**Business Analytics Final Project**

The data envelopment analysis is used to analyze firm’s financial statements and determine a relative financial strength indicator. The DEA approach is studied relating to the 230 US firms to determine optimized RFSI indicators for stock selection. The fundamental analysis about the Investment worthiness by looking at its business or financial level. RFSI [Relative financial strength indicator] is based on studying the correlation between the DEA based score of financial strength and stock market performance. Fundamental analysis is the process of evaluating a public firm for the investment worthiness at the basic or fundamental level.

Fundamental analysis includes analyzing stresses the underlying factors of supply and demand.

The main goal is to predict the future security price and then predict to design equity portfolios.

The traditional programming models are ineffective for portfolio selection. In such cases, data envelopment analysis is used. The important aspect of management is that best set of projects are selected from competing proposals. The Data envelopment analysis is used to evaluate large sets of competing projects. The data envelopment analysis has become the popular area in the operations research. DEA measures the efficiency of the decision making units which can represent the organizations. DEA allows to rank projects from most to least efficient. When two or more projects enter the portfolio we have to compare the respective inputs and outputs with every other possible portfolio. Data envelopment analysis is used for the analysis of entities called Decision making units. DEA provides a measure to compare the firms performance with the other firms. DEA is also used to compare its efficiency overtime.

When the inputs and outputs are more, the PCA is applied for data reduction. DEA measures the relative efficiency of decision making units in organizations such as banks and dental services. DEA and factor analysis has a strong correlation and is used to evaluate efficiency.

DEA is an useful technique for measuring the efficiency of funds and is further developed in operations research. The decision making problems are solved by the Data envelopment analysis. The choice of output variables is important which uses DEA on portfolio analysis.

The undesirable outcomes have been included in the set of input variables. Input variables are checked for volatility risk. The return measures are used as output variables and risk measures are used as input variables. The hedge funds returns are expressed net of such costs. The efficient portfolios are similar to the production frontier. It is a delicate task to measure the risk, return or other performance indicators. The relation between the input and output variables is the first criterion. The framework under which portfolios are studied should be handled with care. The second criterion becomes useless since the first criterion has been successfully applied. The explanatory power of the input and output measures in assets scores relates to the third criterion. The input and output variables should be selected based on the technology. It assumes a relationship of the production kind between risk and return. The level of risk is always to be minimized. An Intent to propose an approach should get rid of monotonicity approach. The minimization of risks and their assimilation to inputs is studied.

The maximization of benefit is done. The risk seeking behaviors should neither be a prior and should not prevent taking them into consideration. The idea of benchmarking is to evaluate investment strategies relative to each other. The factors depend on the decision makers on how to measure financial performance. We have to take the viewpoint of the investor based on theoretical decision making frameworks. Due to the absence of the production process, under the DEA benchmark process the notions of inputs and outputs don’t really matter. Risk measures have always been minimized, studying the financial assets. The unique distribution of returns is characterized by the second order risk. Mean return and risk measure can be derived from the distribution of return. The return is itself the initial amount in the portfolio of finances. The skewness and kurtosis which are the higher moments of distribution are considered as outputs. The time series of returns or prices which are the measures are considered as outputs. The argument is put forward to support our choice of treating risk measures as output variables. The initial amount could generate no return but the initial requirements are met. The shadow prices of input and output would then reveal the investors preferences. The differentiation is made between the bad outputs and good outputs. Shadow prices are negative for undesirable ones positive for desirable outputs. The undesirable byproducts are considered as outputs. Both negative and positive shadow prices are applied on the byproducts. In the production theory the bad outputs are referred by the joint outputs.

All the byproducts in agricultural productions are the unintended outputs. The byproducts could be recycled and used as inputs. The investors will consider the potential impact on the final return. Risk and return are counted and considered as costs or benefits. All DMU’s operate in a similar environments, since environment impacts their performance.

When organizations do not have well defined goals, mixed integer programming models are used for portfolio selection. In such cases Data envelopment analysis is used to build project portfolios. The new DEA-MIP model is used to meet the organizational goals. The second stage DEA is used for calculating the most efficient portfolio. A best set of projects are selected from the competing ones. To evaluate large sets of projects the Data envelopment analysis is used. The DEA has become a popular area in the operations research. The relative efficiency of the decision making units is measured by the DEA. All DMU’s need not have the same set of units of measurement. DEA is capable of discriminating among the inefficient units. The project efficiency scores are not used in the selection of the most useful portfolios. The inputs and outputs of one portfolio should be compared with the inputs and outputs of other portfolios.

