the net cash flows and the discount rate.

When we focus on the discount rate, we will rely on Ferrando and Gomez (2005) to know the CAPM model that will help us to calculate the cost of capital of a company. Making the most of the analysis of the CAPM and relying on Damodaran (1999), we will see the problem that the estimate of the market beta offers us. One of the problems is that the beta can be calculated in a worksheet if we know the historical price of the company shares or of the shares of the sector. But when these contributions do not exist, this will get complicated- for example, when we will try to calculate the market beta of an innovative company that does not have similar competitors in the market.

After becoming aware of the factors that influence the NPV criterion, we discuss in chapter 6 the various methods of introducing risk in the NPV. There are some methods,

from very simple ones, such as adjusting the discount rate and the certainty equivalents, to other methods that need some statistical knowledge as the behavior in probability and the Monte Carlo simulation.

We will examine the sensitivity analysis and the scenario analysis where we can modify variables to observe the effect produced in our investment project. Finally, we are going to examine the decision trees that are graphical schematic forms where we can see the different possibilities that our project can give us.

We want to highlight the Monte Carlo method and the decision trees, as they are not learned in classes of financial management, and it is a contribution made by the author, obtaining information from various literature sources.

To conclude the work, in chapter 7 we will create a practical application, where we will see how to calculate, amongst other things, market beta, cost of capital and net cash flows. These calculations, along with the realization of the selection criteria which take into account the uncertainty, will be made in a spreadsheet where we use tools like the "solver", the probability distributions, conditional functions, etc.

We will show if it is viable that a company of aviation opens flight lines to connect the Castellon airport with cities around the world as this is a current issue in Spain, because there are doubts whether it is necessary to build so many airports in the country.

We will write a final section in chapter 8. In this part, we will present the main conclusions that we came after doing this paper and its practical application. Finally, we resume the references.

2. FREQUENT PROBLEMS ON INVESTMENT

In any investment, the performance that we expected to gain is not safe because in some investments we can have more profits than expected, in others less than expected and maybe we can not even achieve performance. This is the reason why we must add the risk to our systems of choice of investment projects, because all investments will have associated some risk rates of risk, even if minimal.

Therefore, as the author Sapag (2007) explains, in general, an investor always pay attention to the risk-return trade-off on investment, when there are more returns, it assumes more risk. This is where our first problem appears, because an acceptance of a significant risk does not mean that we will always have higher profitability.

Another problem when investing may be the lack of historical data related to the objective of our investment. For example, if a company wants to invest in a new machine, you will not have data on the actual capacity of this machine. So the manager personnel in charge of the operation should study the innovative products; as if there is more innovation, there is less information on which we rely.

Moreover, in cases such as this we must add uncertainty to the obsolescence of our machine, because being a new product, we can not know the real horizon, from which we can get benefits of our investment. In these cases, a good way to reduce the uncertainty would be to conduct a statistical study of the behaviour in time of gadgets like our acquisition in case of making the investment.

Changes in the countries policies can also be a problem for our decisions, changes in tax policies may cause that our cash flows differ from those expected. So it will be very important that, before making an investment, the management should study the political situation, as this can give more uncertainty for investment.

The CEO (Chief Executive Officer) of a company, that is the ultimately responsible for the management and administration of a company, also known as executive director should consider whether a product is seasonal, as they may have significant biases when calculating the cash flows to calculate the value of an operation. If this happens, the results do not reflect the reality if they do not consider this factor.

Another problem of investments may reside in the geographic area where the money is being invested. We must take into account the characteristics of the geographical area for different reasons, such as the weather features, the chances of natural disasters, political factors that may affect our investment depending on the country we invest, etc.

3. INVESTMENT CRITERIA

For a company to choose an investment project must compare different alternatives and to know what is the best for their performing, companies use investment criteria.

There are two key variables when making the selection criteria, these variables are:

- Net cash flows (Q_n). Where we include the initial investment (Q_0).
- The cost of capital (k).

The selection criteria, that the authors Perez, Jimenez and De La Torre (2009), along with many more authors, called classical models for the evaluation and selection of investments can be classified into two groups:

- Static models: these are the models do not take into account the value of the net cash flows in time, that is to say, they assume that a net cash flow 1 € today has the same value as a net cash flow 1 € in a year.
- Dynamic Models: these criteria have into account the temporal structure of the net cash flows. Dynamic models assume that the closest net cash flows are preferred over time. Having to standardize cash flows in order to know the real value of an investment, these models use updated techniques or discount of the net cash flows.

3.1. STATIC MODELS

As the aim of this work is not fully aware of the classical methods of valuation of investments, then we just see static methods that Aguer (2004) called as the main static models:

1. Net cash flow per monetary unit disbursed:
   This model calculates the sum of the cash flows, not adjusted by dividing by the initial investment, thus calculating how many monetary units are obtained for each one that has been invested:

$$r' = \frac{\sum_{j=1}^{n} Q_n}{Q_0}$$

   If r'> 1 the Project is considered feasible.

   The advantage of this model is its simplicity. However it has more disadvantages than advantages. The disadvantages are:

   a. The sum of cash flows is heterogeneous.

b. The profitability refers to the life of the project rather than an annual basis.
c. It does not measure profitability strictly, it measures 1 + profitability.

2. The average annual net cash flows for monetary unit committed (r''):
   With this method we also calculate how many monetary units are obtained for each inverted monetary unit but on an annual basis:

$$r'' = \frac{\frac{1}{n} * \sum_{j=1}^{n} Q_n}{Q_0} = \frac{r'}{n}$$

   This method is also simple to implement but adds the disadvantages of the previous model and it is only useful for projects with the same duration.

3. Payback period:
   The payback period is the time it takes to recover the initial outlay and amortize net negative cash flows that may occur:

$$Payback\ Period = \frac{Q_0}{Q_n}$$

   How the previous static models, the advantage of these methods is the easeness of making the selection criterion.

   The disadvantages of payback period are:
   a. Sum heterogeneous amounts.
   b. Do not use all available information.
   c. Measures liquidity and not profitability.

4. Bond accounting performance:

$$BAP = \frac{Average\ Annual\ Net\ Profit}{Total\ Investment}$$

   The disadvantages of this method are:
   a. The model starts from an accounting point of view.
   b. Prefer short-term investments with high profits.

3.2. DYNAMIC MODELS

Dynamic models are the best models that can help us to bring the investment selection criteria to reality as these models are characterized by the net cash flows are homogenized, updating the initial time investment. In dynamic models include the NPV and internal rate of return, which will name from this moment as the IRR.

To explain these models we rely on Aguer (2004), Sapag (2007), Brealey, Myers and Allen (2006) among others, since it is impossible to cite all the authors who have written on the following two dynamic models:

1. Net present value (NPV):
   The NPV represents the increase or decrease in value of the company following the completion of an investment.
   Analytically, the NPV is calculated as:

$$NPV = -Q_0 + \frac{Q_1}{(1+k)} + \frac{Q_2}{(1+k)^2} + \cdots + \frac{Q_{n-1}}{(1+k)^{n-1}} + \frac{Q_n}{(1+k)^n}$$

   The advantages of the method of the NPV are:
   a. The simplicity of calculation required by your application.
   b. Reduced to a common unit of measure the amounts of money obtained in different moments of time.

