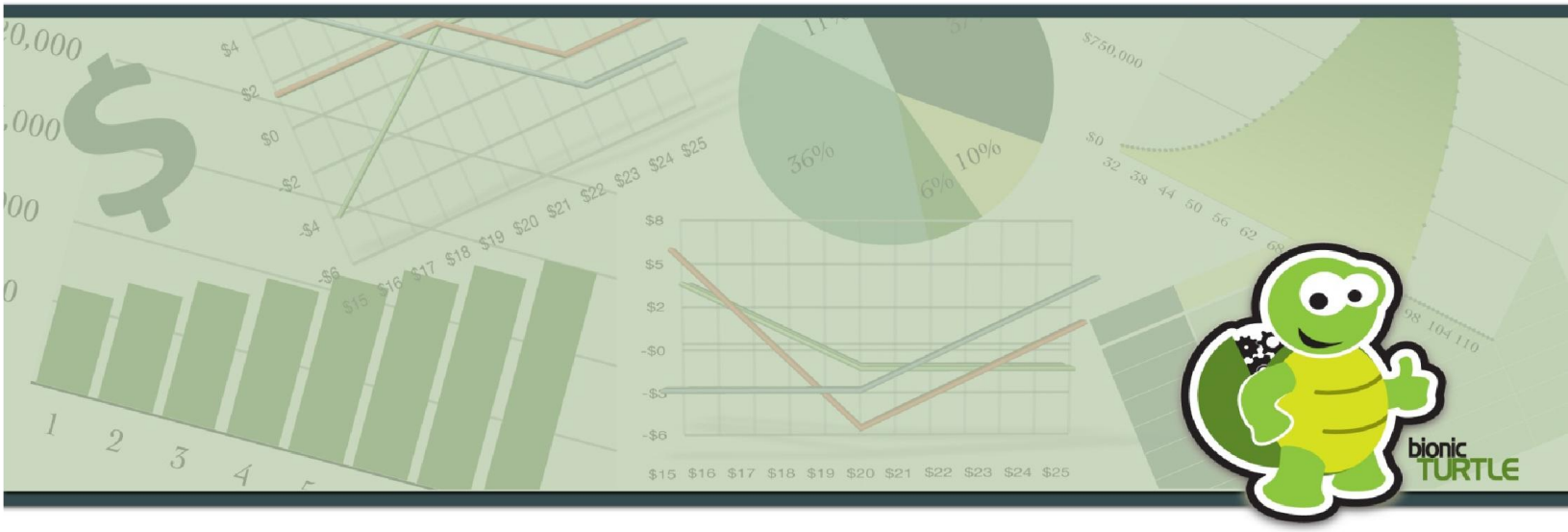

P2.T5. Market Risk Measurement & Management

Bionic Turtle FRM Practice Questions Sample

Hull, Options, Futures & Other Derivatives

By David Harper, CFA FRM CIPM
www.bionicturtle.com

HULL, CHAPTER 20: VOLATILITY SMILES

Hull, Chapter 20: Volatility Smiles

P2.T5.409. Implied volatility smile

AIMs: Define volatility smile and volatility skew. Explain the implications of put-call parity on the implied volatility of call and put options. Compare the shape of the volatility smile (or skew) to the shape of the implied distribution of the underlying asset price and to the pricing of options on the underlying asset.

409.1. In regard to the relationship, if any, between Greek vega and implied volatility, which of the following is **TRUE**?

a) If the implied volatility smile is a perfectly flat, horizontal line (a "volatility stoic," so to speak), then an increase in strike price has no effect on the option's price
b) If the implied volatility smile is a perfectly flat, horizontal line (a "volatility stoic," so to speak), then Greek vega is zero
c) Vega is the first derivative of the implied volatility smiles; i.e., it plots the slopes of lines tangent to the implied volatility plot
d) If we assume it utilizes the Black-Scholes (BSM) option-pricing model, Greek vega is always positive and highest for an at-the-money (ATM) option, but these properties neither predict, nor necessarily inform, any particular shape of the corresponding option's implied volatility smile; these properties allows for a skew, smirk, frown, or other implied volatility shape

409.2. Jerry the analyst estimates a stock's current volatility is 34.0% per annum. Using this as an input to price a European call option on the stock, the output price of the Black-Scholes-Merton (BSM) model is $6.95. However, the market price of the call option is $7.23. He prices a European put option (on the same stock) with the same strike price and maturity and the BSM model price output is $5.12. Which is **NEAREST** to the likely market price of the put option?

a) $4.84
b) $5.12
c) $5.29
d) $5.40

409.3. Sally the Risk Market Analyst calculated implied volatilities based on call options for Google's traded equity. As it turns out, the shape of the corresponding implied volatility skew is somewhat typical of equity options; i.e., downward sloping per decreasing implied volatility as a function of increasing strike price. She draws the following conclusions:

I. The implied distribution of Google's stock price has negative skew and negative excess kurtosis
II. For identical maturities, an in-the-money call (ITM call) option on Google's stock is more expensive than an out-of-the-money put (OTM put) option
III. Compared to the normal distribution, the implied distribution of Google's stock price has a lighter left tail
IV. Compared to the lognormal distribution, the implied distribution of Google's stock price has a lighter right tail

Which of her above conclusions is necessarily **TRUE**?

a) None
b) I. only
c) IV. only
d) II. and III only

Answers:

409.1. D. True: If we assume it utilizes the Black-Scholes (BSM) option-pricing model, Greek vega is always positive and highest for an at-the-money (ATM) option, but these properties neither predict, nor necessarily inform, any particular shape of the corresponding option's implied volatility smile; these properties allows for a skew, smirk, frown, or other implied volatility shape.

- **A vega plot, based on BSM, is a model-based first partial derivative;** but implied volatility is determined by market-price (and the BSM model) such that shifts in supply/demand can alter the shape of the implied volatility smile.
- **In regard to (A), (B) and (C),** each is FALSE.

409.2. D. $5.40. Because c(BSM) - c(M) = p(BSM) - p(M), it follows that p(M) = p(BSM) - [c(BSM) - c(M)] = $5.12 - [$6.95 - $7.23] = $5.12 + 0.28 = $5.40;
i.e., the market price is $0.28 higher for the call (compared to BSM output), such that per put-call parity, it should also be $0.28 higher (than $5.12) for the put with identical strike and maturity

409.3. C. IV. only is true: (I), (II), and (III) are not necessarily true.

Discuss at: https://www.bionicturtle.com/forum/threads/p2-t5-409-implied-volatility-smile.7568/