Initial input

- number of forecasted years (**nfy**) → 3 years
- EMA period (**numPer**)
- risk free rate (**rf**)
- market rate (**rf**)
- scrip volatility (**beta**). This is taken from the site "http://www.topstockresearch.com (http://www.topstockresearch.com)" which is the weekly return for 1 year range
- Historical period Data → Mar-08 to Mar-17

```
Current Market Price for Maruti: 8679
```
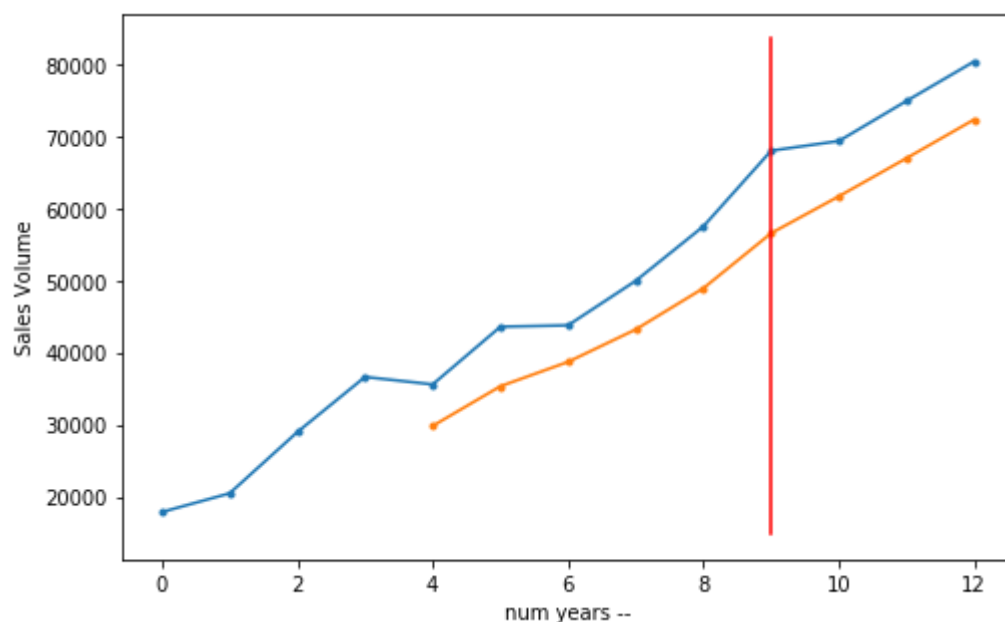
1. Sales

The sales volume is plotted against number of years. The red line divides the historical and the forecasted years. Sales are forecasted for a period of 3 years using by extrapolation using EMA(described below)
blue plot -- sales volume
orange plot -- Exponential moving average

EMA forecast

A line is fitted to the EMA to get the slope. Using the slope as a annual EMA increment, the EMA is forecasted for 3 years. Using the EMA of the forecasted years, the dependent series value for the forasted period is calculated.
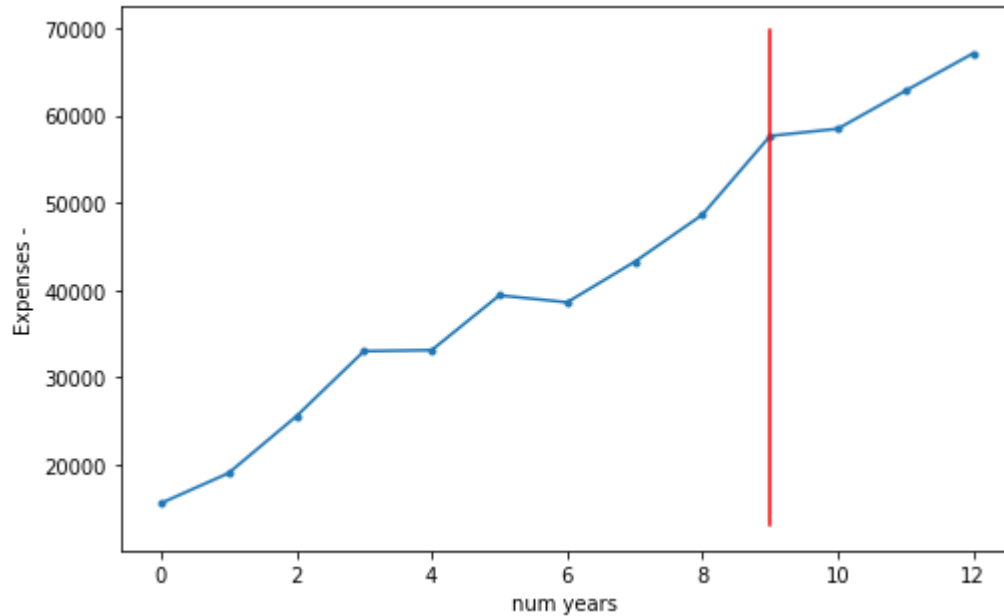

