IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 12, Issue 9, September 2022, ||Series -I|| PP 49-56

Mathematical Modeling: Corruption Case- IV of the Society of India

Dr. Sayaji Rastum Waykar
Yashwantrao Chavan Mahavidyalaya, Halkarni
affiliated to Shivaji University, Kolhapur, Maharashtra (India).
Received 28 September 2022; Accepted 14 October 2022

Abstract:
In this paper we have to study on the problem of 'Corruption' in different ways by using mathematical modeling. In this connection we have found the formula that is Mathematical corruption model for measuring corruption in the society of the country. Therefore we have taken some illustrations for measuring the corruption in the society for case-IV.
Keywords: mathematical thinking, corruption mentality, modeling, applied.

I. INTRODUCTION:

The Mathematical Results for measuring "Corruption" in the society. These mathematical results are as follows:

i. Mathematical Corruption Model (or MC Model) Formula:

$$C = C_0(K + 1)^t$$

ii. Mathematical Corruption-Development Model (or MCD Model) Formula:

$$D(C) = D(0)\,[1 + K]^C$$

iv. Mathematical E-virus Constant Model with Related Time (MEVC Model) Formula:

$$K = \left[\frac{C(t)}{C(0)}\right]^{\frac{1}{t}} - 1 \text{ , } -1 < K < 1$$

v. Mathematical E-virus Constant Model with Related Corruption (MEVC Model) Formula:

$$K = \left[\frac{D(C)}{D(0)}\right]^{\frac{1}{C}} - 1, \; -1 < K < 1$$

Note that if the value of K is more than 1 then we choose or take the value approximately to 1 but not equal to 1.

II. METHODOLOGY:

We have to use the seven steps of mathematical modeling process for solving the problem of corruption in the society of any country of the world. Also we can represent mathematical modeling process in the form "Visual". Therefore it is known as visual mathematical modeling process. It is as follows:

"VISUAL MATHEMATICAL MODELLING"

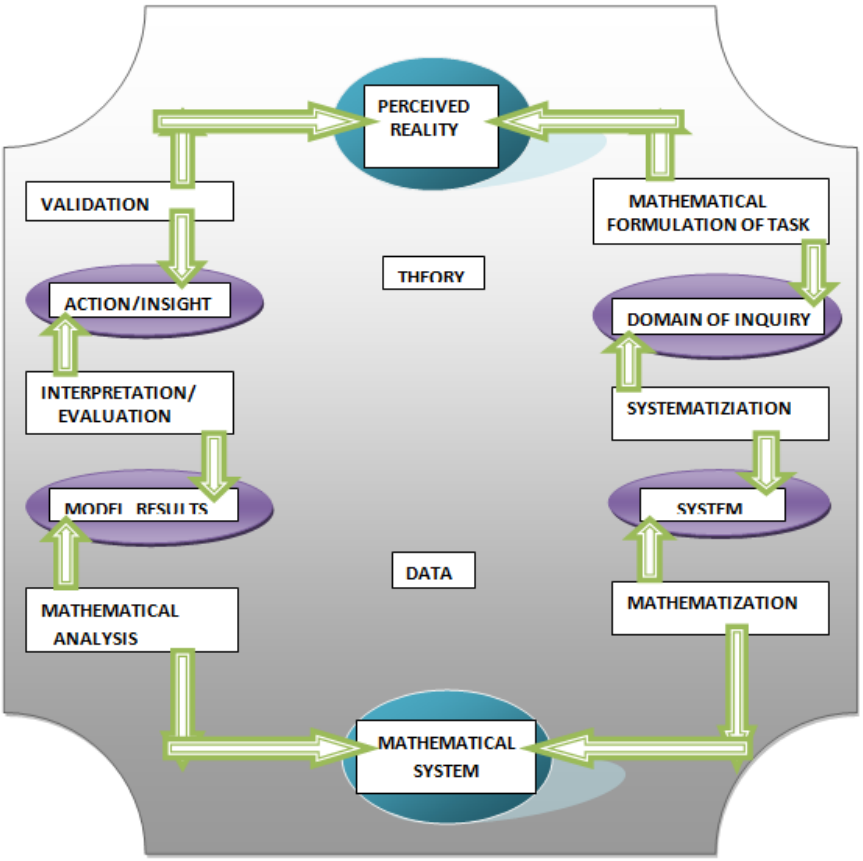


Fig-1: A Visual representation of the Mathematical Modeling process

Mathematical modeling means "Translation from real world problems into Mathematics world."

