Model Proposal

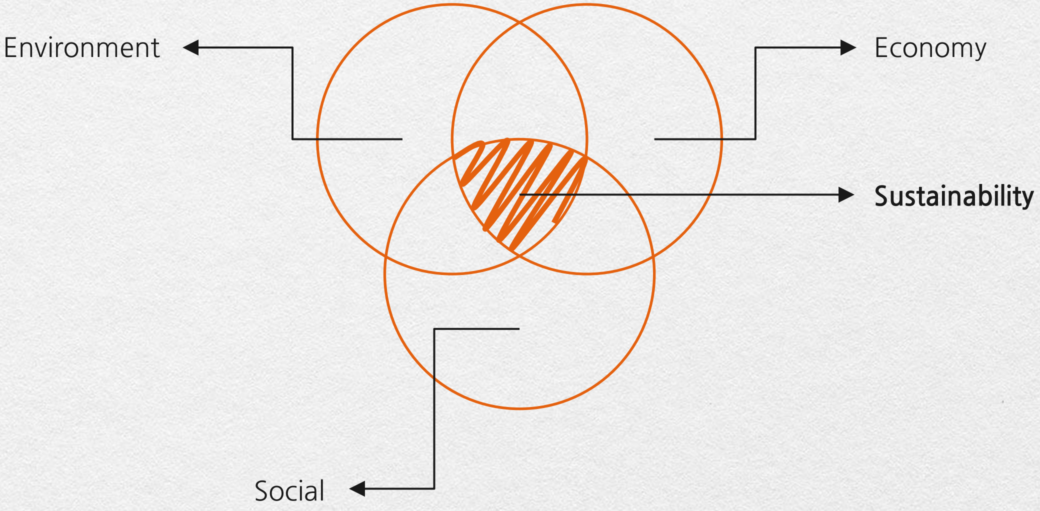
Carbon *footprint* of companies

A multi dimensional approach to analytics

Contents of our presentation

Sustainability and One Point Five degree

Sustainable financing is achieved when all **3 three** pillars of sustainability are taken into consideration.

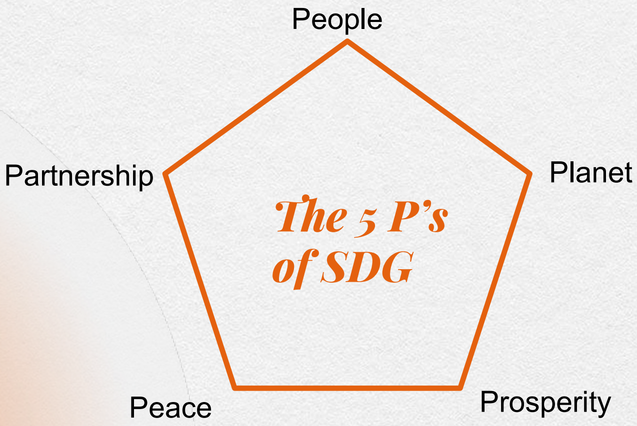


Intergovernmental Panel on Climate Change (IPCC) have assessed global warming control by 1.5 degrees, limiting our carbon footprints through industries and human involvement.

Will you consider a hand woven organically grown shirt sustainable, if child labor exploitation was involved?

Our emphasis is equivalate weightage into all pillars of sustainability.

Sustainability and One Point Five degree



The 2030 Agenda for Sustainable Development provides a shared blueprint for peace and prosperity for people and planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), **an urgent call to action for all countries, in a global partnership.**

Why invest in green future?

Private finance reached **USD 326 billion** on average annually in 2017/2018 account for the majority of climate finance, at around **56%**. Of this quantity, 85% flowed to renewable energy, **14%** to low-carbon transport, and under **1%** to all other subsectors

- *The indifferent curve for green investment **is 3 dimensional.***
- *The curve is no longer a line but a **plane**.*
- *Investments reaps **greater returns** when greater green investments invested.*

