Collected papers
of

Lord Soumadeep Ghosh

Volume 18

The real option

Soumadeep Ghosh

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Abstract

In this paper, I describe the real option. The paper ends with "The End"

Introduction

The real option is the holy grail of options.
In this paper, I describe the real option.

The real option

The real option is a financial option that pays r with probability $0 \leq p \leq 1$ and $r \log r$ with probability $(1-p)$ and has a price r.
Mathematically, we have

$$r = pr + (1-p)r\log(r) \wedge (0 \leq p \leq 1)$$

$$\iff$$

$$((r \neq 0) \wedge (p = 1)) \vee ((0 \leq p \leq 1) \wedge (r = e))$$

where
r is price of the option
p is probability of payout of r
e is the base of the natural logarithm

The End

The probabilistic option

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe the probabilistic option. The paper ends with "The End"

Introduction

The probabilistic option is the holy chalice of options. In this paper, I describe the probabilistic option.

The probabilistic option

The probabilistic option is a financial option that pays r with probability $0 \le p \le 1$ and $r \log r$ with probability $(1-p)$ has a price p and the discount rate p. Mathematically, we have

$$r = \frac{pr + (1-p)r\log(r)}{1+p} \wedge (0 \le p \le 1)$$

$$\iff$$

$$(0 \le p \le 1) \wedge ((p = \frac{1}{2}(r + r(-\log(r)) - \sqrt{(-r + r\log(r) + 1)^2 + 4r\log(r)} - 1)) \vee (p = \frac{1}{2}(r + r(-\log(r)) + \sqrt{(-r + r\log(r) + 1)^2 + 4r\log(r)} - 1)))$$

where
r is price of the option
p is probability of payout of r

The End

Smoke-screening with white phosphorous

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe smoke-screening with white phosphorous. The paper ends with "The End"

Introduction

As of this writing, white phosphorus is the most effective smoke-screening agent known.
In this paper, I describe smoke-screening with white phosphorous.

Smoke-screening with white phosphorous

White phosphorus munitions are weapons that use one of the common allotropes of the chemical element phosphorus.
When white phosphorus burns in air, it first forms tetra-phosphorus decoxide:

$$P_4 + 5O_2 \rightarrow P_4O_{10}$$

However tetra-phosphorus decoxide is extremely hygroscopic and quickly absorbs even minute traces of moisture to form liquid droplets of phosphoric acids:

$$P_4O_{10} + 6H_2O \rightarrow 4H_3PO_4$$

which absorb more moisture because phosphoric acids are hygroscopic.
In practice, the droplets quickly reach a range of sizes suitable for scattering visible light and then start to dissipate from wind or convection.
The smoke cloud thoroughly scrambles any image of an object behind the smoke cloud and also absorbs infrared radiation, allowing the white phosphorous munition to defeat most thermal imaging systems.

Ideal uses of white phosphorous munitions

1. Tactical smoke grenade in close combat.
2. Mortar shell to disorient enemy troops.
3. Airplane bomb to cover land units.

The End

Napalm

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe napalm. The paper ends with "The End"

Introduction

As of this writing, napalm is the most effective fire bombing agent known. In this paper, I describe fire bombing with napalm.

Napalm

Napalm is an incendiary mixture of a gelling agent (usually co-precipitated aluminium salts of naphthenic acid ($C_nH_{2n-z}O_2$) and palmitic acid ($CH_3(CH_2)_{14}COOH$)) and a volatile petrochemical (usually petrol or diesel).

Fire-bombing with napalm

Napalm burns at temperatures ranging from 800°C to 1200°C. In addition, it burns longer than gasoline, is more easily dispersed, and sticks to the target. These traits make it both effective and controversial.

Ideal uses of naplam

1. Tactical personal flamethrower.
2. Large vehicle-mounted flamethrower.
3. Airplane bomb to incinerate enemy land units.

The End

Laser-guided bomb

Soumadeep Ghosh

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Abstract

In this paper, I describe laser-guided bomb. The paper ends with "The End"

Introduction

As of this writing, the laser-guided bomb is the most effective precision weapon used for high-value target. In this paper, I describe laser-guided bomb.

Laser-guided bomb

A **laser-guided bomb** uses active or semi-active laser guidance to strike a designated target with greater accuracy than an unguided bomb. These weapons use on-board electronics to track targets that are designated by laser, typically in the infrared spectrum, and adjust their glide path to accurately strike the target.

Since these weapons track a light signature, not the object itself, the target must be illuminated from a separate source, either by ground/sea forces, by a pod on the attacking aircraft/ship, or by a separate support aircraft/ship.

