Collected papers of

Lord Soumadeep Ghosh

Volume 26

My heuristic for finding a real root of the nonic equation when a real root exists

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe my heuristic for finding a real root of the nonic equation when a real root exists.
The paper ends with "The End"

Introduction

In a previous paper, I've described my heuristic for finding a real root of the octic equation when a real root exists.

In this paper, I describe my heuristic for finding a real root of the nonic equation when a real root exists.

My heuristic for finding a real root of the nonic equation when a real root exists

For the nonic equation

$$x^9 + ax^8 + bx^7 + cx^6 + dx^5 + ex^4 + fx^3 + gx^2 + hx + i = 0$$

whenever

$$56a + 35b + 20c + 10d + 4e + f + 84 \neq 0$$

my heuristic for finding a real root of the nonic equation when a real root exists is to use the initial guess

$$x_0 = 1 - \frac{28a + 21b + 15c + 10d + 6e + 3f + g + 36}{3(56a + 35b + 20c + 10d + 4e + f + 84)}$$

for Newton-Raphson iteration.

The End

My heuristic for finding a real root of the decic equation when a real root exists

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe my heuristic for finding a real root of the decic equation when a real root exists.
The paper ends with "The End"

Introduction

In a previous paper, I've described my heuristic for finding a real root of the nonic equation when a real root exists.

In this paper, I describe my heuristic for finding a real root of the decic equation when a real root exists.

My heuristic for finding a real root of the decic equation when a real root exists

For the decic equation

$$x^{10} + ax^9 + bx^8 + cx^7 + dx^6 + ex^5 + fx^4 + gx^3 + hx^2 + ix + j = 0$$

whenever

$$84a + 56b + 35c + 20d + 10e + 4f + g + 120 \neq 0$$

my heuristic for finding a real root of the decic equation when a real root exists is to use the initial guess

$$x_0 = 1 - \frac{36a + 28b + 21c + 15d + 10e + 6f + 3g + h + 45}{3(84a + 56b + 35c + 20d + 10e + 4f + g + 120)}$$

for Newton-Raphson iteration.

The End

My heuristic for finding a real root of the general real polynomial equation when a real root exists

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe my heuristic for finding a real root of the general real polynomial equation when a real root exists.
The paper ends with "The End"

Introduction

In a previous paper, I've described my heuristic for finding a real root of the decic equation when a real root exists.

In this paper, I describe my heuristic for finding a real root of the general real polynomial equation when a real root exists.

My heuristic for finding a real root of the general real polynomial equation when a real root exists

For the general real polynomial equation

$$\sum_{i=0}^{n} c_i x^i = 0$$

where
$n \in \mathbb{N}$
$n \geq 3$
$c_i \in \mathbb{R}$
whenever

$$\sum_{i=0}^{n} i(i-1)(i-2)c_i \neq 0$$

my heuristic for finding a real root of the general real polynomial equation when a real root exists is to use the initial guess

$$x_0 = 1 - \frac{\sum_{i=0}^{n} i(i-1)c_i}{\sum_{i=0}^{n} i(i-1)(i-2)c_i}$$

for Newton-Raphson iteration.

The End

Tales cities tell

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the tales cities tell.
The paper ends with "The End"

Introduction

I refrain from making comments on specific regions of the world unless knowledge is specifically demanded from me. But in the general case of cities, I think attention is required to the tales cities tell.

Cities have existed from ancient times. Urban populations that acquire knowledge have invariably chosen to aggregate in what can only be described as cities. Urban sociology provides a general overview of a city and also about the variance among cities. While many city dwellers like the business of their city, some city dwellers hate the negativity of urban city life as well. This paper is **not** on urban sociology, which many academics have written about at length.

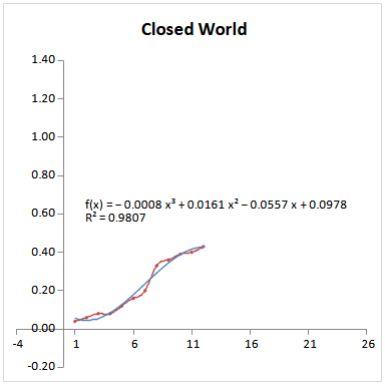
In this paper, I describe the tales cities, specifically the largest city's peak populations, tell.