III. SOME ILLUSTRATIONS FOR MEASURING CORRUPTION IN THE SOCIETY:

3. Mathematical Corruption growths in various fields of the society (general) for case-IV:

We assume that corruption was 1.00 % of total population 35 crore that is 0.3500 crore on 15 August, 1957. Therefore at MEV constant Ƙ=0. When t=0, C (0) = C_0 = 0.3500 crore and when t= 10 years,

C (t) depends on MEV constant. We know that MEV constant formula,

Therefore, $\mathbf{Ƙ} = [\frac{C(t)}{C(0)}]^{\frac{1}{t}} - 1$

Putting in Mathematical corruption model formula(i). it is of the form,

Therefore, $\mathbf{C = C_0(Ƙ + 1)^t}$

$\mathbf{C} = 0.3500 \times [\frac{C(t)}{C(0)}]^{\frac{t}{10}}$ ---------- **(i)**

Where **Ƙ** is known as MEV constant. So we take the various values of MEV constant **Ƙ.** It is lies between 0 and 1. Such values are 0, 0.20, 0.40, 0.60, 0.80 and 0.9988.

Case-I: we take **Ƙ=0 and t= 10 years** then from (vi), C= C_0 = 0.3500 crore

Therefore, **C = 0.3500 crore**

Case-II: when, we take **Ƙ=0.20 and MM period t** = 10 years**,** C (t) = **0.4200 crore** then

from (i), Therefore, $\mathbf{C = 0.3500 \times [\frac{0.4200}{0.3500}]^{\frac{t}{10}}}$ ---------- **(ii)**

When MM period t = 10 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.20]^{\frac{10}{10}}$

$C = 0.3500 \times 1.20$

C = 0.4200 crore

When MM period t = 20 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.20]^{\frac{20}{10}}$

$C = 0.3500 \times 1.44$

C = 0.5040 crore

When MM period t = 30 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.20]^{\frac{30}{10}}$

$C = 0.3500 \times 1.728$

C = 0.6048 crore

When MM period t = 40 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.20]^{\frac{40}{10}}$

$C = 0.3500 \times 2.0736$

C = 0.72576 crore

When MM period t = 50 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.20]^{\frac{50}{10}}$

$C = 0.3500 \times 2.48832$

C = 0.870912 crore

When MM period t = 60 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.20]^{\frac{60}{10}}$

$C = 0.3500 \times 2.985984$

C = 1.0450944 crore

When MM period t = 70 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.20]^{\frac{70}{10}}$

$C = 0.3500 \times 3.5831808$

C = 1.25411328 crore

When MM period t = 80 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.20]^{\frac{80}{10}}$

$C = 0.3500 \times 4.29981696$

C = 1.50493594 crore

When MM period t = 90 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.20]^{\frac{90}{10}}$

$C = 0.3500 \times 5.15978035$

C = 1.80592312 crore

When MM period t = 100 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.20]^{\frac{100}{10}}$

$C = 0.3500 \times 6.19173642$

C = 2.16710775 crore

Case-III: when, we take **Ƙ=0.40 and MM period t =** 10 years**,** C (t) **= 0.4900 crore** then

from (i), Therefore, $\mathbf{C = 0.3500 \times [\frac{0.4900}{0.3500}]^{\frac{t}{10}}}$ ---------- **(iii)**

When MM period t = 10 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.40]^{\frac{10}{10}}$

$C = 0.3500 \times 1.40$

C = 0.4900 crore

When MM period t = 20 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.40]^{\frac{20}{10}}$

$C = 0.3500 \times 1.96$

C = 0.6860 crore

When MM period t = 30 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.40]^{\frac{30}{10}}$

$C = 0.3500 \times 2.744$

C = 0.9604 crore

When MM period t = 40 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.40]^{\frac{40}{10}}$