2. Expenses

1. Raw Material Cost (RMC) → is EMA forcasted
2. Change in Inventory (CI) → is median forecasted
3. Power and Fuel (PnF)

4. Other Mfr. Exp (OME)
5. Employee Cost (EC) → is forecasted with EMA.
6. Selling and admin (SnA)
7. Other Expenses (OE)
8. Operating Cost (OpC)

OpC = RMC + PnF + OME + EC + SnA + OE - CI

The operating cost of the company is forecasted in this section.
The red line divides the historical and the forecasted years.

//------------------------------------
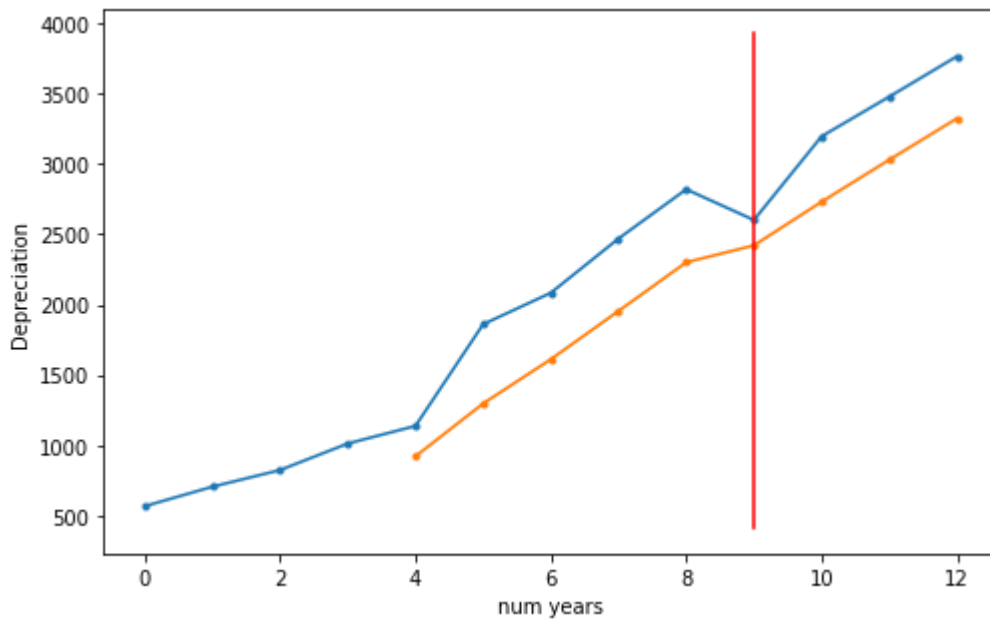blue plot -- Operating cost

3. Other Income

Other income is forecasted as a median of the historical "other income"

```
Other Income:  [837.1, 1000.1, 1024.3, 508.8, 826.8, 812.4, 731.7, 831.6, 1461,
2279.8, 834.35, 834.35, 834.35]
```

