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

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Abstract:
In this paper we have to study on the problem of 'Corruption' in different ways byusing mathematical modeling. The problem of corruption is everywhere, so we will try to find the formula for how to measure corruption in the society? Therefore we have taken someillustrations for measuring the corruption in the society for case-III.

Keywords: *mathematical thinking, corruption mentality, modeling, applied.*

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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:

$$\mathbf{C = C_0(K + 1)^t}$$

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

$$\mathbf{D(C) = D\ (0)\ [1 + K\ ]^C}$$

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

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

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

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

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 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:

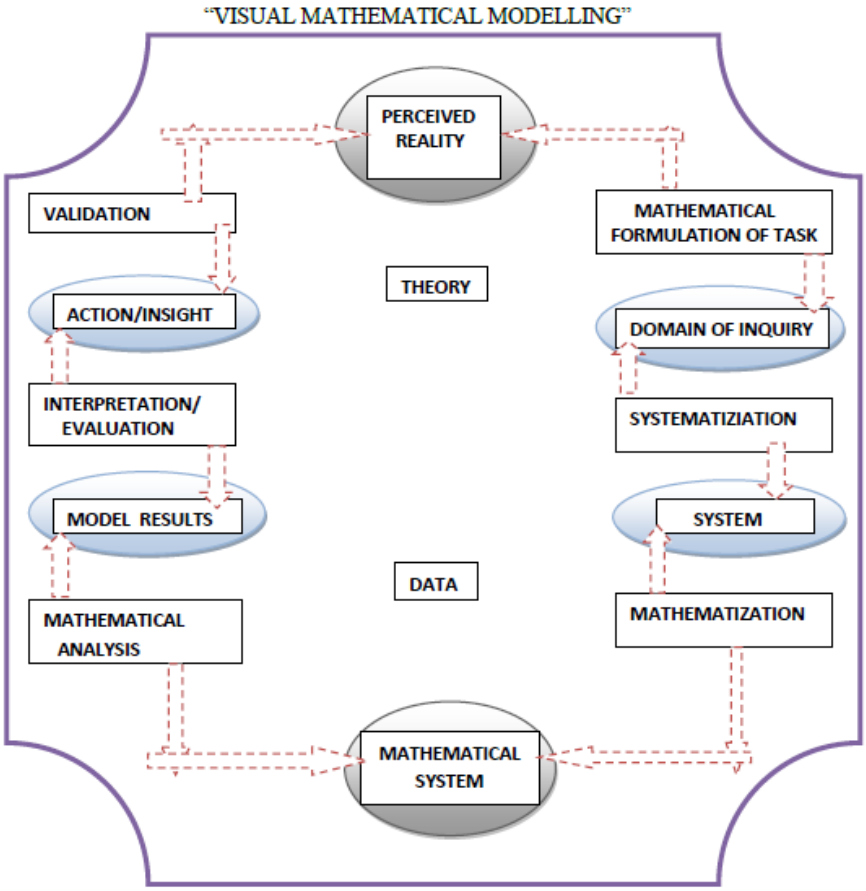


Fig-1: A Visual representation of the Mathematical Modeling process

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

III. SOME ILLUSTRATIONS FOR MEASURING CORRUPTIONIN THE SOCIETY:

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

We assume that corruption was 0.75 % of total population 35 crore that is 0.2625 crore on 15 August, 1957.

Therefore at MEV constant K=0. When t=0, C (0) = C_0 = 0.2625 crore and when t= 10 years, C (t) depends on MEV constant. We know that MEV constant formula,

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

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

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

Therefore, $C = 0.2625 \times [\frac{C(t)}{C(0)}]^{\frac{t}{10}}$ ---------- **(i)**

Where **K** is known as MEV constant. So we take the various values of MEV constant **K.** 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 **K=0 and t= 10 years** then from (i), C= C_0 **= 0.2625 crore**

Therefore, **C = 0.2625 crore**

Case-II: when, we take **K=0.20 and MM period t** = 10 years**,** C (t) = **0.3150 crore** then

from (i), Therefore, $C = 0.2625 \times [\frac{0.3150}{0.2625}]^{\frac{t}{10}}$ ---------- **(ii)**