   And the disadvantages of this method are:
   a. The difficulty of explaining an appropriate discount rate to update the cash flows of the investment.
   b. The lack of realism about the reinvestment rate of net cash flows of the project.

2. The internal rate of return (IRR):

   The IRR is defined as the discount rate or discount (r) that equals the total net return on investment, the NPV, to zero:

$$IRR = -Q_0 + \frac{Q_1}{(1+r)} + \frac{Q_2}{(1+r)^2} + \cdots + \frac{Q_{n-1}}{(1+r)^{n-1}} + \frac{Q_n}{(1+r)^n} = 0$$

If r is greater than the project is deemed feasible. Some advantages of this model are:

a. Upgrade all sums of money at the same time project.
b. Provides easier project profitability when expressed in relative terms display.

Moreover, the disadvantages of the IRR are:

a. The existence of difficulties in calculating and inconsistency in the result.
b. The lack of realism in the reinvestment assumption of interim of cash flows of the investment.

4. COMPARISON OF THE NPV WITH OTHER CRITERIA

As explained in the previous chapter, the NPV criterion is the update of the cash flow to a present moment (present value) minus the initial investment (net present value). In a normal situation, we say that an investment project is always accepted when the NPV is positive, that is to say, if the present value of the cash flow is greater than the initial investment. Analytically expressed as follows:

$$NPV = \sum_{t=1}^{n} \frac{Q_n}{(1+k)^n} - Q_0$$

Now that we know the different investment criteria, we will explain why we use the NPV throughout this work, to do compare it to the criteria used by the CFOs of large companies. As seen in Figure 1 this method is one of the most used, but is it the right one? Consider the following graph made by authors Graham and Harvey (2002), where we see the criteria that will compare with the NPV and utilization rates of the companies that the authors were directed:

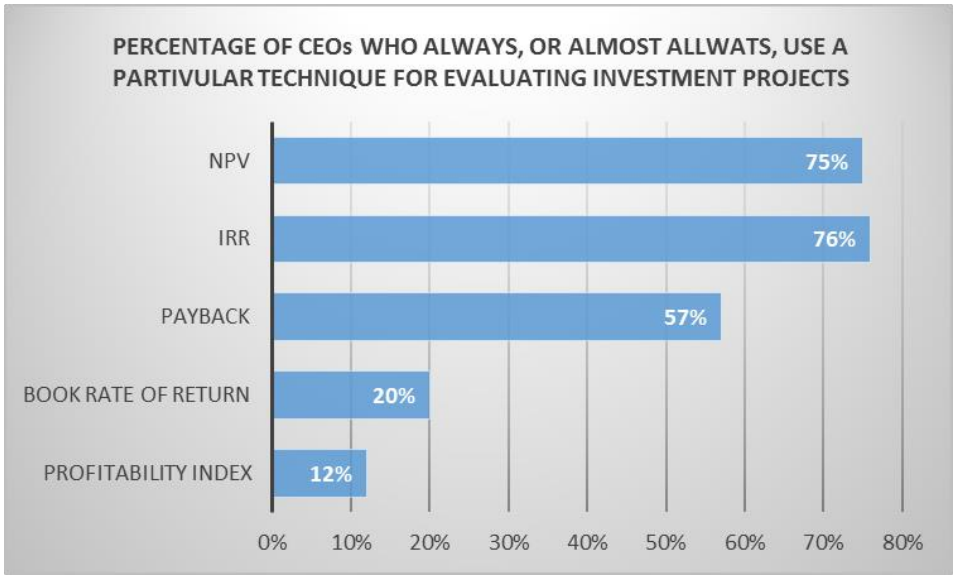

Figure 1 Percentage of use of selection criteria for investment by large companies. (Source: Graham and Harvey (2002))

We can see that the criteria most used are: IRR, NPV and Payback Period. So we will build on these three models, analysing the advantages and disadvantages of the IRR and Payback Period to NAV relying on Brealey, Myers and Allen (2006).

4.1 NPV VS PAYBACK PERIOD

Let us remember that the essence of the Payback Period is to know the time it will take for a company since you place the initial investment until he recovers it. The advantage over the NPV of this method is the ease with which one can calculate:

$$Payback\ Period = \frac{Initial\ Investment}{Cash\ Flow\ per\ Period}$$

But then, this method has a major weakness to NPV and any dynamic model, and is the Payback Period does not take into account the value of money over time, so it does not update the cash flows when calculating upon return.

The other major disadvantage of this model is that it ignores cash flows that are generated after the time of return of the initial investment, assuming a serious error in calculating the viability of a project if there are negative cash flows during the years.

4.2 NPV VS IRR

Now compare the two methods of assessment of investment projects most commonly used by financial managers in companies.

Unlike the NPV, which updates the cash flows at a rate equal to the cost of capital, which we express the IRR is the rate of cost of capital would equal the cash flows to zero. Therefore, if the IRR is greater than the cost of capital would accept and carry out the project that we would be saying the IRR method is that the project offers a higher return than their cost.

Why we chose the method of NPV and not the IRR?

Mainly because the problems that arise when using the IRR method that the authors Kelleher and McCormack (2005) tell us:

- In the same project, various rates of capital cost investment equalling zero may exist. If in the cash flows, there are positive and negative flows we may encounter this problem many times as we have a change of sign.
- Sometimes there are cases where the IRR for the project does not exist, this usually happens when the project has a positive NPV at any discount rate.
- There are times that companies must choose between two investment projects in these cases the IRR rule may be wrong, as when comparing two projects IRR can tell us that project A is more profitable than Project B but if we make the NPV it could indicate that the project B will give us more benefits than A.

- What happens if a project is financed at different rates of cost of capital? In the NPV method would pose no problem as we would use every discount rate at the time you apply:

  $$NPV = -C_0 + \frac{C_1}{(1+k_1)^1} + \frac{C_2}{(1+k_2)^2} + \cdots + \frac{C_n}{(1+k_n)^n}$$

  But, how would we do to calculate the IRR? Would we compare the performance with each one of the capital costs? The answer is no.

  In the case of the IRR, we should calculate a weighted cost of capital investment, which is more difficulty to evaluate the project, so that, once again, I decant us by the NPV.
- With the IRR criterion we can not compare projects with different maturity periods, if we had this problem we should reformulate the cash flows to have the same temporal structure.

In short, we can say that the NPV and IRR give us the same result if we only have to evaluate an investment project, but if you are looking to compare different investment projects at once, we should forget about using the IRR method and the comparison of projects with NPV method.

5. FACTORS TO CONSIDER TO DETERMINE THE NPV

After learning why we prefer the NPV criterion regarding other criteria we are going to analyse the variables that need to know or estimate when calculating the NPV of an investment project. It is important to know in detail these factors as they are the key to apply reliably a selection criterion of investments.

