TECHNO ECONOMY LABORATORY

10A MODULE

FEASIBILITY AND SENSITIVITY ANALYSIS

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LABWORK OBJECTIVES

1. Students are able to understand the financial feasibility of a company.
2. Students are able to process financial data using financial aspects methods of feasibility study.
3. Students are able to do evaluation and able to understand the calculation of feasibility study.
4. Students are able to analyze the sensitivity of a company.

PRACTICUM OUTLINE
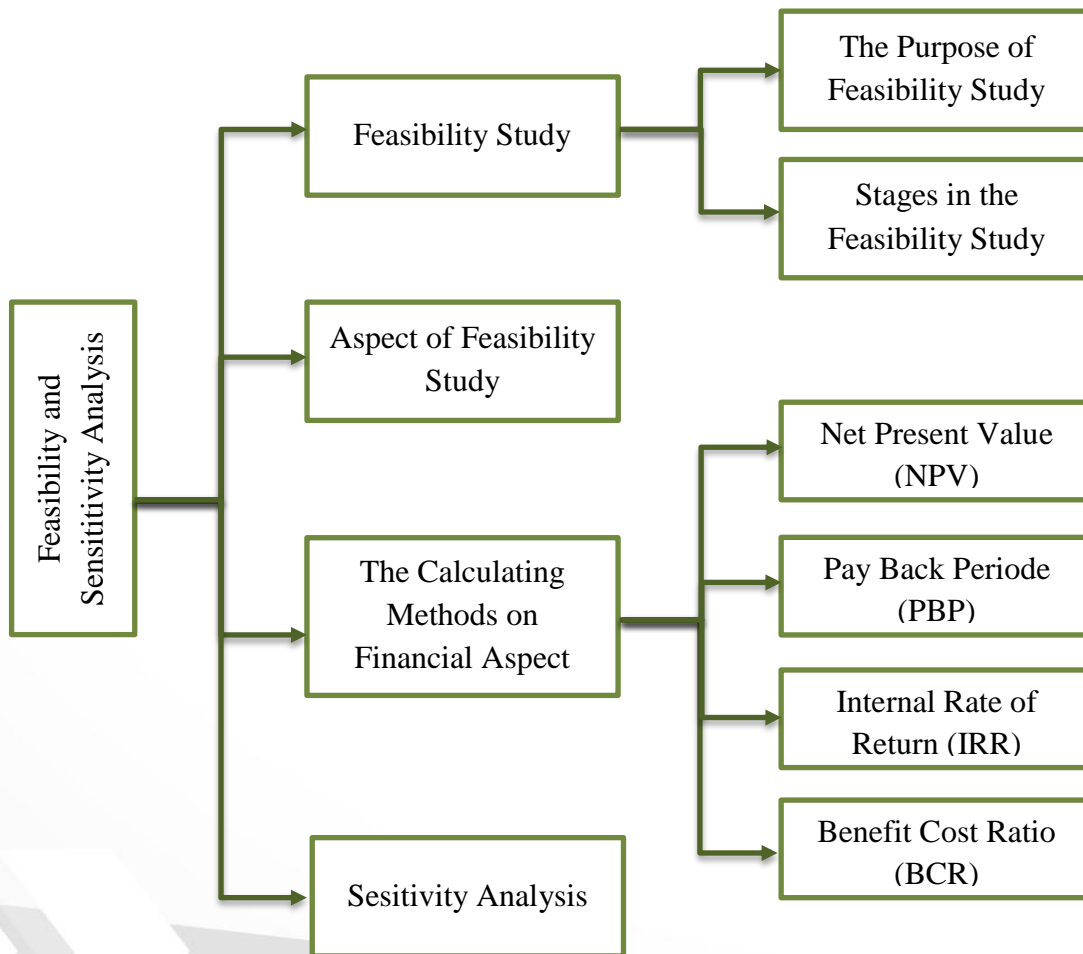
THEORETICAL EXPLANATION

10.1. Feasibility Study

Feasibility Study is a study of the feasibility a project or business that can be an investment to be carried out (Umar, 2001). Determination of whether or not a business is feasible is based on an estimate that the project or investment will or may not produce a reasonable profit if it has been operationalized. According to Kasmir and Jakfar (2013 ed, rev p. 7), the study or business that is being carried out to determine whether the business is feasible or not. Feasibility study is very necessary in the investment decision-making process because it can provide an overview of the prospect of the level of benefits received from the business to be run. According to Umar (2003), in a business feasibility study there are several parties who need a business feasibility study report, including:

