IOSR Journal of Mathematics (IOSR-JM)
e-ISSN: 2278-5728, p-ISSN: 2319-765X. Volume 12, Issue 6 Ver. I (Nov. - Dec.2016), PP 72-79
www.iosrjournals.org

Mathematical Modelling: A Study for how to measure Corruption in the Society

Dr. Sayaji Rastum Waykar
Assistant Professor, Department of Mathematics, Yashwantrao Chavan Mahavidyalaya, Halkarni Tal: Chandgad, Dist: Kolhapur, Maharashtra (India).

Abstract: *In this paper we have to study on the problem of 'Corruption' in different ways by using mathematical modelling. The problem of corruption is everywhere, so we will try to find the formula for how to measure corruption in the society? So, 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.*

Keywords: *mathematical thinking, corruption mentality, modelling, 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:

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

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

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

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

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

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

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

Note that if the value of $\mathbf{\mathbb{K}}$ 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 modelling process for solving the problem of corruption in the society of any country of the world. Also we can represent mathematical modelling process in the form "Visual". Therefore it is known as visual mathematical modelling process. It is as follows:

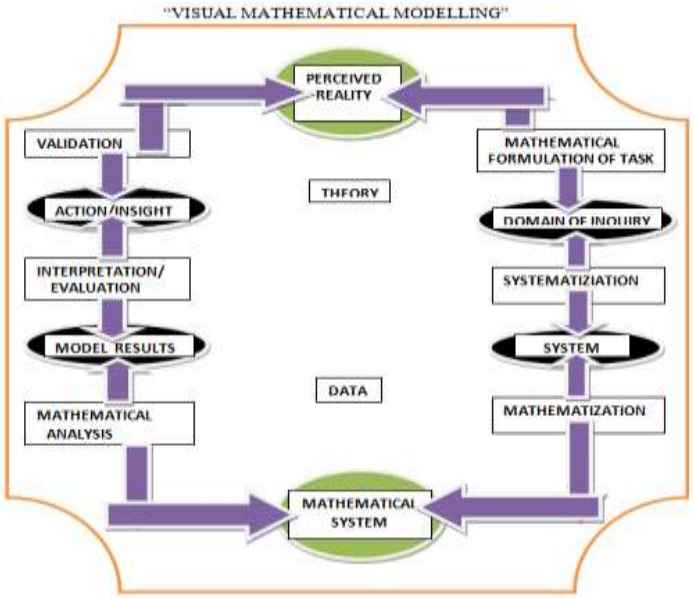


Fig-1: A Visual representation of the Mathematical Modelling process, Mathematical modelling means "Translation from real world problems into Mathematics world."

III. Some Illustrations for measuring Corruption in the society

3. Mathematical Corruption growths in various fields of the society (general) in India:

3.1 Part-II: we assume that corruption (-ve) was 0.50 % of total population 35 crore that is 0.1750 crore on 15 August, 1957.Therefore at MEVC constant ₭=0. When t=0, C (0) = C_0 = 0.1750 crore and when t= 10 years, C (t) depends on MEVC constant. We know that MEV constant formula,

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

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

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

$\mathbf{C} = 0.1750 \times [\frac{C(t)}{C(0)}]^{\frac{t}{10}}$ ---------- **(i)**

Where **₭** is known as MEVC constant. So we take the various values of MEVC constant **₭.** 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 **₭=0 and t= 10 years** then from (i), C= C_0 = 0.1750 crore

Therefore, **C = 0.1750 crore**

Case-II: when, we take **₭=0.20 and MM period t** = 10 years**,** C (t) = **0.2100 crore** then

from (i), Therefore, $\mathbf{C = 0.1750 \times [\frac{0.2100}{0.1750}]^{\frac{t}{10}}}$ ---------- **(ii)**