Largest city's peak population from ancient time to present

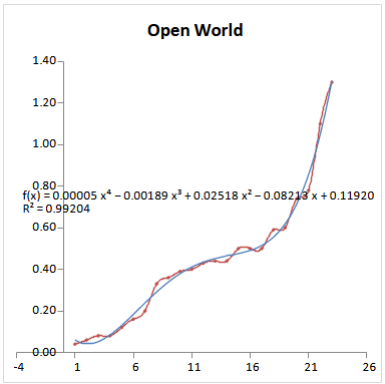
Below is a table of the largest cities of the world and their respective peak population from ancient time to present:

Rank	Largest City	Peak Population (mn)	Standardized	Rate	Standardized	Nation
1	Isin	0.04	-0.34	NaN	NaN	Iraq
2	Lagash	0.06	-0.34	0.50	0.05	Iraq
3	Girsu	0.08	-0.33	0.33	-0.13	Iraq
4	Uruk	0.08	-0.33	0.00	-0.47	Iraq
5	Thebes	0.12	-0.33	0.50	0.05	Egypt
6	Pi-Ramesses	0.16	-0.32	0.33	-0.13	Egypt
7	Babylon	0.20	-0.32	0.25	-0.21	Iraq
8	Córdoba	0.33	-0.30	0.65	0.20	Spain
9	Lin'an	0.36	-0.30	0.09	-0.38	China
10	Rome	0.39	-0.29	0.08	-0.39	Italy
11	Carthage	0.40	-0.29	0.03	-0.45	Tunisia
12	Hangzhou	0.43	-0.29	0.07	-0.39	China
13	Bian	0.44	-0.29	0.02	-0.45	China
14	Vijayanagara	0.44	-0.29	0.00	-0.47	India
15	Yingtian	0.50	-0.28	0.14	-0.33	China
16	Cairo	0.50	-0.28	0.00	-0.47	Egypt
17	Ctesiphon	0.50	-0.28	0.00	-0.47	Iraq
18	Chang'an	0.59	-0.27	0.18	-0.29	China
19	Alexandria	0.60	-0.26	0.02	-0.45	Egypt
20	Constatinople	0.74	-0.25	0.23	-0.23	Turkey
21	Dhaka	0.78	-0.24	0.05	-0.42	Bangladesh
22	Baghdad	1.10	-0.20	0.41	-0.05	Iraq
23	Beijing	1.30	-0.17	0.18	-0.28	China
24	London	7.40	0.63	4.69	4.39	U.K.
25	New York	13.20	1.39	0.78	0.34	U.S.
26	Tokyo	37.30	4.56	1.83	1.42	Japan
Mean	-	2.62	0	0.46	0	-
Std. Dev.	-	7.61	1	0.96	1	-

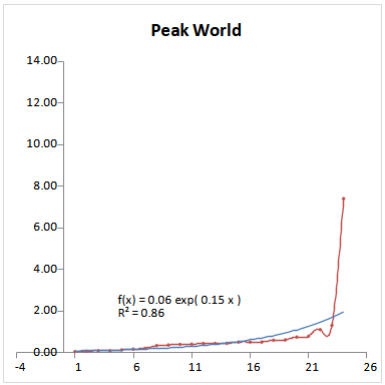
Graphs of largest city's peak population from ancient time to present



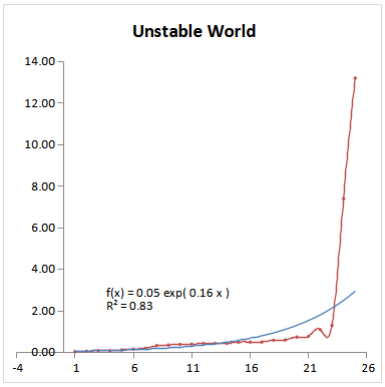
The first graph was plotted by taking only the first half of the data, i.e., the 13 largest cities of the **closed world**.



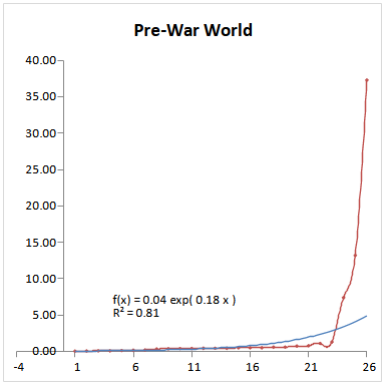
The second graph was plotted by taking cities except the latest 3 largest cities, i.e., the cities of the **open world**.



The third graph was plotted by taking cities except the latest 2 largest cities, i.e., the cities of the **peak world**.



The fourth graph was plotted by taking the cities except the latest largest city, i.e., the cities of the **unstable world**.



The fifth graph was plotted by taking all 26 cities, i.e., the cities of the **pre-war world**.

The analysis

1. The cities of the closed world follow an S-shaped (sigmoid) curve and the total population is small compared to the remaining graphs. Presumably, this world decided to pursue **open macroeconomics** to develop their economies.

2. The cities of the open world follow a quartic curve that results in a total population around 3.28 times that of the closed world. Presumably, this world decided to pursue **financial economics** to support increasing population.