Technologies used in a laser-guided bomb

1. Aerodynamics
2. Image processing
3. Rocket propulsion, if necessary, for larger range
4. Stochastic gradient descent algorithm

Ideal uses of a LGB

1. Striking high-value targets on enemy land or sea with high precision.
2. Defeating smoke-screening units and buildings.
3. Using less explosive per bomb.
4. Causing less collateral damage than from using conventional unguided bombs.

The End

Naval weapons

Soumadeep Ghosh

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Abstract

In this paper, I describe naval weapons. The paper ends with "The End"

Introduction

Naval warfare is as old as fishing. In this paper, I describe naval weapons in increasing order of technological advancement.

Naval weapons can be classified as either ships (vehicles that operate on water) or armaments (implements used in ships). Models like Lanchester-type sea models and Salvo combat models are able to use these ships and armaments.

Ships

1. **Scout boat**

   The scout boat is not intended to be used in enemy waters, but only for reconnaissance from afar.

   They are armed with simple guns for defense and RADAR/SONAR for reconnaissance.

2. **Destroyer**

   The destroyer is a powerful ship armed that can carry cruise missiles, including nuclear warheads.

   They are armed with long guns for defense and RADAR/SONAR for operations in formations.

3. **Aircraft carrier**

   The aircraft carrier is larger and more powerful than a destroyer designed with multiple hulls to prevent sinking.

   They are armed with heavy guns for defense, RADAR/SONAR for operations in formations and can carry Inter-Continental Ballistic Missiles.

   They are primarily used as a power-projection weapon since they can carry tactical weapons like aircraft and helicopters for on-shore delivery.

4. **Frigate**

   The frigate is a small ship that is primarily a strategic weapon.

   The frigate either accompanies or monitors the aircraft carrier and is tasked with reporting back to the naval base if an aircraft carrier is sunk by the enemy.

5. **Nuclear submarine**

   Operated by a silent nuclear reactor and with stealth capabilities, the nuclear submarine is responsible for the ultimate defense, and if necessary, assault on the enemy.

   They are armed with torpedoes for defense, RADAR/SONAR for operations in formations and can carry vertically-launched long cruise missiles armed with nuclear warheads.

   Because they are operated by a silent nuclear reactor, they can lie dormant on the ocean floor for decades if not centuries.

Armaments

1. **Flamethrowers**

   Used to ignite fire on nearby enemy ships, flamethrowers were used in naval warfare since antiquity.

2. **Cannons**

   Used to fire cannonballs on nearby enemy ships, cannons were used in naval warfare since antiquity.

3. **Depth charges**

   Depth charges use non-conventional explosives that explodes underwater like nitrocellulose (also known as gun-cotton) to destroy enemy submarines.

4. **Torpedoes**

   Torpedoes are the modern underwater equivalent of a rocket with solid/liquid propellant and are used in submarine warfare.

The End

$\sin 3^\circ$ and $\cos 3^\circ$

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe $\sin 3^\circ$ and $\cos 3^\circ$. The paper ends with "The End"

Introduction

As of this writing, there are two ways to measure an angle in plane geometry:

1. The degree measure
   In the degree measure, the angle at the center of a circle is 360 degree (also written as $^\circ$)
2. The radian measure
   In the radian measure, the angle at the center of a circle is 2π radian (also written as rad)

In this paper, I describe $\sin 3^\circ$ and $\cos 3^\circ$.

$\sin 3^\circ$ and $\cos 3^\circ$

$$\sin 3^\circ = \frac{1}{16}\left(\sqrt{2}\left(\sqrt{3}+1\right)\left(\sqrt{5}-1\right) - 2\left(\sqrt{3}-1\right)\sqrt{\sqrt{5}+5}\right)$$

$$\cos 3^\circ = \frac{1}{16}\left(\sqrt{2}\left(\sqrt{3}-1\right)\left(\sqrt{5}-1\right) + 2\left(\sqrt{3}+1\right)\sqrt{\sqrt{5}+5}\right)$$

The End

sin 1° and cos 1°

Soumadeep Ghosh

Kolkata, India

Abstract
In this paper, I describe sin 1° and cos 1°. The paper ends with "The End"

Introduction

In a previous paper, I've described sin 3° and cos 3°. In this paper, I describe sin 1° and cos 1°.