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

Therefore, $C = 0.1750 \times [1.20]^{\frac{10}{10}}$

Therefore, **C = 0.21 crore**

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

Therefore, $C = 0.1750 \times [1.20]^{\frac{20}{10}}$

Therefore, **C = 0.252 crore**

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

Therefore, $C = 0.1750 \times [1.20]^{\frac{30}{10}}$

Therefore, **C = 0.3024 crore**

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

Therefore, $C = 0.1750 \times [1.20]^{\frac{40}{10}}$

Therefore, **C = 0.36288 crore**

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

Therefore, $C = 0.1750 \times [1.20]^{\frac{50}{10}}$

Therefore, **C = 0.435456 crore**

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

Therefore, $C = 0.1750 \times [1.20]^{\frac{60}{10}}$

Therefore, **C = 0.5225472 crore**

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

Therefore, $C = 0.1750 \times [1.20]^{\frac{70}{10}}$

Therefore, **C = 0.62705664 crore**

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

Therefore, $C = 0.1750 \times [1.20]^{\frac{80}{10}}$

Therefore, **C = 0.75246797 crore**

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

Therefore, $C = 0.1750 \times [1.20]^{\frac{90}{10}}$

Therefore, **C = 0.90296156 crore**

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

Therefore, $C = 0.1750 \times [1.20]^{\frac{100}{10}}$

Therefore, **C =1.08355387 crore**

Case-III: when, we take **₭=0.40 and MM period t** = 10 years**,** C (t) = **0.2450 crore** then

from (i), Therefore, $\mathbf{C = 0.1750 \times [\frac{0.2450}{0.1750}]^{\frac{t}{10}}}$ ---------- **(iii)**

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

Therefore, $C = 0.1750 \times [1.40]^{\frac{10}{10}}$

Therefore, **C = 0.2450 crore**

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

Therefore, $C = 0.1750 \times [1.40]^{\frac{20}{10}}$

Therefore, **C = 0.3430 crore**

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

Therefore, $C = 0.1750 \times [1.40]^{\frac{30}{10}}$

Therefore, **C = 0.4802 crore**

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

Therefore, $C = 0.1750 \times [1.40]^{\frac{40}{10}}$

Therefore, **C = 0.67228 crore**

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

Therefore, $C = 0.1750 \times [1.40]^{\frac{50}{10}}$

Therefore, **C = 0.941192 crore**

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

Therefore, $C = 0.1750 \times [1.40]^{\frac{60}{10}}$

Therefore, **C = 1.3176688 crore**

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

Therefore, $C = 0.1750 \times [1.40]^{\frac{70}{10}}$

Therefore, **C = 1.84473632 crore**

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

Therefore, $C = 0.1750 \times [1.40]^{\frac{80}{10}}$

Therefore, **C = 2.58263086 crore**

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

Therefore, $C = 0.1750 \times [1.40]^{\frac{90}{10}}$

Therefore, **C = 3.61568319 crore**

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

Therefore, $C = 0.1750 \times [1.40]^{\frac{100}{10}}$

Therefore, **C = 5.06195646 crore**

Case-IV: when, we take **K=0.60 and MM period t =** 10 years**,** C (t) **= 0.2800 crore** then from (i), Therefore, $\mathbf{C = 0.1750 \times [\frac{0.2800}{0.1750}]^{\frac{t}{10}}}$ ---------- **(iv)**

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

Therefore**,** $C = 0.1750 \times [1.60]^{\frac{10}{10}}$

Therefore, **C = 0.2800 crore**

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

Therefore, $C = 0.1750 \times [1.60]^{\frac{20}{10}}$

Therefore, **C = 0.44800 crore**

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

Therefore, $C = 0.1750 \times [1.60]^{\frac{30}{10}}$

Therefore, **C = 0.7168 crore**

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

Therefore, $C = 0.1750 \times [1.60]^{\frac{40}{10}}$

Therefore, **C = 1.14688 crore**

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

Therefore, $C = 0.1750 \times [1.60]^{\frac{50}{10}}$

Therefore, **C = 1.835008 crore**

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

Therefore, $C = 0.1750 \times [1.60]^{\frac{60}{10}}$

Therefore, **C = 2.9360128 crore**

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

Therefore, $C = 0.1750 \times [1.60]^{\frac{70}{10}}$

Therefore, **C = 4.69762048 crore**

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

Therefore, $C = 0.1750 \times [1.60]^{\frac{80}{10}}$

Therefore, **C = 7.51619278 crore**

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

Therefore, $C = 0.1750 \times [1.60]^{\frac{90}{10}}$

Therefore, **C = 12.0259084 crore**

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

Therefore, $C = 0.1750 \times [1.60]^{\frac{100}{10}}$

Therefore, **C = 19.2414535 crore**

Case-V: when, we take **Ƙ=0.80 and MM period t =** 10 years**,** C (t) **= 0.3150 crore** then from (i), Therefore, $\mathbf{C = 0.1750 \times [\frac{0.3150}{0.1750}]^{\frac{t}{10}}}$ **---------- (v)**