$C = 0.3500 \times 3.8416$

C = 1.34456 crore

When MM period t = 50 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.40]^{\frac{50}{10}}$

$C = 0.3500 \times 5.37824$

C = 1.882384 crore

When MM period t = 60 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.40]^{\frac{60}{10}}$

$C = 0.3500 \times 7.529536$

C = 2.6353376 crore

When MM period t = 70 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.40]^{\frac{70}{10}}$

$C = 0.3500 \times 10.5413504$

C = 3.68947264 crore

When MM period t = 80 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.40]^{\frac{80}{10}}$

$C = 0.3500 \times 14.7578906$

C = 5.16526171 crore

When MM period t = 90 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.40]^{\frac{90}{10}}$

$C = 0.3500 \times 20.6610468$

C = 7.23136638 crore

When MM period t = 100 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.40]^{\frac{100}{10}}$

$C = 0.3500 \times 28.9254655$

C = 10.1239129 crore

Case-IV: when, we take **$\mathbb{K}$=0.60 and MM period t =** 10 years**,** C (t) **= 0.5600 crore** then

from (i), Therefore, $\mathbf{C = 0.3500 \times [\frac{0.5600}{0.3500}]^{\frac{t}{10}}}$ ---------- **(iv)**

When MM period t = 10 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.60]^{\frac{10}{10}}$

$C = 0.3500 \times 1.60$

C = 0.5600 crore

When MM period t = 20 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.60]^{\frac{20}{10}}$

$C = 0.3500 \times 2.56$

C = 0.8960 crore

When MM period t = 30 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.60]^{\frac{30}{10}}$

$C = 0.3500 \times 4.096$

C = 1.4336 crore

When MM period t = 40 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.60]^{\frac{40}{10}}$

$C = 0.3500 \times 6.5536$

C = 2.29376 crore

When MM period t = 50 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.60]^{\frac{50}{10}}$

$C = 0.3500 \times 10.48576$

C = 3.670016 crore

When MM period t = 60 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.60]^{\frac{60}{10}}$

$C = 0.3500 \times 16.777216$

C = 5.8720256 crore

When MM period t = 70 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.60]^{\frac{70}{10}}$

$C = 0.3500 \times 26.8435456$

C = 9.39524096 crore

When MM period t = 80 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.60]^{\frac{80}{10}}$

$C = 0.3500 \times 42.949673$

C = 15.0323856 crore

When MM period t = 90 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.60]^{\frac{90}{10}}$

$C = 0.3500 \times 68.7194768$

C = 24.0518169 crore

When MM period t = 100 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.60]^{\frac{100}{10}}$

$C = 0.3500 \times 109.951163$

C = 38.4829071 crore

Case-V: when, we take **Ƙ=0.80 and MM period t =** 10 years**,** C (t) **= 0.6300 crore** then

from (i), Therefore, $\mathbf{C = 0.3500 \times [\frac{0.6300}{0.3500}]^{\frac{t}{10}}}$ ---------- **(v)**

When MM period t = 10 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.80]^{\frac{10}{10}}$

$C = 0.3500 \times 1.80$

C = 0.6300 crore

When MM period t = 20 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.80]^{\frac{20}{10}}$

$C = 0.3500 \times 3.24$

C = 1.1340 crore

When MM period t = 30 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.80]^{\frac{30}{10}}$

$C = 0.3500 \times 5.832$

C = 2.0412 crore

When MM period t = 40 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.80]^{\frac{40}{10}}$

$C = 0.3500 \times 10.4976$

C = 3.67416 crore

When MM period t = 50 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.80]^{\frac{50}{10}}$

$C = 0.3500 \times 18.89568$

C = 6.613488 crore

When MM period t = 60 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.80]^{\frac{60}{10}}$

$C = 0.3500 \times 34.012224$

C = 11.9042784 crore

When MM period t = 70 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.80]^{\frac{70}{10}}$

$C = 0.3500 \times 61.2220032$

C = 21.4277011 crore

When MM period t = 80 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.80]^{\frac{80}{10}}$

$C = 0.3500 \times 110.199606$

C = 38.5698621 crore

When MM period t = 90 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.80]^{\frac{90}{10}}$