At this point we will see how to calculate the cash flows and analyse factors that we must take into account when estimating them. We will also see how we choose a discount rate or calculate if we use the CAPM model, and view the problems that our study contributes to the market beta. Now let us look in more detail these factors:

5.1 NET CASH FLOWS

To use the NPV method, or any other model for evaluating investment projects, we will have a major problem: the prediction of future cash flows, as it is almost impossible to predict the cash flows with 100% accuracy.

The first thing to consider is that the cash flows are obtained with cash inflows which we subtract the outflows of cash, so we never have to clarify that the calculation of the cash flows with accounting data, as which income is accounted not mean that it has collected.

The cash flows should always calculate after tax how the authors Brealey, Myers and Allen (2006) explain us, we must not fall into the typical mistake some companies that calculate pre-tax cash flows and then use rate senior discount for the closer the cash flows to reality. We must also take into account the above, not deduct taxes for the calculation of the cash flows until they have paid.

For the calculation of the net cash flows also have to take into account the opportunity costs. For example, if a company has a tool that is not used, but have doubts on whether to sell or start using, in the case of selling the cash flows increase in the amount charged for selling tool, and decide if should use this tool to subtract to the cash flows the cost of the tool have been sold since this is the opportunity cost of using the machine.

Brealey, Myers and Allen (2006) indicate that overlook the extinct costs as these are spent and unrecoverable, so if you've already spent money on a project, but we will not give benefits, we abort this project although we spent lot of money in the project and these costs will add to a new project future.

The accounting officer of the company shall charge through cost accounting, overhead costs of the project, but we have to take into account these costs as they do not perform or project, these costs like exist in the company. Therefore, as the author Aguer (2004) defines *"under the name of receipts and payments and cash outflows only entries that are directly or indirectly produced by the project implementation will be included in the business."*

Another aspect to consider is the inflation, especially if the investment is made in a country where inflation is very volatile. If this is the case of our investment, we should calculate the cash flows in real terms, not in nominal terms, thus calculating the NPV using the following formula:

$$Real\ discount\ rate = \frac{(1 + nominal\ discount\ rate)}{(1 + inflation)} - 1$$

We have to keep in mind that if we do not consider inflation we discount the cash flows with the nominal discount rate and if we considerate the inflation we have to consider to deduct the actual real discount rate of cash flows. As never we combine real rates or cash flows with nominal cash flows.

The author Sapag (2007) along with many other authors, describe in detail the scheme where you can see the variables that influence the cash flows. In the following table we can see what these variables are and how we calculate them:

NET CASH FLOWS CALCULATION	
+	Receipts before tax.
-	No financial payment.
=	Profit before tax.
-	Taxes.
=	Benefit after taxes.
+	Amortization.
+ / -	Variation on of working capital.
+ / -	investment / disinvestment in fix assets.
=	Net cash flows.

Figure 2 Net Cash Flows Calculation

The cash flows are also affected by risk. The types of risk that usually affects them are:

- The price risk → is the risk that arises from changes in the prices of goods, so if the price of the materials used by a company, its costs will be higher and therefore the lower cash flows.
- The risk of insolvency → this is the risk that a company owed money and can not pay. Logically if the insolvency will decrease the net cash flows is confirmed.
- The risk of type of exchange → is associated with the fluctuation of one currency against another. If a company buys supplies in a country with different currency and this currency appreciates, the cash flows will decrease because the exchange rate that will pay more for the same materials.
- The country risk → is the risk that encompasses transnational operations and especially the funding from one country to another.

5.2 DISCOUNT RATE

The discount rate is important in decision making of investment projects which is the benchmark for investors to decide whether an investment is appropriate or not. As Mascareñas (2001) explains, this is due to what can be considered that the discount rate is the minimum return required by an investor to accept an investment.
Mascareñas (2001) also indicates that the discount rate or cost of capital depends primarily on these 3 factors:

1. The economic situation. Since when have a lot of demand of capital, i.e., in good times where companies provide and ask for more money, the cost of capital is lower.
2. The market risk. Whit more risk of a company, investors will demand greater benefit, so the issue of shares will cost more for the company.
3. The situation of the company. For example, a highly leveraged company will have higher cost of capital when requesting funding.

Generally, we can determine the discount rate to be used in 3 different ways as many authors who include a Mascareñas (2001), Aguer (2004) and Schneider (1970) indicate. These three ways to determine the discount rate are:

- The weighted average cost of capital (WACC): The WACC can be defined as the cost of financial resources of the company. Typically, companies use financial resources from various sources, so that the cost of capital could be half the cost of these funds.

- Opportunity cost: The cost of own resources as we can also consider the cost of capital, because although this cost does not have to be returned, it does have a cost to the company as it is understood to be the cost of what allowed to gain by carrying out other investment. Schneider (1970) defines opportunity cost as *"the capital loss by investing in a project rather than another alternative profitability."*
- The WACC plus a risk premium. In this case we add the WACC a risk premium. This risk premium reflects the risk that owns the asset in which to invest and we will consider mainly these types of risk that highlights the author Ferrando (2005):
    1. Individual Risk: the risk that an asset would have if it were the only one who owns a business.
    2. Corporate risk or internal business risk: the risk that considers the effects of diversification of shareholders, this risk reflects the effect of the investment project on the risk of the company.
    3. Market risk: is the part of risk that can not be eliminated by diversifying this risk depends more on market sector undertaking of the company that owns the asset.

5.2.1 CAPM MODEL

The Capital Asset Pricing Model, CAPM hereafter, is a model used to calculate the cost of capital of a company. Graham and Harvey (2002) tell us that this model is the most used by companies when looking for a discount rate to value its investments. So we have decided to explain the model in our paper as well as being the most widely used model is a very reliable and simple model that can get the discount rate of a company.

Some of the hypotheses that Damodaran (1999) explains on the CAPM model are:

- Investors are risk averse and consequently require higher returns for risky investments and have diversified portfolios, so they are only concerned with systemic risk.
- There is symmetric information, risk free rate at which the investor can borrow or invest.
- There are no market failures and can not influence the price of the asset, i.e., in the market there is perfect competition.

This method aims to estimate the cost of each asset based on their risk and determine an appropriate indicator to estimate the risk.

The formula used to calculate the return on assets is as follows:

$$E_i = \beta * (E_m - R_f)$$

Where:

E_i= The return on the portfolio of assets.

R_f= Return on non-risk asset.

$(E_m - R_f)$= Risk premium.

β = Measure of the volatility of an asset linked to market variability. In the next section we explain how to calculate this variable.

Damodaran (1999) explains various problems that we can find as the absence of market indices or the need to choose a period of time because for each different time period the result of CAPM varies. To solve the various problems Damodaran (1999) we recommend modifying the beta according to the income statement and balance sheet of the company, as companies with high ability to pay often have low betas or companies with highly volatile incomes tend to have a high beta. We also recommend adjusting the beta as the risk of the company or based on financial leverage.

5.2.2 MARKET BETA

As stated above by introducing β, it represents the volatility of the return of an asset to movements of market risk, i.e., the β measures the risk of an asset compared to market risk.