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

Therefore, $C = 0.1750 \times [1.80]^{\frac{10}{10}}$

Therefore, **C = 0.3150 crore**

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

Therefore, $C = 0.1750 \times [1.80]^{\frac{20}{10}}$

Therefore, **C = 0.5670 crore**

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

Therefore, $C = 0.1750 \times [1.80]^{\frac{30}{10}}$

Therefore, **C = 1.0206 crore**

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

Therefore, $C = 0.1750 \times [1.80]^{\frac{40}{10}}$

Therefore, **C = 1.83708 crore**

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

Therefore, $C = 0.1750 \times [1.80]^{\frac{50}{10}}$

Therefore, **C = 3.306744 crore**

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

Therefore, $C = 0.1750 \times [1.80]^{\frac{60}{10}}$

Therefore, **C = 5.9521392 crore**

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

Therefore, $C = 0.1750 \times [1.80]^{\frac{70}{10}}$

Therefore, **C = 10.7138506 crore**

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

Therefore, $C = 0.1750 \times [1.80]^{\frac{80}{10}}$

Therefore, **C = 19.2849311 crore**

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

Therefore, $C = 0.1750 \times [1.80]^{\frac{90}{10}}$

Therefore, **C = 34.7128759 crore**

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

Therefore, $C = 0.1750 \times [1.80]^{\frac{100}{10}}$

Therefore, **C = 62.4831767 crore**

Case-VI: when, we take **Ƙ=0.9988 and MM period t =** 10 years**,** C (t) **= 0.3498 crore** then from (i), Therefore, $\mathbf{C = 0.1750 \times [\frac{0.3498}{0.1750}]^{\frac{t}{10}}}$ **---------- (vi)**

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

Therefore, $C = 0.1750 \times [1.9988]^{\frac{10}{10}}$

Therefore, **C = 0.3498 crore**

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

Therefore, $C = 0.1750 \times [1.9988]^{\frac{20}{10}}$

Therefore, **C = 0.699300175 crore**

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

Therefore, $C = 0.1750 \times [1.9988]^{\frac{30}{10}}$

Therefore, **C = 1.39756132 crore**

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

Therefore, $C = 0.1750 \times [1.9988]^{\frac{40}{10}}$

Therefore, **C = 2.79344555 crore**

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

Therefore, C = $0.1750 \times [1.9988]^{\frac{50}{10}}$

Therefore, **C = 5.58353896 crore**

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

Therefore, C = $0.1750 \times [1.9988]^{\frac{60}{10}}$

Therefore, **C = 11.1603777 crore**

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

Therefore, C = $0.1750 \times [1.9988]^{\frac{70}{10}}$

Therefore, **C = 22.3073629 crore**

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

Therefore, C = $0.1750 \times [1.9988]^{\frac{80}{10}}$

Therefore, **C = 44.5879569 crore**

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

Therefore, C = $0.1750 \times [1.9988]^{\frac{90}{10}}$

Therefore, **C = 89.1224082 crore**

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

Therefore, C = $0.1750 \times [1.9988]^{\frac{100}{10}}$

Therefore, **C = 178.137869 crore**

3.1.1 Mathematical Results for Part-II:

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
10	0.21	0.2450	0.2800	0.3150	0.3498
20	0.252	0.3430	0.44800	0.5670	0.6993
30	0.3024	0.4802	0.7168	1.0206	1.39756
40	0.36288	0.67228	1.14688	1.83708	2.79345
50	0.435456	0.941192	1.835008	3.306744	5.58354
60	0.5225472	1.3176688	2.9360128	5.9521392	11.16038
70	0.62705664	1.84473632	4.69762048	10.7138506	22.30736
80	0.75246797	2.58263086	7.51619278	19.2849311	44.58796
90	0.90296156	3.61568319	12.0259084	34.7128759	89.12241
100	1.08355387	5.06195646	19.2414535	62.4831767	178.13787
$\sum C_i$ /N(crore)	0.545132324	1.71043476	5.0843876	14.0193398	35.613963

