QUANT INSTI™ GO ALGO
Pioneer Institute in Algo Trading

InteractiveBrokers

About the Speaker

Rajib Ranjan Borah

Co-Founder & Director - QuantInsti™

Rajib manages the course segment on option derivatives; and also works with exchanges, financial & educational institutions to design educational programs. He has conducted workshops and conferences in America, Europe and Asia.

Rajib has worked with leading HFT firm Optiver in Amsterdam; working on options derivatives market making, & high frequency equity arbitrage strategies across all major European & US exchanges. Before Optiver, Rajib was a management strategy consultant with PricewaterhouseCoopers where he assisted a consortium in setting up a national commodity derivatives exchange.

A national Olympiad finalist, Rajib has twice represented India at the World Puzzle Championships. He has a post-graduate management degree from Indian Institute of Management Calcutta, a bachelor's degree in Computer Engineering from National Institute of Technology Surathkal; and has internship experiences with Bloomberg in New York (equity option derivatives research) & with Solutia's EMEA strategy HQ in Belgium.

Delta

- Price of option from Black Scholes formula

$$C_t = SN(d_1) - Xe^{-rt}N(d_2)$$

- Delta = ∂C/∂S or ½(∂C/∂S- + ∂C/∂S+) to be more precise

  = N(d1)

$$d_1 = \frac{\ln(\frac{S_t}{X}) + (r + \frac{\sigma^2}{2})t}{\sigma\sqrt{t}}$$

$$N(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{z^2}{2}} dz$$

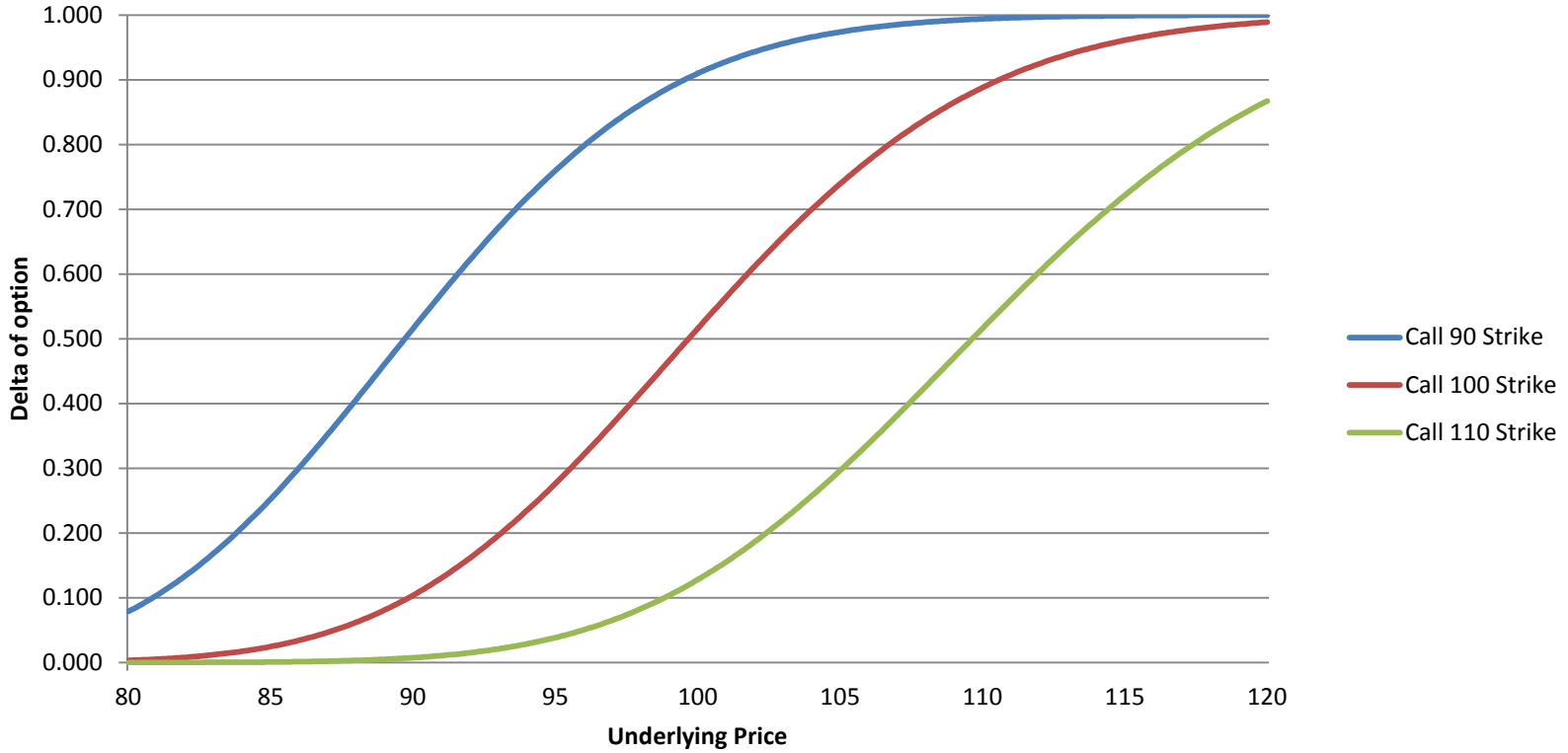
Delta

i.e. Delta is dependent on:

- underlying price,
- time to expiry
- volatility

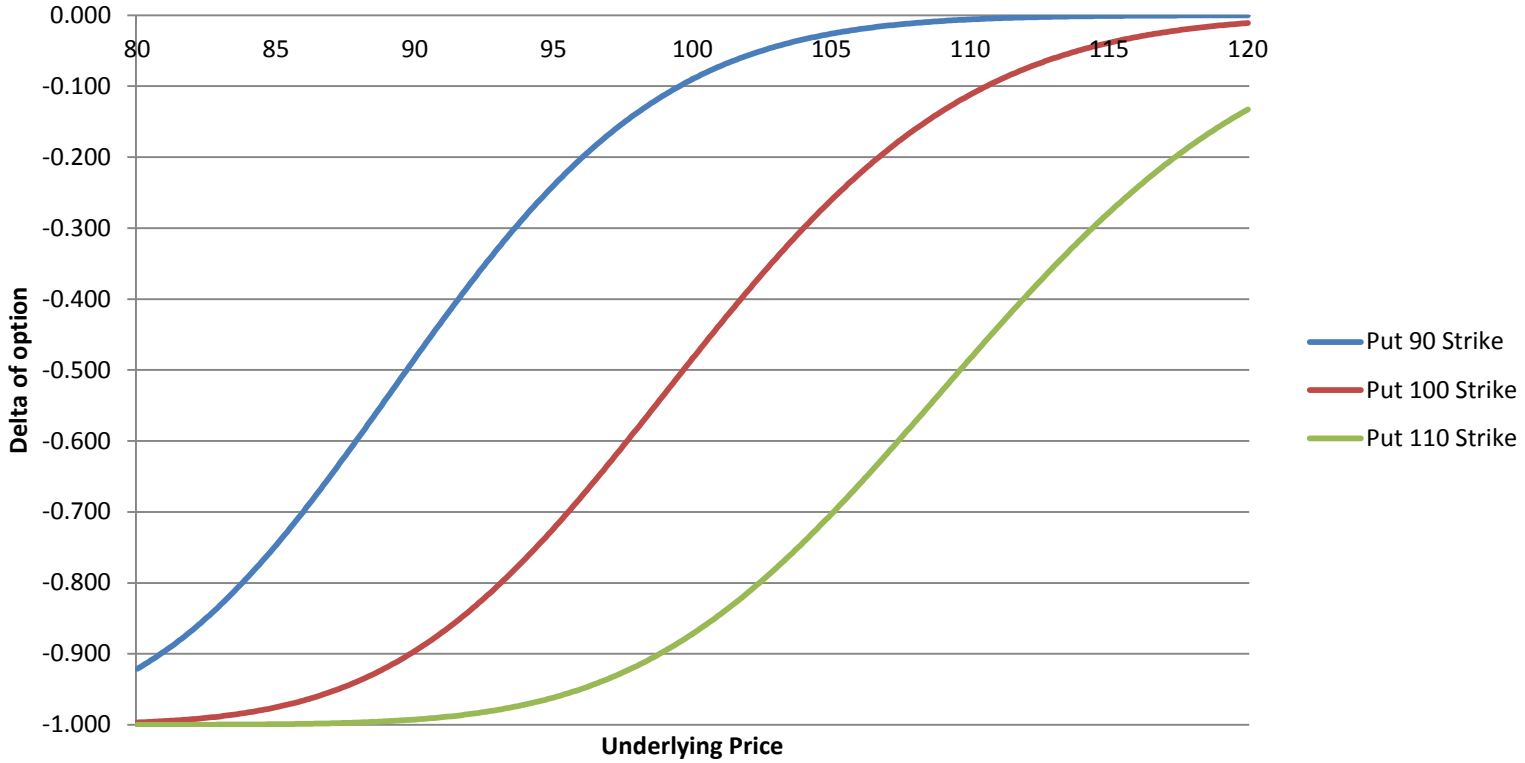
Gamma: Delta vs Underlying Price

- Call Delta vs Underlying Price



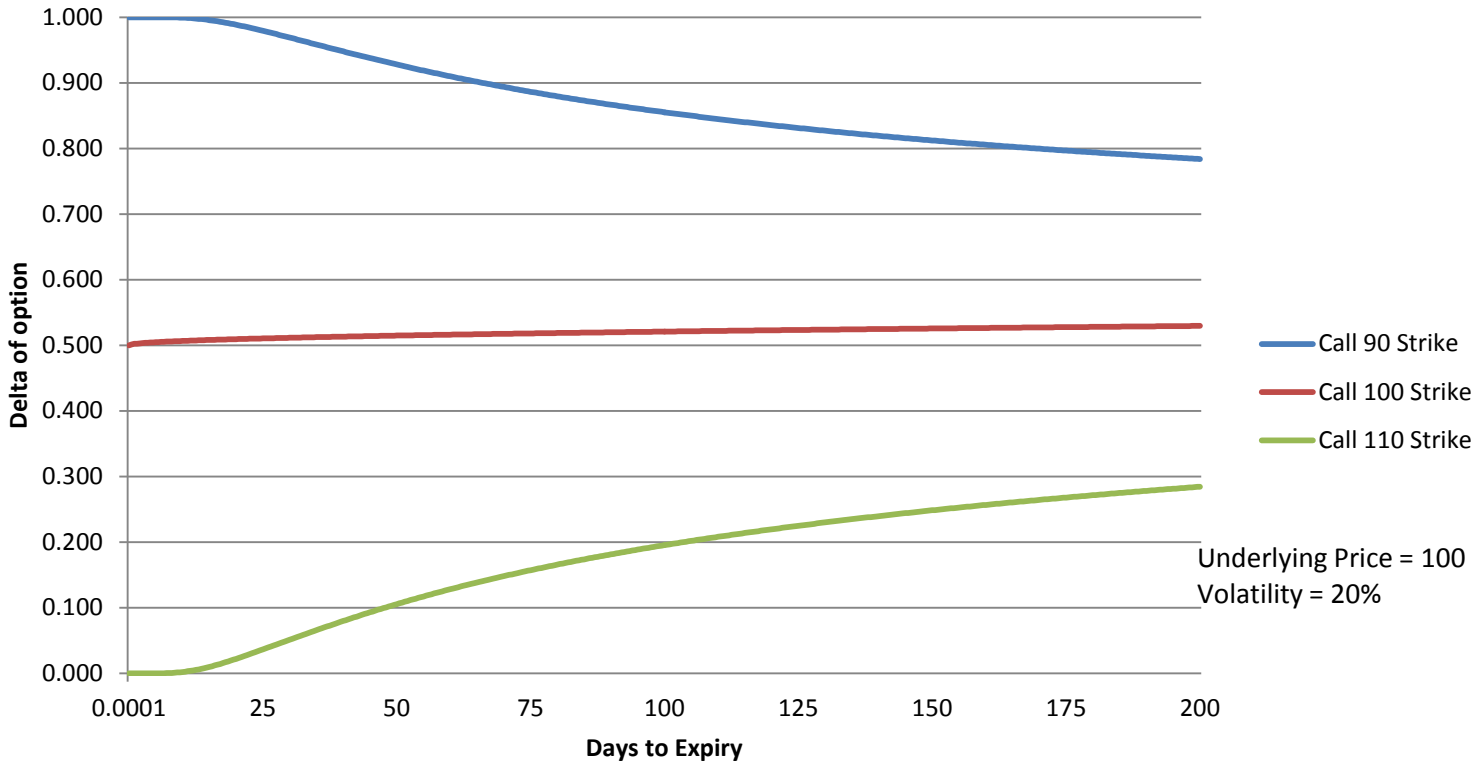
Gamma: Delta vs Underlying Price

- Put Delta vs Underlying Price



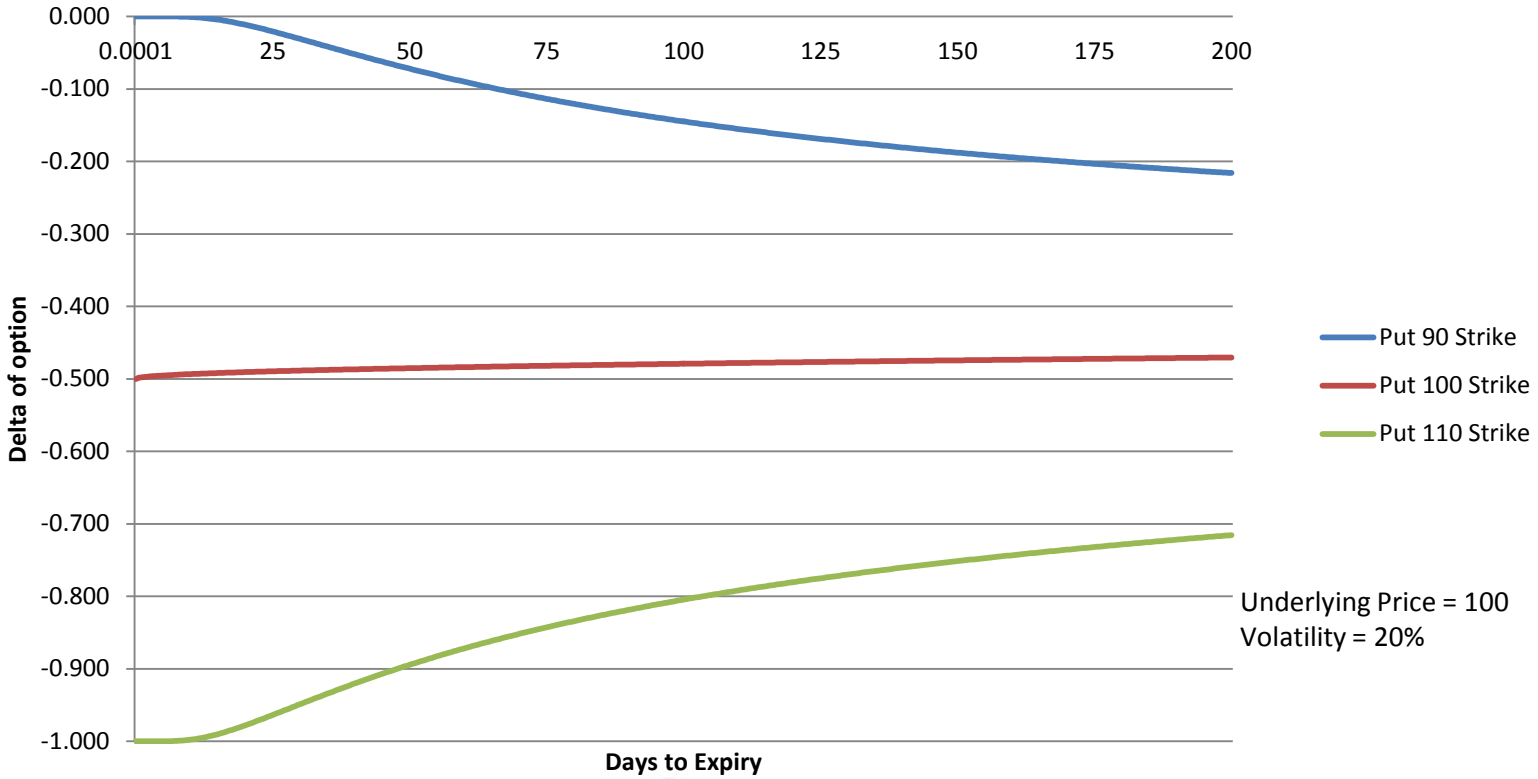