Before explaining how this parameter is calculated, we will explain the four meanings can have β:

- If β = 0 → means that the expected return of the asset is the same as the risk-free asset.
- If β = 1 → asset has the same risk as market risk.
- If β < 1 → this means that we have a defensive asset, i.e., an asset with a lower than market risk.
- If β > 1 → means we have a risky asset because the asset has a higher market risk.

We can estimate the market beta of a company through its historical quotes of stocks, but what do we do if we can not estimate the beta for an investment where we can not obtain historical data?

For these cases, Ferrando and Gomez (2005) recommend us to perform an analysis of the price indices, the returns on sales and valuations of commercial properties. These authors give us three tips when conducting this analysis:

1. Avoid additional factors. Factors should not be added to the discount rate to compensate for situations where your project goes wrong.

2. Think about the determinants of asset betas. Specifically in the cyclic movements and the operating leverage of the company.
3. Do not be fooled by the diversifiable risk as this may reduce or eliminate diversifying among various investments.

Damodaran (1999) discusses more problems of beta:

1. Markets can be dominated by a few companies, i.e., in a small market if there is a large company, this will mark the level of the beta of the companies. This problem is very common and severe in emerging markets and that's where markets tend to have few companies and if a large company will distort the market beta.
2. The betas can be distorted by the market that the regression is calculated, since a beta for the same company give different values when calculated in different markets.
3. The evolution of firms over time. To calculate the beta we rely on historical data, but companies change over time, and the historical data may not reflect the current reality of companies.

6. INTRODUCTION METHODS OF RISK IN THE NPV

After knowing the different criteria for selecting investments and the components that must be taken into account to estimate the NPV, we will go on to explain how different approaches are used to allow us to consider and incorporate the uncertainty (risk) in the practical application of a selection criterion.

We have different ways to take into account the risk when deciding to initiate a project. We will analyse the most common ways to do it.

To do this, we will divide this section into seven subsections, one for each method that we present. In this context, we will see how to enter the risk in the NPV method:

- ✓ Adjusting the discount rate.
- ✓ Certainty equivalents.
- ✓ Behaviour on probability.
- ✓ Sensitivity analysis.
- ✓ Scenario analysis.
- ✓ Monte Carlo simulation.
- ✓ Decision trees.

The introduction of risk in the NPV is especially necessary because when we estimate the net cash flows, it is very difficult to predict accurately the flows. Thus, it is necessary to keep in mind that when a flow is further in the time horizon, the risk will be higher because it will be more difficult to estimate reliably all the factors that can affect it.

6.1 SETTING THE DISCOUNT RATE

In this method, we adjust the discount rate that we are going to use to calculate the NPV of the project with a risk premium, which is the rate that represents the probable risk of the operation.

This method has a great argument in its favour, the simplicity, but otherwise it has the difficulty of knowing what the appropriate risk premium is for our project.

As we explained before in this work, the NPV formula is:

$$NPV = \sum_{t=1}^{n} \frac{FNC}{(1+k)^t} - I_0$$

By using the method of adjusting the discount rate, the result of this formula will be as follows:

$$NPV = \sum_{t=1}^{n} \frac{FNC}{(1+s)^t} - I_0$$

Where: s $= k + p$, now our discount rate is called "s" which is the sum of "k", our initial discount rate, plus the sum of "p" that is the risk premium.

What we can base on when setting the risk premium?

Puértolas and Ruiz (2010) indicate that the most suitable, if it is possible to do, is to estimate the risk premium looking for Benchmarks in the market, for example, comparing our project with previous projects that have been undertaken in the market and that have a similar financial behavior.

The main Benchmarks that can be used to calculate the risk premium are:

- The profitability demanded by the capital market.
- The evolution of the stock exchange.
- Other indices such as the Morgan Stanley Capital International index, which is an index that indicates the value evolution of the companies listed on different exchanges in various countries.
- And the average risk of the companies of the sector.

6.2 CERTAINTY EQUIVALENTS

What is actually being done with the certainty equivalents is to set the cash flows with a coefficient between 0 and 1, which will represent the probability of occurrence of each of the cash flows. These coefficients are called "reduction coefficients to certainty conditions." The higher the risk of cash flow is, the closer to O the coefficient is, and therefore, if it is known that cash flow is almost 100%, it will be fitted with a reduction coefficient close to 1, so that hardly vary the flow.

In the method of the NPV excluding risk, that the cash flows has not been adjusted, means that we ignore the distance in time from the time of calculation of NPV and the time that the cash flows have to be produced, so the risk of the prediction time is omitted. Therefore, certainty equivalents are used to have more real net cash flows that give us a decision about accepting or not the most reliable project.

The authors Brealey, Myers and Allen (2006), show us a scheme of how to adjust cash flows through the certainty equivalents:

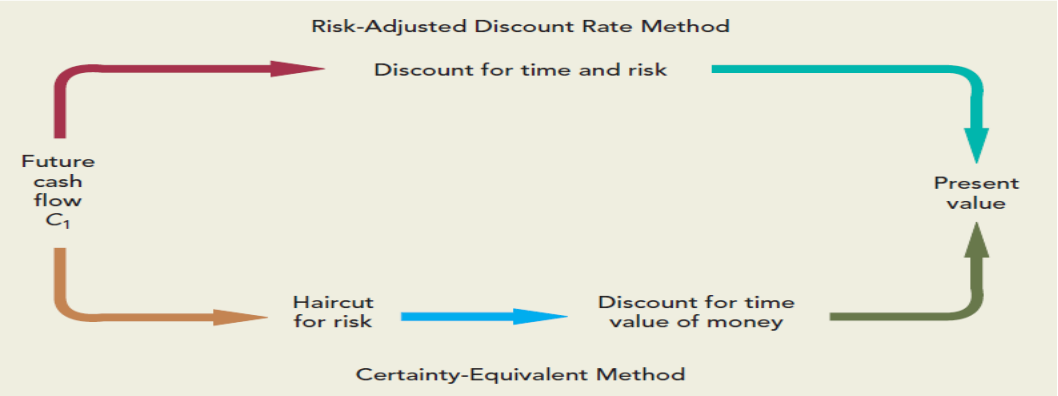

Figure 3 Setting cash flows by certainty equivalents (Source: Brealey, Myers and Allen (2006))

We can see that it uses two methods:

- The first method uses the previously explained of setting the discount rate.
- In the second method, it uses the certainty equivalent, which first performs a reduction of cash flows because of the possible risk and then it makes a discount to the flow for the value of money over time, so that, at the end, both methods arrive at the present value of net cash flow.

As in the method of setting the discount rate, the advantage of this method is its simplicity and above all it is a method that anyone understands what it is being done at all time. But they also share a disadvantage, since it is difficult to estimate the rate with which we adjust the cash flows.

6.3 BEHAVIOR ON PROBABILITY

To know the NPV probability behavior, first we need to know the expectation and variance of the net cash flows. For this, we consider two scenarios:

1. Net cash flows are independent.
2. Net cash flows are perfectly and positively correlated. So the covariance of the net cash flows is equal to 1.