Then we can determine the most efficient portfolio. We seek for the solution which places a low burden on stakeholders. These approaches need to have value judgments to create optimal portfolios.

The main issue with the investors is that they have to find the portfolio which would give them the maximum return on investment with the highest returns for the given level of risk.

DEA is an area which combines operation research, Mathematics and economy.

DEA is used to solve various decision making problems. The DEA methodology to solve a given group of Decision making units uses mathematical programming to process empirical data.

The models can be used as input or output to maximize their outputs and minimize the inputs.

According to the purpose of analysis output oriented models were chosen.

The monthly returns were compared to the market portfolio to evaluate the performance of the DEA portfolios. The DEA models are used to find the efficient stocks in longer time.

In the financial engineering the research of funds has become an important topic. The funds are evaluated by the Data envelopment analysis.

The DEA directly impacts the stock Allocation. By adding several factors such as borrowing, the portfolio allocation management is improved. The project proposal is based on the evaluation of the management. The quantitative measures are hard to estimate. Data envelopment analysis and balanced score card are the two methodologies on which the difficulties of the project are analyzed. DEA in Mathematical programming is used to select the best one. DEA is used in the evaluations of past accomplishments and in planning for future events. The DEA model offers the advantage of dealing with multiple inputs and multiple outputs.

The amount produced for a specified input is given by the production function. The maximum possible outputs are achieved by the DMU’s. DEA started in 1978, when fractional linear measure was converted into linear programming format. DMU’s are assessed based on multiple inputs and multiple outputs. The ratio of total output to the total weighted input is Relative efficiency. The envelope surface defined by the hyperplanes is the determination of DEA. The differentiability is increased by decreasing the DMU’s.

By reducing the inputs and outputs we can reduce the problem of dimensionality. This results in the reduction of the efficient units. The inefficient units are then removed counting the DMU’s. One of the aim is to close the gap between the DEA and the classical statistical approaches. The extension of the regression analysis is the canonical correlation. DEA is used in conjunction with fuzzy logic to fully rank the efficient DMU’s. The DMU”s are ranked differently by all the three statistical techniques. There is exponential rate of growth in the field of the Data envelopment analysis. The DMU’s are both ranked efficient and inefficient by the differential capabilities of DEA. By evaluating the decision making units, we get a balanced view of them.

To evaluate the performance of Decision making units, the data envelopment analysis is a data oriented approach. In the recent years, many applications of DEA have come which evaluate different kinds of entities in different fields. DEA has opened up possibilities to study the relations between multiple inputs and multiple outputs involved in DMU’s. DEA is also used to supply insights into already evaluated methods. The inefficiencies in firms have been identified

by the benchmarking practices of DEA. The use of DEA has suggested reconsideration of previous studies, which were used in banks that were studied by DEA. Since the DEA has been introduced in 1978, researchers have found it excellent for performance evaluations.

DEA is a mathematical programming model used to study observational data for empirical

Estimates. Most of the research in DEA is now available and is incorporated in computer codes that use DEA. The oppurtunities for collaboration between analysts and decision makers is provided by the DEA. The point is to develop approaches to deal with applications without requiring large number of assumptions. The categorical variables are added to obtain refined evaluations and insights. In the DEA models, the ratio of virtual output/virtual input is maximized to determine the weight using Linear programming.

**References:**

1.Greene, W. H. (2008). The econometric approach to efficiency analysis. *The measurement of productive efficiency and productivity growth*, *1*, 92-250.

2. one, K. (2001). A slacks-based measure of efficiency in data envelopment analysis. *European journal of operational research*, *130*(3), 498-509.

3. Adler, N., Friedman, L., & Sinuany-Stern, Z. (2002). Review of ranking methods in the data envelopment analysis context. *European journal of operational research*, *140*(2), 249-265.

4. Weber, C. A. (1996). A data envelopment analysis approach to measuring vendor performance. *Supply Chain Management: An International Journal*, *1*(1), 28-39.