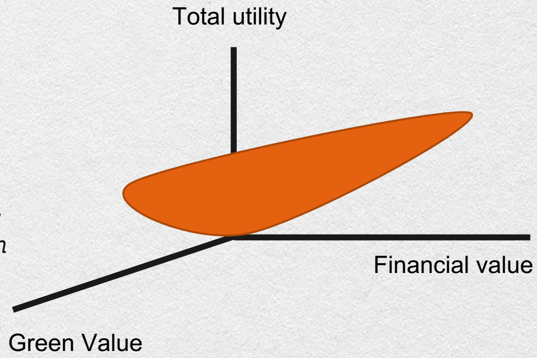
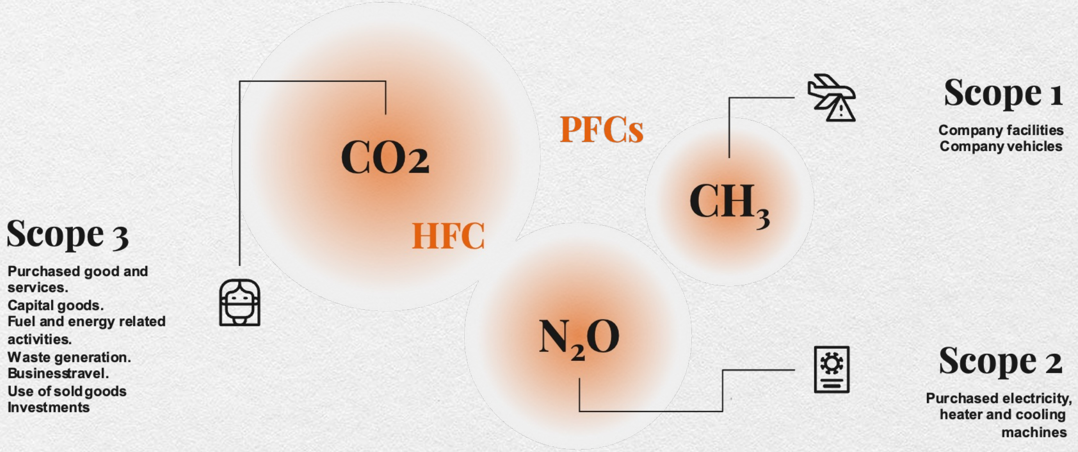


Fig: Indifferent curve for green investment

The Model

- A company's greenhouse gas emissions are classified into **three scopes**. Scope 1 and 2 are **mandatory** to report.
- Scope 3 is voluntary and the hardest to monitor.
- companies succeeding in reporting all three scopes will gain a sustainable competitive advantage.



The Model

Developing the model

- Scopes of the SDG's can be categorized into inputs, transactions and demands for the company. (*now referred as* ***parameters***)
- If company provides (or is gathered) all scope information. We can come up with comprehensive stand of the company's parameters.
- Each of the parameters can be normalised into one scale.
- Scale division is a multiple of 10 (chosen)

Distribution

Interindustry transactions

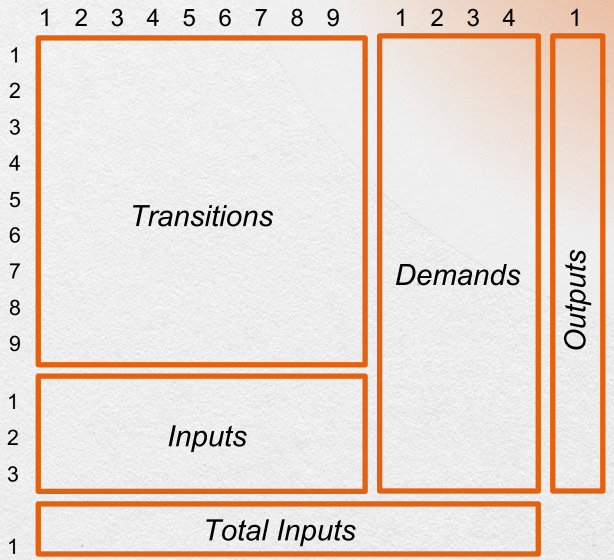
1. Agriculture, non fuel, mining and construction
2. Manufacturing (Excluding petroleum refining)
3. Transportation
4. Communication, trade and services
5. Coal mining
6. Crude petroleum and natural gas
7. Petroleum refining
8. Electric utility
9. Gas utility

Outputs

1. Personal consumption expenditures
2. Gross private domestic investment
3. Government purchase of goods and services
4. Exports

