

Math 456: Topics in Financial Mathematics
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FINAL PROJECT

Choose a publicly traded company that offers a dividend and let XYZ be its common stock. One of the stocks listed among the Standard and Poors 100 (S&P100) is a good choice as these are heavily traded with widely published data.

Use US Treasury T-Bill discount rates to estimate riskless returns.

Analyze contingent claims on XYZ in various ways:

1. Find the implied volatility $\sigma(K,T)$ of XYZ using options at various near-the-money strike prices K and near-future expiry dates T . Justify your choice of options. Use both CRR and Black-Scholes pricing models and compare the results. Also compare your results to published implied volatilities and comment on any differences. Plot the implied volatility surface $\sigma(K,T)$ for your results.

2. Choose a time to expiry T that includes at least two dividend payments expected to equal the most recent. Use the CRR model for American-style options with dividend to price Call and Put options with expiry T at various near-the-money strike prices. What volatility should be used? How do your prices compare with the market prices for these options? How would your prices change if the second dividend was 20% higher than the first?

3. Choose a time to expiry T that contains no expected dividends. Construct an implied binomial tree from the spot price and at least five near-the-money Call option premiums on XYZ with expiry T . Use it to price five near-the-money Put options on XYZ with the same expiry T . Compare your results with the market prices of those Puts and also with the values given by the Call-Put parity formula.

Submit your work electronically. Cite any software that you use. Show any software that you write. Your work will be judged for its clarity as well as for its completeness.