Table 10. 1 Parties Who Need a Business Feasibility

Part	Description
Creditors	Creditors need a business feasibility study report used to conduct an assessment before deciding to give credit.
Company Management	The management needs to study the feasibility study, for example in terms of funding, namely how much is the allocation of their own capital, funding plans from investors and creditors.
Government and Society	The preparation of a business feasibility study needs to pay attention to policies that have been set by the government because the government can directly or indirectly influence company policy.
Economic Development Goals	In preparation of a business feasibility study it is also necessary to analyze the benefits and the costs incurred by the project on the national economy.

10.1.1. The Purpose of Feasibility Study

Business feasibility studies are carried out so that the projects that are carried out will not be in vain or in other words do not waste time, energy, thoughts for free and do not cause unnecessary problems in the future. The objectives of the business feasibility study are: (Kasmir and Jakfar, 2013 ed, rev p.12-14).

Table 10. 2 The Purpose of Feasibility Study

Purpose	Description
Avoid the risk of loss	The function of a feasibility study is to minimize undesirable risks, both those that can be controlled and those that cannot be controlled.
Simplify planning	If you can predict what will happen in the future, it will make it easier to do the planning and what things need to be planned.
Facilitate the implementation of work	The existence of guidelines that are arranged systematically, can facilitate the implementation of work on target and in accordance with the plans that have been prepared.
Supervision	This supervision needs to be carried out in accordance with the guidelines that have been prepared in order to make it easier to identify plans that have deviated.
Control	The purpose of control is to control the implementation so that deviations do not occur and real results are achieved, so that ultimately the company's goals will be achieved.

10.1.2. Stages in the Feasibility Study

According to Kasmir and Jakfar (2013 ed, rev p.18), the stages that need to be carried out so that the business feasibility study can be carried out properly and the study

objectives are achieved. Stages of the feasibility study are carried out to facilitate the implementation and accuracy of the assessment. The steps in conducting a feasibility study are:

Table 10. 3 Stages in the Feasibility Study

Stage	Description
Data and information collection	Gather data and information as needed as completely as possible, both qualitative and quantitative from reliable sources.
Perform data processing	Data processing is carried out correctly and accurately by using methods and measurements that are commonly used in business.
Data analysis	Data analysis is performed in order to determine the eligibility criteria of an aspect. Business eligibility is determined by criteria that have fulfilled the requirements according to criteria that are appropriate to be used.
Make decisions	If it has been measured with certain criteria and the measurement results have been obtained, then the next step is to take a decision on these results.
Provide recommendations	The last step is to provide recommendations to certain parties related to the study report that has been made and suggestions if needed.