Charm: Delta vs Time

- Call Delta vs Time left to expiry



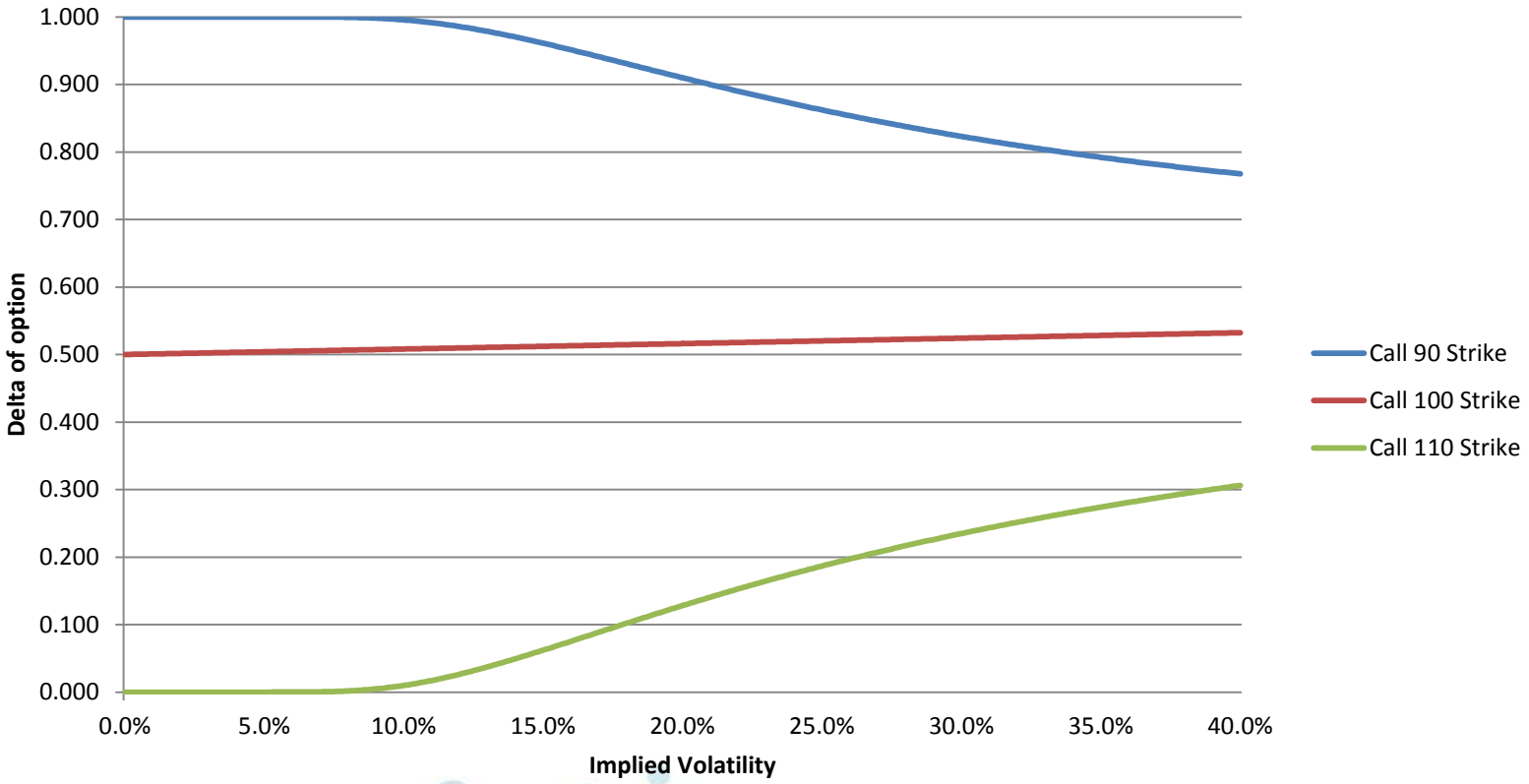
Charm: Delta vs Time

- Put Delta vs Time left to expiry



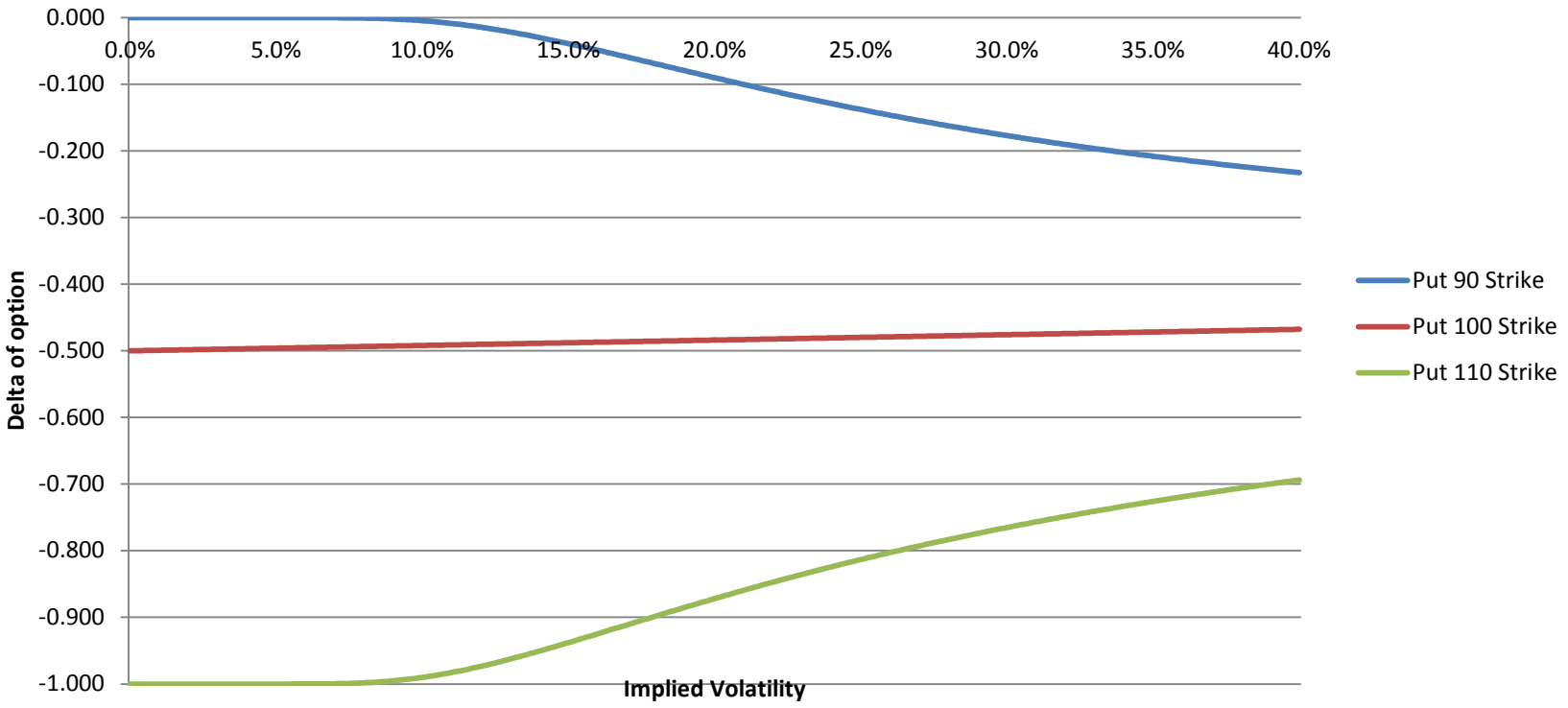
Vanna: Delta vs Volatility

- Call Delta vs Volatility



Vanna: Delta vs Volatility

- Put Delta vs Volatility