4. Depreciation (depr)

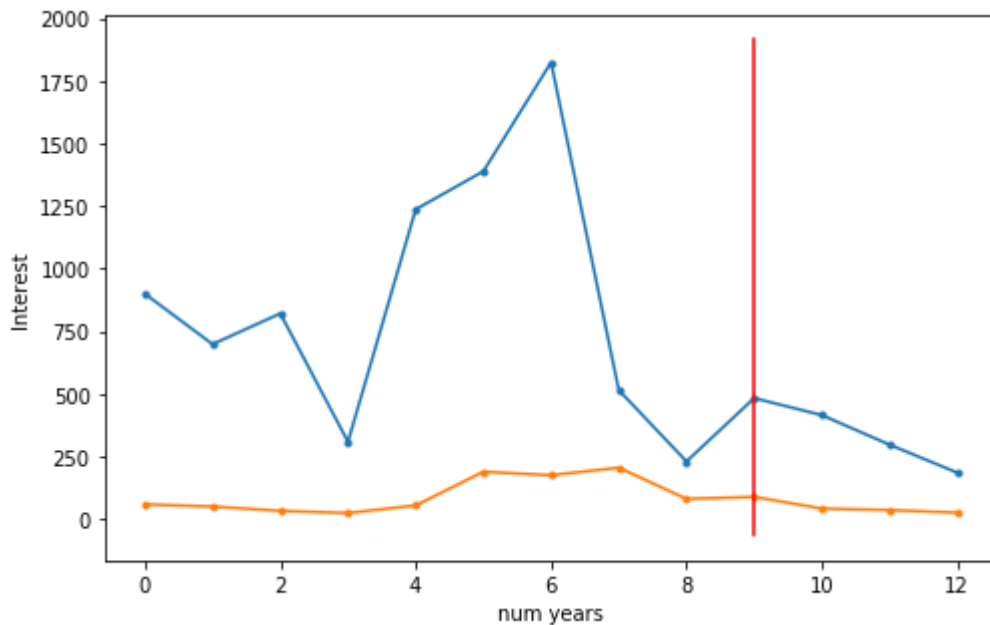Depreciation is EMA forecasted from historical values

5. Interest

Interest (ci) are calculated as percentage ($ciperc$) of borrowings. The borrowing in forecasted as a EMA-forecast and the interest of the forecasted period is calculated as historical median percentage of forecasted borrowings (bor).

$$Int_{forecast} = Median\,[Int_{hist}] \times Borrowings_{forecast}$$
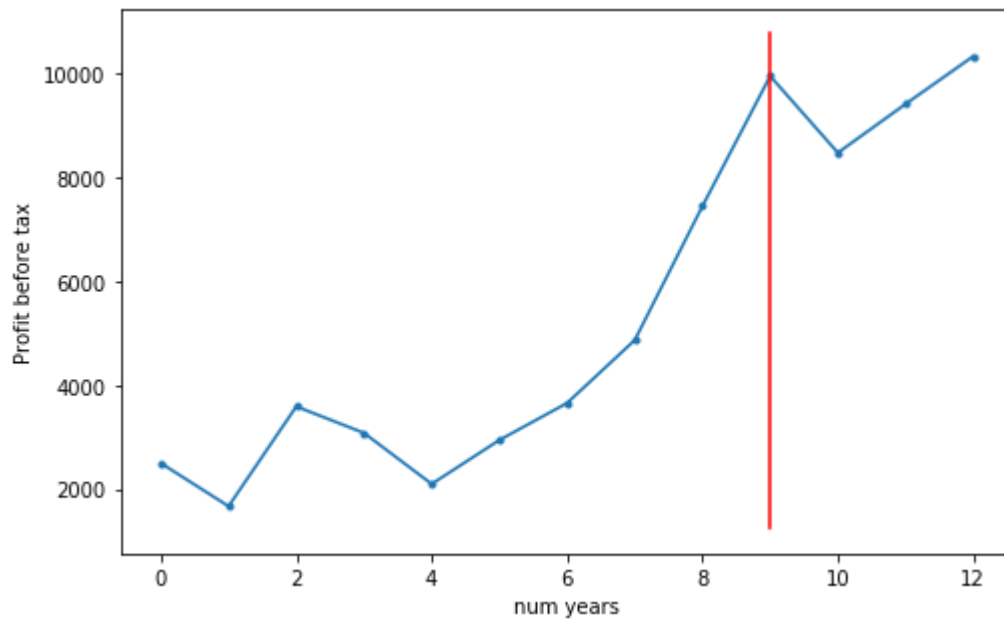
```
Interest:  [59.6, 51, 33.5, 25, 55.2, 189.8, 175.9, 206, 81.5, 89.4, 42.87, 36.
85, 26.39]
median interest: 8.86
```