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

Therefore, $C = 0.2625 \times [1.20]^{\frac{10}{10}}$

$C = 0.2625 \times 1.20$

C = 0.3150 crore

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

Therefore, $C = 0.2625 \times [1.20]^{\frac{20}{10}}$

$C = 0.2625 \times 1.44$

C = 0.3780 crore

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

Therefore, $C = 0.2625 \times [1.20]^{\frac{30}{10}}$

$C = 0.2625 \times 1.728$

C = 0.4536 crore

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

Therefore, $C = 0.2625 \times [1.20]^{\frac{40}{10}}$

$C = 0.2625 \times 2.0736$

C = 0.54432 crore

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

Therefore, $C = 0.2625 \times [1.20]^{\frac{50}{10}}$

$C = 0.2625 \times 2.48832$

C = 0.653184 crore

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

Therefore, $C = 0.2625 \times [1.20]^{\frac{60}{10}}$

$C = 0.2625 \times 2.985984$

C = 0.7838208 crore

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

Therefore, $C = 0.2625 \times [1.20]^{\frac{70}{10}}$

$C = 0.2625 \times 3.5831808$

C = 0.94058496 crore

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

Therefore, $C = 0.2625 \times [1.20]^{\frac{80}{10}}$

$C = 0.2625 \times 4.29981696$

C = 1.12870195 crore

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

Therefore, $C = 0.2625 \times [1.20]^{\frac{90}{10}}$

$C = 0.2625 \times 5.15978035$

C = 1.35444234 crore

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

Therefore, $C = 0.2625 \times [1.20]^{\frac{100}{10}}$

$C = 0.2625 \times 6.19173642$

C = 1.62533081 crore

Case-III: when, we take **K=0.40 and MM period t** = 10 years, C (t) = **0.3675 crore** then

from (i), Therefore, $\mathbf{C = 0.2625 \times [\frac{0.3675}{0.2625}]^{\frac{t}{10}}}$ ---------- **(iii)**

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

Therefore, $C = 0.2625 \times [1.40]^{\frac{10}{10}}$

$C = 0.2625 \times 1.40$

C = 0.3675 crore

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

Therefore, $C = 0.2625 \times [1.40]^{\frac{20}{10}}$

$C = 0.2625 \times 1.96$

C = 0.5145 crore

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

Therefore, $C = 0.2625 \times [1.40]^{\frac{30}{10}}$

$C = 0.2625 \times 2.744$

C = 0.7203 crore

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

Therefore, $C = 0.2625 \times [1.40]^{\frac{40}{10}}$

$C = 0.2625 \times 3.8416$

C = 1.00842 crore

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

Therefore, $C = 0.2625 \times [1.40]^{\frac{50}{10}}$

$C = 0.2625 \times 5.37824$

C = 1.411788 crore

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

Therefore, $C = 0.2625 \times [1.40]^{\frac{60}{10}}$

$C = 0.2625 \times 7.529536$

C = 1.9765032 crore

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

Therefore, $C = 0.2625 \times [1.40]^{\frac{70}{10}}$

$C = 0.2625 \times 10.5413504$

C = 2.76710448 crore

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

Therefore, $C = 0.2625 \times [1.40]^{\frac{80}{10}}$

$C = 0.2625 \times 14.7578906$

C = 3.87394628 crore

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

Therefore, $C = 0.2625 \times [1.40]^{\frac{90}{10}}$

$C = 0.2625 \times 20.6610468$

C = 5.42352478 crore

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

Therefore, $C = 0.2625 \times [1.40]^{\frac{100}{10}}$

$C = 0.2625 \times 28.9254655$

C = 7.59293469 crore

Case-IV: when, we take **K=0.60 and MM period t** = 10 years, C (t) = **0.4200 crore** then

from (i), Therefore, $\mathbf{C = 0.2625 \times [\frac{0.4200}{0.2625}]^{\frac{t}{10}}}$ ---------- **(iv)**