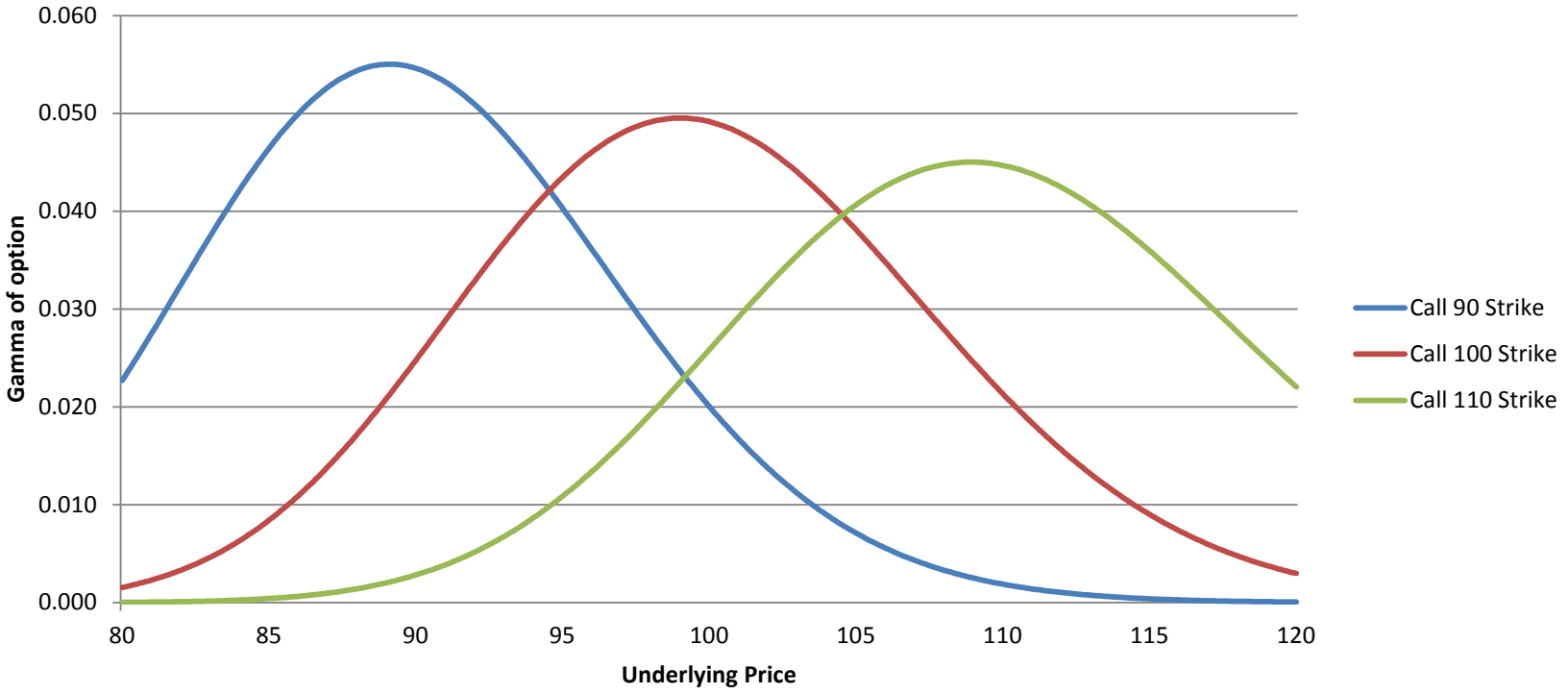
Gamma

- As we have seen, deltas change with underlying price (more so towards expiry)
- Gamma is the second derivative of the change of option price with respect to change in underlying price

$$= \partial 2C/\partial S2 = \partial \Delta/\partial S = N'(h)/ (S\sigma\sqrt{t})$$