10.2. Aspects of Feasibility Study

According to (Kasmir and Jakfar, 2007) the feasibility study requires aspects that support the feasibility of a business by prioritizing aspects of the feasibility study into 7 priorities as follows.
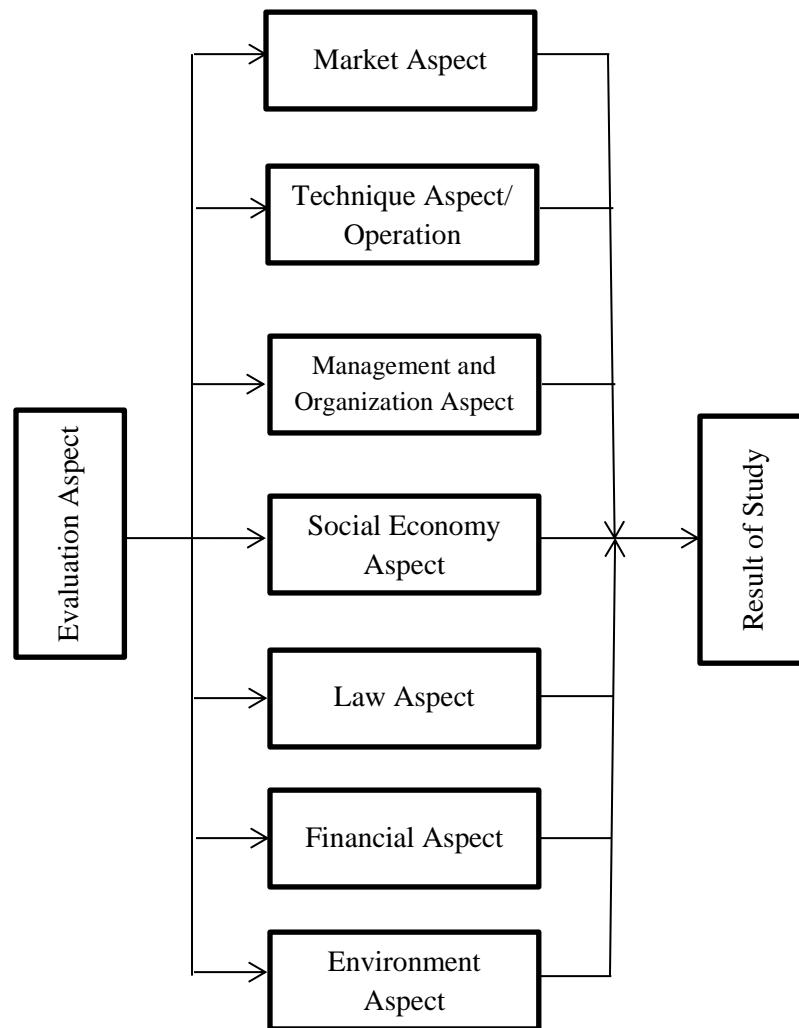
Figure 10. 1 Aspect of Feasibility Analysis (Kasmir dan Jakfar, ed rev. 2013)

10.3. The Calculation Methods on Financial Aspects

10.3.1. NPV

NPV (Net Present Value) analysis is used to determine the present equivalent value of future fund flows from a projected investment plan (Hidayati & Warnana, 2017). So the flow of funds in the future can be estimated and calculated from the current value with the interest rate chosen according to the investment plan. The net present value can be a parameter for a feasibility analysis for the company. Here is the meaning of NPV calculation for investment decisions that will be made:

Table 10. 4 Decision of NPV

NPV > 0	The investment made provides benefits for the company so that the investment is feasible to run.
NPV = 0	It needs to be reviewed because the company **does not get value** for a certain period.
NPV < 0	The investment made causes losses for the company so the investment is **not feasible to run**.

Calculate the Net Present Value according to the formula as follows.

$$\sum_{t=1}^{n} = \frac{(Bt - Ct)}{(1 + i)^t}$$

Or

$$NPV = Present\ Worth\ Income - Present\ Worth\ Outcome$$

Notes :

    t   = Investment age
    i   = discount rate to use
    Bt   = Benefit (benefit investment) on year t
    Ct   = Cost (investment cost) on year t

10.3.2. PBP

Payback period is the period required for the profit or other benefits of an investment to equal the cost of the investment (Newnan, et al. 2012). According to (Ferris, et al. 2006) Payback Period is period of time required to recoup the funds expended in an investment. The payback period is the time required for an investment to reach break-even. How to calculate the payback period is as follows.

Pay Back Period = (Investment Value / Net Cash In) x 1

Or

Payback Periode = n + [(0-C1) / (C2-C1)]

Notes :

        n   = Negatif year

        C1   = Cash flow before return capital

        C2   = Cash flow after return capital

10.3.3. IRR

According to Chaerul D. Djakman (2000: p173), IRR is the capital interest rate that reflects the level of control that balances the current input value with the current output. A project will be considered feasible, if the IRR value is greater than the MARR (Minimum Attractive Rate of Return). MARR is generally determined to be the same as bank interest. According to Kasmir and Jakfar (2012; p108), IRR requirements can be concluded as follows:

> If IRR > MARR, then business or investment is accepted
>
> If IRR < MARR, then business or investment is rejected

