Digital Tools for Finance

Semester project

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1   Equations

Here is a list of important equations taken from the the book "17 Equations that changed the world"

- Pythagoras's equation: $a^2 + b^2 = c^2$

- Logarithms: $\log(ab) = \log(a) + \log(b)$

- Calculus: $\frac{df}{dt} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

- Law of Gravity: $F = G \frac{m_1 m_2}{r^2}$

- Square root of minus one: $i^2 = -1$

- Eulers Formula for Polyhedra: $V - E + F = 2$

- Normal Distribution: $\Phi(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$

- Wave Equation: $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$

- Fourier Transform: $f(\omega) = \int_{-\infty}^{\infty} f(x) e^{-2\pi i x \omega} dx$

- Navier-Stokes Equation: $\rho \left(\frac{\partial v}{\partial t} + v \cdot \nabla v \right) = -\nabla p + \nabla \cdot T + f$

- Maxwell's Equations: $\nabla \cdot E = 0, \nabla \cdot H = 0, \nabla \times E = -\frac{1}{c} \frac{\partial H}{\partial t}, \nabla \times H = \frac{1}{c} \frac{\partial F}{\partial t}$

- Second Law of Thermodynamics: $dS \geq 0$

- Relativity: $E = mc^2$

- Schrodinger's Equation: $i\hbar \frac{\partial}{\partial t} \Phi = H\Phi$

- Information Theory: $H = -\sum p(x) \log(p(x))$

- Chaos Theory: $x_{t+1} = kx_t(1 - x_t)$

- Black-Scholes Equation: $\frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS \frac{\partial V}{\partial S} + \frac{\partial V}{\partial t} - rV = 0$