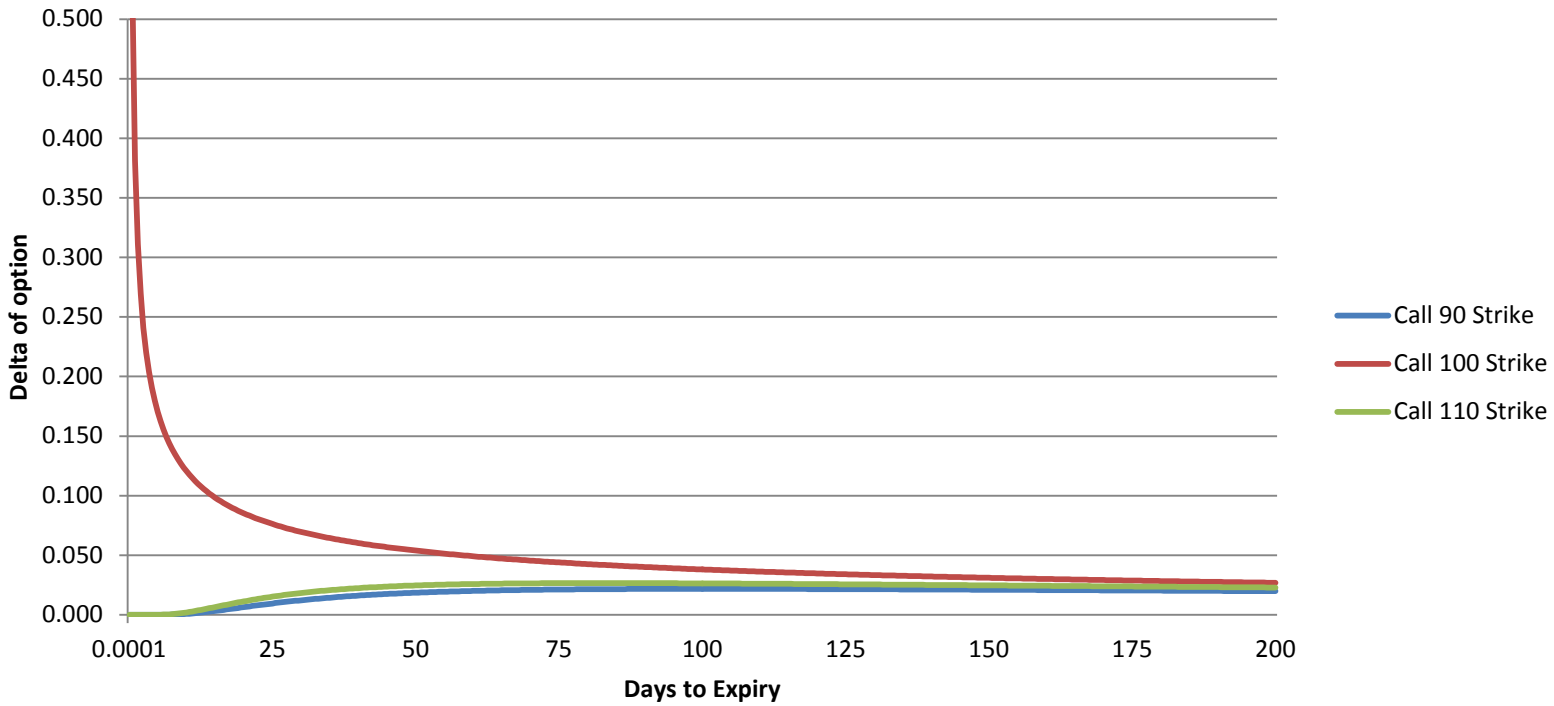
Speed: Gamma vs Price of Underlying

- Gamma vs Price of Underlying



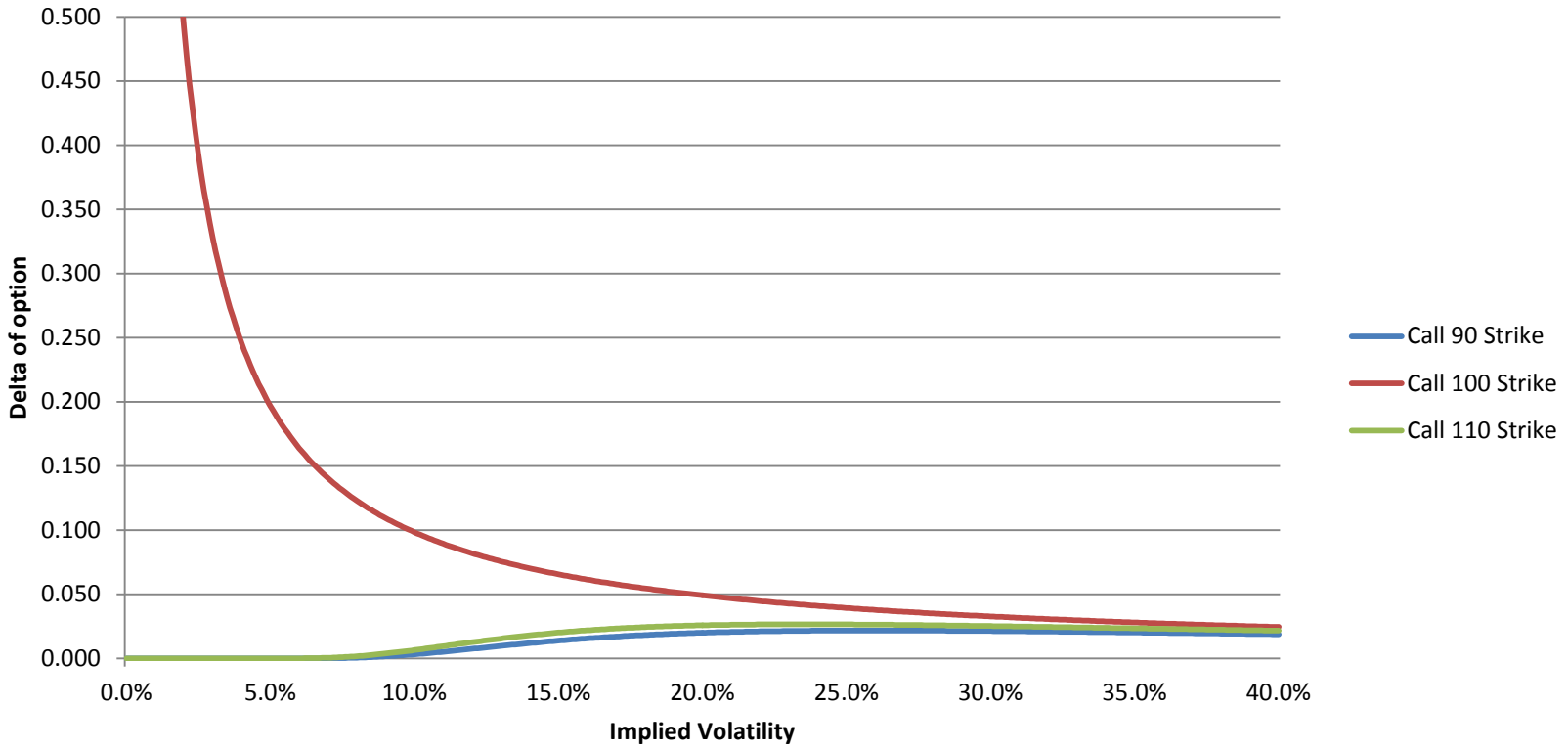
Color: Gamma vs Time

- Gamma vs Time



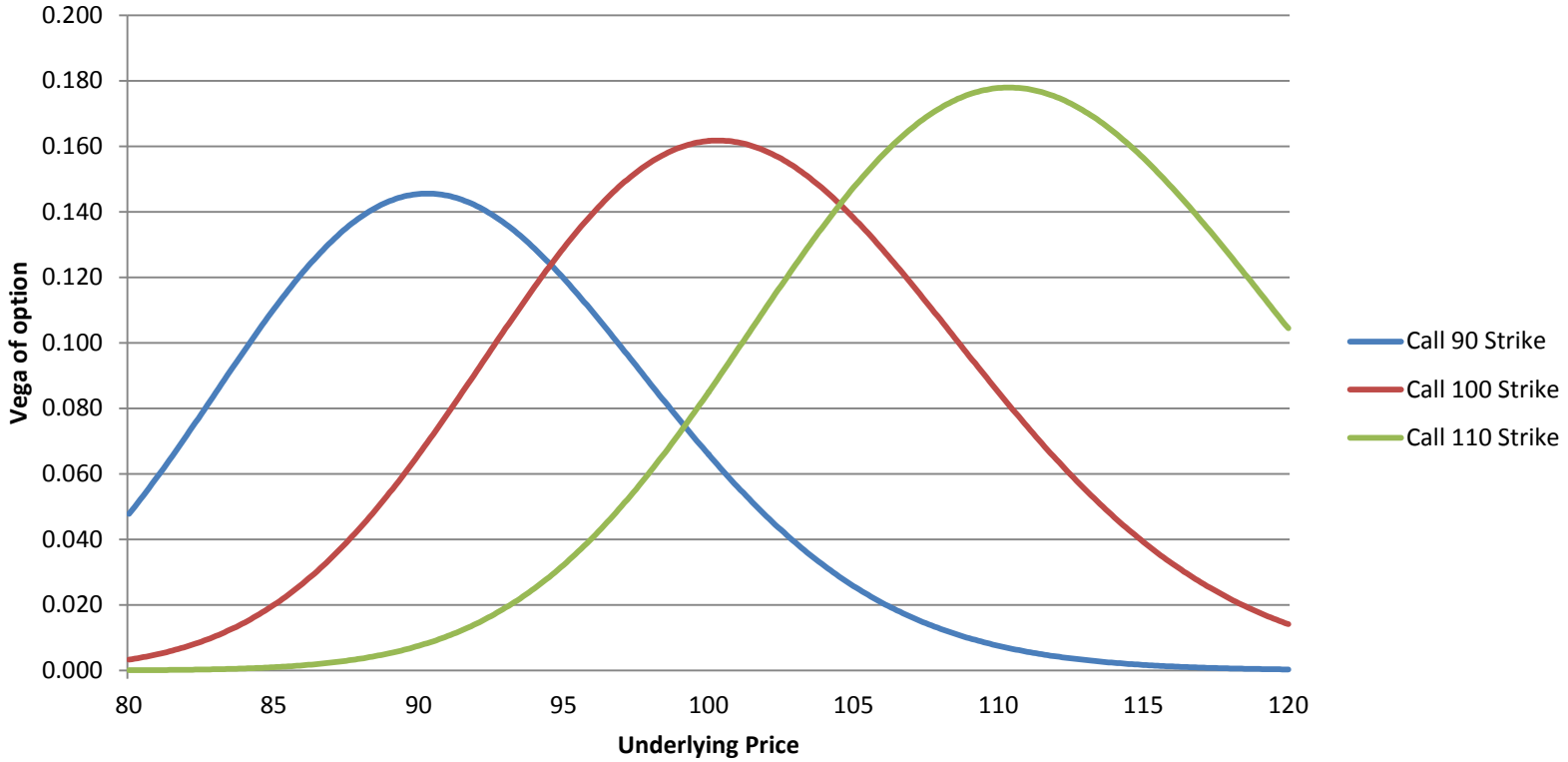
Zomma: Gamma vs Volatility

- Gamma vs Volatility