Inputs

1. Import
2. Capital services
3. Labour services



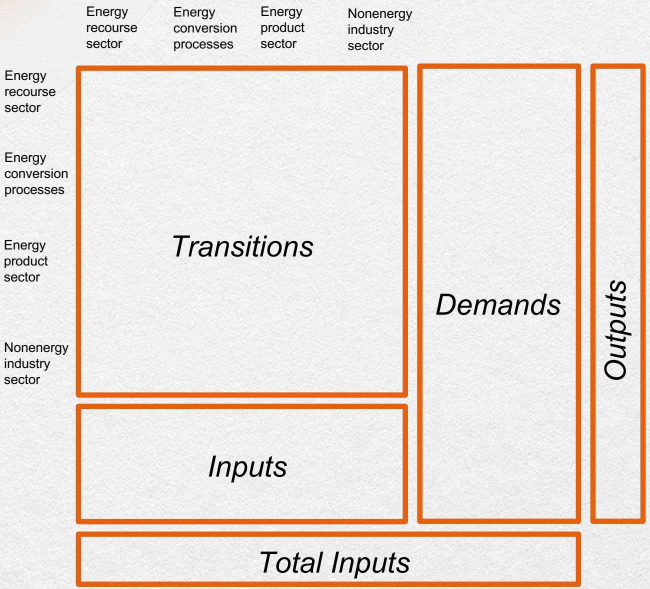
Division of parameters according to Kenneth C. Hoffman Dale W. Jorgenson

Et al. Economic and technological models for evaluation of energy policy

The Model

Clubbing the scope and parameters

- We attempt to merge the parameters and scope.
- This helps in classification of the parameters.



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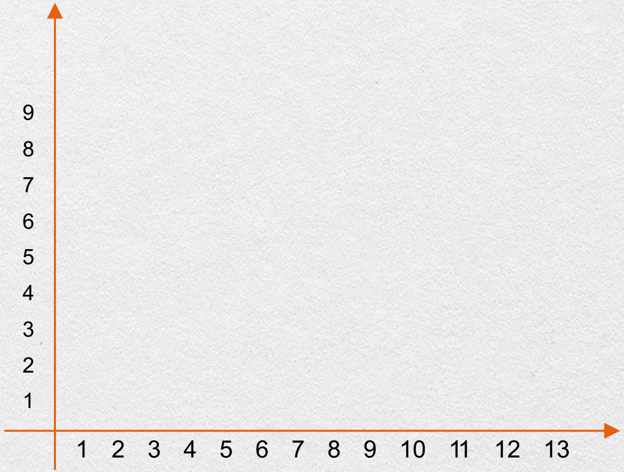

Division of parameters according to Kenneth C. Hoffman
Dale W. Jorgenson

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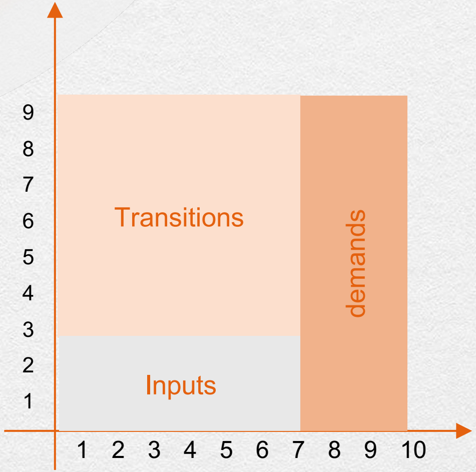
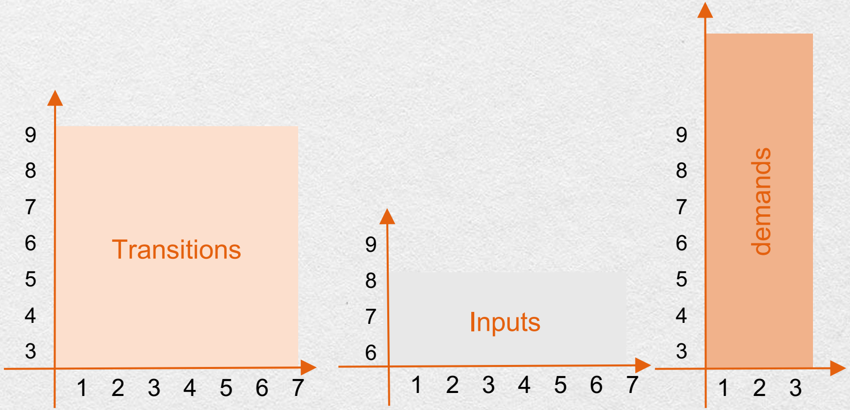
The Model

- The amalgamated scale and scope parameters are clubbed into one graph.
- Each of the factors - (transactions, inputs and outputs) have scales within.
- Now each of the normalised parameters are plotted.