$C = 0.3500 \times 198.359291$

C = 69.4257519 crore

When MM period t = 100 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.80]^{\frac{100}{10}}$

$C = 0.3500 \times 357.046724$

C = 124.966353 crore

Case-VI: when, we take **Ƙ=0.9988 and MM period t =** 10 years**,** C (t) **= 0.69958 crore** then

from (i), Therefore, $\mathbf{C = 0.3500 \times [\frac{0.69958}{0.3500}]^{\frac{t}{10}}}$ ---------- **(vi)**

When MM period t = 10 years from base that is 15 August 1947. What is C ?

Therefore, $\mathbf{C} = 0.3500 \times [1.9988]^{\frac{10}{10}}$

$C = 0.3500 \times 1.9988$

C = 0.69958 crore

When MM period t = 20 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.9988]^{\frac{20}{10}}$

$C = 0.3500 \times 3.99520144$

C = 1.3983205 crore

When MM period t = 30 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.9988]^{\frac{30}{10}}$

$C = 0.3500 \times 7.98560864$

C = 2.79496302 crore

When MM period t = 40 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.9988]^{\frac{40}{10}}$

$C = 0.3500 \times 15.9616345$

C = 5.58657208 crore

When MM period t = 50 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.9988]^{\frac{50}{10}}$

$C = 0.3500 \times 31.904115$

C = 11.1664403 crore

When MM period t = 60 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.9988]^{\frac{60}{10}}$

$C = 0.3500 \times 63.7699451$

C = 22.3194808 crore

When MM period t = 70 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.9988]^{\frac{70}{10}}$

$C = 0.3500 \times 127.463366$

C = 44.6121781 crore

When MM period t = 80 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.9988]^{\frac{80}{10}}$

$C = 0.3500 \times 254.773776$

C = 89.1708216 crore

When MM period t = 90 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.9988]^{\frac{90}{10}}$

$C = 0.3500 \times 509.241823$

C = 178.234638 crore

When MM period t = 100 years from base that is 15 August 1947. What is C ?

Therefore, $C = 0.3500 \times [1.9988]^{\frac{100}{10}}$

$C = 0.3500 \times 1017.87256$

C = 356.255396 crore

IV. MATHEMATICAL RESULTS-IV

From case-I, case-II, case-III, case-IV, case-V and case-VI, we can write the above mathematical results in tabular form of the following:

Table-I

MM period 't' years ↓	MEV constant 'K' 0.20 →	0.40	0.60	0.80	0.9988	**Mean-IV** $\sum C_i/N$ (crore)
10	0.4200	0.4900	0.5600	0.6300	0.69958	**0.559916**
20	0.5040	0.6860	0.8960	1.1340	1.3983205	**0.9236641**
30	0.6048	0.9604	1.4336	2.0412	2.79496302	**1.5669926**
40	0.72576	1.34456	2.29376	3.67416	5.58657208	**2.72496242**
50	0.870912	1.882384	3.670016	6.613488	11.1664403	**4.84064806**
60	1.0450944	2.6353376	5.8720256	11.9042784	22.3194808	**8.75524336**
70	1.25411328	3.68947264	9.39524096	21.4277011	44.6121781	**16.0757412**
80	1.50493594	5.16526171	15.0323856	38.5698621	89.1708216	**29.8886536**
90	1.80592312	7.23136638	24.0518169	69.4257519	178.234638	**56.1498992**
100	2.16710775	10.1239129	38.4829071	124.966353	356.255396	**106.399135**
$\sum C_i/N$ (crore)	1.09026495	3.42086952	10.1687752	28.0386794	71.223839	**22.7884855**

Table- II: STATISTICAL STUDY OF CORRUPTION FOR PART-IV

Data x	Frequency f	f. x	D= (x- X)	D^2	**f.** D^2
10	0.559916	5.59916	-78	6084	3406.52894
20	0.9236641	18.473282	-68	4642	4287.64875
30	1.5669926	47.009778	-58	3364	5271.36311
40	2.72496242	108.998497	-48	2304	6278.31342
50	4.84064806	242.032403	-38	1444	6989.8958
60	8.75524336	525.314602	-28	784	6864.11079
70	16.0757412	1125.30188	-18	324	5208.54015
80	29.8886536	2391.09229	-8	64	1912.87383
90	56.1498992	5053.49093	2	4	224.599597
100	106.399135	10639.9135	12	144	15321.4754
	N=$\sum f$ =227.88	$\sum f.x$ =20157.2264			$\sum f.D^2$ = 55765.3497