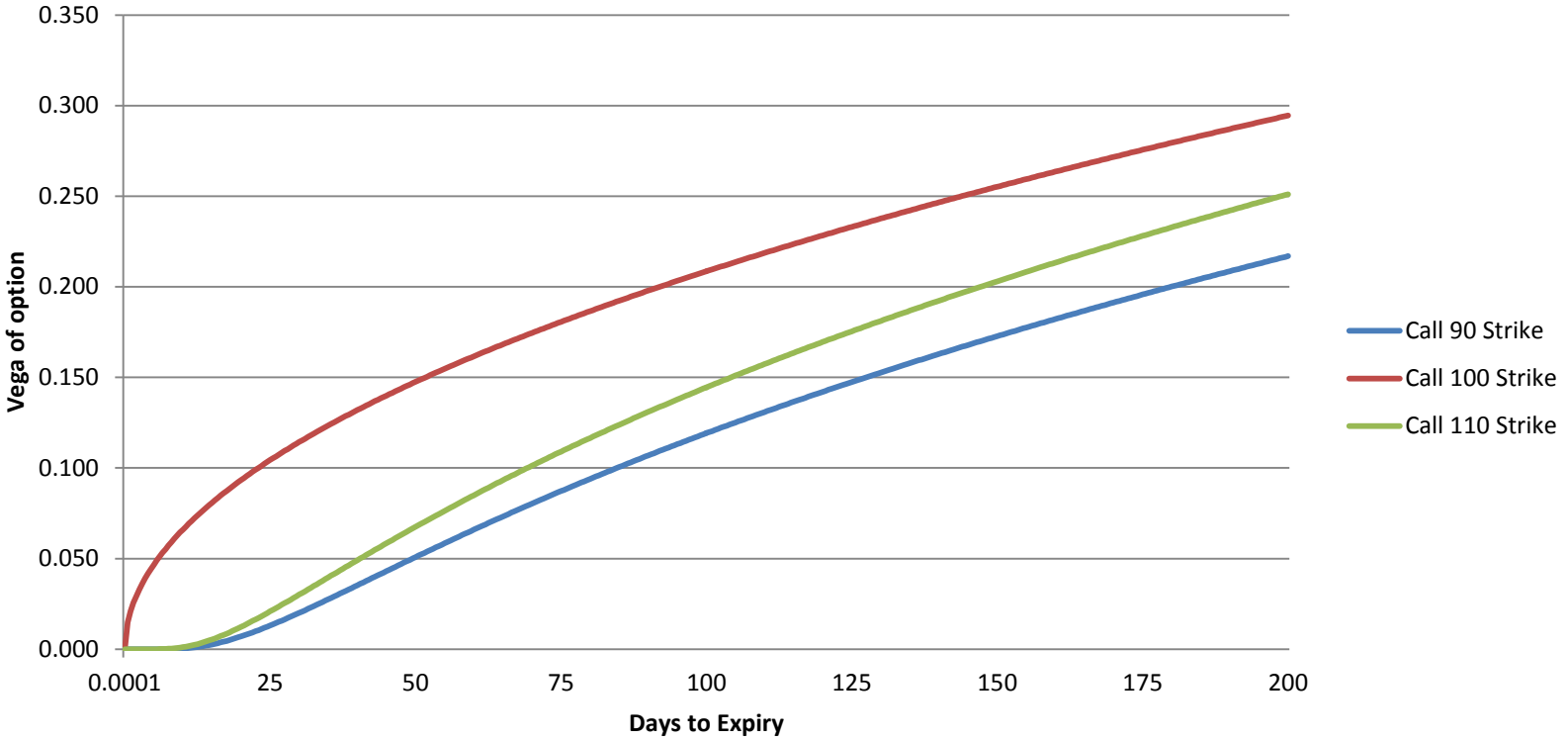
Vanna: Vega vs Underlying Price

- Vega at different strikes



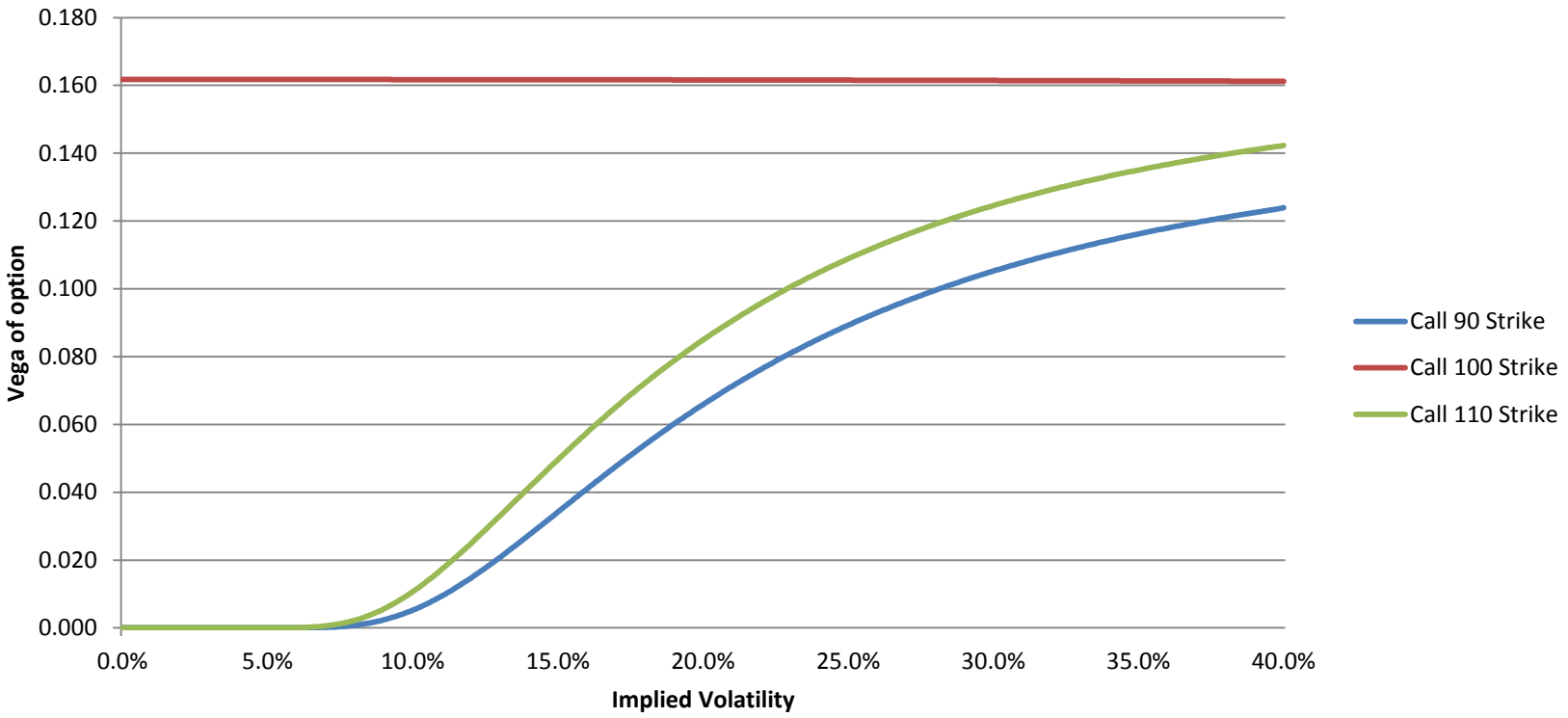
Veta: Vega vs Time

- Vega of an option with varying time left to expiry



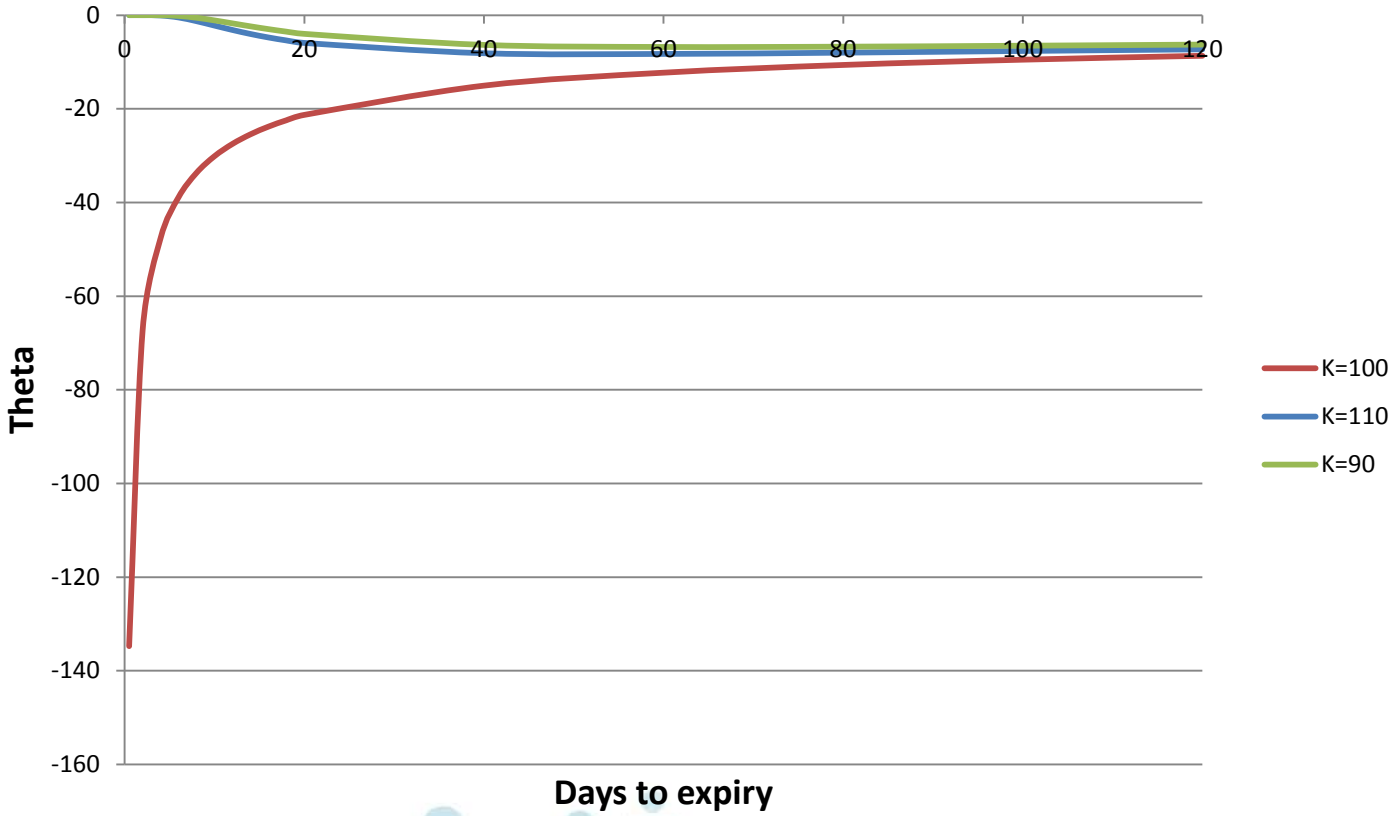
Vomma: Vega vs Volatility

- Sensitivity to volatility is sensitive to volatility itself



Thega: Theta v/s Time to expiration

- Theta with changing time to expiry



TAKE THE NEXT STEP WITH EPAT™

Over **10000 professionals** from **100+ countries** have benefited from QuantInsti's educational initiatives.

Enroll for EPAT™ and become a **Successful Algo Trader**!

For more information visit us on:

https://www.quantinsti.com/epat/

or Call us on

+91-22-6169-1400 / +91-9920-44-88-77

Next Batch Starts from October 28, 2017!

Grab the early bird discount before

September 17, 2017

Questions?