The Model

Evaluation *Scheme*

1

Data plotting

Each of the scope released/
acquired data is plotted

2

Regression

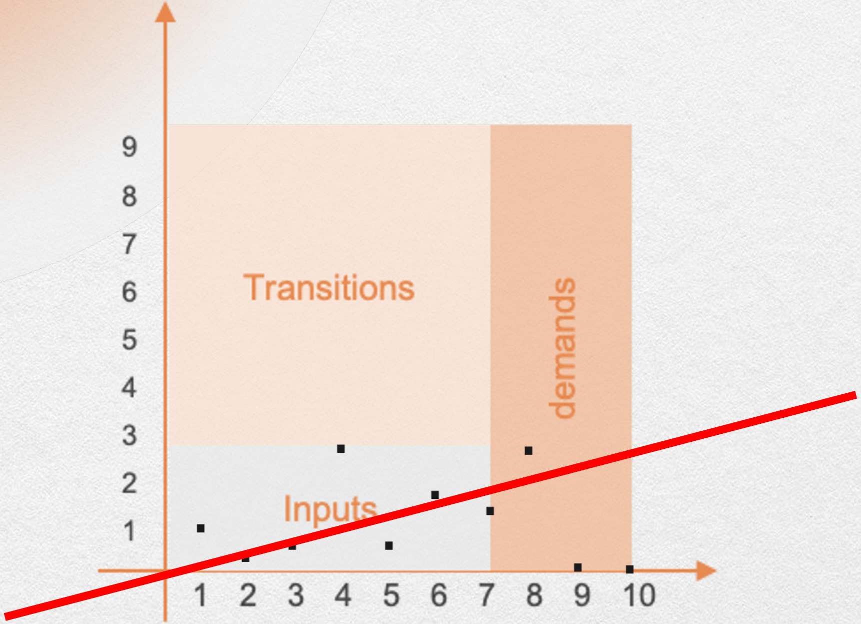
A linear regression is plotted
out of the points

3

Analysis

The slope and intersection of
the line helps us grade the
model

The Model



Company A : With no transitions involved.

Understanding the graph

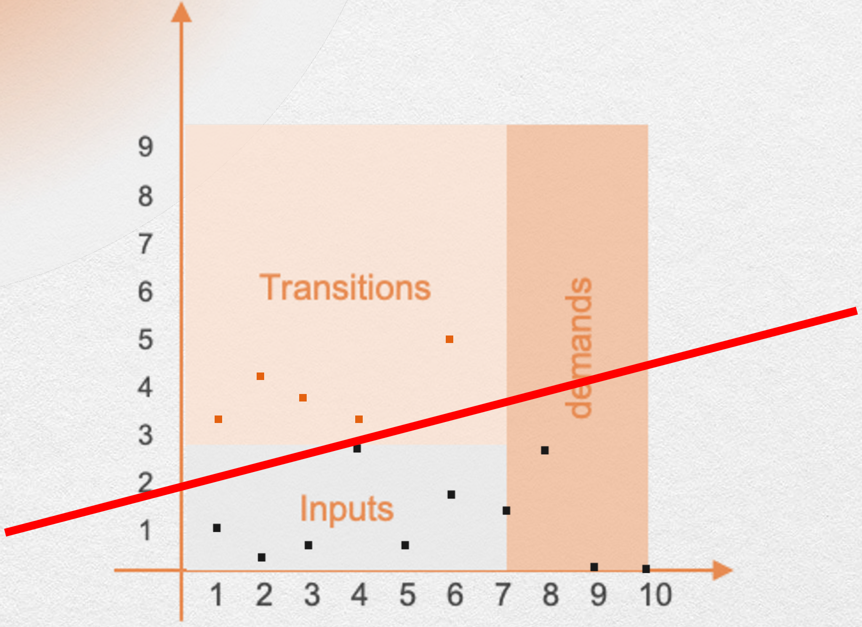
- The **black dots** are the value of each of the parameters (*defined in previous slides*)
- The (red) line is the **regression line** of all the plotted points in the model.
- The red line has a **slope and a y-axis intersection**.
- Our model is based on the value of these value - **(m)y,** *where m = slope and y is the intersection.*

- (**NOTE**) each factor : Transaction, inputs and demands are separately filled and merged into this model.