sin 1° and cos 1°

$$\sin 1^\circ = \sqrt{1+\frac{1}{2}\left(-1-\sqrt{1-\frac{\left(\left(1+i\sqrt{3}\right)\left(-\sqrt{5}+\sqrt{30-6\sqrt{5}}+\sqrt{-2\left(2\sqrt{5}+\sqrt{30\left(5-\sqrt{5}\right)}+\sqrt{30-6\sqrt{5}}+14\right)}-1\right)^{2/3}-4i\sqrt{3}+4\right)^2}{64\left(-\sqrt{5}+\sqrt{30-6\sqrt{5}}+\sqrt{-2\left(2\sqrt{5}+\sqrt{30\left(5-\sqrt{5}\right)}+\sqrt{30-6\sqrt{5}}+14\right)}-1\right)^{2/3}}}\right)}$$

$$\cos 1^\circ = \sqrt{\frac{1}{2}\left(1+\sqrt{1-\frac{\left(\left(1+i\sqrt{3}\right)\left(-\sqrt{5}+\sqrt{30-6\sqrt{5}}+\sqrt{-2\left(2\sqrt{5}+\sqrt{30\left(5-\sqrt{5}\right)}+\sqrt{30-6\sqrt{5}}+14\right)}-1\right)^{2/3}-4i\sqrt{3}+4\right)^2}{64\left(-\sqrt{5}+\sqrt{30-6\sqrt{5}}+\sqrt{-2\left(2\sqrt{5}+\sqrt{30\left(5-\sqrt{5}\right)}+\sqrt{30-6\sqrt{5}}+14\right)}-1\right)^{2/3}}}\right)}$$

The End

$\sin \frac{1}{2}^{\circ}$ and $\cos \frac{1}{2}^{\circ}$

Soumadeep Ghosh

Kolkata, India

Abstract

In this paper, I describe $\sin \frac{1}{2}^{\circ}$ and $\cos \frac{1}{2}^{\circ}$. The paper ends with "The End"

Introduction

In a previous paper, I've described $\sin 1^{\circ}$ and $\cos 1^{\circ}$. In this paper, I describe $\sin \frac{1}{2}^{\circ}$ and $\cos \frac{1}{2}^{\circ}$.

$\sin \frac{1}{2}^{\circ}$ and $\cos \frac{1}{2}^{\circ}$

$$\sin \frac{1}{2}^{\circ} = \frac{1}{8}\sqrt{-\frac{\left(\left(\sqrt{3}-i\right)\left(-\sqrt{5}+\sqrt{30-6\sqrt{5}}+\sqrt{-2\left(2\sqrt{5}+\sqrt{30\left(5-\sqrt{5}\right)}+\sqrt{30-6\sqrt{5}}+14\right)}-1\right)^{2/3}-4\left(\sqrt{3}+i\right)\right)^{2}}{\left(-\sqrt{5}+\sqrt{30-6\sqrt{5}}+\sqrt{-2\left(2\sqrt{5}+\sqrt{30\left(5-\sqrt{5}\right)}+\sqrt{30-6\sqrt{5}}+14\right)}-1\right)^{2/3}}}$$

$$\cos \frac{1}{2}^{\circ} = \sqrt{1+\frac{\left(\left(\sqrt{3}-i\right)\left(-\sqrt{5}+\sqrt{30-6\sqrt{5}}+\sqrt{-2\left(2\sqrt{5}+\sqrt{30\left(5-\sqrt{5}\right)}+\sqrt{30-6\sqrt{5}}+14\right)}-1\right)^{2/3}-4\left(\sqrt{3}+i\right)\right)^{2}}{64\left(-\sqrt{5}+\sqrt{30-6\sqrt{5}}+\sqrt{-2\left(2\sqrt{5}+\sqrt{30\left(5-\sqrt{5}\right)}+\sqrt{30-6\sqrt{5}}+14\right)}-1\right)^{2/3}}}$$

The End

Ghosh's trigonometric tables

Soumadeep Ghosh

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Abstract

In this paper, I describe trigonometric ratios of acute angles to at least 16 digits of precision. The paper ends with "The End"