To calculate the expectation and the variance of NPV we also need to know the expectation and variance of the cash flows. Puértolas and Ruiz (2010) indicate that there are three models of cash flows that are acceptable to simplify calculations:

- Pessimistic cash flow (CF^{pt})
- Likely cash flow (CF^{mt})
- Optimistic cash flow (CF^{ot})

The expected value of the cash flows, as Puértolas and Ruiz (2010) say, may be calculated using one of these three distribution laws:

1. Beta Law: this assumes that the cash flow is a random variable with a density function of the bell and asymmetric probability, then we calculate its expectation and variance as follows:

$$E(CF_t^r) = \frac{CF_t^o + 4CF_t^m + CF_t^p}{6}$$

$$\sigma^2(CF_t^r) = \frac{(CF_t^o - CF_t^p)^2}{36}$$

2. Triangular distribution: this follows the density function of asymmetric triangular probability to right, left or center, so we calculate the mathematic expectation and variance with the following formulas:

$$E(CF_t^r) = \frac{CF_t^o + CF_t^m + CF_t^p}{3}$$

$$\sigma^2(CF_t^r) = \frac{(CF_t^o - CF_t^p)^2 - (CF_t^o - CF_t^m)(CF_t^m - CF_t^p)}{18}$$

3. Uniform or rectangular distribution: in this distribution all intervals of the same length have the same probability, so we calculate the expectation and variance of the cash flow as follows:

$$E(CF_t^r) = \frac{CF_t^o + CF_t^p}{2}$$

$$\sigma^2(CF_t^r) = \frac{(CF_t^o - CF_t^p)^2}{12}$$

Once we have calculated the variance and the expectation of the cash flows we can calculate the expectation and variance of the NPV, using these expressions:

The variance of the NPV is calculated as follows:

$$\sigma^2(VAN) = \left(\sigma(Q_0) + \sum_{j=1}^{n} \frac{\sigma(Q_j)}{(1+k)^j} \right)^2$$

While the expectation of NPV is:

$$E(VAN) = E(Q_0) + \sum_{j=1}^{n} \frac{E(Q_j)}{(1+k)^j}$$

Once we have obtained the variance and expectation of the NPV, we can make inferences considering behaviour on probability to know the probability that the NPV is between two values that we are interested to know when the NPV is positive.

We can analyse them with the two cases:

1. By using the central limit theorem, considering that the NPV is normally distributed.
2. By Tchebycheff inequality.

If we are in an uncertainty model, the NPV can be considered a random variable. So with the central limit theorem, the NPV tends to a normal distribution when cash flows tend to infinity and the various cash flows are independent of each other, being this an unrealistic assumption, since it is normal flows have some correlation.

In the practice, it has been shown that the central limit theorem works. Thus, we can say that a random variable as the NPV is close to normal when the number of cash flows is equal to or higher than ten and also the cash flows are independent random variables. If these two conditions are satisfied, we can say that the NPV is distributed as follows:

$$NPV \sim N(E(NPV), \sigma(NPV))$$

So if we want to know, for example, if the NPV is positive:

$$P(NPV > 0) = P\left(Z > \frac{0 - E(NPV)}{\sigma(NPV)}\right)$$

Where Z we can obtain a typed table or a computer.

The other way to know the behaviour on probability is by Tchebycheff theorem.

For this case we consider that the random variable NPV does not follow any distribution. The theorem tells us that x is a random variable, in our case x = NPV, with average μ, standard deviation σ and h is an arbitrary positive number, then:

$$P(|NPV - \mu| \geq h\sigma) \leq \frac{1}{h^2}$$

This means that if, for example, we want to know the probability that a random variable is within a range between the average and ± 3 times the standard deviation, and we get the following:

$$P(|VAN - \mu| \geq 3\sigma) \leq \frac{1}{3^2} \leq 33.3\%$$

Therefore, the advantage of behaviour on probability is that it gives us the probability that the NPV is placed in the figure we expect. On the other hand, its disadvantage is that, as it has been already mentioned, the assumptions of the central limit theorem are not very realistic and, in addition, the Tchebycheff inequality is only an approximation that may not be very accurate.

6.4 SENSITIVITY ANALYSIS

The sensitivity analysis is a method that many authors detail that is in us, such as Puértolas and Ruiz (2010), Boiten (1994) or Sapag (2007) authors. This method is based in see the sensitivity of NPV in the result when there are variations in some of the variables of our investment. With this what you get is a glimpse of our project confidence through results.

This analysis is very useful in cases when one of the factors on investment (down payment, cash flows or discount rate) is not known with certainty.

With the sensitivity analysis can be studied the ranges of values that may be our variables for the NPV can accept or not accept.

This analysis is performed using the clause "ceteris paribus", i.e., when we play other variable remain constant.

Therefore, in the sensitivity analysis we can change only one of the variables in each analysis.

The advantage of this model is that we know the minimum or maximum at which a variable so that our project is viable and can bring with it more true to the variables of our project. Further sensitivity analysis is very useful for companies, because with this analysis may consider whether a project is viable noting the variables that are often the key to business: prices, sales, expenses, etc. The disadvantage of this model is that we can only change the variables one at a time, so we can not know what would happen in the project if they changed two variables at once. This disadvantage can be overcome with the following method of introduction of risk in investment selection criteria, scenario analysis, which is the best known aspect of sensitivity analysis which we will analyse in the next subsection.

6.5 SCENARIO ANALYSIS

Scenario analysis is a method to introduce an indirect model to evaluate the risk investment projects. The difference between this method and the sensitivity analysis is that in this method not only perform changes in one variable, but that scenario analysis

can alter all variables of our project at a time. So we plan possible situations that may occur in our project and got to know the result of our investment project for each possible situation. So in the scenario analysis estimates the initial outlay is fixed, the cost of capital and the cash flows, a figure very similar to the different situations that may arise in the reality of our project.

Typically in this method, which does not make it mandatory, is to perform a pessimistic forecast, an optimistic forecast and normal forecast. Ideally, the parameters of the scenarios are reviewed constantly and taking into account that the more scenarios will propose more reliable our predictions at the time of investing.

The advantage of scenario analysis is that in this model we can analyse what will happen if more of the variables vary project. Its disadvantage is that we can fix infinite possible scenarios, so it can be laborious and also create many scenarios will not know which scenario will happen in real life.

6.6 MONTE CARLO SIMULATION

The authors Puértolas and Ruiz (2010) tell us that Monte Carlo method takes its name from Monte Carlo casino because this system works like a casino. This system was created by John Von Neumann and Stan Ulam in the late 40s. As in any game of chance, the basis of this method is the randomness of how the results are produced.

The Monte Carlo simulation consists in generating random numbers and turn them into variables of the model, there are various software programs that can make the simulation of Monte Carlo, but we will focus on how to perform the analysis in a spreadsheet.

We can perform the simulation in three phases:

1. In the first phase we assign a probability distribution of the model variables.
2. After generate random numbers that are between 0 and 1, these numbers will represent the cumulative probability.
3. We look the corresponding to the cumulative probability value and the process is repeated many times so that the sample is sufficiently large.