X=Mean= $\frac{\sum f.x}{N} = \frac{20157.2264}{227.88}$ = 88.4554432 ≈ 88

Therefore, **Mean =88**

We know that the formula for Standard Deviation is as follows:

Therefore, S. D. = $\sigma = \sqrt{\frac{\sum f D^2}{N}} = \sqrt{\frac{55765.3497}{227.88}} = \sqrt{244.713664}$

S. D. = σ = 15.6433265

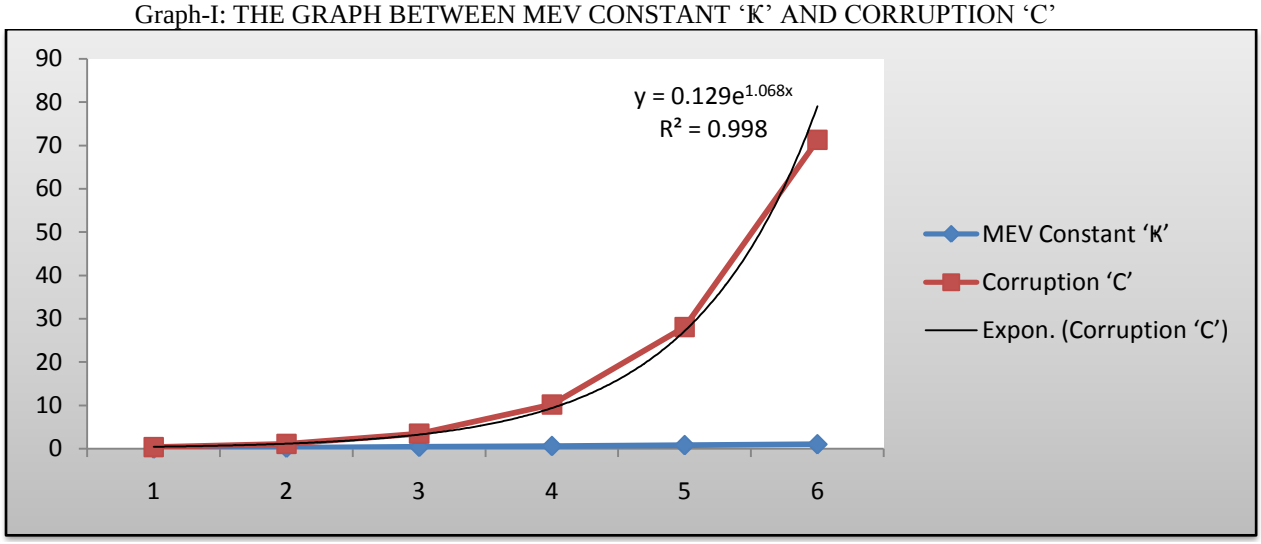
Therefore the standard deviation of corruption in India with related period is 15.6433265.

STATISTICAL GRAPH OF PART-IV:

MEV Constant **'K'**	Corruption **'C'**
0	0.3500
0.20	1.09026495
0.40	3.42086952
0.60	10.1687752

0.80	28.0386794
0.9988	71.223839

Graph-I: THE GRAPH BETWEEN MEV CONSTANT 'Ƙ' AND CORRUPTION 'C'



V. CONCLUSION:

We have observed that when we assumed value 1%, C (0) = C_0= 0.3500 crore. The Results are distributed in population size as

- **First stage corruption:**
  When $0 < Ƙ \leq 0.40$, C= 3.42086952 crore.
- **Medium stage corruption:**
  When $0.40 < Ƙ \leq 0.80$, C= 24.6178099 crore.
- **Final stage corruption:**
  When $0.80 < Ƙ < 1$, C= 43.1851596 crore.

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