But Why?

- Inputs and transitions are on the same x-axis, therefore a sum of both these factors are considered while calculating regression.
- Demands are independent of other factors and have a larger definition value as demands are mandatory business factor.
- (m)y is fixed and is **independent of scope**

The Model



Company B : With transitions involved.

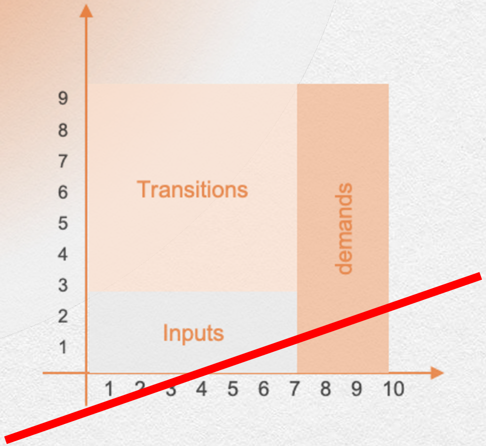
Understanding the graph

- As transition factor has values the regression line is **shifted upward.**
- Hence changing the value of (m)y.
- Therefore there are only a range of values of (m)y that represent acceptable carbon footprint.
- As soon as the value of (m)y goes out of the range. **The line will indicate brown exposure**. As all the elements of brown exposure are in transition factor.

Understanding the range

- Range : for all m less than equal to 0 represents none parameters were active in transitions factor.
- y ranges from negative integers to max(input)

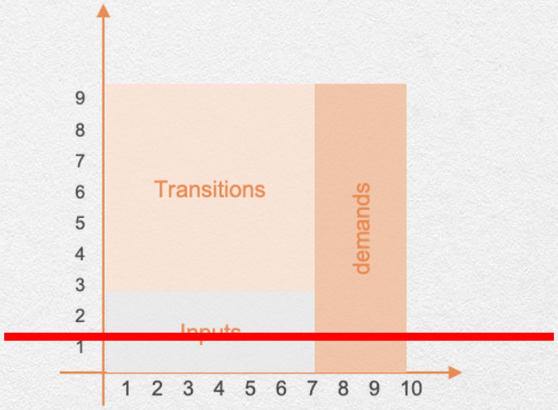
The Model



Company 1

The red line is a upward line with a positive slope and negative y intersection.
It implies that it has **acceptable** carbon usage for demand and inputs and no brown exposure.

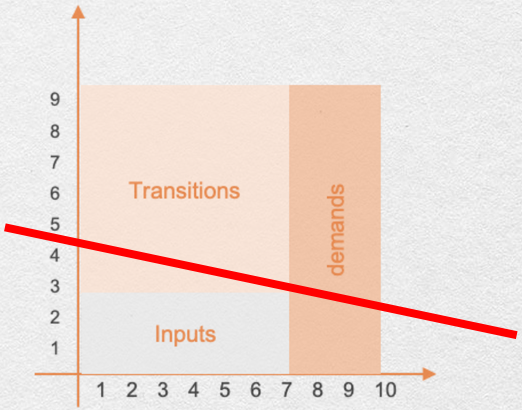
(m)y	(1.2)-3



Company 2

The red line is almost parallel line to x-axis, slope is 0 and a positive y intersection.
It implies the input and demands have followed a regression which nullifies each other and represents zero brown exposure.

(m)y	(0)1.2



Company 3

The red line is has a negative slope and a positive y intersection.
It implies that the transition's parameters are active and infusing the line. This represent brown exposure

(m)y	(-2)4.5

Pilpulist

Dynamic

The (m)y model explains more than simply risky or good

Alert

The model alerts if the company uses brown exposure

Model's *services*

Adaptable

The (m)y can be converted to a scale that's says if the line is risky or good.

Versatile

The model can be used to evaluate individual scopes too.