STATISTICAL STUDY OF CORRUPTION FOR PART-II

Data x	Sample-II f	f. x	D= (x- X)	D^2	**f.** D^2
10	0.27996	2.7996	-78	6084	1703.27664
20	0.46186	9.2372	-68	4642	2143.95412
30	0.783512	23.50536	-58	3364	2635.73437
40	1.362514	54.50056	-48	2304	3139.23226
50	2.420388	121.0194	-38	1444	3495.04027
60	4.3777496	262.664976	-28	784	3432.15569
70	8.0381248	562.668736	-18	324	2604.35244
80	14.9448366	1195.58693	-8	64	956.469542
90	28.0759678	2526.8371	2	4	112.303871
100	53.2016022	5320.16022	12	144	7661.03072
	N=$\sum f = 113.95$	$\sum f.x$ =10102.4855			$\sum f.D^2 = 27883.55$

X=Mean= $\frac{\sum f.x}{N} = \frac{10102.4855}{113.95} = 88.6571786 \approx 88$

Therefore, **Mean =88**

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

Therefore, S. D. = $\sigma = \sqrt{\frac{\sum f D^2}{N}} = \sqrt{\frac{27883.55}{113.95}} = \sqrt{244.699868}$

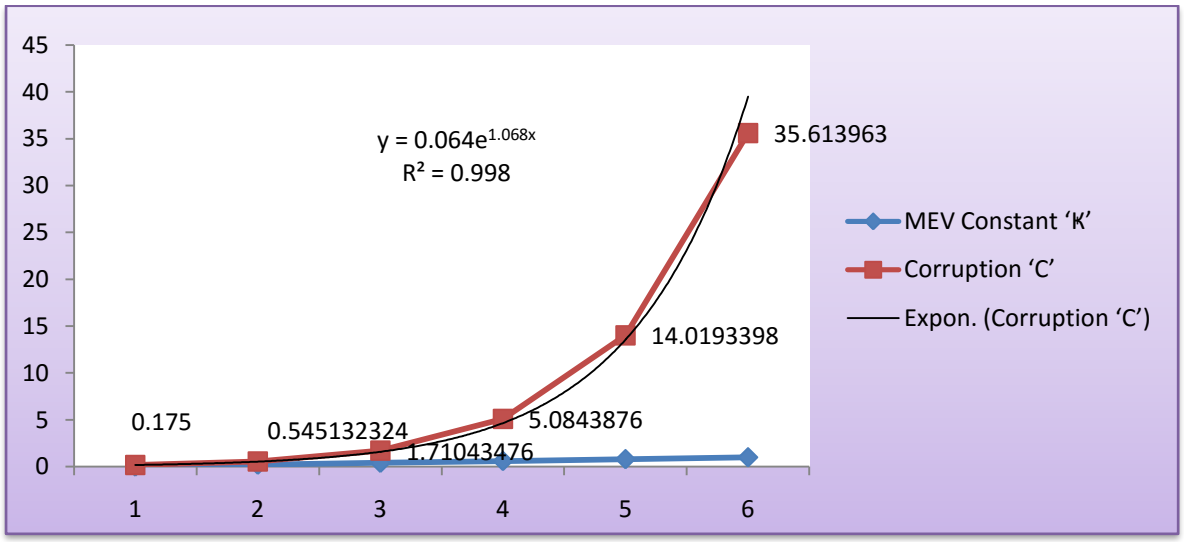
S. D. = σ = 15.6428855

Therefore the standard deviation of corruption in India with related period is **15.64.**

STATISTICAL GRAPH OF PART-II:

MEVC Constant **'Ƙ'**	Corruption **'C'**
0	0.1750
0.20	0.545132324
0.40	1.71043476
0.60	5.0843876
0.80	14.0193398
0.9988	35.613963

THE GRAPH BETWEEN MEV CONSTANT 'Ƙ' AND CORRUPTION 'C'



This shows that the above Mathematical Corruption Model is fit statistically if squared regression (R^2) is less than or equal to one.