The simulation, thus allows knowing the average score and standard deviation of the random variable which in our case is the NPV of an investment project. In short, what you are looking for the simulation is the possible values of the probability distribution of the NPV, and then with these probabilities, randomly selects a value for each variable, repeating the process many times for different combinations of factors and yields, and with this we have a frequency distribution which can be estimated NPV and its standard deviation.

The advantage of this model is that it makes infinite scenarios, which ensures that the analysis is more real about the variability of key variables on our investment.

The biggest problem with this method is that basic knowledge inference, probability and statistics using spreadsheets are needed.

6. *7 DECISION TREES*

The decision tree is a graph that show how the events that may occur from the decision to make an investment in a project, they help us to choose the best approach for our investment as time goes by and allow us to visually display of the project in which we will invest.

The sensitivity analysis and Monte Carlo simulation have a "defect" that can be corrected with decision trees. This "default" is based on these methods do not give us the ability to make changes in our investment as time passes. Not considering what might happen in the future may cause heavy losses to companies, therefore we recommend using decision trees in projects that are "simple", because those projects that can not be many scenarios arise different for the same project.

We can say that the decision trees help us to understand the risk they may have an investment project and makes us can see the effect it will have on investment future actions, helping us to choose to invest more in the project, spend less or discard the project.

Finally we will analyse the advantages and disadvantages of decision trees. The main advantage of this model is that unlike the Monte Carlo analysis and sensitivity analysis, this model gives us the option to modify our project as we move forward in time, if the project goes well we can expand, if the project goes bad we can give up and abandon the project, it seems so logical is not taken into account in other endpoints. Another advantage of decision trees is that visually can know what strategy you must follow our project to give us the NPV as high as possible.

On the other hand, its main disadvantage is that a decision tree can turn into something very complex because of the tree's branches may arise as alternatives, and these alternatives arise other, which can be become difficult to understand and even annoying to the tree view.

7. PRACTICAL APPLICATION.

In our practical implementation we will make the assumption that the aeronautical company Ryanair, which is the leading "low cost" airline, studies to be the first company to carry out flights from the airport of Castellon. We have chosen this example, because today is a significant theme in the Province of Castellon, since the construction of this airport has involved a considerable investment and, to this day, it has not been used for the functions of an airport. Therefore, we have decided to do this feasibility analysis, to see whether it would be feasible for an airline to operate at the Castellon airport.

For our case, we have assumed the following hypotheses:

- Passenger traffic of Castellon airport will average between Almeria airport and Reus airport. We choose these two airports because they have similar characteristics to Castellon airport if we compare the dimensions, the inhabitants and the geographical features of the area. To analyse both airports we have collected information from the website of AENA Airports.
- We calculate prices using the average prices of Ryanair, collected from its website, of the three routes that we will use: flights to and from Castellon road to Dublin, Brussels and London.
- To project the expectations of the following years, we will project that passengers will increase by 2% (average of Reus and Almeria airport) and that prices will increase by 2.5% per year.
- In relation to the costs, we assume that fixed costs, that represent 13% of the sales, will increase by 3% per year. While the variable costs, that represent 69% of the sales, will increase by 1.18% per year, because most of these costs come from kerosene spending and it increases annually in this figure, according to IndexMundi -a website with different price indices.

In line, with these assumptions we can calculate the net cash flows that would arise to invest in the purchase of three aircrafts to cover the new flights. For the calculation, we have performed a projection of receipts and payments that might have during the next 23 years, which are the years of useful life, have the Boeing 737-800 aircraft that are used by the airline according to the annual accounts of Ryanair.

We have obtained the airline charges by calculating the sales revenue and we have joined to this revenue books a percentage of other revenue, which we have calculated from the "other income" in the consolidated balance of Ryanair. On the other hand, the

expenses have been calculated considering the kerosene consumption data that we have obtained from the website of Boeing and other expenses have been estimated from the profit and loss statements of Ryanair.

At this point, in order to know the classic NPV, we only need to know the capital cost. We have calculated this cost using the CAPM, with a beta of 1.03 –we have calculated betas for different periods with Ryanair quotes and NASDAQ market. Moreover, we have used the non-risk asset treasury 10-year bond and, relying on Fernandez (2013), we used a risk premium of 6%.With these three pieces of information we have obtained that $k = 9'55\%$.

With the net cash flows and the cost of capital we have calculated the classic NPV that gives us a positive value of € 6,972,558. According to this result, the project appears to be feasible. Nevertheless, we believe that a number of adjustments should be made to adequately incorporate uncertainty.

7.1 SETTING THE DISCOUNT RATE AND EQUIVALENT OF CERTAINTY

To adjust the discount rate, we have added the cost of equity risk premium of 2.5%, as we consider the average risk to a company which is the leader in its sector is of 1.5%. But as it is exposed to serious consequences if there is any error in any flight of the company, we have increased the risk premium to 1%.

Adding this risk premium we obtain that $s = 12.05\%$. With this rate we will calculate the

NPV and we will use it to calculate the cash flows for certainty equivalents. Calculating both models we conclude that the project is not viable because the NPV of the operation is negative, as it gives us exactly the NPV € -33,808,094.

7.2 BEHAVIOUR ON PROBABILITY

We conducted the analysis using behavioural probability, considering three assumptions regarding the net cash flows distribution: a) uniform structure, b) triangular structure and c) beta law. With these distributions we have calculated the hopes in mathematics of cash flows and their variances as we have explained in section 6.3 of this paper.

For each one of the structures we have calculated the variance and expectation of NPV, and with them, we have obtained the following probabilities:

	UNIFORM STRUCTURE	TRIANGULAR STRUCTURE	BETA LAW
	PROBABILITY	PROBABILITY	PROBABILITY
P(VAN>0)	0%	0%	0%
P(VAN<6.000.000)	100%	100%	100%
P(VAN>10.000.000)	0%	0%	0%
P(VAN<0)	100%	100%	100%

Figure 4 Behaviour on probability

7.3 SENSITIVITY ANALYSIS

With Solver, that is an Excel tool, we performed a sensitivity analysis on the variables that we consider the most important:

- The price of the aircraft, as they are the components of our initial investment.
- The flight ticket prices because they are the main source of revenue for the airline.
- The annual number of passengers, which together with the price, determine the total annual income.
- Price of the kerosene, which is the main source of business expenses.
- And different growth rates or variables that affect our capital cost.