Pilpulist

(m)y model

(m)y

- Alerts *brown exposure*.
- Determines the degree of carbon usage
- Determines carbon consciousness of companies

- Quantitively determination of carbon footprint.
- Scales the magnitude of brown expose

Caviar

Companies spending and buying equal carbon consciousness will produce a (m)y of (0)1. A flat line.

Appendix

Stright line

A line is a one-dimensional figure, having only length and no width. A line is created from a collection of points that can be extended indefinitely in opposing directions. A two-dimensional plane's two points serve as its determining factors. The two points which lie on the same line are said to be collinear points.

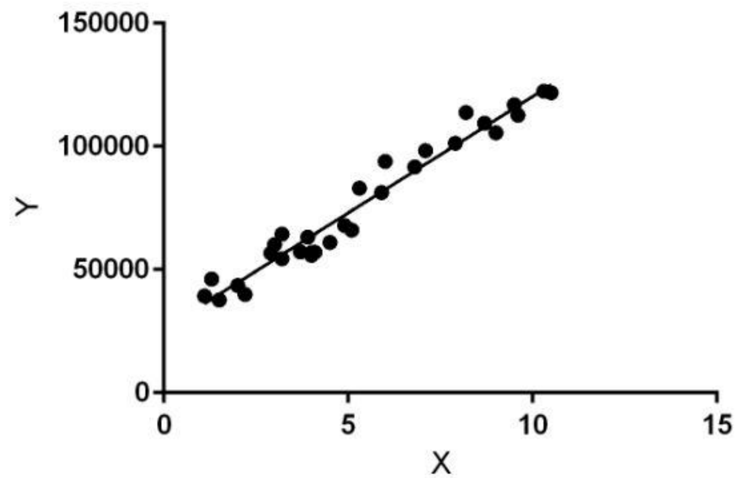
Different types of lines, including horizontal, vertical, parallel, and perpendicular ones, can be found in geometry. With regard to the creation of various polygonal shapes, these lines are crucial. For instance, four lines of equal length form a square, whereas three lines joined end to end form a triangle.

The equation of a line is found using the slope-intercept form of a straight line. For the slope-intercept formula, we need to know the line's slope and the point at which the line crosses the y-axis. Let's take a look at a straight line with slope "m" and y-intercept "b". You can write y = mx + b as the slope-intercept form equation for a straight line with slope "m" and "b" as the y-intercept.

$$y = mx + b$$

Linear regression

Linear Regression is a machine learning algorithm based on **supervised learning**. It performs a **regression task**. Regression models a target prediction value based on independent variables. It is mostly used for finding out the relationship between variables and forecasting. Different regression models differ based on – the kind of relationship between dependent and independent variables they are considering, and the number of independent variables getting used.



Linear regression performs the task to predict a dependent variable value (y) based on a given independent variable (x). So, this regression technique finds out a linear relationship between x (input) and y(output). Hence, the name is Linear Regression.

In the figure above, X (input) is the work experience and Y (output) is the salary of a person. The regression line is the best fit line for our model.

Hypothesis function for Linear Regression :

$$y = \theta_1 + \theta_2 . x$$

While training the model we are given :

x: input training data (univariate – one input variable(parameter))

y: labels to data (supervised learning)

When training the model – it fits the best line to predict the value of y for a given value of x. The model gets the best regression fit line by finding the best θ1 and θ2 values.

θ1: intercept

θ2: coefficient of x

Once we find the best θ1 and θ2 values, we get the best fit line. So when we are finally using our model for prediction, it will predict the value of y for the input value of x.

How to update θ1 and θ2 values to get the best fit line ?

Cost Function (J):

By achieving the best-fit regression line, the model aims to predict y value such that the error difference between predicted value and true value is minimum. So, it is very important to update the θ1 and θ2 values, to reach the best value that minimize the error between predicted y value (pred) and true y value (y).

$$minimize \frac{1}{n} \sum_{i=1}^{n} (pred_i - y_i)^2$$

$$J = \frac{1}{n} \sum_{i=1}^{n} (pred_i - y_i)^2$$

Cost function(J) of Linear Regression is the **Root Mean Squared Error (RMSE)** between predicted y value (pred) and true y value (y).

Gradient Descent**:**

To update θ1 and θ2 values in order to reduce Cost function (minimizing RMSE value) and achieving the best fit line the model uses Gradient Descent. The idea is to start with random θ1 and θ2 values and then iteratively updating the values, reaching minimum cost.