3. The peak world consists of just one more city than the open world, namely **London**, that results in a total population around 1.73 times that of the open world. Presumably, this world reached a **peak of production** since that city is an **outlier** in the graph. This implies that city got high returns for risks in the future.

4. The unstable world consists of just one more city than the peak world, namely **New York**, that results in a total population around 1.75 times that of the peak world. Presumably, this world reached a **peak of risk** since 2 cities are **outliers** in the graph. This implies that city took high risk from the future as the previous city already got high returns.

5. The pre-war world consists of just one more city than the unstable world, namely **Tokyo**, that results in a total population around 2.21 times that of the unstable world. But both return and risk were taken by two previous largest cities. Therefore, this city **neither got returns nor took risk** - this city was **annihilated**.

The End

My first professy on nations about to be invaded by the USA

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe my first professy on nations about to be invaded by the USA.
The paper ends with "The End"

Introduction

In this paper, I describe my first professy on nations about to be invaded by the USA.

My first professy on nations about to be invaded by the USA

The USA will eventually invade these 4 nations:

1. Djibouti
2. Kenya
3. Kyrgyzstan
4. Tuvalu

The End

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Introduction

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My second professy on nations about to be invaded by the USA

The USA will also eventually invade these 4 nations:

1. Sri Lanka
2. Azerbaijan
3. China
4. Trinidad and Tobago

The End

My third professy on nations about to be invaded by the USA

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Abstract

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Introduction

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My third professy on nations about to be invaded by the USA

The USA will also eventually invade these 4 more nations:

1. Croatia
2. New Zealand
3. Malta
4. Denmark

The End

The reduction of two co-integrated real variables

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the reduction of two co-integrated real variables.
The paper ends with "The End"

Introduction

Two real variables x and y are said to be **co-integrated** when

$$a_0 + a_1 x + a_2 x^2 + b_0 + b_1 y + b_2 y^2 + c_0 + c_1 xy = 0$$

for real coefficients a_0, a_1, a_2, b_0, b_1, b_2, c_0 and c_1.
In this paper, I describe the reduction of two co-integrated real variables.

The reduction of two co-integrated real variables

The reduction of two co-integrated real variables has 6 cases and is given by

$$a_0 + a_1 x + a_2 x^2 + b_0 + b_1 y + b_2 y^2 + c_0 + c_1 xy = 0$$

$$\Longrightarrow$$

$$\left(b_2 \neq 0 \wedge \left(y = \frac{-\sqrt{(b_1 + c_1 x)^2 - 4b_2 (a_2 x^2 + a_1 x + a_0 + b_0 + c_0)} - b_1 - c_1 x}{2b_2} \vee y = \frac{\sqrt{(b_1 + c_1 x)^2 - 4b_2 (a_2 x^2 + a_1 x + a_0 + b_0 + c_0)} - b_1 - c_1 x}{2b_2} \right) \right)$$

$$\vee$$

$$\left(b_2 = 0 \wedge b_1 + c_1 x \neq 0 \wedge y = \frac{-a_2 x^2 - a_1 x - a_0 - b_0 - c_0}{b_1 + c_1 x}\right)$$

$$\vee$$

$$\left(b_2 = 0 \wedge c_1 \neq 0 \wedge a_0 = \frac{a_1 b_1 c_1 - a_2 b_1^2 - b_0 c_1^2 - c_0 c_1^2}{c_1^2} \wedge x = -\frac{b_1}{c_1}\right)$$

$$\vee$$

$$\left(c_1 = 0 \wedge b_2 = 0 \wedge b_1 = 0 \wedge a_2 \neq 0 \wedge \left(x = \frac{-\sqrt{a_1^2 - 4a_2\left(a_0 + b_0 + c_0\right)} - a_1}{2a_2} \vee x = \frac{\sqrt{a_1^2 - 4a_2\left(a_0 + b_0 + c_0\right)} - a_1}{2a_2}\right)\right)$$

$$\vee$$

$$(c_1 = 0 \wedge b_2 = 0 \wedge b_1 = 0 \wedge a_2 = 0 \wedge a_1 = 0 \wedge a_0 = -b_0 - c_0)$$

$$\vee$$

$$\left(c_1 = 0 \wedge b_2 = 0 \wedge b_1 = 0 \wedge a_2 = 0 \wedge a_1 \neq 0 \wedge x = \frac{-a_0 - b_0 - c_0}{a_1}\right)$$

The End

The reduction of three co-integrated real variables

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the reduction of three co-integrated real variables.
The paper ends with "The End"

Introduction

Three real variables x, y and z are said to be **co-integrated** when

$$a_0 + a_1x + a_2x^2 + b_0 + b_1y + b_2y^2 + c_0 + c_1z + c_2z^2 + d_0 + d_1xy + d_2yz + d_3zx = 0$$

for real coefficients a_0, a_1, a_2, b_0, b_1, b_2, c_0, c_1, c_2, d_0, d_1, d_2, d_3.
In this paper, I describe the reduction of three co-integrated real variables.