6. Profit before Tax (pbt)

$$pbt = sales - expenses + other\ income - depreciation - interest$$

7. Taxes

Taxes are calculated as a percent of PBT. PBT is forecasted as per EMA-forcast model and future taxes are calulated as the median of the historical tax percentage.

$$Tax_{forecast} = Median\,[PercentageTax_{hist}] \times PBT_{forecast}$$

```
Taxes:  [772.2, 457.1, 1094.9, 820.2, 511, 598.9, 875.5, 1157, 2079.4, 2603.6,
2644.39, 2252.63, 2501.84]
Median Tax percentage:  26.6
```
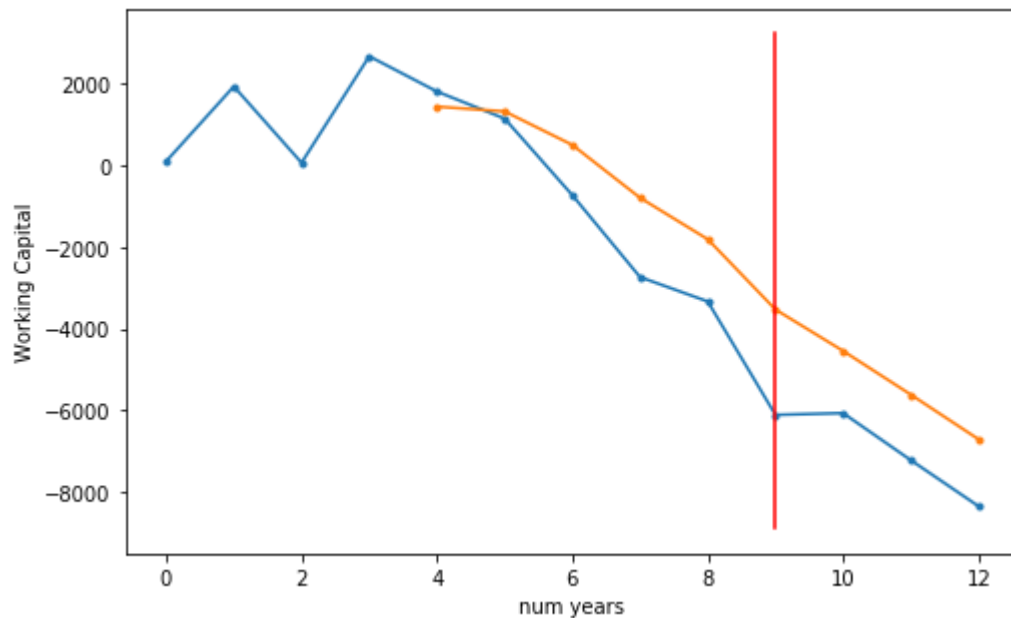
8. Investments

```
Investments:  [5180.7, 3173.3, 7176.6, 5106.8, 6147.4, 7078.3, 10117.9, 12814,
19932.2, 28228.4, 7127.4500000000007, 7127.4500000000007, 7127.4500000000007]
```

10. Working capital (wc)

wc = other_assets(oa) - other_liabilities(ol)