The maximum and minimum results that these variables should achieve for the project to be viable are:

	MAX OR MIN VALUE	INITIAL VALUES	% VARIATION
INITIAL INVESTMENT (max)	178.547.860 €	170.613.930 €	4,65%
PRICE OF THE AIRPLANES (max)	59.515.953 €	56.871.310 €	4,65%
INITIAL PRICE PER TRAVEL FROM CASTELLON TO BRUSSELS (min)	52 €	58 €	-10,30%
INITIAL PRICE PER TRAVEL FROM BRUSSELS TO CASTELLON (min)	48 €	54 €	-11,84%
INITICIAL PRICE PER TRAVEL FROM CASTELLON TO DUBLIN (min)	66 €	72 €	-8,56%
INITIAL PRICE PER TRAVEL FROM DUBLIN TO CASTELLON (min)	82 €	89 €	-7,68%
INITIAL PRICE PER TRAVEL FROM CASTELLON TO LONDON (min)	46 €	53 €	-12,95%
INITIAL PRICE PER TRAVEL FROM LONDON TO CASTELLON (min)	49 €	55 €	-11,39%
PASSENGERS PER DESTINATION IN 2014 (min)	89861	91366	-1,65%
PASSENGERS GROWTH PER YEAR (min)	1,92%	2,1%	-8,92%
ANUAL PRICE INCREASE (min)	2,3%	2,5%	-8,00%
k (max)	9,92%	9,55%	3,84%
RISK FREE (max)	3,71%	3,344%	10,94%
RISK PREMIUM (max)	6,35%	6%	5,83%
PRICE OF THE GALLON OF KEROSEN IN 2014 (max)	2,30 €	2,17 €	5,99%

Figure 5 Sensitivity analysis

Moreover, in the Figure 5 we can observe the maximum percentage of variation that our variables should have for the project in order to be viable. If we look at the critical variable for an airline, it will be the number of passengers, because if it decreases by 1.65% the project ceases to be viable.

7.4 SCENARIO ANALYSIS

We have conducted a scenario analysis using a "pessimistic" scenario, a "most likely" scenario, which would be the case of the classical scenario NPV fulfilled, and an "optimistic" scenario. We can see a theoretical explanation of this type of analysis in section 6.5.

In the pessimistic scenario we have taken into account that a gallon of kerosene increases by 20% due to a new tax on the fuel, getting the price to reach € 2.60 per gallon. We have also increased the price of the initial investment to € 60 million, thinking that by purchasing just 3 aircraft the company Boeing may not offer the usual price for Ryanair.

Finally, we have changed the number of passengers on 82,000 by destination, since we believe that this slight decrease can occur in a time when unemployment has not yet started to fall and, thus, the consumption decreases. Modifying these data we obtain an NPV of € -53,629,511, so if this scenario happens, the project should not be performed.

In the optimistic scenario we have assumed that the growth of travellers per year increases to 3.5%. As the growth in influx of passengers is difficult to predict, we believe that this growth can actually be obtained if the Spanish economy starts to grow from this year. If this growth is given, we also believe that the first year the number of passengers would increase to 100,000 passengers. At last, if this scenario happens, we would come to the conclusion that we would be in good times. So we would use the beta that occurred last year, since it does not take into account the period of 2006-2008, where the beta increased greatly due to the financial crisis which affected half the world. With this beta of 6.64%, the number of passengers and its growth we conclude that the project would be viable, obtaining an NPV € 231,810,329, much higher than the rest of scenarios in which we accepted the projects.

7.5 MONTE CARLO SIMULATION

We have performed Monte Carlo simulation, applying the system on the number of passengers. Concluding that the number of travellers expected by 2014 will be 87,241, and, when we compared it with the sensitivity analysis, we can see that the project will not be viable, even so, we have applied the NPV that the Monte Carlo method indicates and the result is € -12,535,612.

In addition, we have calculated the standard variation of our model that gives us 1,885. Applying this value, we can get a confidence interval which tells us the number of

passengers of our project, according to Monte Carlo system it will vary from 59,237 to 115,079 with 95% reliability.

7.6 DECISION TREES

Finally, in our practical application we have drawn a simple decision tree, using the parameters that the sensitivity analysis has given us:

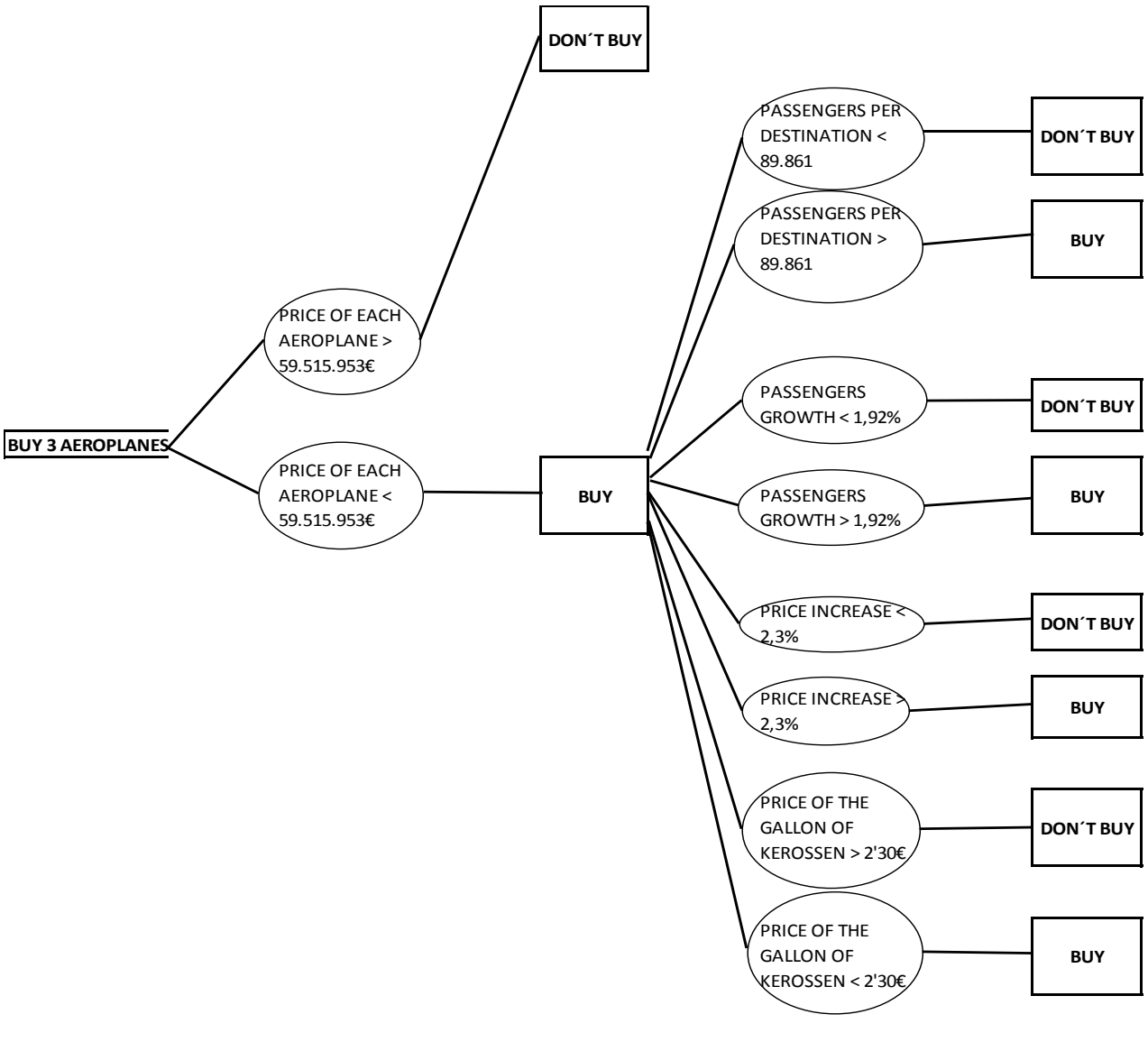

Figure 6 Decision tree

8. CONCLUSIONS

Conclusively, to finish our analysis of how to introduce risk in investment selection criteria, we will explain the conclusions we have reached.