We have observed that when we assumed value 0.50%, C (0) = C_0= 0.1750 crore. Then

First stage corruption:

When 0 < Ƙ ≤ 0.40, C= 1.71043476 crore.

Medium stage corruption:

When 0.40 < Ƙ ≤ 0.80, C= 12.308905 crore.

Final stage corruption:

When 0.80 < Ƙ < 1, C=21.5946232 crore.

3.2 Mathematical Growth of Development Model except Corruption:

We assume that corruption was 0.50 % of total population 35 crore that is 0.1750 crore on 15 August, 1957. Then D (0) = 0.1750 crore (in rupees) when C = 0 and we take MM Period t= 10 years. Therefore D(C) depends on MEV constant **Ƙ**. We know that Mathematical E-virus constant model with related corruption, we have

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

Putting this value in the MCD Model, we get

Therefore, $D(C) = D(0)[1 + Ƙ]^C$

$$\mathbf{D(C) = 0.1750 \times [\frac{D(C)}{D(0)}]^{\frac{C}{0.1750}}} \quad \text{----------} \quad \textbf{(vii)}$$

When Ƙ = 0, C = 0.1750**,** from (vii), **D(C) = D(0) = 0.1750 crore**

When Ƙ = 0.20**, C** = 0.545132324 crore then D(C) = 0.2100 from (vii), we have

Therefore, $D(C) = 0.1750 \times [\frac{0.2100}{0.1750}]^{\frac{0.545132324}{0.1750}}$

Therefore, **D(C) = 0.308809707465 crore**

When Ƙ = 0.40, C= 1.71043476 crore, then D(C) = 0.2450 from (vii), we have

Therefore, $D(C) = 0.1750 \times [\frac{0.2450}{0.1750}]^{\frac{1.71043476}{0.1750}}$

Therefore, **D(C) = 4.691165325 crore**

When Ƙ = 0.60, C=5.0843876 crore, then D(C) = 0.2800 from (vii), we have

Therefore, $D(C) = 0.1750 \times [\frac{0.2800}{0.1750}]^{\frac{5.0843876}{0.1750}}$

Therefore, **D(C) = 149096.43 crore**

When 𝕂 = 0.80, C= 14.0193398 crore, then D(C) = 0.3150 from (vii), we have

Therefore, $D(C) = 0.1750 \times [\frac{0.3150}{0.1750}]^{\frac{14.0193398}{0.1750}}$

Therefore, **D(C) =49322993153429327530.20 crore**

When 𝕂 = 0.9988, C=35.613963 crore, then D(C) = 0.34979 from (vii), we have

Therefore, $D(C) = 0.1750 \times [\frac{0.34979}{0.1750}]^{\frac{35.613963}{0.1750}}$

Therefore, **D(C) = 2.8321309e+60 crore**

Now we have observed that when we assumed value 0.50%, D (0) = 0.3500 crore. Then

First stage corruption: when $0 < 𝕂 \leq 0.40$, C= 1.71043476 crore then

Therefore, **D(C) = 4.691165325 crore**

Medium stage corruption: when $0.40 < 𝕂 \leq 0.80$, C= 12.308905 crore Then D(C) = 0.3150 from (vii), we have

Therefore, $D(C) = 0.1750 \times [\frac{0.3150}{0.1750}]^{\frac{12.308905}{0.1750}}$

Therefore, **D(C) = 27610621330956055 crore**

Final stage corruption: when $0.80 < 𝕂 < 1$, C=21.5946232 crore Then D(C) = 0.34979 from (vii), we have

Therefore, $D(C) = 0.1750 \times [\frac{0.34979}{0.1750}]^{\frac{21.5946232}{0.1750}}$

Therefore, **D(C) =3.98442e+35 crore**

3.2.1 Mathematical Result:

The mathematical result of the above data can be written in the following table. Also, we have observed that the relation between MEVC Constant, Corruption (in population size) and Development (in rupees) are as of the following:

Table-II

MEV Constant '𝕂'	Corruption 'C' (crore)	Development 'D' (crore)
0	0.1750	0.3500
0.20	0.545132324	0.308809707465
0.40	1.71043476	4.691165325
0.60	5.0843876	149096.43
0.80	14.0193398	49322993153429327530.20
0.9988	35.613963	2.8321309e+60

IV. Conclusion

We have observed and it concluded that our mathematical results with related corruption for Part-II when we assumed value 0.50% and the inflation will be approximately 15.64 among 100 years from base. Then the mathematical results are as follows**:**

First stage corruption:
When $0 < 𝕂 \leq 0.40$ C = 1.71043476 crore D(C) = 4.691165325 crore

Medium stage corruption:
When $0.40 < 𝕂 \leq 0.80$ C = 12.308905 crore D(C) = 27610621330956055 crore

Final stage corruption:
When $0.80 < 𝕂 < 1$ C =21.5946232 crore D(C) =3.98442e+35 crore

According to the data provided by the Swiss Banking Association Report (2006), India has more black money than the rest of the world combined. To put things in perspective, Indian-owned Swiss bank Account assets are worth 13 times the country's national debt.[16]

Therefore our Mathematical Corruption Model is valid for the above two illustrations. Also we observed that 'the corruption and inflation are related to each other'. When corruption increases then inflation increases and vice versa[14].

References

[1]. Matti Heilio (2009); Mathematics for Society, Industry and Innovation, Journal of Mathematical Modelling and Application, Vol.1, No.1, 77-88

[2]. Michael Gr. Voskoglou (2009); Transition Across Levels In The Process Of Learning: A Fuzzy Model, Journal of Mathematical Modelling and Application, Vol.1, No.1, 37-44

[3]. Michael Gr. Voskoglou, G. T. E. I. P. Greece **(**2010**)**, A stochastic model for case-based Reasoning, Journal of Mathematical Modelling and Application, Vol.1, No.3, 33-39.
[4]. Patricia Camarena Gallardo, N. P. I. Mexico (2009); Mathematical Modelling and Knowledge Transference, Journal of Mathematical Modelling and Application, Vol.1, No.1, 18-36
[5]. Rui Gomes Neves, Vítor Duarte Teodoro (2010); Enhancing Science and Mathematics Education with Computational Modelling, Journal of Mathematical Modelling and Application, Vol.1, No.2, 2-15
[6]. Rose-Ackerman, Susan 1999. 'Corruption and Government: Causes Consequences and Reform. Cambridge University Press, New York.
[7]. Sayaji Rastum Waykar (2013), Mathematical modelling: A comparatively mathematical Study model base between corruption and development, IOSR Journal of Mathematics, Vol. 6, Issue 2, pp 54-62.
[8]. Sayaji Rastum Waykar (2014), Mathematical modelling: A study of corruption in various fields of the society, IOSR Journal of Mathematics, Vol. 10, Issue 1, Ver. I, PP 29-38.
[9]. Shleifer, Andrei and Vishny, R. W. (1993), 'Corruption' Quarterly Journal of Economics 108:599-617
[10]. Sayaji Rastum Waykar (2013), Mathematical modelling: A study of corruption in the Society, IJSER, Vol. 4, Issue 7, pp 2303-2318 (USA).
[11]. Sayaji Rastum Waykar (2013), Mathematical modelling: A way of a life, IJSER, Vol. 5, Issue 5, May- 2013 edition (USA).
[12]. Schoenfeld A. H. (1994). Mathematical Thinking and Problem Solving. Hillsdale: Erlbaum
[13]. Shabnam Mallick and Rajarshi Sen (2006); The Incidence of Corruption in India: Is the Neglect of Governance Endangering Human Security in South Asia, (Institute of Defence and Strategic Studies Singapore)
[14]. Hasim Akca (2012) et.al, Inflation and Corruption Relationship: Evidence from Panel Data in Developed and Developing Countries, International Journal of Economics and Financial Issues, Vol. 2, No. 3, pp.281-295.
[15]. Wikipedia (2013), Municipal Governance in India, The free encyclopedia- windows Internet Explorer.
[16]. Anna Hazare's Anti-corruption movement (2011), Incredible India! Facts, Stats and the Effects of Corruption, posted by Maansi, India Gate, New Delhi.