The reduction of three co-integrated real variables

The reduction of three co-integrated real variables has 16 cases and is available upon request.

The End

The mathematics of sampling

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the mathematics of sampling.
The paper ends with "The End"

Introduction

The mathematics of sampling is simple but unknown to many economists.
In this paper, I describe the mathematics of sampling.

The mathematics of sampling

The mathematics of sampling is

$$P_s = \frac{N - s}{1 + r_f + p_s}$$

where
N is the size of collection
s is the size of sample
P_s is the price of sampling
r_f is the risk-free rate
p_s is the sampling premium

The End

14 linear solutions to sampling

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe linear solutions to sampling.
The paper ends with "The End"

Introduction

In a previous paper, I've described the mathematics of sampling.
In this paper, I describe 14 linear solutions to sampling.

Linear solutions to sampling

Linear solutions to sampling are

$$N(t) = m + nt$$

$$s(t) = u + vt$$

$$P_s(t) = p + qt$$

$$p_s(t) = x + yt$$

where
for all t
r_f, m, n, u, v, p, q, x, y are real constants

14 linear solutions to sampling

14 linear solutions to sampling are

1. $$r_f = 0, m = 90, n = 18, u = 47, v = \frac{83}{6}, p = \frac{61}{3}, q = \frac{1525}{774}, x = \frac{68}{61}, y = 0$$

2. $$r_f = \frac{9}{1402}, m = 23, n = 56, u = \frac{9}{5}, v = 45, p = \frac{34}{5}, q = \frac{187}{53}, x = \frac{50319}{23834}, y = 0$$

3. $$r_f = \frac{24}{701}, m = 38, n = 9, u = 23, v = \frac{19}{3}, p = \frac{32}{7}, q = \frac{256}{315}, x = \frac{50405}{22432}, y = 0$$

4. $$r_f = \frac{180}{701}, m = 91, n = 32, u = \frac{39}{2}, v = 20, p = 4, q = \frac{96}{143}, x = \frac{93195}{5608}, y = 0$$

5. $$r_f = \frac{195}{701}, m = 98, n = 52, u = \frac{3}{2}, v = \frac{49}{2}, p = \frac{61}{2}, q = \frac{3355}{386}, x = \frac{80637}{42761}, y = 0$$

6. $$r_f = \frac{603}{1402}, m = 9, n = 68, u = \frac{7}{4}, v = \frac{57}{2}, p = \frac{47}{20}, q = \frac{3713}{290}, x = \frac{109055}{65894}, y = 0$$

7. $$r_f = \frac{391}{701}, m = 72, n = 93, u = \frac{95}{2}, v = 30, p = \frac{30}{7}, q = \frac{540}{49}, x = \frac{174923}{42060}, y = 0$$

8. $$r_f = \frac{465}{701}, m = 35, n = 23, u = \frac{20}{3}, v = \frac{34}{5}, p = \frac{50}{3}, q = \frac{162}{17}, x = \frac{257}{7010}, y = 0$$

9. $$r_f = \frac{977}{1402}, m = 46, n = 43, u = \frac{70}{3}, v = \frac{86}{3}, p = \frac{65}{8}, q = \frac{2795}{544}, x = \frac{298783}{273390}, y = 0$$

10. $$r_f = \frac{1007}{1402}, m = 20, n = 35, u = \frac{1}{2}, v = \frac{94}{3}, p = \frac{28}{3}, q = \frac{616}{351}, x = \frac{14565}{39256}, y = 0$$

11. $$r_f = \frac{1039}{1402}, m = 21, n = 40, u = \frac{33}{5}, v = \frac{80}{3}, p = \frac{92}{13}, q = \frac{2300}{351}, x = \frac{47353}{161230}, y = 0$$

12. $$r_f = \frac{609}{701}, m = 96, n = 21, u = 9, v = \frac{33}{5}, p = 33, q = \frac{792}{145}, x = \frac{5919}{7711}, y = 0$$

13. $$r_f = \frac{1247}{1402}, m = 59, n = 92, u = 16, v = \frac{101}{2}, p = \frac{38}{5}, q = \frac{1577}{215}, x = \frac{50192}{13319}, y = 0$$

14. $$r_f = 1, m = 15, n = 22, u = \frac{20}{7}, v = \frac{81}{5}, p = \frac{75}{17}, q = \frac{609}{289}, x = \frac{79}{105}, y = 0$$

The End