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

Therefore, $C = 0.2625 \times [1.60]^{\frac{10}{10}}$

$C = 0.2625 \times 1.60$

C = 0.4200 crore

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

Therefore, $C = 0.2625 \times [1.60]^{\frac{20}{10}}$

$C = 0.2625 \times 2.56$

C = 0.6720 crore

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

Therefore, $C = 0.2625 \times [1.60]^{\frac{30}{10}}$

$C = 0.2625 \times 4.096$

C = 1.0752 crore

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

Therefore, $C = 0.2625 \times [1.60]^{\frac{40}{10}}$

$C = 0.2625 \times 6.5536$

C = 1.72032 crore

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

Therefore, $C = 0.2625 \times [1.60]^{\frac{50}{10}}$

$C = 0.2625 \times 10.48576$

C = 2.752512 crore

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

Therefore, $C = 0.2625 \times [1.60]^{\frac{60}{10}}$

$C = 0.2625 \times 16.777216$

C = 4.4040192 crore

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

Therefore, $C = 0.2625 \times [1.60]^{\frac{70}{10}}$

$C = 0.2625 \times 26.8435456$

C = 7.04643072 crore

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

Therefore, $C = 0.2625 \times [1.60]^{\frac{80}{10}}$

$C = 0.2625 \times 42.949673$

C = 11.2742892 crore

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

Therefore, $C = 0.2625 \times [1.60]^{\frac{90}{10}}$

$C = 0.2625 \times 68.7194768$

C = 18.0388627 crore

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

Therefore, $C = 0.2625 \times [1.60]^{\frac{100}{10}}$

$C = 0.2625 \times 109.951163$

C = 28.8621803 crore

Case-V: when, we take **K=0.80 and MM period t** = 10 years, C (t) = **0.4725 crore** then

from (i), Therefore, $\mathbf{C = 0.2625 \times [\frac{0.4725}{0.2625}]^{\frac{t}{10}}}$ ---------- **(v)**

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

Therefore, $C = 0.2625 \times [1.80]^{\frac{10}{10}}$

$C = 0.2625 \times 1.80$

C = 0.4725 crore

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

Therefore, $C = 0.2625 \times [1.80]^{\frac{20}{10}}$

$C = 0.2625 \times 3.240$

C = 0.8505 crore

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

Therefore, $C = 0.2625 \times [1.80]^{\frac{30}{10}}$

$C = 0.2625 \times 5.832$

C = 1.5309 crore

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

Therefore, $C = 0.2625 \times [1.80]^{\frac{40}{10}}$

$C = 0.2625 \times 10.4976$

C = 2.75562 crore

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

Therefore, $C = 0.2625 \times [1.80]^{\frac{50}{10}}$

$C = 0.2625 \times 18.89568$

C = 4.960116 crore

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

Therefore, $C = 0.2625 \times [1.80]^{\frac{60}{10}}$

$C = 0.2625 \times 34.012224$

C = 8.9282088 crore

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

Therefore, $C = 0.2625 \times [1.80]^{\frac{70}{10}}$

$C = 0.2625 \times 61.2220032$

C = 16.0707758 crore

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

Therefore, $C = 0.2625 \times [1.80]^{\frac{80}{10}}$

$C = 0.2625 \times 110.199606$

C = 28.9273966 crore

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

Therefore, $C = 0.2625 \times [1.80]^{\frac{90}{10}}$

$C = 0.2625 \times 198.359291$

C = 52.0693139 crore

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

Therefore, $C = 0.2625 \times [1.80]^{\frac{100}{10}}$

$C = 0.2625 \times 357.046724$

C = 93.7247651 crore

Case-VI: when, we take **K=0.9988 and MM period t** = 10 years, C (t) = **0.524685 crore** then

from (i), Therefore, $\mathbf{C = 0.2625 \times [\frac{0.524685}{0.2625}]^{\frac{t}{10}}}$ ---------- **(vi)**

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

Therefore, $C = 0.2625 \times [1.9988]^{\frac{10}{10}}$

$C = 0.2625 \times 1.9988$

C = 0.524685 crore

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

Therefore, $C = 0.2625 \times [1.9988]^{\frac{20}{10}}$

$C = 0.2625 \times 3.99520144$

C = 1.04874038 crore

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

Therefore, $C = 0.2625 \times [1.9988]^{\frac{30}{10}}$

$C = 0.2625 \times 7.98560864$

C = 2.09622227 crore

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

Therefore, $C = 0.2625 \times [1.9988]^{\frac{40}{10}}$

$C = 0.2625 \times 15.9616345$

C = 4.18992906 crore

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

Therefore, $C = 0.2625 \times [1.9988]^{\frac{50}{10}}$

$C = 0.2625 \times 31.904115$

C = 8.37483019 crore

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

Therefore, $C = 0.2625 \times [1.9988]^{\frac{60}{10}}$

$C = 0.2625 \times 63.7699451$

C = 16.7396106 crore

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

Therefore, $C = 0.2625 \times [1.9988]^{\frac{70}{10}}$

$C = 0.2625 \times 127.463366$

C = 33.4591336 crore

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

Therefore, $C = 0.2625 \times [1.9988]^{\frac{80}{10}}$

$C = 0.2625 \times 254.773776$

C = 66.8781162 crore

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

Therefore, $C = 0.2625 \times [1.9988]^{\frac{90}{10}}$

$C = 0.2625 \times 509.241823$

C = 133.675979 crore

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

Therefore, $C = 0.2625 \times [1.9988]^{\frac{100}{10}}$

$C = 0.2625 \times 1017.87256$

C = 267.191547 crore

Mathematical Results of Part III:

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-III** $\sum C_i$ /N (crore)
10	0.3150	0.3675	0.4200	0.4725	0.524685	**0.419937**
20	0.3780	0.5145	0.6720	0.8505	1.04874038	**0.69274808**
30	0.4536	0.7203	1.0752	1.5309	2.09622227	**1.17524445**
40	0.54432	1.00842	1.72032	2.75562	4.18992906	**2.04372182**
50	0.653184	1.411788	2.752512	4.960116	8.37483019	**3.63048604**
60	0.7838208	1.9765032	4.4040192	8.9282088	16.7396106	**6.56643252**
70	0.94058496	2.76710448	7.04643072	16.0707758	33.4591336	**12.0568059**
80	1.12870195	3.87394628	11.2742892	28.9273966	66.8781162	**22.41649**
90	1.35444234	5.42352478	18.0388627	52.0693139	133.675979	**42.1124246**
100	1.62533081	7.59293469	28.8621803	93.7247651	267.191547	**79.7993516**
$\sum C_i$ /N (crore)	0.8176985	2.56565215	7.62658141	21.0290097	53.4178793	**17.0913642**

Table II: STATISTICAL STUDY OF CORRUPTION FOR PART-III

Data x	Frequency f	f. x	D= (x- X)	D^2	f. D^2
10	0.419937	4.19937	-78	6084	2554.89671
20	0.69274808	13.8549616	-68	4642	3215.73659
30	1.17524445	35.2573335	-58	3364	3953.52233
40	2.04372182	81.7488728	-48	2304	4708.73507
50	3.63048604	181.524302	-38	1444	5242.42184
60	6.56643252	393.985951	-28	784	5148.0831
70	12.0568059	843.976413	-18	324	3906.40511
80	22.41649	1793.3192	-8	64	1434.65536
90	42.1124246	3790.11821	2	4	168.449698
100	79.7993516	7979.93516	12	144	11491.1066
	N=$\sum f$ =170.9136	$\sum f.x$ = 15117.9199			$\sum f.D^2$ = 41824.0124

$$\mathbf{X}=\text{Mean}=\frac{\sum f.x}{N}=\frac{15117.9199}{170.9136}=88.4535806\approx 88$$

Therefore, **Mean =88**

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

Therefore, $$\text{S. D.}=\sigma=\sqrt{\frac{\sum fD^2}{N}}=\sqrt{\frac{41824.0124}{170.9136}}=\sqrt{244.70851}$$

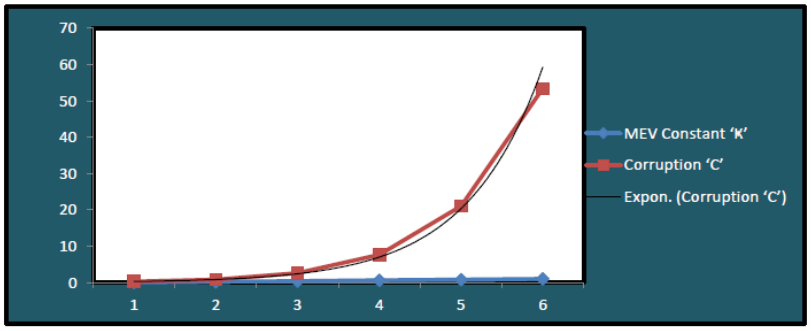
S. D. = σ = 15.6431618

Therefore the standard deviation of corruption in India with related period is 15.6431618.

STATISTICAL GRAPH OF PART-III:

MEV Constant **'K'**	Corruption **'C'**
0	0.2625
0.20	0.8176985
0.40	2.56565215
0.60	7.62658141
0.80	21.0290097
0.9988	53.4178793

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



IV. Conclusion:

We have observed that when we assumed value 0.75%, C (0) = C_0= 0.2625 crore. The Results are distributed in population size as

- **First stage corruption:**

  When $0 < K \leq 0.40$, C= 2.56565215 crore.

- **Medium stage corruption:**

  When $0.40 < K \leq 0.80$, C= 18.4633576 crore.

- **Final stage corruption:**

  When $0.80 < K < 1$, C= 32.3888696 crore.

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