Net change in working capital (cwc) is the difference in working capital levels from one year to the next. When more cash is tied up in working capital than the previous year, the increase in working capital is treated as a cost against free cash flow.
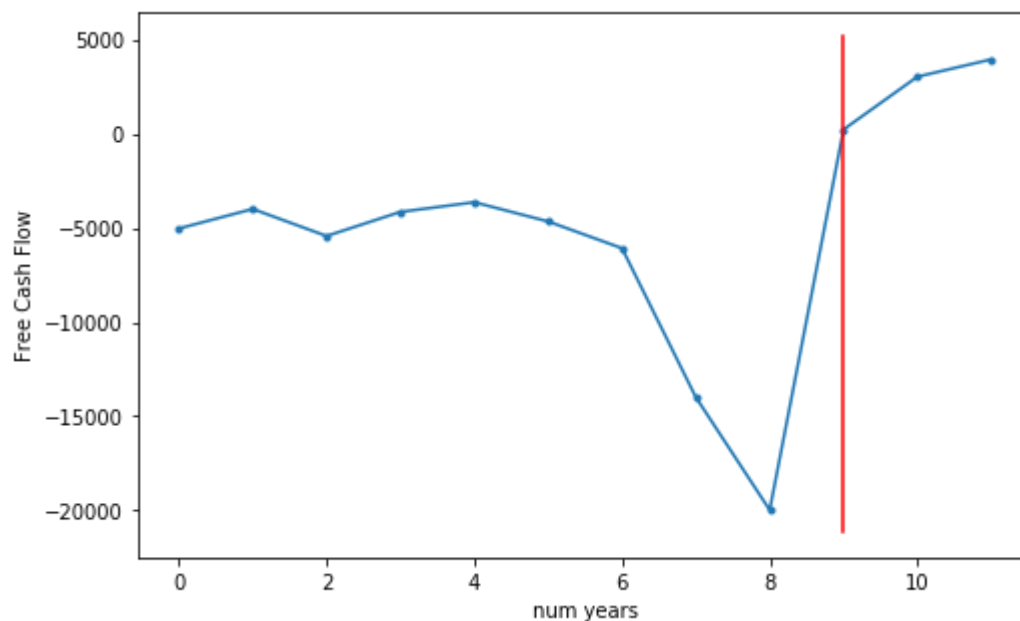
$$cwc = wc_{current\_year} - wc_{previous\_year}$$

```
[1836.3, -1870.8, 2610.4, -863.7, -664.6, -1877.5, -2008.5, -597.7, -2781.2, 4
2.82, -1154.1, -1128.86]
```

11. Free Cash Flow (fcf)

fcf = Sales - Expenses - Taxes -Investments - Change in working capital - other income


```
[  224.783   3026.16   3944.927]
```

12. Calculating Discount rate (disc)

Cost of Equity (Re)
$Re = Rf + \beta(Rm - Rf)$, where β gives the volatility, **Rf** is the risk free rate and **Rm** is market retun rate expected

Cost of debt (Rd)
Rd - current rate of interest paid by the company cost of debt is calculated as **Rd(1-tax rate)** as the company may avail tax deduction on the interest paid

Capital stucture
capital structure is given by weighted average cost of capital (wacc)
D:E = x:1 $\Rightarrow$ $\frac{x}{1+x}$ is the weightage given to debt and $\frac{1}{1+x}$ is the weightage given to equity

$$wacc = Re \times \frac{1}{1+x} + Rd \times (1 - corporate\_tax\_rate) \times \frac{x}{1+x}$$

```
Cost of Equity:  14.696
Cost of Debt:  6.507
Discount Rate:  14.615
```

13. discount FCF

```
Forward FCF:  [  224.783  3026.16   3944.927]
Discounted Forward FCF:  [196.12, 2303.61, 2620.08]
```

14. Fair Value (FV) is calculated

FV = Enterprice Value (EV) - Outstanding Debt (OD) + current cash(cc) + sum of discount forward cash flow for forcasted number of years(sum of discFCF)

```
number of outstanding shares:  302080060
Enterprice Value:  273098.5  crores
Outstanding Debt:  483.6  crores
Current cash:  13.1  crores
Fair Value per share:  9195.0
Market Price:  8679
Ratio CMP/FairVal:  0.9
```

The CMP of Maruti is 0.9 times the 3yr forcasted Value