Ghosh's trigonometric tables

θ	$\sin\theta$	$\cos\theta$	$\tan\theta$
0°	0	1	0
1°	0.01745240643728351	0.9998476951563912	0.01745506492821759
2°	0.03489949670250097	0.9993908270190957	0.03492076949174773
3°	0.05233595624294383	0.9986295347545739	0.05240777928304120
4°	0.06975647374412530	0.9975640502598242	0.06992681194351041
5°	0.08715574274765817	0.9961946980917455	0.08748866352592401
6°	0.1045284632676535	0.9945218953682733	0.1051042352656765
7°	0.1218693434051475	0.9925461516413220	0.1227845609029046
8°	0.1391731009600654	0.9902680687415703	0.1405408347023914
9°	0.1564344650402309	0.9876883405951377	0.1583844403245363
10°	0.1736481776669303	0.9848077530122081	0.1763269807084650
11°	0.1908089953765448	0.9816271834476640	0.1943803091377185
12°	0.2079116908177593	0.9781476007338056	0.2125565616700221
13°	0.2249510543438650	0.9743700647852352	0.2308681911255631
14°	0.2419218955996677	0.9702957262759965	0.2493280028431807
15°	0.2588190451025208	0.9659258262890683	0.2679491924311227
16°	0.2756373558169992	0.9612616959383189	0.2867453857588079
17°	0.2923717047227367	0.9563047559630355	0.3057306814586604
18°	0.3090169943749474	0.9510565162951536	0.3249196962329063
19°	0.3255681544571567	0.9455185755993168	0.3443276132896652
20°	0.3420201433256687	0.9396926207859084	0.3639702342662024
21°	0.3583679495453003	0.9335804264972017	0.3838640350354158
22°	0.3746065934159120	0.9271838545667874	0.4040262258351568
23°	0.3907311284892738	0.9205048534524403	0.4244748162096047
24°	0.4067366430758002	0.9135454576426009	0.4452286853085362
25°	0.4226182617406994	0.9063077870366500	0.4663076581549986
26°	0.4383711467890774	0.8987940462991670	0.4877325885658614
27°	0.4539904997395468	0.8910065241883679	0.5095254494944288
28°	0.4694715627858908	0.8829475928589269	0.5317094316614787
29°	0.4848096202463370	0.8746197071393958	0.5543090514527689
30°	0.5000000000000000	0.8660254037844386	0.5773502691896258
31°	0.5150380749100542	0.8571673007021123	0.6008606190275604
32°	0.5299192642332050	0.8480480961564260	0.6248693519093275
33°	0.5446390350150271	0.8386705679454240	0.6494075931975106
34°	0.5591929034707468	0.8290375725550417	0.6745085168424266
35°	0.5735764363510461	0.8191520442889918	0.7002075382097098
36°	0.5877852522924731	0.8090169943749474	0.7265425280053609
37°	0.6018150231520483	0.7986355100472928	0.7535540501027942
38°	0.6156614753256583	0.7880107536067220	0.7812856265067174
39°	0.6293203910498375	0.7771459614569709	0.8097840331950071
40°	0.6427876096865393	0.7660444431189780	0.8390996311772800
41°	0.6560590289905073	0.7547095802227720	0.8692867378162267
42°	0.6691306063588582	0.7431448254773942	0.9004040442978399
43°	0.6819983600624985	0.7313537016191705	0.9325150861376617
44°	0.6946583704589973	0.7193398003386511	0.9656887748070740
45°	0.7071067811865475	0.7071067811865475	1

The End

Normal Alchemy

Soumadeep Ghosh

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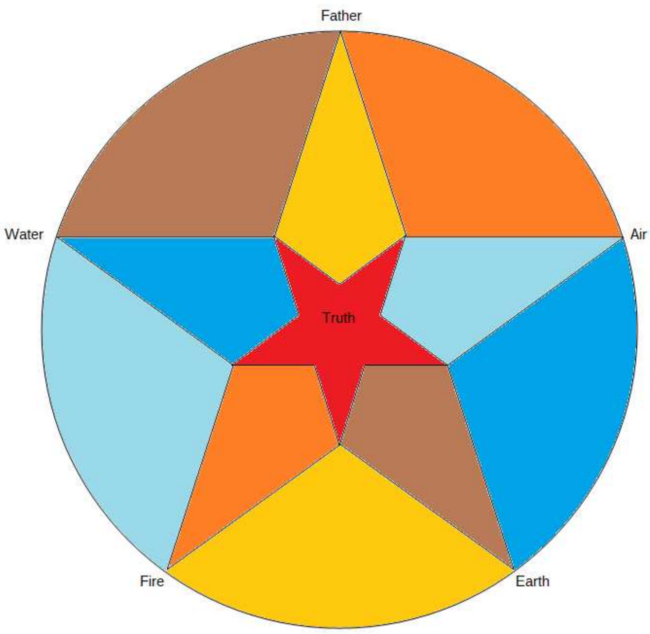
Abstract

In this paper, for the benefit of all economies, I describe Normal Alchemy.
The paper ends with "The End"

Normal Alchemy



The End