The first conclusion that we have drawn and we consider important is that the variables used in the NPV criterion are the key to value the investment project. Therefore, our analysis of the investment project might not work at all if we do not achieve that the net cash flows forecast and the discount rate determination take more real and closer to the future realizations.

Thus, we have to consider many factors that influence the model variables to be able to make a realistic estimation of the cash flows and the capital cost. If we obtain that these are very similar to the data that will arise in the future, we can ensure that our project evaluation will be accurate and it can guide us whether it is worth to make an investment.

In addition, when we talk about the CAPM model, we can conclude the same. If we want to use the CAPM model to calculate the capital cost, we need to set some values that are closer to reality, particularly in the estimation of calculating the market beta, which is the more problematic part of the CAPM. Especially when trying to calculate it for a company that is not listed on a stock exchange, as it is difficult to find a company with similar features to use the data for the beta calculation.

In the input methods of risk, we consider that we will work with forecasts of the main variables. These are the net cash flows and the variables that defined them, such as the sales price, units sold, growth rates of the previous variables, evolution of fixed costs and variables, etc. We would like to highlight the great variety of ways in which we can introduce uncertainty using these forecasts.

Moreover, we would like to emphasize the problems that these methods can cause when using statistical criteria as, for example, some difficulties can arise when knowing the distribution functions that follow our variables. In addition, we may have some difficulties when assigning subjective probabilities to our analysis.

To do the work, we have relied on many works and authors, almost all of them use the models we have analyzed for introducing risk in investment selection criteria. As they say, we believe these models are very important to value investments with the highest possible reliability.

The methods of setting the discount rate and certainty equivalents are the simplest methods in terms of calculations. On the other hand, these methods can give us many difficulties in choosing the risk premium.

The behaviour method on the probability can be very useful to estimate the probability of occurrence of the facts that we are interested in learning. Therefore, we recommend this method to evaluate projects with uncertainty in the occurrence of various events, although we should accept their hypotheses, which may not be similar to reality. For example, the independence of net cash flows or certain distribution functions of the net cash flows.

The sensitivity analysis appears to be interesting because it is the appropriate manner to show how much the most important variables can vary to make the project viable.

Referring to the scenario analysis, we can do the same that we have done with the sensitivity analysis, but varying a set of variables at once, and therefore the possible relationships between them can be considered. Nevertheless, there is the problem that there is no possibility to show the endless scenarios that may exist.

In the end, we have done two different approximations: the Monte Carlo simulation, that analyses the endless scenarios but requires advanced knowledge of statistics; and the decision trees, that allow us to consider some additional aspects which are not considered in previous approximations, such as the possibility to expand or reduce our project as it is carried out, because it is especially relevant for investors.

Furthermore, we can conclude that our practical application shows us perfectly what we have explained in the work. Since we can observe a project in which we do not take into account the risk differs from one that considers the uncertainty. In fact, if we observe our feasibility study we see a change from a viable analysis in which we do not include the risk to a non-viable analysis when we take into account uncertainty.

Therefore, we can conclude that it is not feasible for an airline to open flyways from the Castellon airport if the assumptions we have reflected in our analysis are given. Since our assumptions may not be successful with the realization of all the proposed analysis (sensitivity, scenarios, distribution functions, etc.). In fact, what we have done is to identify and analyze the variables that can influence more on the results and determine the project risk.

Ultimately, our conclusion is that the financial director of a company must take into account non-typical factors in finance, in order to carry out reliably any of the models analysed. Some of these factors are: political and geographical factors, and features and information on the products to invest.

Consequently, the CFO should have an efficient connection with the other areas of a company. Thereby, the CFO will achieve that his forecasts get closer to reality and will

obtain selection criteria of investment projects more reliable, with which he will decide about what the appropriate investment for the company is.

Therefore, we can say that, no matter how experts we are in making selection criteria of investment projects, we will never be able to create a criterion without the support of the other members of a company. It is impossible to have knowledge of all the areas of a large company and of all types of companies in the market.

REFERENCES

ARTICLES AND MANUALS

- Aguer, M. (2004): *Decisiones de inversión en la empresa, un enfoque práctico.* Pirámide. Cap. 3-5.
- Boiten, S. (1994): *Administración financiera*. Ed. Limusa. Cap. 7.
- Brealey, R. A., Myers, S. C and Allen, F. (2006): *Principles of Corporate Finance.* Mc Graw-Hill (8th Editon).
- Damodaran, A. (1999): *Estimating Risk Parameters.* New York University, faculty digital archive. Downloaded from: https://archive.nyu.edu/bitstream/2451/26789/2/S-CDM-99-02.pdf
- Fernández, P. (2013): *La prima de riesgo del Mercado: histórica, esperada, exigida e implícita.* EISE Business School.
- Fernández, P., Aguirremalloa, J. and Corres, Luis. (2011): *Prima de riesgo del Mercado utilizada para España: Encuesta 2011*. IESE Business School.
- Ferrando, M. and Gómez, A.R. (2005): *Teoría de la financiación I. Modelos CAPM, APT y aplicaciones.* Pirámide. Cap. 2 and 7.
- Graham, J. and Harvey, C. (2002): *How do CFOs make capital budgeting and capital structure decisions?*. Journal of Applied Corporate Finance 15, pp.8-23
- Kelleher, J.C. and MacCormack, J.J. (2005): *Internal rate of return: A cautionary tale.* The McKinsey Quarterly 2005 special edition: Value and performance, pp. 71-75
- Mascareñas, J. (2001): *El coste de capital*. Universidad Complutense de Madrid.
- Pérez, C., De La Torre, A. and Jimenez, J.L. (2009): *Dirección financiera de la empresa: teoría y práctica.* Pirámide. Cap.3.
- Puértolas, F. and Ruiz, S. (2010): *Análisis de inversiones: Teoría y Práctica en Excel.* Delta Publicaciones. Cap.6
- Sapag, N. (2007): *Proyectos de inversión. Formulación y evaluación.* Pearson-Prentice Hall. Cap. 7-10.
- Schneider, E. (1970): *Teoría de la inversión*. Buenos Aires: El Ateneo.

DATABASE AND WEBSITES

- Aena aeropuertos [online website]. Available at: www.aena-aeropuertos.es. [Accessed: 15/03/2014]
- Boeing [online website]. Available at: www.boeing.es. [Accessed: 19/03/2014]
- Instituto Nacional de Estadística [online webside]. Available at: www.ine.es. [Accessed: 15/03/2014]

- IndexMundi [Web online]. Available at: www.indexmundi.com .[Accessed 15/03/2014]
- Ryanair [online webside]. Available at: www.ryanair.com. [Accessed: 18/03/2014]