Formula IRR:

$$IRR = if(x) = i_1 + \frac{NPV_1}{NPV_1 - NPV_2} \times (i_2 - i_1)$$

Notes:

i_1 = Interest rate of NPV_1

i_2 = Interest rate of NPV_2

NPV_1 = The result of calculation of positive NPV1 with interest rate i_1

NPV_2 = The result of calculation of positive NPV1 with interest rate i_2

10.3.4. BCR

Benefit Cost Ratio (BCR) is a method used for the initial stage of investment planning evaluation as an additional analysis of the validation of the evaluation results (Pavelis, 1971). There are several variations to calculating the benfit-cost ratio. However, the fundamental approach must be the same. All estimated costs and benefits must be converted to monetary units in general (PW, AW, or FW) at the interest rate (Blank & Tarquin, 2017). So it can be said that BCR is a comparison between positive total PVCF (Present Value Cash flow) compared with negative total PVCF (Present Value Cash flow). If the total positive PVCF is greater than the negative one, it means that the project provides a greater profit compared to the cost (Newnan, et al., 2012).

Formulasi BCR

There are three equivalents that can be used (Newnan, et al., 2012):

- PW (Present Worth) analysis
- AW (Annual Worth) analysis
- FW (Future Worth) analysis

$$\frac{B}{C} = \frac{AW\ Benefit}{AW\ Cost} = \frac{PW\ Benefit}{PW\ Cost} = \frac{FW\ Benefit}{FW\ Cost}$$

After doing the calculations as above, the benefit-cost ratio has two criteria. The following are the criteria for benefit-cost ratio as follows.

Table 10. 5 Criteria of Benefit Cost Ratio

$\frac{B}{C} \geq 1$	Investment accepted
$\frac{B}{C} < 1$	Investment rejected

10.4. Sensitivity Analysis

Sensitivity analysis is used in consideration of sensitivity measurement of effectiveness due to changes in one or more input parameters (Sullivan, et al 1996). Sensitivity analysis is used when uncertainty conditions occur in one or more input parameters. Sensitivity analysis is intended to support decision makers with specific information such as the behavior of measuring economic effectiveness against errors in estimating the value of input parameters and knowing the potential side of various alternative economic investments.

The use of sensitivity analysis is part of the decision making process. According to Bergonovo & Peccati (2006) there are three types of use of sensitivity analysis as follows.

Table 10. 6 Types of Use Sensitivity Analysis

Types	Explanation
Sensitivity Analysis as validitaion	From the results of a simulation model or commonly called a correctness test. Changes to the output which follows changes to the input are used to correct the consistency of the model that was created.
Sensitivity Analysis as Realibility	Then sensitivity analysis is used as a supporter of risk analysis or so-called stress test. Changes in the output model are used to retain changes in various assumptions.
In the second type of usage	Usefulness of sensitivity analysis to assess the importance of an input parameter, where the parameter affects the decision.

Example of a case study for applying NPV and Payback Period :

Investment = 80.000.000

Return of 10%

Tahun	Arus Kas		Kumulatif		Tingkat Bunga (i=10%)	Present Value	
a	b				c	d=b x c	
0	-Rp	80,000,000					
1	Rp	30,000,000	Rp	30,000,000	0.90909	Rp	27,272,727
2	Rp	30,000,000	Rp	60,000,000	0.82645	Rp	24,793,388
3	Rp	30,000,000	Rp	90,000,000	0.75131	Rp	22,539,444
4	Rp	30,000,000	Rp	120,000,000	0.68301	Rp	20,490,404
5	Rp	30,000,000	Rp	150,000,000	0.62092	Rp	18,627,640
6	Rp	30,000,000	Rp	180,000,000	0.56447	Rp	16,934,218
Total Present Value						Rp	130,657,821
Net Present Value						**Rp**	**50,657,821**
Payback Periode							**2.67**

- **NPV**

    NPV $= ((b_1 \times c_1) + (b_2 \times c_2) + ... + (b_n \times c_n)) - \text{Investment}$

    $= ((30.000.000 \times 0.90909) + (30.000.000 \times 0.82645) + ...(b_n \times c_n)) - 80.000.000$

    $=$ Rp 50.657.821

- **Payback Period**

    Payback Period $= n + (I - Z_1) / (Z_2 - Z_1) \times 1$ Tahun

    $= 2 + (80.000.000 - 60.000.000) / (90.000.000 - 60.000.000) \times 1$ Tahun

    $= 2.67$

Notes:

I   = Investment

n   = Negative year (year before return capital)

Z_1 = Cash flow before return capital

Z_2 = Cash flow after return capital

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